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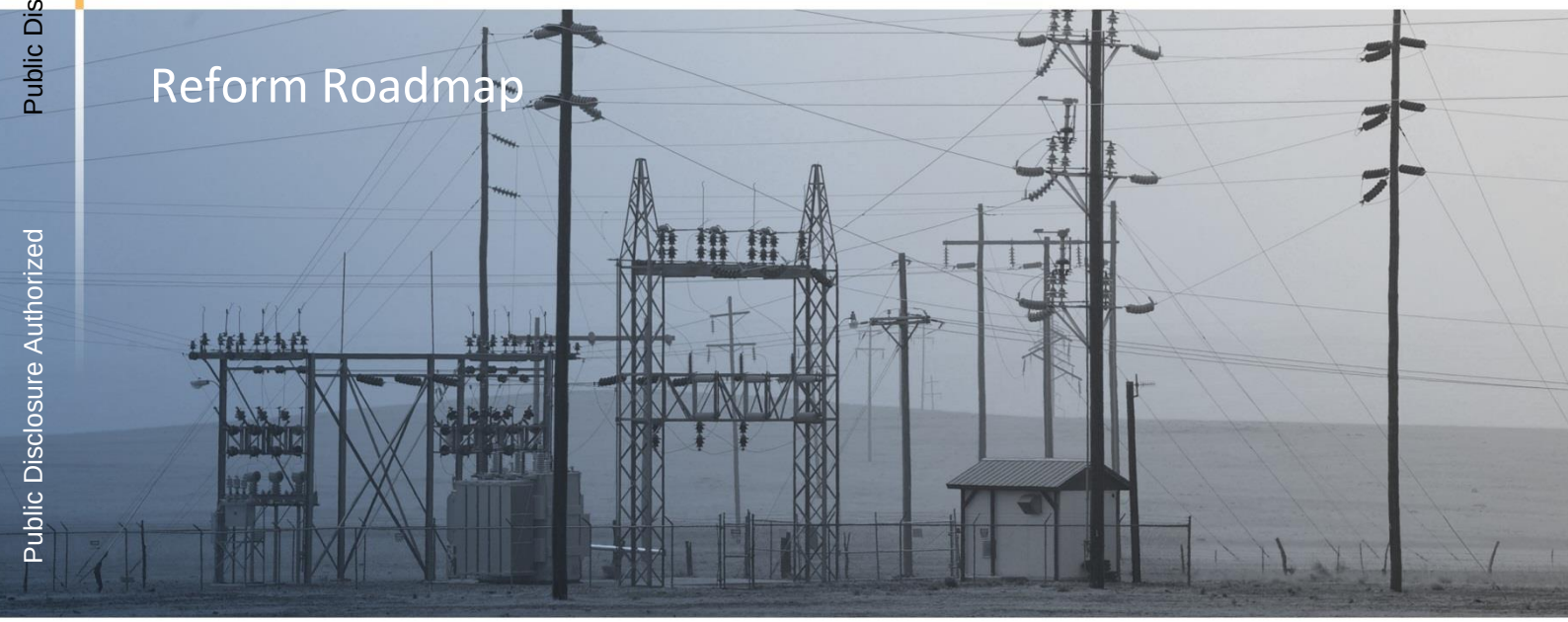

Development of a Reform Roadmap for the Electricity Distribution Sector in Iraq

Prepared for:

Ministry of Electricity & World Bank (PPIAF)

Prepared by:

CPCS

In Association with:

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Solutions for growing economies

CPCS Ref: 13357
February 25, 2015

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April 30, 2015 CPCS Ref: 13357

Republic of Iraq
Ministry of Electricity
Attention: Deputy Minister for Distribution Office
Mr. Nafea Abdula Sada

Re: Development of Reform Road Map for the Electricity Distribution Sector in Iraq

Subject: Reform Roadmap

Please find attached the Reform Roadmap Report, the fourth and final deliverable under the Development of Reform Road Map for the Electricity Distribution Sector in Iraq project.

This Report builds on the previous reports, namely the Sector Assessment, Benchmarking and Reform Recommendations report (Draft Reform Roadmap), along with collaboration and feedback from the Ministry of Electricity, World Bank and other Stakeholders. This report brings together discussions held in Istanbul, Beirut and two separate consultations in Baghdad between CPCS, the Ministry of Electricity and the World Bank. From the consultations recently in Baghdad, we outline a general timeline for reform measures and supplementary "order of magnitude" investment program.

We trust these findings will assist the Ministry of Electricity in developing a better understanding of measures needed to reform its Distribution sector and the power sector as a whole.

Yours very truly,

CPCS Transcom International Limited

Cezley Sampson
Project Manager

Acknowledgements

CPCS would like to acknowledge the kind assistance provided by the staff of the World Bank to its consultancy team which visited Baghdad in early December 2013, Istanbul in April, 2014, Beirut in December, 2014 and Baghdad in April, 2015. In addition we wish to thank the officials in the Ministry of Electricity who gave so generously of their time and shared with us their insights into the future reform of Iraq's Electricity distribution sector. Any errors of fact or interpretation are ours.

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Acronyms/Abbreviations

ATC&C	Average Technical Commercial and Collection losses
EAT	Electricity Appeals Tribunal
EDRIP	Electricity Distribution Reform and Investment Project
EE	Energy Efficiency
ESI	Electricity Supply Industry
ESMAP	Energy Sector Management Assistance Program (WB)
FSA	Fuel Supply Agreement
GGFRI	Global Gas Flaring Reduction Initiative (WB)
GAP	Governance Action Plan
GDP	Gross Domestic Product
GoI	Government of Iraq
IBRD	International Bank for Reconstruction and Development
IEA	International Energy Agency
IEPHC	Iraq Electricity Power Holding Company
IERC	Iraq Electricity Regulatory Commission
INES	The Iraq's Integrated National Energy Strategy
IPD	Independent Power Distributors
IPO	Initial Public Offering
IPPs	Independent Power Producers
ISP	Independent System Operator
LV	Low Voltage
KPIs	Key Performance Indicators
KRG	Kurdistan Regional Government
MO	Market Operator

MoE	Ministry of Electricity
MoF	Ministry of Finance
MoO	Ministry of Oil
MW	Mega watt
NGO	Non-Governmental Organisation
PMAC	Prime Minister's Advisory Commission
PPA	Power Purchase Agreement
PSP	Private Sector Participation
PPP	Public Private Partnership
PPIAF	Public-Private Infrastructure Advisory Facility (WB)
RE	Renewable Energy
SCADA	Supervisory Control and Data Acquisition
SO	System Operator
SOE	State Owned Enterprise
TSP	Transmission Service Provider
UNDP	United Nations Development Program
USAID	United States Agency for International Development
USO	Universal Service Obligation
WB	World Bank

Definitions of Institutional Reform Terminologies

The following terms are used not only in this Inception Report but will also be used to denote the major institutional reforms which will be outlined in the later chapters.

Commercialization – The utility is run as a commercial business, with tariffs that, at minimum, meet the cost of service or preferably provide a return on capital employed (or other economic measure) in order to help fund investment. Commercialisations often taken to involve setting prices to meet long run marginal cost.

Corporatization – A legal institutional/ management structure which involves the enterprise being incorporated as limited liability Company under the national Companies Act or incorporated as a statutory enterprise by Act of Parliament or Decree. The enterprise carries its own distinct legal personality from central government ministerial structure and can be sued or sue in its own right. The main focus of the new structure is to provide for managerial independence in respect of day-to-day operation of the enterprise so that the enterprise is in a position to pursue commercial objectives.

Privatization – Majority ownership of the enterprise is transferred from the government to the private sector. The private owners are responsible for operating the enterprise commercially and to meet its major investment requirements.

Unbundling – Unbundling can be referred to at two levels.

- At the first level the ministerial responsibility covering service delivery, regulation and policy formulation is unbundled with service delivery assigned to commercially operated enterprises or to the private sector, regulation is assigned to an independent regulator outside the ministerial hierarchal structure and the ministry is then left with responsible for policy formulation, legislative matters and performance supervision.
- At the second level the vertically and horizontally integrated enterprise is first unbundled vertically –electricity is unbundled into generation, transmission, distribution/retail business followed by vertical unbundling – generation and distribution is vertically unbundled into several competing business.

Independent Regulation – A separate regulatory agency, often referred to as a Commission, Authority or Office is institutionalised, preferable by Act of Parliament or decree outside the hierarchical structure of the sector ministry and is given independence from the political bureaucracy to set tariff and technical standards.

Executive Summary

Main Components of the Reform and Roadmap

We set out two main components to this Iraq Distribution Reform and Roadmap Project and they encompass:

- A *supplemental* investment program of USD 2.0 billion which complements existing reform and investment plans by the Ministry of Electricity. This supplemental investment program includes plans to physically upgrade, rehabilitate, expand and strengthen the distribution network and to improve its operational efficiencies. The investment program addresses areas not yet envisaged or emphasized as priority by the MoE.
- A policy reform agenda, industry restructuring, institutional, legal, regulatory and governance changes which will transform the Iraq ESI from a civil service departmental enterprise structure and public sector monopoly utility to an unbundled, liberalised, commercially oriented industry, with the necessary environment for major private sector participation, especially in the generation and distribution retail business. Instead of a monopoly market structure the Iraq ESI will transition first to a single buyer market structure and to a competitive wholesale power market over the medium to long term.

Below we set out the case for urgent reform of the Iraq distribution sector and the overall ESI.

Iraq ESI: Urgency for Reform

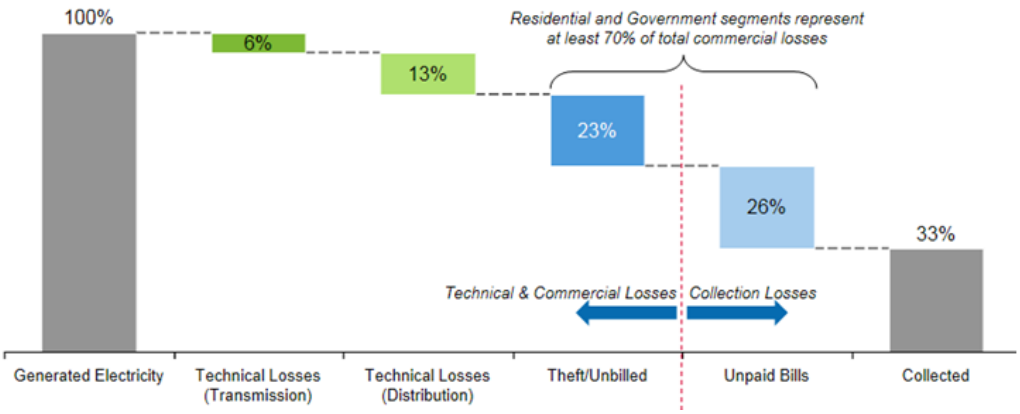
While the reform recommendations within this report focus primarily on the distribution sector of the ESI, the report makes reference to the integrated nature of the ESI and the need for coordination of the reforms in the distribution sector with the reforms and investments in transmission and the generation sectors. The need for reform in the Iraq power sector is at a critical stage. There are concerns about system's ability to provide consistent supply, its operational inefficiencies and significant ATC&C losses. At the same time the Iraq ESI is witnessing one of the highest rates of demand growth in the world, and being capital intensive, takes up a large share of the GoI's capital investment program. The financial burden of the Iraq ESI is further exacerbated because of the huge subsidies needed to cover recurrent expenditure. Tariffs are so low they do not cover 20% of the recurrent expenditure making the subsidy level one of the highest in the world. There is not only a huge fuel and tariff subsidy - the employment of over 50,000 workers in a situation which would normally not require more than 15,000 workers is another major and indirect socioeconomic subsidy.

The power shortages and those inefficiencies are estimated to cost the Iraqi economy around $3 to 4 Billion per year[1]. The Global Energy Architecture Performance Index Report 2014[2] alludes to the negative impact and prevalence of subsides in a region that creates inefficient use of energy resources, along with high cost, and dominance of fossil fuels in the energy mix that results in high CO_2. Iraq incidentally is ranked 98th on the EAPI Performance, with the Iraq GDP growth is the highest in the MENA countries. However, this is negatively impacted by the subsidies and the energy intensively of hydrocarbon production and refining. IMF estimates that 8.5% of MENA regional GDP is spent on subsidies in 2011, highlighting the impact of Iraq and MENA government budget.

These shortages and inefficiencies are creating hardship and negatively affecting the economic development. The current supply situation is exacerbated by deteriorated network conditions due to many years of dis-investment and the absence of adequate maintenance, which has left all three components of the value chain; generation, transmission, and distribution in critically degraded conditions. Due to the inadequacy of the public utility, Iraqis have had to rely on their own or private generation and the estimate is that 90% of Iraq households supplement their grid power need with private generating capacity. In 2012, a related report indicated the total number of private units ranged between 55,000-80,000, with estimated capacity of around 8,000MW.

Further, according to the MoE's reported statistics, nearly 37% of the electricity produced in 2013 was lost, which includes both technical, commercial and administrative losses. This ratio varies by distribution directorate and ranges from 13% in Basrah to 51% in Sadr[2]. Unfortunately, an accurate breakdown of technical versus commercial losses is not available, but the following provides an estimate of losses through the Iraq's ESI:

Losses Components (in % of electricity generated)



Source: Ministry of Electricity Data, Booz & Company analysis, in in Iraq's Integrated National Energy Strategy (2012)

[1] INES – Integrated National Energy Strategy, Booz and Co, 2012.
[2] Global energy Architecture Performance index Report 2014 , World Economic Forum
[2] Ministry of Electricity records, 2013.

There is no mistaking that the Average technical Commercial and Collection (ATC&C) losses in the Iraq ESI are significant. A variety of factors account for these losses within the sector, which must be targeted. Examples of this widespread system breakdown include:

- The estimated transmission and distribution losses are a combined 40-50% in Iraq, and the estimate is that 80-90% of which relate to distribution losses.[3] Inefficient management and operation of the distribution sector are contributors to this issue, including billing, metering, customer service, and an inability to increase system performance.
- While substations are distributed evenly across the country, figures indicate that around 17% of the total capacity is lost. This loss is predominantly the result of a combination of conflicts, lootings, and vandalism and these actions have severely affected the performance and reliability of the entire power system infrastructure in the country. Some substations also have been exposed to accidents that affect their performance, e.g., fire damage affected the 132 kV/33 kV/11 kV Air Insulated Substation in Fallujah in 2006.
- At present, the end-user metering in Iraq is very poor, with a combination of outdated or malfunctioning meters and widespread theft or unmetered connections. Estimates from the MOE indicate unmetered customers are over 160,000 which do not include an estimate of illegal connections or connections with old or faulty meters. Although it is difficult to estimate accurately, the Booz & Company assessment suggested that around 23% of the power supplied is lost to theft via illegal connections to the system.[4] In addition, according to MoE, the majority of the existing end-user meters, around 80%, are more than 30 years old and some of them have never been recalibrated for accuracy purposes.
- The end-user metering reality is compounded by the absence of effective billing and collection systems and procedures, which in turn leads to widespread theft of electricity, lack of invoicing and non-payment,.
- The power sector structure is that of a state-owned vertically integrated monopoly utility similar to that existing prior to the commencement of the reform process in New Zealand and Australia in the mid-1980s. The GOI, through the MOE, is not only the policymaker and regulator, it is also responsible for service delivery of power in the areas of generation, transmission, distribution and retail supply throughout the country (other than the self-governing Kurdistan Region), as well as for system operation, industry planning and project development and implementation. This structure sets up a conflict of roles.
- Given the existing market structure, there is an absence of a supportive regulatory, legal and institutional framework necessary for sector reform.
- There is an absence of a cost reflective tariff and an appropriate tariff methodology such as a Multi-Year Tariff Order (MYTO) tariff, which would allow the industry to move to achieve financial sustainability .
- Although MoE has invested efforts to unify the various directorates nationwide, there is still a wide variation between each of the directorates in terms of capability, expertise and experience. While oversight is provided from the MoE headquarters, there does not

[3] Murthy, K.V.S., and Raju, M., 2009. *Electrical Energy Loss in Rural Distribution Feeders- A Case Study.* ARPN Journal of Engineering and Applied Sciences, 4(2), pp. 33-37.

[4] Booz & Company analysis, in in Iraq's Integrated National Energy Strategy (2012)

appear to be formal structures within the MoE organization to undertake the capacity development needed to meet the directorates' skills and management requirements.

To address this overarching situation and create a platform for economic growth and prosperity for the Iraqi people, extensive reform is required. This reform agenda takes a long-term perspective of the Iraq ESI development, with specific focus on the distribution sector. The vertically integrated nature of the industry means that any reforms proposed for the distribution sector must take account of the whole electricity industry structure. Electricity distribution cannot be considered in isolation.

Iraq is some time away from major private sector participation and the introduction of competition in the wholesale or bulk electricity market (Wholesale Electricity Market {WEM}) phase. However, it is important to lay the foundation for private sector participation, increased competition and the development of new legislative and regulatory frameworks. Any actions taken now must support longer term market liberalisation and not seriously constrain future private sector participation.

Initially the focus should be metering supply, especially to end users, accompanied by an aggressive distribution loss reduction (technical and non-technical) program, improved cash-flow (revenue cycle) management, rehabilitation and improvements to the network capacity and improved asset management and business planning. Standards, specifications and procedures should be introduced and made easily accessible to all staff, followed by staff training and capacity building. Use of standard techniques will facilitate redeployment of staff in the later stages of reform. Robust business systems should be introduced, based around the identified end to end distribution business processes (for example, making a new electricity connection).

General Electricity Policy Goal

GoI has identified short and long term goals in the INES Master Plan and these goals seek to ensure that Iraq develops an ESI that will:

- Meet all current and prospective demands for electricity throughout Iraq;
- Modernise and expand its coverage of the entire ESI, and in particular distribution; and
- Support national economic and social development.

The aim is to ensure an adequate electricity supply for all, at an affordable price. Initially this will be through operational (electrical plant) and non-operational (e.g. IT) investment and efficiency improvements.

Given the attendant technical and commercial constraints confronting the electric utility, GoI has articulated its commitment to, among other things:

- Improving electricity supply, initially through a rehabilitation and investment expansion program, supported by a dedicated medium term financing plan in the form of an Investment Action Plan and Roadmap;
- Repairing and upgrading the system control and communication facilities;
- Strengthening the transmission and distribution network to support a new power market for bulk power.
- Ensuring that all households are connected.

However, relating to the need to move to financial suitability over the long run, CPCS further cautions that electricity industry sector reform is a long term exercise. For example, the Turkish reforms have been ongoing since 1992. Electricity sector reform is not a short term exercise. Sustainable reform requires step changes involving a sound legal framework, supported by well sequenced interventions through all aspects of the system – both physical asset and system investment, as well as reforms in industry structure, market, regulatory and institutional frameworks.

During the later stages of reform, further efficiency improvements can be obtained through private sector participation and the introduction of a competitive wholesale or bulk electricity market, supported by an independent and transparent regulatory framework. The phasing of competition therefore should be first competition for the market for additional generation capacity, followed by product market competition or a competitive bulk electricity market. Transmission and distribution remain a natural monopoly and will of necessity require independent regulation, especially structured around key performance indices (KPIs).

With this context in mind, CPCS outlines the overall objective of the Distribution Sector Reform: to create a sustainable, efficient and viable ESI. To achieve this goal, CPCS has established a framework outlining the reforms sequenced over the short term, medium and long term. A detailed description of this framework is provided below.

Phases of Reform

Below we show the proposed timelines for the introduction of each reform initiative using the three phases:

- pre-transition,
- transition, and
- Long term /wholesale electricity market.

Most of the initiatives that commence in the pre-transition phase continue through the transition phases.

CPCS reiterates that Iraq's electricity industry reform path is multifaceted. No one single reform has the capacity to secure significant improvements to sector efficiency and build a viable, reliable distribution network. A step-change relying on a coordinated and sequenced reform interventions be required to secure lasting and sustainable sector improvements.

The below diagram illustrates the high level process of reform.

Source: CPCS

Pre-Transition Phase

This phase is expected to last from now to approximately 5-10 years. However, it is not time bound but rather milestone bound. The pre-transition phase covers the preparation phase where new legislation, regulatory framework, tariff structure, electricity codes and procedures and institutional and industry arrangements are initiated. In parallel with the institutional reforms, major physical interventions are needed to the network to ensure that peak demand can be met, with a suitable margin in reserve.

Within each Reform Program, a section has been developed which clearly outlines the immediate reform measures which can be initiated by the MoE. These identified immediate action items will create positive reform momentum in the first years of the program and allow for "early wins" by the GoI. This will, in part, foster supportive public perception which is critical to support a long-term reform effort. To illustrate, some key early intervention action items are metering of end use customers and distribution systems loss reduction (technical and non-technical) interventions. Additionally, this should be accompanied by improved revenue cycle management focused interventions to rehabilitate the system and improve network capacity, improved asset management interventions and business planning. Standards, specifications and procedures

should be introduced and made easily accessible to all staff, followed by staff training and capacity building. Use of standard techniques will facilitate redeployment of staff in the later stages of reform. Robust business systems should be introduced, based around the identified end to end distribution business processes (for example, making a new electricity connection).

Modern billing, account collection and customer information systems will be introduced during the early phases of the reform. New processes and systems should be implemented using well-known techniques such as business process re-engineering and total quality management. Systems will need to be compatible with the metering strategy. Particular attention should be paid to systems integration.

Further, there will be the need for operational (electrical plant and infrastructure facilities) and efficiency improvement interventions involving improved IT, communication and commercial management systems.

The period also includes crisis management response to the security situation developing from June 2014. The pre-transition requires a comprehensive platform upon which a competitive bilateral Wholesale Electricity Market can be built over the longer term.

Transition Phase

The transition phase sees the full introduction of the transitional market for the Single buyer market structure. The shift from the transition phase will not be so time specific, but will be based on the industry meeting certain pre-conditions. These include:

- All legislative and regulatory provision and regulatory institutions must be in place;
- The unbundling of the industry and the creation of a new industry structure based on incorporated horizontally unbundled distribution companies;
- At least 70% of the generation and distribution sector should be in private hands;
- ATC&C will need to have been reduced by at least 50 % and the market is approaching financial sustainability;
- At least 50% of customers will have been fully metered;
- Installation of revenue grade interface meters between generation and transmission, transmission and distribution and border meters between discos;
- Cost reflective tariff system in place and unbundled into generation , transmission and retail tariff;
- Lifeline tariff in place for underprivileged and socially deserving consumers;
- Surplus of generating and transmission evacuation capacities above peak demand;
- The Transmission service provider (TSP) function separated from the system/market operation function. This can be achieved initially by ring-fencing before the incorporation of

an Independent system Operator (ISP) as separate legal entity operating independently of TSP;

- Robust contract structure in place, especially (the PPAs, transmission and Vesting contract); and
- All the legacy debt would have been removed from the market.

WEM/Long Term Phase

To enter this long term phase of reform, the Iraq electricity legislation will have provided for the eventual transitioning to a competitive Wholesale Electricity Market, preferably a bilateral contracts market and balancing Pool, as against a mandatory or compulsory Pool. The coming into operation of the WEM will not be time bound but will depend on certain condition precedents: substantial privatisation of generation and distribution businesses, maturity of the market in terms of financial sustainability, transition to cost-reflective tariff, etc. The Iraq Bulk Electricity Trading Company would have been established as the single buyer and could become another spoil trader in the market with no monopoly rights.

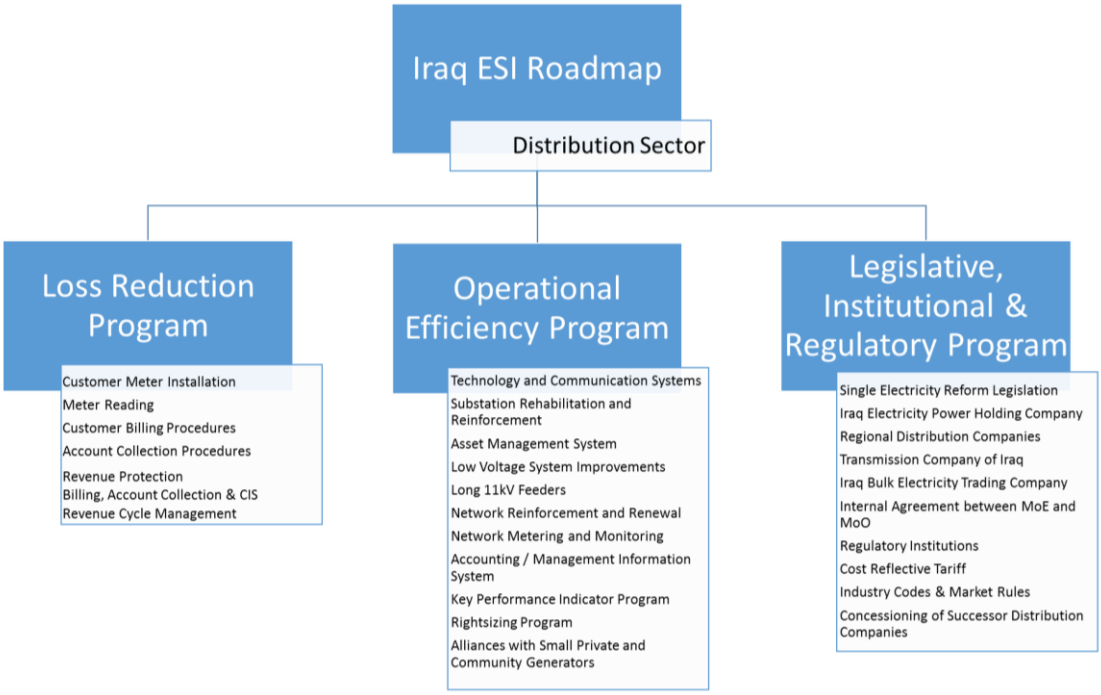
We do not expect the creation of a WEM in Iraq in the early stages of the electricity sector reform; however since it should be the longer term goal, there is the need to ensure that steps being taken in the earlier phases of the reform do not later become impediments to introduction of a WEM.

A framework for the distribution reform recommendations and roadmap is provided below. These recommendations aim to establish and maintain an efficient and viable Electricity Supply Industry. The recommended initiatives have been grouped into three “Basket of Programs” described throughout the report:

- Loss Reduction Program;
- Operational Efficiency Program; and
- Legislative, Institutional, governance and Regulatory Program.

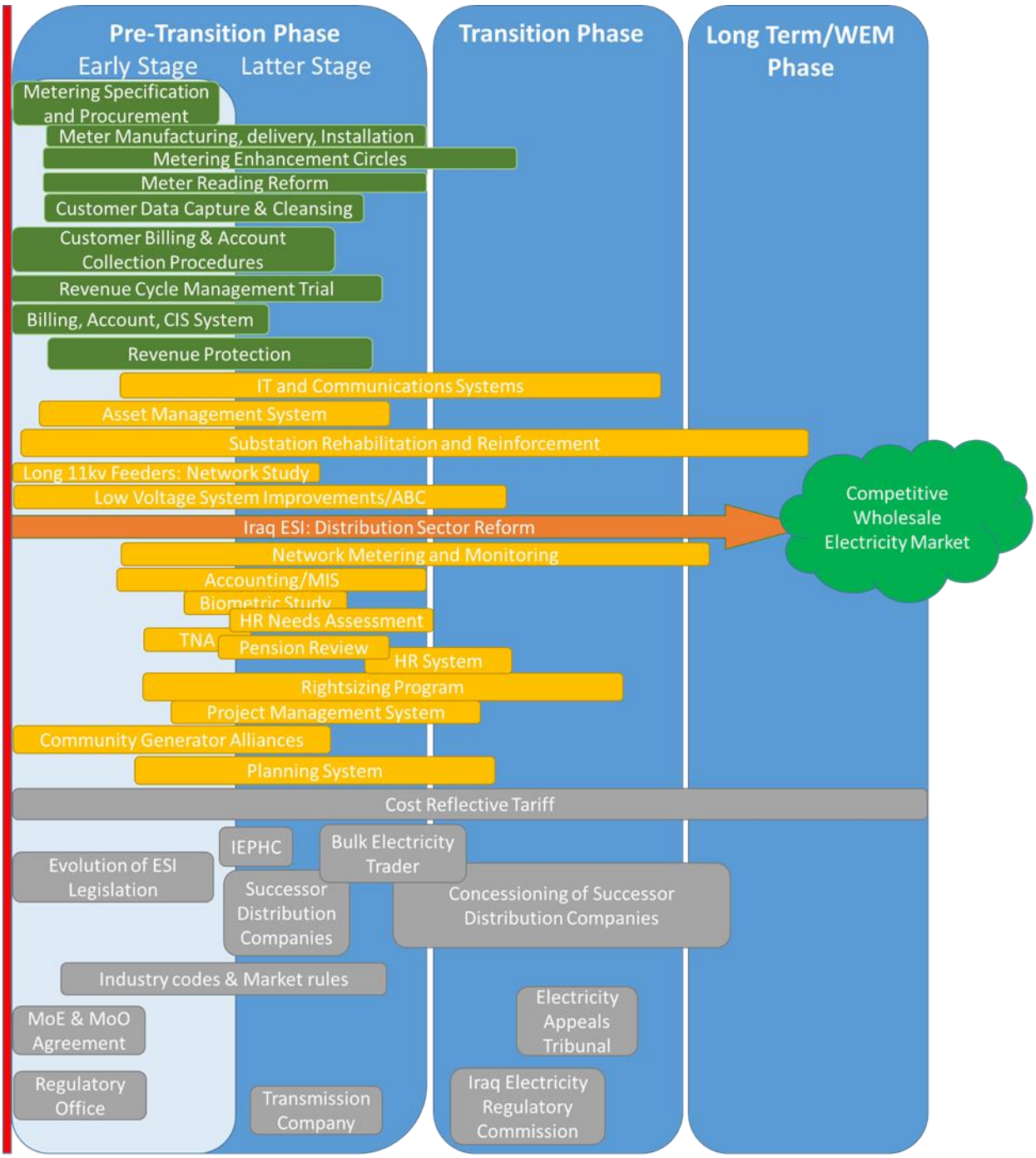
The programs are represented below with associated reform recommendations:

Reform Roadmap and associated Programs



Source: CPCS

Summary of Reform Recommendations, by Reform Phase



Source: CPCS

The red line at the left most side of the figure reflects the "emergence from crisis". The reform recommendations which interconnect with the red line represent the immediate action items which CPCS recommends the MoE engage in. From both a budgetary and overall reform impact perspective, these reform recommendations will provide the largest benefits to sector reform

and can commence with either already earmarked MoE budgets or smaller supplementary budget allocations.

Reform Program Details

Each reform program and its enclosed recommendations are explained in detail within this report, the below provides a summary.

Loss Reduction Program

The aim of this program is to reduce the exceptionally high Aggregate Technical, Commercial and Collection (ATC&C) losses, including theft.

This will be achieved through:

- Eliminating the widespread theft of electricity;
- Enhancing customer metering, billing and revenue collection; and
- Improving cash-flows.

These measures will improve the viability and financial sustainability of the entire ESI as well as the reliability and quality of electricity supply. Loss reduction programs are generally self-financing, with the improvements in losses, collections and efficiency generating a substantial return on the investment made. The increased availability of funds will in turn generate confidence in the other reform programs outlined in the roadmap.

Loss Reduction Program: Urgency

The loss reduction programme represents an easily identifiable piece of work with many international precedents. It aims to improve the entire revenue cycle management process – metering, billing, payment collection and theft prevention. These are at present a source of major concern for Iraq. Ineffective metering, lack of meter reading, poor billing and poor collection contribute to the high commercial losses. In many cases where meters are being regularly read, non-payment is the norm. 80% of existing meters are 30+ years old electro-mechanical devices that have not been calibrated for many years. There are an estimated 3.2 million existing customers and a rapidly expanding number of households requiring an electricity supply. This indicates an urgent need for a continuous program of meter installation, with the objective of all eventually metering all customers. In addition, Information technology for revenue cycle management exhibits serious weaknesses, and this should be addressed as part of the loss reduction program.

Loss Reduction Program: Phasing

CPCS recommends that the Loss Reduction Program is given the highest priority and initiated as soon as possible in the Pre-Transition phase. Major investment should concentrated in the pre-transition phase, continuing at a reduced level through Transition, WEM and beyond.

The reasons are:

- The Loss Reduction Program will immediately improve cash-flows and start to identify areas of greatest weakness with respect to ATC&C losses
- The improved cash-flows will immediately benefit the investment program; and
- The Loss Reduction Program is easily understood, and early success will set the context for more intricate and longer term reforms.

Loss Reduction Program: Reform Recommendations

End-user Metering (Customer Metering)

This provides for a customer meter installation program. This is an important step towards 24 hours a day, 7 days a week supply to all customers in Iraq and will enable timely and accurate billing. This in turn will lead to improved cash-flow, releasing valuable additional resources for investment in other initiatives.

Non-technical losses in Iraq are often related to metering errors, inaccurate meters, improperly read meters and estimated consumption due to lack of meters. A customer metering program will have a significant positive impact on losses and hence better utilisation of the generation, transmission and distribution capacities.

The proposed program consists of 2 million meters, representing approximately 50% of the customer population over an initial five year period. This can be accelerated depending on project management capacity. This will replace a significant number of the old and faulty meters. The complete metering of the whole customer base in Iraq will be achieved in the long term as corporatization and commercialization is introduced into the sector. CPCS recommends that the metering implementation programme should be targeted in areas where the percentage of the population receiving electricity is at its highest and also where losses are at the highest. This will ensure the maximum rate of return on investment.

MoE has indicated that there is a trial Smart metering program of about 100,000 meters. Smart metering will require advanced IT systems and facilitates advanced distribution system management including outage management and in the long term, will help to deliver smart grids.

The following commercial benefits will also be available:

1. Eventual remote application of time of day tariffs;
2. Encouraging demand-side response;

3. Identifying and managing unplanned outages;
4. Customer benefits such as in-home displays;
5. Identifying illegal connections to the system; and
6. Disconnecting individual customers for change of occupier and non-payment of bills.

End-user Meter Reading

This proposed initiative provides a robust and accurate system of meter reading. We strongly recommend the deployment of Hand Held Units (HHU) to capture data and meter readings because they eliminate much of the inaccuracy in the data collection process. The HHU should also include a Global Positioning System (GPS) capability to record the precise location of each meter. The proposal includes "training the trainers" within the existing MOE and Directorate framework. This recommendation is to help cement capacity within the MOE and Directorates relating to these closely integrated loss reduction reform measures.

Customer Billing Procedures

Current operating arrangements do not adequately ensure that customers are properly billed for their electricity consumption.

Revenue cycle management, which includes metering readings, billing processing, invoicing preparation, invoicing delivery, and payment collections, is currently a major weakness in the sector and requires a major overhaul.

This initiative proposes a review and detailed audit of existing processes and practices to identify and rectify weaknesses. The purpose of the review will be to introduce working practices and processes to:

- Identify which customers have working meters and which do not, including type of meter, when it was installed and expiry date of certification;
- Keep a register for every customer detailing installed meter, consumption and billing history;
- Promptly issue accurate bills for all customers;
- Apply appropriate meter reading frequencies;
- Apply adequate controls to minimise and correct meter readings and billing errors;
- Prevent and identify theft of electricity and corruption;
- Provide a suite of suitable KPIs that is regularly monitored; and
- Manage, supervise and monitor meter reading staff performance.

Account Collection Procedures

In parallel with the Customer Billing Procedures initiative mentioned above, a similar initiative for Account Collection Procedures is proposed:

The purpose of the review will be to introduce working practices and processes to ensure that:

- Bills are tracked in a registry to identify which have been paid and which are outstanding;
- There is prompt effective follow up to chase outstanding bills;
- Appropriate action is taken to deal with persistent bad payers, e.g. use of prepayment meters;
- Disconnection for non-payment in appropriate cases;
- Appropriate management information is maintained, e.g. aged debtor analysis;
- A suite of suitable KPIs is established, monitored and used for corrective action;
- Adequate controls to minimise the scope for fraud or corruption; and
- Arrangements are in place for the prompt settlement of bills to government departments.

Revenue Protection

CPCS proposes that a Revenue Protection Policy should be prepared and endorsed by senior management, and a Revenue Protection Team (RPT) established.

The policy should outline:

- The scope and objectives of the RPT;
- The action to be taken against those caught; and
- Publicity about the work of the RPT.

The RPT will investigate and deal with illegal connections and meter tampering. It should be publicly explained that protected revenue will help to develop and improve electricity supplies.

Billing, Account Collection and Customer Information Systems

CPCS propose that performance can be greatly improved with the introduction of modern billing, account collection and customer information systems. New processes and systems should be implemented using well-known techniques such as business process re-engineering and total quality management. Systems will need to be compatible with the metering strategy. Particular attention should be paid to systems integration.

The systems should include a robust customer database and registry incorporating billing details, credit history, risk profile, metering details etc., which will also improve customer service capability. Capability will include customer account and network connection information, metering, connection, disconnection and reconnection and provide the management team with KPIs.

Pilot: Outsource Revenue Cycle Management

This reform recommends the procurement of a private revenue cycle management firm (or firms) to contract for a pilot project in a selected geographical region within Iraq. This would be supported by a technical assistance package comprising a Transaction Advisor to procure the services of a number of Private Revenue Cycle Management firms.

Operational Efficiency Program

The Operational Efficiency Program aims to deliver substantial investment in the electricity infrastructure and distribution business management. The objective is to create a measurable platform for future expansion. The focus is on major rehabilitation and physical expansion improvements to the distribution system. In addition, operational business efficiency can be enhanced by the adoption of standardised best practices, guidelines and procedures.

Operational Efficiency: Urgency

Today the Iraq electricity distribution sector is far from being considered efficient and financially sustainable. For example, as indicated in the Sector Assessment Report, in the year 2012, revenue collected from energy sales was not even sufficient to meet employees' salaries for the same year. In summary, the Iraq Electricity Distribution Sector in 2012 collected revenues enough to pay for only a miniscule proportion of its cost, with a recovery ratio of 11.5%. Therefore, any Cost-Benefit Analysis to evaluate this Operational Efficiency Program should consider this revenue-cost imbalance in tandem with all the additional socio-economic benefits created from providing a more sustainable and efficient distribution system.

Operational Efficiency: Phasing

This Operational Efficiency Program commences in the Pre-Transition phase and extends through the Transition and Long-Term phases. It is closely related to the Loss Reduction Program.

Operational Efficiency: Reform Recommendations

Information Technology and Communication Systems

The introduction of modern high capacity IT systems will enable other technologies to perform to their best. The communications systems will need to be robust and diverse. Examples of the hardware required will include copper wire circuits including Power Line Carrier, fibre optic, radio, microwave and cellular. The IT platform and associated communication systems will provide the core on which will sit sub-systems, such as the asset management system and real time network management. It will enable the integration of all the engineering activities. Communication requirements will vary from dedicated lines to individual Primary substations to connections required to customer metering for the development and introduction of Smart Metering systems. These measures will address the critical need for adequate information and communication for both the management of the distribution business and the management of the electricity distribution system. This is a major task and will require years to implement. It is

important to build up momentum as quickly as possible, commencing with initial scoping and establishing user requirement specifications.

Asset Management System

This initiative proposes to record all asset attributes in an asset management database, providing clear information on which to base key business decisions on activities such as asset rehabilitation, replacement, reinforcement, maintenance and repair.

Substation Rehabilitation and Reinforcement

Many initiatives have been undertaken by the MoE to address the state of the substations throughout the country, the majority of which include new builds. This recommendation seeks to address incorporate and build on the existing programs relating to current substations and new build.

We recommend that a holistic approach is taken to undertake system rehabilitation and reinforcement. Ideally, a dedicated team should carry out network studies with the objective of producing a long term development plan spanning 5, 7 or 10 years. Each element at all voltages of the system (132kV, 33kV, 11kv, LV) should be addressed:

- Substations;
- Overhead lines; and
- Cables.

Low Voltage System Improvements

The impact of phase imbalance on transformers and network voltage is considerable in Iraq, along with that of poor power factor. Both of these problems can be resolved at very little capital cost.

To address this situation, CPCS recommends three related initiatives:

1. Install capacitors to compensate for the lagging power factor caused by motors. This can either be achieved on the customer's equipment or on the network close to the offending equipment.
2. Overhead linesmen to inspect the LV overhead lines and balance connections where they are found to be out of balance.
3. Assess and develop rules and regulations to be included in Primary Legislation that control the import or manufacture of goods, such as air conditioning units so that they do not require abnormal amounts of reactive energy.

Long 11kV Feeders

Voltage regulation and supply capabilities are limited by long 11kV overhead lines. Upgrading or replacing the 11kV lines with 33kV enables better voltage regulation to the end customer, as well as providing more capacity. New Primary 33/11kV substations will be required at the load centres. An extensive program is proposed, commencing in Pre-Transition and continuing through Transition, WEM and beyond.

Network Reinforcement and Renewal

The existing bare overhead lines are prone to illegal connections that deprive the utility of revenues and significantly increase the need for system reinforcement.

The replacement of bare overhead line conductors on the Low Voltage network with Aerial Bundled Conductors (ABC) will significantly reduce losses due to illegal connection. In addition, the reliability performance of ABC is far superior to the existing open wire construction. Consideration should be given to the inclusion of fibre optic strands in the ABC for future communications and monitoring systems. In urban areas, it is proposed to bury mains and service cables where possible. This improves reliability and reduces the opportunity to steal electricity with illegal connections.

Network Metering and Monitoring

CPCS proposes comprehensive metering and monitoring of the energy at all nodes on the 132kV system. This can be subsequently extended to 33kV and 11kV substations enabling the future development of a smart grid. The aim would be to ensure that as a minimum, all entry and exit points to the systems should be metered.

Accounting/Management Information Systems

CPCS proposes an appropriate accounting/financial management system based on commercial lines, incorporating accrual accounting, profit and loss, balance sheets, cash flow statements and asset accounting. The system should integrate fully with the distribution business systems such as the capital investment program, asset management, procurement and stock control systems.

Key Performance Indicators

CPCS recommends that a set of KPIs should be developed. The KPIs should address areas that are key to the success of the business and in a distribution business, typically would include:

- Network performance;
- Service quality (for example overall customer service satisfaction, supply reliability and availability;
- Financial performance;

- Monitoring of contracts;
- Personnel resource and productivity performance; and
- Health and Safety.

Rightsizing Program

As illustrated in CPCS' Regional and International Benchmarking Report, the current number of employees within the distribution sector is extremely high by both regional and international standards and there appears to be significant scope for rightsizing the numbers in the directorates and eventually in the successor distribution companies. This program addresses the urgent need to develop a people strategy and a set of initiatives with the support of consultants. This reform should involve culture change. MoE should identify the needs of the new incorporated distribution companies and develop initiatives to facilitate rightsizing which should not involve drastic reduction or disruption in the workforce. We are not proposing large sale redundancy, but programs can involve voluntary disengagement, special early retirement for older workers etc.

Project Management System

An integrated project management system and a dedicated medium term source of project financing are proposed. The system should facilitate communication and collaboration among directorates and departments for both large and small investment programs. Specifically, information on the progress of project implementation at the different stages (highlighting critical issues) in addition to information on budgeting, tendering, procurement, payment, scheduling and monitoring of the progress of work are needed. Integrated project management will help to open up the channels of management communication.

Alliances with Small Private and Community Generators

It is recommended that discussions are held with a selected sample of existing small generators to explore possible options for collaboration. Such collaboration could range from paying the generators a fee for reading customer's meters and collecting payments (which is a form of outsourcing) to incorporating the generator's activities within the existing public sector or buying the generator's output to sell to customers.

Planning System

The purpose of this reform is to strengthen the planning process and make it more transparent to other parts of the distribution business. This reform is designed to assist the Distribution Planning Department of the MOE.

CPCS recommends that all existing company policies should be captured in an electronic format and made available to all MoE and directorate staff electronically using off-the-shelf software such as Adobe Acrobat and Adobe Reader. This software has the ability to create searchable indexes, making it very easy for staff to find appropriate policies and procedures. Similarly,

technical standards, standard letters and equipment specifications can be captured in the same way. In addition, standard quotations, connection agreements and connection ownership schedules can be made available.

Legislative, Institutional and Regulatory Program

This program is complementary to the other reform programs. Whilst the establishment the electrity industry and regulatory legislation is achievable over the short term, establishing a regulatory structure is a longer term exercise. Review of most electricity sector reform shows that those not grounded in a policy and robust legislation tend to result in failure. An example of this is the early Turkish electrity reforms. International experience shows that a reform process such as that being envisaged in Iraq will take at least 15 years to move from a vertically integrated state monopoly to a market that eventually provides for competition in generation and supply. This legislation provides for the regulation of natural monopolies; System Operator, Transmission System Owner/Operator and Distribution System Owner/Operator.

Legislative, Institutional & Regulatory: Urgency

These initiatives are essential to facilitate commercialisation of the businesses, opening the way eventually for private sector participation and financing of investments in the power sector. The reform recommendations also set out where and when private sector finance and private sector participation may be accommodated into the Iraq ESI in order to supplement public investment, especially with respect to the distribution/retail sector. The industry environment at this stage is not conducive to major private sector operation and financing.

Legislative, Institutional & Regulatory: Phasing

This proposal takes a long term view of Iraq's ESI. While the ultimate objective of this program is to achieve a competitive, wholesale electricity market over the medium, term, there are a number of incremental and phased steps required to reach this end state, and these steps should be commenced now and continue through to transition. Some elements such as tariff reform will continue development and evolution through the WEM and beyond. It is important to view this reform program as an aspiration for the end state.

This program encompasses larger scale reforms at the generation and transmission end and will require significant support and momentum by the GoI.

Legislative, Institutional & Regulatory: Reform Recommendations

Single Electricity Industry Reform Legislation

CPCS urges the GoI to establish a single, modern electricity reform and electricity regulatory law to provide for a holistic legislative framework and phased establishment of an independent electricity regulatory commission and an electricity appeals tribunal. The law would set out the powers of the two bodies to regulate and adjudicate in the electricity sector, independent of political controls. A legal framework of multiple electricity industry and regulatory laws should

be avoided as these set up an environment for conflicts in their application. Consultancy to fine tune the policy reforms and on which the law should be based should receive priority.

Regulatory Institutions

The establishment of the regulatory framework is the second key component of the Law following the setting out of the new industry structure. This aspect of regulatory reform and roadmap is fundamental to a properly functioning electricity network. At present, the GoI serves as policy maker, legislator, regulator, power producer, service provider and systems operator and financier. It also serves as a major user of electricity services (consumer). These roles are often in conflict mitigating against effective planning and management. Coupled with a lack of clarity in objectives and competing demands on the GoI, this has dramatically negatively impacted Iraq's ESI.

The establishment of the Office of Regulation in the MoE should continue (as planned) within the hierarchal structure of MoE, however the regulatory responsibility should be removed from the MoE at the end of five years and an independent electricity commission established with responsibility for independent regulation of the industry, backed up by an appeals tribunal to deal with disputes between the regulator and the industry players in the short to medium term.

Iraq Electricity Power Holding Company (IEPHC)

Our recommendation for the business enterprise governance structure is the establishment of an electricity holding company model. This model utilizes an Electricity Holding Company (EHC) as the strategic management holding company to drive the reform agenda and to take over management of the electricity businesses. This model has been widely adopted in the region, turkey for example. The holding company also is responsible for eventual execution of the private sector participation program in generation and distribution/retail supply. This company may be created as a statutory cooperation to hold all the government subsidiaries in the electricity sector covering generation, transmission, distribution/retail supply and project development and management and a newly created bulk electricity trading company to act initially as the single buyer. All core functions will be devolved to the business units incorporated as limited liability companies (under the companies Act).

Multiple Regional Distribution Companies

The GoI has already proposed horizontal unbundling and incorporation of the distribution business into multiple distribution successor companies in draft legislation. We feel this set of provision in the draft legislation does not go far enough. The law should not state how many business units should be created. This should be revisited to provide for executive decision to determine the several unbundled successor generation and several unbundled distribution companies as subsidiaries of the EHC. We recommend multiple regional distribution companies, much along the geographical boundaries of the existing 7 distribution directorates to provide for yardstick competition. Several distribution companies are essential to address the information asymmetry problem and to ease the cost of regulation. We also recommend two distribution

licences: one to the wires or lines business and the other to the ring-fenced retail business in anticipation of retail competition.

Transmission Company of Iraq

With the introduction of IPPs and separation of transmission from unbundled generation and distribution businesses, the transmission business should be restructured into one Transmission Company for the 15 directorates. This transmission company will provide non-discriminatory third party access to the high voltage network i.e. to act as transmission services provider (TSP) as well as the central load dispatch centre. The Transmission Company should be internally ring fenced into two licensed parts:

1. An independent system operator (ISP) system/market operator and ISP license. The ISP is required to balance electricity supply and demand including dispatch of generation, and to develop the grid code and market rules for the restructured power market and to operate codes governing the associated commercial and technical issues.

2. Transmission Service Provider (TSP) license to provide for the wheeling of electricity over the transmission system. The TSP assets principally consist of overhead lines, cables and substations. This license will also require the operation of codes or contracts governing the commercial and technical issues associated with connection to, and use of, the Transmission System.

Iraq Bulk Electricity Trading Company (EBETC)

Typically in reforming the ESI it is very difficult to go straight from a vertically integrated state owned monopoly to competitive wholesale electricity market. In the process of reform, the single buyer model market structure is designed to facilitate trading between the IPPs and the single buyer for new capacity. The structure also facilitates trading between the single buyer and the distribution companies or large end users through bulk supply agreement. This structure can readily transform to a multi-buyer or principal buyer structure as the large end user market is liberalised.

CPCS proposes the establishment of a single buyer as a subsidiary successor company of IEPHC, where the single buyer initially becomes the sole purchaser of all bulk power. There are regional precedents for this in Jordan, Oman and Turkey.

Internal Agreements between MoO and MoE

No coordinating mechanism currently exists between MoO and MoE and there is no fuel supply agreement. The result is that fuel supply arrangements are subject to bureaucratic interventions in the decision making process relating to prices, volume and timing. Although the two ministries have agreed on the overall volumes of fuel required, they have failed to introduce the detailed joint planning needed to ensure timely delivery of the appropriate fuels to particular power plants. Maintenance schedules are not well coordinated and joint contingency plans and strategic reserves have not been developed.

The unreliable fuel supply to the generation sector has a knock-on effect to the distribution sector's sustainability. This is one example where the ESI supply chain is fundamentally linked and a weakness in one sector directly impacts the performance of the other sectors.

CPCS recommends internal agreements between MoO and MoE are developed addressing these shortcoming and risks outlined above. This will assist in creating a more sustainable platform for the distribution reforms being implemented throughout this process.

Cost Reflective Tariff

Existing tariffs in Iraq are very low by international standards and cover only a small proportion of operating costs. For instance, Iraq's average electricity retail power tariff increased to reach US ¢ 3.2/kWh (38 ID/kWh) in 2011. Similarly, the cost recovery in terms of recurrent O&M expenditures is low and does not exceed 20% in 2012.

Tariffs would be set at a level sufficient to cover the efficient operating costs of the business, whilst also allowing the financing of capital expenditure and a return on investment if private finance is sought. This cost reflective tariff is likely to be significantly higher than existing tariffs (perhaps more than 10 times current levels). Government will need to set a glide path towards consumers meeting a fully cost reflective tariff over a number of years as system issues such as availability of electricity of supply are addressed.

A lifeline tariff should be included to protect vulnerable customers under universal or social services obligation.

There is no reason why a cost reflective tariff structure cannot be established within 2 years. We should make a difference between the cost reflective tariff to cover long run marginal cost and the average tariff the consumer is required to pay. If the government deems it necessary that the average tariff the consumer pay should be less than the cost reflective tariff then the deficit should be met by MoF under statutory obligation condition. In this case, the subsidy becomes transparent and it is possible to set a trajectory as to when the tariff the consumer should pay matches the cost reflective tariff.

Electricity Industry Codes and Market Rules

CPCS propose specific industry codes and rules which need to be developed.

These include dispatch instructions, grid code updating, new distribution code, metering code, market rules for the initial single buyer market, settlement code and performance standards code, etc. These market rules and codes will need to be approved by the Electricity Regulator. These measures would provide recognisable standards for improvement as well as providing to the private sector a familiar environment in which to enter the market later and invest.

The Market Rules and Codes will also govern the technical and commercial interfaces between all the discrete entities in the electricity industry.

Concession Successor Distribution Companies

The real issue in Iraq is not public versus private investment in electricity utility, but complementing public resources with private resources over the near term and beyond.

CPCS recommends that the successor distribution companies be structured to facilitate eventual privatisation. CPCS recommends the engagement of a consultancy firm to advise on the appropriate distribution sector privatisation strategy later in the program. This privatisation options study should take place towards the end of the Pre-Transition phase or early stages of the Transition phase of reform. Iraq faces, and will continue to face, a resource mobilisation problem and public investment will be needed over the Pre-Transition phase of reform to bring the system to saleable condition. A strong cash flow will be needed to attract private-sector participation in concessioning privatisation models. In the interim, we feel Iraq could accommodate private sector participation by outsourcing the revenue cycle management function.

Budget Summary

Below we provide the high level budget summary for CPCS' proposed reforms. This budget must be regarded as *complimentary* to the existing MoE investment program in the distribution sector as part of its reform program. This supplemental investment program includes plans to physically upgrade, rehabilitate, expand and strengthen the distribution network and to improve its operational efficiencies. The program addresses reform activities for comprehensive sector reform, including activities and their associated budgets not yet envisaged or emphasized as priority by the MoE.

All numbers are US Dollars (USD) Millions. Each Program budget is expanded in the respective chapters and reform recommendations to provide an order of magnitude of the investment, breakdown between softer investments required (studies, training and consultancy) and physical asset investments. The total *supplemental* **Distribution Sector Reform and Roadmap budget** is estimated to be USD 2.0 billion over the three phases of reform. Further studies within each reform recommendation will be required to improve the accuracy of investment required.

The three programs and their investment budgets are outlined below:

Program	Total
Total Loss Reduction	900.0
Total Operational Efficiency	1,000.0
Total Legislative, institutional, regulatory	100.0
Total	**2,000.0**

Source: CPCS

It is clear that the primary investment requirements of this supplemental budget are housed within the Operational Efficiency and Loss Reduction Programs, which together account for more than 95% of the order of magnitude supplemental budget. Asset investment is paramount to a reformed distribution sector, capable of providing "a sustainable, efficient and viable ESI".

The *Loss Reduction Program's* primary investment requirement is in end-user metering, with an order of magnitude investment estimated at USD 800 million spanning the Pre-Transition to Long-Term phase of reform. The remaining reform recommendations in this program support this metering campaign to immediately reduce ATC&C losses and theft, while improving revenue collection.

Within the *Operational Efficiency Program*, the MoE has already created investment strategies for the large physical asset components of sector reform, namely in refurbishment/replacement and expansion of substations and switchgears, long 11kV feeders, network reinforcement and renewal and backbone communications infrastructure expansion. As a result, budgets relating to these reforms are excluded. CPCS has outlined expected investments required for supporting commercial management systems, which together account for approximately 80% of this supplemental budget relating to the Operational efficiency program.

The other Operational Efficiency Program initiatives combine to address providing a sustainable and efficient distribution sector, especially in the areas of substation metering which has been largely neglected in MoE sector investment plans.

Finally, while the Legislative, Regulatory and Institutional Program appears small in estimated investment required at USD 100 million, its importance to the overall Reform Roadmap cannot be mistaken. This program outlines the framework for the ESI sector functioning, which will ultimately allow for private sector participation and sector reform. It takes a long term view of Iraq's ESI, but ensures immediate actions are taken which supports the overall Roadmap's goal of a sustainable, efficient and viable ESI.

This roadmap seeks to empower and complement the GoI's firm commitment to reforming the existing electric power sector. The aim is to rehabilitate Iraq's deteriorated energy sector and expand it to meet domestic energy demand so as to foster growth of a diversified economy, whilst improving living standards of Iraqi citizens and thus positioning Iraq as a major player in regional and global energy markets[5]. There is no doubt that the distribution sector (and greater ESI) reform aspirations by the GoI are ambitious and globally forms one of the largest energy sector development liberalisation program ever to be undertaken in recent years. If fulfilled, Iraq will become one of the region's dominant economies for developers, contractors, and suppliers.

This roadmap seeks to accomplish this aim of the GoI, through a carefully developed Distribution sector Reform Roadmap, which is the point in Iraq's ESI most vital for revenue collection and therefore system sustainability/viability.

[5] SIGIR, September 2013.

1 Reform Roadmap Introduction

1.1 Reform Roadmap

This Reform Roadmap is the final deliverable under the Development of Reform Road Map for the Electricity Distribution Sector in Iraq Project. The report builds on findings from previous reports and several consultations with the Ministry of Electricity (MOE), World Bank and other stakeholders in Iraq. In developing this Report the CPCS also benefited from previous reports generated for the Iraq ESI, including the INES and Booz Allen Reports. A key aspect of the consultation is to ensure these reform recommendations are in line with stated objectives of the MoE and the Government.

1.1.1 Urgency for ESI Reform

The need for reform in the Iraq power sector is at a critical stage. While, this Roadmap Report focuses primarily on the distribution sector of the ESI, the report highlight the need for an integrated policy and road map to cover the electricity value chain of generation, transmission and distribution/retail supply and especially integration of the transmission and distribution policies.

The current state of the distribution sector of Iraq's ESI is addressed in greater detail in two previous reports by the CPCS: the Sector Assessment and the Regional and International

Benchmarking Reports. However, we have the stark realities of the sector to convey the need for urgency in reforming the ESI.

Insufficient electricity supplies have afflicted Iraq electricity supply since the 1990s[6]. During the Gulf War in 1991, about 90% of Iraq's power generation and distribution systems were destroyed and full recovery was not attainable[7]. Iraq has since been able to restore about 50% of the electricity generation infrastructure[8], but during the postwar period 2003-2013, the power sector suffered from a severe shortage of electricity generation capacity and the system was unable to meet the domestic demand for household, commercial, and industrial uses. This situation was aggravated by a sharply growing demand for power since 2003. Military actions, vandalism, sabotage, and corruption further worsened the problem. The power shortages are estimated to cost the Iraqi economy around $3 to 4 Billion per year[9]. These shortages are creating hardship and negatively affecting the economic development. The current deteriorated network is exacerbated by years of dis-disinvestment and the absence of adequate of maintenance, which has left all three components of the value chain; generation, transmission, and distribution in critically degraded conditions.

To address this situation, Iraq Booz & Company Energy Outlook Assessment Report (2012) indicated that around 90% of Iraqi households supplement the public network with expensive private auto-generators mainly from small inefficient diesel and petrol plants. Estimates are that nearly 23% of the households are relying on those self-generators as a primary source of electricity supply[10]. Booz & Company report also stated that in 2012, the total number of private units in operation ranged between 55,000-80,000, with estimated capacity of around 8,000MW. In 2011, the situation improved, where the net capacity available at peak increased to about 9,000 MW[11]. Nonetheless, the estimated net capacity required to meet peak demand was 15,000 MW, resulting in a need for around 6,000 MW more available capacity – an increase of around 70%[12]. This increase in electricity gap is attributed to the rapid increase in the demand for power by Iraqi household and industries, together with more widespread use of affordable electric appliances; especially air conditioning units in the summer, and heating in the winter. Cumulatively, these development serve to make the electricity supply in Iraq unreliable. [13]

Given to the government's firm commitment to improve the power security situation in Iraq, the MoE reported that total generating capacity on its national grid, including electric power imported from Iran, climbed to 10,000 MW in 2013[14]. More than one-fifth of that capacity, however, was unproductive because of lack of fuel, low water levels at hydroelectric plants, and

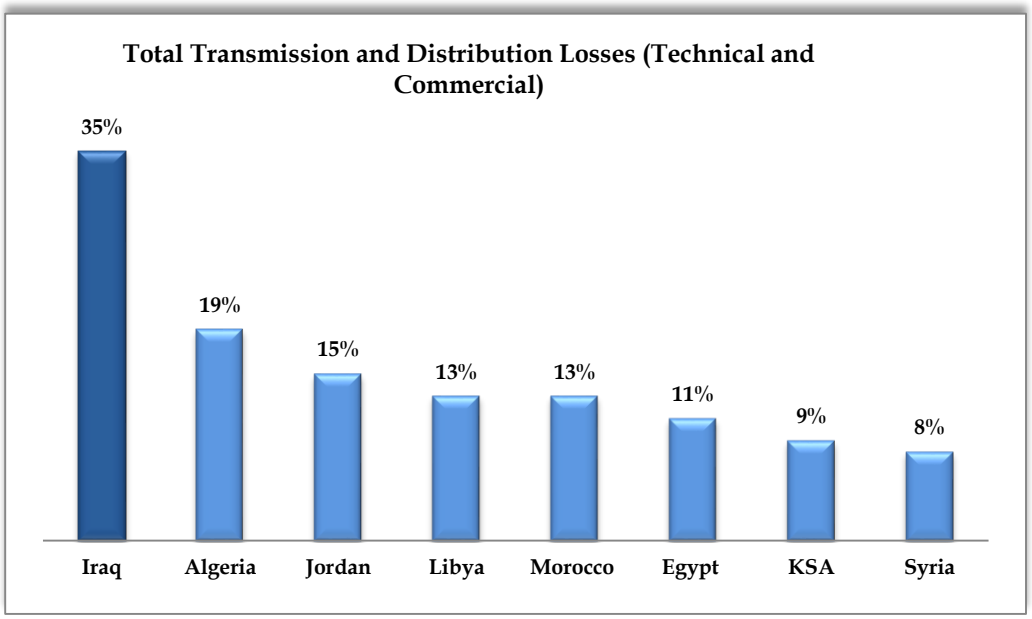
[6] SIGIR, September 2013.
[7] Library of Congress – Federal Research Division, 2006. In Rashid, S., 2012. *Electricity Problem in Iraq*.
[8] USGAO, 2007.
[9] INES – Integrated National Energy Strategy, Booz and Co, 2012.
[10] Booz and Company, 2012. *Integrated National Energy Strategy (INES).*
[11] International Energy Agency (IEA), 2012. *Iraq Energy Outlook*.
[12] ibid.
[13] Rashid, S., 2012. *Electricity Problem in Iraq.*
[14] SIGIR, September 2013.

temporary shutdowns for maintenance. Accordingly, actual supply at the point of generation averaged about 7,800 MW.

Similarly, as a result of Iraq's inefficient power transmission and distribution networks, the amount of electricity that reached end users likely was less than 5,500 MW. This accounts for more than 50% of technical losses from the national grid. Moreover, demand for electric power at the time, according to the MoE's estimates, totaled about 14,700 MW, indicating a deficit of almost 9,200 MW.

The International Energy Agency (IEA) conservatively estimated the Iraq systems loss at 1/3 of the power produced making it one of the highest rate in the Middle East, as presented in Figure 1-1: Electric Power Transmission and Distribution Losses below.

Figure 1-1: Electric Power Transmission and Distribution Losses



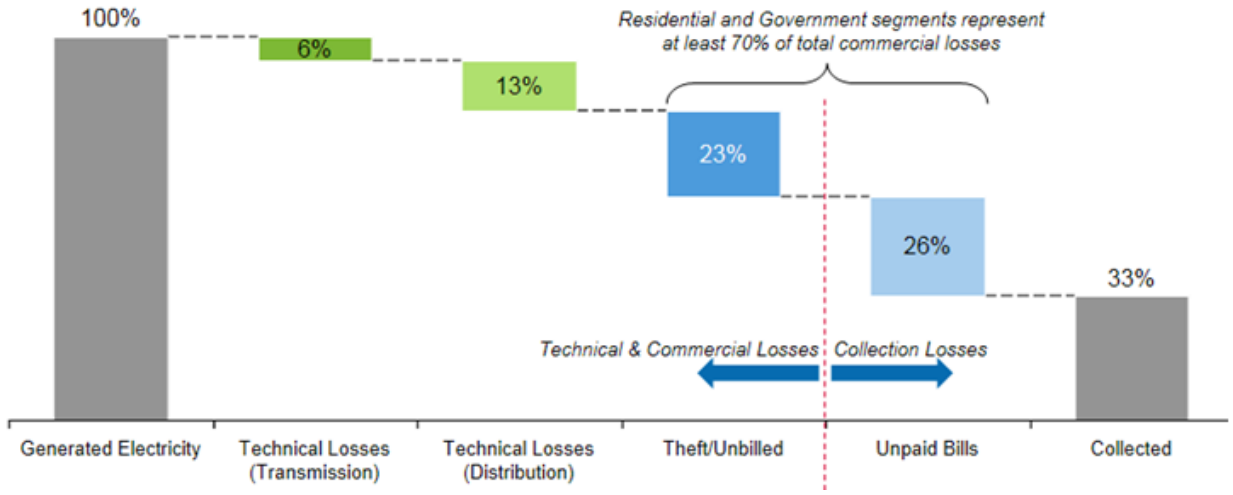
This includes losses in transmission between sources of supply and points of distribution, and losses in the distribution to consumers, including pilferage (2011).

Source: International Energy Agency (IEA Statistics © OECD/IEA, http://www.iea.org/stats/index.asp), Energy Statistics and Balances of Non-OECD, in the World Bank website.

Statistics from the MOE relating to the 2012 billing data indicate that a total of MWh 49 million were delivered in 2012, however, only MWh 35 million were actually sold. This translates to losses near 30%. This situation has been further deteriorated in 2013. According to the MoE's reported statistics, nearly 37% of the electricity produced in 2013 is lost, which includes both technical and administrative losses.

This ratio varies by distribution directorate and ranges from 13% in Basrah to 51% in Sadr[15]. Unfortunately, a current breakdown of technical versus commercial losses is not available, but the following provides an estimate of losses by category.

Figure 1-2: Losses Components (in % of electricity generated)



Source: Ministry of Electricity Data, Booz & Company analysis, in in Iraq's Integrated National Energy Strategy (2012)

Regardless of the estimate, there is no mistaking that the ATC&C losses in the Iraq ESI are significant. We note these various estimate to illustrate that without accurate end use and interface meters it is impossible to come up with reliable set of data. There is no single source which explains these losses, instead there are numerous facets within the sector which must be targeted.

For instance, distribution lines that carry limited quantities of power over short distances are a major contributor to system losses. Total transmission and distribution losses account for about 40-50% of the system losses in Iraq, with the majority of this loss due to the distribution sector (i.e., 80-90% of the total transmission and distribution losses)[16]. Inefficient management and operation of the distribution sector are contributors to this issue, including billing, metering, customer service, and an inability to increase system performance.

Similarly, although substations are distributed evenly across the country, figures indicate that around 17% of the total capacity is lost. This loss is predominantly the result of a combination of conflicts, lootings, and vandalism and these actions have severely affected the performance and reliability of the entire power system infrastructure in the country. Some substations also have been exposed to accidents that affect their performance, e.g., fire damage affected the 32 kV/33 kV/11 kV Air Insulated Substation in Fallujah in 2006.

[15] Ministry of Electricity records, 2013.
[16] Murthy, K.V.S., and Raju, M., 2009. *Electrical Energy Loss in Rural Distribution Feeders- A Case Study.* ARPN Journal of Engineering and Applied Sciences, 4(2), pp. 33-37.

Due to a restricted supply situation, load shedding is widespread on the distribution network. Because of this unreliable supply of electrical power from the national grid, consumers private self-supply at all levels of demand, including domestic and industrial users. Private generation is particularly pervasive at low voltage and is used in both rural and urban environments. The problems is compounded by the high levels of unmetered customers, absence of effective billing systems, which in turn leads to widespread theft of electricity. In addition there is a high level of non- or under-collection of billed electricity.

Compounding the supply issues is the growth in demand for energy supply. According to the MoE, the average growth rate of peak load in the whole country is estimated at 7.9% per year; with the highest growth rates projected for Al-Anbar (18.2% per year), Babil（10.9% per year), and Karbala (9.9%per year). Over 80% of Iraqi customer base is domestic or household users, with great demand for air conditioners in the summer and heating in in the winter.

Iraqi households up to 2013 were receiving on average of 8 hours of electricity per day through the public network. A quarter of households had no access to another source of electricity. Even with the support of expensive communal and private generators, households in most governorates were receiving less than 18 hours of power per day. For Iraq's internally displaced (IDPs), the situation is often very poor, with 37% of IDP households receiving less than four hours of electricity daily.

Finally, the Iraq power sector structure is that of a vertically integrated monopoly utility with the state as the sole owner and operator. The operations has yet to be corporatised and the ESI operations are departmental entities structured within the framework of the civil service. This structure is similar to those structures which existed prior to the commencement of the reform process in countries like Oman, in the Middle East and New Zealand and Australia in the mid-1980s.

The Iraqi power sector is comprised of two vertically integrated publicly owned systems; one operating in the self-governing Kurdistan Region and the other operating in the remaining 15 regions in the rest of Iraq and controlled by the Ministry of Electricity. The two vertically integrated systems operate independently of each other. The situation prevailing, in the Kurdistan Regional Governorate (KRG), is generally better where there has been a more reliable supply. By 2004, the region's population then had access to electricity 24 hours a day. This has been achieved through the rehabilitation of existing plants (including two hydroelectric plants), and the setting-up of Independent Power Producers (IPPs) in main cities. KRG had its own Master Plan and Energy Sector Strategy conducted in 2006, and is in the process of implementation through a more balanced investment plan that gives due regard to transmission and distribution[17].

This Roadmap report focuses on the 15 regions controlled and managed by MoE. The operations of the Iraq ESI are highly centralised and frustrates initiatives and or innovative venture. All

[17] Middle East Economic Digest, 2012.

important decisions are essentially centralised in the hands of the Sector Minister who further has to seek Cabinet approval for most decisions.

The Government of the Republic of Iraq, through the Federal Ministry of Electricity, is not only the policymaker and regulator, it is also responsible for service delivery of power in the areas of generation, transmission, distribution and retail supply throughout the country (other than the self-governing Kurdistan Region), as well as for system operation, industry planning and project development and implementation. The system of regulation is that of self- regulation. MoE until recently had a monopoly on ownership and operation of the interconnected electricity grid. Recently Independent Power Producers (IPP) has been permitted with the removal of monopoly rights to the state at the generation capacity level.

Although MoE has invested efforts to unify the various directorates nationwide, there is still a wide variation between each of the directorates in terms of capability, expertise and experience. While oversight is provided from the MoE headquarters, there does not appear to be formal structures within the MoE organization to undertake the capacity development needed to meet the directorates' skills and management requirements.

Given the existing market structure, there is an absence of a modern regulatory, legal and institutional framework necessary for sector reform.

In order to address this overarching situation and create a platform for economic growth and prosperity for the Iraqi people, pervasive and system reform is required.

1.2 National Development Plan Targets

Government of Iraq has a very ambitious economic development plans over the near term. The Iraqi National Development Plan for the years 2010-2014 defined the main policy objectives to improve macro-economic investment in the country. Those key policy objectives are outlined as follows:

- Increasing the GDP at a rate of 9.3% per year for the duration of the plan. This is to be made through diversifying the economy and focusing more on sectors other than oil industry, particularly agriculture, manufacturing industry, and tourism sectors;
- Improving and increasing productivity, and promoting competition in all economic sectors on the economy, including the electricity. More focus is to be directed towards activities that have a comparative advantage, such as oil, gas, petrochemicals, cement, plastics, pharmaceuticals, and electricity across Iraq to ensure a robust economy for the country;
- Increasing the employment rate, particularly among youth and women, by increasing the private sector's role in generating employment. This should reduce the high unemployment rate of 15% , consisting of both seasonal unemployment and underemployment;

- Increasing, as well as improving the supply of water provided for human consumption, quantitatively and qualitatively, over both the mid and long term periods. Additionally, enhancing sanitation services by doubling the area covered by sanitation projects to reach all governorates;
- Working seriously to alleviate the widespread poverty in Iraq. This would entail creating job opportunities and securing basic social services for the poor, particularly vulnerable groups like orphans, widows, and people with special needs;
- Achieving comprehensive growth that guarantees investments in the natural resources in Iraqi. This would be achieved by decreasing disparities and barriers at the regional level. Furthermore, the plan aims at achieving well distribution of infrastructure, social services, and suitable housing for all people within the different governorates; and
- Addressing rural development issues, particularly the poor performance of agricultural sector in terms of productivity and job creation, as well as weak infrastructure in rural areas.

1.3 The Overall Policy and Regulatory Reform Objectives

Electricity is still technically a vertically integrated system and despite institutional unbundling, there is the need for an overarching policy framework to cover the entire value chain of generation, transmission and distribution/retail. Once power is generated it must be used instantaneously unlike other product the ability to store electricity is very limited. This policy coordination in the three sectors is needed to ensure that policies in distribution and the other electricity businesses reflect a cohesive and integrative structure. The Consultant therefore finds it necessary to set an overarching and integrative electricity policy framework. In developing this framework the Consultant benefited from the INES and Booz Allen Reports.

The Need for Power Sector Reform

The electric power sector is very capital intensive. It has become obvious to the GoI that, with its many financial responsibilities in other sectors of the economy, it cannot finance all of its developments. Additionally, GoI is concerned about the efficiency and financial performance of the industry, therefore there is a need to reform the sector as a whole so as to:

- Attract and encourage private sector participation into the ESI; and
- Attract capital funds outside of the public and development finance sectors to finance electricity expansion and upgrading of the industry.

General Policy Goal

GoI has identified short and long term goals in the INES Master Plan and these goals seek to ensure that Iraq develops an ESI that will:

- Meet all current and prospective economically justifiable demands for electricity throughout Iraq;
- Modernise and expand its coverage of the entire ESI, and in particular distribution; and
- Support national economic and social development.

GoI's recommended goal is to ensure the provision of adequate electricity supply through an effective electricity market structure, within transparent regulatory frameworks and to ultimately encourage a competitive generation market and efficient transmission, distribution and supply sectors, providing for private sector participation in generation and distribution/retail supply, in a manner that fosters sustainable and sound development of the industry.

Corporate Restructuring

Government has decided to move from the centrally controlled monopoly state owned electric utility to an unbundled structure with multiple generation and distribution/retail supply companies. In order to implement the unbundling and restructuring of the electric utility (currently operated as part of the civil service through the MoE), GoI intends to:

- Vertically unbundle the public electric utility into generation, transmission and distribution/retail businesses and further horizontally unbundle generation and distribution/retail activities into multiple commercial businesses;
- Incorporate generation, transmission and distribution/retail businesses as commercial companies with GoI's ownership of the shares;
- Transfer appropriate employees, assets and liabilities from GoI to each of the unbundled generation, transmission and distribution/retail business;
- Ultimately, transfer controlling interests in the unbundled generation and distribution companies to the private sector, to be made up of strategic or core investors with experience and resources in the ESI; and
- Retain non-controlling interests in such companies which may be transferred to the Iraq public, through initial public offer on the Iraq Stock Exchange to ensure indigenous participation in the power sector.

Given the attendant technical and commercial constraints confronting the electric utility, GoI is committed to, among other things:

- Improving electricity supply, initially through a rehabilitation and investment expansion program, supported by a dedicated medium term financing plan in the form of an Investment Action Plan and Roadmap;
- Repairing and upgrading the system control and communication facilities;
- Strengthening the transmission and distribution network to be able to support a new power market for bulk power; and

- Ensuring that all end users are metered

Obligations to Supply

GoI will impose an obligation on electricity distribution companies to connect, serve and supply electricity to all Iraq consumers.

Natural Gas Interface

To reduce electricity costs, GoI intends to expand natural gas supply and natural gas pipeline networks in addition to speeding up the adoption of CCGT.

International Cooperation

GoI will ensure that it meets its international obligation by participating actively in all relevant international electricity bodies whose objective is to promote electricity development in Iraq.

Policy Implementation

- GoI intends to implement the Power Reform Policy as soon as it is approved by the Governing Council;
- Thereafter, annual reports on electricity development would be prepared and published; and.
- The reform process is to include unbundling of the Iraq SOE Electric Utility, submission of the Electric Supply Industry Reform Bill to the National Assembly and enactment of the Bill; Establishment of Iraq National Electricity Regulatory Commission (INERC, and establishment of a medium term capital investment plan, inclusive of a capital investment plan for distribution and the provision of dedicated source of financing for the sector.

To meet these policy objectives of the GoI, CPCS has developed this set of reform recommendations designed to address operational, institutional, and legal and market structure. The reforms are to be implemented over three phases: pre-transition or short term, transition or medium term and long term or wholesale competition.

Below we outline the essential characteristics of the existing Iraq ESI and the main reform measures currently underway in the electricity value chain. This is important, as reforms taking place in any one sector of the value chain have an impact on each other, and if not integrated, can lead to a waste of effort, time, resources and stranded investment.

1.4 Summary of Existing ESI Structure and Reform Measures

The Iraq electricity distribution system is structured into seven distribution directorates; each with limited levels of autonomy from the MoE headquarters office in Baghdad. There are three directorates located in Baghdad and these are Al Karkh, Al Rusafa and Al Sadr City Directorates. Outside of Badhdad there are four distribution directorates which are the Northern, Central, Middle Euphrates and the Southern Directorates.

The institutional structure of the Iraq ESI is still based on the old vertically integrated centrally controlled monopoly model. The system functions as part of government bureaucracy; the civil service, with generation, transmission and distribution/retail supply being departmental enterprises under the management and control of the MoE. The public utility's financial system follows that of the public finance system, being that of income and expenditure which does not provide for accrual accounting or a list of assets. Currently efficiency and commercial aspects have been neglected or ignored, including the development of a cost-reflective tariff framework.

Overall, the electricity system in Iraq consists of the following infrastructure:

- Power Generation plants - basically some Steam Turbines and Open Cycle Gas Turbines fueled by liquid and gas fuel that produce power;
- Transmission systems that transmit electricity at higher voltage, mainly on 400 kV lines (facilities above 132kV) from power generation plants to distribution networks;
- Distribution systems that distribute electricity at lower voltage, mainly on 33 kV and 11 kV lines (facilities below 132 kV) to the end users; and
- System dispatch and manned control system, which is a centralized communication and control system under development, designed to dispatch power plants and to monitor system performance and control of power[18].
- **Shared or neighbourhood generators:** these operate at neighbourhood level and are generators owned by private investors and used to generate electricity to be sold to the neighbourhood community. Those generators meet some of the deficit demand resulting from the public network shortfalls. The price of the electricity they provide to consumers is considerably higher than grid electricity at about USc 3/kWh. Electricity price from this source often amounts to $40 per Ampere per month, outside the reach of the less well-off consumers. In order to mitigate the effect of the high price, the MoO agreed to provide limited quantities of subsidised fuel to owners of off-grid self-generators who deliver at least 10, or capable of producing at least 10 hours of electricity per day. With the subsidised fuel, more affordable prices are available to residential customers[19]. This price is currently ranging between $4 and $8 per ampere per month at 220 Volts and equates to USc8-17/kWh[20].
- **Private household generators:** these are generators that are owned by the households and used to self-generate electricity when shortfalls in the national grid occur. A significant proportion of Iraqi households own these small diesel and petrol driven generators, particularly in urban areas. In the urban areas these households are invariably connected to the national electricity grid and the plants are used once cut off power takes place. The cost of electricity from these inefficient units is often in excess of 33US$/kWh.

[18] USGAO, 2007
[19] SIGIR, September 2013.
[20] Booz and Company, 2012. *Integrated National Energy Strategy (INES).*

- Large industrial user auto-generators: these are large industrial users, like the cement plants and the international oil companies who provide their own (mainly larger gas turbine plants) to meet their domestic production needs.

Main technical challenges facing the ESI in Iraq can be summarised as follows:

- Inadequate generation capacity and inefficient units;
- Lack of preventative and routine maintenance practices over the ESI value chain;
- High technical and administrative transmission and distribution (T&D) losses;
- Overloading on various components of the T&D network;
- Distribution networks that cannot accommodate the growing loads;
- Excessive illicit connections (theft of electricity);
- Lack of a proper end-user metering system;
- Low performance in terms of billing and collection; and
- Over reliance on HFO and simple cycle technology in generation.

1.4.1 Generation Sector and the Reform Measures in Progress

The Iraq electricity installed generation capacity was reported to be 10,110 MW in 2012[21]. Total generating capacity on the national grid, including power imported from Iran has experienced increased capacity over the last 5 years; however over 20% of this capacity is stranded due to lack of fuel, low water level, or temporary shutdown arising from inadequate maintenance. The MoE plans to spend about $27 billion between 2012-2017 on new power generation, transmission, and distribution projects[22].

[21] Central Intelligence Agency, 2014.
[22] Middle East Economic Digest databases, 2012.

Iraq's Energy Master Plan envisions, about 24,400 MW of new additional capacity between 2012 -2017. This includes 13,000 MW of gas-fired capacity, 7,000 MW of thermal power capacity, and 400 MW of renewable energy to come on stream by 2015.

Figure 1-3: Master Plan Construction Goals, 2012-2017

Source :MoE

A further 4,000 MW is being added by the conversion of open-cycle gas turbine (OCGT) power plants to combined-cycle gas turbine (CCGT)[23] technology.

While plans are underway to address the challenges faced by the generation sector in terms of rehabilitating existing plants, adding new units, and replacing ageing facilities, addressing the transmission and distribution infrastructures have only recently commenced. There is a need for additional generation investment to be closely coordinated with planned investments in the transmission and distribution sectors if the system is not to further aggravate the stranded investment in generation.

The electricity generation system is dominated by thermal power plants fuelled by oil and natural gas (i.e., 47% gas turbines and 34% steam turbines)[24]. Approximately 16% is produced from hydroelectric power, though the hydro share continues to decrease due to drought and added upstream usage by other countries, combined with the expansion of thermal power plants. In addition to the government owned generation plants, there are private generators (some of these plants are connected to the grid, whilst others are standalone systems supplying power to households, commercial and industrial users).

Reliable supply of fuel to the generation plants has been a major problem in Iraq due to shortage of both fuel oil and natural gas. Iraq has the world's eleventh largest gas reserves estimated at 3.6 trillion cubic meters in 2010; however natural gas production did not reach 1.9 billion cubic

[23] ibid.
[24] Booz and Company, 2012. *Integrated National Energy Strategy (INES).*

meters until 2011.[25] A significant proportion of Iraq natural gas supply is associated gas and significant levels of flaring have been taking place.

Most of the older generation plants have been fuelled by heavy fuel oil (HFO) and crude oil. Iraq does not produce enough HFO and has to import the expensive finished product for its generation plants. The electricity crises will not be resolved until there is sufficient feedstock for the thermal generation plants. The Government has embarked on a strategy which calls for most of the new generation plants to be fuelled by natural gas; however these are mostly single cycle plants. There is a program also to convert some of the plants fueled by HFO to natural gas and for the open cycle plants to be converted to combined cycle gas turbine (CCGT). Current estimates are that based on the expansion of natural gas generation plants will need 7-10 million cubic meters per day of natural gas supply and this will necessitate importation of natural gas from Iran.

The main challenge facing the generation sector is the deteriorated conditions of several generation plants and the shortage of HFO and natural gas. The MoE has prepared a program that is scheduled to start after 2015 to phase out old and obsolete units.

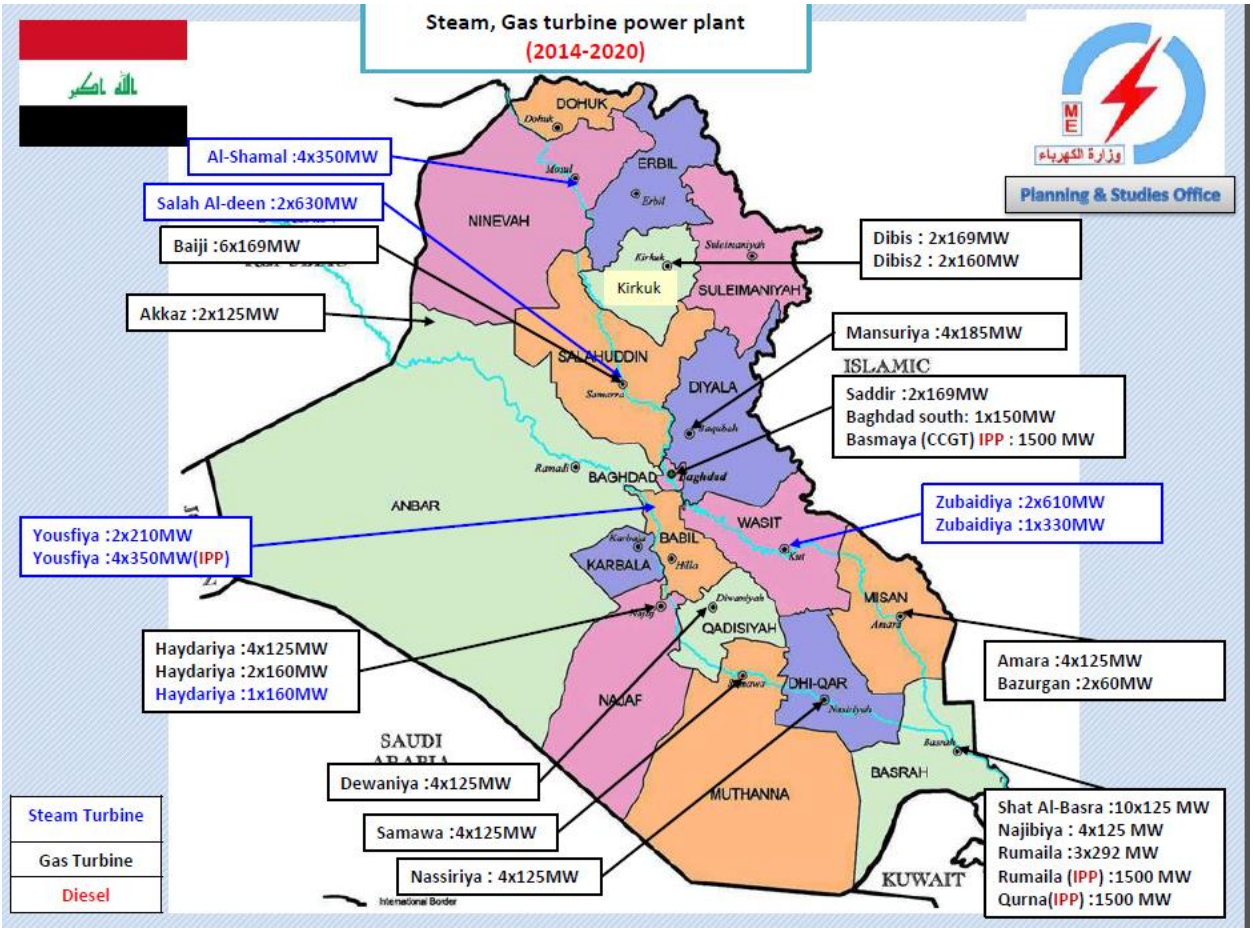
The Generation Reform Measures are summarised as follows:

- Phasing out old and obsolete generation units;
- A generation expansion plan which focuses on Natural Gas Open Cycle Units and Steam Turbines;
- As part of the generation expansion plan Introducing private sector Independent Power Producers, targeting Natural Gas Open Cycles with place for a CCGT;
- Fuel conversion from HFO to Natural Gas (including conversion to CCGT) of some of the generation plants;
- Introducing Distributed Renewable Energy Generation Units (Solar and Wind); and
- Introduction of Supply-side and Demand -side Management Energy Efficiency measures.

Figure 1-4 below shows the MoE generation plan by region for the period 2014-2020:

[25]BP 2012; Statistical Review of world energy – Natural Gas: http//www.bp.com/liveasset/bp_internet /globallbp_uk_english/reports

Figure 1-4: Generation Plan 2014-2020



Source: MoE Minister Presentation, Dubai, February 2014

Power Procurer

The power procurement entity in the MoE is responsible for generation capacity planning, based on the planning criteria contained in the grid code and the procuring of new power purchase agreements (PPAs). In addition, it is responsible for the monitoring of existing PPAs, and has the right to audit the scheduling; dispatch; and operational planning of the transmission system operator (TSO) to ensure the equitable operation of the PPAs. Presently, the power procurer entity retained the responsibility for the supply of wholesale energy to principal consumers, and to the distribution network service providers.

Renewable Energy

Sustainable development and green economy are becoming increasingly important to the Iraqi national context as the country engages in a process of long-term development following years of conflict. As outlined in the Government of Iraq National Development Plan 2010-2014 and the United Nations Development Assistance Framework (UNDAF) for 2011-2014, reaching this

objective requires reframing national development strategies and implementing policies towards environmental and long- term economic development and poverty eradication.

Hydro Power

Hydro power represents about 16% of generating capacity and 10% of the electricity supplied Iraq (around five TWh) and represents the most important renewable energy source in Iraq. [26] Most hydropower production occurs in the north of the country, where the installation of additional small-scale hydropower stations is likely to serve more remote communities. It is projected that the generation capacity will increase modestly until reaching 14 TWh in 2035 through the expansion of hydro-electricity mainly in Kurdistan Region but also in the rest of Iraq[27]. However, this projection will largely depend on the future precipitation in the country, decisions taken in other countries that affect water availability in the main Iraqi rivers, and the water management policies of the Ministry of Water Resources.

The most important hydropower station, Mosul, is located in the governorate of Ninewa and is the fourth largest hydropower station in the Middle East. The other stations are located in the governorates of Anbar (Haditha dam), Salah al-Din (Samarra dam), and Diyala (Hamrin dam). Two important operating hydroelectric plants are located in Kurdistan Region: Doukhan and Darbandikhan dams.

Figure 1-5: Hydropower Plants in Iraq and Kurdistan Regional Governorate

Name of the Dam	River/Lake	Governorate	Generation Capacity (MW)	Available Capacity (MW)
Mosul	Tigris	Ninewa	1,050	470
Haditha	Euphrates	Anbar	660	660[28]
Hamrin	Diyala	Diyala	50	50
Samarra	Tigris	Salah al-Din	84	84
Doukhan	Doukhan Lake	Sulaymaniyah	400	75
Darbandikhan	Diyala	Sulaymaniyah	249	70
Total			**2,493**	**1,349**

Source: Ministry of Electricity

[26] International Energy Agency (IEA), 2012. *World Energy Outlook Special Report 2012 - Iraq Energy Outlook*.
[27] Different sites have been identified as having potential for new hydroelectric plants. In two of these sites (the Bekhma and Badoush dams on the Tigris River), the construction of hydropower stations began during the 1980s, but was abandoned in the wake of the sanctions imposed in the 1990s.
[28] For Haditha dam, the available capacity in MW is assumed equivalent to the designed generation capacity in the absence of the effective number.

The total gross installed capacity of these plants is nearly 2,500MW, but the operating capacity is estimated to be around 1,300MW due to a combination of various operational problems, low water levels in reservoirs upstream, and the constraints imposed by the competition of different sectors on water use (mainly for agricultural use).

Solar Power

Iraq has very good solar resources. The MoE has a number of off-grid solar research stations, with capacity of a few tens of megawatts. Despite the strong solar power potential in Iraq, grid-connected solar electricity generation, either through photovoltaic (PV) or concentrating solar power (CSP), comparatively, remain a very high-cost option, compared to fossil fuels and hydro power. Projection scenarios so far assume only a small amount of solar PV capacity – less than 50 MW –to be added by 2035[29].

1.4.2 Transmission Sector and the Reform Measures in Progress

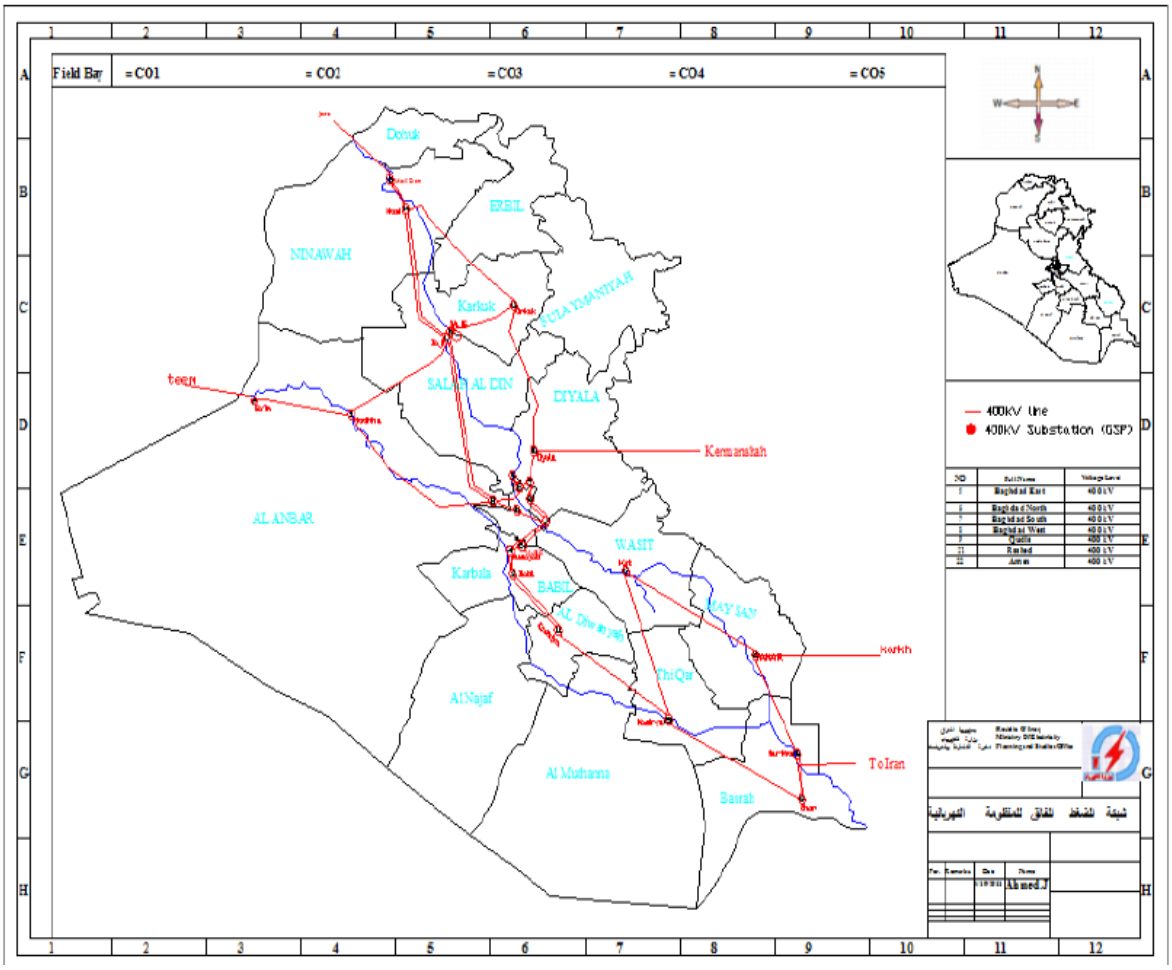
With the expansion in generation capacity, the already constrained transmission network has proven to be incapable of supplying the increasing load being placed on the network, resulting in continued instability conditions prevailing in the system. High-voltage bottlenecks (or constraints) exist, especially around power-plant clusters in the northern, central, and southern parts of the country. Additionally, high loads in the central region, particularly in Baghdad, further constrain transmission capacity.

Over the last three years MoE has been paying more attention to improvements and expansion of the transmission system capacity. Current conditions indicate the need for strong transmission infrastructural enhancement and reinforcement actions, as well as the installation of additional high voltage lines to meet the increasing load coming onto the electricity network.

Figure 1-6 below shows the Iraq Transmission 400 kV Network.

[29] International Energy Agency (IEA), 2012. *Iraq Energy Outlook*.

Figure 1-6: 400 kV Transmission Grid



Source: MoE Minister Presentation, Dubai, Feb 2014

Figure Figure 1-7 shows the 400 kV and 132 kV lines and Substations Transmission Grid Expansion plan 2014-2020" planned by MoE.

Figure 1-7: 400 kV and 132 kV lines & Substations Grid Expansion plan 2014-2020

	Exist 2013	Planned to be in operation (2015)	Planned to be added(2020)
400 kV Substations	29	25	
400 kV Overhead Lines	**5100 km**	**900 km**	**3000 km**
132 kV Substations	219	64	91
132 kV Overhead Lines	**12,600km**	**3300 km**	**3500 km**

Source: MoE, Feb 2014

Transmission System Operator (TSO)

The TSO entities are responsible for the overall security and reliability of their transmission systems. The TSO coordinates the efficient and safe operation of the transmission system amongst all electricity grid users, and liaise with the transmission network service provider and power procurer. The TSO is also responsible, in collaboration with the power procurer, for generation scheduling and dispatch in accordance with the grid code. The main operational point of contact for users with the TSO is through the national and regional control centers.

Transmission Network Service Providers (TNSPs)

The TNSP entities are responsible for the development and maintenance of their regional transmission networks. They are also responsible for those switching operations on their regional transmission network, in coordination with the TSO. The TNSP network planner is also responsible for network master plan studies of the transmission network.

The Transmission Sector Reform Measures are summarised as follows:

- Interconnection with Iran Power System;
- Building New 400 kV transmission lines;
- Building New 132 kV transmission lines;
- Building New 400/132 kV Substations;
- Building New 132/33/11 kV Substations;
- Refurbishing 400/132 kV Substations;
- Refurbishing 132/33/11 kV Substations;
- Deployment of Grid Metering System; and
- Improvement System Operation Capabilities, including SCADA and Dispatching Control.

1.4.3 ESI Implications for Distribution Sector

The reforms being undertaken in generation and transmission carry major implications for the distribution sector reforms because of the vertically technically integrated nature of electricity production systems, hence coordination is needed in the reform plans and programing.

Below is a short description of the implication of generation and transmission reforms on the distribution system.

New installed capacity in the generation and transmission sectors will require major capital investment in distribution if distribution is not to become the bottleneck in the system. The distribution sector will need to achieve financial sustainability as soon as possible if the overall system is to become financially sustainable.

The introduction of IPPs will require from the electricity distribution sector the development of a new power market, at least centered on the single/principal buyer model in the initial stages and involving the development and introduction of power purchase agreements (PPAs) between IPP and off-takers. There will be the need for new dispatch mechanisms, requirement for procuring ancillary services to maintain system balance, calling for ancillary services agreements, as well as compensation of reactive power and the monitoring of power factor of different power facilities accordingly and based on a new grid Code.

The distribution sector will need to develop its capabilities to purchase energy from these IPP private entities, hence the requirement for new skills in the distribution sector: that of commercial and contractual skills.

This will require urgency in introduction of a new power market and structural reforms, such as:

- Establishment of a clear cost reflective tariff framework or a trajectory to cost reflectively. For example, in Oman the tariff is set by the independent regulator at cost reflective level. Government then decides the tariff consumers should pay and through a statutory instrument impose an obligation on the Ministry of Finance to make up the shortfall now amounting to 33%;
- Establishment of an independent System Operator (technical system operation-SO and market operations -MO), initially within the unbundled transmission company, together with associated user charges;
- The introduction of Transmission Network Use of System (TNUoS) and Distribution Use of System Charges (DUoS) to for use of the transmission and distribution network to transmit electricity;
- The introduction of distribution to transmission grid connection agreements and associated charges (exit charges), to be paid by users connected to the Transmission System; for example, generators, distribution companies, and very large demand customers, possibly amortised over (say) 15 years;
- Establishment of commercialised or corporatisatised business entities;
- Establishment of the Independent Regulatory Authority; and
- Establishment of a Power Purchase Agreement Framework.

The introduction of renewable energy distributed generation operators will also require from the electricity distribution sector a reliable metering network and end-user metering system and energy accounting in connection points with all distributed generation equipment. The distribution sector will need to be prepared for handling this energy coming to the distribution network. Again the development of commercial and contractual skills will be needed so as to enable distribution to purchase energy from those distributed renewable energy generation entities efficiently.

1.5 The Distribution Sector

In every country, the electricity distribution sector is vital part of the power system because it is required to deliver reliable low voltage electricity and services to end-users. Compared to the generation and transmission sectors in Iraq, the distribution sector is perhaps in worst state of deterioration and undercapitalisation. Fundamentally there is a lack of adequate interface or boundary metering between transmission and distribution and at the main transmission and distribution facilities and at the end-consumer level. Although there is high levels of systems losses, without metering it is difficult to establish the true levels. Further, there are high levels of illicit connections –theft of electricity. Similarly, with the existing very low tariff levels, coupled with poor billing and collections, the result is very low cost recovery ratios and very high subsidy levels. This low level of cost recovery is not a sustainable operation over the long term and will be a major disincentive to the entry of private independent distribution producers (IDP) to the system in future.

This low revenue collection and absence of a cost reflective tariff structure in the electricity distribution sector is ultimately impacting the entire ESI value chain in terms of financial sustainability, compromising the economic sustainability of the upstream generation and transmission businesses. In addition, the weak value chain impacts the fuel payments to the MoO, which at the same time is unable to provide sufficient amount and quality of fuel to operate the existing power plants. This is a vicious cycle and absence of fuel supply has resulted in stranded generation plants, the net effect being an increased shortfall in power supplies.

In accordance with the Electricity Law, a distribution licensee for a specified site can hold a retail supply license. At present, the main retail supply function is carried out by Distribution directorates. For the principal consumers, retail supply is performed by the power procurer, which is also responsible for the settlements administration.

The above creates the growing urgency for the operational, market and structural reforms not just to the Iraq electricity distribution sector, but for the entire value chain.

With this distribution sector context in mind, CPCS outlines the overall objective of the Distribution reform:

“To create a sustainable, efficient and viable ESI”.

This process must start with the distribution sector.

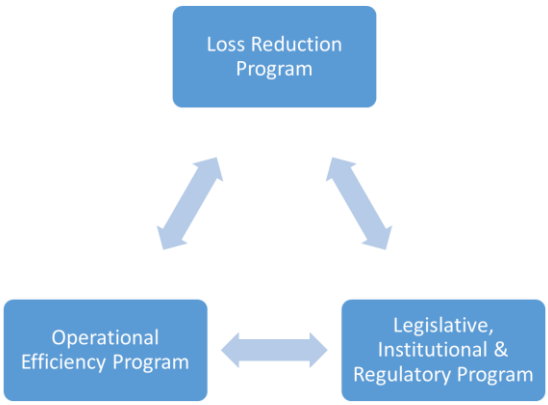
This Roadmap Report explores the necessary reform measures required to overhaul the Distribution sector and ultimately achieve this goal of sustainability.

1.6 Report Structure

CPCS has outlined specific recommendations on policy reform measures and specific initiatives which Iraq government needs to enact in its drive to rehabilitate expand and reform the Iraq Distribution sector.

The Report is structured into three reform programs, which are:

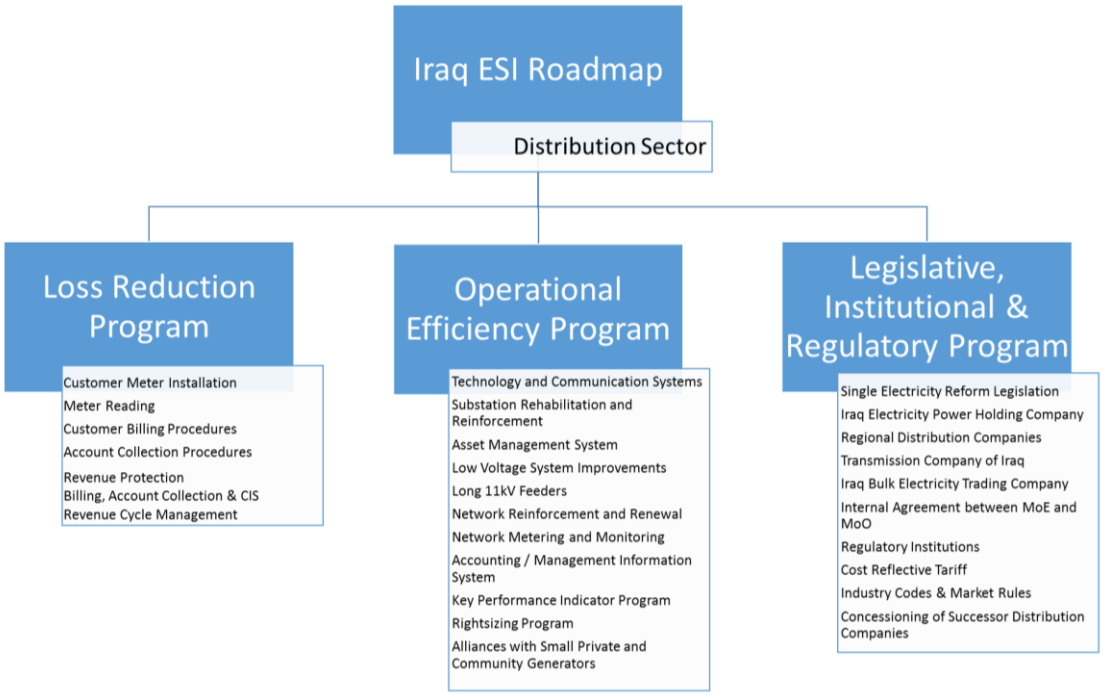
Figure 1-8: Reform Programs



Source: CPCS

Each reform program has a unique objective, linked to the overarching reform goal to establish an efficient, sustainable and viable distribution sector. A depiction of these three reform programs and the recommendations within each is found below:

Figure 1-9: ESI Distribution Sector Roadmap Reform Programs



Source: CPCS

Within each program, there are a number of reform recommendations which when combined together, creates the systemic reforms. These recommendations include not only physical and technical equipment changes; but also institutional, legal, regulatory and reform of the power market, as well as specific efficiency and operational improvement measures. Each recommendation sets out the following:

- Reform name;
- Phase of Reform;
- Reform Description and Context for Reform;
- Capacity Assessment and Development;
- Implementation Horizon;
- Investment Order of Magnitude; and
- Related Reform Initiatives.

Based on the three reform programs within this roadmap, a high level order of magnitude investment program has been developed, the summary of which is provided in Section 1.8 below.

The Report also sets out a detailed capital investment plan envisioned over the three phases of reform: Pre-Transition, Transition and Long-Term/WEM. The sector reform phasing is described in detail below.

1.7 Distribution Sector Reform: Phasing

It is very important to recognize that almost all successful reform programs take a long term perspective and the same should apply to the reform measures for the Iraq ESI, with specific focus on the distribution sector. We note, however, that it is not possible to structure a reform agenda solely for the distribution business, as the electricity industry is still technically a vertically integrated one with vertical economics, despite being separated institutionally into distinct legal entities. We need to know the end goals.

The reform is a process not an event. Pressures for rapid results should not obscure the point that reforming the structure of the power market is a long term process that requires patience and commitment to achieve desired results.

Therefore, we are recommending a phased approach to the reform, moving from pre-reform/pre-transition (the old vertically integrated monopoly structure) to transition stage of single buyer structure and then to multiple buyer and a competitive wholesale electricity market. In subsequent chapters, CPCS has outlined our recommendation for the timing of each reform measure, according to the applicable phase. Further, in order for Iraq to move from one phase of reform to the next, there are preconditions to be met or certain milestones which must be achieved, such as a single electricity legislation, based on an approved policy framework, providing and supporting systemic power market reform.

A description of each reform phase is provided below:

Pre-Transition Phase

This phase is expected to last from the short term to approximately 5 years, though depending on the mobilization and support the MOE receives and GOI puts towards ESI reform, this stage could take much longer. Ultimately, the pre-transition phase is not time bound and five years is set merely as a target time period.

The pre-transition phase covers the preparation phase where new legislation, a new industry, power market structures and a new institutional structure are established to facilitate private sector entry and competition. The pre-transition stage therefore requires unbundling from the vertically integrated state monopoly to embrace competition for the market in generation and corporatization of the unbundled stare owned business. In addition to a new holistic and comprehensive reform legislation, there will be the need for new market structures, new institutions, a new regulatory framework, new grid, distribution and metering, codes and procedures, new system dispatch arrangements and a new industry contract framework.

During this phase, we are recommending a major capital investment in physical improvements to be made to the network to address the years of disinvestment and a war torn system. This will ensure physical and operating supply conditions are in place able to evacuate the capacity put on the system. Generation and evacuation capacity will need to exceed peak demand. The period also includes crisis management response to the security situation developing from June 2014. Given the current situation in Iraq, crisis management will be required to preserve the safety and integrity of the electricity infrastructure. The pre-transition requires a comprehensive platform upon which a competitive bilateral wholesale market can be built going forward over the medium term.

Immediate Priorities: Within each Reform Program, a section has been developed which clearly outlines the immediate reform measures which can be initiated by the MoE. These identified immediate action items will create positive reform momentum in the first years of the program and allow for "early wins" by the GoI. This will, in part, foster supportive public perception which is critical to support a long-term reform effort. Following the implementation of these priority initiatives in the Roadmap, a targeted incentive campaign can begin to be created for management and certain personnel such as meter readers. For example, the installation of smart meters at both the end-user level and substation level will allow meter readers to be incented to match readings from both meters. Through capacity building and capital investment, as the readings improve, various ATC&C losses are reduced and the meter reader receives incentives for his or her efforts. Similarly, management teams can be encouraged to reduce ATC&C losses through targeted capacity development initiatives and capital programs, such as conductor refurbishment and upgrade campaigns involving ABC. The result is personnel and management improvement projects with updated technical skills, improved operations, enhanced governance and accountability frameworks and a platform for the eventual corporatization and unbundling of distribution companies.

Transition Phase

The transition phase sees the full introduction of the transitional market for the Single buyer market structure. The shift from the pre-transition phase will not be so time specific, but will be based on the industry meeting certain pre-conditions or milestones. These include:

- All legislative and regulatory provisions must be in place;
- The sector is progressing towards being vertically and horizontal unbundled and the service delivery business incorporated as commercially driven companies or cooperation;
- 70% of the generation and distribution sector should be in private hands;
- ATC&C will need to have been reduced by at least 50% and the market is approaching financial sustainability;
- At least 50% of customers will have been fully metered with modern metering systems;
- Installation of revenue grade interface meters between generation and transmission, transmission and distribution and border meters between discos;

- A multi –Year Tariff (MYT) system is in place or in development;
- Unbundled generation , transmission and retail tariff;
- Lifeline tariff in place for to meet the needs of underprivileged and deserving consumers- Universal Services obligation;
- Surplus of generating and transmission execution capacity, above peak demand to provide for spinning and general reserves and economic order dispatch;
- The Transmission supply (TSP) function unbundled or at least ring fenced from the independent systems operation (ISP), and provision for the ISP to be incorporated as a legal entity operating independently of TSP;
- The contract structures would be in place especially (the PPAs and Vesting contract or bulk supply agreement between the single buyer and the distribution companies; and
- All the legacy debt would have been removed from the market.

WEM/Long Term Phase

To enter this long term phase of reform, the Iraq electricity legislation will have provided for the eventual transitioning to a competitive wholesale power market, preferable a bilateral contracts market as against a mandatory or compulsory Pool. The coming into operation of the WEM will not be time bound either but will depend on certain condition precedents: substantial levels of private sector participation in the generation and distribution /retail businesses, maturity of the market in terms of financial sustainability and transition to fully cost reflective tariff, etc. At this stage an Iraq Bulk Electricity Trading Company would become another trader in the market with no monopoly rights.

We do not expect the creation of a competitive wholesale electricity market in Iraq in the early stages of the electricity sector reform, certainly not in the first five years; however since it should be the longer term goal, there is the need to ensure that steps being taken in the pre-transition phase of the reform do not later become impediments to introduction of a WEM, as has been the case in say Jamaica.

Bilateral trading and centralised power exchanges are the main market design options that have emerged for competitive power markets. In the gross or centralised (mandatory) pools, generators have to sell all their bulk power into an organised electricity exchange. In the balancing market or net pool structure, generators enter into bilateral contracts for the bulk of their supply needs and typically about 10% of the bulk power is then traded in the balancing market. The balancing market serves to eliminate imbalances between supply (from Generator) and demand (made by discos and large consumers or traders). In its simplest form, the Systems Operator (SO) designates one generation plant to increase or decrease production as necessary to keep supply and demand in balance all the time. The SO determines the market clearing price (or spot price) that it pays generators selling energy into the balancing market. The market clearing price is the last megawatt purchased in the bids stacked for the balancing energy and is

paid to all generators providing this service. Gross pool or centralised market requires mandatory participation of all participants and involves substantial intervention into unit commitments and schedules by the systems operator. For wholesale markets generators, IPPs, auto-generators, distributors, and large consumers, trade in bulk power based on a set of market rules and codes according to production cost, subject to approval of contract terms by the regulator. Under bilateral trading, settlement for contracted power is carried out bilaterally, and each distributor is financially responsible for its own contracts. Only the value of power which is sold in the balancing market passes through the wholesale market settlement procedures. Generators are therefore individually exposed to payment risks with distributors. With centralised pool the risks are centralized and shared.

Within this phase of reform, there is a further stage of power market reform, that of retail competition. We do not see this in Iraq for the next decade except for liberalisation of the league industrial users connected to the transmission network like a large cement plant.

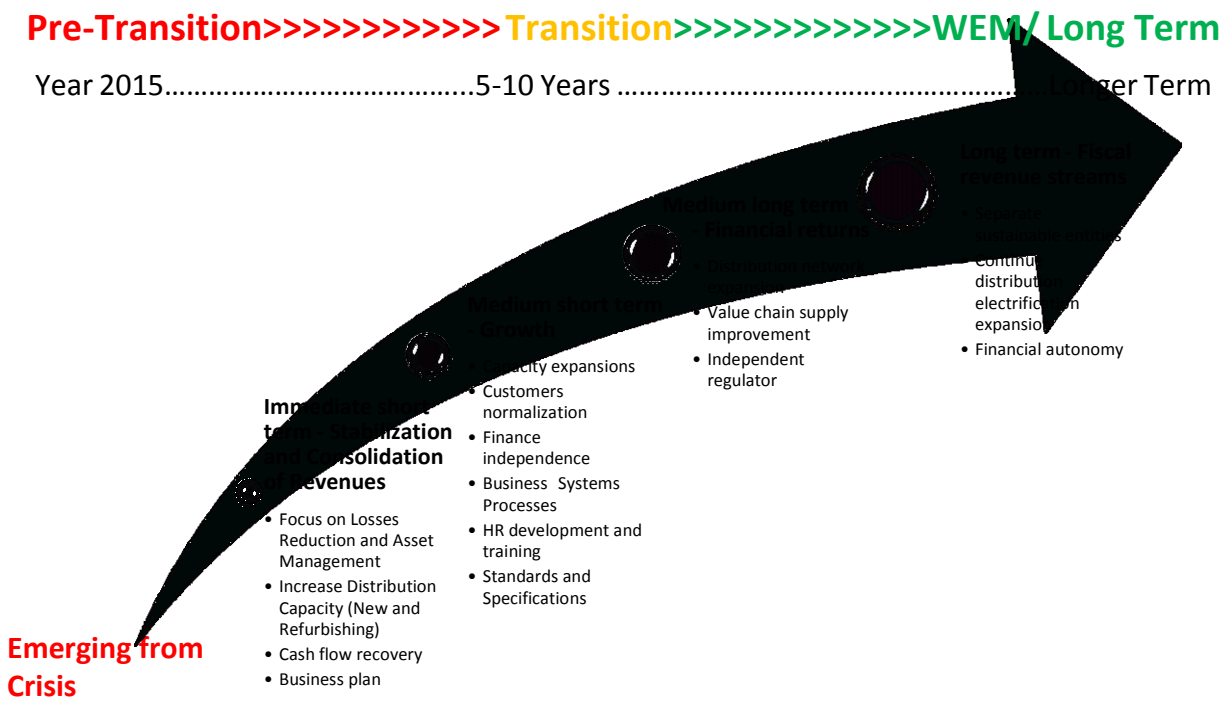
Reform Phasing: Conclusion

In conclusion, the objective of this overarching reform process is to set out the requirements for an efficient, viable and sustainable distribution sector. This reform will ensure that Iraq has the fundamental legal, institutional, regulatory and governance structures in place to enable moving from the current civil service governance centralised and monopolistic structure. It is important to note that the reform measures build on core policy directions already evident, and a proposed electricity industry reform law that defines this unbundling of the sector, corporatisation of the unbundled business and early steps towards regulatory independence, including moving toward cost reflective tariff structures.

The pre-transition stage therefore focuses on getting the market ready for commencement of limited competition – competition for the market and entry of private sector participation. Essentially, the power sector reform program, especially in the pre-transition phase, seeks to provide for improvements to the quality of electricity services and efficiency of market operations, whilst providing the enabling environment for private sector participation to complement traditional public sector financing and management.

The figure below shows a model form of Reform Roadmap which distinguishes the phases of the Reform, from the Pre-transition, Transition, to longer Term-wholesale Competition.

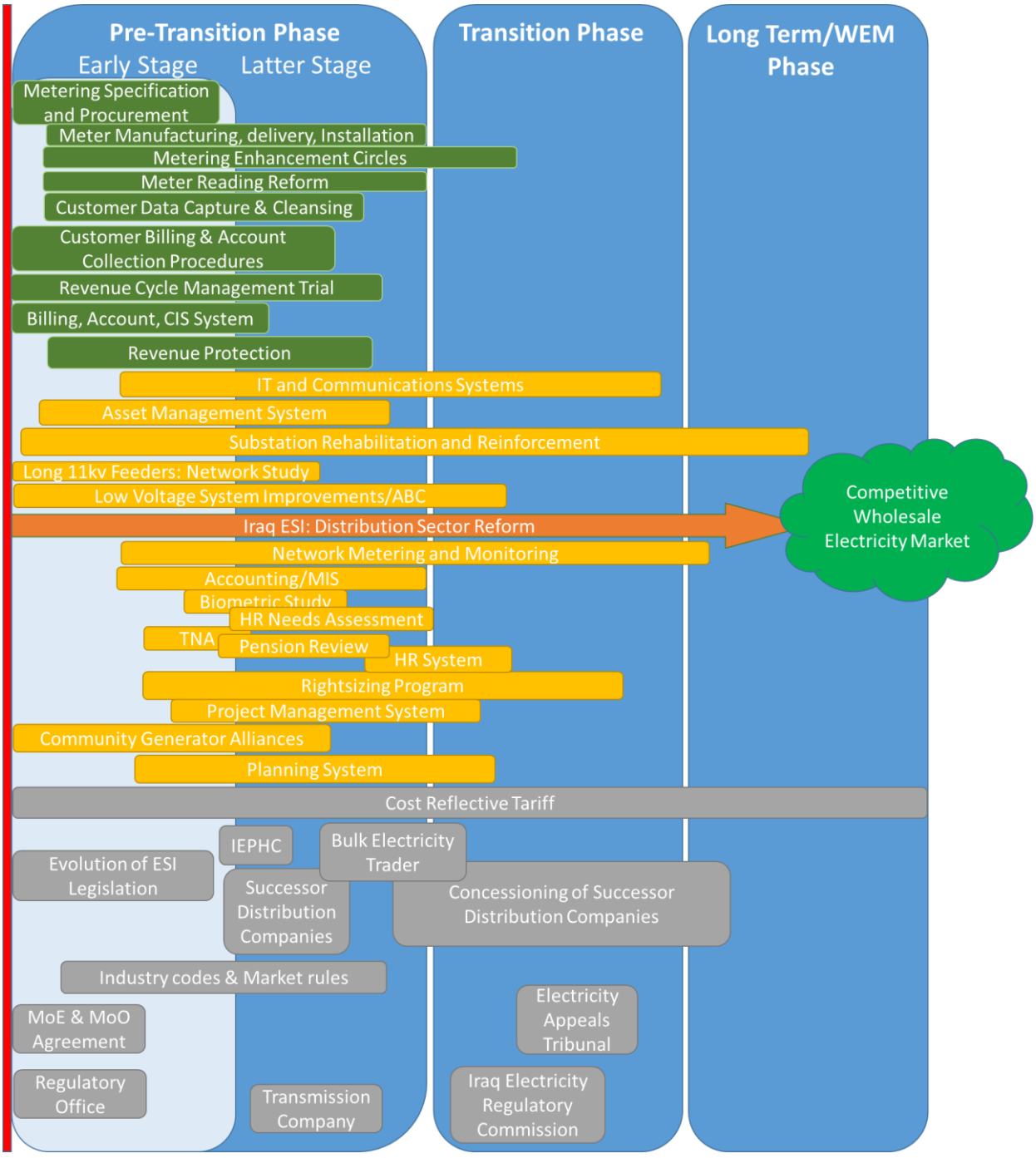
Figure 1-10: Tentative Electricity Distribution Sector Phases



Source: CPCS

Figure 1-11 below shows the relative proposed timescales for the introduction of each reform initiative using the three phases; pre-transition, transition and competitive wholesale electricity market. Many of the initiatives that commence in the pre-transition phase continue through the transition and WEM phases. The reform is a continuous process and the measures span throughout all phases and are shown in each phase for clarity.

Figure 1-11: Roadmap Reforms Summary: Phasing and Staging



Source: CPCS

The red line at the left most side of the figure reflects the "emergence from crisis". The reform recommendations which interconnect with the red line represent the *immediate* action items which CPCS recommends the MoE engage in. From both a budgetary and overall reform impact perspective, these reform recommendations will provide the largest benefits to sector reform

and can commence with either already earmarked MoE budgets or smaller supplementary budget allocations. Each reform recommendation is explained in detail within this report.

1.8 Distribution Sector Reform: Budget

In developing this reform budget, CPCS drew on numerous consultations with primary stakeholders such as the MoE and World Bank, along with a number of prior consultancy reports, such as the Parsons Brinkerhoff Iraq Electricity Masterplan and the INES Report.

The section represents CPCS' expectation on an investment order of magnitude package which ***supplements*** the MoE's current investment plans in distribution sector reform. At present, consultations with the MoE and World Bank indicate the current investment plans developed by the MoE mainly comprise investment in distribution physical assets. Therefore, within this Roadmap, the reform recommendations with specific order of magnitude budgets excluded are:

- Information Technology and Communication Systems (Operational Efficiency Program, Section 3.1)
- Substation rehabilitation and reinforcement (Operational Efficiency Program, Section 3.3)
- Long 11kv Feeders (Operational Efficiency Program, Section 3.5)
- Network Reinforcement and Renewal (Operational Efficiency Program, Section 3.6)
- Alliances with Small Private and Community Generators (Operational Efficiency Program, Section 3.12)

Consequently, throughout this Roadmap, CPCS has included an order of magnitude budget discussion for reform recommendations which have not yet been included in the MoE's investment and reform plans.

The overall budget presented in this Roadmap is a build-up of each of the three distinct reform programs and enclosed recommendations which supplement existing MoE investment plans.

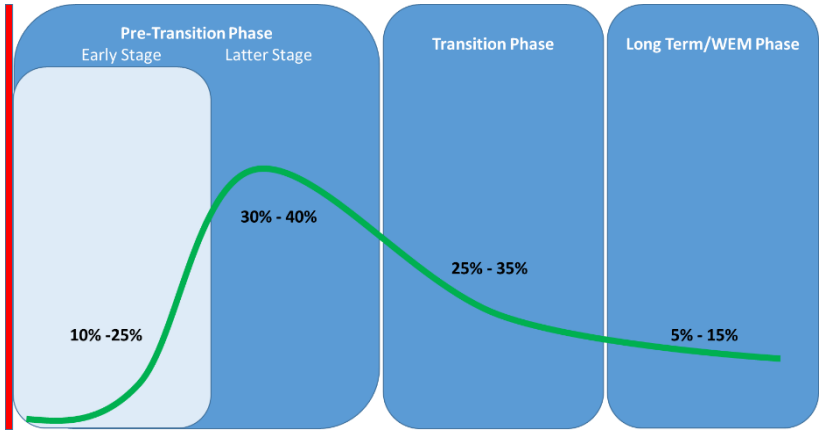
A summary of CPCS' supplemental order of magnitude budget is provided below. Further details on the individual investment orders of magnitude found are located within each reform recommendation throughout the report.

Figure 1-12: Reform Roadmap Budget, in USD millions

Program	Total
Total Loss Reduction	900.0
Total Operational Efficiency	1,000.0
Total Legislative, institutional, regulatory	100.0
Total	**2,000.0**

Given consultations with the MoE, CPCS acknowledges that the timing and appropriation of budgets and financial support to implement the Reform Roadmap is expected to follow a ramp-up, peak and tapering cycle. An illustration of this anticipated investment lifecycle is shown below, according the Reform phases outlined in Section 1.7.

Figure 1-13: Anticipated Investment Lifecycle



Source: CPCS

As discussed in the Reform Roadmap phasing section 1.7 above, the initial investment in the "Early stage" of the Pre-Transition Phase of reform will support the reform recommendations which can commence immediately. From this point, a natural resource mobilization is expected, with approximately 50%-60% of investment anticipated to occur in the Pre-Transition phase of reform. This is understandable, as the Pre-Transition phase of reform is fundamental to setting the ground work for the entrance of private sector involvement in the Transition and Long-Term phases.

It is clear that the primary investment requirements of this supplemental budget are housed within the Operational Efficiency and Loss Reduction Programs, which together account for more than 95% of the order of magnitude supplemental budget. Asset investment is paramount to a reformed distribution sector, capable of providing "a sustainable, efficient and viable ESI".

The *Loss Reduction Program's* primary investment requirement is in end-user metering, with an order of magnitude investment estimated at USD 800 million spanning the Pre-Transition to Long-Term phase of reform. The remaining reform recommendations in this program support this metering campaign to immediately reduce ATC&C losses and theft, while improving revenue collection.

Within the *Operational Efficiency Program*, the MoE has already created investment strategies for the large physical asset components of sector reform, namely in refurbishment/replacement and expansion of substations and switchgears, long 11kV feeders, network reinforcement and renewal and backbone communications infrastructure expansion. As a result, budgets relating to these reforms are excluded. CPCS has outlined expected investments required for supporting

commercial management systems, which together account for approximately 80% of this supplemental budget relating to the Operational efficiency program.

The other Operational Efficiency Program initiatives combine to address providing a sustainable and efficient distribution sector, especially in the areas of substation metering which has been largely neglected in MoE sector investment plans.

Finally, while the Legislative, Regulatory and Institutional Program appears small in estimated investment required at USD 100 million, its importance to the overall Reform Roadmap cannot be mistaken. This program outlines the framework for the ESI sector functioning, which will ultimately allow for private sector participation and sector reform. It takes a long term view of Iraq's ESI, but ensures immediate actions are taken which supports the overall Roadmap's goal of a sustainable, efficient and viable ESI.

This roadmap seeks to empower and complement the GoI's firm commitment to reforming the existing electric power sector. The aim is to rehabilitate Iraq's deteriorated energy sector and expand it to meet domestic energy demand so as to foster growth of a diversified economy, whilst improving living standards of Iraqi citizens and thus positioning Iraq as a major player in regional and global energy markets[30]. There is no doubt that the distribution sector (and greater ESI) reform aspirations by the GoI are ambitious and globally forms one of the largest energy sector development liberalisation program ever to be undertaken in recent years. If fulfilled, Iraq will become one of the region's dominant economies for developers, contractors, and suppliers.

This roadmap seeks to accomplish this aim of the GoI, through a carefully developed Distribution sector Reform Roadmap, which is the point in Iraq's ESI most vital for revenue collection and therefore system sustainability/viability.

[30] SIGIR, September 2013.

2 Loss Reduction Program

Loss Reduction Program: Definition and Objectives

We have higlighted the distrbution Loss Reduction Program as one to the priority steps of the first reform process which needs to be implemented as this step is central to financial sustability of the entire ESI. While the overall goals of the Distribution Sector reform is to increase system and business efficiency and provide an improved quality of services to the consumer, the objective of this program is to immediately address the following:

- A need for reducing the exceptionally high technical and commersial lossses losses;
- Eliminating theft of electrity; and
- Enhancing billing and revenue collection, which include improvements on customer metering and subsequently meter reading and bill collection.

These objectives directly impact aspects of technical, commercial and collections components typically referred to as Aggregate technical, commercial and Collection (ATC&C) losses.

In summary, the intent of the Loss Reduction Program is intended to immediately improve cashflows, which will contribute to improving the viability and financial sustainability of the entire ESI and ultimately the reliability and quality of supply. This will directly assist in providing for increased internally generated funds for the newly corporatised successor created companies and generate confidence in the other reform programs outlined in the roadmap. Loss reduction

programs are generally self financing with the improvements in losses, collections and efficiency, thereby generating a substantial return on the investment made.

Loss Reduction Program: Urgency for Reform

As previously stated, the overall objective of the Reform Roadmap is to improve the system viability, efficiency and quality of supply of the distribution sector within Iraq's ESI. To support this goal of improving system efficiency and quality of supply, the Loss Reduction Program targets the improvement in the entire revenue cycle management process – metering, billing, revenue collection and identification of energy being used by each customer.

Electricity metering, billing, and payment collection, like in most pre-reform ESIs, are major concerns as is the case for Iraq electricity sector reform. Ineffective metering, coupled with high losses in collection revenue are strongly correlated to the total losses in the distribution system. Where sufficient meters exist, consumption readings are rarely undertaken due to security issues and existing billing/collections procedures, particularly in areas of high tension. Moreover, for most households that have meters that are being regularly checked, nonpayment behavior of consumers is the norm. This is due to inadequate and outdated information technology for the entire revenue cycle management to secure tracking of billing and payments throughout the cycle. Besides the lack of advanced metering devices in various locations, the weak management and operational practices followed to track consumption is matter of major concern. Many end users do not use meters, or even use aging meters, non-electric in some locations. Such aged inaccurate meters do not reflect actual and accurate readings. Most meters have not been calibrated for years.

With an estimated 3.2 million customers and 80% of meters being of the electro-mechanical type and at least 30 years old, and with a population of 32 million, coupled with a significant increase in the number of households, there is a need for a continuous program of meter installation, with the objective of all customers eventually being properly metered. This Reform Roadmap (and the Metering recommendations below) targets a metering program of 2 million customers over a five-year period, i.e. the pre-transition phase. This represents approximately 50% of the metered population. The complete metering of the whole customer base in Iraq will only be achieved in the long term and it is not proposed to achieve that level of meter installations within the Pre-transition stage.

This Loss Reduction Program will allow the MoE to understand the true nature of losses, whether technical or commercial. In addition, the program will identify which parts of the Distribution system require the greatest attention.

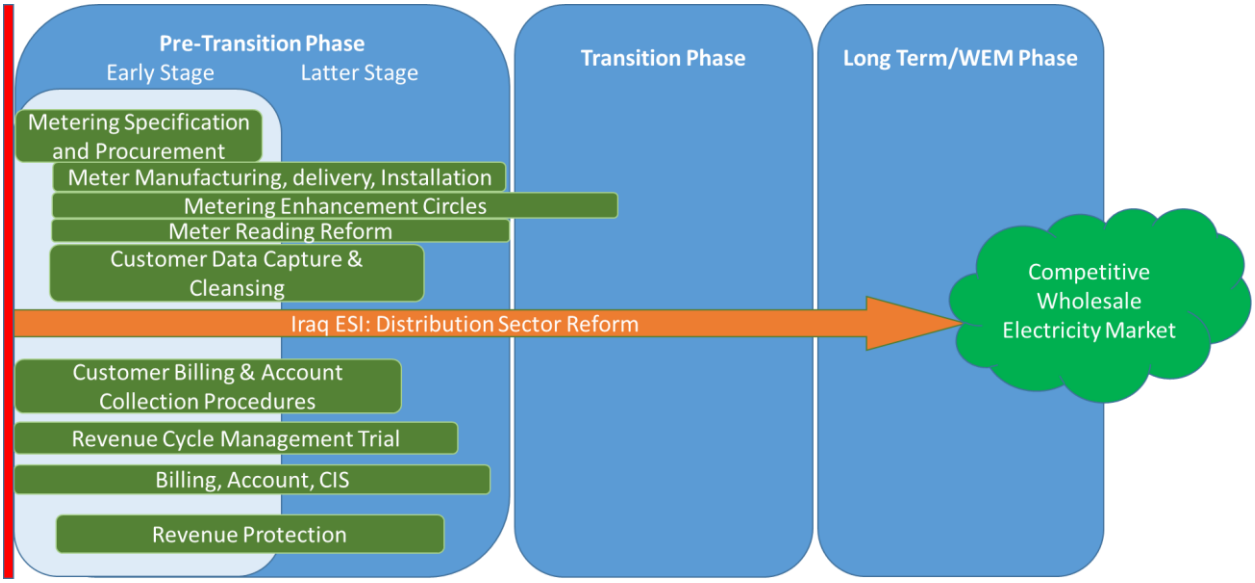
Our expectation is that with a successful implementation of this Loss Reduction program, immediate improvements will be made in terms of billing, collections and understanding of troubled areas through a dedicated metering installation initiative. Further, the loss reduction program elements are expected to encourage energy conservation and better consumption habits in targeted areas.

Loss Reduction Program: Phasing

This Loss Reduction Program is an essential element of the reform program and must be initiated as soon as possible in the Pre-Transition phase. CPCS stresses the necessity for this Loss Reduction Program to be given the highest priority for a number of reasons. First, these reforms will immediately improve cashflows and start to identify areas of greatest weakness with respect to ATC&C losses. Further, these reforms are relatively simple to enact and will set the foreground for more intricate and longer term reforms to be initiated.

There are numerous inter-related reform recommendations with this Loss Reduction Program and other reforms. For example, CPCS has outlined a suite of reform measures which integrate together to directly address system losses, whether its technical, commerical or collections losses. Numerous initiatives in the Operational Efficiency category will address these aspects of system efficiency, but the focus is on medium to longer term improvements.

Figure 2-1: Loss Reduction Program: Phasing and Staging



Source: CPCS

The figure above illustrates key tasks which are included in this Loss Reduction Program recommendations set out below.

Immediate Priorities

The reform recommendation in this Loss Reduction Program which interconnect with the red "emergence from crisis" line reflect the immediate action items. These recommendations include:

- Metering, End-user (Section 2.1)

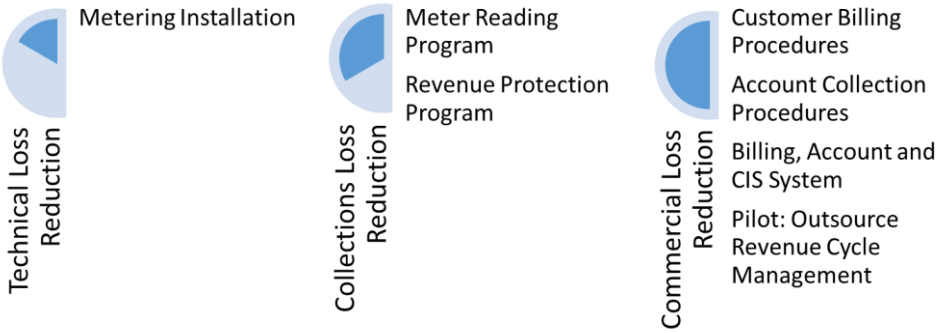
- Billing, Account Collection & Customer Information System and related procedures (Sections 2.3, 2.4, 2.6)
- Pilot: Outsource Revenue Cycle Management (Section 2.7)

These identified immediate action items will create positive reform momentum in the first years of the program and allow for "early wins" by the GoI. In the case of this Loss Reduction Program, the early win will be dramatically improved cash flows and a reduction in ATC&C losses through the metering program and supporting recommendations.

This Loss Reduction Program provides an initial platform for the development of a targeted incentive campaign for management and certain personnel such as meter readers. For example, the installation of smart meters at both the end-user level and substation level will allow meter readers to be incented to match readings from both meters. Through capacity building and capital investment, as the readings improve, various ATC&C losses are reduced and the meter reader receives incentives for his or her efforts. Incentive campaigns such as this will begin to ease the transition from the current monopoly structure to the eventual corporatisation and commercialization of the ESI.

The figure below provides an overview of how each of the Loss Reduction Program reforms integrate to improve collections and system revenues as quickly as possible.

Figure 2-2: Loss Reduction Program



Source : Developed by CPCS

Appendix A provides linkages for all Reform Roadmap recommendations, along with key expected cross dependancies which exist between measures and sub tasks of each iniative. It is clear that for the Reform Roadmap to be successful, a significant level of integration, coordination and cooperation are required.

Loss Reduction Program: Budget

The below Loss Reduction Program budget is provided, which indicates a soft budget of USD 28 million in studies, training and consultancy. The greater investment in this Loss Reduction Program is in the physical assets, which comprises a total of USD 872 million over the three

phases of reform. The total order of magnitude budget outlined by CPCS for the Loss Reduction Program is USD 900 million.

Figure 2-3: Loss Reduction Program Budget, in USD millions

Category	Total
Studies, Training, Consultancy	28.0
Asset Investment	872.0
Total Loss Reduction	**900.0**

Figure 2-4: Loss Reduction Program, Reform Recommendation Budget Detail, in USD millions

Section #	Reform Title	Studies/ Consultancy	Asset Investment
2.1	Metering, End User	20.0	780.0
2.2	Meter Reading (End User)	3.0	30.0
2.3	Customer Billing Procedures	0.2	3.0
2.4	Account Collection Procedures	0.6	6.0
2.5	Revenue Protection	0.2	3.0
2.6	Billing, Account Collection & CIS	2.0	30.0
2.7	Pilot: Outsource Revenue Cycle Management	2.0	20.0
Total		**28.0**	**872.0**

As discussed in Section 1.8, and outlined in Figure 1-13: Anticipated Investment Lifecycle, CPCS expects approximately 50% of the investment program supporting the various recommendations will occur within the Pre-Transition phase, with the remainder of the investment program spread over the Transition and Long-Term phases of reform.

2.1 Metering, End-user

Reform Phase: Pre-Transition; Transition and WEM/Long Term

Reform Description and Context for Reform:

This reform recommendation provides for a meter installation program at the customer (end-user) level. End-user (customer) metering is an expensive and important item in the process of achieving twenty-four hours- a- day supply to all customers in Iraq.

Non-technical losses, sometimes called “commercial losses”, in Iraq are often related to metering errors, inaccurate meters, improperly read meters and estimated consumption due to lack of

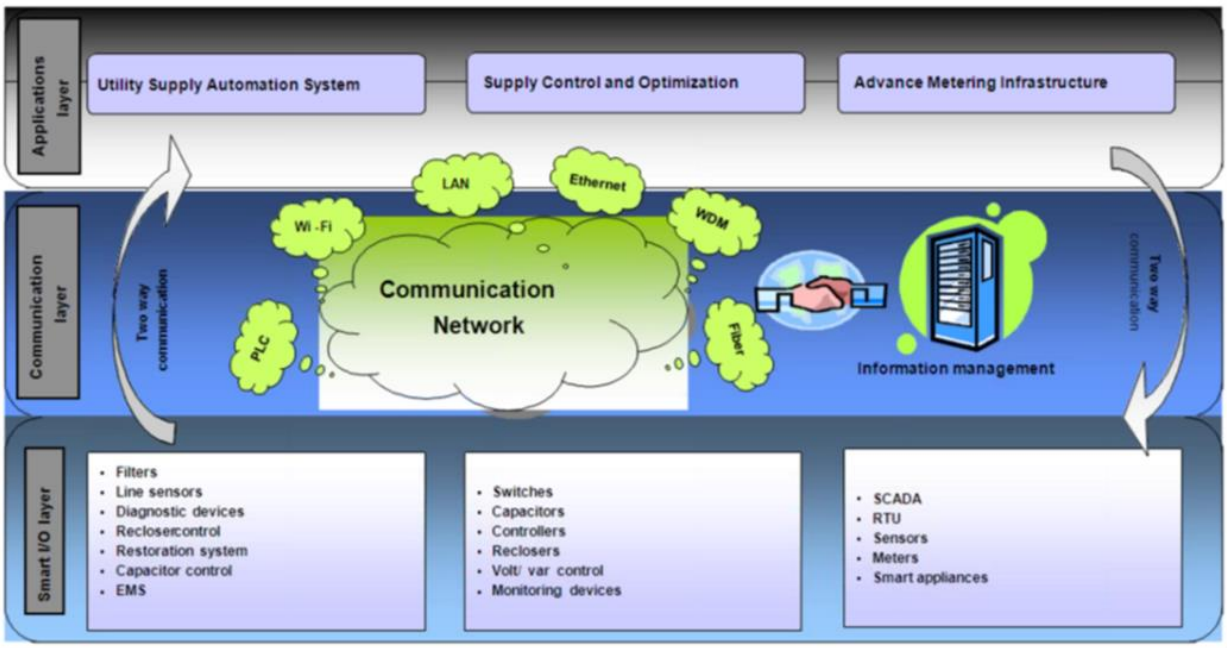
meters. Unauthorized connections, as well as administrative errors are additional sources of non-technical losses. At present, the end-user metering system is virtually non-existent, what exist involves a combination of outdated or malfunctioning meters and widespread theft or unmetered connections. Estimates from the MoE indicate unmetered connections exceeds 160,000, and this does not include an illegal connections or connections with old or faulty meters. Although it is difficult to accurately estimate, the Booz & Company assessment suggested that around 23% of the power supplied is lost to theft, via illegal connections to the system, and fails to reach customers.[31] In addition, according to MoE, the majority of the existing end-user meters, around 80%, are more than 30-years old and most of them have never been recalibrated for accuracy purposes.

Therefore, an end-user metering program will have a significant positive impact on the technical and commercial system losses and hence better utilisation of the generation and transmission and distribution network capacities. Without an accurate and timely metering system it will not be possible to develop a reliable new data management structure and introduce key performance based management indicators (KPIs) as system of modern management controls.

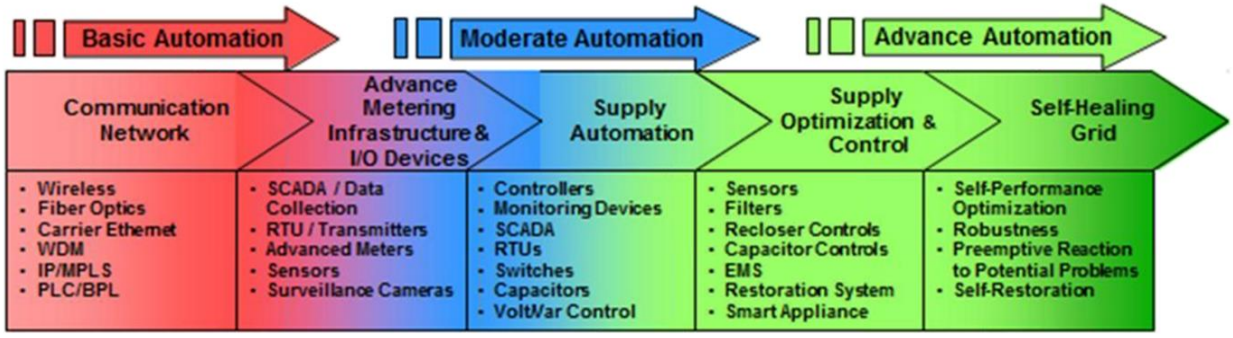
The types of metering may range from Automatic Meter Reading (AMR) systems to the full blown Smart Metering and Home Automation Network (HAN) requiring sophisticated telecommunications systems. Sophisticated Telecommunications Systems or Advanced Communication Technologies are required because establishing the appropriate telecommunication support systems unlock the potential of the various smart grid applications, as shown in the following figure:

[31] Booz & Company analysis, in in Iraq's Integrated National Energy Strategy (2012)

Figure 2-5: Depiction of Communication Network



Further details are included in the next figure which outlines different telecommunication systems and metering infrastructure.



Source: CPCS

According to the level of telecommunication system adopted, network control is achievable with Smart Metering, thus allowing the System Operator to control load flows to very specific areas of the network or to impose instantaneous load shedding of residential properties, whilst allowing essential supplies, such as to hospitals and water pumping stations to remain on load. This would be in addition to demand reduction using voltage reduction achieved through SCADA operating voltage control equipment.

CPCS has taken care to recommend an end-user metering strategy for the MoE over the Pre-Transition phase of reform and this calls for end-user meter installation program of 2 million meters to be installed over the initial five year period; essentially replacing a significant amount of the old and faulty meters with modern units. This target of 2 million meter installations

represents approximately 50% of the customer population. The complete metering of the whole customer base in Iraq will only be achieved in the long term as corporatization and commercialization is introduced into the sector. CPCS recommends that the metering implementation programme should be targeted in areas where the percentage of the population receiving electricity is at its highest and also where losses are at the highest. This will ensure the maximum rate of return on investment.

CPCS recommends a nuanced strategy with respect to the metering technology to be procured and installed. This is to involve a trial of multiple metering technologies, with a mix of AMR and smart metering technologies, as below:

1. *Smart meter Technology:* According to the MoE, Iraq has already started the process of small scale trials of 109,263 Smart Meters in Baghdad.[32] This will be the start of a very steep learning curve and require significant training and capacity building of both field installation and office staff. Integration with existing billing systems and the data cleansing exercise will require considerable effort. While CPCS is not currently recommending a full program of smart meter installation for the end customer at this stage of reform, this trial underway by the MoE represents an opportunity to support a demand side energy management trial. This could be as simple as limiting the amount of energy taken by smaller customers at specific times of day, as well as sending signals to larger industrial and commercial customer to reduce their load. Incentives can be provided by the government to those larger customers that have shown that they reduced their load when requested by the System Operator. With respect to this metering program, CPCS suggests this smart metering trial be supplemented by 1-2 similar smart meter trials in regions where system capabilities and customer density support the higher meter costs.

2. *AMR Technology:* In areas of high theft, poor collection rates and low metering penetration, CPCS recommends an AMR campaign to quickly install metering capability for existing end-user. AMR technology is older, but tried and tested. The cost of these types of meters is cheaper, which offsets a concern of using older technology since the improvement in ATC&C losses will be significant. Where possible, CPCS recommends the MOE conduct a number of trials using different AMR and communication systems so as to evaluate the most effective system. Urban areas may require a very different solution to that required in the rural areas.

In both cases, it is important not to select a single solution or manufacturer. “Don’t put all your eggs in one basket.” Adoption of proven technology is a better solution for Iraq rather than trying to use the most sophisticated and untested technology. Remember, the recommendation here is for a 50% metering program for approximately two million existing customers. We nuance this end-user metering recommendation by emphasizing the potential benefits to be attained by installing smart meter for larger industrial and commercial (I&C) customers. Smart meter

[32] CPCS “Sector Assessment Report”.

installations with these customers will allow for future benefits such as demand side management, which therefore reduces capital investments in the entire ESI value chain.

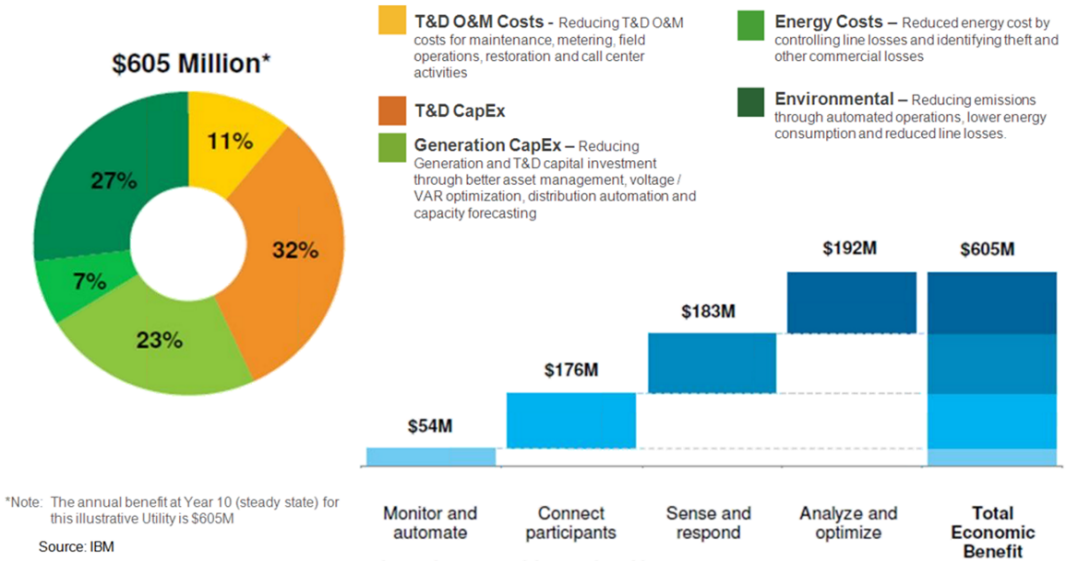
This program will yield numerous learnings and benefits which can be extracted to inform future metering campaigns targeted at the remaining 50% of the customer base and expansion programs.

End-user metering program needs to ensure compatibility of different metering systems, as the MoE should not expect facilities on different manufacturer's product to be available through common protocol software. Each manufacturer tries to differentiate his product by offering additional features that appeal to certain network operators. Invariably, this will require the use of bespoke software produced by that manufacturer. Therefore, the MoE should establish common standards to ensure interoperability.

Further, opportunities exist with modern metering devices to switch the customer between a credit and pre-payment tariff (pre-paid meters). This can be achieved remotely, where a communications network has been installed for customer metering. The use of pre-payment methods of metering ensures that customers have some control over their expenditure and thus make payments on a regular basis. This technique clearly helps those customers who are unable to associate the demand placed on the system by various appliances in terms of kWh with how much it will eventually cost them in their bills. Pre-payment brings cash to the ESI before the energy is actually used and if a close watch is maintained on the integrity of the metering installation, then the system will reduce system commercial losses and improve cash-flow. In addition, the use of prepayment meters also circumvents the current challenges relating to poor billing and collections procedures.

From the cost-benefit analysis point of view, we can observe what the tentative benefits at 10 years are for a recent study on a 2 Million customer's integrated utility the following figure:

Figure 2-6: Annual Benefits at year 10 for an Illustrative Utility



Capacity Assessment and Development:

The ultimate goal of the capacity development and training for this reform measure is to "train a core group of trainers" within the existing MOE and Directorate framework. To support this metering installation program, CPCS recommends the following key staff positions within the MOE be identified for training and capacity building:

- 1-2 staff from each of the seven Directorates, and
- 1-2 staff from the MoE Baghdad headquarters.

CPCS recommends these key staff be comprised of staff from both the directorate and MoE headquarters level. This will help to ensure capacity development and expertise relating to metering is spread between the ministry staff and the staff at the directorate level. Eventually, the goal is to corporatize the seven directorates into stand-alone distribution companies with commercial mandates and this will ensure expertise is developed in each directorate.

Capacity development of these key staff is fundamental in order to ensure the proper lifecycle implementation of the metering program. From the onset, CPCS recommends contracting competitively a small scale consultancy to be responsible for delivering capacity building and training of the key staff members within the MoE and the distribution directories. The consultancy will also seek to ensure correct types of specifications, deal with the subtleties and requirements inherent in modern metering technology. Following this training, the procurement involving determination of specifications and tendering should commence followed by a metering implementation project. The trials as stated earlier should utilize different smaller rollouts across select regions and directorates. These technical staff who are trained would become internal ESI industry trainers to support future internal training initiatives, especially under the successor corporatised distribution companies. A team of Installation Inspectors and Meter Fixers should be the desired outcome from this capacity building initiative.

Finally, CPCS recommends the creation of internal discussion teams in the MoE and Directorates as "Metering Enhancement Circles", which will bring together the new Metering Specialists and allow the exchange of information and best practices among them to pursue a continuous improvement in this key matter. In addition, those teams could collaborate and assist in preparing feasible targets for losses reduction programs in different areas of the distribution network. This concept of sharing best practices is a simple example of how to create synergies as the MoE moves towards corporatizing the directorates as successor distribution companies.

Implementation Horizon:

By the end of this metering campaign, the MoE will need to make a decision whether it should at this stage adopt a policy regarding the type of metering technology it will employ. The use of end-user smart metering technology is not only knowledge intensive, but is going through rapid technological changes and obsolescence. The other broad option is to progress through a less knowledge intensive metering technology, such as automatic metering. CPCS refrains from

making a firm recommendation on the technology to adopt for end-user meters, instead we recommend a number of trials to be used to inform the final decision. These trials should be implemented in different directorates, using different technology in order to evaluate the results and inform future metering policy.

CPCS recommends the metering program be targeted in directorates and regions which have high customer density, high illegal connection rates, high losses but also high payment ratios and better supply availability. This approach will have the combined effect of immediately reducing illegal connections, but also be supported by the existing customer base with the strongest payment record. The recommendation of implementing the metering program in areas of greater availability of supply supports the notion that a customer will be more willing to pay for a service that provides a more reliable, steady supply. Therefore, our recommendation for the first directorates to target are:

- **Three Baghdad Directorates General for Distribution (DGD)s:** The recommendation to focus on the Baghdad directorates is due to the high customer density. In addition, losses are particularly high at 51% in Sadr. Baghdad (along with Basrah and Mosul) consumes approximately 55% of supply, with the remaining 45% shared by the fifteen other provinces in the country[33]. In addition, illegal connections are estimated at approximately 5% of the customer base, according to MOE data provided relating to the year 2011.
- **DGD Middle Euphrates and DGD South:** As outlined in the Sector Assessment Report, data available from the MOE relating to 2011 and 2012 indicate that DGD Middle Euphrates and DGD South had the highest illegal connections at approximately 20% and 30% respectively of the customer base. The average illegal connections for all of Iraq for the same time period is approximately 15% according to MOE statistics. Further in 2012 and 2013, middle Euphrates directorate had the highest payment ratios.

As shown below, the lifecycle of a metering installation program includes the following broad elements:

[33] UNIDO, 2011. *Investment Map for Iraq.*

Figure 2-7: Metering Program and Support Activities

This Metering Installation reform program includes the steps 1 and 3 from the above Metering process chart, which are bolded and highlighted in green. Steps 2 and 4 of the metering process are housed within related reform recommendations of this Loss Reduction Program.

An expected timeframe for the implementation of this End-user Metering reform recommendation (two million customer meters) in the Pre-transition stage is outlined below using Microsoft Project.

Investment Order of Magnitude:

- Studies, training and consultancy: USD 20 million
- Asset investment: USD 780 million

The asset investment order of magnitude of USD 780 million includes the current MoE smart metering pilot, which has an associated cost of approximately USD 52 million for 109,263 meters.

There is currently a significant difference in infrastructure costs and timescales to install and commission Smart Meters, compared with the wide range of Automatic Meter Reading options available across the World. However, this is a trend which should be closely watched as smart metering is becoming increasingly more prevalent and production costs are continuously dropping. Similarly, AMR technology is being consistently replaced by smart technology, meaning availability of production is decreasing.

Based on the current contract within the MoE for the smart meter pilot project, it is estimated that the cost per smart meter is approximately $500 USD.[34] Therefore, the order of magnitude

[34] MOE information available indicates the Contract value for the smart meter installation of 109,263 is approximately $52 million USD.

cost for the existing customers in Iraq will be in the order of 2 billion USD (circa 4 million customers). This has to be compared with a much shorter timescale and availability of AMR metering which is likely to cost in the order of USD 450 million for complete installation to all customers.

Thus, for this metering program with a target of two million customers over the first three to five years the order of magnitude cost is estimated at USD 730 million, including installation for a mixed implementation of both smart and AMR technologies.

To re-iterate, metering is an ongoing exercise, not only to meet existing requirements, but there will be an increasing number of households which will need to be connected over the next five years, as inevitably changes in technology, and development of new devices and software occur. Additionally, the life of end-user meters is expected to be about fifteen years.

Related Reform Initiatives:

This metering reform program will be closely supported by the following:

- Meter Reading (Section 2.2), which will establish the software and procedures necessary to track and communicate metering information to the billing system;
- Information Technology and Communication Systems (Section 3.1), for the tracking of faults and abnormalities on the power network; and
- Billing, Account Collection & Customer Information Systems (Section 2.6), to translate metering information into customer billing.

2.2 Meter Reading (End-user)

Reform Phase: Pre-Transition; Transition and WEM/Long Term

Reform Description and Context for Reform:

Alongside the installation of millions of end-user meters, there needs to be a robust and accurate system of meter reading. This is the second reform measure of this Loss Reduction program. It is an important step in the cycle of capturing the necessary data and providing information to guide eventual recovery of electricity costs. To meet the needs of accuracy and data entry into a customer billing system, we strongly recommend the deployment of Hand Held Units (HHU) as this will enable the meters to be read on-site by a meter reader and transferred via a docking station to the billing system without the laborious process of taking down information in the field and then transcribing this information into data sets in the office. HHU can eliminate much of the inaccuracy in the data collection process.

Trials need to include the Hand Held Unit (HHU) or hand held device that will be used to capture data and meter readings from the various makes of meter for transfer to the billing system. The

HHU should also include a Global Positioning System (GPS) capability to record the precise location of each meter.

While CPCS, does not recommend this as a first measure, as the communications infrastructure progresses, the use of Automatic Meter Reading (AMR) technologies will come into play. As Iraq progresses into the Transition and Long Term stages of reform, AMR technology will also provide for instantaneous meter reading for Change of Tenancy (CoT) and billing/reading disputes.

Most modern electronic static electricity meters are capable of storing large volumes of data together with alarm indications if tampering has occurred. All this data is time-stamped and provides invaluable evidence of when any tamper or theft has occurred. These complex systems will support the Revenue Protection teams in their efforts to stamp-out tampering and by-passing of the meters.

Capacity Assessment and Development:

The ultimate goal of the capacity development and training for this reform measure is to "train a core group of trainers" within the existing MOE and Directorate framework. This recommendation is to help cement capacity within the MOE and Directorates relating to these closely integrated loss reduction reform measures. To support the Meter Reading program, CPCS recommends the key staff identified for training and capacity building be the same individuals identified in Section 0, the Meter Installation Reform. In addition, a number of staff will need to be trained on physically carrying out the meter reading using the hand held HHU's.

The following key staff positions within the MOE be identified for initial training and capacity building:

- 1-2 staff from each of the seven Directorates; and
- 1-2 staff from the MOE Baghdad headquarters.

Given information available during the sector assessment exercise, CPCS recommends the key management staff be comprised of staff from both the directorate and MoE headquarters level. The reason for this recommendation is to ensure capacity development and expertise relating to metering and meter reading is spread between the MoE and the Directorate level as the eventual goal is to corporatize/privatise the seven directorates into stand along distribution companies. Capacity development of these key management staff is fundamental in order to ensure the proper lifecycle implementation of the metering program. From the onset, CPCS recommends a small scale consultancy to train and educate the key staff members within the MoE of the types of specifications, subtleties and requirements inherent in HHU technology. Following this training, the commencement of specifications, tendering, HHU procurement should be carried out on a trial basis, utilizing numerous smaller rollouts across select regions and directorates.

With respect to the staff requiring training and capacity building relating to the actual task of meter reading using HHU's, CPCS recommends a short training course can be held at a central facility such as a training school (or better still a meter test station if sufficient space and facilities

either exist or could be created). A short course of a few days duration would be required covering techniques for reading different types of meters, use of different HHUs, domestic, industrial and commercial metering. Safety inspection and customer service training should also be included. A separate advanced course could provide training for Maximum demand, current transformer (Ct), voltage transformer (VT) and other complex metering arrangements.

Following this training, an internal program for meter reading technicians must be rolled out to each directorate. The training and support program must be in sufficient volume to ensure a meter reading team can cover each newly metered area as it is installed.

In addition, this capacity building effort will be reinforced with the implementation of the "Metering Enhancement Circles".

Implementation Horizon

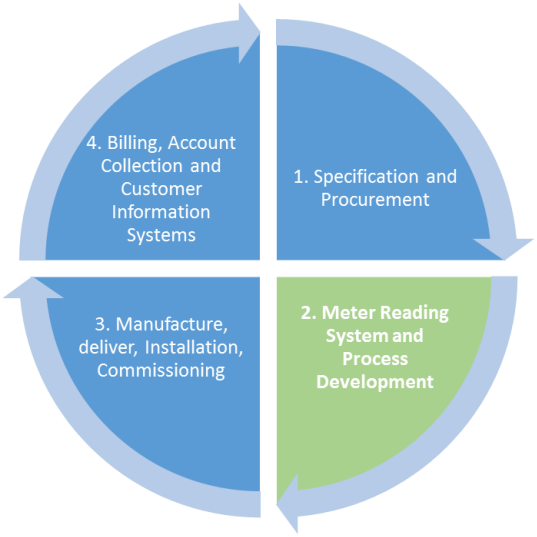
Similar to the Metering Reform measure above, CPCS refrains from making a firm recommendation on the technology to adopt at this stage. Instead we recommend a number of trials be conducted. These trials should be implemented in different directorates, using different technology in order to evaluate the results and inform future metering rollouts.

CPCS recommends that the metering reading initiative is targeted in the same directorates as the Metering End User initiative. This is a logical follow through to ensure that the newly installed meters are properly read. It will ensure the highest return on investment in terms of reduction in theft and reduction in commercial losses associated with meter reading, billing and account collection. Our recommendation for the first directorates to target are:

- **Three Baghdad Directorates General for Distribution (DGD)s**
- **DGD Middle Euphrates and DGD South**

As shown below, the lifecycle of a metering installation program includes the following broad elements:

Figure 2-8: Metering Reading Activity



This Metering Reading reform program forms Step 2 from the above Metering process chart, which is bolded and highlighted in green. The Meter Reading Reform measure sets out the recommendation to procure HHU's and train a contingent of meter reading personnel, including an early team of meter readers which we have termed the "Revenue Protection Team" (RPT) as outlined in Section 2.5. This RPT is viewed as an element of Step 4 in the above Metering lifecycle.

An expected timeframe for the implementation of this Meter Reading reform recommendation is in the Pre-transition stage, coinciding with the meter installation program.

This reform measures supports the procurement and installation of the 2 million meters over the first 5 years of the roadmap.

Investment Order of Magnitude:

- Studies, training and consultancy: USD 3.0 million
- Asset investment (mainly staff): USD 30 million

The investment order of magnitude outlined here is intended to support the meter reading program for the initial installation of 2 million meters in the next 5 years, and further extension into the transition and WEM period. This investment is expected to cover the following during the pre-transition period:

- Training: USD 3.0 million
- Meter readers, capital cost: USD 29.0 million; and
- HHUs: USD 1.0 million

The above capital cost for meter reading is CPCS' anticipation of redeployment of staff and business process re-engineering required to support the meter reading activity. This is separate

from estimated training and consultancy above.Note, as metering of the entire Iraqi customer base continues, the meter reading program, personnel training and capacity building must also continue in support. Metering and meter reading is an ongoing exercise, not only because of an increasing number of population and households, but because there be will the inevitably changes in technology, as well as development if new devices and software.

Related Reform Initiatives:

This metering reform program will be closely supported by the following:

- Metering, End-User (Section 0), which includes an end-user meter installation program for 2 million customers.
- Information Technology and Communication Systems (Section 3.1), for the tracking of faults and abnormalities on the power network.
- Billing, Account Collection & Customer Information Systems (Section 2.6), to translate metering information into customer billing.
- Revenue Protection (Section 2.5), targeted at reducing illegal power connections, meter tampering and improving billing collections.

2.3 Customer Billing Procedures

Reform Phase: Pre-Transition.

Reform Description and Context for Reform:

Revenue cycle management, which includes metering readings, billing processing, invoicing preparation, invoicing delivery, and payment collections, is currently a major weakness in the sector and requires a major overhaul. While billing ratios within Iraq vary by Directorate and governorate for numerous reasons, including security, personnel capability and training, losses in the sector are excessively high, reaching more than 50%.[35] Current operating arrangements do not adequately ensure that customers are properly billed for their electricity consumption. Experience from other countries suggests that a large part of these is due to weak systems, procedures and controls. It is expected that without robust systems, controls and management there will be significant leakages at each stage throughout the meter reading and billing cycle, e.g. some customers are not visited for a meter reading, some meter readings are not collected or transferred to the billing system correctly, some bills are prepared incorrectly, estimated accounts are inappropriate and some bills are not even delivered to customers.

Although there is no doubt that there is a requirement for a major meter installation program and a modern billing system, a major review of existing processes and practices can be

[35] Source: Ministry of Electricity Data, Booz & Company analysis, in in Iraq's Integrated National Energy Strategy (2012)

undertaken immediately in order to identify and rectify weaknesses. The review should take the form of a comprehensive review of the laid down procedures which may identify some weaknesses but, more importantly, should include a detailed audit to test what happens in practice.

The purpose of the review will be to introduce working practices and processes that ensure that:

- Information is available as to which customers have functioning meters and which do not, including a brief description of which kind of meter is installed, and when it was installed;
- Every customer has its own registry and records of installed meter and consumption;
- Appropriate meter and billing records are held for all customers;
- Customers' consumption is recorded and the data collected;
- Accurate bills are issued promptly for all customers;
- Frequency of meter reading is appropriate;
- There are adequate controls to ensure meter readings and billing errors are minimised, identified and corrected;
- There are adequate precautions to prevent and identify theft of electricity and corruption;
- A suite of suitable KPIs is established and regularly monitored;
- Adequate controls ensure that there is little scope for fraud or corruption; and
- Management, supervision and performance monitoring of meter reading staff is appropriate.

Capacity Assessment and Development:

Directorates with the lowest billing ratios should be targeted first for analysis and support. CPCS recommends a core billing team of at least 5 staff be selected for training and development. Following this capacity development of a core team within each directorate and MOE HQ, an additional capacity development program will be required on billing procedures. This internal training should also include the Meter Reading staff to ensure consistency and understanding of how meter reading, billing, account collection and the system coordinate and operate together.

To support any billing system upgrade, a comprehensive data capture and data cleansing exercise will be needed. It should be assumed that at least 50% of the customer registered on the existing system will have some errors in their data held on file. The manpower and time to resolve these errors will be substantial.

In addition, this capacity building effort will be reinforced with the implementation of the "Metering Enhancement Circles" as discussed in Section 2.2.

Implementation Horizon

CPCS expects an external consultancy will be engaged in the first year of the roadmap to assist with the billing procedures and process development. Ideally, the Customer Billing Procedures should be developed in advance of procuring either an off the shelf system or custom system as the procedures will help identify functionality required in the system.

Further, this reform measure can be commenced immediately and will provide numerous synergies with the meter installation program and meter reading implementation.

Data cleansing will take many years (up to 10) and requires the utmost diligence, skill and local knowledge to achieve credible results.

CPCS recommends that the Customer Billing Procedures initiative is targeted in the same directorates as the Metering End User and Meter Reading initiatives. This is a logical follow through to build the end to end process of meter installation, reading, billing and account collection.

Our recommendation for the first directorates to target are:

- **Three Baghdad Directorates General for Distribution (DGD)s**
- **DGD Middle Euphrates and DGD South**

This Customer Billing Procedures reform is a critical component of the final step of the metering lifecycle, as shown in the figure below. It sets the stage for the procurement of the Billing, Account, Collection and CIS System.

Figure 2-9: Customer Billing Procedures

CPCS has reflected this initiative duration to be five years, commencing immediately. This conceptually allows for the data cleansing process of existing accounts, together with required training and implementation throughout Iraq. The bulk of this initiative will be done in the short

term (within 1 year), with the remaining implementation expected to coincide metering installation trials over the first five years.

In practice, customer billing procedures are dynamic and will be constantly updated to reflect current realities.

Investment Order of Magnitude:

- Studies, training and consultancy: USD 0.2 million
- Asset investment: USD 3.0 million

This investment order of magnitude includes CPCS' recommendation for a short term external consultancy to:

- Assess the current billing procedures for each directorate;
- Identify weaknesses and areas for improvement, as well as case studies of potential billing practices which are succeeding in certain areas;
- Set out a rigorous billing protocol, complete with information to be collected and tracked;
- Assist and develop internal capacity for existing data cleansing process;
- Training for MOE and Directorate teams;
- Development of KPI's for inclusion in the KPI program development;
- Short term support of implementing procedures once the Billing, Account, CIS system is in place; and
- Subsequent long term development and support.

Related Reform Initiatives:

This reform initiative is not specifically dependent upon any other measure in order to begin. However, the development of the updated and revised Customer Billing Procedures directly supports the following reform measures:

- Metering, End-User (Section 0), which includes an end-user meter installation program for 2 million customers;
- Account Collection Procedures (Section 2.4), which brings together refreshed billing procedures with a strategy, process and procedures to improve and sustain account collection rates;
- Revenue Protection (Section 2.5), targeted at reducing illegal power connections, meter tampering and improving billing collections;
- Billing, Account Collection and Customer Information Systems (Section 2.6), to collect and house billing, account and customer information at an international standard; and

- Key Performance Indicator Program (Section 3.9), which outlines a KPI program to enable the management team to target, measure and control system performance.

2.4 Account Collection Procedures

Reform Phase: Pre-Transition

Reform Description and Context for Reform:

As mentioned previously and in past CPCS reports, billing losses are categorized under non-technical losses, which consist of losses not related to the physical power system but rather to loss sources like electricity thefts and errors in billing and meter reading. Although it is difficult to be accurately estimated, the Booz & Company assessment suggested that around 26% of the power supplied to end customers are billed, but are not ultimately paid (a category that includes several government agencies). Other information supplied by the MoE indicates an account collection ratio in the order of only 60%. In either case, this collection rate is unacceptably low and poor by international standards. While there is clearly a need for improvements in IT systems, significant progress can be made through the operation of tighter processes and controls – as recommended in this reform measure.

The account collection component is a core part of Revenue cycle management, which is currently a major weakness in the sector and requires a major overhaul. Although there is no doubt that there is a requirement for modern systems, a major review of existing processes and practices can be undertaken immediately in order to identify and rectify weaknesses. This should take the form of a comprehensive review of the laid down procedures which may identify some weaknesses but, more importantly, should include a detailed audit to test what happens in practice.

The purpose of the review will be to introduce working practices and processes that ensure that:

- Bills issued are tracked in a registry to identify which have been paid and which are outstanding;
- There is effective follow up to chase outstanding bills;
- Follow up is prompt, effective and appropriate;
- Appropriate action is taken to deal with persistent bad payers, e.g. use of prepayment meters;
- There is an appropriate policy for disconnection for nonpayment and, if so, that it is used effectively;
- Appropriate management information is maintained, e.g. aged debtor analysis;
- A suite of suitable KPIs is established and regularly monitored;
- Adequate controls ensure that there is little scope for fraud or corruption; and

- Arrangements are in place for the prompt settlement of other government departments.

Capacity Assessment and Development:

The above account collection considerations for the procedures are very important. However, in practice, it is likely there will be differences in approach depending on the region or directorate. CPCS recommends the account collection procedures be developed and piloted in specific regions with differences in approach, customized for the directorate or region.

While Account Collection procedures can be developed for all directorates and regions, the account collection rollout should accompany the regions and directorates which receive the focus of the metering program.

In addition, this capacity building effort will be reinforced with the implementation of the "Metering Enhancement Circles" discussed in the section 2.1 above.

Implementation Horizon:

CPCS expects an external consultancy will be required at the onset of this reform to assist with the Account Collection procedures and process development. These procedures should ideally be developed in advance of procuring either an off the shelf or custom Billing/Account Collection system, as discussed in Section 2.6. The procedures will help identify functionality required in the system.

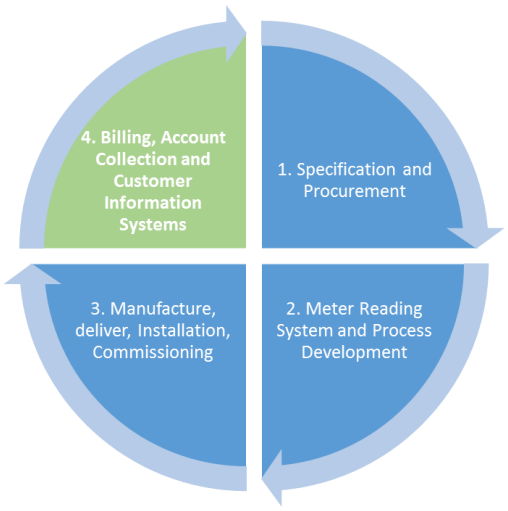
CPCS recommends that the Account Collection Procedures initiative is targeted in the same directorates as the Metering End User, Meter Reading and Billing initiatives. This is final step in the end to end process of meter installation, reading, billing and account collection.

Our recommendation for the first directorates to target are:

- **Three Baghdad Directorates General for Distribution (DGD)s**
- **DGD Middle Euphrates and DGD South**

Further, this reform measure can be commenced immediately and will provide numerous synergies with the meter installation program and meter reading implementation. CPCS recommends the rollout of this reform to be in tandem with the targeted end-user metering program. This Account Collection Procedures reform is a critical component of the second and final step of the metering lifecycle, as shown in the figure below.

Figure 2-10: Customer Billing Procedures



CPCS has reflected this initiative duration to be five years, commencing immediately, with the bulk of implementation expected to coincide with metering installation trials over the first five years.

Investment Order of Magnitude:

- Studies, training and consultancy: USD 0.6 million
- Asset investment: USD 6.0 million

This investment order of magnitude includes CPCS' recommendation for a short term external consultancy to:

- Assess the current account collection procedures for each directorate;
- Identify weaknesses and areas for improvement, as well as case studies of potential account practices which are succeeding in certain areas;
- Set out a rigorous account protocol, complete with information to be collected and tracked;
- Assist and develop internal capacity for revenue cycle management;
- Training for MOE and Directorate teams;
- Development of KPI's for inclusion in the KPI program development; and
- Short term support of implementing procedures once the Billing, Account, CIS system is in place.

The findings from this process will provide useful information for the procurement or development of the Billing, Account and CIS system.

Related Reform Initiatives:

This measure is not dependent upon any other measures being completed, before it can commence. However, the development of Account Collection Procedures directly supports the following reform measures:

- Metering, End-User (Section 0), which includes an end-user meter installation program for 2 million customers;
- Customer Billing Procedures (Section 2.3), which develops a billing protocol, complete with identified KPIs to improve the billing ratio within Iraq;
- Revenue Protection (Section 2.5), targeted at reducing illegal power connections and improving billing collections;
- Billing, Account Collection and Customer Information Systems (Section 2.6), to collect and house billing, account and customer information at an international standard; and.
- Key Performance Indicator Program (Section 3.9), which outlines a KPI program to measure and track system performance.

2.5 Revenue Protection

Reform Phase: Pre-Transition

Reform Description and Context for Reform:

Alongside poor performance in Billing and Account Collection, theft of electricity is widespread. This increases the figures on non-technical losses and reduces further the already low revenues recoverable through account collection. It must be recognised that illegal connections cannot be eliminated entirely as the practice continues even in countries with modern and sophisticated power utilities; nevertheless, it can be reduced significantly through targeted, robust and concerted actions.

Illegal connections take place because consumers believe that their actions will not be detected or even when they are detected (or are sometimes quite obvious) that no action will be taken. These views and the practice itself can be countered through policy, practice, punishment and publicity. In the first instance (and this should not be a lengthy or time-consuming exercise) a Revenue Protection Policy should be prepared and endorsed by senior management. The Policy, which can be amended and enhanced over time, should outline:

- The objective of the Revenue Protection Team (RPT);
- The work that it will do, including, for example, collection of evidence;
- The action that will be taken against those caught; and

- How both the existence and work of the Team, together the names of those caught will be publicised.

The RPT will have the responsibility of attending customers' premises to investigate and deal with illegal connections and meter tampering, and this will be its prime focus. The RPT may discover instances of theft itself, but mostly it will act upon information received from meter readers, field engineers, linesmen and, eventually, the public.

It is to be expected that the RPT will not be popular, at least in the early days. An early action in parallel with the establishment of the RPT will be to publicise through the media, leaflets and other appropriate vehicles the fact that it is being established and that it will take action. Importantly, consumers must be told why the RPT is being established and demonstrate that over time the protected revenue will help to develop and improve their electricity supply service. Publicity should also make clear that those caught will be punished for theft according to law and their names made known through the media. The aim should be to make illegal abstraction a universally unacceptable practice where the perpetrators are viewed as stealing from their neighbours rather than the State.

Capacity Assessment and Development:

The Revenue Protection Team (RPT) training will undoubtedly be included in the various training exercises relating to the Billing and Account Collection reform initiatives. However, additional awareness training will be required relating to the specific circumstances the RPT is likely to find themselves in (hostile, suspicious, unwelcoming environments).

A specific RPT for each directorate must be formed which should focus on this work only so as to gain skills and expertise. The RPT must have trusted strong leadership through a Senior Manager reporting to a Director, each with specific KPIs for their work. In practice, the RPT will comprise of a series of small units spread strategically around the country targeting the main cities where theft will undoubtedly take place in the highest concentrations.

Part of the RPT's remit will be to train their field colleagues as to what to look for as evidence or suspicion of theft. A swift reporting mechanism must be put in place to allow for reporting of evidence or suspicions to the RPT. This feedback loop must be incorporated into the Billing and Account Collections procedures, discussed as part of this Loss Reduction Program.

In addition, this capacity building effort will be reinforced with the implementation of the "Metering Enhancement Circles" as discussed in Section 2.2.

Implementation Horizon:

All of the above actions necessary for implementation could be achieved within six months. Again, this reform measure will supplement the metering program, together with the updated billing, account and collection procedures. CPCS recommends the RPT be developed and rolled out in succession with the metering pilots and account collection priority areas.

The Revenue Protection reform will be implemented and sustained in the short term as the capacity of a regular Account collections and meter reading team are developed. On the premise that all elements of the Loss Reduction program are initiated, CPCS expects the RPT would be a "stop-gap" and would slowly be minimized in its necessity by normal meter readers and technical engineers, (supported by the billing/collections procedures and system) within the first 3-4 years. However, the reality is the RPT will never be fully obsolete, it will instead adapt with time.

The highest payment rate is recorded in the middle Euphrates directorate (i.e., 20.1%). Conversely, the payment ratio is found in Baghdad Al Karkh distribution directorate (i.e., 5.9%). In addition, the billing rate in rural Nienwa area of the North Directorate, for instance, is recorded the lowest (i.e., 8.7%). The revenue protection initiative is best targeted at the areas where high levels of theft are known and where the billing rates are particularly low.

CPCS recommends that the Revenue Protection initiative is targeted initially in these directorates:

- **Three Baghdad DGDs, in particular Al Karkh**
- **North DGD, in particular Nienwa**

Investment Order of Magnitude:

- Studies, training and consultancy: USD 0.2 million
- Asset investment: USD 3.0 million

It is expected that the development of this RPT will require specific adaption depending on the region or directorate being targeted. CPCS recommends a short term consultancy to work with the MOE HQ and directorates to develop, provide training and implement the RPT in the short term.

Related Reform Initiatives:

This measure is not dependent on other measures, although it should be evaluated as part of the review of billing and account collection processes. Other reforms which this initiative will directly support are:

- Metering, End-User (Section 0), which includes an end-user meter installation program for 2 million customers;
- Customer Billing Procedures (Section 2.3), which develops a billing protocol, complete with identified KPIs to improve the billing ratio within Iraq; and
- Account Collection Procedures (Section 2.4), which brings together refreshed billing procedures with a strategy, process and procedures to improve and sustain account collection rates.

2.6 Billing, Account Collection and Customer Information Systems

Reform Phase: Pre-Transition

Reform Description and Context for Reform:

Billing and Account Collection performance is very poor, available statistics from the MOE suggest that the proportion of bills issued that are settled (the collection ratio) is in the order of 60%. Notwithstanding the security situation in Iraq, this is unacceptably low and very poor by international standards.

Whilst there is clearly a need for improvements in working practices and processes, significant improvements can be made with the introduction of modern systems incorporating effective reporting and controls. For this reform initiative, CPCS recommends the introduction of a modern billing, account collection and customer information system sufficient to meet international standards. This system reflects an element of what is often referred to as the Commercial Management system. A Commercial Management system houses this Billing, Account collection and CIS and an Accounting Management System. For the purpose of this reform roadmap, CPCS has separated the two systems as two distinct reform measures to communicate the importance of both elements. In addition, the billing, account and CIS elements are particularly important in the short term to be addressed given the poor procedures and collections rates within Iraq.

Key aspects will be the development of a robust customer database and registry incorporating billing details, credit history, risk profile, metering details etc., which will also improve customer service capability.

What follows is a summary of high level generic features for a “typical” billing system/CIS:

- Customer Information: Personal data, account type, supply address, feeder and transformer information;
- Meter Readings and Information: Meter manufacturer, type, ratings, and factors, reading value and date, reading history, maintenance records including calibration;
- Connections, Disconnections, and Reconnections: List of customers to be connected for the first time, customers to be disconnected or face temporary shutoff for non-payment, and reconnection and dates for scheduled services;
- Customer Invoices: Company name, customer name and billing address, account type, current usage, tariff schedules, reading date, billing date and due date, aged debt, notice of disconnection if applicable and disconnection date;
- Receivables Sub-Ledger: Current, aged, and total receivables;
- Payments and Receipts Modules: Cash register, checks and bounced checks, payment types, prepaid amounts and partial payments, payment locations, credit history, receipt printing;

- Cash Control and Reporting: Cash books and daily cash reports;
- Customer Security Deposits: Amount, date paid, date refund is due to customer;
- Customer Project Risk Deposits: For large customer hook-ups non-refundable prepayment, refundable deposit, number of years to be credited against account;
- Report Module: Reports by account type, daily payments, daily breakdown by area/book, lists of clients with credit or in arrears, ad hoc reports, etc.;
- Portal to General Ledger: Aggregated receivables and accounts due; and
- Key Performance indicators Features.

Typical providers of metering head end systems integrated with billing and account systems include CGI, IBM, Itron, Landis & Gyr and Siemens. It is well worth investing in the services of a systems integration specialist company such as Utiligence based in Masdar City, Abu Dhabi, United Arab Emirates.

Prepayment metering provides many benefits including:

- Improved distribution company cash flow
- Less susceptibility to poor billing and collection procedures
- No need for credit checking or obtaining deposits from customers
- Easier budgeting for some customers

CPCS recommends that care should be taken in selecting prepayment technology. The early technologies using keys and credit-card style cards have been largely superseded by systems where the meters can be remotely programmed and controlled using powerline carrier, fibre-optic, or encrypted mobile phone technology. These latter technologies have proven to be resistant to the counterfeiting techniques that marred the implementation of earlier systems.

However, as we mention throughout the Roadmap, any new process and/or system should be implemented in a controlled manner under a change management process and a coordinated overall IT strategy. The investment in IT should be based on business need, particularly the future needs of the business to operate as an efficient commercial entity. The first stage of this measure will be a detailed investigation and study of the business requirements, followed by a business requirements specification. It is essential that a system, or systems, procured or developed is fit for purpose and sufficiently flexible to adapt to developing business needs. Systems will need to be compatible with the metering strategy and will need to accommodate appropriate communication channels depending on future data collection strategy. The systems will also need to integrate with other systems such as the accounting and management information system.

The most important parameters from the Billing, Account Collection and Customer Information System should be displayed in a Dashboard where Senior Management will get quick information about their performance.

Capacity Assessment and Development:

This reform initiative houses the physical system development to support billing, account collection and CIS. It is supported by the subsequent related reform measures in Section 2.3 (Customer Billing Procedures) and Section 2.4 (Account Collection Procedures). Therefore, we focus our emphasis of this capacity assessment and development initiatives on procuring and operationalizing this system.

CPCS recommends a specific consultancy to determine the billing, account and CIS elements necessary to be collected and tracked for the Iraqi customer base. This consultancy must also integrate with metering strategy to ensure the metering technologies complement and empower this system.

From a training perspective, CPCS recommends a core group of specialists at both the Directorate and HQ level be identified and trained in the system operation. CPCS recommends the tender or procurement strategy for the billing, customer, CIS system include a training component for these core staff. The intent will be to ensure strong internal capacity is developed and training material is created to empower each directorate to manage its own system. This will set the stage for corporatization and commercialisation during later stages of the reform process.

Implementation Horizon:

CPCS recommends the initial scoping for the procurement and/or development of the Billing, Account Collection and CIS to commence as soon as possible, at least within the early stage of the Pre-Transition phase.

Full implementation of the system is likely to take many years, including system definition, procurement, installation and training. One element of the system implementation which is especially time consuming is customer referencing (customer supply address), which can take years to accomplish on its own.

Account and billing procedures/processes must also be developed to support the system implementation, as described in the related reform initiatives of this Loss Reduction Program.

CPCS recommends that the Billing, Account Collection and Customer Information Systems initiative is targeted in the same directorates as the Metering End User, Meter Reading and Billing initiatives. This is final step in the end to end process of meter installation, reading, billing and account collection.

Our recommendation for the first directorates to target are:

- **Three Baghdad Directorates General for Distribution (DGD)s**
- **DGD Middle Euphrates and DGD South**

This Billing, Account and CIS reform initiative is a critical component of the final step of the metering lifecycle, as shown in the figure below.

Figure 2-11: Billing, Account Collection and CIS System

CPCS anticipates this system can be procured and installed within3-4 years of its commencement. It is recommended that this system be implemented as quickly as possible to support the related metering installation and meter reading initiatives. Ideally, this system should be implemented within the early stage of the Pre-Transition phase, following the billing and account collection procedure reforms. Certainly, this measure must be fully operational by the conclusion of the recommended metering program of 2 million end-user customers.

However, CPCS expects the data collection and cleansing activity required to fully implement this system will be significant and take a number of years. In appendix A, this activity has been allocated four years to complete.

The rollout of this system will provide one further element necessary for a comprehensive metering, billing and account collection system.

Investment Order of Magnitude:

- Studies, training and consultancy: USD 2.0 million
- Asset investment: USD 30.0 million

The initial business needs investigation and high level system design will require significant external support to identify a suitable solution or solutions, which may mean the procurement of an off the shelf system or the development of a bespoke system. At that stage, the specific requirements and functional specification for software, hardware and communication can be developed together with the anticipated costs.

An off the shelf system, together with integration and hosting typically requires an investment in the range of USD 15 million, excluding data capture and cleansing. An approximate breakdown of this investment includes:

- Billing system: USD 5.0 million;
- Prepayment head-end system: USD 3.0 million for 2 million customers; and
- Systems integration and hosting (to prevent data loss): USD 7 million.

The hosting element above could be included in part of the supply and install contract from the system provider as Iraq develops its own expertise. The hosting can be undertaken from a different country, particularly in the early stages.

Related Reform Initiatives:

- Customer Billing Procedures (Section 2.3), which supports the Billing, Account and CIS system installation with robust billing procedures and processes;
- Account Collection Procedures (Section 2.4), which brings together refreshed billing procedures with a strategy, process and procedures to improve and sustain account collection rates;
- Metering, End-User (Section 0), which includes an end-user meter installation program for 2 million customers;
- Revenue Protection (Section 2.5), targeted at reducing illegal power connections and improving billing collections; and
- Accounting/ Management Information Systems (Section 3.8), to establish international standard accrual accounting practices, financial statements and business management.

Maintaining a billing system is a never-ending job and will need a large dedicated team of staff to track changes to metering equipment, customer and tenancy changes and new connections. The team needs to consist of both office and field staff and should include at least one distribution/metering engineering specialist in each directorate. As experience is gained with the operational requirements, it will be necessary to review and update procedures so that new staff can adopt best practice.

2.7 Pilot: Outsource Revenue Cycle Management

Reform Phase: Pre-Transition

Reform Description and Context for Reform:

This reform initiative is closely related to the overall objective of the Loss Reduction Program within this roadmap. The reforms outlined in the Loss Reduction Program focus on internal

capacity building and immediate actions aimed at reducing ATC&C losses in the distribution sector. This reform recommends a parallel project to procure a private revenue cycle management firm (or firms) to contract for a pilot project in a selective geographical region within Iraq. Care needs to be taken in the development of the contract especially in the provision of clear KPIs for measurement of impacts.

Billing and Account Collection performance is very poor in the sector and experience from other countries suggests that there may be benefits from outsourcing revenue cycle management if carefully secured through competitive bidding and a good outsourcing contract framework. It is suggested that one or two *discrete small areas be* selected to be used for a time bound pilot study and a suitable firm is selected to undertake the principal revenue cycle activities, including meter reading, bill preparation and account collection. The commercial arrangements will need to be carefully developed to ensure objectives are properly addressed and should include a mechanism for payment by results. With more than one firm comparison of outputs is possible.

In terms of the revenue cycle management, the distribution lines or wires business would remain under management of the successor publicly owned distribution companies, but there would be a contract between the successor distribution company and the revenue cycle management firm for the management of the revenue cycle process. A key component of the contract will be the KPIs. Accounting ring-fence and provision for separate retail licences should be considered. The outsourcing contract should carry a tenure of 3-5 years. Government should initially introduce outsourcing in a selected directorate before rolling out sourcing out on as a national programme under the successor incorporated distribution company structure.

Capacity Assessment and Development:

CPCS recommends a technical assistance package in the form of engagement of a Transaction Advisor to procure the services of a number of Private Revenue Cycle Management firms to support this reform initiative. Capable private sector providers will be engaged that will ensure the introduction of processes and systems that:

- Functioning meters are installed in customers' premises;
- Appropriate meter and billing records are held for all customers;
- Customers' consumptions are recorded and the data collected;
- Accurate bills are issued promptly;
- There are adequate controls to follow-up no-access and other exceptions;
- There are adequate controls to ensure meter reading and billing errors are minimised;
- Ensure a good contract framework with appropriate KPIs and the other performance measures, capable of facilitating effective performance monitoring of the contracts;
- There are adequate precautions to prevent and identify theft of electricity and corruption;

- There is adequate follow up of outstanding bills and effective action is taken, e.g. disconnection of supply, use of pre-payment meters; and
- Appropriate billing and debt information are maintained and monitored.

The Transaction Advisor should also be required to develop an evaluation robust reporting mechanism to allow the MoE to monitor and evaluate the outcome of this pilot project. This will allow for internal MoE expertise for potential future expansion of such a project in to other regions or directorates.

Implementation Horizon:

A revenue cycle private management firm would be recruited competitively and offered three to five year contract, ideally. Performance based contracts would be in two parts: a fixed fee component and a performance based component based on certain key KPI such as reduction in ATC & C, metering roll out, etc.

The results of such a pilot study will need to be carefully monitored to compare performance against the current performance and the performance in other areas. CPCS recommends the MOE endeavour to implement this pilot project in the short term in order to allow for analysis and study of the outcome near the end of the Pre-Transition phase of reform. A full cost benefit analysis should then be undertaken before a possible extension to other areas.

Investment Order of Magnitude:

- Studies, training and consultancy: USD 2.0 million
- Asset investment: USD 20.0 million

Related Reform Initiatives:

- Customer Billing Procedures (Section 2.3), which supports the Billing, Account and CIS system installation with robust billing procedures and processes;
- Account Collection Procedures (Section 2.4), which brings together refreshed billing procedures with a strategy, process and procedures to improve and sustain account collection rates; and
- Key Performance Indicator Program (Section 3.9), which outlines a KPI program to measure and track system performance.

3 Operational Efficiency Program

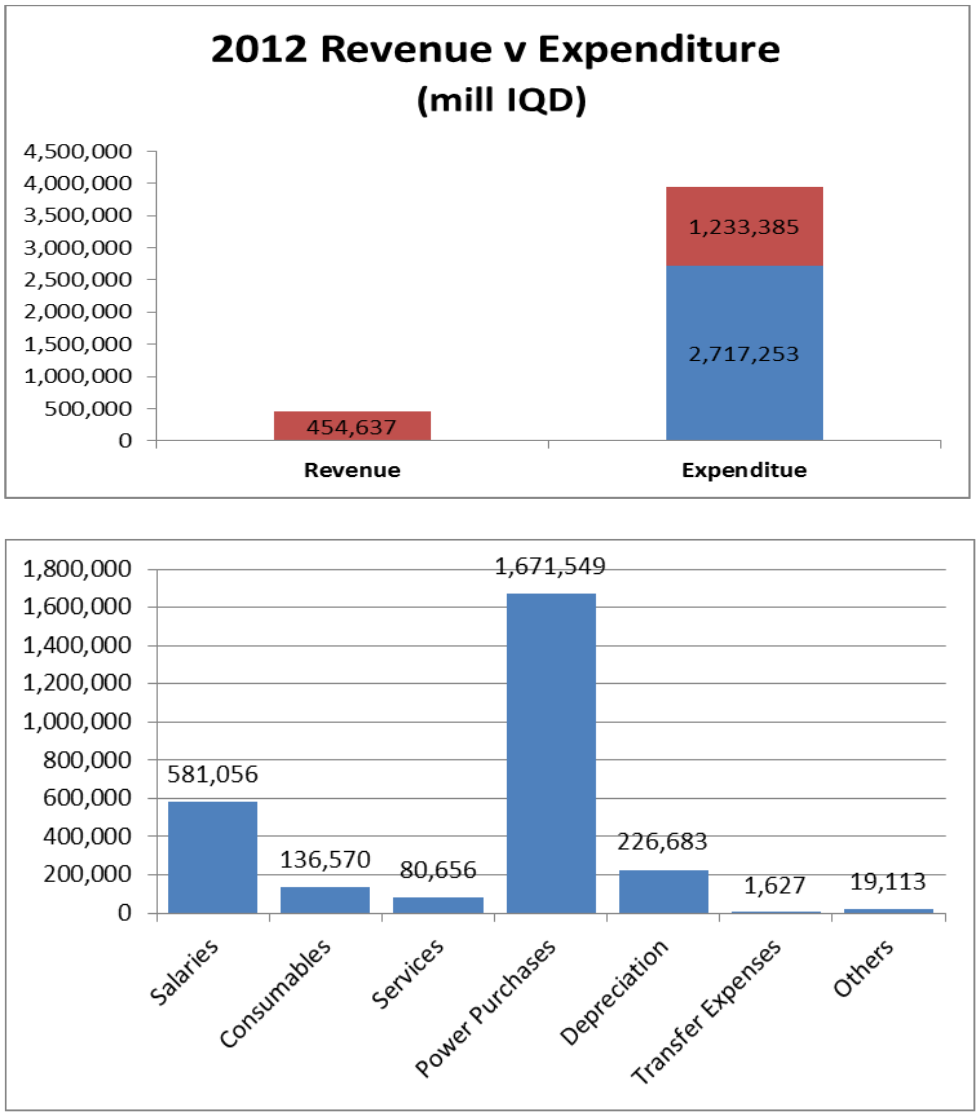
Operational Efficiency Program: Definition and Objectives

The Operational Efficiency Program is intended to cement and reinforce the Loss Reduction Program by addressing measures which create a backbone for further the distribution sector efficiencies. The objective of this reform program is to create a measurable platform for future expansion. The focus is on physical improments on the technical system and operational efficiency by reducing the need for subsidies and growing system revenue collection. Operational efficiency has typically meant standardization and adoption of best practices, guidelines and procedures. The fewer the variations, the lower the cost, the higher the repeatability, the greater the efficiency and availability of supply.

Operational Efficiency Program: Urgency for Reform

Today the Iraq electricity distribution sector is far from being considered an efficient and a financially sustainable system. For instance, as indicated in the Sector Assessment Report, in the year 2012 system revenues collected from energy sales was not even sufficient to meet employees' salary expenses for the same year. Figure 3-1 below emphasizes the relationship between revenue collected and cost for the year 2012:

Figure 3-1: 2012 System Revenue vs. Expenses



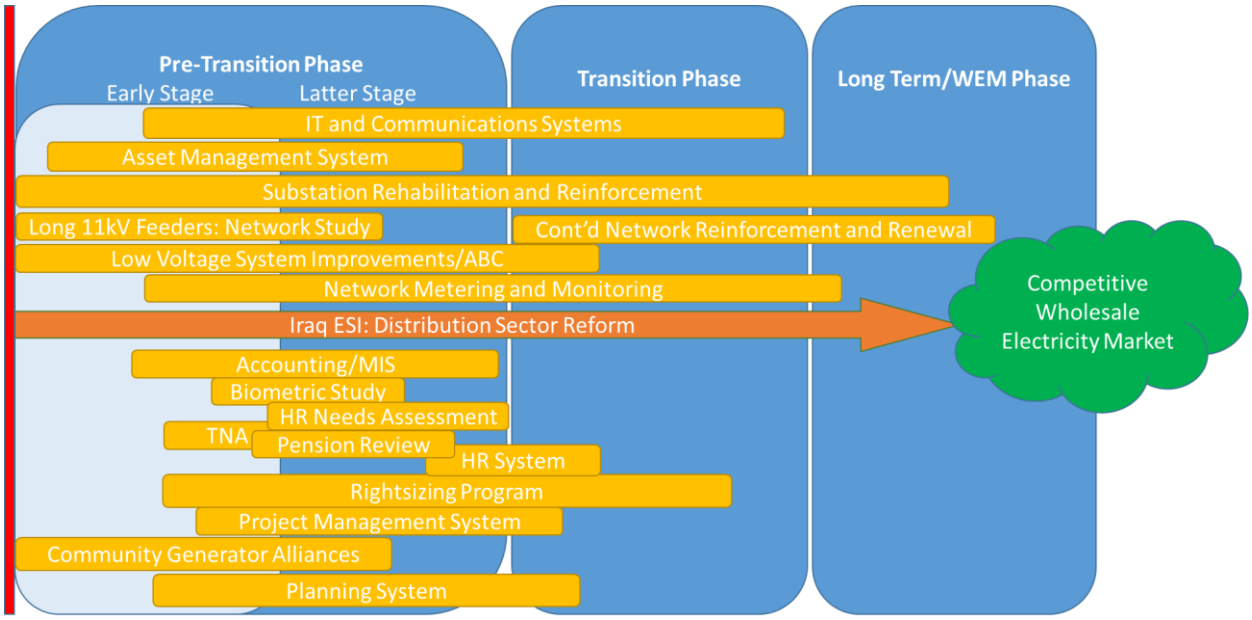
Source: MOE

In summary, the Iraq Electricity Distribution Sector in 2012 collected revenues enough to pay for only a miniscule proportion of its cost; with a recovery ratio of 11.5%. Therefore, any Cost-Benefit to evaluate this Operational Efficiency Program should consider this revenue-cost imbalance in tandem with all the additional socio-economic benefits created from providing a more sustainable and efficient distribution system.

Operational Efficiency Program: Phasing

This Operational Efficiency Program generally commences with numerous of its specific reforms in the Pre-Transition phase, but extends implementation into the Transition and Long-Term phases. It closely reinforces the Loss Reduction Program with a framework for corportization and commercialisation of the power distribution sector. Figure 3-2 below illustrates the package of measures.

Figure 3-2: Operational Efficiency Program: Phasing and Staging



Source: CPCS

As illustrated, the Operational Efficiency Program reforms should commence at the beginning of the Pre-Transition phase, with many initiatives spanning into the Long term phase of reform.

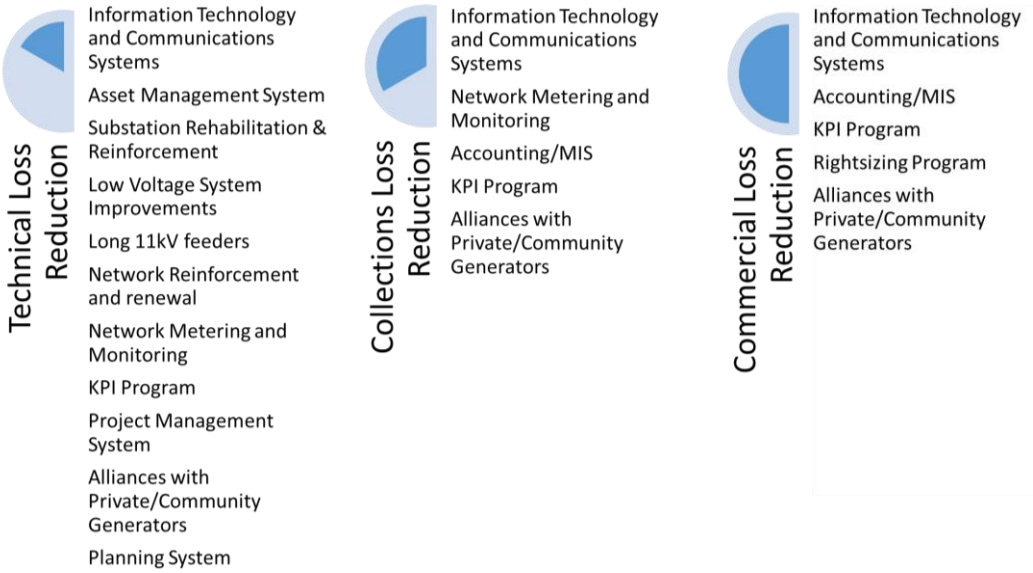
Immediate Priorities

The reform recommendation in this Operational Efficiency Program which interconnect with the red "emergence from crisis" line reflect the immediate action items. These identified immediate action items will create positive reform momentum in the first years of the program and allow for "early wins" by the GoI and positive public perception of sector reform.

Following the implementation of these priority initiatives in Operational Efficiency Program, a targeted incentive campaign can begin to be created for management and certain personnel such as linesmen, meter readers and management. For example, management teams and linesmen can be encouraged to reduce ATC&C losses through targeted capacity development initiatives and capital programs, such as conductor refurbishment and upgrade campaigns involving ABC and concentric service cables. Through capacity building and capital investment, as the readings improve, various ATC&C losses are reduced, allowing for incentives to personnel for their efforts. The result is personnel and management improvement projects with updated technical skills, improved operations, enhanced governance and accountability frameworks and a platform for the eventual corporatization and unbundling of distribution companies.

Further, the Figure 3-3 below provides an overview of how each of the Operational Efficiency Program reforms integrate to improve ATC&C losses throughout the system.

Figure 3-3: ATC&C Impacts by the Operational Efficiency Program



Source: CPCS

An indicative timing and implementation for each reform measure is provided at the end of the chapter, together with CPCS' expectation of supporting capacity building and training objectives required to successfully implement the program.

Appendix A provides linkages for all Reform Roadmap recommendations, along with expected cross dependancies which exist between measures. It is clear that for the Reform Roadmap to be successful, a significant level of integration, coordination and cooperation are required.

Operational Efficiency Program: Budget

The Operational Efficiency Program represents and extensive investment by the MoE. The program includes elements such as a reduction in the length of low-voltage lines by relocation of selected substations, installation of new transformers of lower capacity to reduce losses, increase in equipment redundancy levels and increase supply reliability and installation of compensation devices to reduce losses and power factor as well as investment in information and and communication technlogies and systems.

As informed by the MoE, the following reform recommendations enclosed within this Operational Efficiency Program have already been identified as strategic priorities by the MoE with budgets being developed to support their implementation:

- Information Technology and Communication Systems (Operational Efficiency Program, Section 3.1)
- Substation rehabilitation and reinforcement (Operational Efficiency Program, Section 3.3)

- Long 11kv Feeders (Operational Efficiency Program, Section 3.5)
- Network Reinforcement and Renewal (Operational Efficiency Program, Section 3.6)
- Alliances with Small Private and Community Generators (Operational Efficiency Program, Section 3.12)

With specific budgets for these impacted reform recommenations excluded, the below Operational Efficiency budget is provided, which indicates a soft budget of approximately 10% in studies, training and consultancy. The greater investment in this program is in the physical assets. A total of USD 1.0 billion in supplementary sector investment is anticipated to be required over the three phases of reform.

Figure 3-4: Operational Efficiency Budget, in USD millions

Category	Total
Studies, Training, Consultancy	87.0
Asset Investment	913.0
Total Operational Efficiency	**1000.0**

Figure 3-5: Operational Efficiency, Reform Recommendation Budget Detail, in USD millions

Section #	Reform Title	Studies/ Consultancy	Asset Investment
3.1	Information Technology & Communications Infrastructure	**Included in MoE Investment Plan**	
3.2	Asset Management System	4.0	4.0
3.3	Substation Transformer and Switchgear Capacity	**Included in MoE Investment Plan**	
3.4	Low Voltage System Characteristics	20.0	50.0
3.5	Long 11kv Feeders	**Included in MoE Investment Plan**	
3.6	Network Reinforcement and Renewal	**Included in MoE Investment Plan**	
3.7	Network Metering and Monitoring	4.0	80.0
3.8	Acounting, MIS	20.0	350.0
3.9	Key Performance Indicator Program	4.0	4.0
3.1	Rightsizing Program	30.0	0.0
3.11	Project Management System	2.0	410.0
3.12	Alliances with Small Private and Community Generators	**Included in MoE Investment Plan**	
3.13	Planning System	3.0	15.0
Total		**87.0**	**913.0**

3.1 Information Technology and Communication Systems

Reform Phase: Pre-Transition to Transition phase

Reform Description and Context for Reform:

The introduction of modern high capacity IT systems will enable other technologies to perform to their best and hence provide a cost effective way of managing energy shortfalls and losses. Communications systems will inevitably need to be robust and varied. Examples of the hardware required will include copper wire circuits (Power Line Carrier), fibre optic, radio, microwave and cellular. Each system will have particular advantages and where the communications forms part of operational control of the system, at least two totally different methods should be employed.

The range of applications suitable for the Iraq Distribution Systems, including the collection of data from customer metering, is extensive and well proven. The IT systems should be based around either a SAP or Oracle platform with interface flexibility to other software systems. As far as practical the solutions should be off-the-shelf packages that will minimise development time and costs. Care should be taken not to lock the IT system into a single source provider.

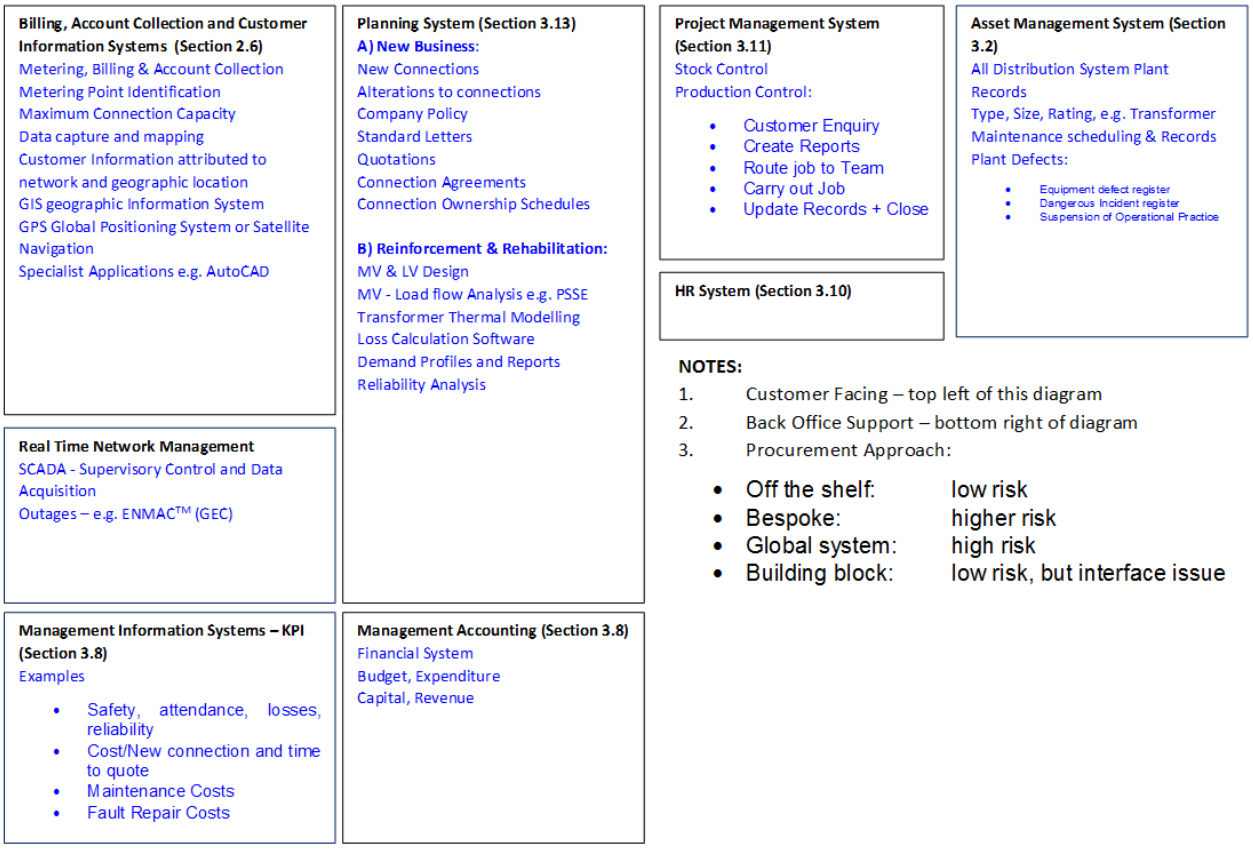
Communication requirements will vary from dedicated lines to individual Primary substations to the multitude of connections required to service Iraq's customers for the development and introduction of Smart Metering systems.

The IT platform and associated communication systems will provide the core on which will sit sub-systems, such as the asset management system and real time network management. It will enable the integration of all the engineering activities.

These measures will address the critical need for adequate information and communication for both the management of the distribution business and to manage the electricity distribution sub-system. This is a major task, and will require years to implement. It is important to build up momentum as quickly as possible, commencing with initial scoping.

A key success factor for any business is the ability to produce timely and accurate bills. This is dependent on reliable IT and communication systems capable of handling large volumes of data. This data must of course be 100% accurate and will require a substantial data capture and cleansing exercise. In addition to timely and accurate billing, adequate Information Systems are required to run the overall distribution business. The figure below illustrates the importance of this IT and Communications systems, together with key elements. Related "systems" recommendations are housed within this reform roadmap, the Figure 3.4 below provides section numbers for ease of reference.

Figure 3-6: Distribution Business IT Systems – Enterprise Resource Planning – Building Blocks



Source: CPCS

Capacity Assessment and Development:

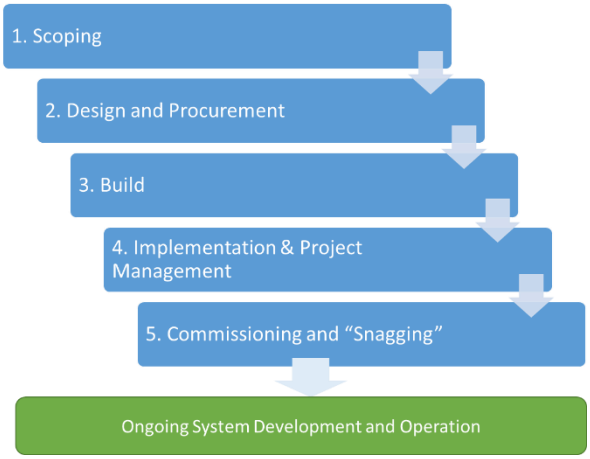
CPCS recommends that the communication systems central procurement, for items like Power Line Carrier, copper or fibre pilot cables. However, some support infrastructure will be needed form external companies, such as telephone and GPRS network companies.

Staff training and competencies will need to be improved with access to overseas training centres at the manufacturer's own premises. Ideally, CPCS recommends a contingent of staff from both MoE HQ and from each directorate be trained on IT system operation and maintenance, as well as system scaling as the distribution sector infrastructure is improved. This will also allow for further distribution sector evolution and will serve as an essential platform for to corporatization and commercialisation of the successor distribution companies.

Implementation Horizon:

CPCS recommends a consultancy to support the implementation of this system. The steps needed to implement the system should include project scoping by an international specialist consultant in conjunction with local experts. The project should consist of the following phases:

Figure 3-7: IT and Communications Implementation Phases



Overall implementation should be guided by a steering group with input from the international consultant, led by an overall project manager.

The IT and Communications centres should be located in safe and separate locations, paying particular attention to adequate redundancy, backup and disaster recovery, as well as paying close attention to data security and privacy. Expansion of the IT and Communication systems will follow a fairly natural progression towards the complete integration of Smart Grids and Smart Metering. In turn, this will allow for the better use of limited generation and system capacity at the times of maximum stress.

It is expected this reform will require a significant and multi-staged implementation process, with regions and directorates successor distribution companies transitioning to a supportive IT backbone. CPCS reflects the momentum for this reform to start in the early stage of the Pre-transition phase through to the Transition phase of reform.

Investment Order of Magnitude:

- CPCS understands that MoE have already included funds for this activity within their existing capital investment program budget. To avoid duplication of budgets, these funds have been excluded, although the supporting commentary is included in this roadmap to illustrate the importance and interdependencies of the recommended reforms.

This is a very long term investment. A breakdown of investments that should be included in the existing program includes:

- External Consultancy for scoping, design and procurement;
- Implementation team, commissioning and training;
- IT System; and
- Communication System.

Related Reform Initiatives:

This recommendation is central to most of the reform measures. In particular it supports:

- Loss Reduction Program, in its entirety;
- Accounting/ Management Information Systems (Section 3.8), to establish international standard accrual accounting practices, financial statements and business management; and
- Key Performance Indicator Program (Section 3.9), which outlines a KPI program to measure and track system performance.

3.2 Asset Management System

Reform Phase: Pre-Transition

Reform Description and Context for Reform:

It is generally clear that the distribution equipment in Iraq has an ageing profile, which has been accelerated by lack of maintenance and good operating practise. Even though rehabilitation works are under way and the replacement program has started, there has been no effort to detail the asset inventory and management system. There is currently uncertainty as to how this work is allocated.

Unfortunately, the public electric utility system does not provide for a comprehensive asset management system. There will be need for an asset transfer system, particularly for assets which are to be transferred from central government to the successor incorporated distribution companies. There is an urgent need to document the assets in the system and their conditions. This will establish actual conditions at site.

A fundamental part of this overarching reform agenda must be to establish a starting point for the Iraq Distribution System. Once the Distribution assets have been formally recorded in an asset management database, a clear understanding can be establish for the key areas of the network to be modernised or reinforced.

Infrastructure asset management is the combination of management, financial, economic, engineering, and other practices applied to enhance the integrity of physical assets with the objective of providing the required level of service in the most cost-effective manner there by reducing equipment down time. It includes the management of the whole life cycle (design, procurement, construction, commissioning, operating, maintaining, repairing, modifying, replacing and decommissioning/disposal) of physical and infrastructure assets.

Benefits of Asset Management are:

- Improved financial performance (O&M Savings, operational efficiency);

- Improved distribution system performance on measures such as supply reliability, equipment availability and quality (e.g. voltage stability and flicker);
- Provides for informed asset investment decisions (more effective and easier decision-making based on facts);
- Managed risk (understand probabilities of asset failures);
- Improved services and outputs (less outages higher operational efficiency, less socio-economic losses);
- Ensures organizational sustainability (O&M better schedule and preventive maintenance); and
- Finally improved operating efficiency and effectiveness (O&M Savings).

Although previous reports have identified the introduction of an Asset Management System and tools as essentials for target investment and achievement of the overall goal of 24 hours supply for all customers, there was little evidence of such a management system having being developed or in the process of implementation to the standards required by International investors.

The initial survey should also involve repairing all of the temporary twist joints, check connections, rebalancing of loads between phases and remove any illegal connections. This would go a long way towards the reduction of some of the technical losses.

Capacity Assessment and Development:

The evidence provided so far indicates there is only a list of major plant items with no information on maintenance history or the condition of individual items. It is essential to train staff in the assessing and recording of asset information on site. This will enable a transition to modern condition and preventative based maintenance, which is much more efficient than time based maintenance.

There is a need to develop an in-house manual and procedures for the gathering, loading and analysis of data. One of the most important actions of this initiative is to establish training sessions for the staff involved in the process of gathering the data. It is also essential that data is recorded in a common way for each item of plant. This means that staff will need to receive specialist instruction for each type of equipment/asset and test their skills at recording the information such as condition to the same level. Once gathered, the information needs careful filtering and analysis to identify the key areas for replacement or reinforcement of assets.

Additionally senior staff will require formal training at Internationally Recognised centres in the methods of analysis of the data.

This database initiative needs to be driven by MOE HQ, with participation by staff assigned for capacity development training from all directorates.

Implementation Horizon:

Investors will expect the Asset Management System employed to be similar to ISO 55000 (previously known as PAS55) and establish a whole life cycle for the management of the physical assets. The standard is divided into two parts: Part 1 is the specification for the optimised management of physical infrastructure assets; Part 2 is the guidelines for the application of the standard.

A central distribution system asset database should be created, with a clear detailing of assets by directorate and the successor distribution companies. CPCS recommends a small consultancy to assist MoE HQ and the directorates with the procurement of an Asset Management System and the development of guidelines for creating and maintaining the database. It is expected these guidelines would be created in tandem with the chosen developer of the database.

The procurement, training and initial audit of distribution assets can be implemented in year 1 of the reform program. Following this period, the newly created guidelines will provide for careful tracking of the reform program, especially with respect to new installation of distribution assets and maintenance activities.

CPCS recommends that the Asset Management System initiative is commenced in the Central DGD. The reasons are that this region has a very diverse mix of plant installed over a very wide region. Accurate asset information will reap major benefits in this very large geographic region, enabling staff to reduce travelling time and also enable maintenance teams to have a clear understanding of the state of the assets.

Our recommendation for the first directorate to target:

- **Central DGD**

The on-going recording of asset information will be an important part for potential investors to see what progress is being made to the Distribution System. The analysis undertaken in the Pre-Transition stage should be maintained and the statistical results applied to the replacement and refurbishment of primary plant in accordance with the analytical results.

Investment Order of Magnitude:

- Studies, training and consultancy: USD 4.0 million
- Asset investment: USD 4.0 million

The majority of this investment is expected to occur in the Pre-Transition phase of reform.

The expected activities which fall under this estimated budget include:

- Consultancy to procure the database system, and create guidelines for database implementation and asset recording procedures;

- Review the work at other utilities World-wide to gather the most up-to-date information on the performance of individual items of plant and the comparisons with the Iraqi equipment.
- Support to the MOE on the initial asset survey and recording of assets in the database; and
- Training of MOE staff on database procedures.

Related Reform Initiatives:

The related Reform initiatives include all asset related installation and refurbishment reforms, as these will be recorded in the Database.

3.3 Substation Rehabilitation and Reinforcement

Reform Phase: Pre-Transition; Transition and WEM/Long Term

Reform Description and Context for Reform:

In Iraq currently, the related Sector Assessment Report indicates substation conditions are very poor with the majority of substations now more than 40 years old. In some instances, it is noted that particular substations have maintenance plans, however the existence of spare parts, regular maintenance and general maintenance protocols have been less than desirable.

Although substations are distributed evenly across the country, figures provided by the MoE indicate that around 17% of the total capacity is lost. A combination of conflict, looting, and vandalism have severely affected the entire power system infrastructure in the country, causing damage to a number of substations, ultimately removing them from service. Examples on substations that are currently out of service include Rumaila substation in Basrah governorate, a couple of substations in central, southern, and northern Baghdad, and a substation in Mussayeb in Babil governorate. Some substations also have been exposed to accidents that affect their performance, e.g., fire damage affected the 132 kV/33 kV/11 kV Air Insulated Substation in Fallujah in 2006.

CPCS notes the numerous programs which have been outlined by the MoE to address the state of the substations throughout the country, the majority of which include new builds. This recommendation seeks to address the current substations, while new substations are in the process of being built.

We recommend that a holistic approach is taken to undertake system rehabilitation and reinforcement. Ideally, a dedicated team should carry out network studies with the objective of producing a long term development plan spanning 5, 7 or 10 years. Each element at all voltages of the system (132kV, 33kV, 11kv, LV) would be addressed:

- substations
- overhead lines

- cables

Ideally, the current installation programs would continue, whilst a planning team would identify the next areas for targeted investment. This should be supported by a planning consultancy that would deliver support and training in current international best practice system planning.

Studies should identify actual and potential overloads as well as situations where voltage and stability problems occur. Standards such as UK Planning Standard P2/6 can be used to assist in ensuring that the overall system is designed to a uniform standard. This in turn will ensure that investment is targeted to the most effective places.

Integrated with the work would be system reliability analysis, enabling investments to be targeted at the most appropriate places on the system.

This reform initiative ties closely with the Asset Management System recommendation in Section 3.2. The Asset database coupled with system load information from existing SCADA systems should identify those transformers that are overloaded or likely to have their life shortened by periods of high demand. Standard guidelines exist (for example BS7735) setting out rating and temperature limits for oil-immersed power transformers.

The analysis of the gathered data will lead to a program of targeted interventions at substations where transformer replacement will relieve constraints. Old transformers should be serviced and re-used if their economic life expectancy warrants such action.

Implementation of an overarching program to focus the planning of these initiatives should be established as a priority so that an overall improvement in system capacity can be achieved via replaced cables, overhead lines, switchgear and transformers. In addition, CPCS expects there will be a need to reinforce the interconnection between some Grid and Primary substations to allow for network outages for transformer replacements.

Spare transformers of standard capacity should be held at the central stores and an order line from preferred manufacturers aimed at some standardisation put in place. This will enable a steady flow of work to be achieved for both manufacturers and their lead times as well as for the staff engaged on installing the equipment.

Capacity Assessment and Development:

CPCS understands numerous initiatives have been announced by the MoE to address the Substation conditions throughout the Country. To support the new builds, contract management of the various EPC's, future procurement plans and the above recommendation to assess and refurbish existing substations, CPCS recommends a project team at the MoE level be earmarked for capacity development. We recommend this project team be selected from or moved to be housed within the existing Distribution Planning Department of the MoE.

This development should be supported by a training program to highlight international best practices. This training should include the establishment of procedures and criteria that will allow for the orderly rehabilitation, reinforcement and expansion of the distribution system.

Following the training of this core team, development of directorate level capacity is strongly recommended.

Implementation Horizon:

This reform initiative can be commenced in the early stages of the distribution sector reform. CPCS recommends retaining an external consultant to assist in the above training and capacity building components.

Within the first year, an overarching substation investment program should be implemented. By the end of the Pre-transition stage, CPCS recommends a target at least a full assessment of all existing substations, coupled with new build program which services at least 50% of the existing customer base.

The identification of those transformers that are causing constraints on the system will need to be undertaken prior to any orders being placed with manufacturers.

Investment Order of Magnitude:

CPCS understands that MoE have already included funds for this activity within their existing capital investment program budget. To avoid duplication of budgets, these funds have been excluded, although the supporting commentary is included in this roadmap to illustrate the importance and interdependencies of the recommended reforms.

As indicated in the Parsons Brinckerhoff Electricity Roadmap, the short term investment required to replace and refurbish the entire Bulk Supply Point assets is estimated to be USD 41 million.[36] As outlined in CPCS' Sector Assessment Report, information available indicates plans to refurbish and build new substations amount to approximately USD 1.0 billion have been announced as of 2013. This investment program by the MoE falls within this investment schedule proposed by PB Power. CPCS recommends substantially increasing this program to include the entire 132kV, 33kV, 11kV and LV systems.

Related Reform Initiatives:

- Asset Management System (Section 3.2), which records all assets housed within the distribution system, including maintenance received and condition.
- Planning System (Section 3.13), which is intended to strengthen the planning process and make it more transparent to other parts of the distribution business.

3.4 Low Voltage System Improvements

Reform Phase: Pre-Transition; Transition and WEM/Long Term

[36] Parsons Brinckerhoff Iraq Electricity Master Plan, Volume 5, page 102.

Reform Description and Context for Reform:

The impact of phase imbalance on transformers and network voltage is considerable in Iraq, along with that of poor power factor. Both of these problems can be resolved at very little capital cost.

Phase imbalance is simply caused by too much load being connected to either one or two of the three phase conductors. The imbalance causing abnormal voltage rises on the neutral conductor as well as overstressing the transformer windings. This can result in premature failure of the transformer and excessive voltage drop.

The second issue lies with a poor power factor created when equipment such as air conditioning motors are badly designed and require significant amounts of reactive energy. Reactive energy has no place in the Distribution network and only serves to cause higher system losses and poor voltage regulation.

To address this situation, CPCS recommends three related initiatives:

4. Install capacitors to compensate for the lagging power factor caused by motors. This can either be achieved on the customer's equipment or on the network close to the offending equipment.

5. Overhead linesmen to inspect the LV overhead lines and balance connections where they are found to be out of balance.

6. Assess and develop rules and regulations to be included in Primary Legislation that control the import or manufacture of goods, such as air conditioning units so that they do not require abnormal amounts of reactive energy. Legislation can prescribe the efficiency of air conditioning plant by the simple measure of the kVAh required to treat one tonne of air. This could be introduced as part of an overall package of energy efficiency legislation. An ongoing program of enforcement of regulations and the periodic examination and testing of imported units by various wholesalers is recommended to ensure compliance.

Capacity Assessment and Development:

CPCS recommends a core team be identified for capacity building. This team should consist of at least 5 engineers from each directorate and a core management team. The training should provide expertise and methods for installing capacitors and conducting LV network studies.

The initial network study is important, but a skillset must be developed and fostered to support future expansion and work on the distribution system. This staffing allocation ensure engineers from each directorate develop sufficient capacity as a first step towards eventual corporatization/privatisation of distribution companies.

Following the training, the engineers can immediately commence identifying obvious signs of imbalance and begin to make repairs, even while a network study is being conducted.

Implementation Horizon:

As with other reforms, this initiative can be commenced as soon as possible. CPCS recommends this initiative begin in year 1 of the Pre-Transition phase. However, at a minimum, we recommend the network study and 50% of identified capacitor installations are completed by the end of the Pre-Transition stage.

This measure will continue into the Transition and Long-Term reform phases, in support of future expansion and maintenance.

Our recommendation for the first directorates to target are those with high levels of LV overhead lines:

- **North DGD**
- **Central DGD**
- **Middle Euphrates DGD**
- **South DGD**

Investment Order of Magnitude:

- Studies, training and consultancy: USD 20.0 million
- Asset investment: USD 50.0 million

This budget outlined covers a consultancy for the following:

- Complete a network study of the entire LV distribution system;
- Provide training and capacity building to the utility engineering team and management;
- Create procedures and protocols for future network study updates and installations; and
- Create an outline for inclusion or amendment in primary legislation supporting this initiative.

Related Reform Initiatives:

- Single Electricity Reform Legislation (Section 4.1), intended to provide the platform for sector reform and expansion.

3.5 Long 11kV Feeders

Reform Phase: Pre-Transition; Transition and WEM/Long Term

Reform Description and Context for Reform:

Voltage regulation and supply capabilities are limited by long 11kV overhead lines. By upgrading the 11kV lines to 33kV it enables better voltage regulation to the end customer, as well as providing more capacity. New Primary 33/11kV substations will be required at the load centres

close to villages or collection of villages. It may not be necessary to install firm capacity of n-1 if it is possible to provide interconnection to other primaries or where emergency standby generation can be transported to the location at short notice.

Some European countries have solved this problem by simply uprating 11kV lines to 20kV. However, in the case of Iraq, as a more fundamental step change is required, the expansion of the 33 kV system is recommended.

Capacity Assessment and Development:

Analysis and identification of the networks limited by length and poor voltage regulation should be the target of investment to achieve reliable voltages within the regulation limits set by the Ministry or Government.

The MoE will require assistance to create network planning, not only in support of this reform but for the entire distribution system. However, capacity building is a core component of sustaining this initiative from the Pre-Transition through to the Long-Term phases of reform. CPCS recommends a core team of engineers, overhead linesmen and management staff representing all directorates and MoE HQ be identified for initial training. The training should include key areas of:

- Targeting capital investment for greatest return on investment,
- 33 kV and 11 kV network design including load flow analysis and voltage drop studies,
- Specifications for procurement and installation of 33kv and 11kV lines and substations,
- Construction of 33 kV and 11 KV lines and substations,
- Consideration should be given to turnkey contracts for the construction of 33 kV overhead lines and substations if insufficient skilled staff are available, and
- Procedures for ongoing maintenance.

Implementation Horizon:

The expansion of the 33kv system is important.

CPCS recommends that the Long 11kV Feeders initiative is commenced in the Central and North DGDs. The reason is that these are very large geographic regions and likely to have the longest 11kV feeders with excessive voltage drop. In addition, with the asset management system also being implemented in Central DGD, the initiatives will complement each other.

Our recommendation for the first directorates to target:

- **Central DGD**
- **North DGD**

By the end of the Pre-Transition phase, CPCS recommends that the commissioning of at least the network study to identify priority 33 kV network expansion including identification of 11kv lines for replacement. However, this program will be a long term initiative over a period of 10 years or so.

Investment Order of Magnitude:

- CPCS understands that MoE have already included funds for this activity within their existing capital investment program budget. To avoid duplication of budgets, these funds have been excluded, although the supporting commentary is included in this roadmap to illustrate the importance and interdependencies of the recommended reforms.

The initial consultancy required for this initiative is recommended to include scoping, network studies, design software and training.

Related Reform Initiatives:

- Asset Management System (Section 3.2), which records all assets housed within the distribution system, including maintenance received and condition.

3.6 Network Reinforcement and Renewal

Reform Phase: Pre-Transition; Transition and WEM/Long Term

Reform Description and Context for Reform:

The existing tangle of Low Voltage bare overhead lines lends itself to temporary and permanent illegal connections which deprive the utility of revenues and significantly increase the need for further reinforcement of generation and transformers.

The replacement of bare overhead line conductors on the Low Voltage network will significantly reduce losses due to illegal connection. Replacement of bare and insulated single conductors should be achieved using Aerial Bundled Conductors (ABC) and concentric service cables where ever possible. This will make it much harder for illegal connections to be made, but it will not completely eradicate the problem.

Consideration should be given to the inclusion of fibre optic strands being included in the ABC cable construction for future communications and monitoring systems.

In urban areas, consideration should be given to the undergrounding of mains and service cables. This has a much greater impact on the number of illegal connections and hence losses.

Capacity Assessment and Development:

There will need to be standard specifications developed for the erection and replacement of the existing network. Training of overhead linesmen in the safe installation and connections to ABC

and concentric service cables will need to be undertaken. The use of training schools and instructors from abroad will be required.

In keeping with the approach CPCS recommends, a small contingent of overhead linesmen, engineers and management staff representing all directorates should be identified for initial training. An internal training program and standard specifications can then be developed and leveraged.

Implementation Horizon:

CPCS recommends the target for implementation of this reform in the Pre-Transition period should be 50% upgrade or replacement of the existing system overhead line conductors. Problematic areas with high theft rates and low voltage reliability should be targeted first as this will provide the greatest impact. It is expected the work completed on this reform will be met with resistance and security could be an issue. Therefore, for the first few smaller project upgrades, CPCS recommends using EPC contracts. As the training program is developed and implemented, the ongoing replacement program can be conducted in house. This program will be long term in nature and will require knowledge and skills upgrades for internal linesmen, engineers and management.

Engineering support and electrical system design will be required to ensure proper implementation of this initiative.

This process will be a long term program and new and extended networks will require the same ABC and concentric service cables.

CPCS recommends that the Network Reinforcement and Renewal is initiative is commenced in the areas where load growth is highest and also where there is a large amount of existing load. In addition, the ABC and concentric service cable initiative should be targeted at the areas with extensive LV overhead line networks associated with the highest levels of theft.

Our recommendation for the first directorates to target are:

- **Three Baghdad Directorates General for Distribution (DGD)s**
- **DGD Middle Euphrates and DGD South**

Investment Order of Magnitude:

- CPCS understands that MoE have already included funds for this activity within their existing capital investment program budget. To avoid duplication of budgets, these funds have been excluded, although the supporting commentary is included in this roadmap to illustrate the importance and interdependencies of the recommended reforms.

The program should include provision for project scoping, network studies, design and scheme selection, ABC, Concentric service cables and fibre optic capital investment.

Related Reform Initiatives:

- Asset Management System (Section 3.2), which records all assets housed within the distribution system, including maintenance received and condition.

3.7 Network Metering and Monitoring

Reform Phase: Pre-Transition:

Reform Description and Context for Reform:

There is evidence of some metering at Grid Supply Points (GSP) in parts of Iraq. However, this seems to be over longer periods than half-hourly. In addition, although substations are distributed evenly across the country, figures indicate that around 17% of the total capacity is lost. A combination of conflict, looting, and vandalism have severely affected the entire power system infrastructure in the country, causing damage to a number of substations, ultimately removing them from service. Examples on substations that are currently out of service include Rumaila substation in Basrah governorate, a couple of substations in central, southern, and northern Baghdad, and a substation in Mussayeb in Babil governorate. Some substations also have been exposed to accidents that affect their performance, e.g., fire damage affected the 32 kV/33 kV/11 kV Air Insulated Substation in Fallujah in 2006.[37]

In addition, there is no exit point metering other than those customers with monthly read meters. This leads to a high degree of inaccuracy with respect to system losses (technical) and commercial losses due to failure to meter, bill or simply illegal connections.

Before accurate assessments of the various stages of network improvements and customer metering can be evaluated, there needs to be a comprehensive metering and monitoring of the energy entering the distribution system at 132kV. This reform addresses a systematic improvement of metering and monitoring of all key points within the distribution system. End-user metering formed a separate reform under the Loss Reduction Program, and this initiative seeks to improve the connection point between transmission and distribution and the substation level.

To accompany and support the end-customer metering program for 2 million meters, CPCS recommends a metering program throughout the system to be implemented in tandem. At the substation level, the same issues of smart metering in terms of required capability of the entire system, do not apply. A smart meter installed at the distribution substation can use a technology platform to send usage information via the cell network and does not require manual meter reading. The benefit of combining a smart meter program at the transmission/distribution transfer point, substation level and a metering program at the customer level is that usage can be compared between what is read at the substation level and what is accounted for at the

[37] CPCS Sector Assessment Report.

customer level. This is an additional measure to improve system efficiency and isolate instances where tampering, theft or meter reading practices are in question. In addition, the installation of substation smart meters sets the foreground for a future end-user smart meter installation program.

Therefore, with the current advances in static metering technology, there is ample opportunity to use Class 0.2s metering at all bulk supply points and for the half-hour data to be made available on-line to the Ministry staff. There is no reason these days why all 11kV ground mounted substations shouldn't be metered. This may be a long term aim, but will pay dividends when trying to establish which areas of the network are causing the most losses in the system.

Capacity Assessment and Development:

Similar to the Capacity assessment and Development recommendations of the end-user metering reform (Section 0), the ultimate goal of the capacity development and training for this reform measure is to "train a core group of trainers" within the existing MOE and Directorate framework. CPCS recommends the following key staff positions within the techno staff be identified for training and capacity building:

- 1-2 staff from each of the seven Directorates, and
- 1-2 staff from the MoE Baghdad headquarters.

Given information available during the sector assessment exercise, CPCS recommends these key staff be comprised of staff from both the directorate and MoE headquarters level.

From the onset, CPCS recommends a small scale consultancy to train and educate the key selected staff members of the types of specifications, subtleties and requirements inherent in modern metering technology. In addition, the consultancy should assist in identification and mapping all BSP points to be metered. Following this training, the commencement of specifications, tendering, procurement and metering implementation should be carried out.

A team of trained engineers and meter installation personnel would be the desired outcome from this capacity building initiative.

Implementation Horizon:

The implementation of this measure will ensure clear monitoring and reporting at all critical points within the distribution system. This will allow for a comprehensive understanding of where losses are occurring throughout the system. However, in view of the entire Reform Program, CPCS understands that all investments and initiatives cannot commence in tandem. Therefore, CPCS recommends that at a minimum, efforts to meter/monitor all the BSPs have been commenced as Iraq approaches the end of the Pre-Transition phase. Ideally, a small consultancy has been fulfilled by the end of the first few years of this reform roadmap in order to assist with the metering program.

Further, in order that the metering and monitoring of the GSP entry points can be undertaken, there needs to be installed the appropriate Voltage Transformers (VT) and Current Transformers (CT) on the HV circuits. This reform initiative is discussed under Section 3.3. These items of equipment are expensive and need to be installed as close as possible to the boundary with the Transmission System. It is recommended the transformer upgrades under this related reform initiative be commenced prior to this reform initiative.

Finally, a telecommunication system suitable for the reliable transfer of data will be required before the system can become an effective on-line tool. In the meantime manual methods of half-hourly data collection are viable, but will cause a delay in the availability of the data.

CPCS recommends this initiative is targeted in the same directorates as the Metering End User initiative. This is a logical follow through to ensure that a complete picture can be built up. Our recommendation for the first directorates to target are:

- **Three Baghdad Directorates General for Distribution (DGD)s**
- **DGD Middle Euphrates and DGD South**

Investment Order of Magnitude:

- Studies, training and consultancy: USD 4 million
- Asset investment: USD 80 million

The Investment order of magnitude outlined above covers the consultancy and in-house training program to be developed in support of this initiative. In addition the budget provides for the consultancy to assist with an investment prioritization of the distribution network BSPs for metering and monitoring.

Note, the Parsons Brinckerhoff Iraq Electricity Master plan does not specifically provide for a substation metering program. Therefore, CPCS has estimated the initial investment required to roll out a substation metering plan to support 50% of its customer base, or approximately two million customers.

CPCS recommends class 0.5 smart meters be installed at distribution substations. The approximate distribution (11kV/LV) substation to customer ratio is 1:100 meaning for every 1,000 customer (end-user) meters installed, the utility should expect to install 10 substation smart meters. Therefore, for the initial related two million customer (end-user) meter program, we expect to procure and install approximately 20,000 – 40,000 substation smart meters. CPCS recommends the smart meters be installed according to end customer density and in support of the customer metering trial programs through each identified area and Directorate.

The distribution substation smart metering costs are based on USD 2,000 per substation. This would include meters, cts, wiring, communications slave unit and Rogowski coils where necessary in difficult locations. Total costs for distribution substation metering installations

would be USD 40 million – USD 80 million. The substation meters would use the same communications infrastructure as the customer metering.

Related Reform Initiatives:

- Network Reinforcement and Renewal (Section 3.6), a replacement program of bare ABCs to improve low voltage and illegal connections;
- Metering, End-User (Section 0), which includes an end-user meter installation program for 2 million customers;
- Substation Transformer and Switchgear Capacity (Section 3.3), which includes the identification and upgrade of transformers and switch gears;
- Asset Management System (Section 3.2), which records all assets housed within the distribution system, including maintenance received and condition; and
- Information Technology and Communication Systems (Section 3.1) for reliable data transfer and integration.

3.8 Accounting/ Management Information Systems

Reform Phase: Pre-Transition.

Reform Description and Context for Reform:

There is an urgent need to implement an appropriate accounting/financial management system based on commercial lines, incorporating accrual accounting, profit and loss, balance sheets, cash flow statements and asset accounting. This will enable meaningful financial reporting, financial accountability and effective financial management. The current quality of management and accounting information which reflect the accounting system in the central civil service is not appropriate for commercial operation. The actual supporting systems is poor, relying on manual and bureaucratic processes. There is virtually no business process and existing cost information cannot be analysed in a meaningful way to allow accountability or effective management.

This system reflects an element of what is often referred to as the Commercial Management system. A Commercial Management system houses this Billing, Account collection and CIS and an Accounting/financial Management System. For the purpose of this reform roadmap, CPCS has separated the two systems as two distinct reform measures to communicate the importance of both elements.

A minimum requirement of an accounting system is its capability of producing timely and accurate financial reports, particularly profit and loss accounts, balance sheets, and cash flow statements. The system should also support effective financial management of the business,

enabling appropriate analysis and management of costs, including reporting of appropriate performance measures and KPIs.

The major elements of a typical MIS system for the electrical distribution sector are:

- Planning and Budgeting Module: Planning and budgeting models are a critical element for any business entity. It is important that these modules are consistent (share the same chart of accounts or have a mapping algorithm) and that they are integrated with the accounting and financial modules.
- Financial/Accounting Ledger Systems: These are essential components for utility. Many individual accounting/financial management packages provide excellent product offerings. Those solutions have strong financial modules but lack the range of additional modules, such as billing or construction management. In non-US locations the standard for accounting practices is International Accounting Standard (IAS) principles.
- Human Resources and Payroll Systems: A modern, integrated system is required to manage employee data and payroll information. Payroll and HR procedures are unique for each country.
- Procurement Management Systems: The Distribution Network requires maintenance and new capital construction projects. Financial control of large capital construction projects is necessary to allow MOE and Directorates Senior Management to quickly and continuously monitor the construction projects. This Item is related to Section 3.12 Project management Office.
- Asset Management System, including Materials and Inventory Management Systems: A Asset Management System is a necessary component of an operating entity such as the Iraq distribution sector. An integrated inventory system also allows the entity to control stocks and possibly avoid duplicating inventory.
- Fleet Management System: A distribution sector that administers assets over large distances must track vehicle usage. Fleet management is a fairly generic process, including fuel consumption per unit and costing.
- Decision Support System: A decision support system (DSS) is required to provide MOE and Directorates Senior management with feedback of critical key performance indicators (KPI). A DSS may take several forms. A common approach is to develop a data warehouse from which KPI data can be drawn. Alternatives include models of the enterprise that management can use in a “what if” mode to evaluate the possible impacts of actions or scenarios. A data-driven system (i.e., data warehouse) must be integrated with the overall MIS, whereas a model-driven DSS may be loosely coupled (for example, key assumptions such as interest rate, cost of materials for all regions, should be common with the corporate MIS).

The investment in this IT should be based on business need, particularly the future needs of the business to operate as an efficient commercial entity. The first stage of this measure will be a

detailed investigation and study of the business requirements, including a thorough assessment of output requirements, including format and frequency of regular reports and other information requirements.

The format and structure of regular management accounting information will be designed so that the costs of the business are analysed in a manner consistent with the way the business operates. For example, cost information may be required by different activities, e.g. meter reading or asset maintenance but may also be required on a geographic basis when regional management exists. It is essential that a system, or systems, procured or developed is fit for purpose in the Iraqi context and sufficiently flexible to adapt to developing business needs. The accounting system will also need to integrate with other systems such as billing systems, stock control, payroll etc. and it is important that a coordinated approach is adopted for the development of the overall IT strategy.

Capacity Assessment and Development:

We do not believe it will be possible to just select the distribution directories as being a small area of the civil sector accounting procedures and change these to meet corporate accounting and auditing requirements. We feel that corporate accounting has to go with the incorporating the distribution directorates as limited liability companies which imposes this standard of accounting and or statutory cooperation. There will be the whole process of a transfer mechanism to transfer assets and staff from the civil service directorates under MoE to the individual companies, which most likely will have to be part of the new electricity legislation. This will require considerable investigation and significant external support to identify assets to be transferred to the individual companies and eventually developing a suitable accounting solution (or solutions). This could be the procurement of an off the shelf system or the development of a bespoke system. At that stage the specific requirements and functional specification for software, hardware and communication can be developed together with the anticipated costs.

CPCS recommends a consultancy to assist the MoE HQ in the following:

- Outlining the business needs of such an account/MIS for Iraq. The system will need to form part of the process of incorporating the seven directorates into limited liability companies (separate accounting system for seven business and roll-up to the Holdco. This will need to be integrated with corporatisation and commercialisation of the individual directorates as limited liability companies.
- Identification of distribution assets and transfer of assets (related recommendation)
- Development of Accounting policies and procedures.
- Staff training program for MOE HQ and directorates.
- Ensuring cross pollination and integration of the accounting and management information system with other systems recommended throughout this roadmap.

CPCS recommends accounting staff for each directorate be identified for training and development on the new system. It is expected that a minimum of 3-4 staff for each directorate will be required to ensure maintenance and accuracy of data in the system. At least one or two of these individuals in each team should have a proper professional accounting designation. The remaining team can be trained on more simple data integrity aspects of the system functions.

Implementation Horizon:

CPCS recommend the development of commercial accounting system proceeds simultaneously with the incorporation of the seven directorates into limited liability companies also recommends an overarching IT infrastructure and implementation plan be developed (which is discussed in Section 3.1). Following the development of this IT framework, this Accounting/management information system can be procured, with training and development activities in tandem and rolled out over the seven businesses.

Full implementation is likely to take at least two years and will need to identify assets which are to be transferred from central government to the new separate legally incorporated entities accompanied by a design of processes and staff training. CPCS envisions this initiative can commence in the second year of the Pre-Transition stage or immediately after the electricity legislation has been enacted providing the authority for the transfer of assets and transfer mechanism. At a minimum, we recommend a simple and improved Accounting system be in place as a pre-requisite to moving into full commercial accounting.

Investment Order of Magnitude:

- Studies, training and consultancy: USD 20 million
- Asset investment: USD 350 million

The physical system procurement and installation is expected to account for the bulk of this required investment.

Related Reform Initiatives:

- Single Electricity Industry Reform legislation (Section 4.1), which sets out the basis for a robust ESI system and structural reform.
- Multiple Regional Distribution Companies (Section 4.4), which establishes numerous regional distribution companies under the IEPHC.
- Key Performance Indicator Program (Section 3.9), which outlines a KPI program to measure and track system performance.
- Billing, Account Collection and Customer Information Systems (Section 2.6), to collect and house billing, account and customer information at an international standard.

3.9 Key Performance Indicator Program

Reform Phase: Pre-Transition.

Reform Description and Context for Reform:

The quality of management information currently prepared within the sector is very poor and little or no use is made of Key Performance Indicators (KPIs) to measure performance. Measures that are available are concerned principally with meter reading, billing, account collection and losses and are not automatically generated in a standard form across the businesses. The information that is available is often incomplete, inaccurate and inconsistent making performance monitoring difficult.

In view of the scarcity of information that is currently available within the sector, it is recommended that a program be developed so that an initial small set of high level, high impact KPIs is established as early as possible, and as systems and processes allow better data to be collected, additional measures are added. There are several standard KPIs that internationally are used by distribution businesses, but many of these are currently not capable of being developed because the source data does not exist in the Iraq ESI.

In order to track performance over time and against targets a set of KPIs should be developed. The KPIs should address areas that are key to the success of the business and in a distribution business, typically would include KPIs measuring:

- Network performance;
- Service quality (overall customer service satisfaction, reduction of error rate through consistent quality management, etc);
- Financial performance;
- Monitoring of contract
- Personnel resource and productivity performance; and
- Health and Safety.

It is important that the KPIs are consistent with the key objectives and are adequate at commencement to be developed into a sufficiently comprehensive system over time.[38]

Over time, KPIs should become a central part of performance management and cascaded throughout the organisation especially under the new corporate management structure so that

[38] A detailed discussion with CPCS recommendations relating to relevant KPIs in the distribution sector can be found in the related report “Regional and International Benchmarking Report”.

individual managers are given specific KPIs feeding into the higher level company goals. Once the initial set of measures is established, targets can be set to facilitate the monitoring and improvements over time.

Further, the consistent approach will enable comparisons to be made not only between the seven distribution companies in Iraq but with distribution companies in the Middle East region, as well as globally. As the electricity Distribution system improves and IT systems allow for the real-time monitoring of the network performance, more reliance can be placed on the KPI statistics and their accuracy.

Capacity Assessment and Development:

CPCS recommends that initially an external consultancy is competitively procured to facilitate the development of the KPI program with 2 parts. The first part of the KPI Program will be a limited suite of KPIs which can be established and tracked in the short term with current capabilities and information available. Targets for improving these KPIs should also be outlined and with a simple incentive program for achieving targets.

The second part of the program should be a more all-encompassing, international standard KPI program covering the five categories discussed above. This program will require IT capability and new information to be tracked, measured and incentives provided for meeting performance target. Thus, full rollout of this part of the program will take time as the various related IT initiatives are implemented.

Standards and procedures will also need to be developed for the KPI program. Wherever possible the data collected should only be input by an individual once only. Further collation should be automatically undertaken by the IT software systems. The manual entry of data should be performed using a 'blind double entry system', where the first entry is not visible during the second set of key strokes.

The consultancy should also assist in ensuring the various IT systems can integrate and produce the required KPI data set across the seven directorates and companies eventually. The software programmes should automatically produce the relevant KPIs of a regular basis. It should not be possible for the management to manipulate the KPIs or the raw data input. The raw data will need gathering over different periods. For example fault statistics may be on a daily basis, whilst customer billing data is on a monthly basis, and population or registered customers is on an annual basis.

Statistics such as the customer minutes lost and number of interruptions will track the system improvements over time. Comparisons with more mature Distribution Networks in the region can eventually lead to targets that compare well with regional and international standards of customer satisfaction, eventually leading to financial investment by private companies. Performance improvement will be a long process there is the need however to start somewhere and now is the time to start.

Implementation Horizon:

CPCS recommends the consultancy to develop the two-part KPI program be procured in the early stage of the Pre-Transition phase. A KPI program using existing information, reporting and technical capabilities.

At a minimum, by the end of the Pre-Transition stage, the KPI program should be outlined with Part 1 of the program implemented throughout the distribution directorates or successor companies.

Part 2 of the KPI program will gradually roll out as IT capabilities and internal expertise are developed over the commencing in the pre-transition but becoming more entrenched in the Transition stage of reform.

Investment Order of Magnitude:

- Studies, training and consultancy: USD 4.0 million
- Asset investment: USD 4.0 million

This budget outlined covers the development of the KPI program using an initial external consultancy. The consultancy should include the following elements:

- Development of the KPI program (2 parts).
- Assistance with standards and procedures for collecting, analyzing and reporting the results.
- Recommendations to the initial simple incentive scheme for staff for the part 1 program followed by the more embracing incentive scheme for the fuller KPI programme.
- Recommendations on IT requirements to ensure future IT procurement will support the KPI program.
- Training of in-house MOE staff from MOE HQ and directorates. The training should include selected individuals from respective departments covering the five categories of the KPI program, outlined above.

Related Reform Initiatives:

- Billing, Account Collection and Customer Information Systems (Section 2.6), to collect and house billing, account and customer information at an international standard.
- Information Technology and Communication Systems (Section 3.1), for the tracking of faults and abnormalities on the power network.
- Accounting/ Management Information Systems (Section 3.8), to establish international standard accrual accounting practices, financial statements and business management.

3.10 Rightsizing Program

Reform Phase: Pre-Transition.

Reform Description and Context for Reform:

As illustrated in CPCS' Regional and International Benchmarking Report, the current number of employees within the distribution sector is extremely high by for both regional and international standards and there appears to be significant scope for rightsizing the numbers in the directorates and eventually in the successor distribution companies. For instance, information available during the benchmarking exercise indicated there are approximately 71 customers per employee, as compared to a ratio of 333:1 and 238:1 in Jordan and New Delhi, India respectively for the same period. Since 2003 there has been a rapid buildup of workers in the state electrity business increasing from 23,000 to over 96, 000 employees by 2013. At the end of 2013, there were 96,770 workers employed in the state owned electricity sector generation, transmission and distribution/retail supply, of which 57,470 were engaged in the distribution sector. [39]

There are several weaknesses associated with the human resources in the electricity sector in general, and the distribution sector particular since it employs the largest portion in the Iraq ESI. There is an urgent need to develop a people strategy and a set of initiatives with support of external consultants. MoE must identify the needs of the new organization and develop initiatives to facilitate rightsizing which should not involve drastic reduction or disruption in the workforce. The people strategy has to take Iraq socioeconomic setting into consideration and cultural nuance. This should go hand in hand with the physical investment in infrastructure and operational efficiency programs being implemented. Expanding the sector's generation, transmission, and distribution capacity cannot be achieved without a parallel development in the people strategy and the personnel side of the sector.

CPCS recommends a comprehensive rightsizing and people strategy program throughout the distribution sector of the ESI. The reform will need to address culture change issues hence the program is recommended to be multifaceted and include the following:

Figure 3-8: Rightsizing Program Elements

Source: CPCS

[39] CPCS "Regional and International Benchmarking Report".

1. HR Needs Assessment;
2. Training Needs Assessment (TNA);
3. Pension review and a biometric study;
4. Create a Change Management program;

HR Needs Assessment

A sector HR Needs Assessment should be undertaken to identify the optimum number of staff that should be employed within the distribution sector, identify the critical skill set needed and the envisioned regional distribution utilities (seven directorates), in the short, medium and long term. It is expected that over a number of years, staff numbers will need to significantly reduce if there is to be improvement in labour productivity. The study should consider, inter alia, the following:

- The current lack of modern IT systems and the bureaucratic nature of many operations partly explain the apparent over-staffing. There should be a phased reduction in numbers particularity through an attrition and a voluntary separation programme. The introduction of modern IT systems and more efficient business processes will reduce existing demands for manpower. Options that should be utilized to facilitate this transition include early retirement with incentives, and other forms of semi-retirement that the civil service law offers.
- There should be a transition towards a structure with fewer levels of management, especially middle management with broader spans of authority to facilitate communication and speed up decision making through devolving responsibilities. Modern communication has allowed for a less hierarchal structure. It is important, however, that a second generation of management be in place.
- As the distribution sector undertakes a transition to an independent commercial company, there may be a need for additional recruitment into areas of critical skills such as specific functions not currently undertaken, e.g. a treasury function to manage loans and a regulatory function when a system of regulation is introduced.
- The need for resources to cope with growth in customer numbers and customer relations and the network, and the improved quality of the services.
- Increasing demands of the staff as they go through change. Whilst new systems will bring long term benefits, there will be initial extra demands in terms of training and data transfer etc.

A rightsizing plan can then be developed to manage the transition to the optimum number. It is possible that the rightsizing may be achievable through natural wastage or attrition (particularly staff retirements). However, there may need to be a managed exit of significant numbers while ensuring that the best people are retained as far as possible. This will require careful management.

Along with the right sizing analysis there will be the need to carry out a change management program, including a communication program to build the case for change and the vision, strategy culture and behavior within the new company structures. It is a fundamental change to move from a civil service structure to a commercial profit oriented performance oriented structure and people have to be prepared for this change and this should not be underestimated. We will need to ensure employees receive factual and timely information on the change process

Training Needs Assessment

To support the rightsizing program, a full Competency and Training Needs Assessment (TNA) is required of all staff in the various departments, and across the different job categories. This will help identify the current competence and skills gaps that need to be addressed within the various categories of employees within the MoE. The TNA should consider not only those skills required within the public sector environment, but should also consider those that will be required for a commercially orientated utility. It is expected that if distribution utilities operating on a commercial basis be incorporated to take over from the MoE, then a completely different skill set would be needed. Therefore, it is very important that the TNA takes into consideration the capacity building needs for a commercialized electricity distribution operation. This TNA will support the various development activities outlined in each specific reform outlined in this roadmap by creating an overarching Needs Assessment.

Pension Review

Generally, there are two types of retirement and pension systems in Iraq. All public servants are covered by the Civil Service Retirement plan, while private sector employees are covered by the Social Security Retirement plan.

Being governmental employees, the retirement Law applies to all MoE employees. The retirement is administered by a national retirement authority, which is autonomous and affiliated with the Ministry of Finance. The authority is responsible for the conduct of all actuarial studies for evaluating their assets every five years. The authority is also responsible for maintaining databases of all public employees. The authority is also responsible for investing the retirement deductions collected from employees, and the contributions made by their employers.

The civil service retirement and pension is viewed as a “safety cushion” by most public servants. Therefore, transitioning to a commercialized operation of the distribution sector will most probably be resisted on account of losing the civil service pension. This will have to be carefully managed.

Capacity Assessment and Development:

In order to ensure the future success of the sector and to enable it to implement the necessary changes, it is essential that the ESI (MoE HQ and each directorate/successor distribution companies) has the right people, with the right skills in the right place and with the right attitude to effect change, and to drive the business forward. Initially, there is a need to identify the key

skills and competencies required to run the business, assess those of the current employees and available workforce, and determine the gaps in technical capacity that would need to be filled through the recommended TNA. This TNA will assist in setting out the requirements and help create custom design training and capacity building programs, and help identify external recruitment that needs to take place. This platform will form a direct link for the Training and HR departments housed within the current MoE framework. In addition, the TNA will feed into the various training and development initiatives discussed within each reform initiative in this roadmap.

To support the HR needs assessment, people strategy program and pension review, CPCS recommends a biometric study of the distribution sector workforce be conducted. During the course of this project, data was not made available relating to the average age of employees, the average length of service, or the numbers of employees becoming eligible for employment in the next five years. Such information is needed prior to the properly complete this reform initiative. Therefore, it is important to undertake a detailed assessment of all employees of the sector to better understand the ageing profile of current employees in order to accurately determine what portions of employees are up for retirement in the next several increments of time (e.g., 3 years, 5 years, and so on). This will both help determine the remaining staff that could be transferred to the corporatized operations, and the proportion of staff that could be retired early prior to the conversion. This should also facilitate the introduction of any new pension system and actuarial analysis. Furthermore, the biometric study will help identify any “non-existent” or ghost employees that appear on the payroll, yet are not actually contributing to the workforce as this is a common in various corporatization efforts in developing countries.

As part of the Pension review exercise, there is a need to conduct a study that examines the benefits received by public servant retirees, and to design a pension system for the sector once corporatized that would be acceptable to employees of the sector, and would encourage their transfer to a private sector environment. Such study shall examine the existing civil service retirement, and the Social Security retirement plan for privates sector employees in order to develop a new pension system for MoE distribution employees that would be moved to a corporatized entity once implemented. Such study shall also examine the categories of current employees that could be offered an incentive to retire early, thus, providing a partial solution towards the rightsizing reform initiative. The study shall also coordinate with other efforts undertaken by different ministries and sectors to ensure minimal variation in the pension systems being considered by the various sectors considering corporatization.

Implementation Horizon:

The recommended implementation horizon for this reform is the following:

1. Biometric Study (within the first two years of the Pre-Transition phase),
2. TNA (Second year of the Pre-Transition phase),
3. HR Needs Assessment culture change and people strategy program and Pension Review (commence following Biometric Study and complete by the end of the Pre-Transition Stage),

4. Creation of HR and people communication system,
5. Action plan from TNA, Biometric Study, HR Needs Assessment and Pension Review to be implemented through Pre-Transition and Transition phases of reform.

The Biometric study can be commenced in the early stage of the Pre-Transition Phase, in order to allow maximum impact of the HR needs assessment and pension review. The employee database should be created and HR procedures should be developed to ensure accurate information is recorded and maintained. The database should delineate staff details for each directorate for future reform progression.

With respect to the TNA, CPCS recommends a two tier approach be adopted. The needs of senior managers as leaders responsible for driving the business forward will be addressed from both a general management perspective, and any subject-specific needs that they may have. The needs of staff in technical and administrative roles will be addressed, primarily from a job- specific knowledge and skills perspective whilst also providing an appropriate level of management and supervisory training for those responsible for the work of others. The TNA should be conducted within the Pre-Transition phase of reform.

Following the completion of the biometric study, the Pension review exercise can commence. CPCS recommends the MOE coordinate with other efforts undertaken by different ministries and sectors to ensure minimal variation in the pension systems being considered by the various sectors considering corporatization.

Investment Order of Magnitude:

- Studies, training and consultancy: USD 30.0 million
- Asset investment: none

CPCS expects more than one consultancy will be required for this set of reform initiatives.

The TNA exercise will require international expertise from an HR perspective, with a specialty in an understanding of distribution sector fundamentals and operations. An expected budget of USD 1.5 Million is anticipated to support this aspect.

The HR Needs Assessment, pension review, Change management program and biometric study are expected to require a combined budget of at least 8.0 million USD.

Related Reform Initiatives:

This reform recommendation complements the objectives of the overall Reform Roadmap.

3.11 Project Management System

Reform Phase: Pre-Transition, Transition and WEM/Long Term.

Reform Description and Context for Reform:

Currently, the approach to project management and procurement in Iraq is well below internationally best practice standards within the ESI and especially the distribution network sector. This has inevitably led to cost inefficiencies for infrastructure projects, as well as late delivery of key deliverables. Poor standardisation and specification of procured assets is also likely to have resulted in high failure rates and maintenance costs.

In regards to investment projects, while the Planning and Studies Department compiles initial plans, the Projects Directorates manage project implementation, which consists of project design, tendering, procurement, construction, and post contract monitoring and inspection. Effective control of a project however resides at the MoE head Office. The problem is that the MoE's management system is obsolete and the resource and capabilities for effective project management does not exist at MoE. In particular, the system has not been computerized to a sufficient degree, and almost all information is still handled on a paper basis.

The Commercial Affairs Section is responsible for procurement; however, whilst the Procurement Department of a power utility may be independent, the Commercial Affair Section of the MoE is directly linked to political directorates. Procurement is managed on directorate basis, and there is no linkage with other directorates, although the management procedure is the same among all directorates.

Because of the annual budgetary appropriation procedure to projects there is no certainty that funds will be there to complete the execution of the projects. The result is stop/ start of projects and several projects with extensive time and cost extension and a long list of unfinished projects in the system.

An integrated project management system and a more dedicated medium term source of project financing is needed. There is also a need to facilitate communication and collaboration among relevant directorates and departmental enterprise units for both large and small investment programs. Specifically, information on the progress of project implementation at the different stages, the reason why projects are held up, in addition to information on budgeting, tendering, procurement, payment, scheduling and monitoring of the progress of work are needed. There is also the need for project progress reporting and inspection to provide information readily accessible to relevant officials across directorate and departments. Such integrated project management will help to open up the current closed environment of not only project management but also communication among officials.

Distribution network investment programmes e.g. transformer capacity increases and other network reinforcement schemes, will require support from project management professionals to ensure that that project outputs are delivered to higher standards of safety, timeliness and cost efficiency. In addition, a procurement team will need to be established to ensure that plant and

services are properly specified, tender documents are produced and bid responses are objectively assessed and evaluated, prior to entering into any contractual arrangements with suppliers. A key part of the enhanced procurement process will be the establishment of a Technical Standards team who will document functional and technical specifications for all asset groups, and carry out checks and audits on suppliers' offerings, including factory acceptance testing at manufacturers' facilities.

In addition to the above, CPCS recommends that a real-time network management and outage management system should be procured and implemented (for example GEC ENMAC™). This would be a long term development, dependent on accurate customer and asset information (including SCADA), together with the associated systems. These systems have been shown to provide electricity reliability and availability for customers, as well as increasing overall business efficiency and substantially reducing costs.

Capacity Assessment and Development:

This reform initiative will develop a project management system dealing with the initial design phase, through specification and bill of quantities, through to physical construction and commissioning. For customer related activities, where payment for services is required, the system will include the ability to integrate customer estimates and quotations through to billing and payment.

For a customer related activity such as a domestic LV new connection, the following elements are required:

1. Stock Control
2. Production Control, which consists of:

- Customer Enquiry
- Create Reports
- Route job to Team
- Carry out Job
- Update Records + Close

A major project would require a much more sophisticated project management system.

CPCS recommends a consultancy to determine the needs and develop specific proposals for implementation of project management systems and to oversee implementation.

The components are:

- Consultancy to determine needs, including training needs analysis, and develop proposals;

- Procurement and installation of project management system(s); and
- Ongoing refresher training and development.

We recommend that the activities of authoring standard equipment specifications, system design, policies and procedures (standard techniques) should be carried out in the Planning and Studies Department, with involvement by each directorate. This will require training needs analysis followed by detailed capacity building and training. A simple policy management system should be adopted using off-the-shelf software such as Adobe Acrobat™. Procurement for bulk routine items of equipment should be handled centrally to maximise the benefits from economies of scale. Again, off-the-shelf systems should be used for procurement and stock control.

To support this initiative, the development of project managers, procurement officers and technical writers may be required.

Implementation Horizon:

This initiative should commence with a short consultancy to determine the needs and develop specific proposals for the entire project management cycle.

This reform initiative requires a number of subtasks to be completed. CPCS recommends the Planning and Studies Department commence with a business process re-engineering study to develop the method for designing and rolling out the Project Management System. This exercise will be supported by an external consultancy and should include resources from all directorates to ensure capacity is built throughout as project management will be a crucial skill following corporatization/commercialization of successor companies.

In parallel, writing of policies procedures specifications and implementing Adobe Acrobat are all simple steps that can start now and will take two or three years to implement.

Procurement and project management is longer term. CPCS suggest starting now with business process re-engineering (with consultancy assistance) perhaps initially focusing on the planning and studies Department.

Finally, the Project Management system will either be procured or designed in the latter stages of the Pre-Transition reform phase.

Investment Order of Magnitude:

- Studies, training and consultancy: USD 2 million
- Asset investment: USD 410 million

The key elements of this initiative are as follows:

- Consultancy for training needs analysis, BPRE, capacity building
- Procurement System

- Major project management and job tracking system (few large complex jobs)
- Small project management control (many simple jobs with many stages)
- Real time asset management system and peripheral improvements

Related Reform Initiatives:

- Billing, Account Collection and Customer Information Systems (Section 2.6), to collect and house billing, account and customer information at an international standard.
- Information Technology and Communication Systems (Section 3.1), for the tracking of faults and abnormalities on the power network.
- Asset Management System (Section 3.2), to relate specific events on the system to assets, providing an historic record and the ability to identify repeated failures in particular items of plant.
- Accounting/ Management Information Systems (Section 3.8), to establish international standard accrual accounting practices, financial statements and business management.
- Key Performance Indicator Program (Section 3.9), which outlines a KPI program to measure and track system performance.

3.12 Alliances with Small Private and Community Generators

Reform Phase: Pre-Transition.

Reform Description and Context for Reform:

Billing and Account Collection performance is very poor in the sector but it would appear that customers are willing to pay for electricity provided by small local generators. There currently exist a large number of small private generators which provide electricity to local communities because of the unreliability of the public system. It is estimated that over 75% of households use a secondary electricity source, such as a private generator. It does not appear that these generators have the same problems experienced by the public sector in collecting payment for electricity used even though the price charged is significantly more than the public sector. This issue is particularly relevant in some areas which are considered unsafe for public sector employees to enter (such as Mosul).

Whilst these generators may consider the public electricity supply a threat to their own businesses there may be opportunities to learn from their practices or work collaboratively to mutual benefit. In fact, GoI has begun to formalise the relationship of the private sector group by selling them fuel at special prices so that tariff of these suppliers can be regulated and brought to more affordable levels.

It is recommended that discussions are held with a selected sample of small generators to explore possible options for collaboration. Such collaboration could range from paying the generators a fee for reading customer's meters and collecting payments (which is a form of outsourcing) to incorporating the generator's activities within the existing public sector or buying the generator's output to sell to customers. The future enhancement of the public electricity network will increase the risk to the private generators' businesses and their existence cannot be ignored.

Capacity Assessment and Development:

There is an opportunity to learn billing and collections techniques, along with tariff implications as is now practised by the informal sector and to incorporate them more fully into the process.

Implementation Horizon:

CPCS recommends a study be undertaken using the support of an external consultancy to explore options and create dialogue with a select group of private generators. All the community suppliers would need to be licensed in the first instance by the new Office of regulation.

The reform steps for this initiative would include:

- Pilot projects implementation in collaboration with a local consultancy
- Post implementation review of the pilot projects,
- Developments of contracts -terms etc. and working relationships for a regional rollout program
- Proposals to roll out further projects based on the above review.

The timing of this reform is recommended to take place in the Pre-Transition phase.

Investment Order of Magnitude:

- CPCS understands that MoE have already included funds for this activity within their existing capital investment program budget. To avoid duplication of budgets, these funds have been excluded, although the supporting commentary is included in this roadmap to illustrate the importance and interdependencies of the recommended reforms.

CPCS recommend a consultancy to provide the following activities:

- A review and assessment of the existing community supply market
- Compare with international examples
- An assessment of the viability of community generation projects

- Recommend ways to develop community generation in Iraq based on the above in the context of international experience
- Develop contract structure and relationship to incarnate community electricity suppliers into the formal system
- Implement a trial project assisted by a consultant
- Review the trial and provide lessons learned and recommend next steps

Related Reform Initiatives:

- Pilot: Outsource Revenue Cycle Management (Section 2.7), designed to test an external contract for revenue cycle management.

3.13 Planning System

Reform Phase: Pre-Transition

Reform Description and Context for Reform:

The purpose of this reform is to strengthen the planning process and make it more transparent to other parts of the distribution business. This reform is designed to assist the Distribution Planning Department of the MOE.

CPCS recommends that all existing company policies should be captured in an electronic format and made available to all MoE and directorate staff electronically using off-the-shelf software such as Adobe acrobat and reader. This software has the ability to create searchable indexes, making it very easy for staff to find appropriate policies and procedures. Similarly, technical standards, standard letters and equipment specifications can be captured in the same way.

In addition, standard quotations, connection agreements and connection ownership schedules can be made available.

Capacity Assessment and Development:

To support the rehabilitation reinforcement and expansion part of the planning department, CPCS recommend the purchase of tools to assist engineers in carrying out the following tasks:

- MV & LV Design
- MV - Load flow Analysis e.g. PSSE
- Transformer Thermal Modelling
- Loss Calculation Software

- Demand Profiles and Reports
- Reliability Analysis

An initial training program should be developed with the assistance of an external consultant to ensure adoption of the new software and systems outlined above. Key staff from all directorates should be identified for training to ensure skill building for future private sector involvement.

Implementation Horizon:

Implementation can commence immediately and proceed at an appropriate pace. However, at a minimum, CPCS recommends that this Planning System be in place as the sector moves into the Transition phase of reform.

Investment Order of Magnitude:

- Studies, training and consultancy: USD 3.0 million
- Asset investment: USD 15.0 million

CPCS expects activities and investments required for this reform to include:

- Initial consultancy and training;
- Online policy software system;
- MV & LV Design;
- MV - Load flow Analysis e.g. PSSE;
- Transformer Thermal Modelling;
- Loss Calculation Software;
- Demand Profiles and Reports; and
- Reliability Analysis.

Related Reform Initiatives:

- Project Management System (Section 3.11), to facilitate both large and small investment programs.
- Asset Management System (Section 3.2), which first establishes a distribution sector asset database, but also provides a platform for improved system performance in numerous areas.

4 Legislative, Institutional & Regulatory Program

Legislative, Institutional & Regulatory Program: Definition and Objectives

This Legislative, Institutional & Regulatory Program is complementary to the other reform programs. A step change foundation is needed to allow for a disintegrated, commercially driven and liberalised market structure. This is not a short term exercise, as international experience shows that a reform process such as being contemplated in Iraq will take at least 15 years to move from a vertically integrated state monopoly (still part of the civil service institutional structure) to power market that eventually provides for competition in generation and the retail business, with private sector participation. The overall objectives of this program is to set out the legal, regulatory, industry organisation, and institutional changes needed to support the physical and operational efficiency changes outlined in the Loss Reduction and Operational Efficiency Programs. This will allow the Iraq ESI (with specific focus on the distribution sector) to transition from its pre-reform vertically integrated state owned monopoly structure to one with multiple operators in generation and distribution/retail supply businesses. This program also outlines reforms and perspectives needed to accommodate competition in generation and retail supply, while implementing regulation in the monopoly transmission and distribution lines businesses.

Legislative, Institutional & Regulatory Program: Urgency for Reform

Until 1990's, the publicly owned monopoly utility model was the globally preferred model, and Iraq followed this structure. In Iraq, this framework has not only failed to deliver competitive and efficient electricity services, it has failed to secure high levels of access to its citizens.

The change from the centralised vertically integrated monopoly structure started in Chile in the early 1980s and gained momentum with the reforms in England and Wales in the early 1990s. Since then most developed markets, several Latin American countries and a few Middle East countries like Turkey and Oman have been pursuing major institutional, legal, regulatory and organizational changes. Initially, the changes concentrated on entry of the private sector to the ESI and focused on liberalisation of the additional generation capacity and the entry of IPPs under competition for the market. IPP entry has typically involved 15-30 year Power Purchase Agreements with conditions of take or pay for the capacity component. Essentially, much of the risks remained with the public sector, as the single buyer (either the vertically integrated state monopoly or a newly created Electricity Bulk Trading Company acting as the single buyer). More recently, international experience has shown that the focus in emerging and developing markets should be on reforming the distribution sector as this is where most of the inefficiencies lie in the ESI. This focus has primarily been to reduce the excessive ATC&C losses down to tolerable levels and bring prices to a cost reflective point. In other words, the focus of recent distribution programs have been to monetise the market and improve electricity market liquidity.

The role of the Iraq government in the ESI up to now has been multi-faceted as it encompasses policy maker, legislator, power producer, service provider, financier and regulator, whilst being a large systems operator. It also serves as a major user of electricity services (consumer) and regulator. The scope for conflicts amongst these roles has been found to be too great to effectively and efficiently manage the ESI. Further the civil service structure, which the electricity in Iraq currently operates under and which is based standardised procedures for all units and departments, is not designed to deliver commercial services. The nature of the system is that it inhibits innovation and creativity, and rewards conformity.

Similarly, the demand for electricity in Iraq is growing at one of the highest rates in the world. The high cost, high levels of systems losses and inefficient management of resources makes restructuring and privatisation inevitable. Countries like Jordan, Turkey and the UAE have undertaken restructuring and encouraged the private sector to enter the ESI with some degree of success. The GoI has realised that the state owned vertically integrated monopoly model is no longer a viable option if the crippling shortages in the electricity sector is to be resolved and all its citizens are to be provided with modern energy services.

In 2012, the Iraq Parliament voted on a resolution requiring the public sector to open investment to private players into electricity sector. This was followed by a decision of the Cabinet in 2013 to amend the Iraq Electricity Law to allow private sector participation in energy projects and in the operation and delivery of electricity services as part of the electricity sector reform. In order to meet the challenges, breaking up or unbundling of the vertically integrated state owned monopoly structure will be necessary and further horizontal unbundling of the generation and distribution sector will be necessary as well. Government has also laid out a plan to incorporate

the unbundled distribution and generation sector and the transmission into individual corporate commercial entities.

However, there has been a lack of clarity in corporate objectives, with social macro-economic objectives often intertwined with commercial objectives, to the detriment of both. There have been overlapping responsibilities, pervasive ministerial and political intervention in the day-to-day operations of the electricity departments (departmental enterprise structure), poor governance structure, lack of financial transparency and accountability and the subordination of individual needs of the public utility to macro-economic and political considerations. The culmination of these factors has had detrimental effects on Iraq's ESI.

The reforms which are set out in this program outline part of the process that is intended to change the behaviour and motivation of management towards cost reduction, efficiency and accountable customer service. For instance, a private firm will be less willing to provide uneconomic or subsidised services. Whilst physical improvements to the technical systems are important, these must be accompanied by a new legal and regulatory framework, the development of new electricity market structures, new industry and enterprise governance structure and a platform for commercialisation of the distribution, generation and transmission businesses. Currently there is no clear executive team with the authority to manage the business on commercial lines, meaning there is lack of clarity and focus. Overall, the department enterprise structure is not optimized for driving performance, and operational performance lacks benchmarking. The departmental structure under the civil service framework is not the organizational framework needed to execute performance management.

These initiatives are designed to initially facilitate commercialisation of the businesses, eventually opening the way for private sector participation and financing of investments in the power sector. The reform recommendations also set out where and when private sector finance and private sector participation may be accommodated into the Iraq ESI in order to supplement public investment, especially with respect to the distribution/retail sector. The industry environment at this stage is not conducive to major private sector ownership, operation, and financing.

Legislative, Institutional & Regulatory Program: Phasing

The objectives of ESI and power market reforms in developing and emerging markets are often different from the objectives of reforms in mature power markets. In emerging markets the objectives are improved efficiencies; reduction in equipment down time, reduction of persistent power outages, improvements to the quality of power, expansion of the generating capacity and network to facilitate increased access, and finally to meet USO and to reduce government subsidy. Often when reforming mature markets the objectives are to eliminate excess capacity, to develop better fuel mix and provide security of supply. It is important to bear these considerations in mind when designing emerging developing country power markets.

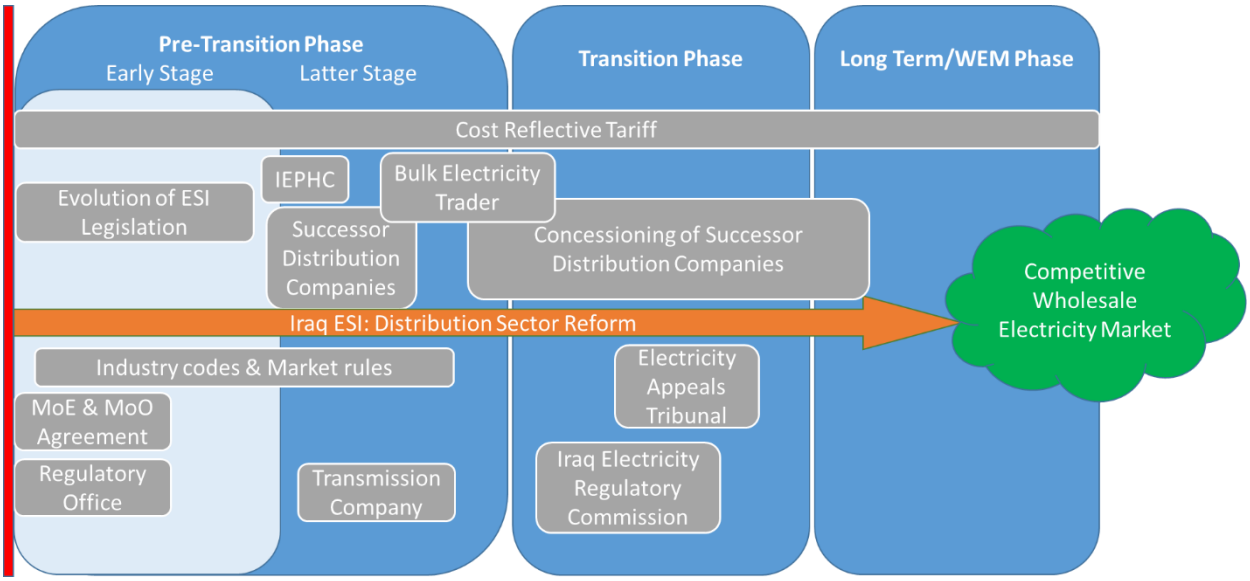
The pace at which competition can be advanced depends on the maturity of the market. In a mature and highly developed market with robust collection of revenues, all participants in the

value chain can be compensated. However, this is not the case in Iraq where the market shows an inability to finance even annual recurrent expenditure. Hence, what may be applicable in a developed mature market, like the UK or even Turkey, may not be applicable in an immature and emerging market like Iraq; with high levels of market illiquidity, low access and a constrained network.

This Legislative, Institutional & Regulatory Program of reform must take a long-term view of Iraq's ESI if these reform measures are to be successfully implemented and for them to have the necessary positive impact on the sector's performance. While the ultimate objective of this program is to achieve a competitive, wholesale electricity market over the medium-term, there are a number of incremental and phased steps required to reach this end state. It is important to view this reform program as an aspiration for the end state.

While there are incremental steps that can be taken in the early stages of the Pre-Transition phase, this program encompasses larger scale system-level reforms at the generation and transmission end as well, and will require significant support and momentum by the GoI to implement.

Figure 4-1: Legislative, Institutional & Regulatory Program: Staging



Source: CPCS

Immediate Priorities

The reform recommendation in this Program which interconnect with the red "emergence from crisis" line reflect the immediate action items. These recommendations include:

- Single Electricity Reform Legislation (Section 4.1)
- Establishment of an Independent Regulatory Office (Section 4.2)

- Internal Agreements between MoO and MoE (Section 4.7)
- Cost Reflective Tariff (Section 4.8)

These identified immediate action items will create positive reform momentum in the first years of the program and allow for "early wins" by the GoI. In the case of this Legislative, Institutional & Regulatory Program, the early win will be ESI legislation to serve as a backbone for the reform process, followed by regulatory and institutional developments which will set the Iraq's ESI up for sustainable reform.

As illustrated above, intiatives in this program span the Pre-Transition phase through to the Long-Term/WEM phase of sector reform. A detailed breakdown of reform initiative sub-steps and cross-dependancies is outlined in Appendix A.

Legislative, Institutional & Regulatory Program: Budget

The below Legislative, Institutional & Regulatory Program budget is provided, which indicates a total budget of USD 100 million in studies, training and consultancy. This program is fully reflective of softer reforms required in the sector and no physical asset investment requirement exists under this sub-head.

Figure 4-2: Legislative, Institutional & Regulatory Program, in USD millions

Category	Total
Studies, Training, Consultancy	100.0
Asset Investment	0.0
Total Legislative, Institutional, Regulatory	**100.0**

Figure 4-3: Reform Recommendation Budget Detail, in USD millions

Section #	Reform Title	Studies/ Consultancy	Asset Investment
4.1	Single Electricity Industry Reform Legislation	7.0	0.0
4.2	Regulatory Institutions	10.0	0.0
4.3	Iraq Electricity Power Holding Company	10.0	0.0
4.4	Multiple Regional Distribution Companies	17.0	0.0
4.5	Transmission Company of Iraq	10.0	0.0
4.6	Iraq Bulk Electricity Trading Company	10.0	0.0
4.7	Internal Agreements between MoO and MoE	1.0	0.0
4.8	Cost Reflective Tariff	5.0	0.0
4.9	Electricity Industry Codes and Market Rules	10.0	0.0
4.1	Concession Successor Distribution Companies	20.0	0.0
Total		**100.0**	**0.0**

As discussed in Section 1.8, and outlined in Figure 1-13: Anticipated Investment Lifecycle, CPCS expects approximately 50% of the investment program supporting the various recommendations will occur within the Pre-Transition phase, with the remainder of the investment program spread over the Transition and Long-Term phases of reform.

4.1 Single Electricity Industry Reform Legislation

Reform Phase: Pre-Transition

Reform Description and Context for Reform:

Currently, the electricity sector operates under the 2003 Electricity Law which has been inherited from the previous regime; as well as under the laws regulating the Electricity Commission contained in the Ministry of Industries law and various other relevant laws. Additionally, there is the State Owned Industry Law which also has an impact on the electricity sector. The existing laws which affect the electricity sector will not permit the implementation of the government's decentralisation and liberalisation policies, nor provide for private sector participation and reform of the sector to deliver adequate and quality power supply at affordable prices.

The indication is that incorporation of the unbundled electricity businesses will take place under the SOE Act. This Act still provides for centralised management by the MoE. Other than allowing for accrual accounting, separation of the accounts of the SOE from that of central government, and giving the enterprise its own legal personality, much of the old order of centralised control

is retained under the SOE form of incorporation. For generation and distribution companies, which may be considered later for privatisation, there is no provision under the SOE Law to sell the shares of an SOE to the private sector or to enter into PPP relationships. In our view incorporation under the SOE Law may hinder the companies from operating on a commercial basis with any degree of financial autonomy.

If the intention is that the unbundled businesses are to operate as commercialised entities as well as providing for public private participation (PPP) or later for privatisation then incorporation should be carried out under the Companies Law No., (21) of 1997, preferably as a Joint Stock Company, as set out in the SOE Roadmap. The SOE law also provides that "it is permissible to include the state sector in the private joint-stock company or limited liability Company with a share of less than 25% of the capital." While a joint stock company appears to most closely resemble the corporate form familiar to international investors, an obstacle arises in terms of the Companies Law requirement of at least five shareholders. It may also be the case that government ownership will be limited to 25%. We understand that the SOE Law is under review and the objective of this revision is to give the SOEs more latitude to operate on a more commercial basis. However, at the time of this report CPCS has not been provided with the governing principles of these revisions. These restrictions would need to be removed.

The key provisions of the 2003 Electricity Law are summarised below:

Figure 4-4: Key Provisions of Electricity Law

MoE Establishment	The law establishes the Ministry of Electricity (MoE) as the entity responsible for all operational activities in the electricity sector in Iraq covering generation, transmission and distribution
MoE Objectives	In order to achieve its objectives, the law grants MoE the right to: • Develop overall sector strategic vision, goals, master plans, policies and feasibility studies for expansion projects • Grant licenses for private participation in electricity activities • Develop and enforce regulations
MoE Structure and SOEs	The law prescribes the organizational structure of the MoE including the deputy ministers, director generals and advisory teams The law stipulates that state owned entities (SOEs) under the supervision of the MoE will be self-funded
Tariff Mandate	The law gives the right to the MoE to propose tariff levels proportionate to operating expenses after government approval (CoM and CoR) The law includes a provision to establish different consumption categories that include residential, commercial, industrial, government and agricultural
Collection Enforcement	The law gives authority to the MoE to take disciplinary actions in case of delayed payments or theft in the form of suspension of service or financial penalties

Source: The Ministry of Electricity Law (2009)

CPCS urges the GoI to establish a single, modern electricity reform and electricity regulatory law to provide for a holistic legislative framework and phased establishment of an independent electricity regulatory commission and an electricity appeals tribunal. The law would set out the powers of the two bodies to regulate and adjudicate in the electricity sector, independent of political controls. A legal framework of multiple electricity industry and regulatory laws should be avoided as these set up an environment for conflicts in their application. We therefore cannot see the rationale for enacting two sets of laws: an Electricity Law and an Electricity Regulatory Law.

Although there is a proposed Electricity Bill, it does not go far enough in handling the various impediments to decentralisation and eventual private sector participation in the Iraq ESI. Article 11 of the draft Bill specifies that the MoE shall open investment opportunities to encourage the private sector to invest in the power sector. The provisions also need to open the door for outsourcing of distribution and other services, such as billing and collection. Bill collection and

revenue cycle management are areas where the private sector should be accommodated as a matter of policy at the earlier stages of the reform of private sector participation process.

Further deficiencies in the draft Bill include the risk that, although assets and personnel would have separate personality in (legal) form, in substance these entities would be mere extensions of the Ministry and they would not be able to enter into partnerships with the private sector. The Bill appears to contemplate that key decisions could only be carried out by the MoE, which defeats the whole purpose of liberalisation, decentralisation and commercialisation. The Ministry should be responsible for setting broad policy, and the enterprise board and management allowed independence in carrying out such policy to meet commercial objectives. It is recommended that each of the proposed successor companies should be empowered to enter into private sector partnerships, either immediately through outsourcing of services, through some other form of partnership, or in the form of PPP and/or eventual privatisation.

Given the existing plans for incorporation of the distribution unbundled business and their requirement for operating on commercial principles, the constraint applicable to private sector entry to the generation business outlined in the Allen and Overy Report as it relates to IPP, also holds for Independent power distributors (IPDs). There is a need for resolution to these problems before private sector is invited to participate in the distribution market. The legal and market arrangements needed for private IPPs and Independent Power Distributors are not in place, or the environment provided in the proposed two new Electricity Bills does not adequately address these critical issues.

The new law should also provide for the creation of a Rural Areas Electricity Company to be responsible for rolling out access in the rural areas, including establishment of a Rural Electricity Fund to finance connection to rural households. The law also needs to provide for the provision of a lifeline tariff to meet the universal service obligation (USO) imposed by the Government.

A few further elements which should be included in the revised electricity law include:

- Newly unbundled successor operating entities to take the form of a joint-stock company;
- The 25% government ownership limit be removed to allow for at least two GoI entities to meet the shareholding requirement;
- The adoption of a single Electricity Power Holding Company model – Iraq electricity holding company (IEPHC) with the successor companies as it subsidiaries;
- Non-discriminatory third party access to transmission and distribution lines, i.e. impose common carrier obligation and the requirement for eventual separation of retail function from the lines business and the eventual issue of separate licenses for the two unbundled businesses (line and retail);
- Provision for a single Transmission Company of Iraq to be the TSP and system/market operator and subsequently for system/market operator to be unbundled from TSP into a separate ISO.

The new law will derive its mandate from an approved electricity sector policy reform. This policy has to be approved by the Council of Ministers and by Parliament to be robust enough to generate the necessary confidence in the new arrangements. We previously supplied a sample drafting instruction, merely as a guide to developing an integrated electricity reform Act. The final drafting instruction will need to be guided by the policy approved for the entire sector and not just a policy for the distribution business. We are not aware of a law being developed just for the electricity distribution sector reform alone in any other jurisdiction.

This Reform initiative can be undertaken immediately and could involve setting out a definitive policy for the entire ESI, review/revision of the proposed Electricity Sector Reform and Regulatory Bill, review of the SOE Law and development of drafting instructions based on the policy and subsequently drafting of a Bill to be enacted by Parliament.

Capacity Assessment and Development:

CPCS recommends a short term consultancy to assist the GoI and MoE in developing definitive electricity sector reform policy, followed by the development of drafting instructions to facilitate the drafting of a new integrated Electricity Reform and Regulatory Bill; and eventually for the enactment of the Bill by Parliament. The legislation for Iraq's ESI should be all-encompassing and should capture the required elements for the entire sector reform: generation, transmission and distribution/retail supply.

The consultancy will assist the GoI to set out initial policies for the electricity sector reform and regulation and transformation. Subsequently, drafting instructions would be prepared, and once approved by the Council of Ministers, would be summited to Parliament for enactment. The Act will give legal effect to the policies.

Implementation Horizon:

CPCS views the development and approval of an electricity sector reform policy, review of the draft bills, and update, as critical to the entire reform process. The single electricity sector reform legislation is priority landmark in the reform process. As such, we recommend this reform initiative receive the highest priority from the MoE and the government.

Activities within the scope of a consultancy to assist the GoI/MoE:

- Establishment of a clear Electricity Industry Reform Policy to form the basis of the new legislation;
- Government approval for the new overall electricity industry policy framework;
- Provision for review and update of the existing bill and developing drafting instructions to be approved by the Council of Ministers; and
- Drafting of the Bill in conjunction with the Iraq legislative draftsman and submission to Parliament for approval as a priority legislative instrument.

CPCS views the overhaul of the existing legislation as a primary milestone required to be in place in order for the sector to move from the Pre-Transition phase to the Transition phase of sector reform.

We are aware of the involved political process and steps required to support such an overhaul in the short term. Further, we understand that it is likely the process could involve a few iterations of the legislation to "get it right" in the Iraq context. Therefore, for the purpose of the Roadmap, we illustrate this initiative as one of the first steps of this program, to commence in the early part of Year 1 of the reform process. There are other small initiatives (which could be undertaken simultaneously or in advance), which would also steer the sector towards reform; such as setting up the ring fenced Office of Regulation in MoE.

Investment Order of Magnitude:

- Studies, training and consultancy: USD 7.0 million
- Asset investment: none

It is expected that this initiative would be completed wholly in the pre-transition phase.

Policy Reform will be required to support this important initiative. CPCS has estimated a budget for technical assistance in the form of external consultancy to support implementation. Elements of the consultancy envisioned are outlined above.

Related Reform Initiatives:

Once the legal framework has been established, numerous knock-on reforms will be feasible. A few of the closely associated reforms are listed below:

- Customer Billing Procedures (Section 2.3), which supports the Billing, Account and CIS system installation with robust billing procedures and processes.
- Pilot: Outsource Revenue Cycle Management (Section 2.7), designed to test an external contract for revenue cycle management.
- Iraq Electricity Power Holding Company (Section 4.3), which establishes the initial holding company structure which will enable further structural reforms within the sector.
- Multiple Regional Distribution Companies (Section 4.4), which establishes numerous regional distribution companies under the IEPHC.

4.2 Regulatory Institutions

Reform Phase: Pre-Transition, spanning to Transition phase

Reform Description and Context for Reform:

The establishment of the regulatory framework is the third key component of the reform to the Law following the setting out of the new industry structure and passages of the new embracing electricity reform Act. This aspect of regulatory reform is fundamental to a properly functioning electricity network. At present, the GoI serves as policy maker, legislator, regulator, power producer, service provider and systems operator and financier. It also serves as a major user of electricity services (consumer) and fulfills regulatory functions. Coupled with a lack of clarity in objectives and competing roles and demands on the GoI, this has negatively impacted Iraq's ESI development. Therefore, CPCS is recommending removal of the regulatory function from under MoE in the short to medium term.

Regulation of electricity service providers and consumers is a means of providing an attractive environment for the private sector participation and to ensure orderly implementation of the market arrangements. Economic regulation of the industry is the formal mechanism used to balance the economic interests of market participants; power generators, suppliers, network providers and other market service providers and users. International best practice prescribes independent regulation if the long-term goal is a private sector driven industry. There needs to be arm's length regulation of service and owners of the system from the government and from large consumer groups. The regulator has to balance the interests of the service provider /owner, the consumers and government. Effectively, he distributes rent between the three players. In addition to economic regulation, there are regulatory provisions for technical matters; safety, environmental, and service standards hence the regulator must be independent if he is to be credible.

The rationale for regulation can be summarised as follows:

- Electricity assets are capital-intensive and become sunk cost once invested (since the assets cannot be profitably redeployed), so inventors need protection, especially from the state and especially from regulatory expropriation or setting unrealistically low tariffs.
- Economic regulation is needed where competition is not feasible, or practical; for example in sectors that still display inappropriate market failure characteristics; such as natural monopoly (considerable economies of scale and scope, especially for the networks, which limits the number of viable players), information asymmetry, and externalities.

Utilities and infrastructure services are said to be basic and essential to the well-being of society. The technological and economic features are such that they display certain market features which limit competition, such as:

1. Security: where supply is limited, rents will accrue.

2. Natural monopoly: A single firm may serve aspects of the market at less cost than any two or more firms-decreasing cost to scale.

3. Information asymmetry: Consumer will not normally have the information to make informed decision, or it will be too costly for the consumer to search for the information.

4. Externalities: The product imposes costs and benefits on third parties not reflected in the internal costs and revenues of the firm; toxic and carbon dioxide emissions.

In the electricity industry, the major factor which over the years has created the need for regulation, especially where private provision of electricity is involved, is that of natural monopoly. Under restructuring, only the transmission high voltage, systems operations, and the distribution wires business will remain with natural monopoly features. Achieving improved economic efficiency in the natural monopoly sectors requires independent regulation.

Another important role of the regulator is to encourage enough investment to meet customer demand and to compensate investors with a reasonable rate of return on their invested capital. In a regulatory regime that sets revenues for an industry characterised by assets with long lives and fixed-sunk assets, the credibility of the regulatory commitment is critical to the successful operation of the industry. The regulator will also need to ensure transparency in the market.

Given the existing culture and practices in Iraq it may be difficult to move to an independent regulatory structure immediately. However, the intention to move to such a structure should be clearly articulated in Law. It is important that this is signalled to private investors and private financial institutions as a key feature of the reform if the intention is to attract private investors, especially financing from private financial institutions to the electricity sector in Iraq.

In Iraq, the first step is to separate the regulatory function from the rest of the Ministry of Electricity's function. The initial office should be set up outside the MoE, but function as an advisor to the Minister on tariff and technical regulation. In this regard, the GoI is proceeding to establish the Office of Electricity Regulation, within the hierarchical organisation of the Ministry of Electricity, which essentially creates a self-regulating structure. This mechanism of self-regulation may be appropriate under full public ownership and operation of the ESI, but will be inappropriate for a market with a private sector driven industry. The GoI should establish the Office of Electricity Regulation immediately, but provide for the establishment of independent regulator, outside the hierarchal structure of MoE at the end of five years. The legislation should provide for the IERC to be given independence to regulate tariff for the electricity sector, to control market entry where this is needed and to regulate technical standards.

CPCS recommends the establishment of the IERC to be supported by an Independent Electricity Appeals Tribunal to adjudicate on disputes between the regulator and market participants. The role of the courts should be ensure that the regulator is acting within the remit of the law and not to make substantive regulatory decisions. Otherwise, the court will become the regulator and courts are not equipped with the competence to adjudicate on economic regulation. The

court process is time consuming and expensive .The Tribunal provides the safety valve to ensure that disputes can be resolved expeditiously and transparently, and according to legal principles.

In conclusion, the shift towards unbundling and creating separate state owned companies, eventually to be owned privately, requires separate regulation to create explicit and stable regulatory arrangements. This will illustrate the regulatory commitment capable of promoting economic efficiency and which provides for managers to be given clearer objectives so that they can be held accountable for their decisions. It also makes it more difficult for the government to renege on undertakings in response to short term political pressures. Separation of regulation and the elaboration of an explicit regulatory framework show government commitment to a particular type of sector policies, including cost reflective pricing arrangements that support long term investments. An explicit regulatory arrangement minimizes political interferences and arbitrary changes in sector policies. With private ownership, arbitrary changes could have major consequences for property rights.

The regulatory system operates within a legal framework which follows one of three approaches: UK, European or US. The US approach operates under strong and well established administrative law code and regulatory tradition of over 100 years, European regulation tends to operate within Napoleonic law codes, with tradition of public service obligations, whilst the UK approach relies on achieving compromises between parties, rather than resorting to courts, as is often the case in the USA. We recommend the UK approach, which is the approach most widely adopted by emerging markets.

Capacity Assessment and Development:

Key staff within the MoE structure with expertise in the discipline of regulation, such as regulatory issues, tariff development, tariff implementation, tariff lifecycle review, technical regulation, etc. should be identified for transfer to the regulatory agency. If expertise in these areas are not currently available within the MoE, CPCS recommends a recruitment initiative be considered, following an HR needs assessment.

CPCS recommends an external consultancy be initially contracted to support the establishment of the independent Office of Electricity Regulation and support the Pre-Transition activities outlined below. This external consultancy should include at least two residential experts: one an economic /tariff specialist and the other a legal regulatory specialist; both at least for one year.

Implementation Horizon:

In the Pre-Transition phase of the reform roadmap, the GoI should follow global international practices providing clear provisions for the following activities:

- Include provisions for independent regulation in the Electricity reform legislation;
- *Immediate priority:* Allow initially for the Office of Electricity Regulation to have a ring fenced relationship within MoE and the political directorate, and arm's length relationship from the companies being regulated or for that matter powerful consumer groups;

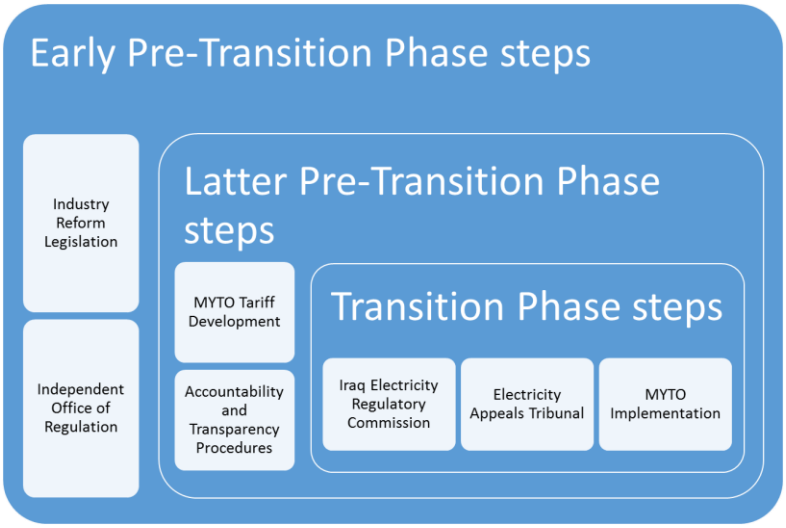
- Establish safeguards for accountability, and scrutiny by the public audit office of the regulatory office's performance;
- Establish rigorous transparency procedures;
- Provide for an exemption from civil service rules and regulation of the independent regulator;
- Establish procedures for recruitment of professionally qualified personally to be members of the regulatory commission, and as well as to serve as part of a professional secretariat;
- Provide in the law for earmark funding to finance the regulatory function. Here the practice has been to allow the regulatory agency to levy a fee (say about 1.5 to 2%) of the revenues on the industry for its operation and not to have to rely on annual and unpredictable government appropriation. The principle is that consumers who are the beneficiary of regulation should pay for the cost of regulation and not the general taxpayers;
- Provide capacity building in tariff and rate setting and in setting technical standards.

As Iraq progresses into the Transition phase of reform, CPCS recommends the following activities be implemented:

- Provide for the establishment of the independent electricity regulator in the new electricity Reform Act
- Establish the Iraq Electricity Regulatory Commission (IERC) as an independent institution outside the hierarchal structure of the MoE;
- Establish clear provisions for dispute resolution through the creation of the Electricity Appeals Tribunal (EAT) so that appeals are handled by a quasi-judicial system rather than by the political directorate;
- Establishment of the initial set of regulatory orders and licenses for the regulator;
- Establishment of the initial set of dispute tribunal guidelines;
- Ongoing capacity building in tariff and rate setting and in the setting of technical standards;
- Senior members should be required to adhere to certain ethical standards and to show that there is no conflict of interest with their duties,
- The Regulator should be required to publicize it rules and give reasons for it decisions; and
- There should be clear provisions for consultation with industry participants and consumers on major industry decisions.

The Figure below depicts the progression of this reform initiative over the roadmap phases.

Figure 4-5: Important Steps in Regulatory Reform



Source: CPCS

It is important to re-iterate that CPCS views the introduction of a robust electricity sector legislation as the primary reform initiative to be implemented as soon as possible. However, for numerous reasons, this may not occur in the immediate term. Therefore, we emphasize that reform initiatives such as the initial progression steps towards an independent Office of Regulation and tariff development can commence in tandem or prior to the robust legislation being enacted.

Investment Order of Magnitude:

- Studies, training and consultancy: USD 10.0 million
- Asset investment: none

It is expected that this initiative would proceed throughout pre-transition and complete in the transition phase.

Progression from the Office of Electricity Regulation to establishment of IERC & EAT should be supported by a technical assistance consultancy. CPCS estimates the order of magnitude of this support at USD 9.9 million. A description of activities and aspects where the external consultancy will support is listed below.

Related Reform Initiatives:

- Single Electricity Industry Reform legislation (Section 4.1), which sets out the basis for a robust ESI system and structural reform.
- Cost Reflective Tariff (Section 4.8), which provides for a long term goal of a multi-year tariff order regulated and reviewed on an annual basis.

4.3 Iraq Electricity Power Holding Company (IEPHC)

Reform Phase: Pre-transition

Reform Description and Context for Reform:

At present, the electricity business is operated as civil service units under a standard civil service code of practice which restricts individual initiative and does not reward special performance. It is CPCS' strong view that implementation of a major investment program and operational reform within the civil service structure would not secure the desired result because the bureaucratic nature of the civil service makes this goal impractical. New Zealand tried departmental enterprise structure (which effectively is the new Iraqi directorate arrangement) in the 1980s and it proved to be a failure. We have no precedent for any major improvements to the ESI taking place under a civil service governance structure.

CPCS recommends a holding company structure model be adopted, whereby there is one power holding company, fully owned by GoI, incorporated under the SOE Law. This company is to take on the mandate to carry out the restructuring, overall management of the improvement program, and eventual privatisation of the government owned companies. Adoption of a holding company structure is expected to facilitate a technical, and commercial approach as part of the corporatisation and commercialisation process. Shares of the holding company would be held by the government, whilst shares of the successor companies would be held by the holding company. Here, the roles of the government and the Holding company are to be essentially that of a shareholder in a limited liability company.

This holding company may be created as a statutory cooperation to hold all the government subsidiaries in the electricity sector covering generation, transmission, distribution /retail supply and project development and management of a newly created bulk electricity trading company to act initially as the single buyer. All core functions will be devolved to the business units incorporated as limited liability companies (under the companies Act). Support functions will be removed from the MoE headquarters and split between the successor companies and the holding company. MoE headquarters is to become a small ministry with responsibility for electricity policy, overseeing policy implementation, developing legislative frameworks, ensuring performance management and dealing with the subsidy; and for the time being the securing of the major investments requirements for the ESI[40] the MoE is to be relieved of the implementation and service provision responsibilities. Additionally, the MoE is to be relieved of the regulatory responsibility and regulation should progress from a ring-fenced regulatory department within MoE to an independent regulatory authority or commission leaving MoE to concentrate on policy formulation, coordination with other ministries, like Ministry of Oil, development of legislation and monitoring of reform initiatives.[41]

[40] CPCS "Regional and International Benchmarking Report".
[41] CPCS "Regional and International Benchmarking Report".

This approach has also been adopted in Turkey as seen in the benchmarking exercise. As another international best practice, Oman currently provides a very good example of successful operation of the holding company model. Oman was not part of the benchmarking exercise, but represents a good example of an international best practice.

This arrangement will facilitate PPP and privatisation of the successor companies. Further, during the subsequent privatisation stage, a layer of "insulation" between the GoI and the owner of the assets to be privatised will facilitate the transaction process and instill confidence within the private sector bidders.

Further functions of the Holding company structure is to provide a supportive environment for effective planning and budgeting processes to provide a focus for the organisation and to provide a framework for improved financial control of the businesses. There is an urgent need to improve financial disciplines with a well-structured approach to the development and management of individual company operating expenses and capital budget. Budgets can be prepared on a top-down basis by breaking down the annual business plan into managed portions and also on a bottom-up approach where managers develop their own budgets by building up in detail the expenditures they need in order to achieve their objectives.

The unbundled successor subsidiary companies are to be mandated to take on the service delivery functions of generation, transmission, distribution/retail supply and project management. A separate discussion of the establishment of Successor Distribution companies and a separate Transmission company are found in Sections 4.4 and 4.5 respectively.

Legislation would be needed for the introduction of this new industry and governance structure. The legislation should provide generally for the creation of multiple generation and distribution /retail supply companies and not set the number of multiple companies in the legalisation, except that there should be one transmission company for the 15 directorates. The law should provide for private financing of transmission networks, should there be a requirement for such assets to be transferred to the single transmission grid operator once they are commissioned and start to evacuate power from more than one source; or if a large user seeks to connect to that network.

Capacity Assessment and Development:

The MoE Head Office is not currently equipped with the resources to manage a group of unbundled companies from a corporate stand point and to execute the reform agenda.

Part of the consultancy which we recommend will be to assist in setting up the organisational structure of the holding company. The key staff for the IEPHC are expected to comprise of a CEO, with Heads of divisions reporting to the CEO in areas like operations director, finance director and, HR, legal /regulation, with appropriate support staff. The total number of staff required would be in the region of 20-30, looking after all the Holding functions. Additional staff will be needed during the period of initial set up.

CPCS recommends that additional training is provided in subjects such as business process re-engineering, together with accountancy and finance, regulatory and performance management and total quality management.

Implementation Horizon:

CPCS envisages the creation of the IEPHC structure to occur within the Pre-Transition phase of reform. The creation of the structure could commence within the first year as shadow operational units with full establishment following passage of the Electricity Industry Reform Act. This holding company model is based on the principle of the unbundling of the successor distribution and generation companies, into multiple company operations.

Investment Order of Magnitude:

- Studies, training and consultancy: USD 10.0 million
- Asset investment: none

It is expected that this initiative would be completed wholly in the pre-transition phase.

Policy reform is required to ensure this holding company structure is implemented. To assist this process, CPCS has estimated that technical assistance to support implementation could be in the range of USD 3.0 million.

This consultancy will include tasks such as:

- Assist in the establishment of the successor companies, the IEPHC and the new organizational structure of the MoE head office.
- Assist the MoE with developing a protocol for systematic reporting and integration, as discrete systems are established for each successor company.
- Assist with the process of asset identification which are to be transferred to the each Successor Company and to IEPHC. Asset valuation will be required, together with the transfer to the newly incorporated successor companies and IEPHC.
- Assist with developing governance structure (the board) and in the professional selection of candidates for the board and professional selection of the initial senior management team, including the CEO.
- Draw on the biometric study and conduct an HR audit to enable the identification of resources available and required to manage the new structure.
- Assist the MoE with developing ways to develop and re-deploy staff displaced during the implementation of the new structure.

Related Reform Initiatives:

- Single Electricity Industry Reform legislation (Section 4.1), which sets out the basis for a robust ESI system and structural reform.
- Multiple Regional Distribution Companies (Section 4.4), which establishes numerous regional distribution companies under the IEPHC.
- Transmission Company of Iraq (Section 4.5) which establishes an independent transmission company to cover the responsibilities of systems and market operation.

4.4 Multiple Regional Distribution Companies

Reform Phase: Pre-Transition (within the first 2-3 years)

Reform Description and Context for Reform:

The GoI has already proposed horizontal unbundling and incorporation of the distribution business into multiple distribution successor companies in a draft legislation. We feel this set of provisions in the draft legislation does not go far enough. This should be revisited to provide for executive decision-making authority to create several unbundled successor generation and several unbundled distribution companies as subsidiaries of the IEPHC. We recommend multiple regional distribution companies so as to reduce the problem of information asymmetry and market power, and provide for yardstick competition.

A single or a few distribution companies would present the problem of information asymmetry and the few distribution companies would be in a much stronger position than the customers they serve and the regulator, which is meant to monitor against abuse of a monopoly position. Information asymmetry presents major problems for effective regulation. The relative strength of this situation can be significantly weakened by the creation of several distribution companies (at least 7 in Iraq as now exist under the departmental structure) providing the basis for comparing several relative performances.

Therefore, CPCS recommends at least seven regional distribution businesses be created from the unbundled distribution directorates. There are many benefits to implementing regional distribution companies. These not only include a reduction in market power by minimising information asymmetry. Several smaller distribution companies allow more opportunity for local ownership of distribution, as opposed to creating a few large distribution businesses as these, from experience, are more likely to go to foreign investors. Distribution is essentially a local business. In addition, smaller companies would be easier to privatise at a later date. Further, the existence of several distribution companies makes it easier for the regulation of the distribution sector by providing for yardstick competition - more companies to be included in the benchmarking and comparative exercise.

Also, there may be some instances, depending on how boundaries between the distribution companies' service territories are defined, for the companies to compete for the right to extend their lines to deliver power to currently unserved customers or to be involved in border

competition. The benefits available from competition – yardstick competition and competition for the market – are very compelling. Yardstick or benchmark competition (i.e. competition based on relative performance of companies providing similar services) has advantages both to the regulator, by providing a strong informational basis for comparing performance of the different regulated distribution companies, and potentially consumers too, who, if properly informed, can compare relative performance as well. We need to balance higher regulatory costs of large firms (more intrusive) against economies of scale if they do occur.

In the case of the distribution sector, efficiencies are not so much economies of scale, except scale economies in corporate administration and financing. The economics of distribution relates more to economics of density and higher per capita consumption. In this regard, a smaller dense customer base distribution company can conceivable display lower cost and higher efficiencies than a firm with large numbers with a sparsely distributed consumer base.

In a World Bank Study carried out in 2000 ('*An Analysis of Electricity Distribution in Developing Countries; What Government Can do to Improve the Prospects for Success'*, World Bank), it was shown that in successful distribution company privatisation in developing countries, the average number of customers per sale was just over 700,000, involving companies with a consumer base as small as 250,000. The smallest companies in the sample were two in Argentina and Peru. Turkey has 21 distribution companies and in New Zealand, the number of distribution companies is even greater. With the planned expansion, customer base could be expected to grow to be over a minimum of 350,000 even for the smallest company in a seven company distribution structure over the next five years. In a recent exercise in which the consultant was the transaction advisor, the unbundling provided for 11 distribution companies with the smallest having a customer base of 200,000.

The multiple distribution companies should be restructured and incorporated as subsidiaries of the IEPHC under the general company's law. Further, it is recommended that each of the proposed successor companies should be empowered to enter into private sector partnerships, either immediately through outsourcing of services, such as revenue cycle management, as well as through some other form of partnership, or in the form of PPP and/or eventual privatisation.

Capacity Assessment and Development:

The MoE civil service structure is not currently equipped with the resources to manage a group of unbundled successor companies from a corporate and commercial operations stand point; being essentially a civil service driven structure.

The successor distribution companies should have their own company board, made up of professionally selected members and operating with a professionally appointed executive management team; led by a professionally appointed CEO. The managers reporting directly to the CEO would typically manage each discrete component of the distribution business, either as a line manager or as a staff function manager.

CPCS recommends a consultant be engaged to assist the MoE in establishing the successor distribution company framework, including preparation of articles of association, and incorporation of several distribution business dealing with the initial staffing and transfer of assets from the civil service central government.

Implementation Horizon:

CPCS envisages the creation of the distribution company structure to coincide with the establishment of the IEPHC structure. Progress towards this structure is recommended to occur as a conditions precedent of transitioning out of the Pre-Transition phase of reform. This is to allow for private sector participation in the ownership and operation of the distribution companies during the Transition phase of reform.

Investment Order of Magnitude:

- Studies, training and consultancy: USD 17.0 million
- Asset investment: none

It is expected that this initiative would be completed wholly in the pre-transition phase.

Policy reform and legislation are required to ensure the IEPHC/subsidiary distribution company structure is implemented. To assist this process, CPCS has estimated that technical assistance to support implementation could be in the range of USD 9.8 million.

This consultancy will include tasks such as:

- Assist the MoE with the establishment of a multiple distribution company framework to facilitate effective yardstick competition, and which lends itself to local ownership of the distribution companies on privatisation;
- Assist in the establishment of a professional board structure and in the recruitment of a professionally qualified executive management team and CEO;
- Separation of installed accounting and IT systems to ensure appropriate reporting of each successor distribution company and the incorporation of a key performance management framework;
- Assist with the process of asset identification, valuation and transfer to the newly incorporated distribution companies;
- Create and value individual shares of the newly established distribution companies. Ownership to be initially held by the IEPHC;
- Provide technical assistance to develop a business plan and a forward capital budget for each successor distribution company. The budget will need to be in line with the appropriate tariff structure relating to each company's customer base;

- Assist the executive management to develop an initial distribution loss reduction program, complete with ATC&C targets for each distribution company;
- Obtain appropriate licences from the regulating body and bulk supply agreement with the bulk trader or single buyer for bulk supply of power; and
- Conduct an HR audit to enable the identification of resources available and required to manage the new structure.

Related Reform Initiatives:

- Iraq Electricity Power Holding Company (Section 4.3), which establishes the initial holding company structure which will enable further structural reforms within the sector.
- Asset Management System (Section 3.2), which records all assets housed within the distribution system, including maintenance received and condition.
- Accounting/Management Information Systems (Section 3.8), to establish international standard accrual accounting practices, financial statements and business management.
- Key Performance Indicator Program (Section 3.9), which outlines a KPI program to measure and track system performance.

4.5 Transmission Company of Iraq

Reform Phase: Pre-Transition

Reform Description and Context for Reform:

With the introduction of IPPs and the separation of transmission from unbundled generation and distribution businesses, there is the need to restructure the transmission business into one Transmission Company for the 15 directorates. This transmission company will provide non-discriminatory third party access to the high voltage system. This transmission company will fulfill the role of transmission services provider (TSP) and to convert the central load dispatch centre which currently functions under command and control internal procedures into a system operation function. Initially the Transmission Company will be ring fenced into an independent systems operator to cover the responsibilities of systems operation (SO) and Market Operation (MO).

Two separate licenses are to be issued to the transmission company of Iraq by the industry regulator, both requiring non-discriminatory access to the Transmission System and associated services. The two licenses to be issued to the Transmission Company of Iraq are:

1. There is to be an independent system operator (ISO) system/market operator and ISO license. The ISO is required to balance electricity supply and demand, including dispatch of generation, and to develop new grid codes and market rules for the restructured power

market and to operate codes governing the associated commercial and technical issues. The ISO will be responsible for co-ordinating, planning (determining additional capacity requirements to the system), dispatching and supervising the operations of the system and the power market. The ISO should be assigned the additional responsibility for the development of market rules and administration of the Market. These rules will need to be approved by the Regulator. Market administration is concerned with the commercial side of the business of the unbundled parties; settlement payments etc. The system/market operator's function should initially be ring fenced from the TSP function if the intentions to go to a bilateral contracts market. At a later stage, the ISO would be separated out as a separate legal entity operating under its own licence.

2. Transmission Service Provider (TSP) license to provide for the wheeling of electricity over the high voltage network. The TSP assets principally consist of overhead lines, cables and substations. This license will also require the operation of codes or contracts governing the commercial and technical issues associated with connection to, and use of, the Transmission System.

The Transmission Company of Iraq will initially be owned by the GoI, however provisions should be put in place for concessioning the PSP business at a later stage. There should be cross-ownership restrictions ensuring that private owners of generation and/or distribution will not be able to take ownership interest in the Transmission Company of Iraq. Conversely, the Transmission Company of Iraq should not be able to take ownership interest in private generation and distribution companies.

As mentioned in Section 4.1, the new legislation would need to provide for a Transmission Company of Iraq to be the TSP and system/market operator and subsequently for system/market operator to be unbundled from TSP into a separate ISO. Further, industry codes and market rules will need to be developed, following the creation of the TSP. This reform initiative is discussed below.

Also, when establishing the Iraq Transmission Company, it is necessary to indicate clearly the boundaries among future Distribution Companies and Generation companies (either IPPs or Government owned). In those borders, meters should be installed to record and compute the energy balances among the new business entities. These will facilitate any potential ATC&C losses reduction initiative.

Capacity Assessment and Development:

As with the discussion of capacity assessment/development for the newly created electricity holding company and successor distribution companies, the existing MoE structure does not currently hold the required skillset for the operation of a separate transmission company.

Further, the new roles of the TSP and ISO must be clearly defined. Consultancy services are recommended and would be required to assist in establishing the organisational structure of the transmission company and the ISP, and their initial staffing.

Some important key staff positions to be filled within the newly created TSP could include:

- Chief Executive Officer
- Chief Operational Officer
- Director of Operations
- Director of Systems Planning
- Director of TSP
- Director and of Project Management and Transmission Constructions
- Director Communications, GIS and Asset Management, and
- Director of Finance and Administration

Important key staff positions to be filled within the newly created ISO should include:

- Chief Executive Officer
- Chief Operational Officer
- Director System Operations (SO)
- Director Market Operations(MO)
- Director IT Systems
- Director of Planning and Forecasts
- Director of finance and Administration

CPCS recommends an HR audit be conducted to identify existing personnel capable of fulfilling these managerial roles and commence a program to fill the gaps in the management structure.

Implementation Horizon:

CPCS envisages the creation of a single unbundled successor transmission company to coincide with the establishment of the IEPHC structure. Progress towards this structure is recommended to occur as a condition precedent of progressing out of the Pre-Transition phase of reform.

Investment Order of Magnitude:

- Studies, training and consultancy: USD 10.0 million
- Asset investment: none

Policy reform is required to ensure the holding company/transmission company structure is implemented. To assist this process, CPCS has estimated that technical assistance to support

implementation could be in the range of USD 9.8 million for the establishment of the transmission company.

This consultancy will include tasks such as:

- Assist the MoE with the process of asset identification, valuation and transfer to the newly incorporated transmission company and ISO;
- Assist the MoE with developing governance structure of a board and executive managers to include establishing transparent selection and appointment procedures for board members (who should not be more than 9);
- Provide technical assistance to develop a five year business plan and a five year forward capital budget for the transmission company;
- Create a transmission loss reduction program, complete with ATC&C transmission loss reduction targets;
- Develop a systems and transmission master plan;
- Obtain appropriate licences from the regulating body;
- Conduct an HR audit to enable the identification or resources available and required to manage the new structure;
- Establish a KPI program for transmission based on best international practices, serving as an incentive structure for management, and;
- Provide capacity building and training specific on Systems Planning and Operations, Market Operations, Market Settlement System, SCADA, and GIS for maintenance and asset management, for the personnel of the new entities, Transmission Service Provider (TSP) and Independent System Operator (ISO), in order to enhance their skills and education needed to face the new responsibilities of the entities indicated above.

Related Reform Initiatives:

- Single Electricity Industry Reform legislation (Section 4.1), which sets out the basis for a robust ESI system and structural reform.
- Electricity Industry Codes and Market Rules (Section 4.9), which establishes the contracting network and operational base for the functioning of the new market structure.

4.6 Iraq Bulk Electricity Trading Company

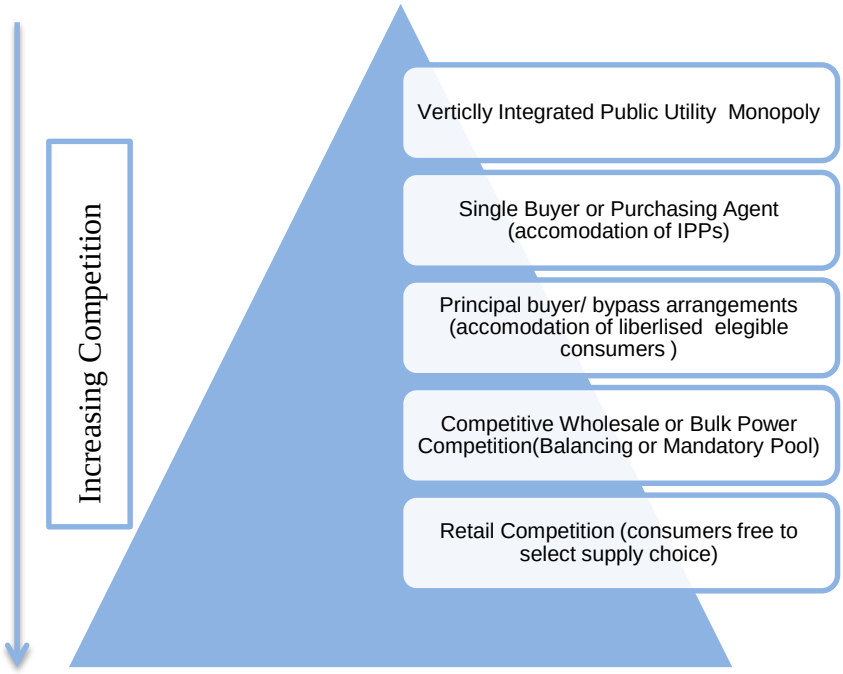
Reform Phase: Latter stage of Pre-Transition phase/early stage of Transition phase

Reform Description and Context for Reform:

Typically, in reforming ESI, it is not possible to go from a vertically integrated monopoly structure to competitive wholesale electricity market structure as was done in the England and Wales reforms. In the process of reform the single buyer (later principal buyer) model is established as the public wholesaler of bulk power – buys power from IPPs mainly though PPAs and the state owned generators and sells bulk power to the state owned distributing companies or large and liberalised consumers. With PPAs, the Bulk Electricity Trading Company takes most of the market risk and needs to be appropriately capitalised to meet is financial commitments or securitized by government sovereign guarantees. The single buyer is responsible for new capacity procurement, demand and supply forecasts, and fixing fuel mix policy. The Iraq Bulk Electricity Trading Company would be a successor subsidiary of IEPHC. The single buyer will need to establish a fuel mix and capacity procurement policy and guideless procedures.

The evolution of the power market structure can be illustrated as below with each stage providing an increasing degree of competition. In the case of distribution, there is no definitive model for the structuring of the distribution sector. The difficulty arises from an industry which delivers its product to a spatially disbursed group of customers. Output expansion can occur in several different ways: increased demand by existing customers, additional demand by new customers within the firm's service area, or an expansion of the service area. These can all lead to increased outputs, but each can have different impacts on unit cost and this leads to different degrees of scale economies. The distribution service is a combination of a natural monopoly (wires service) and the competitive retail business. As a result, the variety of market structures emerging from power market reforms can be categorised according to the increasing degree of competition:

Figure 4-6: Market Structures and Degree of Competition



Source: CPCS

Currently the power market structure in Iraq is moving from the pre-reform internal command and control market mechanism within an integrated Utility controlled by the MoE (monopoly model). The Government's new policy is to provide for IPPs, IPDs and unbundled successor generation companies.

The single buyer structure manages competition for long term market share amongst generators and IPPs. The single buyer possesses monopoly for supplying the distribution sector, except where partial monopoly is prescribed through allowing large customers to bypass the single buyer (Principal Buyer).

In the case of the wholesale power market, the structure is usually arranged as a centralised or mandatory pool/power exchange or a bilateral contracts market and balancing pool.

The final structure is retail competition, which is the most liberalized arrangement providing for freedom of supply choice by consumers as is the case in the UK, Australia, certain Latin American countries like Colombia; as well as in certain European countries.

Restructuring power trading arrangements in developing countries tends to progress from pre-reform monopoly internal market control mechanism within an integrated power structure to an unbundled structure, allowing entry of IPPs, selling power to a single buyer, to the opening of access to the power market by large users (principal buyer) and eventually to a power exchange under competitive trading conditions.

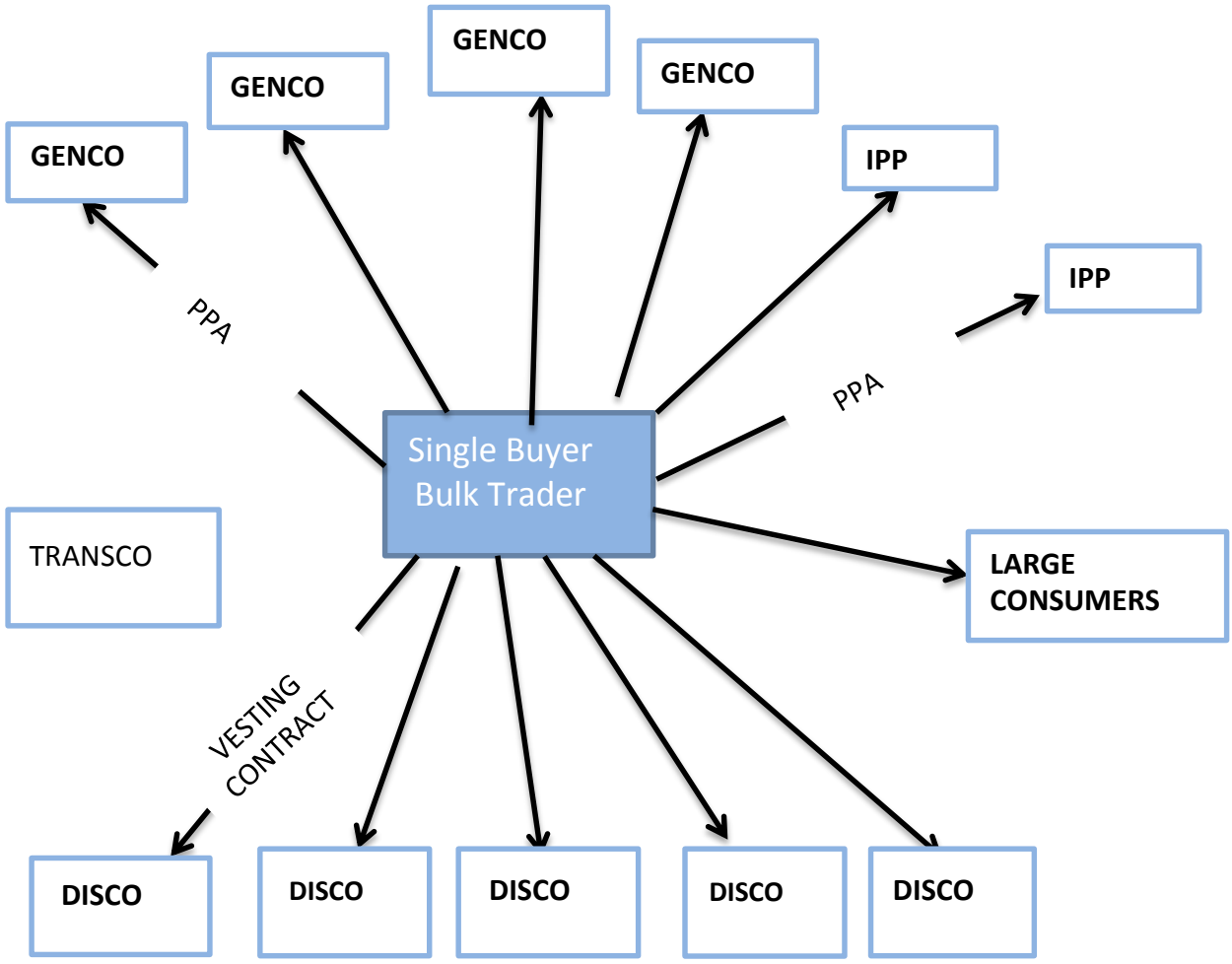
As Iraq moves towards allowing for IPPs, private distribution companies and generation companies, a credible offtake will be required, such as the Iraq Bulk Electricity Trading Company (IBETC), as per the Oman, Turkish or Jordan model. IBETC is to be structured under the single buyer model, which CPCS considers to be the most optimal transition arrangement for Iraq until a competitive wholesale electricity market (WEM) can be introduced. It can be structured to leave future options towards WEM flexible. IBETC can be created immediately after the incorporation of the several unbundled successor companies. However, for the single buyer model to work efficiently, new market rules are needed such as competitive procurement for new capacity to benefit from competition for the market. These rules define procedures that the single buyer must use to procure bulk power, to guarantee transparency, efficiency and competition. The single buyer acts as a load aggregator which is an efficient and useful function in the transitional stages. It can be taken to the principal or multi-buyer stage with simple modification, introduction of eligible (or liberalised) customer regulation.

With the single buyer reform model, the single buyer becomes the sole purchaser of all bulk power. The electric utility may remain vertically integrated, however in the case of Iraq the government has opted for horizontally unbundling the ESI. In this single buyer arrangement, the transmission company's contractual relationship and income flows would be by grid connection and ancillary services agreements; with the Gencos and IPPs and transmission use of service and grid connection with the distribution companies. If a large eligible customer arrangement is introduced, then there is transition to the principal buyer structure. With the single or principal buyer model the new capacity or generation market is liberalised and private power producers and auto-generators are permitted to enter the market for additional generation capacity, but must enter through long term power purchase agreements (PPAs) selling all its bulk power to the public utility in the case of single buyer with the option to contract with large eligible customers (principal buyer arrangement). Whilst the PPA is the key contractual arrangement for the generation companies, the key contractual arrangement is a bulk supply agreement or a Vesting Contract with the single buyer which allows the single buyer to sell bulk power to the unbundled incorporated distribution companies.

Under the single buyer model/purchasing agency model, regulation revolves around preventing natural monopoly segments from abusing their natural monopoly power by charging monopoly prices and in minimising the exercise of market power, regulating self-dealing and conflicts of interests; especially where the generation sector is not separated from the purchasing agency.

Figure 4-7 below shows what a single buyer model could like for Iraq, complete with income flows:

Figure 4-7: Single Buyer Market Structure for Iraq: Financial & Commercial Relationships



Source: CPCS

The advantages of the Single Buyer model for emerging markets with a shortage of capital for new generation capacity are that it provides an accessible institutional framework to attract private and foreign direct investments in the generation business. FDIs and private financiers will seek long term PPAs between IPPs and the single buyer, with substantial government guarantees. The IPPs are usually highly leveraged and can be as high as 80% debt, usually with non-recourse or partial-recourse financing. The cash flow of the IPP project must be able to sustain the debt repayments. Another advantage of this structure is that it retains the ability to meet universal/social service obligations as it is still possible to practice cross-subsidisation to meet universal services obligation.

Although this model is often the preferred approach for a variety of technical, economic, and institutional reasons, there are shortcomings. One such shortcoming is that the model only provides for very limited competition. As explained earlier, the single buyer has monopoly power over sales of the bulk power to the distribution companies as the distribution companies must buy all their bulk power from this company. Further, investments in additional generating capacity are often not driven by market incentives, but rather by bureaucratic preferences. Decisions about expanding capacity are made by government officials who do not face the financial consequences of their actions. Instead they often abandon least cost expansion alternatives because of political reasons and expediency.

If the single buyer also owns generation, it may select bids for new capacity from its generation subsidiary or related company or bias competition in favor of itself. Incumbent single buyers are loath to face the test of competition – which may reveal high operational costs and is well placed to impede entry by imposing unreasonable conditions. This can result in potential generators being reluctant to incur the costs of preparing a bid, reinforcing the power of the incumbent buyer and thus defeating the purpose of opening generation to outside investors. Therefore, we recommend that the single buyer should not own generation capacity. In addition, the single buyer is to be limited to commercial activities as distinct from the transmission company which deals with the physical relationships in the market.

Another shortcoming of the single buyer model tends to create a situation in which all financial risks are concentrated in the hands of a single agent – usually the state owned entity. If the single buyer is not able to meet its obligations to generators, then government intervention and support is required. Thus power purchase agreements under the single buyer model may create a contingent liability for the government and this can affect the government's credit worthiness; hence making taxpayers – not investors – bear all the risks. This type of competition which emerges for the single buyer is called *competition for the market*; once entry takes place there is very little further competition. Separation into two tier-pricing for capacity and energy does provide some competition for energy on a day–to-day basis.

Following the transition to the Single Buyer structure, it will be possible to progress to the Principal Buyer variation. This will provide for further market liberalisation and expansion of competition and requires separating the central dispatch transmission function from the procurement function and the establishment of a Bulk Trader. In this case, the Bulk Trader becomes a principal buyer and provision is made for eligible large customers to purchase bulk power through bilateral contracts with generators (which bypasses the principal buyer). The rest of the market, small residential and commercial users, remain captive (Captive Customers) to the distributor in their respective franchise areas.

To support this recommendation, non-discriminatory access to transmission and distribution lines are required (common carrier obligation imposed). Liabilities are typically between the generation company and the eligible customer or the distribution company (example Panama at the early stages of the reform).

While our recommendation focuses on the Distribution sector, we must also discuss the implication on other sectors of the electricity value chain. In unbundling the public utility, the Government should provide for multiple generation companies, in addition to the recommended multiple regional distribution companies. Further, a single transmission company with the system operation should be set up (inclusive of market operation), ring fenced initially within the transmission company. The systems operator later should be vertically unbundled from the transmission company to become a separate independent entity, separate from the transmission service provider's (TSP) function. Transmission will need to provide non-discriminatory third party access. A further discussion of this reform parameter is beyond the scope of this consultancy.

Capacity Assessment and Development:

This single buyer structure does not currently exist within Iraq's current ESI framework. The governance stature will be the same and it would be incorporated as a Limited Liability Company and subsidiary of the IEPHC. Consultancy will be required to establish the Bulk Electricity Trading Company and to advise on its organizational and governance structure.

Key staff positions which could be considered in the creation of IBETC include a Commercial Director, Finance and Administration Director, Bulk Trader, Head of Legal and Regulatory Sservices and HR & PR Director supported by senior managers for:

- Electricity purchases;
- Electricity sales; and
- Tariffs, load management research, profiling and forecasting.

To support this process, CPCS recommends an initial external consultancy to assist the MoE/GOI. Specific responsibilities of this consultancy have been outlined below.

Implementation Horizon:

The establishment of IBETC will require support from the MoE/GOI. One of the most important support roles by the MoE/GOI will be to ensure IBETC is properly financed in terms of it capital and that it can provide appropriate securitization to ensure market confidence.

In terms of timing, IBETC can be set up as the reform process transitions out of the Pre-Transition phase, following the holding company structure establishment.

Investment Order of Magnitude:

- Studies, training and consultancy: USD 10.0 million (this does not include the capital required to set up the Bulk Trader)
- Asset investment: none

Policy reform is required to ensure the IBETC is created. To assist this process, CPCS has estimated a technical assistance to support implementation could be in the range of USD 10.0 million.

This consultancy will include tasks such as:

- Development of a bulk electricity supply contract or, if necessary, vesting contracts for each distribution company
- Development of model PPAs contracts;
- Assist with developing governance mechanisms and appointment procedures for the board and senior executives (including the CEO who must have power trading experience), officers and directors of IBETC;
- Conduct an HR audit to enable the identification of resources available and required to manage the IBETC;
- Assist the MoE to develop staff development programs and succession planning; and
- Assist in the development of the capital structure and form of securitization instruments to make IBETC seen as the MoE/GoI to ensure securitization of the IBETC as a credit worthy counterparty.

Related Reform Initiatives:

- Single Electricity Industry Reform legislation (Section 4.1), which sets out the basis for a robust ESI system and structural reform.
- Iraq Electricity Power Holding Company (Section 4.3), which establishes the initial holding company structure which will enable further structural reforms within the sector.

4.7 Internal Agreements between MoO and MoE

Reform Phase: Pre-Transition (within the first year of the reform)

Reform Description and Context for Reform:

Electricity generation in Iraq depends mostly on petroleum products; crude, heavy fuel oil, gas oil and diesel, as well as natural gas for over 85% of its fuel supply and this is provided by the Ministry of Oil. In addition, there is currently an uncertain fuel outlook for Iraq's power plants (supply, quality, type and allocation, and transfer prices) as supply is allocated on an ad hoc basis and not on any agreed principle clearly laid out in a document.

This creates the need for a formal coordinating mechanism; however, no such mechanism exists and there is no fuel supply agreement between the MoE and MoO. The result is that fuel supply arrangements are subject to bureaucratic interventions in the decision making process; relating

to prices, volume and timing. Although the two ministries have agreed on the overall volumes of fuel required, they have failed to introduce the detailed joint planning needed to ensure timely delivery of the appropriate fuels to particular power plants. Maintenance schedules are not well coordinated, and joint contingency plans for potential fuel stock-outs have not been developed. Further discussion of this issue is beyond the scope of this report.

The unreliable fuel supply to the generation sector has a knock-on effect to the distribution sector's sustainability. This is one example where the ESI supply chain is fundamentally linked and a weakness in one sector directly impacts the performance of the other sectors.

CPCS recommends internal agreements between MoO and MoE are formalised so as to address these shortcoming and risks outlined above. This will assist in creating a more sustainable platform for the distribution reforms being implemented throughout this process.

Capacity Assessment and Development:

CPCS' view is that key staff and fundamental skills are present within the MoE and MoO structure currently to commence a further coordination amongst ministries. What is lacking is a deeper understanding and experience in implementing agreements and MoU's of this nature. Therefore, CPCS recommends a small external consultancy to assist the MoE through this process. A basic requirement is for a fuel coordinating Committee between the Bulk Trader and the subsidiary generating companies.

Implementation Horizon:

This reform initiative is not dependant on any other reform measure in order to be completed. CPCS recommends this integration between ministries be considered and actioned as soon as possible. We view this reform measure to be relatively straight forward to complete and thus do not foresee a need to delay. This is an "Early Stage" Pre-Transition phase initiative.

Investment Order of Magnitude:

- Studies, training and consultancy: USD 1.0 million
- Asset investment: none

It is expected that this initiative would be completed wholly in the early stage of the pre-transition phase.

Technical assistance is required to ensure the various internal agreements are established. To assist this process, CPCS has estimated a technical assistance to support implementation could be in the range of USD 9.8 million.

This consultancy will include tasks such as:

- Capacity building of key staff within the MoO and MoE.

- Assistance for joint planning initiatives, including maintenance schedules and contingency plans.

Related Reform Initiatives:

This reform measure is not explicitly tied to other reforms, instead is supports the overall roadmap goal of a sustainable ESI.

4.8 Cost Reflective Tariff

Reform Phase: Pre-Transition, Transition and WEM/Long Term

Reform Description and Context for Reform:

Existing tariffs in Iraq are very low by international standards and cover only a small portion of operating costs. For instance, Iraq's average electricity retail power tariff increased to reach US ¢ 3.2/kWh (38 ID/kWh) in 2011. Similarly, the cost recovery in terms of recurrent O&M expenditures is low and does not exceed 20% as per the 2012 figures. This is attributed both to a highly subsidized tariff, coupled with low billing ratios, and even lower collection rates. In addition, the current reliance on finance through budget subvention is unsustainable and also introduces a high level of uncertainty in the financing of the electricity sector.

Figure 4-7 below summarises collection rates from tariffed electricity customers for the period December 2009 to December 2012. The figure shows the volume of units wheeled and the total value of the wheeling charges due from electricity sales.

Figure 4-8: Income from Tariffed Customers (000 IQD)

Item	2009	2010	2011	2012
Total units wheeled (MWhs)	25,857,349	27,443,762	26,629,126	35,075,355
Value of electricity wheeled	501,087,308	627,477,006	948,232,884	655,231,585
Collection	304,795,045	415,548,057	553,060,126	454,636,732

Source : Ministry of Electricity

The MoE depends wholly on the government budget allocated each year by the Ministry of Finance (MoF). In fact, tariffed revenues go directly to the MoF which then makes annual budgetary appropriations to the sector. There is therefore a disconnection between operating cost and revenue collection and in the tariff function is divorced from the financing of both the operation and maintenance and capital expenditure. The Iraq system of civil service budgeting provides for two budget categories: recurrent and investment (capital). The former is used meet day-to-day operation and maintenance expenditure (O&M) and the latter is intended to cover investment or capital expenditure. The dependence on annual budgetary subvention for both OPEX and CAPEX not only imposes a very high burden on the MoF (it is unsustainable), it also introduces a high level of uncertainty in the financing of electricity operation, especially for the capital component in Iraq. As government's budget allocations are provided on a year-to-year

basis forward financial planning is almost impossible with any degree of certainty. For the financial year 2013 the MoE requested from the MoF US$ 15 billion, however only about half of this was approved and appropriated by the MoF.

There is a need for improvements in the self-financing capacity of the ESI and this is definitely necessary so as to establish a more reliable and predictable source of financing, and to allow for the development of the power sector towards more as a self-supporting utility. It is not realistic to increase tariffs while power service remains chronically unreliable. The mismatch between production cost and selling price therefore has to be addressed. So long as tariffs remain substantially below costs, it will be difficult for the government to encourage efficient consumption of power or to promote effective energy conservation.

International investors and especially international electricity financiers, will require independence of the tariff setting from the political directorate, as an incentive for large scale investment. Electricity investments are a substantial and long-run sunk cost, and investors and financiers fear that once their investments are made the political directorate will fail to honour their contractual commitment. International experience also shows that private investors and financiers will not be incentivised to make large investments in the electricity sector if they have to rely on the public purse to recover their investments.

The MoE has been attempting to change the tariff to enable a higher portion of cost recovery since 2010. According to calculations of a recent JICA funded study on the distribution sector in Iraq, electricity cost in 2011 averaged around in 8.1 US ¢ /kWh (95.3 ID/kWh); based on MoE data. This cost covers only operation and maintenance cost, such as fuel cost and wages, however depreciation of the investment and cost of capital are not included in the cost. When calculating the subsidy to the electricity tariff from the government, the subsidy accounted for over 80% in 2009, 72% in in 2010, and 60% in 2011. However, the method of providing the subsidy is not transparent and does not provide an incentive framework for effective financial management. Government should allow for the development of a cost relative tariff. Where government decides that the consumer end use tariff is less than the cost reflective tariff, there should be a statutory obligation on the MoE to meet the shortfall and pay the companies (such as in Oman).

A subsidy system for the poor is indeed another important public policy for most developing and emerging markets, however the subsidy mechanism can be better targeted to the poorer Iraq citizens.

The long term objective of a tariff is to provide sufficient income to maintain an electricity network to supply energy to its customers on a twenty-four hour a day regime, and provide an income for the operating utility. In the case of an Electricity Supply Industry situation, the tariff recovers the investment, operating costs and fuel supplies for the whole infrastructure including Generation, Transmission and Distribution business costs; as well as payment for regulation and administration of bulk trading.

The regulation of electricity distribution tariffs is well established throughout the world and invariably provides for cost reflective tariffs, either based on rate of return cost of service methodology or price cap involving; RPI – X plus Y, where ‘RPI’ is the rate of inflation, ‘X’ is a

technology factor and 'Y' the cost pass through factor based on a thorough review of the operating cost and capital cost requirements of the business, or a hybrid of the two methodologies.

Universal service obligation of ability to pay is also a consideration and the provision of a subsidised (or lifeline) tariff for poor income customers should also be a priority. Though, ability to pay does not seem to be a major issue for the main stream Iraqi's as most residential householder consumers are now paying over 8 US ¢ /kWh from the expensively produced private and community generators.

There is no reason why a cost reflective tariff cannot be establish by the Office of Electricity Regulation within the first few years to signal to government what the consumer should be required to pay for electricity. What they pay as end use tariff is a different matter. If the cost reflective tariff is 12 US ¢ /kWh and government decides the average consumer tariff to be 8 US ¢ /kWh, then government should carry the responsibly to make up the 4 US ¢ /kWh gap. This is not a step change, however it would establish transparency in the tariff process and the GoI would for the first time know what the actual amount of subsidy is. In some jurisdictions instead of the obligation to meet the subsidy cost being an executive decision, the obligation is entrenched in the Electricity Reform Act, thus making it a statuary obligation. Each year, the Regulator calculates the subsidy component based on the amount the government says consumers should pay and then the Ministry of Finance has the statutory obligation to fund this eventual deficit or subsidy amount. This arrangement could be established in Iraq within the pre-transition period.

In addition to the tariff subsidy there is often a fuel subsidy. Governments are also moving away from the fuel subsidy and making the fuel cost-reflective, like oil and natural gas. As the generation cost is a cost pass through item, cost removal of the fuel subsidy means the tariff subsidy component may increase if all this increase is passed through to the retail tariff.

Government can then decide the rate at which consumer tariffs should match the cost reflective tariff. For example, within the first five years government could decide that large industrial and commercial customers should pay the cost reflective tariff, with mostly the residential tariff carrying a subsidy.

In Iraq, a step change to a fully cost reflective tariff would be unacceptable in the short term, particularly in view of the current poor standard of supply. As the issue of supply is being addressed throughout this Reform Roadmap, we focus on the issue of eventual long-term financial sustainability of the ESI system through a tariff regime.

In order to achieve financial sustainability, tariffs should be set at a level sufficient to cover the long run marginal costs. The introduction of a cost reflective tariff is a feature of most regulated electricity sectors and is a reasonable target for Iraq in the long term. Under such a tariff regime, tariffs would be set at a level that would be sufficient to cover the efficient operating costs of the business, whilst also allowing the financing of capital expenditure and a return on investment if private financing is sought. This cost reflective tariff is likely to be significantly higher than

existing tariffs (perhaps more than 10 times current levels). This necessitates a glide path towards a fully cost reflective tariff which consumers will pay over a number of years as system issues such as availability of electricity of supply are addressed.

The Regulator will need to negotiate with the tariff developers to ensure that the tariff reflects the quality of service standards, as well as providing controls on the efficiency and profitability of the individual Distribution Businesses. Additional safeguards will need to be established to ensure that the poor and vulnerable customers are not over-burdened by increases in electricity tariffs, through introduction of a life line tariff set at possibly an electricity consumption of 150 kWh per month.

The strategy that will need to be developed must ensure buy-in from all participants. These include the Government, MoE, Ministry of Finance, and all Departments within the Ministry of Electricity, the new Regulator, existing local standby generators and the consumers.

Capacity Assessment and Development:

As discussed in the Regulatory Institutions reform (Section 4.2), tariff specialists will need to be identified and trained using international best practices, in order to work towards the eventual implementation of the new tariff framework – a multi-year tariff order (MYTO). These tariff specialists must be located within the regulatory institution, which we recommend to initially be the ring-fenced independent Office of Regulation.

As the reform process continues, the corporatized distribution companies which are recommended to be created will create a business plan, complete with a loss reduction program and required tariff structures to support commercial operations. These proposed tariff structures will need to be reviewed and fine-tuned compared with the MYTO created by the independent regulator.

With respect to the new cost reflective tariff development, CPCS recommends that the tariff consultant utilize a building block approach for use by both the regulator and utilities. In order to calculate a projected annual value for each of the building blocks an estimate is required for:

- The initial value of the sector's assets;
- The weighted average cost of capital to be achieved;
- The capital expenditure programme;
- An appropriate method of depreciation;
- An efficient level of operating expenditure and overheads; and
- A rate of improvement in Key Performance Indicators.

Multi-year forecasts will be required for each part of the electricity sector: generation, transmission and distribution. The building block approach provides an overall revenue

requirement for the sector which is then used to calculate the revenue to be collected per unit of sales.

Implementation Horizon:

CPCS views the development of a cost reflective tariff as an immediate goal to transparency, and economic efficiency to be a long-term goal for Iraq's ESI. The rate the consumers pay and the trajectory of the consumer tariff to match cost relativity is a decision of the government of Iraq. However, there are steps which can be taken to progress the sector toward this goal.

In the Pre-Transition phase, CPCS recommends the following activities:

- Identify and build capacity amongst key tariff specialists, who will be housed within the Office of Regulation;
- With the assistance of an external consult, develop the appropriate tariff methodology and, upon approval, calculate the first cost relative tariff;
- Calculate the subsidy impact on the MoF;
- Establish a trajectory to reduce the subsidy by requiring industrial users for example to pay cost reflective tariff within the first five years;
- Track progress of the asset database, which is recommended to be created under the related reform Asset Management System, Section 3.2. This information will form the understanding of the sector's asset values;
- Establish a transparent framework for how the existing electricity subsidy is calculated and disbursed;
- Collaborate with the MoE to conduct and carry out an updated cost of service operating cost study for Iraq's ESI;
- As electricity supply issues are gradually addressed throughout the initial Pre-Transition phase, continually seek to ensure that operating costs are covered through the subsidized tariff regime;
- Establish a lifeline tariff to protect vulnerable citizens and clearly establish rules for cross subsidies (i.e. whether subsidies come from electricity consumers or taxpayers); and
- Track key performance indicators over time and reassess initial assumptions made.

In the Transition phase of reform, additional measures can be addressed which progress the sector towards a sustainable tariff regime. Such activities include:

- Creation of business plans from newly corporatized distribution companies and the Transmission Company. These business plans will set out important tariff inputs such as loss reduction programs and capital investment requirements;

- As distribution companies are privatized, clarity of the sectors weighted average cost of capital will be achieved;
- Develop an asset depreciation framework for inclusion in the accounting component of MYTO development;
- Seek input from stakeholders such as consumers, distribution companies, transmission company, bulk trader, generators and IPPs in the development of the new tariff methodology on MYTO development;
- Create an MYTO for implementation in the latter stages of the Transition phase or into the Long-term phase of reform;
- Ensure tariffs proposed by distribution companies reflect improvements in the quality of service provided by the utility business along with controls on the efficiency and profitability of the individual Distribution Businesses; and
- Establish safeguards to ensure that the poor and vulnerable customers are not over-burdened by increases in electricity tariffs.

Investment Order of Magnitude:

- Studies, training and consultancy: USD 5.0 million
- Asset investment: none

To support the capacity building initiative within the Office of Regulation, CPCS recommends an external consultancy be procured providing for a resident tariff consultant which should include one of two resident tariff and regulatory specialist experts to support the tariff development activities outlined above and train key staff.

Related Reform Initiatives:

- Regulatory Institutions (Section 4.2), which recommends the eventual creation of the Iraq Electricity Regulatory Commission (IERC) and the Electricity Appeals Tribunal (EAT).
- Single Electricity Industry Reform legislation (Section 4.1), which sets out the basis for a robust ESI system and structural reform.
- Multiple Regional Distribution Companies (Section 4.4), which establishes numerous regional distribution companies under the IEPHC.

4.9 Electricity Industry Codes and Market Rules

Reform Phase: Pre-Transition (within the first 3/5 years), spanning into the Transition phase

Reform Description and Context for Reform:

The market structure proposed in this roadmap, with enabling market rules and codes, does not currently exist in Iraq. This reform addresses the specific industry codes and rules which need to be developed.

The two licenses required for the Transmission Company (system/market operator) have a direct impact on the interaction of the distribution companies and the transmission company. It will be important to "ring fence" the market and system operation functions within the transmission company. In terms of reporting relationships and access to information, the system and market operation functions must take place, and must be perceived as taking place, on a neutral and transparent basis not only as between different generators, but as between potential generation and transmission solutions as well (where the system is constrained). To promote confidence in the system and certainty for private generation investors, the system and market operations functions must not be seen to favour their related transmission assets.

In addition, dispatch instructions, new grid codes and distribution codes, metering codes, market rules for the initial single buyer market, settlement codes and performance standards codes, etc. will need to be developed. These market rules and codes will need to be approved by the Electricity Regulator. These measures would provide recognisable standards for improvement as well as providing to the private sector a familiar environment in which to enter the market later and invest.

The Market Rules and Codes will also govern the technical and commercial interfaces between all the discrete entities in the electricity industry and replace the internal command and control system generic to a vertically integrated monopoly structure utility.

These entities are:

- Transmission Company of Iraq consisting of the System/Market Operator and the TSP
- Generators
- Eligible Demand Consumers
- Distribution Companies consisting of a) electricity supply and b) distribution

The following codes are proposed:

<u>Performance Standards Codes</u>

Performance Standards codes will be regulatory codes introduced and used by the regulator to regulate the monopoly licensees, laying down clearly defined standards of performance in areas such as reliability and availability of supply and time to establish a new connection. This will enable the regulator to define what is required of the monopoly licensees in a clear and transparent manner.

Market Rules and Settlement and Payment Rules

These cover the commercial operation of the single buyer market and will develop as the market matures

Grid Code

The Grid Code is already in existence covering the technical issues associated with the interface between the transmission system and all those entities connected to the transmission system (i.e. generators and major consumers), and distribution companies.

The grid code will need to be revised and updated to accommodate the single buyer market structure. The Grid Code should cover the technical issues associated with the interface between the transmission system and all those entities connected to the transmission system (i.e. major generators and consumers), and distribution companies. Further updates will be required to accommodate distributed generation and renewable generation such as wind and solar technologies.

Distribution Code

Drafting of a Distribution Code is required for the complete operation of a Distribution System which can be translated from the current Nationalised Operators to privately owned operators. The Distribution Code is a high level document that will give parameters to be included or met by a series of subordinate documents usually tailored to the individual power company. Further updates will be required to accommodate distributed generation and renewable generation such as wind and solar technologies (co-ordinated with Grid Code updates).

Metering Code

This will cover metering specifications, installation and operating procedures. This code is a vital pre-cursor to the bulk installation of meters, particularly smart meters.

Transmission and distribution Agreements

There will be the need for Generation and Distribution Grid Connection Agreements for the unbundled incorporated entities and the new IPPs, Ancillary Services Agreements to provide for the SO to purchase ancillary services such as black start, spinning reserves and voltage control to keep the system secure and in balance.

The Transmission and Distribution agreements cover all commercial issues associated with connection to and use of the transmission grid system and distribution network. Major contents will include Transmission Use of System (TUoS) and Distribution Use of System (DUoS) charging methodologies and actual charges. Service levels will also be included.

These measures will provide recognisable standards for improvement as well as providing the framework for an unbundled ESI moving away from an integrated monopoly market operation and provide private sector with a familiar environment in which to enter the market and invest.

Capacity Assessment and Development:

The expertise required to develop these market rules and codes do not currently exist given the ESI currently operates as a monopoly/vertically integrated system. In the related recommendation, Regulatory Institutions (Section 4.2) CPCS recommends an external Legal/Regulatory Specialist be initially housed in the regulatory body to assist with internal capacity building of the regulator. CPCS envisions this external specialist will function as a trainer and capacity builder, while assisting the regulator to procure the expertise required to draft the various market rules and codes.

CPCS recommends a minimum of 2-3 transmission technical and legal/regulatory specialists be staffed within the regulator to oversee this important system function.

Implementation Horizon:

This recommendation is best suited to be implemented following the establishment of the following related reforms:

- Transmission Company of Iraq (Section 4.5)
- Independent Office of Regulation (Section 4.2)

Therefore, CPCS recommends mobilizing this reform in the latter stage of the Pre-Transition phase of reform, spanning into the Transition phase of reform, to coincide with related reforms.

However, depending on timeframes of the related reforms, initial work on these codes and market rules can commence earlier.

Investment Order of Magnitude:

- Studies, training and consultancy: USD 10.0 million
- Asset investment: none

It is expected that this initiative would proceed throughout pre-transition and complete in the transition phase.

Related Reform Initiatives:

- Regulatory Institutions (Section 4.2), which recommends the eventual creation of the Iraq Electricity Regulatory Commission (IERC) and the Electricity Appeals Tribunal (EAT).
- Single Electricity Industry Reform legislation (Section 4.1), which sets out the basis for a robust ESI system and structural reform.
- Multiple Regional Distribution Companies (Section 4.4), which establishes numerous regional distribution companies under the IEPHC.

- Transmission Company of Iraq (Section 4.5) which establishes an independent transmission company to cover the responsibilities of systems and market operation.

4.10 Concession Successor Distribution Companies

Reform Phase: Transition phase, spanning into Long-Term phase

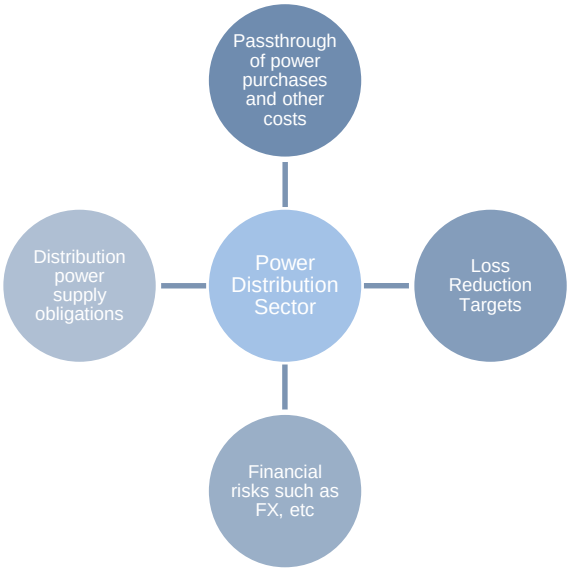
Reform Description and Context for Reform:

The real issue in Iraq is not public versus private investment in electricity utility, but complementing public resources with private resources over the near term and beyond.

CPCS recommends the successor distribution companies be readied for privatisation by the end of the Pre-Transition phase or early stages of the Transition phase of reform. There is no doubt that the distribution sector in Iraq faces, and will continue to face, a resource mobilisation problem and public investment will be needed over the Pre-Transition phase of reform to bring the system to saleable condition. A strong cash flow will be needed to attract private-sector participation in concessioning privatisation models.

The introduction of the private sector into the distribution business, in the form of concession or privatisation, revolves around the allocation of risks in commercially enforceable contracts. The best principle of risk allocation is that a particular risk should be borne by the party that can mitigate the risk at the lower cost. For the distribution sector, the four broad risk categories are:

Figure 4-9: Power Distribution Sector Risk Categories



Source: CPCS

Below we provide a more detailed description of these risks that private investors would face in investing in and owning distribution business in Iraq:

Figure 4-10: Major Risks for Privately Run Distribution Compannies

Risks	Explanations
Collection Risk	Risk that the company will be unable to collect its allowed revenues. This might occur for one or more of the following reasons: customers refuse to pay their bills, customers tamper or disconnect meters, company employees receive bribes to make illegal connections or under collect metered or billed amounts, and government officials or courts are unable or unwilling to support disconnections or other actions against non-paying customers.
Power Purchase Risk	Risk that the company will not be allowed to charge tariffs that recover the cost of its power purchases. This could occur if the regulator disallows the prices paid or the quantities purchased.
Demand Risk or Volumetric	Risk that the quantity of electricity received and sold is less than the amount projected by the company or the regulator in setting tariffs.
Obligation-to-Supply	Risk that the company will collect lower revenues and/or pay penalties because it is unable to meet supply obligations specified in its license or concession. The company's failure to supply may be caused by its own actions (e.g., poor transformer maintenance), actions of others (e.g., inadequate generation or transmission capacity) or acts of God (e.g., a major drought).
Operating Cost Risk	Risk that the company will not be able to recover the costs of operating its distribution system (i.e., the "wires or lines" function) or the costs of retailing electricity (i.e., the retail supply function) either because the regulator disallows certain operating costs or sets unrealistic performance targets. The allowance for some technical and non- technical losses is sometimes included as operating costs.
Capital Cost Risk	Risk that the company will not be able to recover its capital costs because the regulator sets a low allowed capital base, disallows costs of certain capital expenditures, or sets low rates of return.
Inflation Risk	Risk that company's tariff will not be adjusted for general inflation.
Exchange Rate Risk	Risk that the company will not receive sufficient revenues from its customers to pay for costs incurred in "hard" currencies. Foreign Exchange risk that the government will not give the company access to sufficient foreign exchange
Convertibility Risk	Foreign exchange to repatriate earnings and to pay for costs incurred in other currencies.
Financing Risk	Risks related to the financial risks borne by entities that have lent money to the company

Risks	Explanations
Regulatory Risk	Risk that the regulator will reinterpret existing regulations or create new ones that will increase costs or reduce revenues.
Political Risk	Risks of expropriation, nationalization, war, civil disturbances and breach of contracts
Subsidy Risk	Risk that the government does not pay promised subsidies or pays with considerable delay.

Source: Bakovic, Tonci, Bernard Tennenbaum and Fiona Woolf. 2003, 'Regulation by Contract: A New Way to Privatise Electricity distribution?' Working Paper No. 14, World Bank, Washington, D.C

Further, a private sector participation program in the Iraq ESI does not exist. A program such as this is required to encourage the private sector to begin to have faith in Iraq's ability to support sector reform of the ESI. In order to establish a credible program for private sector participation, Iraq will need to introduce a credible and legally backed contract process which includes the following elements:

- Amending the existing laws to ensure that war, terrorism and other political risks are assumed by the GoI in full;
- Reformulating the compensation on termination payments to be acceptable to lenders, by requiring the GoI to buy out the lenders in cases of termination;
- Removing the requirement on bidders to use turbines supplied by the GoI;
- Making fuel supply in the case of gas to energy generation (quality and quantity) risk a responsibility of the GoI under a tolling energy conversion structure and ensuring there is fuel supply agreements;
- Providing for inflation indexation payments;
- Ensuring that the generation project companies start to get paid the capacity payments where it is unable to commission the plant due to fuel shortages and where any permits it has properly applied for do not get issued on time;
- Removing the requirement to obtain judgment from an Iraqi court prior to enforcement of any arbitral action;
- Establishing an Internal Management Contracting function, accompanied by outsourcing of the Revenue Cycle Management function, as recommended in Section 2.7. This will lay the groundwork for the introduction of a full contract market framework. All parties in the market would be operating under commercial contract terms within a single/principal buyer market, plus licences from the regulator; and
- Establishing IEPHC to drive the privatisation program.

Capacity Assessment and Development:

The introduction of private investment and partnership in Iraq's ESI is multifaceted and nuanced with a number of issues which Iraq has little experience in implementing. CPCS recommends an experienced transaction advisor be procured to assist the GoI/MoE with this process. The consultant should be tasked with developing the strategy which should be adopted for the private sector participation in the distribution/retail supply subsector.

This process will require a structured procurement and implementation process which would be developed in advance, in collaboration with the GoI, MoE, and other government ministries.

Implementation Horizon:

Over the medium to long term, CPCS expects the Iraq distribution companies to transition to private sector ownership and operation. This is a pivotal step in Iraq's distribution sector reform process and brings the sector towards the ultimate goal of an efficient system and wholesale market operation.

However, substantial improvement would be needed to the ESI, such as cost reflective tariff, establishment and functioning of an Independent Regulatory framework, introduction of credible legislative framework, supportive of private sector participation, extensive metering of retail consumers and, establishment of the Electricity Appeals Tribunal. Each of these aspects are addressed in this Roadmap and form conditions precedent for private sector participation in the distribution business.

It is important to emphasize that we have outlined this reform initiative to commence in the latter stage of the Pre-Transition phase of reform. However, many of the above related initiatives must be in progress or completed in order to ensure the private sector participation in the distribution companies has the best possible chance of success. It is likely the involvement of the private sector may require a few phases depending on investor and international lending appetites. CPCS has reflected the duration of this reform initiative into the Long-Term phase of reform to accommodate this expected timeframe.

Investment Order of Magnitude:

- Studies, training and consultancy: USD 20.0 million
- Asset investment: none

Technical assistance will be required to assist the GoI/MoE through this transaction process. CPCS estimates total external consultancy to be approximately USD 19.6 million.

It is expected that this initiative would commence in the early part of pre-transition with the bulk of the effort being carried out in the latter half of pre the transition phase.

A consultant transaction advisor is recommended to carry out the privatisation options analysis, a gap analysis and a privatisation strategy to support the GoI/MoE in this process. A few important phases that the consultant advisor would assist with during the process will include:

- Due diligence (Financial, Legal/Regulatory, Technical, Environmental, HR)
- Privatisation options analysis;
- Gap analysis;
- Financial analysis and modelling;
- Private sector engagement (market sounding, Information Memorandum, investment road shows, PPP/Transaction agreements, etc.) and
- Procurement process (EOI, RFP, evaluations, negotiations, transaction closure, etc.)

The Consultant Transaction adviser to prepare the privatisation strategy should be appointed on the basis of a fixed fee and successes components. An indicative budget for this transaction advisory is estimated to be at least a fixed fee USD 10.0 million, exclusive of the success fee which could be about 1% of the privatisation proceeds. The fee is typically paid by the winning bidders, not the government.

Related Reform Initiatives:

This reform is dependent on the successful implementation or commencement of a number of related reform initiatives. Key related reforms are:

- Metering, End-User (Section 2.1), which includes an end-user meter installation program for 2 million customers.
- Regulatory Institutions (Section 4.2), which recommends the eventual creation of the Iraq Electricity Regulatory Commission (IERC) and the Electricity Appeals Tribunal (EAT).
- Single Electricity Industry Reform legislation (Section 4.1), which sets out the basis for a robust ESI system and structural reform.
- Multiple Regional Distribution Companies (Section 4.4), which establishes numerous regional distribution companies under the IEPHC.
- Iraq Electricity Power Holding Company (Section 4.3), which establishes the initial holding company structure which will enable further structural reforms within the sector.
- Cost Reflective Tariff (Section 4.8), which will establish a MYTO over the long-term to ensure a sustainable ESI.

Appendix A: Reform Roadmap Gantt Chart

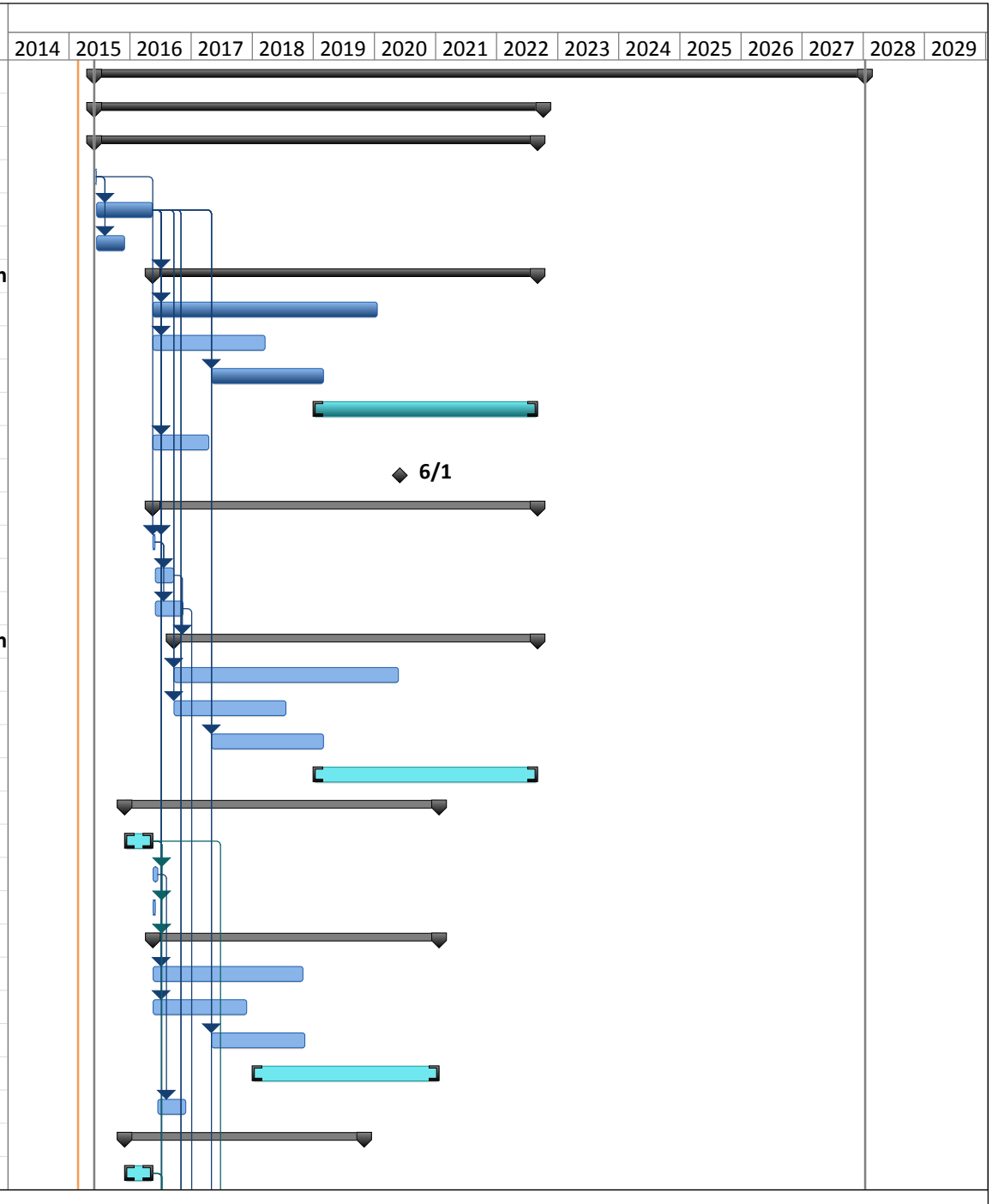
Appendix A provides linkages for all Reform Roadmap recommendations, along with key expected cross dependancies which exist between measures and sub tasks of each iniative. The cross dependancies reflected are not exhaustive, rather illustrate the primary relationships between reform recommendations. Further cross-dependancies and related reform measures are discussed under each reform recommendation under “Related Reform Initiatives”.

Note, this roadmap is not timebound but relies on conditions precedent to move between phases of reform. Therefore, for simplicity, this Gantt chart has used the below phase duration estimations to provide a visual assessment of Iraq’s reform of the Distribution Sector:

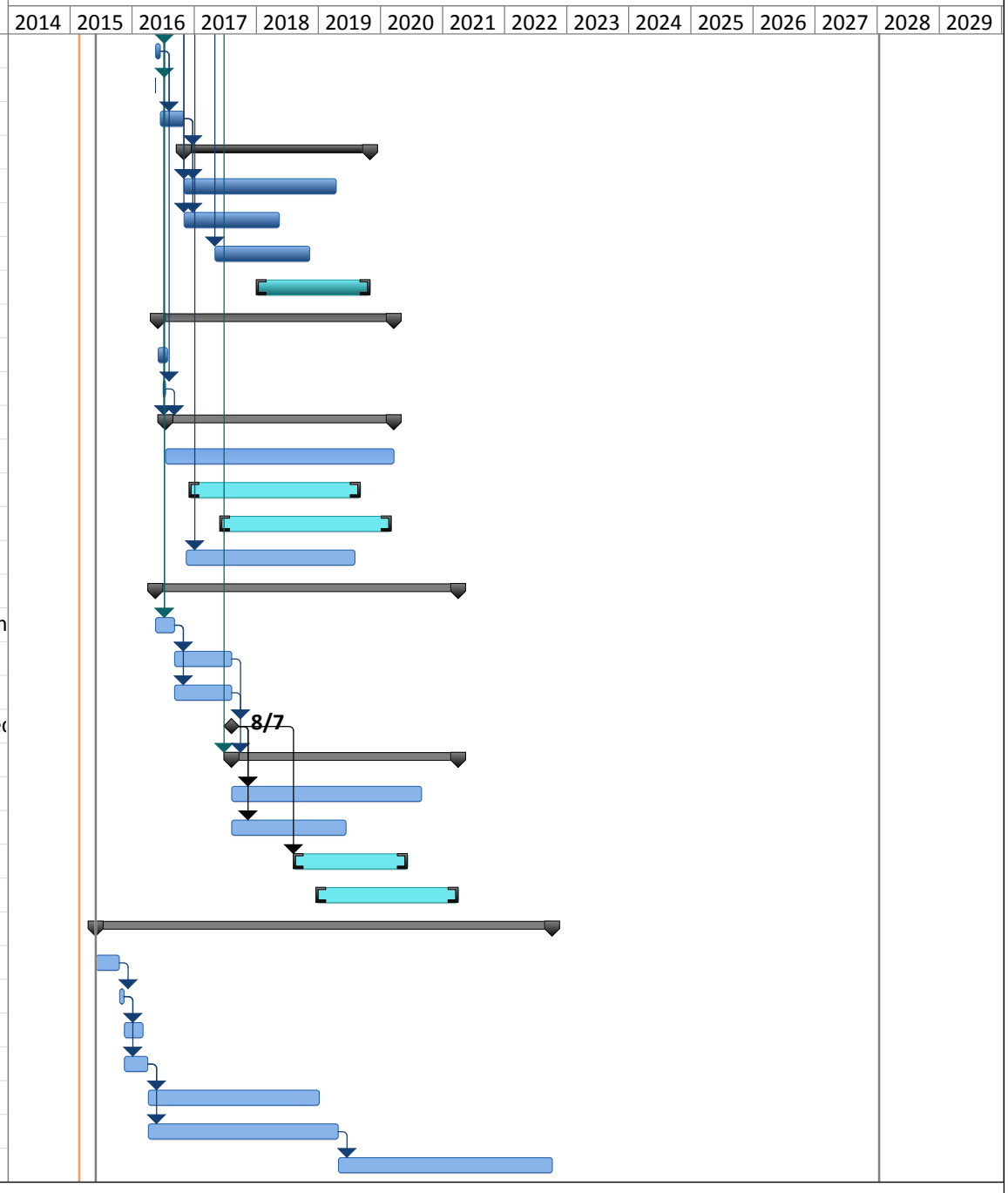
- Pre-Transition Phase: 5 years notionally allocated, for the year 2015 through to 2020.
- Transition Phase: 5 years notionally allocated, for the year 2020 through to 2025.
- Long-Term Phase: The year 2025 and beyond.

It is clear that for the Reform Roadmap to be successful, a significant level of integration, coordination and cooperation are required.

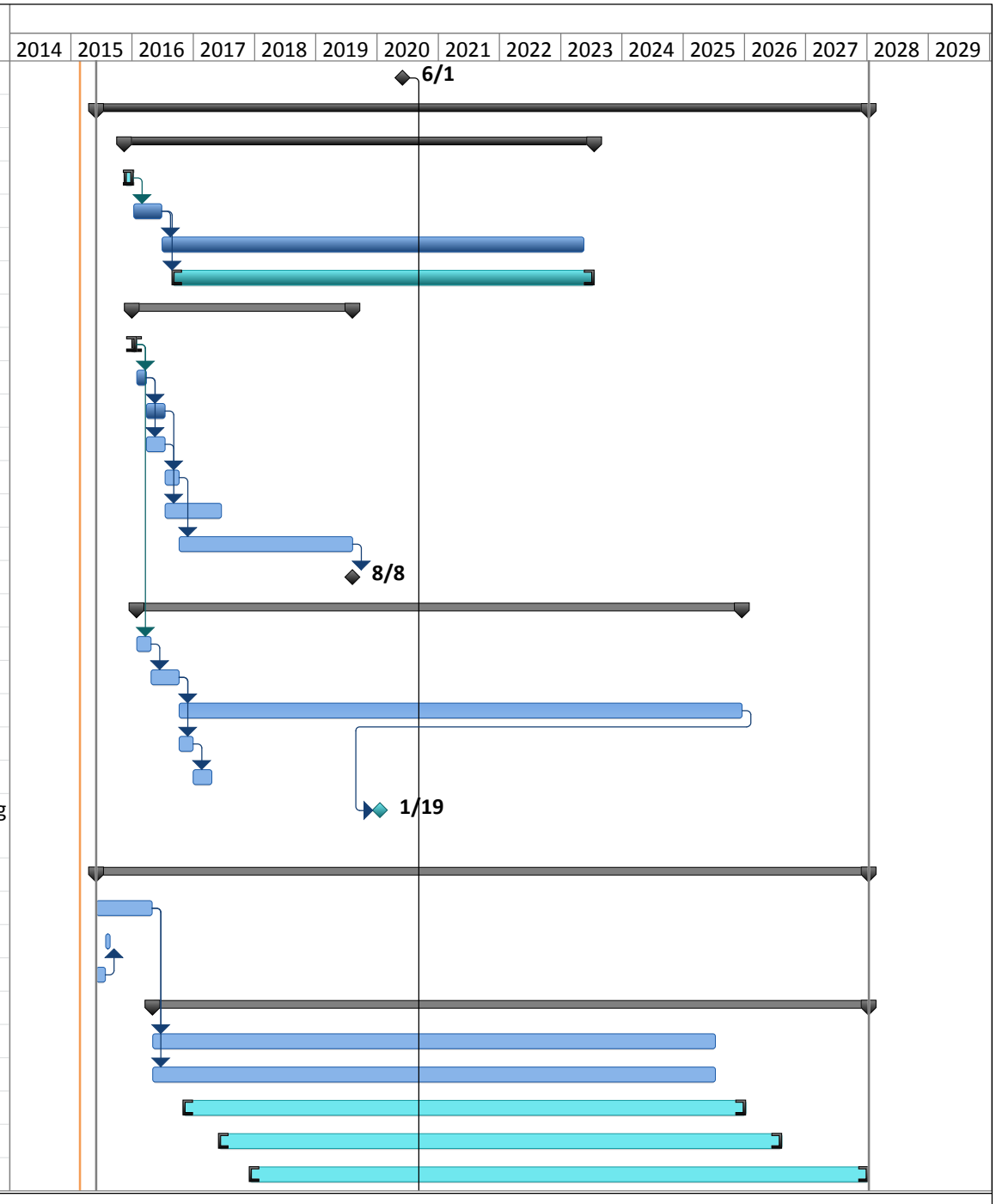
ID	Note	Task Name
1		**Iraq Power Distribution Roadmap**
2		**Loss Reduction Program**
3	**2.1**	**Metering, End User**
4		Initial Training (Consultancy)
5		Specification and Procurement Trials
6		Internal Training (HQ & Directorates)
7		**Manufacture, Deliver, Installation, Commissionin**
8		3 Baghdad DGD's
9		Middle Euphrates DGD
10		Southern DGD
11		All other DGD's
12		Creation of "Metering Enhancement Groups"
13		50% of End Users metered
14	**2.2**	**Meter Reading, End User**
15		Initial Training (Consultancy)
16		Specification and Procurement Trials
17		Internal Reader Training (HQ & Directorates)
18		**Manufacture, Deliver, Installation, Commissionin**
19		3 Baghdad DGD's
20		Middle Euphrates DGD
21		Southern DGD
22		All other DGD's
23	**2.3**	**Customer Billing Procedures**
24		Billing Procedures (Consultancy)
25		Initial Training (Consultancy)
26		KPI Development
27		**Data Cleansing**
28		3 Baghdad DGD's
29		Middle Euphrates DGD
30		Southern DGD
31		All other DGD's
32		Internal Training (HQ & Directorates)
33	**2.4**	**Account Collection Procedures**
34		Process and Procedures (Consultancy)



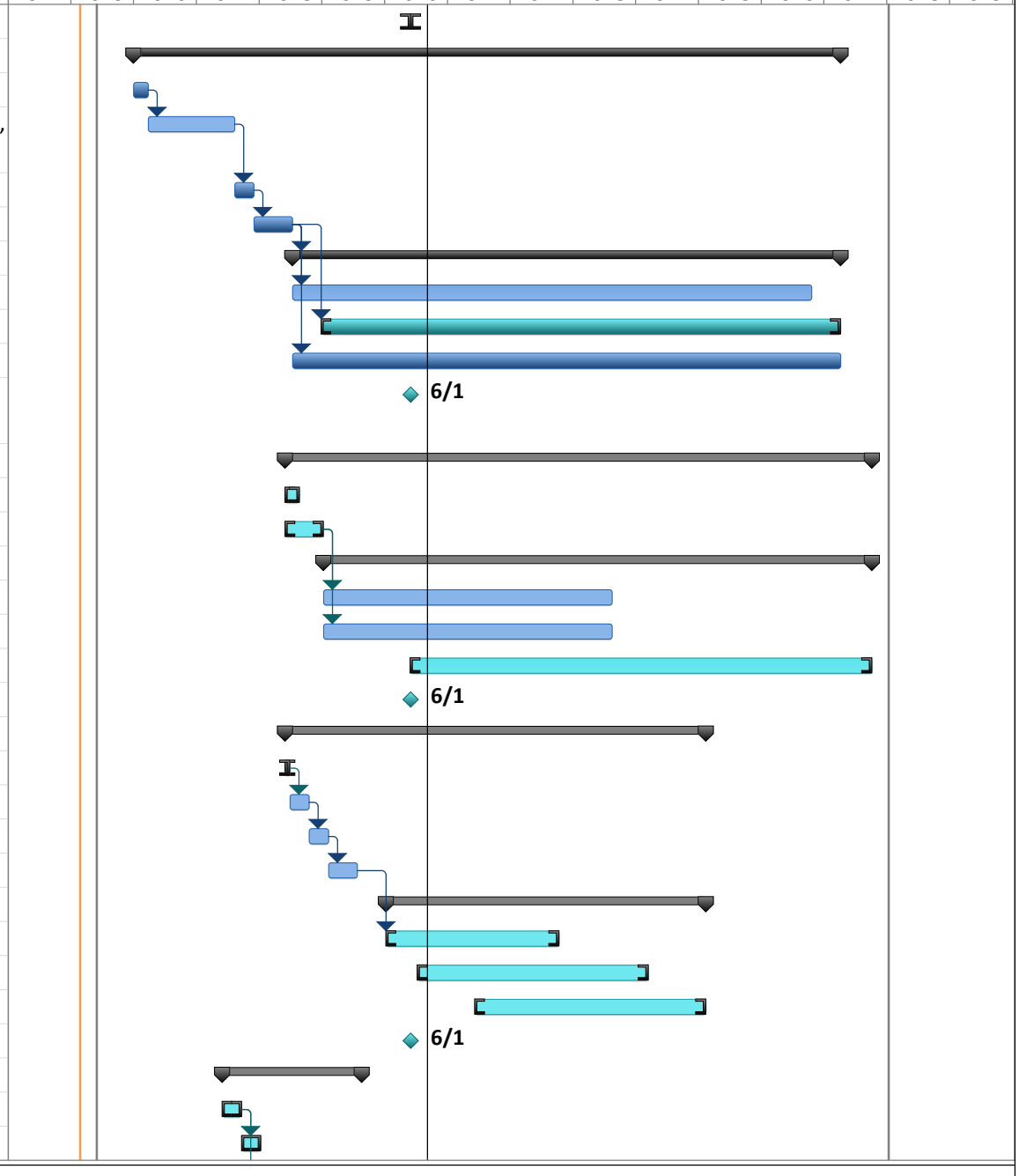
ID	Note	Task Name
35		Initial Training (Consultancy)
36		KPI Development
37		Internal Training (HQ & Directorates)
38		**Rollout of Processes and Procedures**
39		3 Baghdad DGD's
40		Middle Euphrates DGD
41		Southern DGD
42		All other DGD's
43	**2.5**	**Revenue Protection**
44		Mandate, Procedures, Scope (Consultancy)
45		Environment Training (Consultancy)
46		**Internal RPT Training Rollout**
47		3 Baghdad DGD's, in particular Al Karkh
48		North DGD, in particular Nienwa
49		All other DGD's
50		RPT Support to Meter Reading Program
51	**2.6**	**Billing, Account Collection and CIS**
52		System Needs Definition, Procurement (Consultan
53		System Installation/Implementation
54		Internal Specialist Training (HQ and Directorates)
55		Billing, Account Collection and CIS System Installe
56		**Data Entry and Cleansing**
57		3 Baghdad DGD's
58		Middle Euphrates DGD
59		Southern DGD
60		All other DGD's
61	**2.7**	**Pilot: Outsource Revenue Cycle Management**
62		Procure Transaction Advisor
63		Develop framework for engagement of Pilot
64		Internal Training (HQ & Directorates)
65		Tender and Award Revenue Cycle Contract
66		Revenue Cycle Contract Term
67		Monitor and Evaluate Performance
68		Expand Program if deemed successful



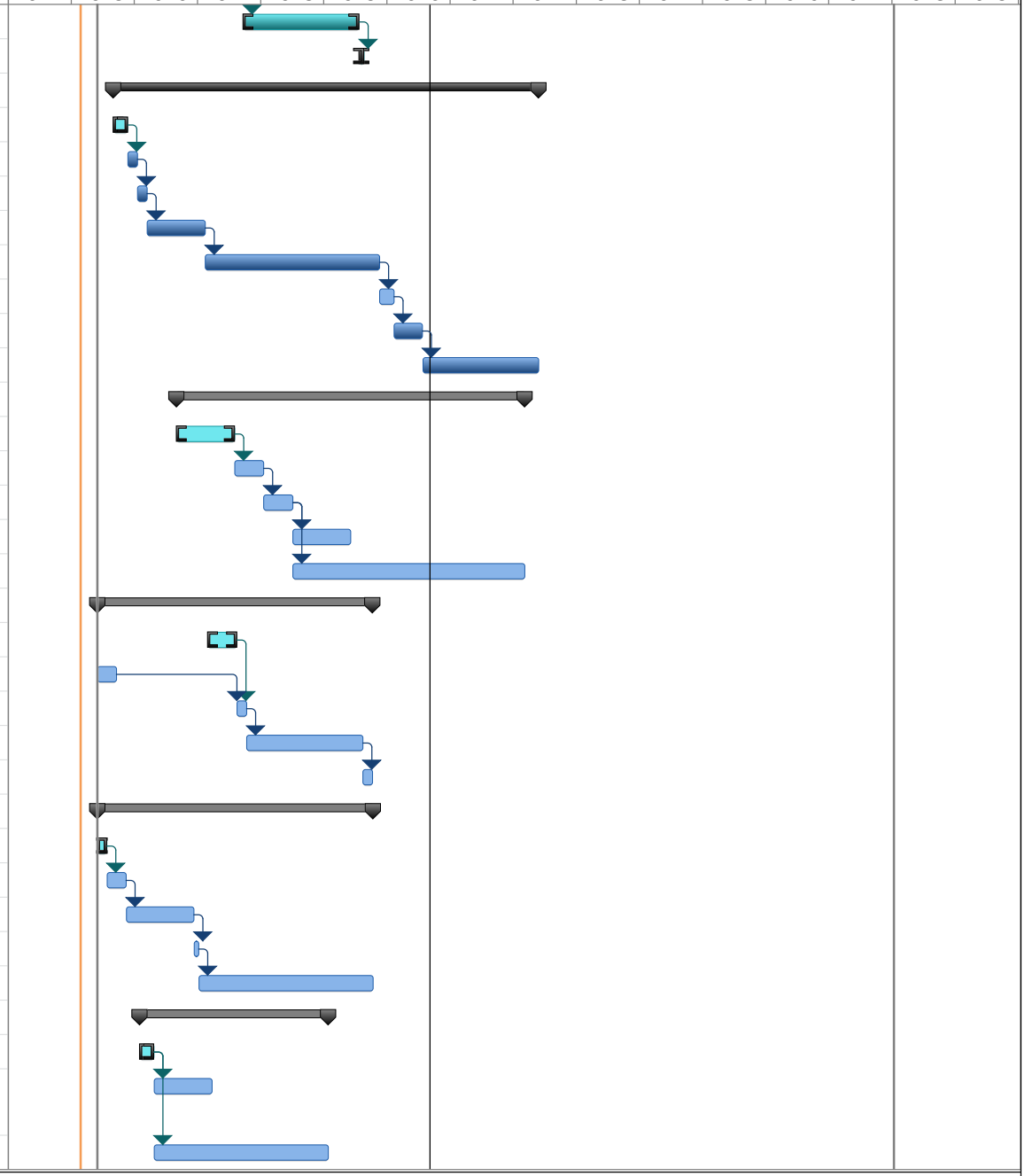
ID	Note	Task Name
69		Loss Reduction Program Completion
70		**Operational Efficiency Program**
71	**3.1**	**IT & Comm. Systems Uprade/Installation**
72		Scoping (Current State/Needs Analysis)
73		It & Comm. Systems Design and Procurement
74		IT and Comm. System Build/Installation
75		Commissioning and "Snagging"
76	**3.2**	**Asset Management System**
77		Initial Training (Consultancy)
78		System Specification
79		System Procurement
80		Guidelines and Procedures developed
81		Database Training (HQ and Directorates)
82		System Installation/Implementation
83		Initial Asset Survey in Database Input
84		Database Installed & Maintained
85	**3.3**	**Substation Rehabilitation and Reinforcement**
86		Initial Training (Consultancy)
87		Substation Investment Program
88		Targetted Investment Implementation Program
89		Rehab/Reinforcement Procedures
90		Rehab/Reinforcement Training (HQ & DQ's)
91		New build/Rehabilitation covering 50% of existing Customers
92	**3.4**	**Low Voltage System Improvements**
93		Network Study
94		Initial Training (Consultancy)
95		Network protocols/procedures
96		**LV Repairs/Upgrades**
97		North DGD
98		Central DGD
99		Middle Euphrates DGD
100		South DGD
101		All other Directorates



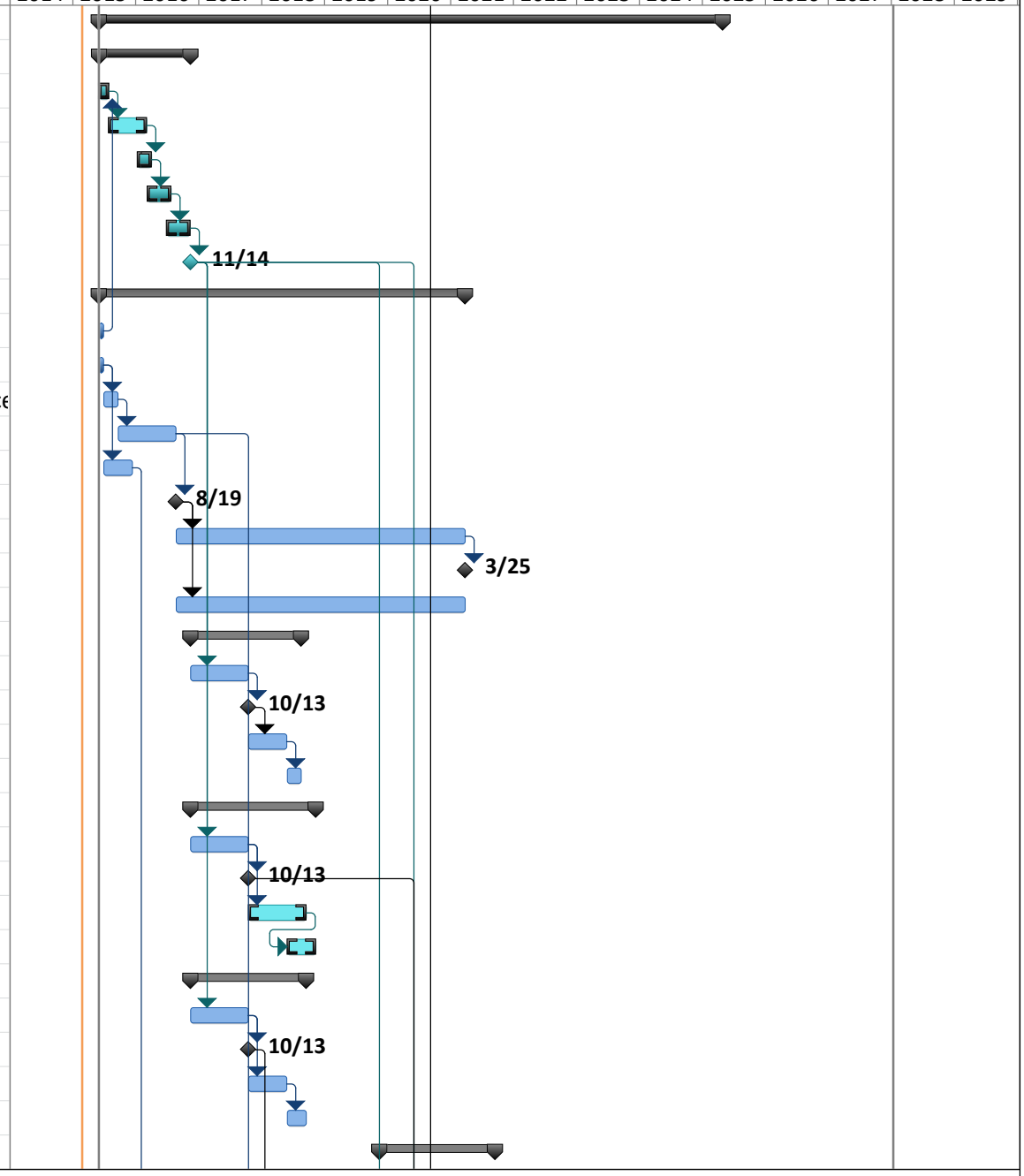
ID	Note	Task Name
102		50% of LV lines repaired
103	**3.5**	**Long 11kV Feeders**
104		Initial Training (Consultancy)
105		Network Design Studies: Load Flow, Voltage drop, etc
106		Targetted Investment Program
107		Specification and Procurement
108		**Turnkey Contract installations**
109		Central and North DGD
110		All other Directorates
111		Ongoing Maintenance Procedures development
112		Minimum: Network Study and other Studies complete
113	**3.6**	**Network Reinforcement and Renewal**
114		Linesman and Installer Training (Consultancy)
115		Engineering support (System Design)
116		**Reinforcement and Renewal**
117		Three Baghdad DGD's
118		Middle Euphrates and DGD South
119		All other Directorates
120		50% installation/renewal
121	**3.7**	**Network Metering and Monitoring**
122		Initial training (Consultancy)
123		Network/BSP Mapping, etc
124		Targetted Investment Program
125		Specification and Procurement
126		**BSP Metering, VT, CT Installations**
127		Three Baghdad DGD's
128		Middle Euphrates and DGD South
129		All other Directorates
130		BSP Meters installed
131	**3.8**	**Accounting/MIS**
132		System Needs Assessment (Consultancy)
133		Outline simple (Stop-gap) system in interim



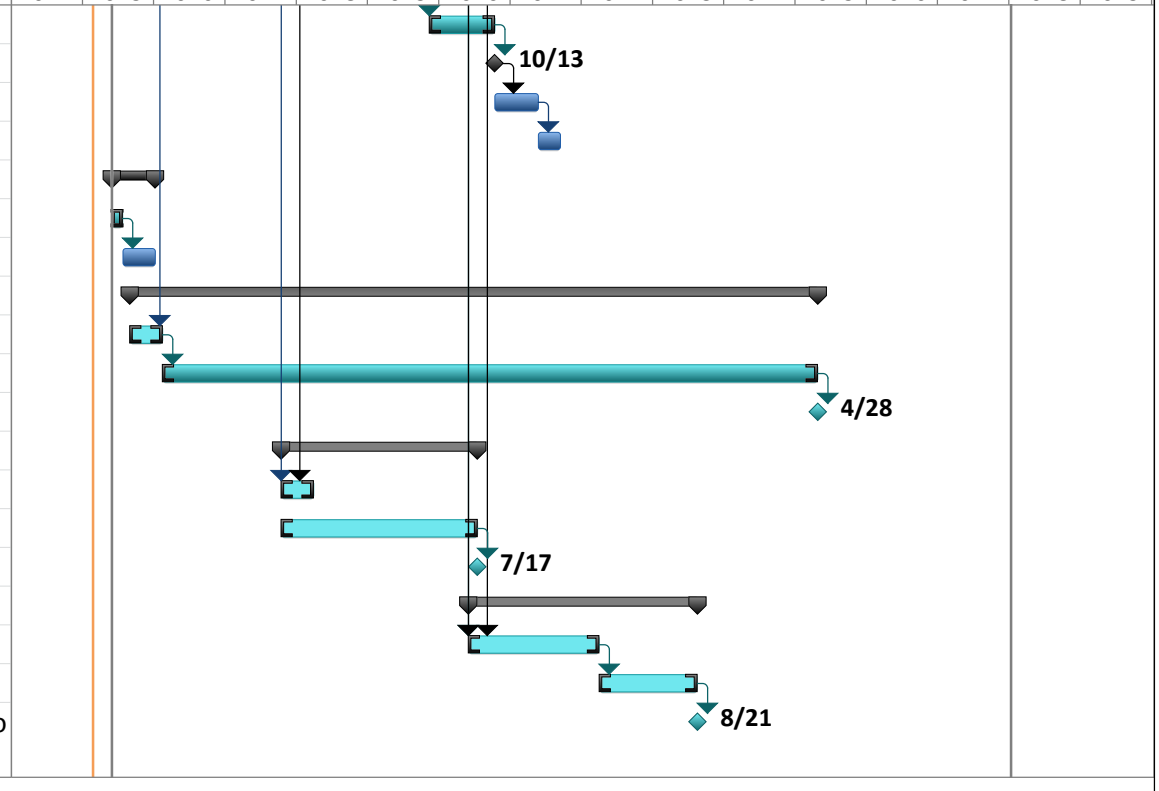
ID	Note	Task Name
134		System Procurement and Installation
135		System training (HQ and DGD)
136	**3.9**	**Key Performance Indicator Program**
137		Consultancy: Part 1 KPI Suite
138		KPI standards and Procedures
139		HQ and DGD Training
140		Part 1 KPI Implementation
141		Monitoring and Evaluation
142		Consultancy: Part 2 KPI Suite
143		HQ and DGD Training
144		Part 2 KPI Implementation
145	**3.10**	**Rightsizing Program**
146		Biometric Study
147		Training Needs Assessment
148		HR Needs Assessment/Pension Review
149		HR System Implementation
150		Rightsizing Action Plan/Implementation
151	**3.11**	**Project Management System**
152		Business Process Re-engineering Study
153		Policies and Procedures (Consultancy)
154		Internal training (HQ & Directorates)
155		System Procurement and Installation
156		System training (HQ and DGD)
157	**3.12**	**Alliances with Small/Private Community Generators**
158		Community Consultation (Consultancy)
159		Options Study (Consultancy)
160		Pilot collaboration Project rollout
161		Pilot evalutation
162		Potential Rollout to greater regions/areas
163	**3.13**	**Planning System**
164		Initial Training (Consultancy)
165		Online Policy Software System Procurement/Installation
166		Tools Training (MV/LV Load analysis, etc)



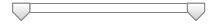
ID	Note	Task Name
167		**Legislative, Institutional, Regulatory Program**
168	**4.1**	**Single Electricity Legislation**
169		Establish a clear policy
170		Government approval for policy framework
171		Drafting Instructions
172		Drafting of the Bill
173		Parliamentary approval
174		Single Electricity Legislation
175	**4.2**	**Regulatory Institutions**
176		Regulatory provisions in legislation
177		Identify key internal Staff/Recruit others
178		Consultancy to assist with independent Office
179		Independant Regulatory Office
180		Capacity Building/Training
181		Independent Regulatory Office Established
182		Progression toward IERC & EAT
183		IERC & EAT Established
184		Consultancy for IERC & EAT
185	**4.3**	**Iraq Electricity Power Holding Company**
186		Consultancy to support IEPHC creation
187		IEPHC Established
188		Key Resource Identification
189		Training Program
190	**4.4**	**Multiple Regional Distribution Companies**
191		Consultancy to support Disco framework
192		Disco's Established
193		Key Resource Identification
194		Training Program
195	**4.5**	**Transmission Company of Iraq**
196		Consultancy to support Transco framework
197		Transco Established
198		Key Resource Identification
199		Training Program
200	**4.6**	**Iraq Bulk Electricity Trading Company**



ID	Note	Task Name
201		Consultancy to support IBET framework
202		IBET Established
203		Key Resource Identification
204		Training Program
205	**4.7**	**MoE & MoO Internal Agreements**
206		Capacity Building/Training Consultancy
207		Agreements drafted and executed
208	**4.8**	**Cost Reflectice Tariff**
209		Consultancy - tariff mechanics
210		Glide path to cost reflective tariff
211		MYTO Implementation
212	**4.9**	**Electricity Codes and Market Rules**
213		External Consultancy to develop codes/rules
214		Capacity development of regulator
215		Industry Codes/Rules implemented
216	**4.10**	**Private Sector introduction to Disco's**
217		Overarching Transaction advisory
218		Private Sector Procurement
219		Successful introduction of Private Sector into Distribution Businesses of Iraq's ESI.



Project: Iraq Roadmap - Distributi
Submitted: February 2015

Task		External Milestone		Manual Summary Rollup	
Split		Inactive Task		Manual Summary	
Milestone		Inactive Milestone		Start-only	
Summary		Inactive Summary		Finish-only	
Project Summary		Manual Task		Deadline	
External Tasks		Duration-only		Progress