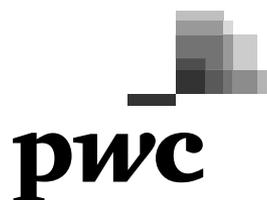


*Task C: GECOL Institutional dev.
and perform. improvement*

&

Deliverable 5: Final report



Disclaimer and copyright note

This document has been prepared only for the International Bank of Reconstruction and Development ("IBRD") and solely for the purpose and on the terms agreed with the IBRD in our agreement dated 21 March 2017 relating to Task C.

The scope of our work was limited to a review of documentary evidence made available to us. We have not independently verified any information given to us relating to the services.

We accept no liability (including for negligence) to anyone else in connection with this document. We have agreed with you that the report will be provided by you to GECOL for their consideration. We would ask that it not be provided to anyone else unless otherwise agreed in writing by us.

This is a draft prepared for discussion purposes only and should not be relied upon; the contents may still be subject to amendment or withdrawal and our final conclusions and findings will be set out in our final deliverable planned for December 2017

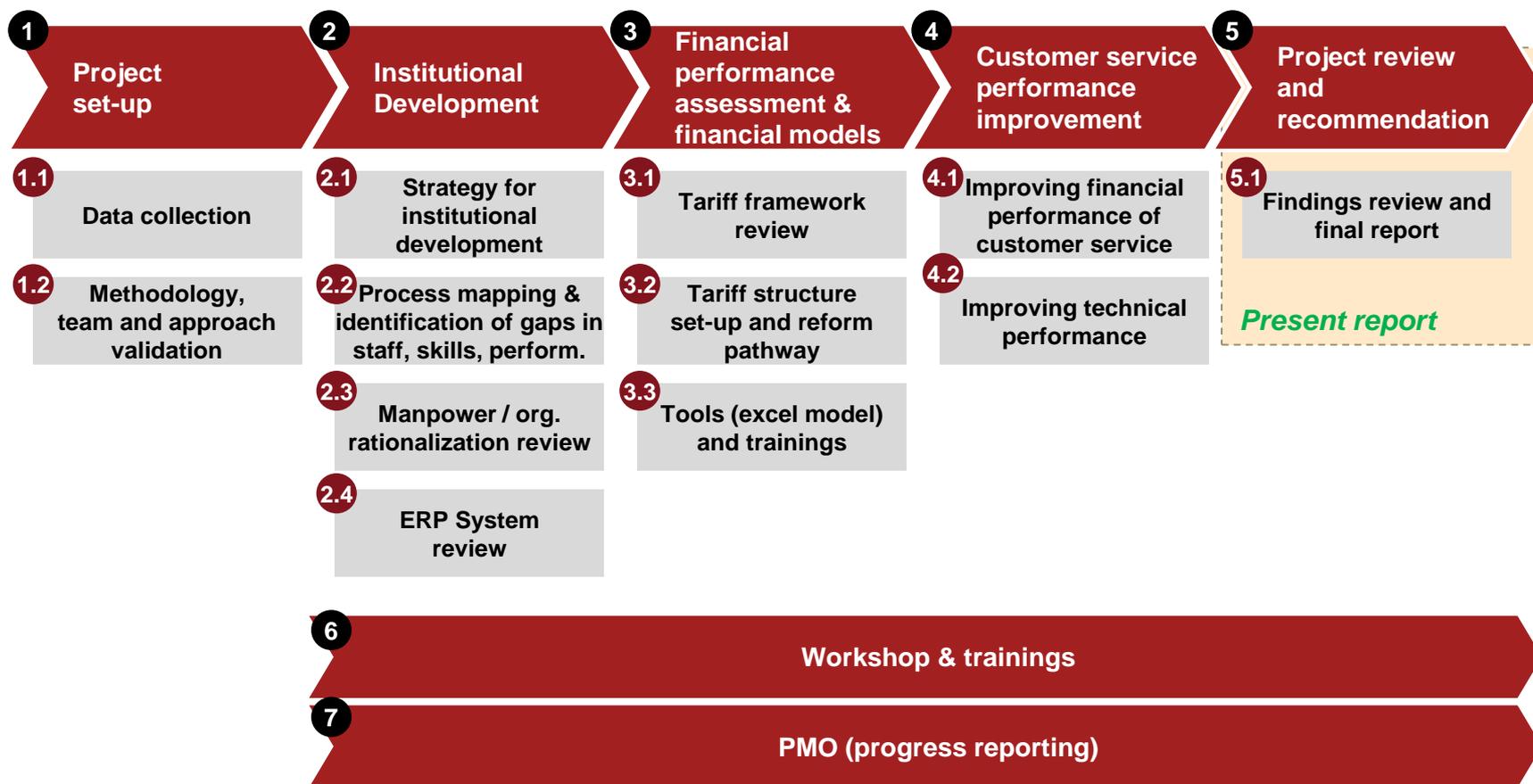
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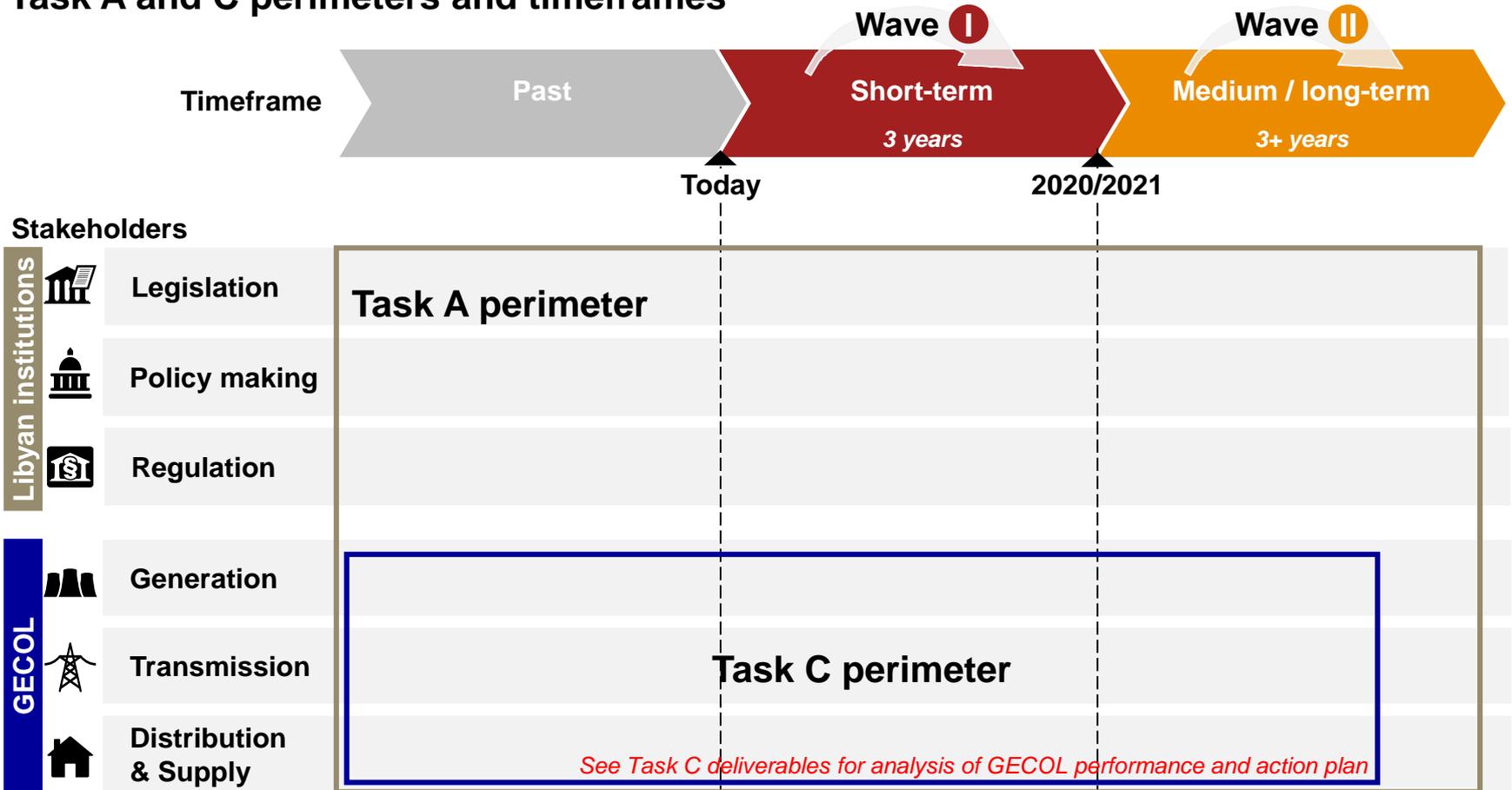
The present document is the final deliverable of the Task C

Task C project approach and current report focus



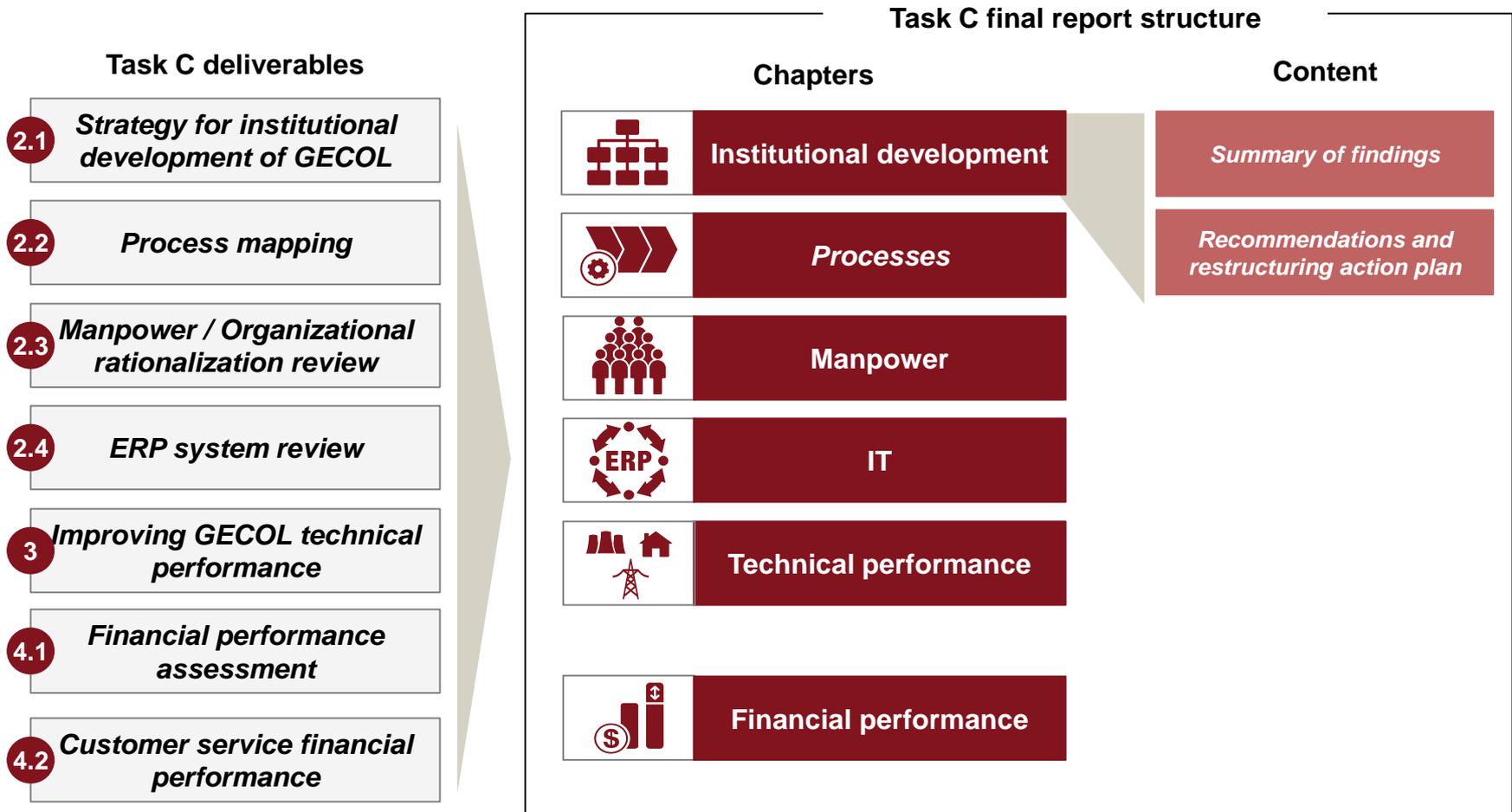
Task C focuses on GECOL (differently than Task A which addresses the Libyan institutions)

Task A and C perimeters and timeframes



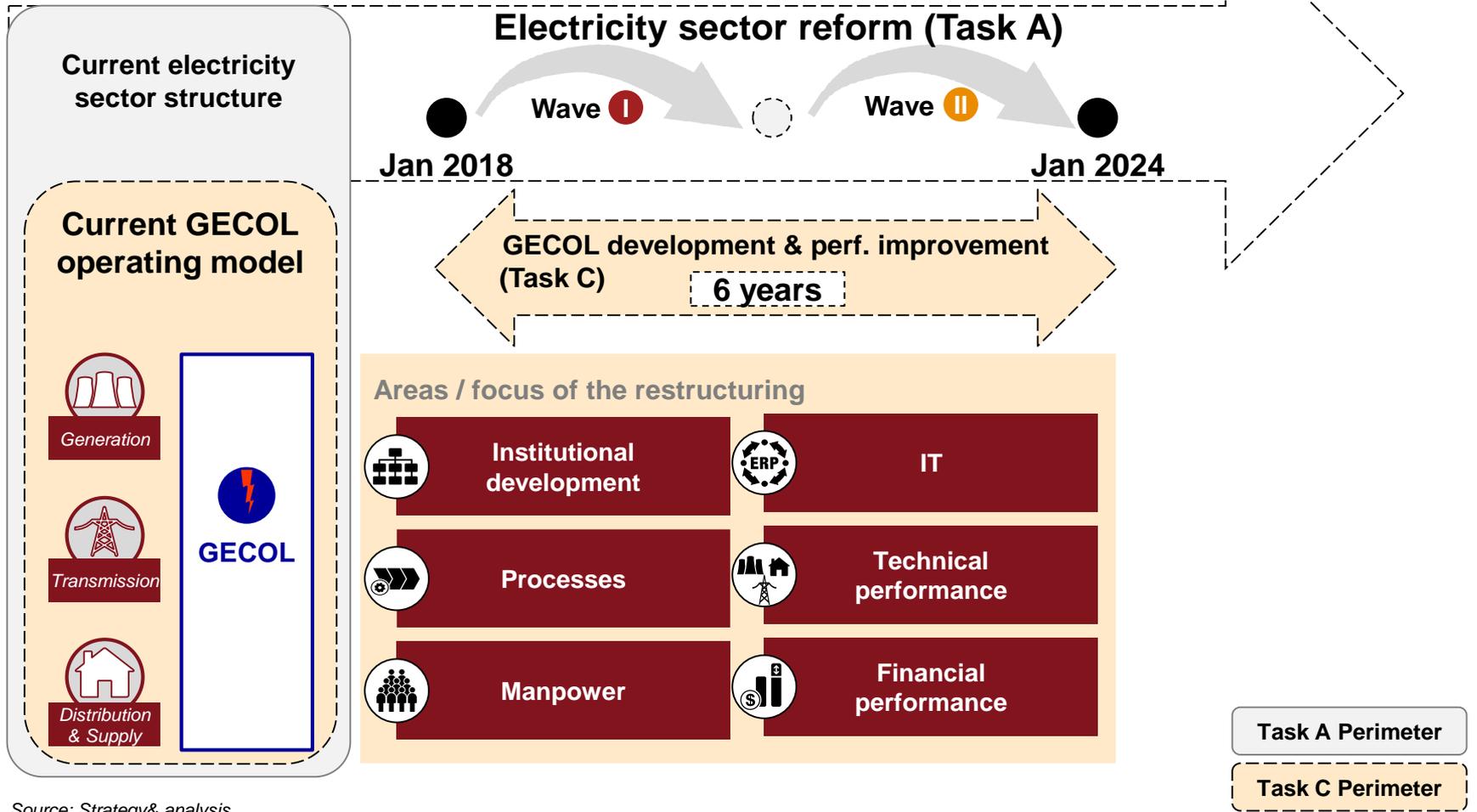
Task C report is organized in 6 sections, each one related to one deliverable of the project

Structure of the present report



The report focus on GECOL development & performance improvement with a 6yrs horizon (in alignment with Task A)

Task C perimeter of analysis



The Task C started with the review of the previous strategic objectives set by GECOL in its 2010-2015 strategic plan...

GECOL's 2010 Six Part Strategy – Objectives



...and analyzed GECOL progress against such objectives (taking into account the adverse external conditions)

GECOL's 2010 Six Part Strategy – Targets

	1 Improve system performance	2 Reduce commercial losses	3 Redeploy resources	4 Build and retain capabilities	5 Strengthen information resources	6 Influence sector policies
TARGETS	<ul style="list-style-type: none"> • 18% Reserve margin • No delay of maintenance of generation assets • 33% thermal efficiency • 2.8% transmission losses • 5.2% distribution losses 	<ul style="list-style-type: none"> • 9% commercial losses • 7000 connection backlog 	<ul style="list-style-type: none"> • 1.0 output productivity • 100% business process implementation • 100% outsourcing implementation • 100% job description development 	<ul style="list-style-type: none"> • 100% career development implementation • 100% adequacy training • 100% performance appraisal implementation 	<ul style="list-style-type: none"> • 100% database coverage • 100% GIS implementation • 100% transaction accuracy • 100% data accuracy 	<ul style="list-style-type: none"> • 100% documented perspectives on sector policy issues • No financial impact of government decrees within strategic plan period

Source: GECOL Strategic Plan Update (2009)

The review confirmed that several objectives remain well behind completion

High-level assessment of results (2010-2015)

	1 Improve system performance	2 Reduce commercial losses	3 Redeploy resources	4 Build and retain capabilities	5 Strengthen information resources	6 Influence sector policies
Status	Limited progress	No progress	No progress	N/A	N/A	No progress
Description	<ul style="list-style-type: none"> Capacity expansion was only partially fulfilled Reserve margin has worsened, while efficiency increased more than expected T&D losses only slightly improved 	<ul style="list-style-type: none"> Commercial losses have registered a dramatic increase, growing to ~60% instead of decreasing to strategic plan 9% target 	<ul style="list-style-type: none"> GECOL productivity per FTE did not improve, thus failing to meet the +40% target increase 	• ...	• ...	<ul style="list-style-type: none"> No documented perspectives on sector policy issues made available Gov. decrees carried negative financial impacts on GECOL
Root-causes	<ul style="list-style-type: none"> Political turmoil Decreasing CAPEX support Unclear GECOL guidance 	<ul style="list-style-type: none"> Political turmoil Payment exemption Decreasing service quality and control 	<ul style="list-style-type: none"> FTE increase 	• ...	• ...	<ul style="list-style-type: none"> Gov. decrees impacted GECOL ability to recover costs

Source: GECOL Strategic Plan Update (2009)

Task C has thus began with the refresh / up-date of the strategic priorities of GECOL...

Need for new strategic priorities definition

Analysis of progress against 2010-2015 strategic objectives

In the institutional development report, we reviewed the objectives set within GECOL 2010-2015 strategic plan...
 GECOL's 2010 Six Part Strategy – Objectives
 ... and the related previously set targets...
 GECOL's 2010 Six Part Strategy – Targets
 ... And confirmed that several objectives are well behind completion
 High-level assessment of results (2010-2015)

Status	Limited progress	No progress	No progress	Not a	Not a	No progress	
Objective	1. Develop a... 2. Establish a... 3. Strengthen... 4. Enhance... 5. Improve... 6. Increase...	1. Develop a... 2. Establish a... 3. Strengthen... 4. Enhance... 5. Improve... 6. Increase...	1. Develop a... 2. Establish a... 3. Strengthen... 4. Enhance... 5. Improve... 6. Increase...	1. Develop a... 2. Establish a... 3. Strengthen... 4. Enhance... 5. Improve... 6. Increase...	1. Develop a... 2. Establish a... 3. Strengthen... 4. Enhance... 5. Improve... 6. Increase...	1. Develop a... 2. Establish a... 3. Strengthen... 4. Enhance... 5. Improve... 6. Increase...	1. Develop a... 2. Establish a... 3. Strengthen... 4. Enhance... 5. Improve... 6. Increase...
Issues	1. Public... 2. Financial... 3. Human... 4. Technical... 5. Institutional...						

Baseline and issues identification

In terms of technical performance, we carried out an extensive review of GECOL and identified a series of issues
 Poor operating performance issues

Among the processes analyzed, we thus identified several issues/areas of intervention

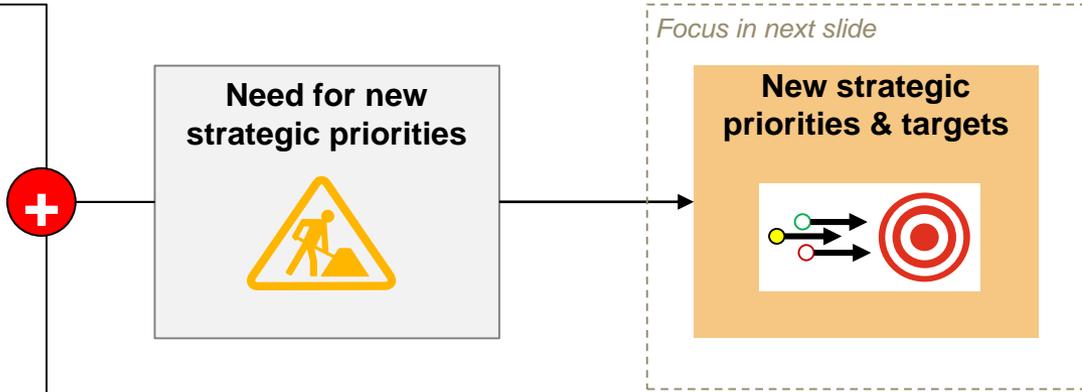
Identified issues

Processes: 1. Maintenance, 2. OPEX budgeting, 3. CAPEX budgeting, 4. Investment bidding, 5. Collection

...and we identified several organizational issues which currently limit GECOL's efficiency and effectiveness

Summary of issues

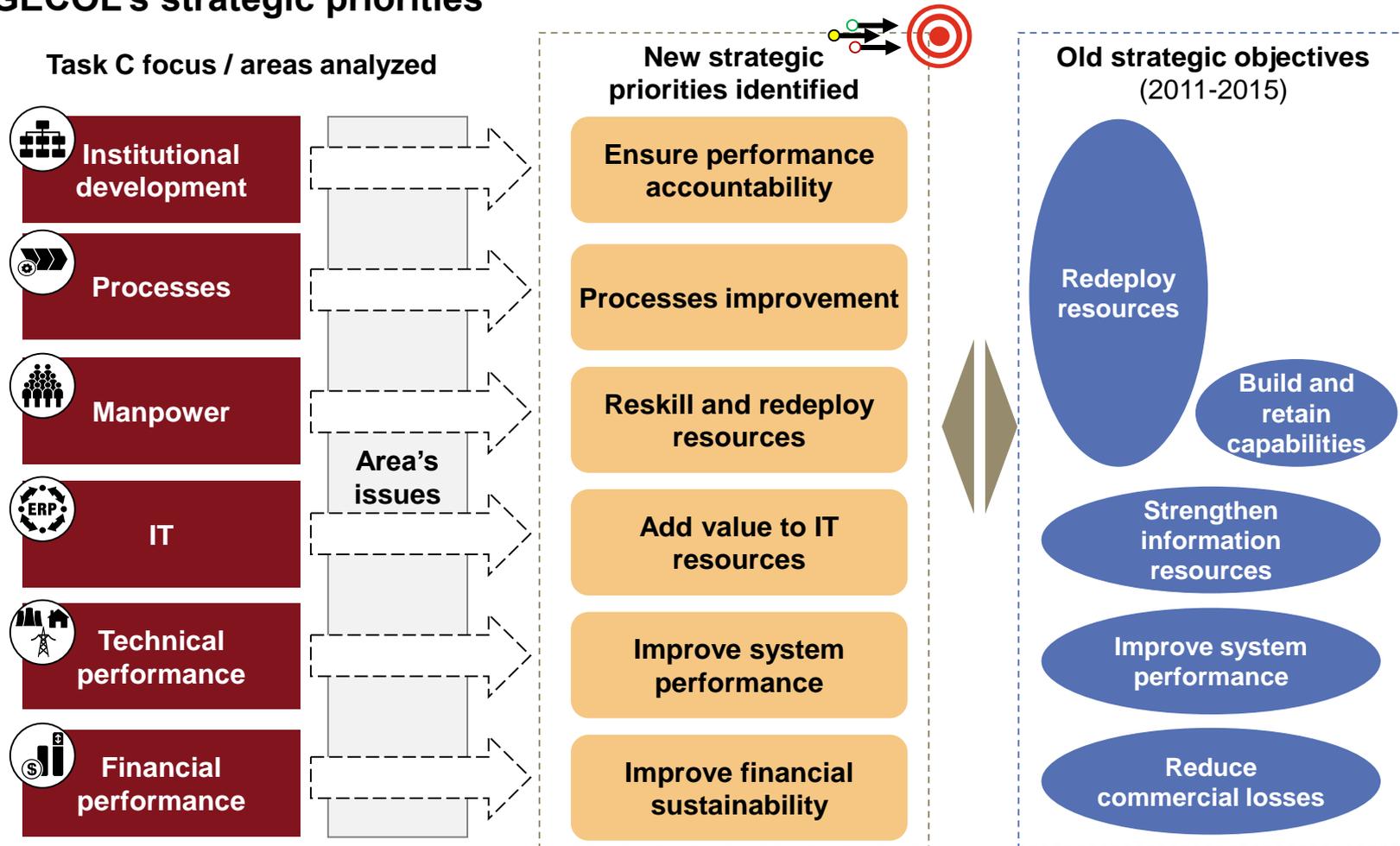
Identified issues	Criteria for the assessment of GECOL's operating model				
	Costs	Efficiency	Results	Customer	Agreement
1. HR management	---	---	---	---	---
2. Financial management	---	---	---	---	---
3. Procurement	---	---	---	---	---
4. HR management	---	---	---	---	---
5. HR management	---	---	---	---	---
6. HR management	---	---	---	---	---
7. HR management	---	---	---	---	---
8. HR management	---	---	---	---	---
9. HR management	---	---	---	---	---
10. HR management	---	---	---	---	---



Sources: Strategy & analysis

...and proposed six new strategic priorities, mostly in line with the objectives previously set by GECOL for 2011-2015

GECOL's strategic priorities



Sources: Strategy& analysis

Task C strategic priorities were then translated into a series of measures where GECOL should focus in the next 6 years...

GECOL's new strategic priorities and measures

New strategic priorities	Ensure performance accountability	Processes improvement	Reskill and redeploy resources	Add value to IT resources	Improve system performance	Improve financial sustainability
<p>MEASURES</p>	<ul style="list-style-type: none"> • Reorganization • Accounting unbundling • Functional unbundling 	<ul style="list-style-type: none"> • Pilot revised business processes • Roll-out new processes • Validate current state • Design target state processes • Prioritize and mitigate risk • Roll-out processes and manage risk • Transition to operations 	<ul style="list-style-type: none"> • HR strategy development • Manpower rebalancing and workforce planning • Corporate reskilling • Performance management • Succession planning 	<ul style="list-style-type: none"> • Fix IT resources • Upgrade IT system • Add value to IT structure 	<ul style="list-style-type: none"> • Increase plant availability & utilization • Complete ongoing capacity additions • Launch new capacity expansion projects 	<ul style="list-style-type: none"> • Set cost reflective tariff • Metering roll out • Address electricity theft • Fight insolvency • Improve credit collection • Control operating expenses

...and for each measure, a series of related milestones to be achieved were also derived

GECOL's new strategic priorities and milestones

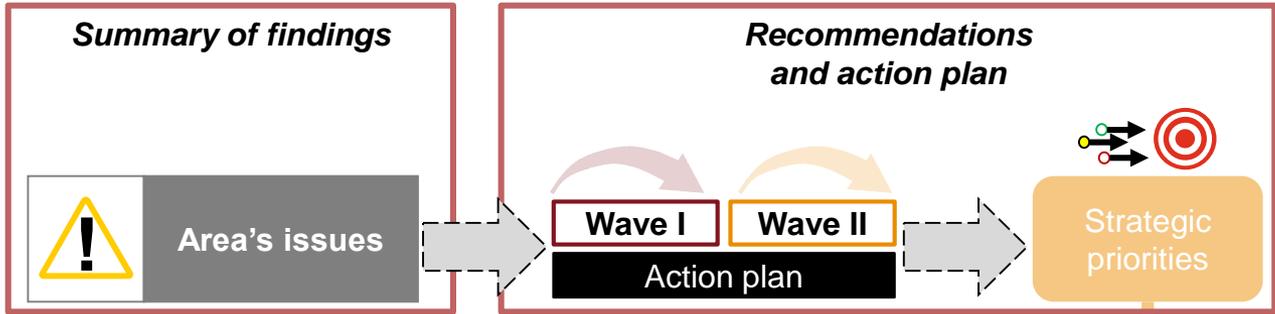
	Ensure performance accountability	Processes improvement	Reskill and redeploy resources	Add value to IT resources	Improve system performance	Improve financial sustainability
MILESTONES	<ul style="list-style-type: none"> • Core Bus separated • ICT, AFC, HR and E&P corporate core established • Separated annual accounts submitted • Independent functional managers appointed 	<ul style="list-style-type: none"> • Pilot processes implemented • New processes designed • Implementation plan ready 	<ul style="list-style-type: none"> • HR&O department under MD • HR strategy in place • Critical resource map • Manpower rebalancing plan • Workforce planning in place • Capabilities skills map • Reskilling program • GECOL Academy • Appraisal system in place • Succession planning in place 	<ul style="list-style-type: none"> • Data center repaired and upgraded • ERP upgraded • New IT governance 	<ul style="list-style-type: none"> • Complete generation, transmission, control, MV & Distribution targets <p style="text-align: center; color: red;">See separate chapters for detailed milestones</p>	<ul style="list-style-type: none"> • Tariff covering part of P&L costs and fuel subsidies • Theft area map • Customers database • SMS/e-mail billing in operation • GECOL's mobile app running

The next chapters will summarize the issues identified for each focus area and the related recommended action plan

Approach of the following chapters

Focus areas analyzed

-  Institutional development
-  Processes
-  Manpower
-  IT
-  Technical performance
-  Financial performance



Recommendations and action plan | Ensure performance accountability

		6 years					
		Year	n	n+1	n+2	...	Owner
Measures	Resolve backlog of overdue maintenance	Plan a concentrated 3 year maintenance and overhauling program	[Timeline bar]				Generation BU
		Carry out 7 overhauls of GT units, 3 overhauls of ST units, 6 maintenance, repair and replacement activities every year	[Timeline bar]				Generation BU
			90% of suspended units back in service				
	Plan maintenance of running units	Execute a timely maintenance program for running units (expect 6 GT units per year)	[Timeline bar]				Generation BU
			No new buildup of overdue maintenance				

Milestones

Source: Strategy& analysis

Institutional development

Processes

Manpower

IT

Technical performance

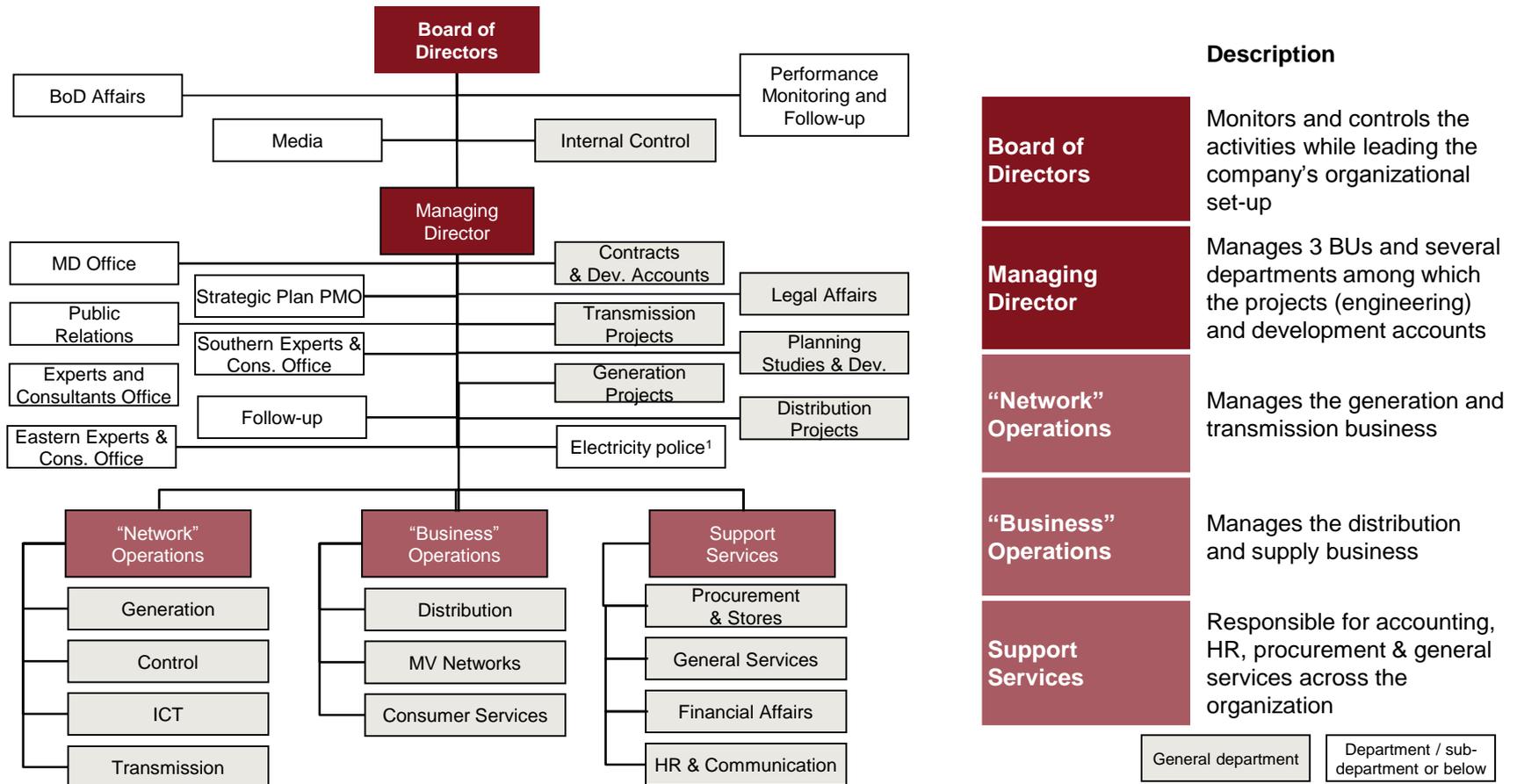
Financial performance

Back-up – Review of 2011-2015 GECOL 6 part strategy

In terms of institutional development, the report analyzed the current GECOL's organizational structure...

GECOL organization²

Up-date 12/6/2017



1) Electricity Police is not included within GECOL's organization chart 2015 (unit collocation still to be confirmed by GECOL); within next slides, electricity police is thus excluded
 2) Referred within the report as operational (or organizational) units as they seem not to own all levers of a BU/SBU (e.g. accountability on P&L, etc.);

Source: Latest up-date of GECOL company organization chart 2015 (June 2017)

... Assessing its operating model along a number of criteria

Criteria for the assessment of GECOL's operating model



VI Alignment with Strategic Priorities

- Alignment with GECOL strategic priorities / pillars identified within GECOL institutional development strategy

More in detail we set the following objectives for GECOL to be achieved in the next 6 years..

GECOL's new strategic objectives

	Ensure performance accountability	Processes improvement	Reskill and redeploy resources	Add value to IT resources	Ensure security of supply	Achieve financial equilibrium
OBJECTIVES	<ul style="list-style-type: none"> • New org structure roll out • Accounting unbundling • Functional unbundling 	<ul style="list-style-type: none"> • Solve identified issues • Comprehensive business process reengineering • Align processes with new organization 	<ul style="list-style-type: none"> • HR strategy development • Merger rebalancing and workforce planning • Corporate modeling • Performance management • Succession planning 	<ul style="list-style-type: none"> • Fix IT resources • Upgrade IT system • Add value to IT services 	<ul style="list-style-type: none"> • Increase spare capacity & utilization • Complete ongoing capacity additions • Launch new capacity expansion projects 	<ul style="list-style-type: none"> • Ret cost effective staff utilization • Meeting roll out • Address electricity fuel • Fight inefficiency • Improve credit collection • Control operating expenses

Source: GECOL Strategy Plan Update (2005)

Several issues which currently limit GECOL’s efficiency and effectiveness were identified

Summary of issues

Identified Issues	Criteria for the assessment of GECOL’s operating model					
	I Clearly defined operating model	II Alignment vs. best practices	III Results accountability	IV Efficiency	V Preparation for future evolution	VI Alignment with Strategic Priorities
1.1 BU “concentration”		!	!	!	!	
1.2 Limited levers for effective BU management		!	!	!	!	!
2 Fragmentation of engineering & projects		!		!		
3 Lack of a strong AFC function	!	!	!	!		!
4 Sub-optimal set-up of ICT	!	!	!		!	
5 HR&O responsibilities partially outside MD area	!	!	!	!		!
6 Unclear role of Contracts & Development Accounts		!	!	!		
7 BoD overstaffed and including functions typically under MD	!	!	!	!	!	!

! Target organizational dimension negatively impacted by related identified issue

Source: Strategy & analysis



Task C recommended that GECOL upgrades its operating model through a full re-organization

Measures and activities

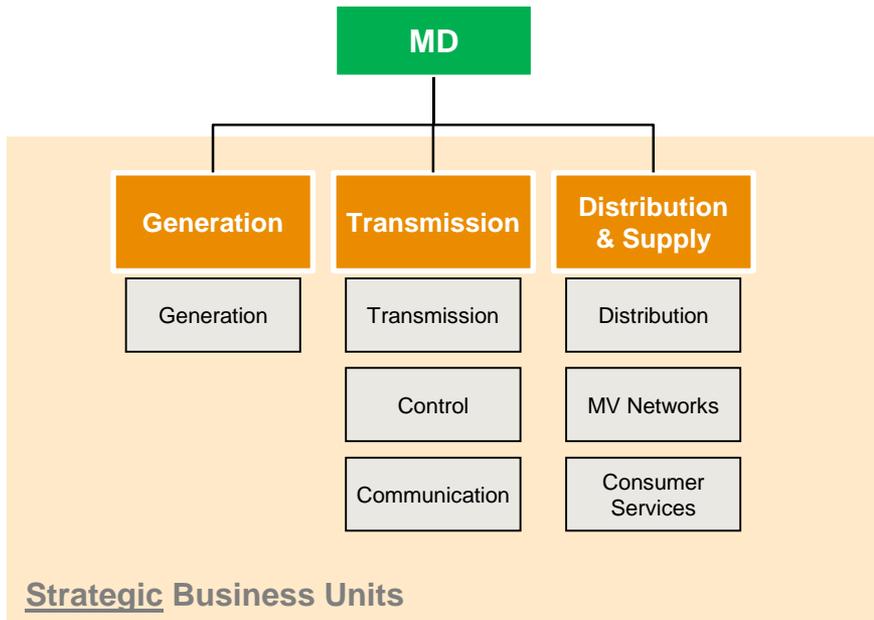
Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner
Reorganization	Separate Generation and Transmission into different BUs				▲				MD & Head of BUs
	Create new core ICT function (managed by CIO) reporting directly to MD			▲					MD & Head of ICT
	Move IT away from network into ICT corporate core dept. with direct report to MD			▲					CIO & MD
	Move Communications unit under Transmission BU								CIO, MD & Transmission head
	Group Generation, Transmission, Distribution projects in an integrated E&P function								MD & Head of BUs
	Move Projects Planning & Studies to E&P function								MD & Head of E&P
	Move Projects Accounting away from Contracts and Dev. Accounts within E&P function								MD & Head of E&P, Head of Contracts
	Move Tenders & Contracts from Contracts & Dev. to Procurement								MD & Head of Contracts
	Create AFC function managed by CFO reporting to MD								MD & CFO
	Move related units ¹ in the newly created AFC core function, led by a new CFO								MD & CFO
	Consolidate in HR&O department (under MD) all the HR-related core functions leaving non-core HR activities within Support Services								MD & Head of HR
	Separate the E&P division by dividing projects within each operational SBU								Head of E&P
	Assign Projects Accounting to SBUs								Head of E&P
Create a new institutional relations unit within BoD								BoD Chairman	
Create dedicated support services units for each BU if Option 1 is selected								MD & Head of support BUs heads	

1) Units to be migrated to AFC are: Performance Monitoring general dept. (from BoD), core activities of Financial Affairs (e.g. Financial Planning and Ledger & Fin. reports) and L/C Financing and Customs Clearance from Contracts and Development accounts; Source: Strategy& analysis ▲ Milestones



After separating Generation and Transmission GECOL shall be organized in 3 SBUs, with full performance accountability

To be GECOL organization/management structure



Example of typical activities

O&M & technical affairs

- Execute operation of assets and/or installations
- Execute investigations and analyses
- Analyze technical support
- Coordination and execution of maintenance
- Resolution of day-to-day tech. problems

Operations Management & Planning

- Manage budget spending
- Personnel staffing and deployment
- Prepare (& submit) budget for approval
- Propose operational targets (KPI)
- Plan O&M strategy
- Take corrective actions to align performance with objectives

Sales
(for supply only)

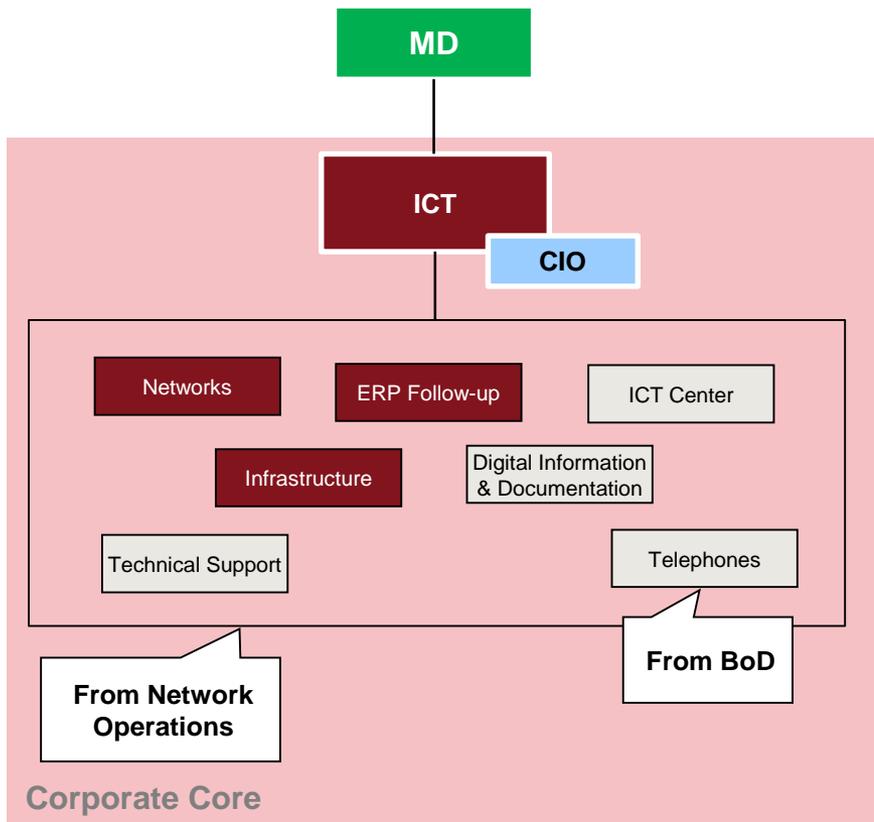
- Sales and customer relations
- Meter reading
- Customer service
- Billing and collection

Sources: GECOL (company organization chart 2015), Strategy& analysis



Moving IT outside the network BU, GECOL will create a core ICT function headed by the CIO, reporting directly to the MD

To be GECOL organization/management structure

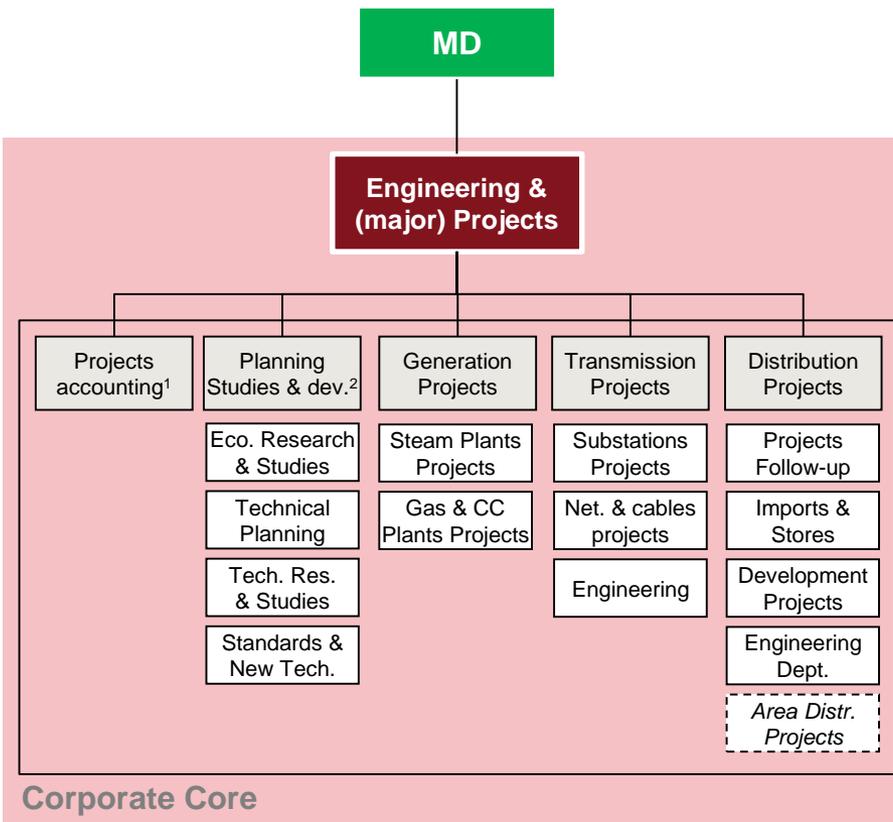


Example of typical activities

- | | |
|---|---|
| Software and Applications Management | <ul style="list-style-type: none"> • Perform maintenance of IT hardware/software • Manage the IT application system • Manage IT supplier relationships and contracts |
| End-user Services | <ul style="list-style-type: none"> • Ensure service efficiency for user workplace, telephony, printer services, etc. • Users requests / issues resolution |
| ERP Follow-up | <ul style="list-style-type: none"> • Ensure IT system deployment • Conduct ERP implementation |
| Methods and Communication | <ul style="list-style-type: none"> • Manage internal and external IT communications |
| Architecture and Infrastructure Management and Development | <ul style="list-style-type: none"> • Formulate IT policies and standards • Perform IT planning & budgeting activities • Design IT strategy & procedures • Ensure business continuity • Conduct IT quality assurance • Plan and manage IT development in alignment with corporate objectives |

Grouping projects into an integrated E&P center of excellence will speed-up projects implementation

To be GECOL organization/management structure



Example of typical activities

Planning & Budgeting

- Support MD, BUs, AFC and Government in planning and budgeting activities related to projects
- Evaluate projects economics

Engineering

- Promote innovation
- Perform engineering and technical support to business
- Assess maintenance needs and performs reliability studies

Project Management Services (Tracking, control, etc.)

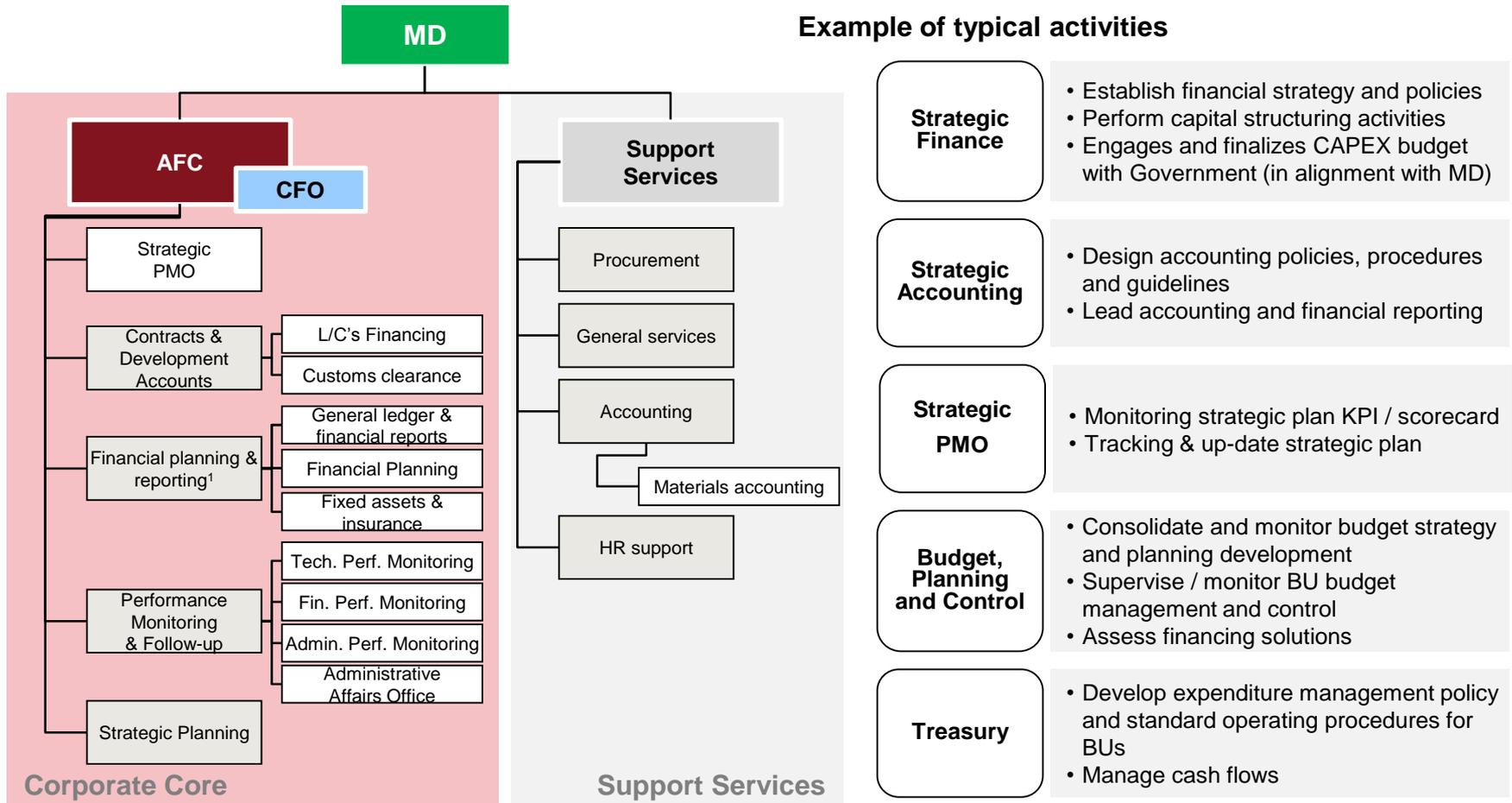
- Act as “owner’s engineer” in relationships with EPC contractors
- Project management services
- Supervise projects implementation
- Monitor projects budget realization
- Manage and control project specification, schedule, quality, contract and construction costs
- Drive operation and construction excellence across projects
- Obtain permits and ensure regulatory and legal compliance throughout projects implementation
- Develop projects reports for MD

1) From Contracts and development accounts department; 2) Strategic Planning from Planning Studies & dev. is moved under AFC function;

Sources: GECOL (company organization chart 2015), Strategy & analysis

A full consolidation of the AFC function headed by a CFO will increase accountability on GECOL's financial viability

To be GECOL organization/management structure

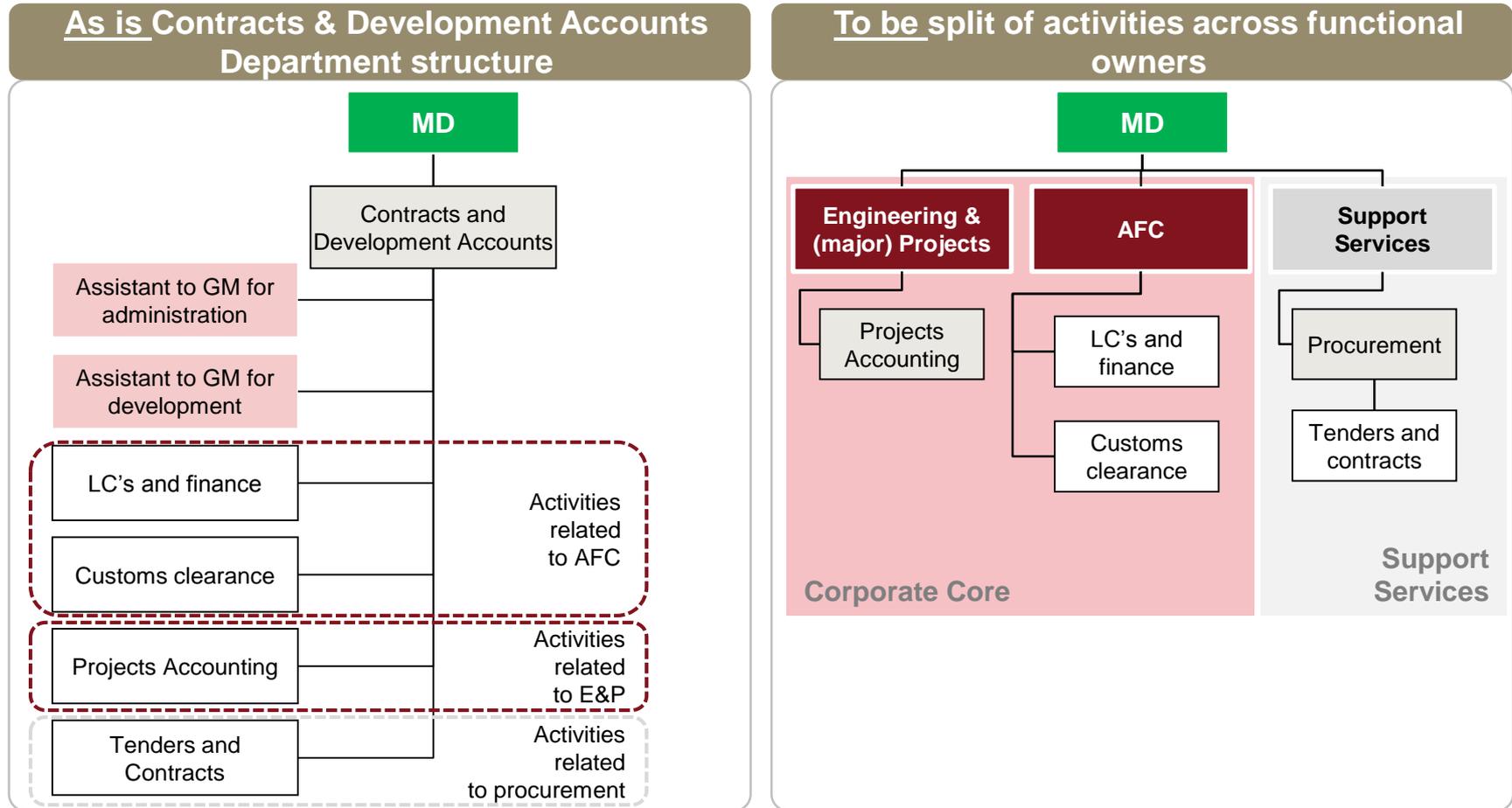


¹ Includes corporate core activities from Financial Affairs (i.e. Ledger and Financial reports and Financial Planning); Sources: GECOL (company organization chart 2015), Strategy & analysis



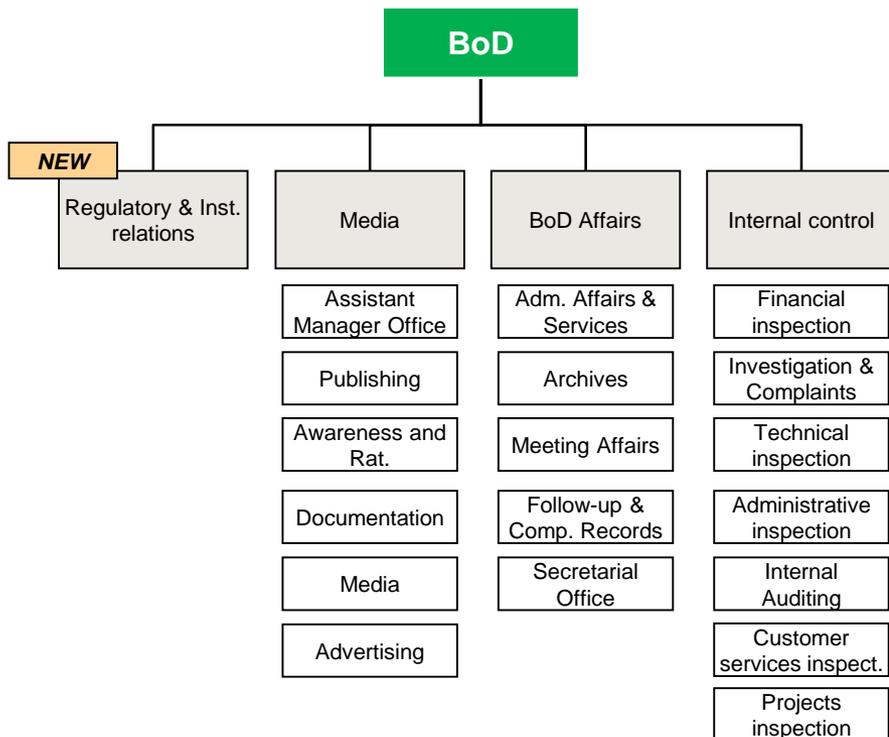
The Contracts and Development Accounts department will be split across different functions

Contracts and Development Accounts split



BoD will acquire a leaner and more effective structure, and be equipped with a Regulatory & Institutional relations unit

To be direct reports to BoD



Example of typical activities

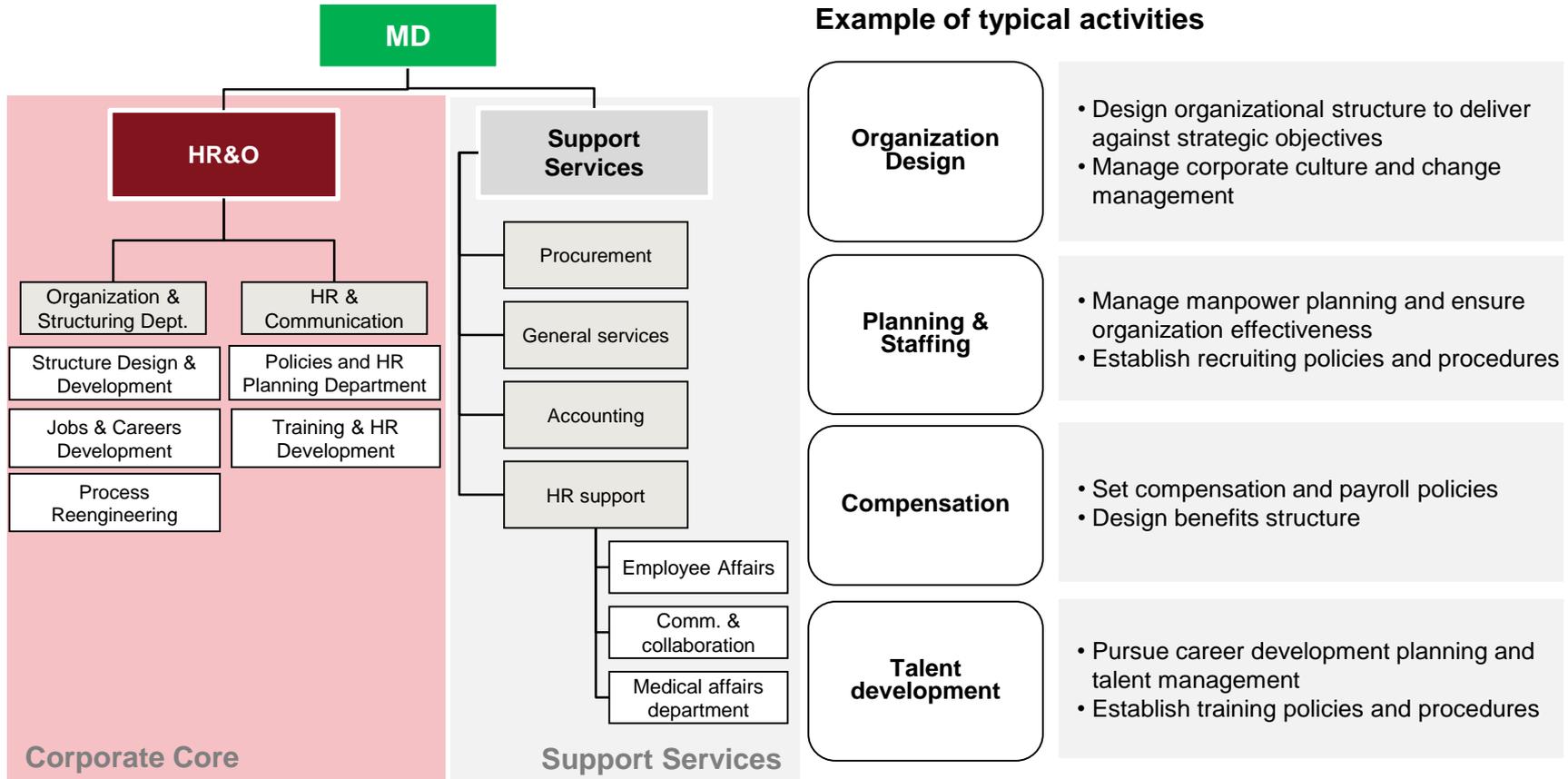
- | | |
|--------------------------------|---|
| Audit
(& compliance) | <ul style="list-style-type: none"> • Conduct active auditing on BU (financial, technical, administrative, etc.) • Define policies and procedures |
| Corporate Governance | <ul style="list-style-type: none"> • Review and approve corporate governance mission and structure • Conduct and approve the assessment of MD performance • Review, validate and monitor level 1 appointment, compensation and development |
| Strategic Leadership | <ul style="list-style-type: none"> • Formulate strategic objectives • Review and approve corporate strategy and values, and ensure alignment |
| Identity | <ul style="list-style-type: none"> • Develop corporate image that fits with the company's values and communicate identity to the public and employees |
| Capital | <ul style="list-style-type: none"> • Agree on / set capital spending criteria and parameters • Approve capital and operating plan and major investments and divestitures |

Sources: GECOL (company organization chart 2015), Strategy & analysis



A new HR&O function directly reporting to MD will increase relevance of this function in GECOL's org. structure

To be GECOL organization/management structure

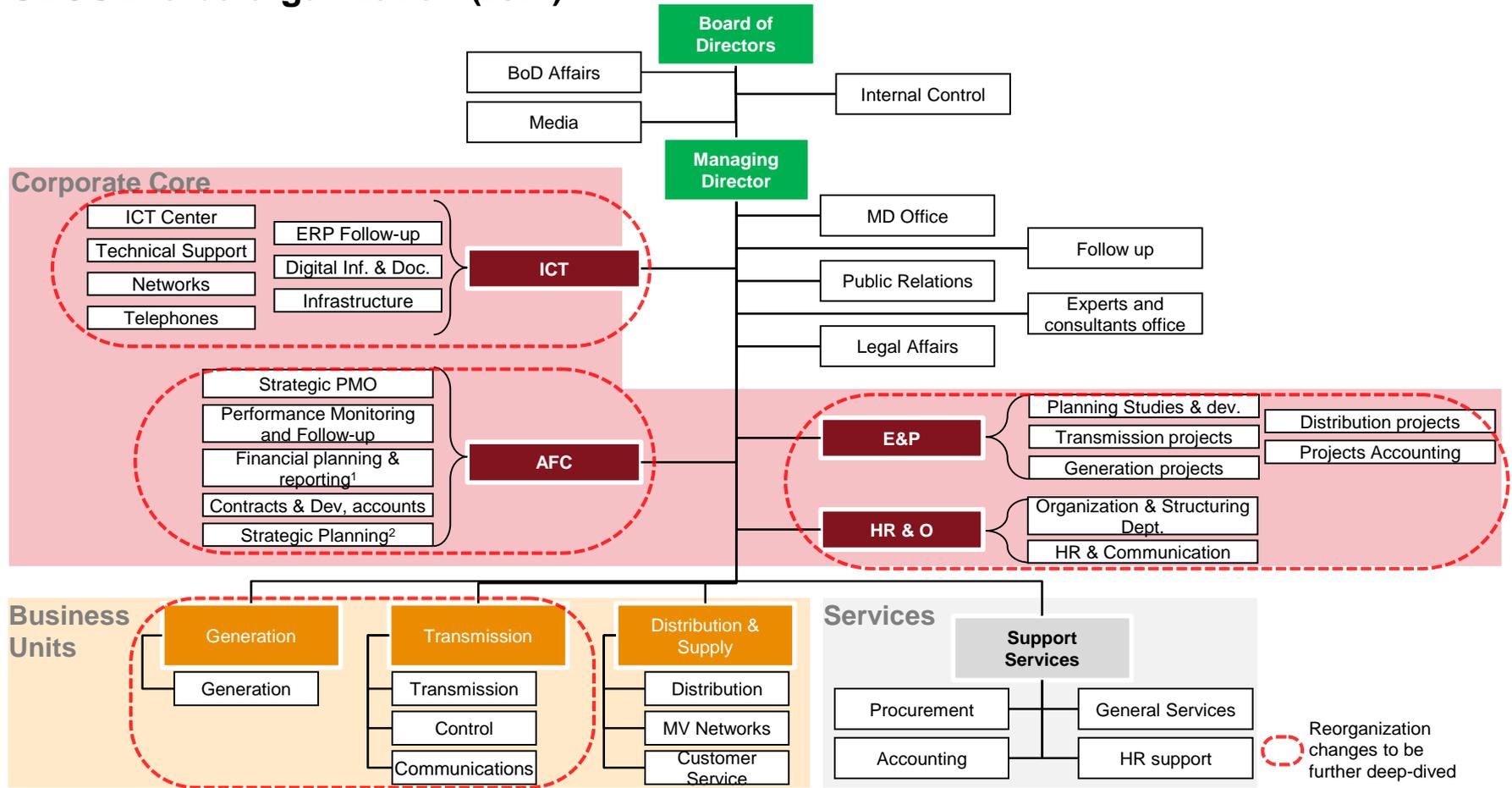


Sources: GECOL (company organization chart 2015), Strategy& analysis



The first reorganization will lead to corporate core AFC, ICT, HR&O and E&P departments, and clearly distinct BUs...

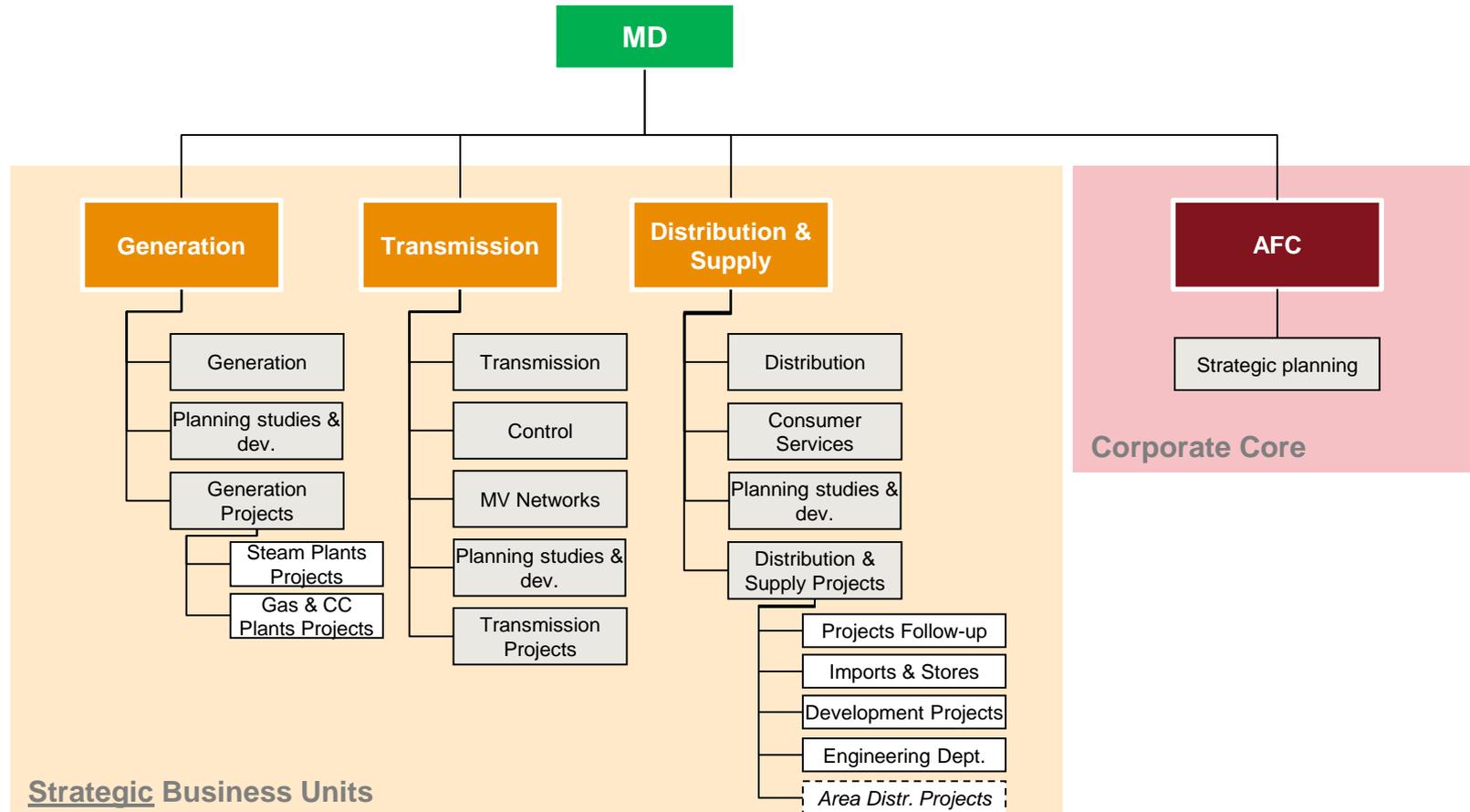
GECOL to be organization (2021)



1) Includes corporate core activities from Financial Affairs (i.e. General ledger and financial reports, Financial Planning and Fixed assets and insurance); 2) Strategic Planning unit from the Planning Studies & development division; Sources: GECOL (company organization chart 2015), Strategy& analysis

... However, in the long run higher, synergies might be realized if SBUs have full responsibility over projects

To be GECOL organization/management structure



Sources: GECOL (company organization chart 2015), Strategy & analysis

After the first reorganization GECOL will decide between embedded or shared support services

Reorganization options



Option 1 Embedded support services

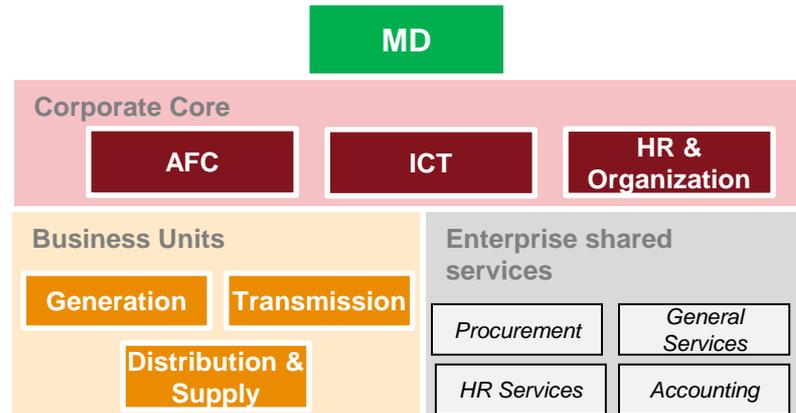
Move shared services units below business units to empower BU managers and prepare for an holding structure

Business Units

Generation	Transmission	Distribution & Supply
Embedded support services		
Generation Procurement	Transmission Procurement	Distribution & Supply Procurement
Generation HR Services	Transmission HR Services	Distribution & Supply HR Services
Generation Accounting	Transmission Accounting	Distribution & Supply Accounting
Generation General Services	Transmission General Services	Distribution & Supply General Services

Option 2 Enterprise shared services

Clustered shared services separated from corporate core and BUs in order to outsource non value added activities in the near future



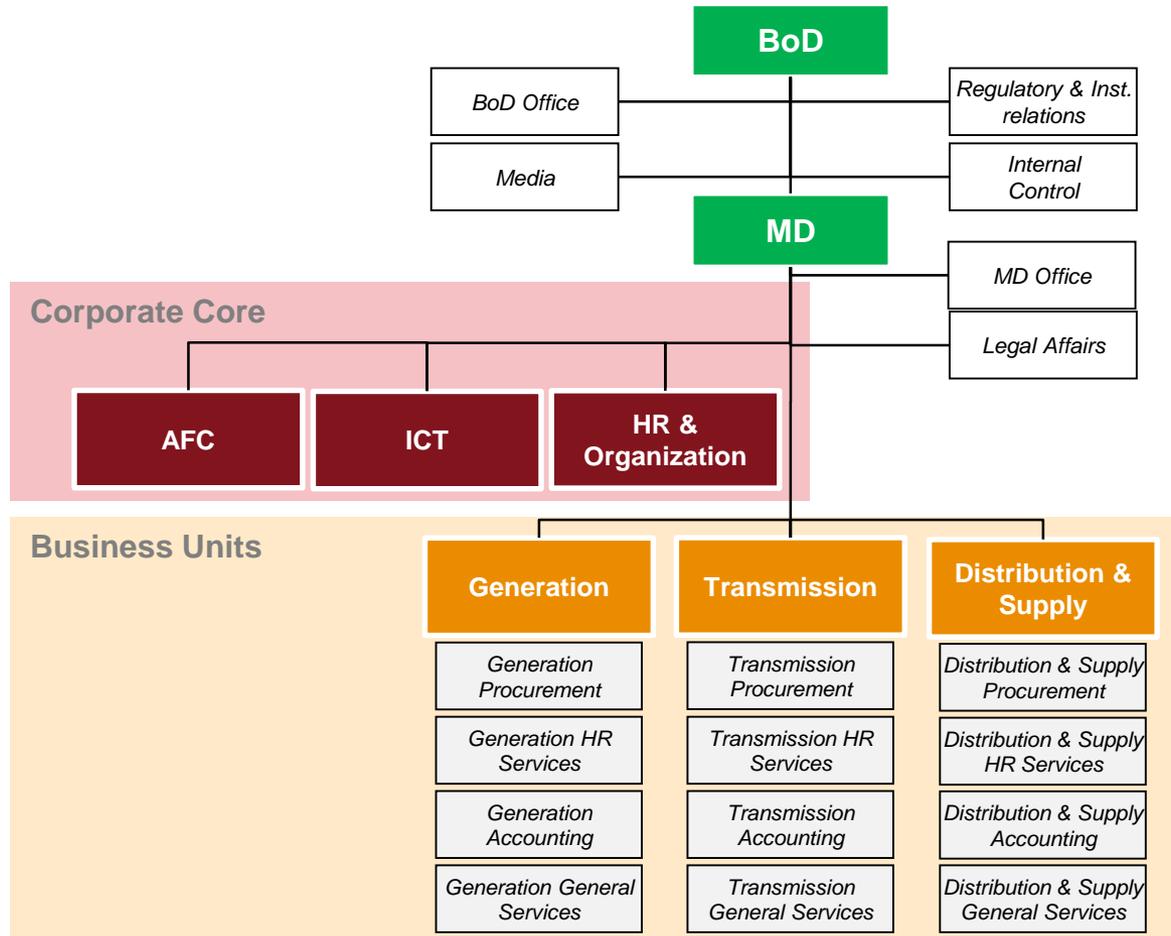
Source: Strategy& analysis



If the embedded support services option is selected the organization will be more compact with more powerful SBUs

GECOL embedded support services organization (2024)

Option 1



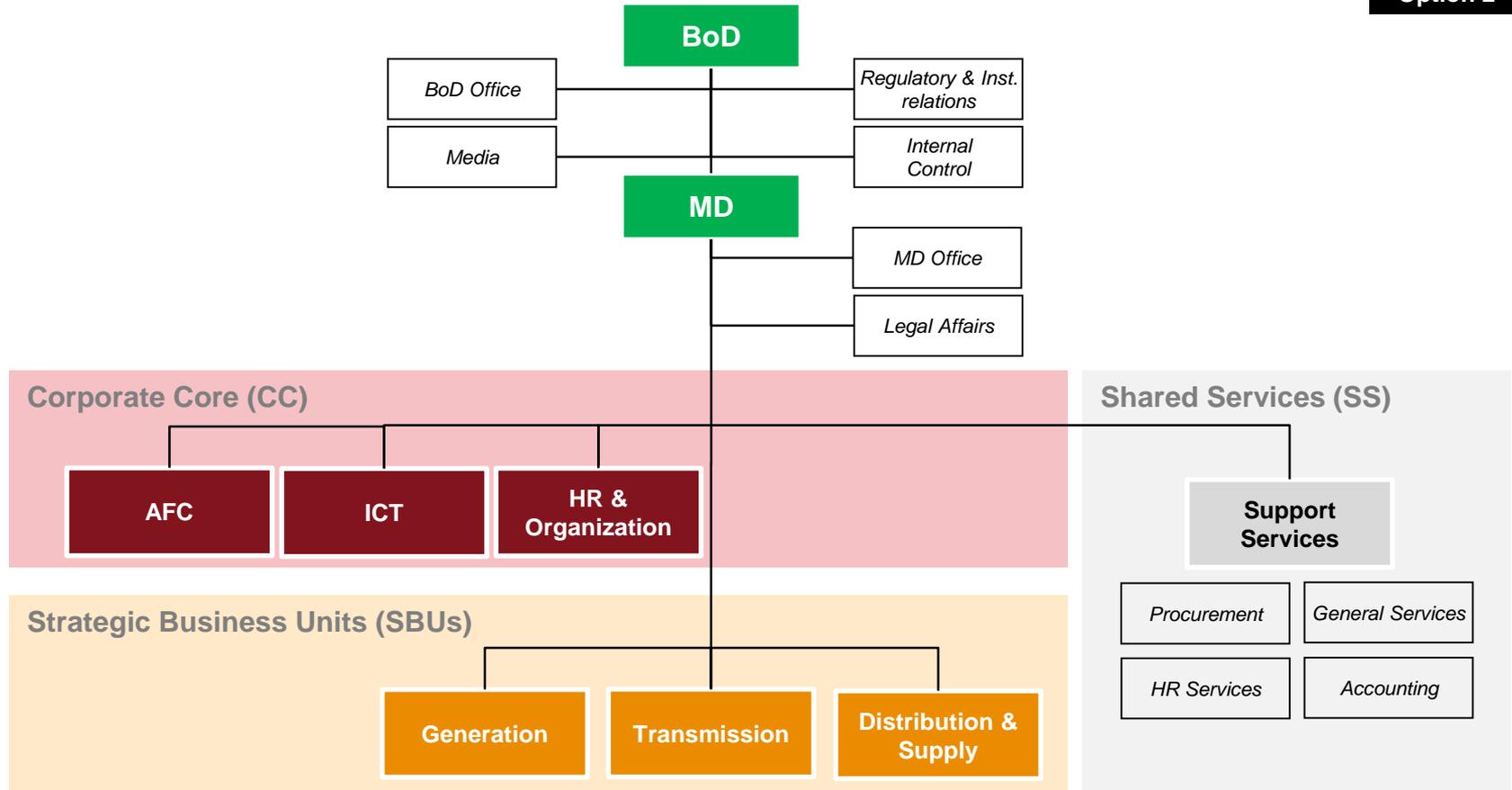
Source: Strategy& analysis



On the other hand, if the shared support services is selected a clear division of roles between CC, SBUs and SS will emerge

GECOL enterprise shared services organization (2024)

Option 2

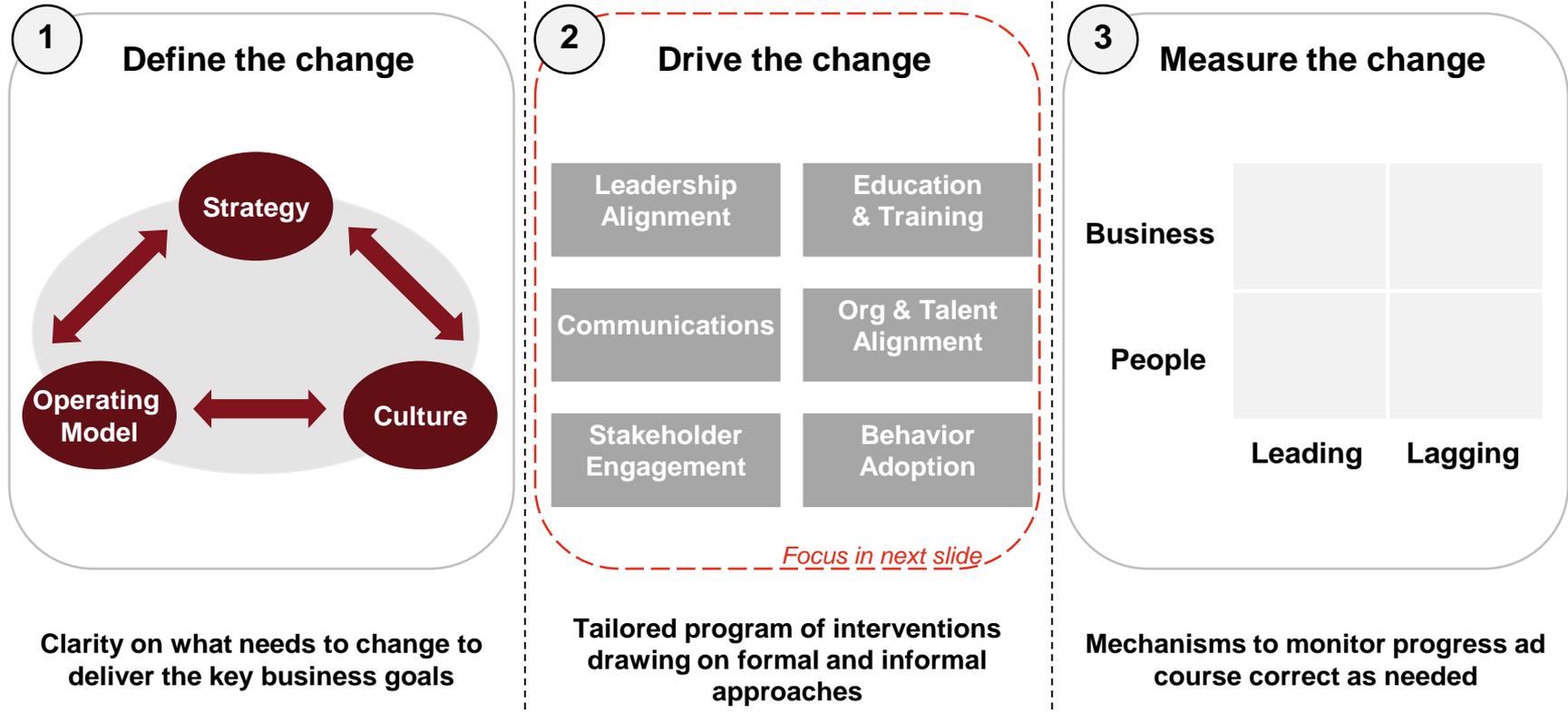


Source: Strategy& analysis



Reorganization shall be coupled with a structured change management program...

Change program phases

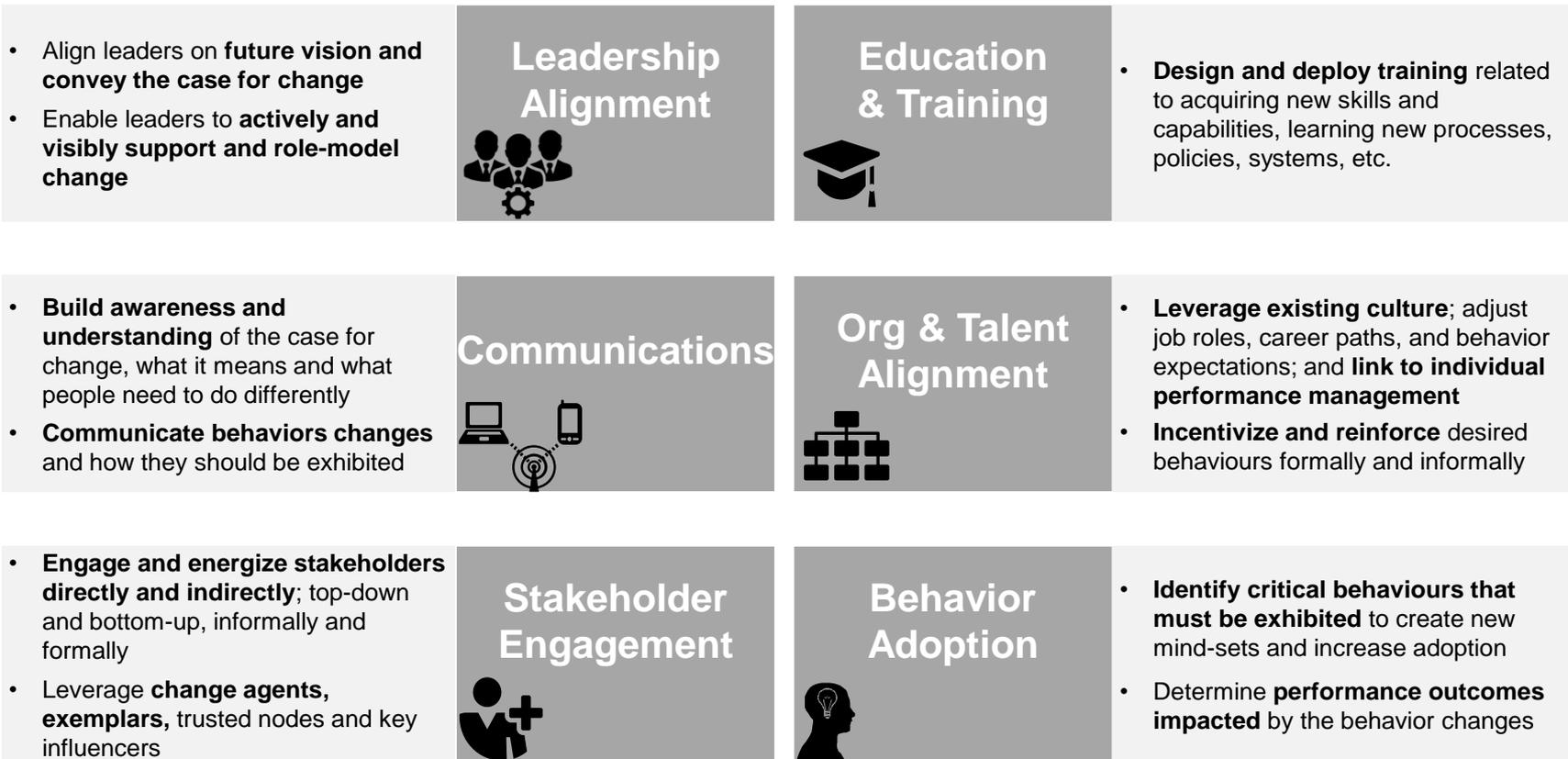


Source: Strategy & Analysis



...which will drive change through 6 levers to achieve rational compliance and emotional commitment

Drive the change measures



To ensure performance accountability, GECOL shall also pursue its accounting and functional unbundling by 2023

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner
Accounting unbundling	Establish clear accounting system to allocate directly and indirectly related BS and IS accounts to value chain activities			■					CFO
	Draft separated annual accounts (IS and BS) for each BU				■				AFC function
	Submit separated annual accounts (IS and BS) for each value chain activity to the regulatory agency					▲			AFC function
									Sep. annual accounts submitted
Functional unbundling	Select and appoint independent managers for each SBU						■	▲	MD & BoD
	Provide SBUs managers with full authority over financial resources personnel							■	MD & BoD

▲ Milestones

1) Units to be migrated to AFC are: Performance Monitoring general dept. (from BoD), core activities of Financial Affairs (e.g. Financial Planning and Ledger & Fin. reports) and L/C Financing and Customs Clearance from Contracts and Development accounts;

Source: Strategy& analysis

Institutional development

Processes

Manpower

IT

Technical performance

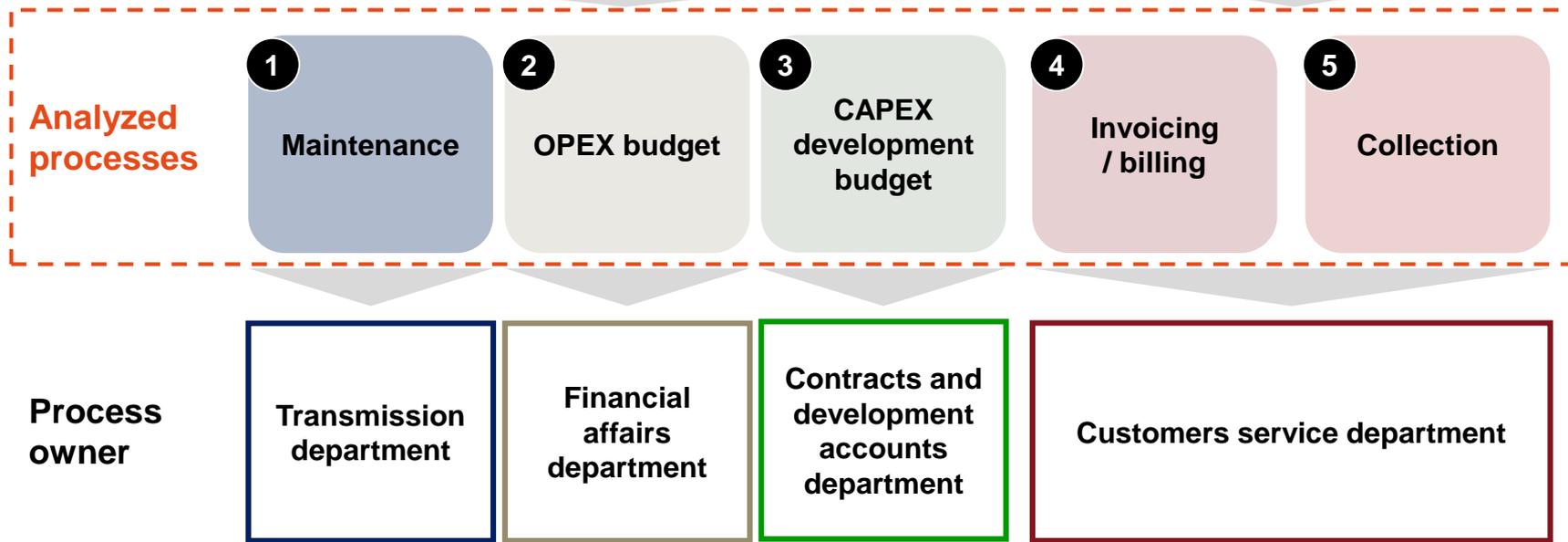
Financial performance

Back-up – Review of 2011-2015 GECOL 6 part strategy

Task C analyzed the 5 main business processes which were directly linked to the most pressing issues affecting GECOL

Processes analysis overview

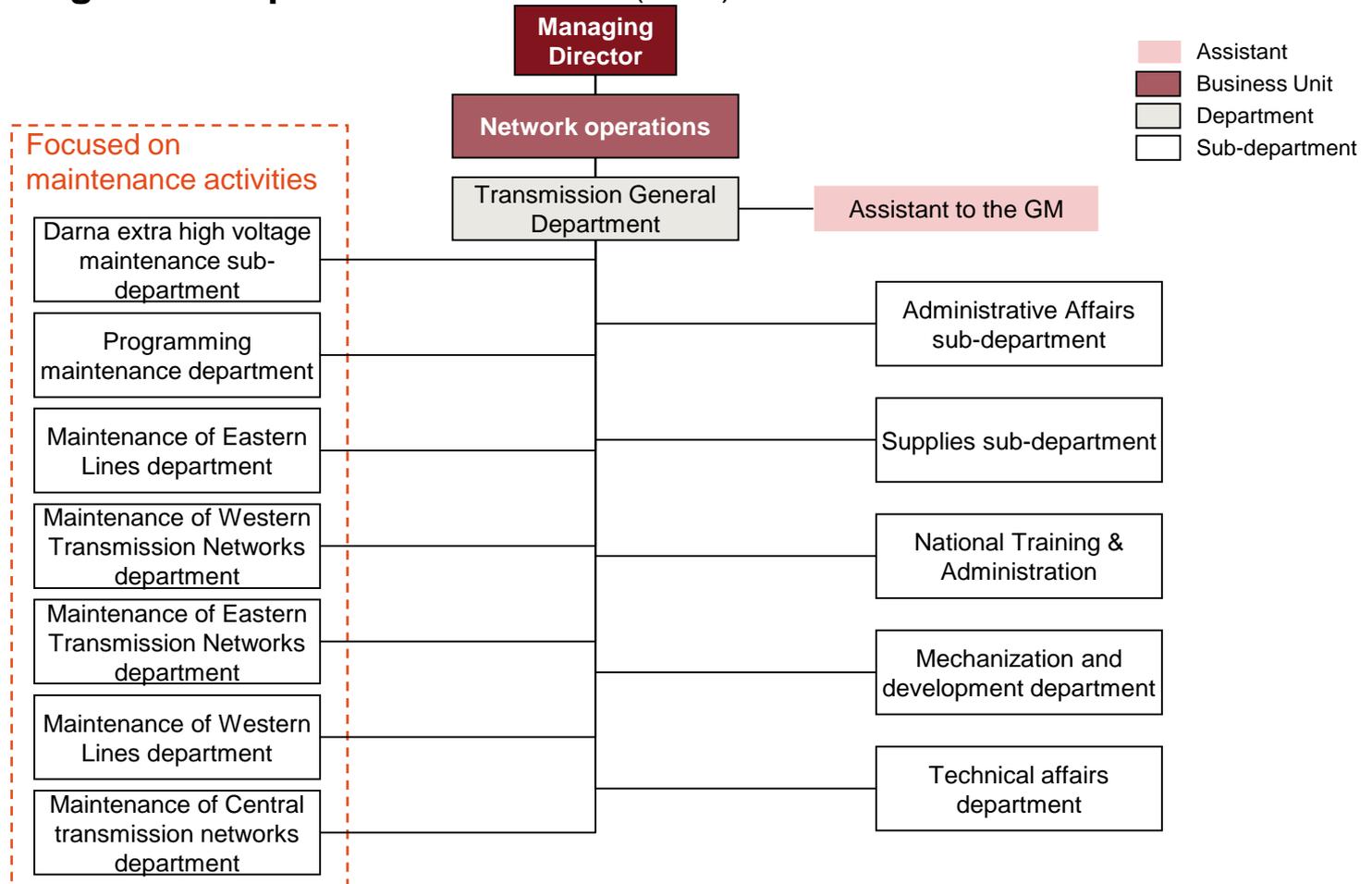
Task A-
Electricity
sector
issues' root
causes



Source: Task A-Final report; PWC-Process mapping & identification gaps of staff skills and performance; Strategy& analysis

The maintenance process was mapped within with the Transmission General department

Transmission general department structure (2017)



Source: Latest up-date of GECOL company organization chart 2015 (June 2017); PWC-Process mapping & identification gaps of staff skills and performance

GECOL currently uses three different types of maintenance approaches to support the network

Overview of GECOL’s maintenance approaches

	Preventive maintenance	Predictive – Condition Based maintenance	Corrective (breakdown) maintenance
Definition	<ul style="list-style-type: none"> Regularly performed on an equipment to check the likelihood of its failing Performed while the equipment is still working, so that it does not break unexpectedly 	<ul style="list-style-type: none"> Performed to predict when equipment failure might occur Monitors the actual condition of the asset to decide if maintenance needs to be done 	<p>Performed when equipment failure occurs</p>
Application criteria used by GECOL	<ul style="list-style-type: none"> For all substations equipment For high voltage lines For substations indoor feeders For lines remote protection For load shedding scheduling 	<ul style="list-style-type: none"> For all substations equipment For high voltage lines 	<ul style="list-style-type: none"> All failed equipment
Frequency	<p>Scheduled periodically (e.g. daily, weekly, monthly, semi-annually, annually, etc.)</p>	<p>Triggered by asset/equipment condition</p>	<p>Triggered by asset/equipment failure</p>

Source: PWC-Process mapping & identification gaps of staff skills and performance

Maintenance activities are initiated by the maintenance programming dept. which prepares the yearly plan

Maintenance plan sections

1. Substations preventive and predictive maintenance

- It includes predictive and preventive plan for 97 substations in 12 areas in the year
- It sets the maintenance period (starting date and the end date) for each substation

2. Indoor feeders preventive maintenance

- It includes preventive plan for the indoor feeders in 80 substations in 2 regions (Eastern & Western) in the year
- It sets the maintenance period (starting date and the end date) for each substation

5. Transmission lines preventive and predictive maintenance

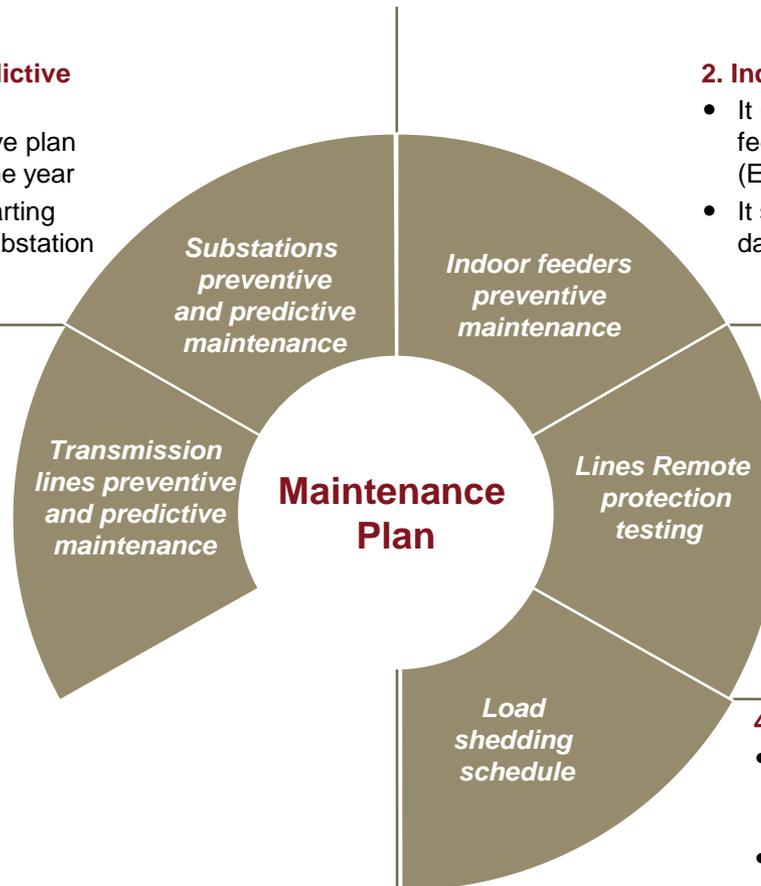
- It includes predictive and preventive plan for 175 line (220 & 400 kV) in 2 regions (Eastern & Western) in the year
- It includes cleaning plan for 154 lines (220 kV) in 2 regions (Eastern & Western) in the year
- It sets the maintenance period (starting date and the end date) for each line

3. Lines remote protection schedule

- It includes preventive plan for 108 high voltage lines in 2 regions (Eastern & Western) in the year
- It sets the maintenance period (starting date and the end date) for each substation

4. Load shedding testing schedule

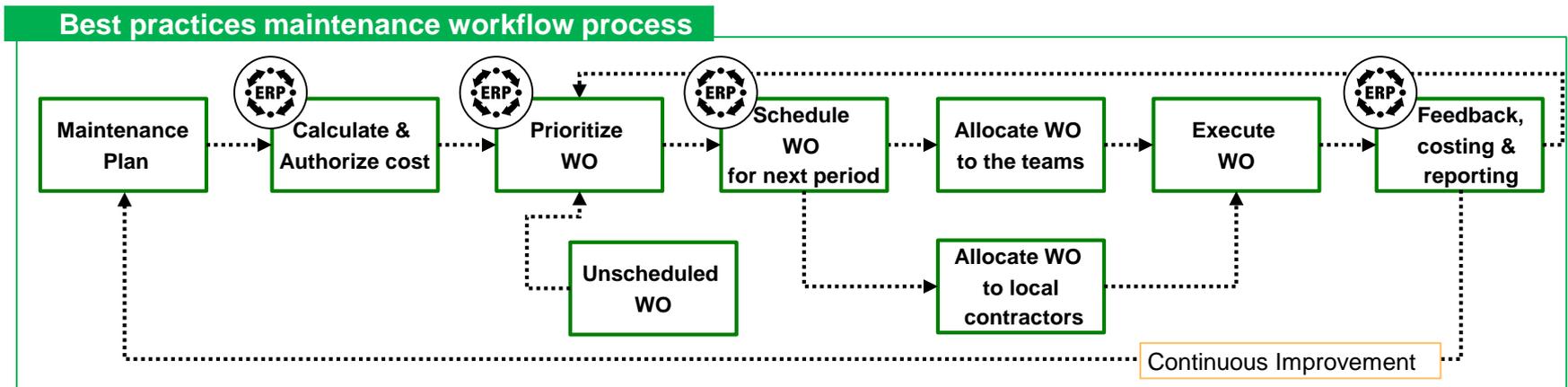
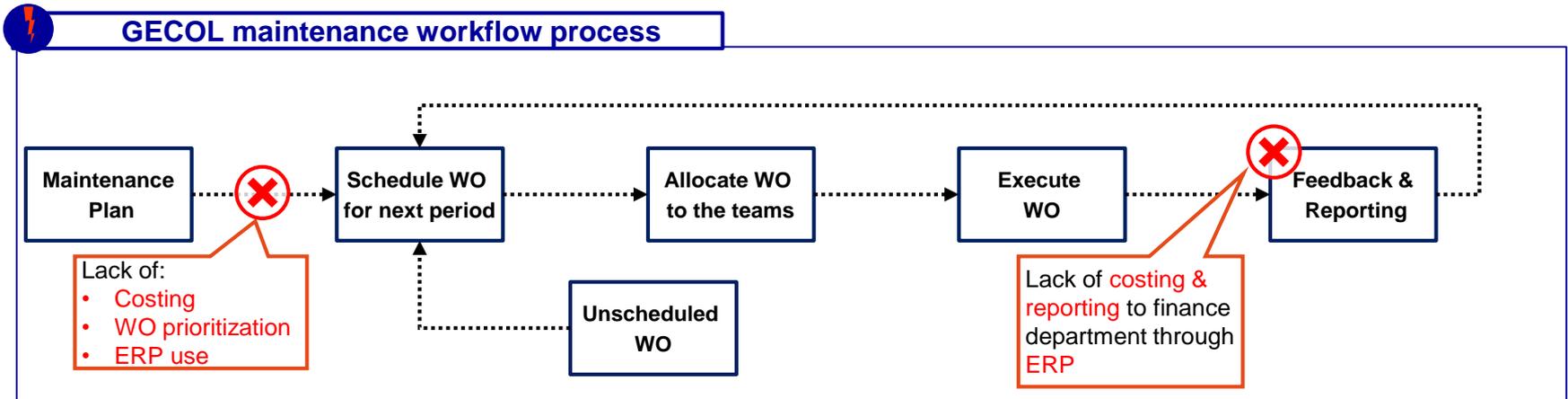
- It includes preventive plan for 63 substations in 12 areas in the 4 quarters
- It sets the maintenance period (starting date and the end date) for each substation



Source: Transmission department-2017 Maintenance plan; PWC-Process mapping & identification gaps of staff skills and performance

Lack of costing, WO prioritization and ERP use have been identified as the most compelling issues of O&M practices

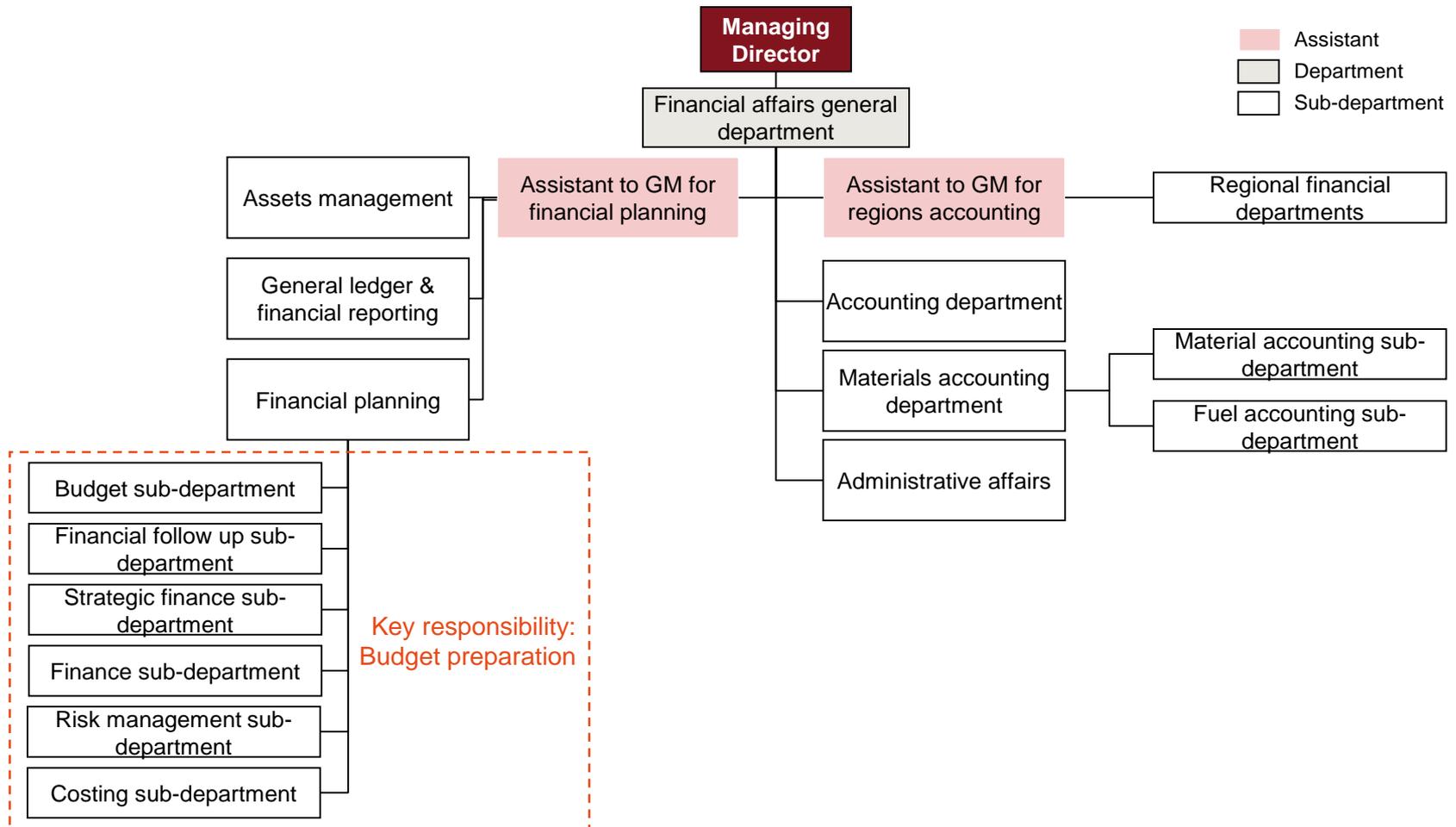
Benchmark of existing vs. best practice workflow



Source: PWC-Process mapping & identification gaps of staff skills and performance; Strategy & analysis

The OPEX budgeting process was mapped within the financial affairs department

Financial affairs department structure (2017)



Source: Latest up-date of GECOL company organization chart 2015 (June 2017); PWC-Process mapping & identification gaps of staff skills and performance

The OPEX budget today is split in 7 categories dealing with expenses related to operations and small investments

OPEX budget categories

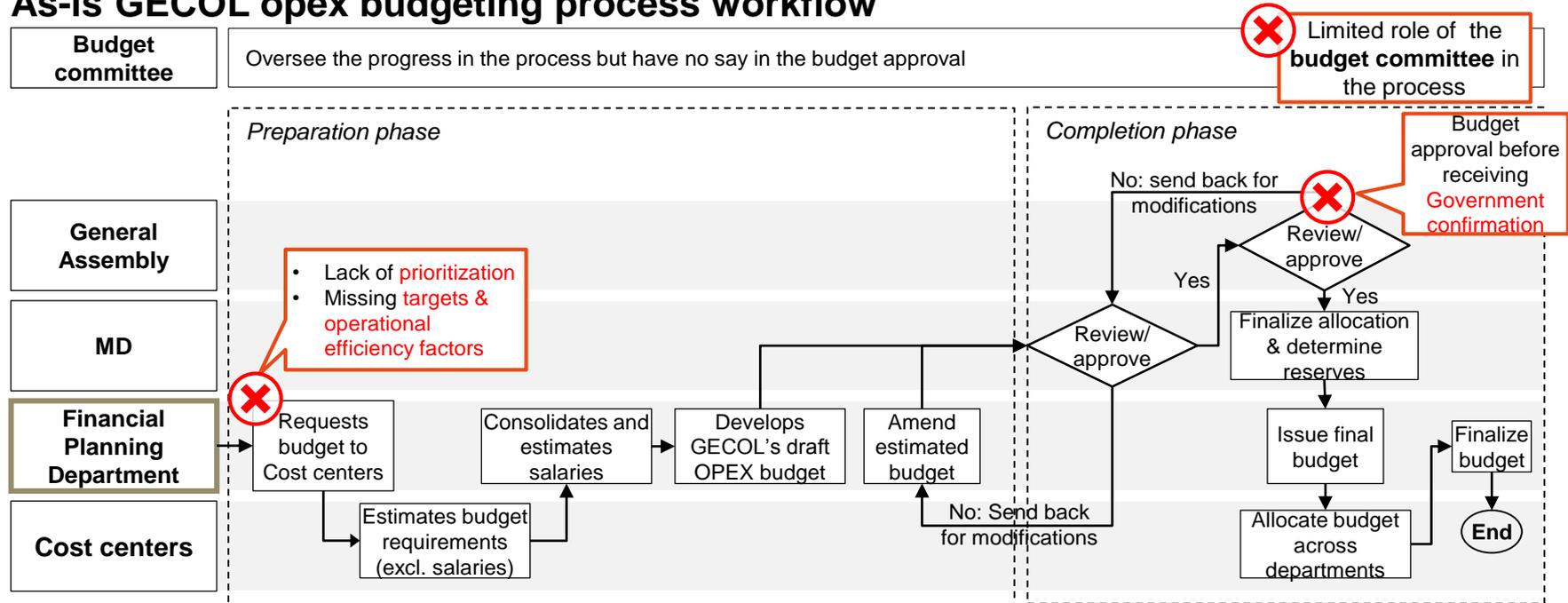
OPEX budget						
Categories						
I	II	III	IV	V	VI	VII
Salaries	Fuel	Material & spare parts	Maintenance	Other services	Financial expenses & power purchases	Small investments ¹
<ul style="list-style-type: none"> • Basic Salaries • Benefits • Overtime • Social security 	<ul style="list-style-type: none"> • Heavy/Light fuel • Natural gas • Lubricants 	<ul style="list-style-type: none"> • Chemicals • Spare parts for generation/transmission/distribution stations • Spare parts for vehicles and cars • Spare parts for street lighting • Fuel and oil for vehicles and cars 	<ul style="list-style-type: none"> • Buildings maintenance services • Vehicles and cars maintenance services 	<ul style="list-style-type: none"> • Travel expenses • Lodging allowances • Ports and airport expenses 	<ul style="list-style-type: none"> • Customs, maritime expenses • Bank expenses • Power purchase 	<ul style="list-style-type: none"> • Cars and vehicles • IT equipment • Trainings

1) Small capital expenditures that require investment within the annual budgeting period

Source: PWC-Process mapping & identification gaps of staff skills and performance; Strategy& analysis

Key issues identified in the OPEX budget process are items ranking, target setting and the limited role of the committee

As-is GECOL opex budgeting process workflow

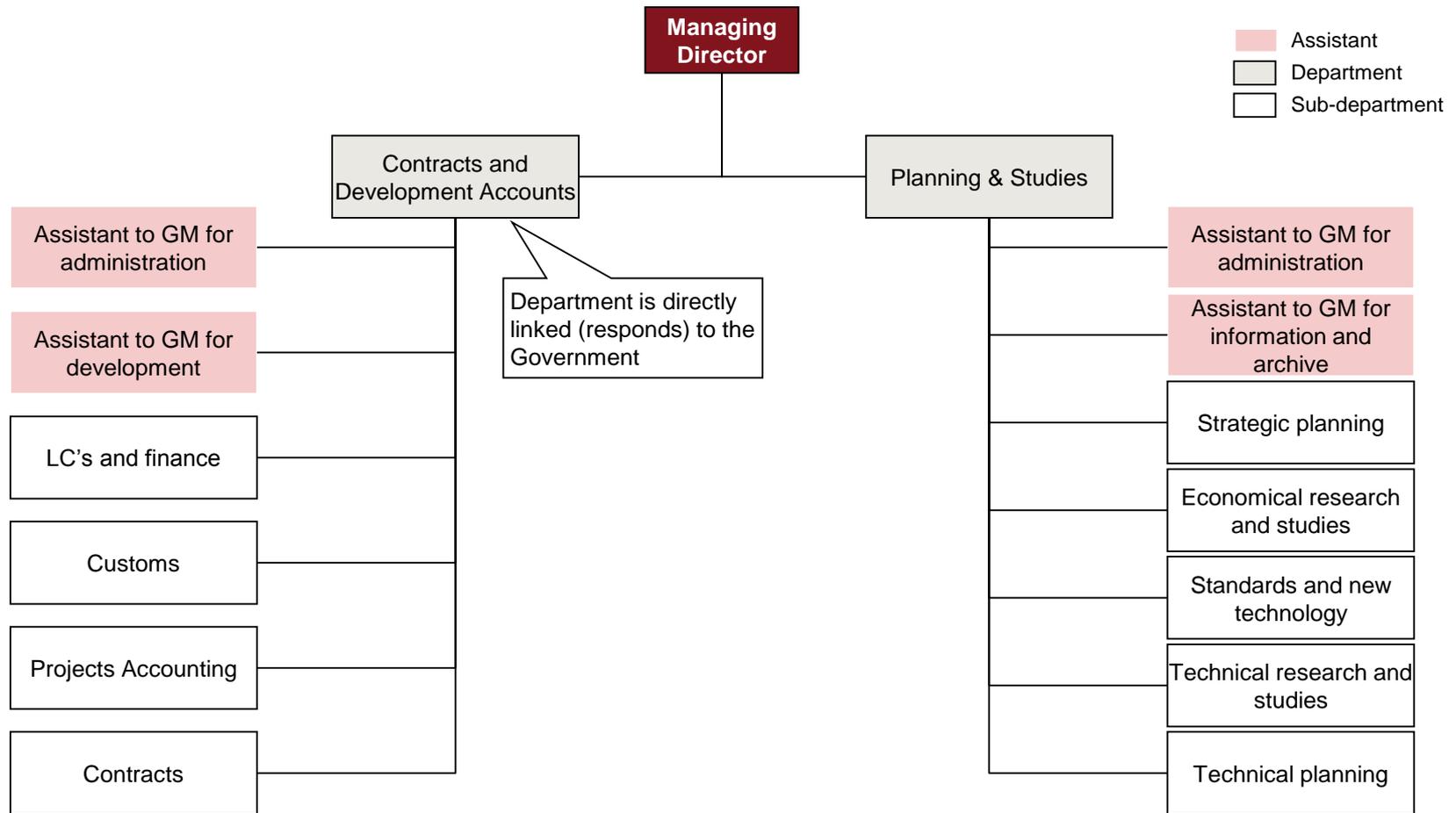


- Other identified issues**
- Lengthy and manual process (using excel and not ERP)** - The opex budget is compiled **using Excel** and does not use GECOL ERP system
- Organizational coordination complexity** - The finance departments in each area increased from 7 in 2010 to 15 in 2017 creating coordination complexity
- Challenging budget follow up** - Budgets are separated for the areas making follow up challenging and resulting in diseconomies of scale and increase in costs
- Lack of transparency & accountability** - GECOL budgeting process lacks transparency between the different departments and accountability of budgeting execution

Source: PWC-Process mapping & identification gaps of staff skills and performance; Strategy& analysis

The CAPEX budgeting process was mapped with the Contracts & Development and Planning Studies departments

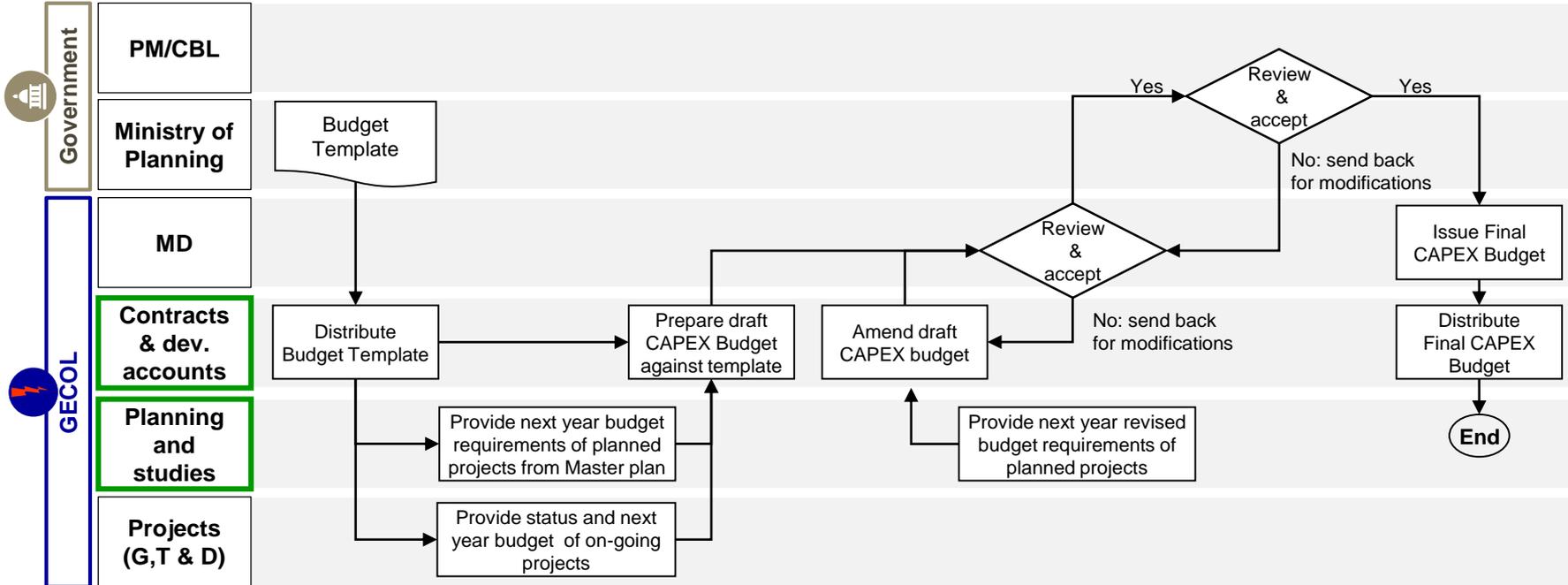
Contracts and development and Planning studies department structure (2017)



Source: PWC-Process mapping & identification gaps of staff skills and performance; Strategy & analysis

The issues related to the CAPEX process is the limited control over sums and priorities of GECOL

As-is capex budgeting workflow process



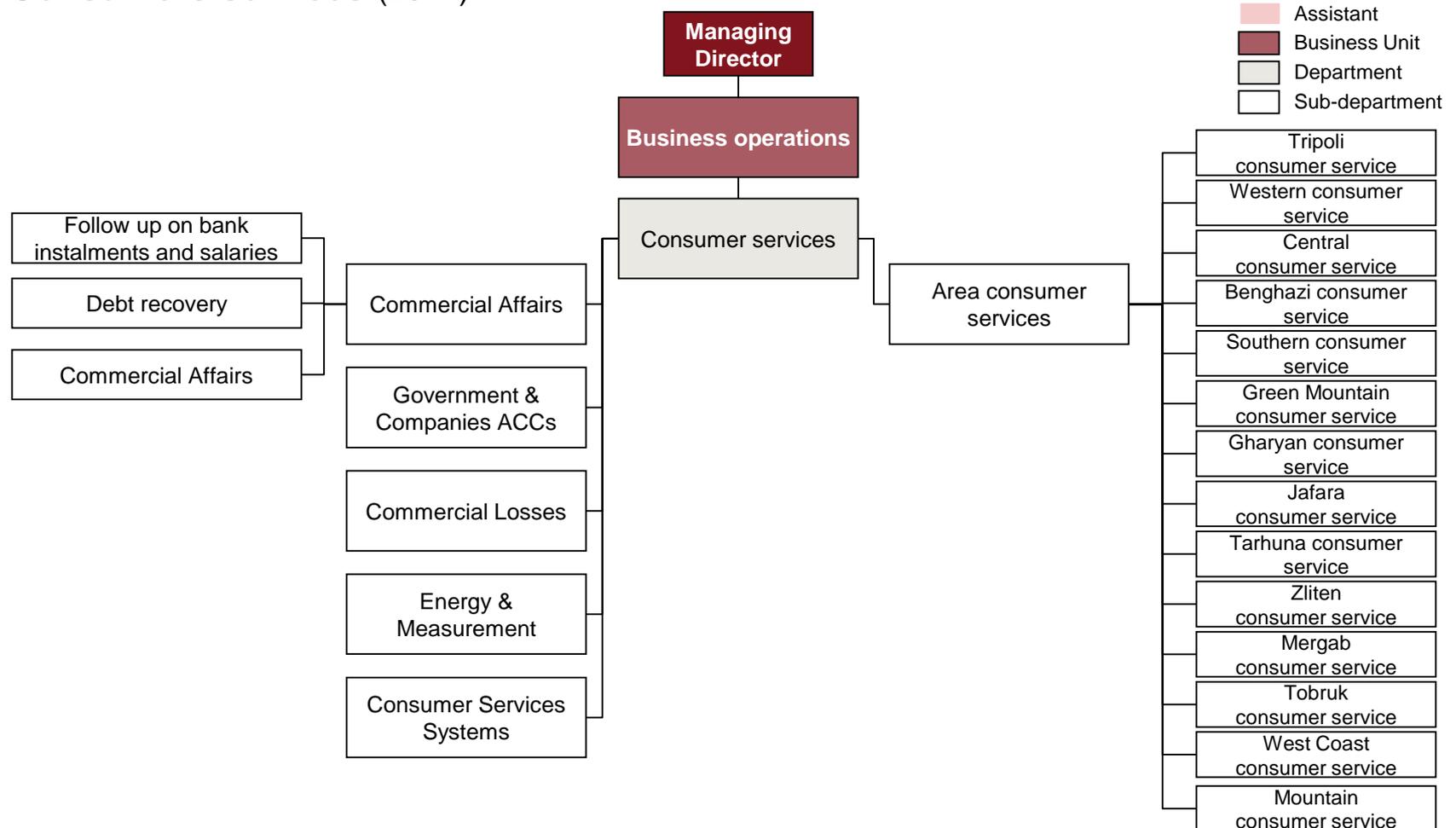
Identified issues

- Limited power over setting priorities in the budget allocation process
- No control over **Development Projects Budget** from GECOL
- Difficulties in budget estimation due to **long lead time** of infrastructure projects
- Delays in budget finalization

Source: PWC-Process mapping & identification gaps of staff skills and performance; Strategy & analysis

The invoicing and collection processes were mapped within the Consumers services department

Consumers services (2017)



Source: Latest up-date of GECOL company organization chart 2015 (June 2017); PWC-Process mapping & identification gaps of staff skills and performance

GECOL meter-to-invoice is today highly dependent on manual work of meter readers

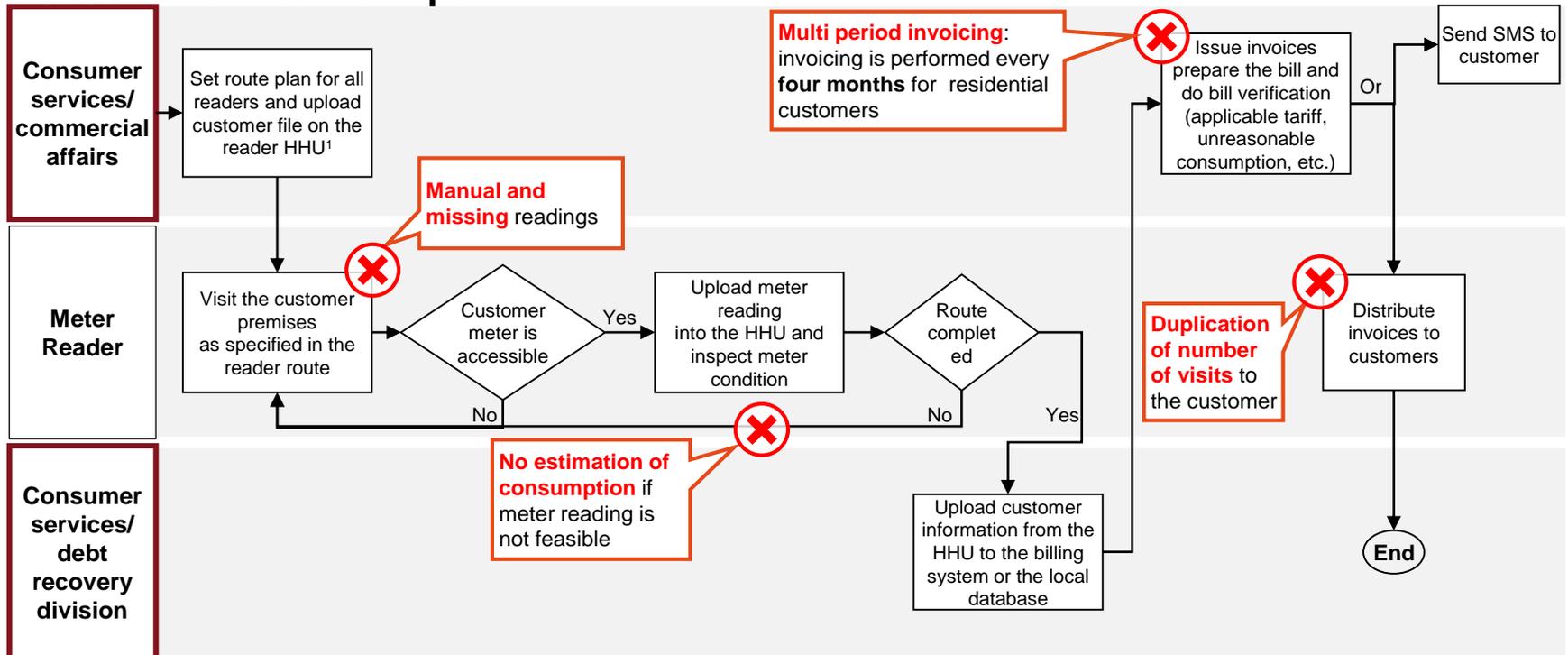
As-is meter-to-invoice process

Process	Process step/activity	Description
Meter reading Process	Route plan	<ul style="list-style-type: none"> • Metering department sets a route plan for all meter readers defining the areas that they need to visit and the time plan • The plan is installed on a Hand Held Unit (HHU)
	Meter reading and inspection	<ul style="list-style-type: none"> • The meter readers will conduct a visit to all meters assigned to them and will get the reading of the meters on the handheld system • GECOL doesn't estimate the consumption of any missing readings • Meter readers will also inspect the meters and report back whether any visible manipulation to the meter was made
	Export data	<ul style="list-style-type: none"> • Once back in the headquarters (or branch), customer information will be uploaded to the billing system or the local database by the debt recovery division
	Generate invoice	<ul style="list-style-type: none"> • Billing department will prepare the bill and do bill verification (applicable tariff, unreasonable consumption, etc.) • Generate bill • Update AR
Invoicing Process	Invoice delivery	<ul style="list-style-type: none"> • Meter readers will visit again the customers to deliver the invoice, also it can be delivered by email and soon by SMS
	Time frame	<ul style="list-style-type: none"> • Quarterly for residential customers • Monthly for others (Commercial, Industrial, Agricultural)

Source: PWC-Process mapping & identification gaps of staff skills and performance; Strategy& analysis

Manual readings, no estimation of consumption, duplication of visits are the key issues in this process

As-is meter-to-invoice process



Other issues identified not directly related to the process

- Lack of installation of meters**: Meters are not installed to all GECOL's customers, hence GECOL does not issue invoices to customers not having meters
- Not fully automated billing system**:
 - The system is **not fully automated** across all regions and different billing systems exist across regions
 - Lack of integration between local databases and ERP**: revenues are collected manually and the auditing employees record it in the accounting system (costly and time consuming exercise)

1) Hand Held Unit (HHU)

Source: PWC-Process mapping & identification gaps of staff skills and performance; Strategy & analysis

Customers can settle their position in several ways, each one corresponding to a different collection process

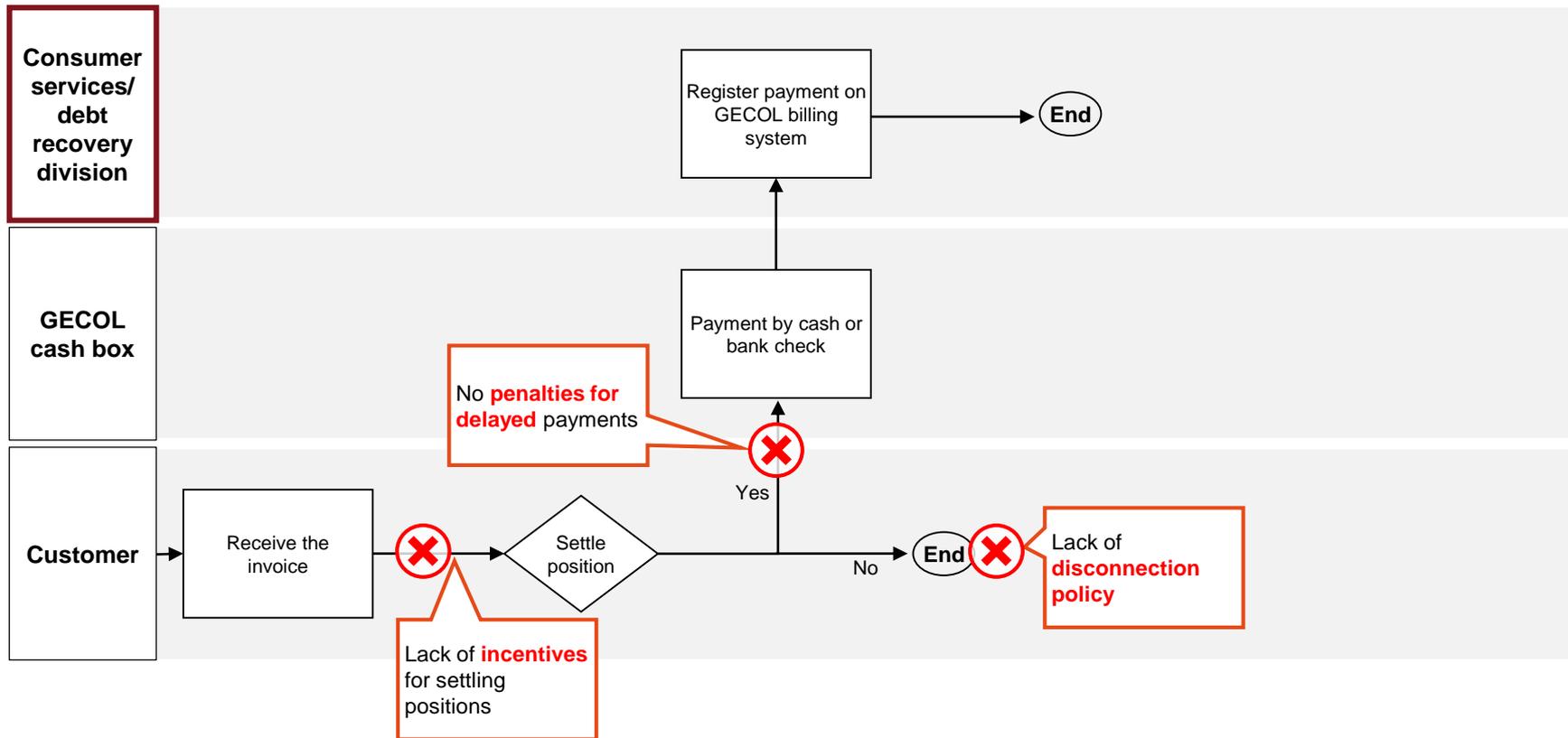
As-is customers settling facilities

Process	Process step/activity	Description	Processes flowcharts
Invoices collection methods	Cash	Customers pay the invoice in cash in GECOL's branches	
	Bank Checks	Customers pay the invoice by checks in GECOL branches	
	Preauthorize bank	Invoice amount is deducted directly from customer bank account based on a prior arrangement	
	Preauthorize salary (GECOL employee)	Invoices of GECOL employees are deducted from their salaries	
	LYD pre-paid card	Customers pay the invoice through LYD prepaid card	
	Netting	Institutions invoices are settled (netted) through the general budget	

Source: PWC-Process mapping & identification gaps of staff skills and performance; Strategy & analysis

Yet, if customers do not settle voluntarily their positions, no penalties or disconnection policy are in place

As-is collection process



Source: PWC-Process mapping & identification gaps of staff skills and performance; Strategy & analysis

Overall, we identified several issues/areas of intervention on the key processes identified

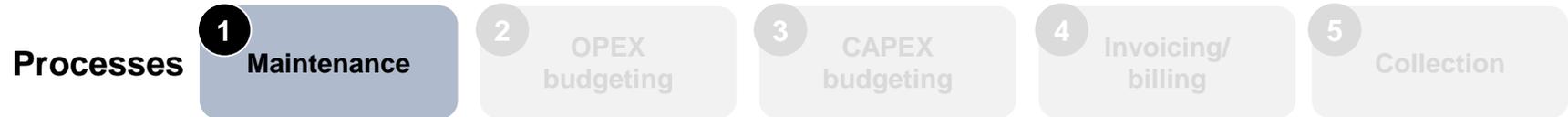
Identified issues

Processes	Organization related		IT related		
	1	2	4	5	
	Maintenance	OPEX budgeting	CAPEX budgeting	Invoicing/ billing	Collection
 Issues	Lack of ranking/ prioritization to determine order of maintenance	Lack of prioritization among OPEX items	Limited power over setting priorities in the budget allocation process	Not fully automated billing system & no integration across local billing databases and ERP	No penalties for delayed payments
	Missing cost and budgeting info	Organizational coordination complexity Missing targets & operational efficiency factors	No control over Development Projects Budget from GECOL	Lack of meters installation	Lack of disconnection policy
	Underutilized ERP functionalities	Lengthy and manual process (using excel not ERP) Challenging budget follow up Limited role of the budget committee in the process Budget approval before receiving Gov. confirmation Lack of transparency and accountability	Difficulties in budget estimation due to long lead time of infrastructure projects Delays in budget finalization	Multi-period invoicing Manual and missing meters readings No estimation of consumption if meter reading is not feasible Duplication of number of visits to the customer (for meter reading and for collection)	Lack of incentives for settling positions

Source: PWC-Process mapping & identification gaps of staff skills and performance; Strategy & analysis

We designed the TO BE maintenance process, proposing several solutions to address the issues highlighted

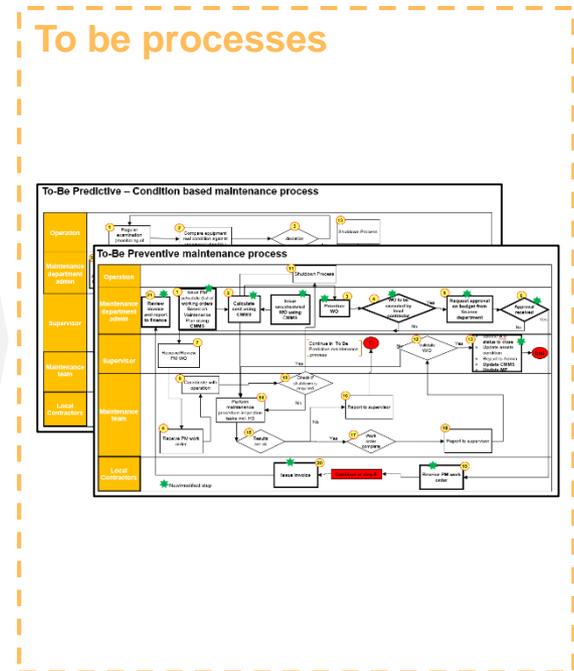
Proposed solutions





Proposed solutions

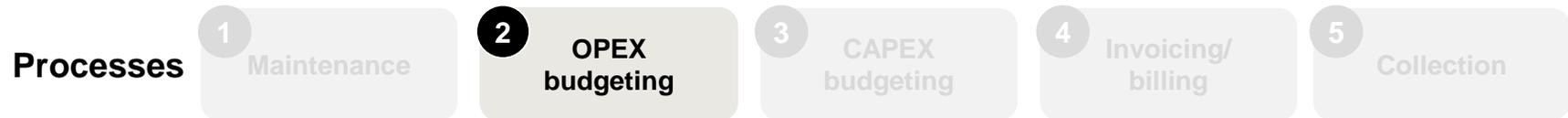
- Once received both scheduled and unscheduled work orders, **critically rank** them according to the asset failure consequence on GECOL
- Include maintenance **cost & budget information** in maintenance report
- Request **approval on budget** from finance department before sending wo to maintenance team
- **Use ERP** to:
 - Issue PM schedule (list of work orders based on maintenance plan)
 - Issue scheduled work orders
 - Compute & monitor costs
- Explore the possibility of working with **local contractors** to increase efficiency of maintenance



Source: PWC-Process mapping & identification gaps of staff skills and performance; Strategy & analysis

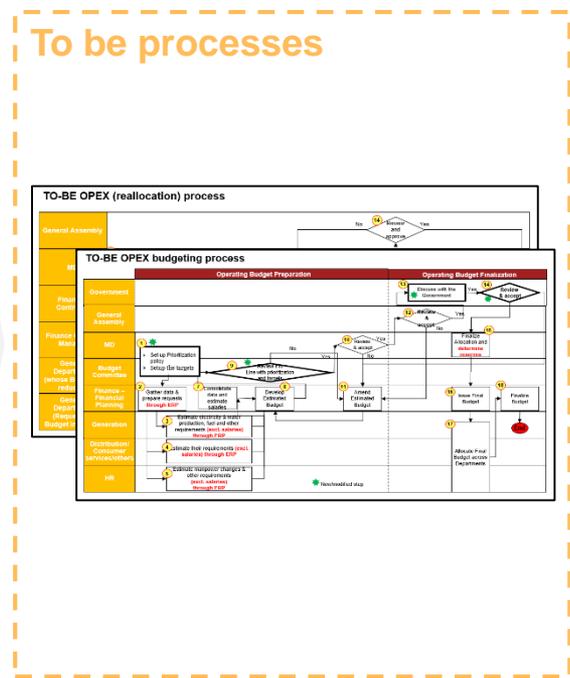
The TO BE OPEX process introduce ranking, efficiency targets, ERP us and a wider role of the budget committee

Proposed solutions



Proposed solutions

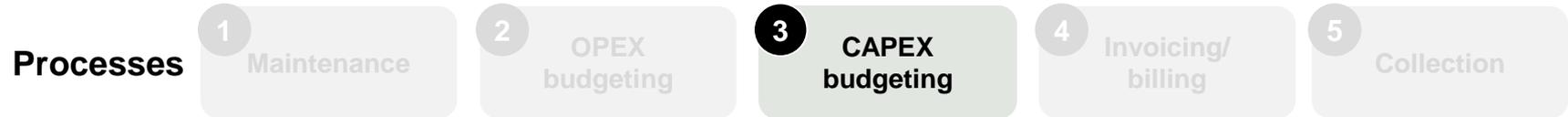
- Set up **prioritization plan** to rank different OPEX items and separate what must be done now and what can be done later
- Set **targets and efficiency factors** for OPEX expenditures
- Increase **role of budget committee**, which together with MD shall:
 - Set prioritization policy and targets
 - Enforce efficiency factors
- **Use ERP** to:
 - Gather data and prepare requests
 - Estimate electricity and water production, fuel and other requirements (Generation dept.)
 - Estimate Distribution and Consumer services requirements
 - Estimate manpower changes and other requirements
- **Discuss with the Government** before finalization



Source: PWC-Process mapping & identification gaps of staff skills and performance; Strategy& analysis

We recommended to transform the CAPEX budget into a 3-5 years plan with revisions carried out on an annual basis

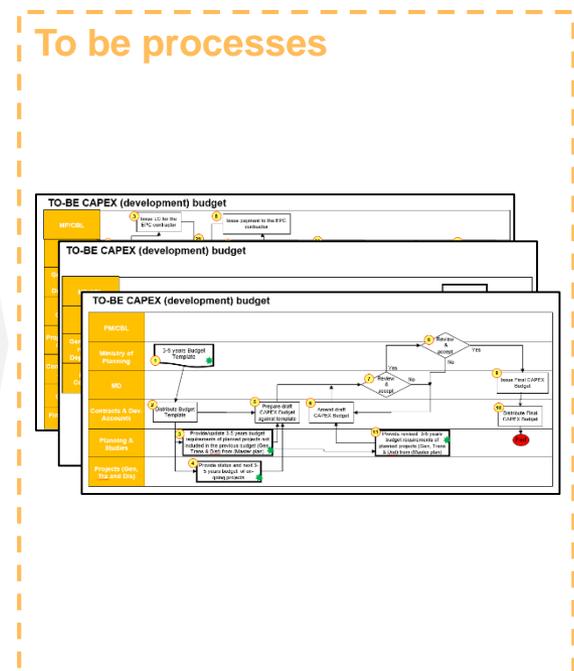
Proposed solutions





Proposed solutions

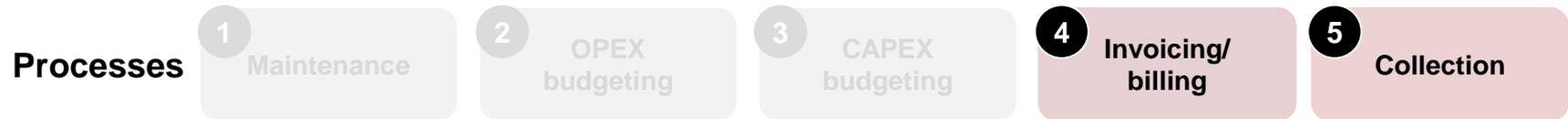
- Transform the CAPEX budget into a **3-5 year plan** approved and committed by the Government with a revision carried out on an annual basis
- Include **risk identification/assessment** and monitoring to ensure risk mitigation
- Make risk identification an **iterative process** involving the project team and other key stakeholders (i.e. MD/MP/CB)



Source: PWC-Process mapping & identification gaps of staff skills and performance; Strategy& analysis

Invoicing and collection shall include penalties for late positions settling and a new disconnection policy

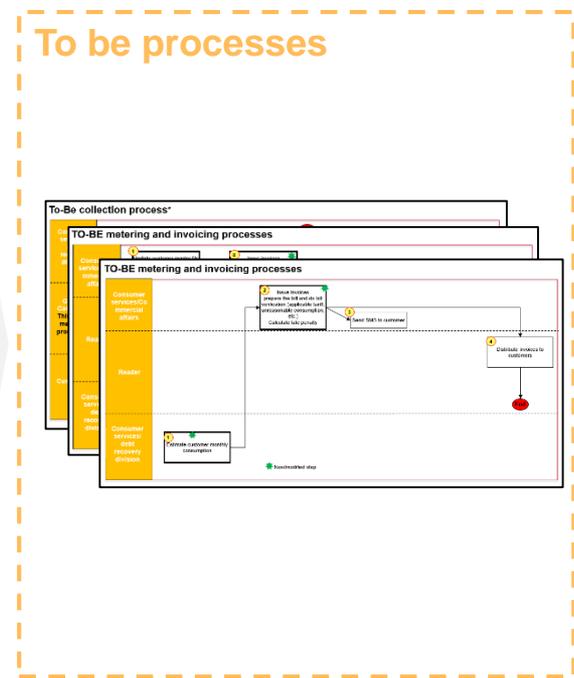
Proposed solutions





Proposed solutions

- Collect and maintain **customer master file** to include all GECOL customers connected to the grid
- **Estimate reading** based on set parameters when customer meter is not accessible
- Introduce **penalties for late positions settling**
- Introduce **disconnection policy** against non-paying customers based on specific criteria (e.g. number of unpaid invoices)
- Introduce a wider array of payment channels to make payment more agile for customers, also exploring the possibility of engaging **third party merchant processors**
- Work closely with the Government to advertise and make people aware of changes in collection policies including fees, timelines and disconnection
- Send **reminders to non paying customers** and consequently disconnect electricity in line with the disconnection policy in force



Source: PWC-Process mapping & identification gaps of staff skills and performance; Strategy& analysis

GECOL shall first test the implementation of the 5 processes analyzed at the beginning of 2018

Measures and activities

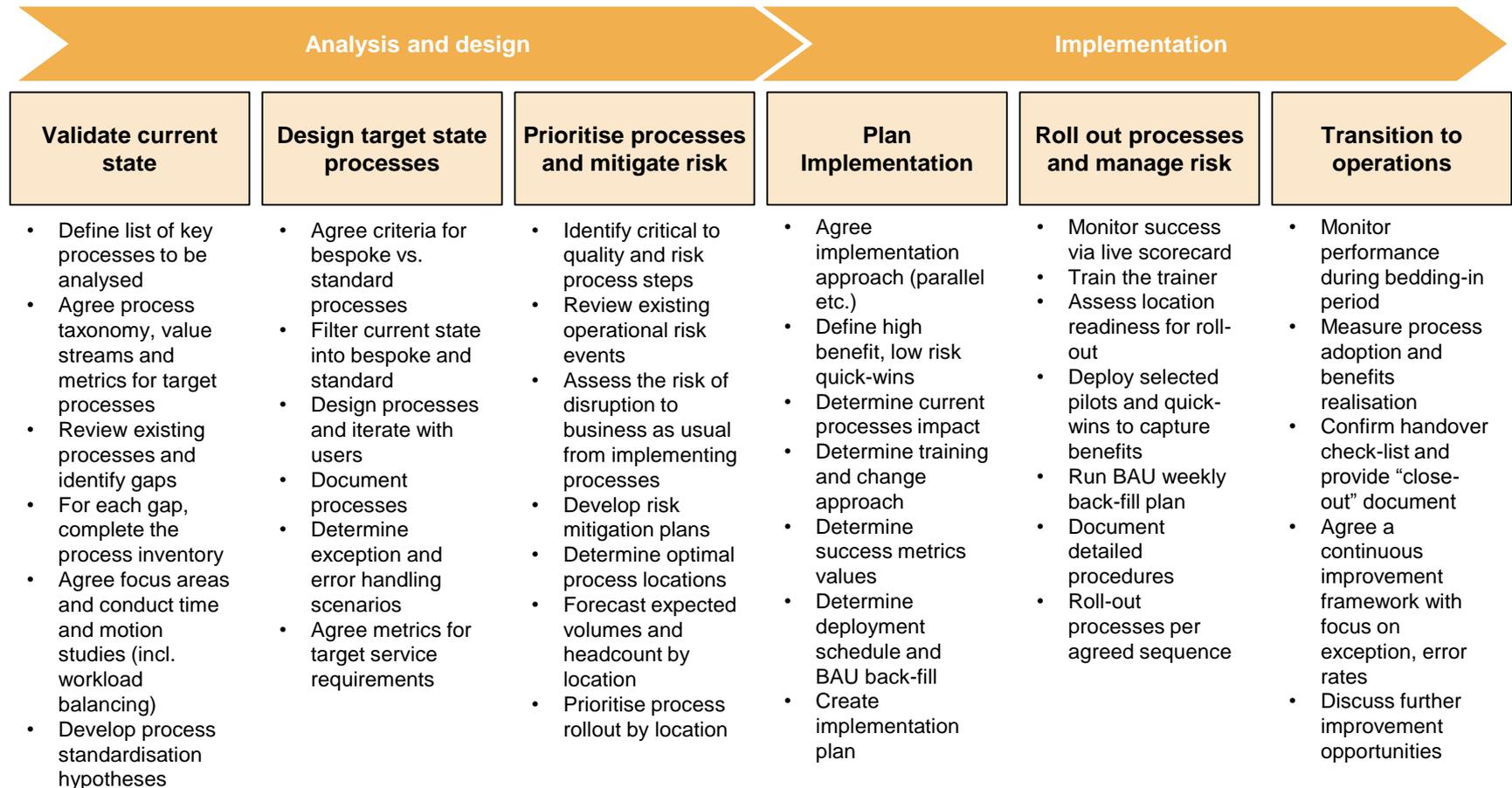
Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner
Pilot revised business processes	Test solutions identified in the design phase for the 5 analyzed processes		■						Department in charge of the process
	Assess improvement against previous performance and if any identify areas of improvement		■						Department in charge of the process
	Finalize solutions based on results of the pilot test		■						Department in charge of the process
Roll-out new processes	Roll-out processes		■	■	■	▲			Department in charge of the process

▲ Milestones

Source: PWC-Process mapping & identification gaps of staff skills and performance; Strategy& analysis

GECOL should also extend the process reengineering activities towards other departments and areas...

Business process reengineering approach



Source: PWC-Process mapping & identification gaps of staff skills and performance; Strategy& analysis

... With the target to launch the implementation of several new (prioritized) processes by 2019

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner
Validate current state	Define key processes to be analyzed		■						GECOL management & External consultants GECOL management & External consultants External consultants
	Agree value streams metrics for target processes		■						
	Conduct time and motion studies (including workload balancing)		■						
Design target state processes	Agree criteria for bespoke vs standard processes		■						GECOL management & External consultants External consultants External consultants
	Design processes and iterate with users		■						
	Document processes		▲						
Prioritize and mitigate risk	Identify prioritization criteria for rollout and review operational risk		■						External consultants External consultants
	Develop risk mitigation plans		■						
Plan implementation	Agree implementation approach and define quick wins		■						GECOL management & External consultants External consultants
	Create implementation plan		▲						
Roll-out processes and manage risk	Document detailed procedures			■					External consultants External consultants & HR Department in charge of the process Department in charge of the process
	Train the trainer			■					
	Deploy selected pilots and quick wins			■					
Transition to operations	Roll-out processes as per agreed sequence			■	■	■			Department in charge of the process Dept. in charge & External consultants
	Monitor performance during bedding-in period			■	■	■			
	Confirm handover check-list and provide closed-out documents			■	■	■			

▲ Milestones

Source: PWC-Process mapping & identification gaps of staff skills and performance; Strategy& analysis

Institutional development

Processes

Manpower

IT

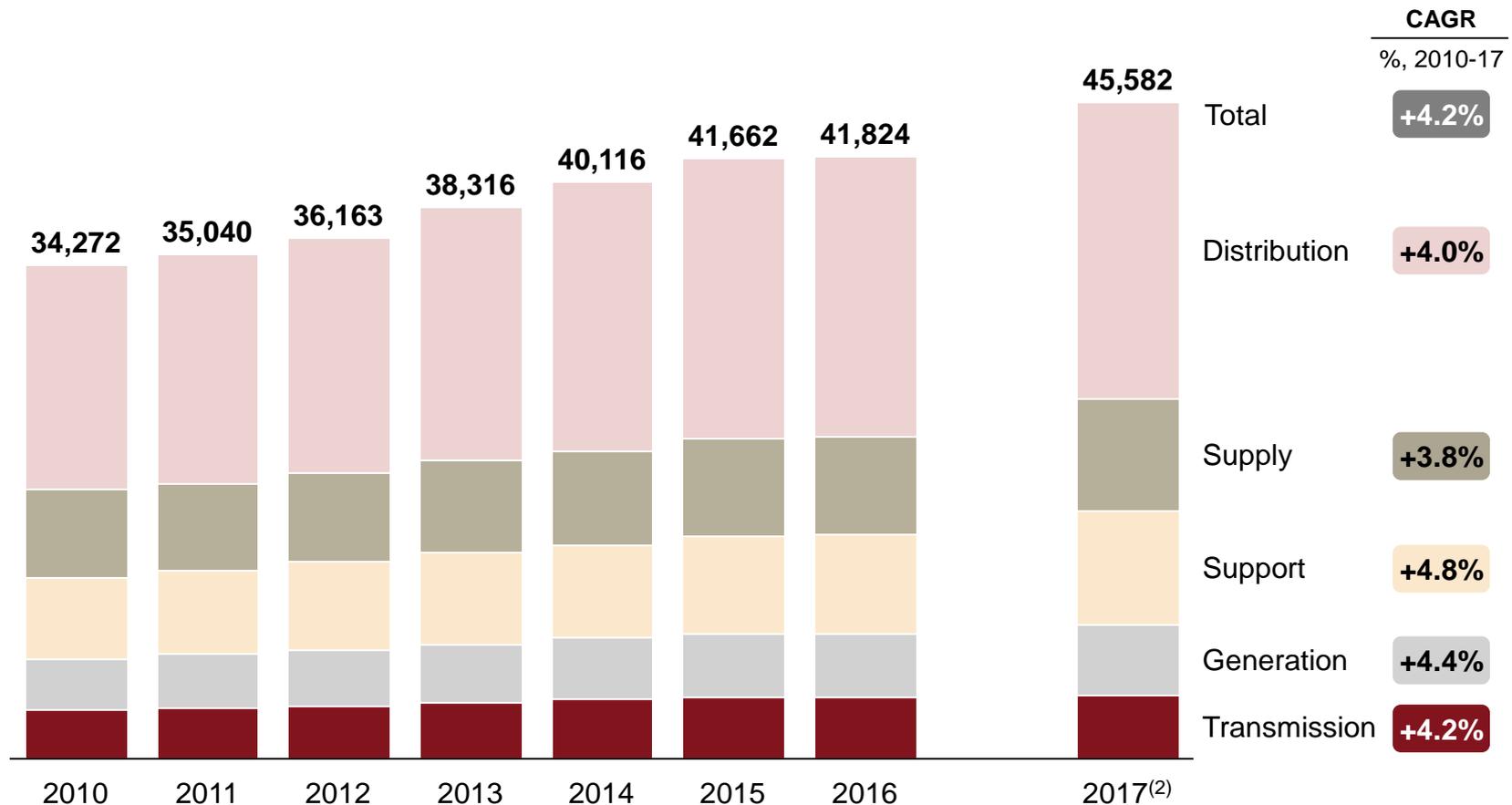
Technical performance

Financial performance

Back-up – Review of 2011-2015 GECOL 6 part strategy

Task C carried-out a manpower sizing exercise, assessing the distribution of staff and resources across GECOL ...

FTE evolution (2010-2017)¹



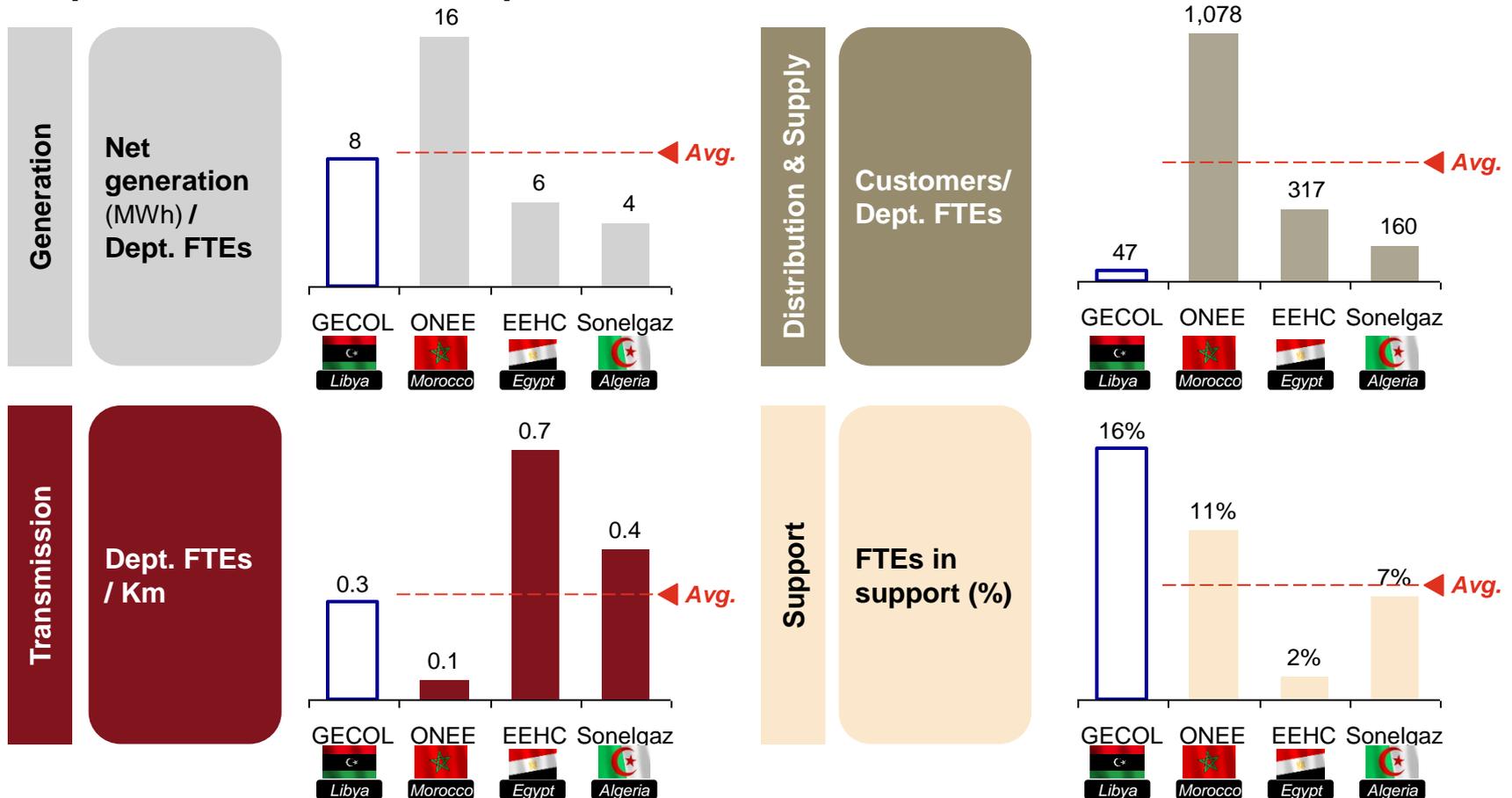
1) Different data sources: 2010-2015 data received by GECOL on 31/10/2017; 2017 data received by GECOL on 05/04/2017

2) Data excluding police and collaborators received on 05/04/2017

Source: GECOL data collection ID17; PWC-Manpower/Organizational Rationalization Review; Strategy& analysis

...and confirming the magnitude of GECOL staff unbalance, especially when compared to regional peers

Manpower benchmark / comparison



Note: Data for GECOL refers to 2015

Source: GECOL data collection ID1; GECOL data collection ID17; GECOL data collection ID24; GECOL data collection ID36; ONEE Annual Report 2016; EEHC Annual Report 2015/2016; Sonelgaz Annual Report 2016; PWC-Manpower/Organizational Rationalization Review; Strategy& analysis

The manpower and skills assessment has identified four key issues affecting GECOL

Identified manpower and skills issues

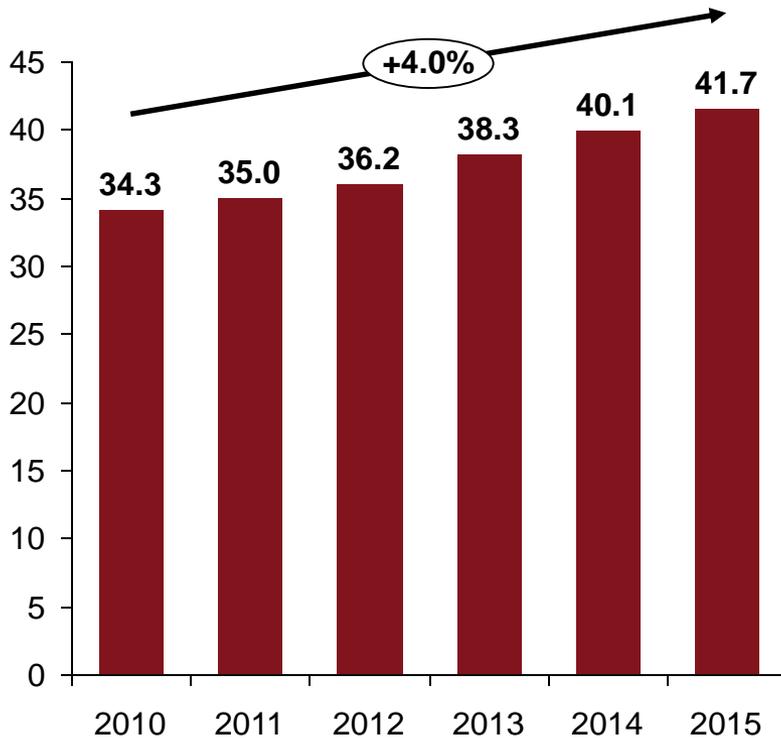
Issues	Description
 <p>Increasing staff & low productivity</p>	<ul style="list-style-type: none"> • Manpower increased annually by 4% between 2010 and 2015 • Productivity ratio is among the worst across regional peers
 <p>Skills shortage</p>	<ul style="list-style-type: none"> • Technical skill gaps identified in all business units • Succession planning issues are not addressed leading in the future to critical knowledge loss
 <p>Limited role of HR department</p>	<ul style="list-style-type: none"> • HR and organization are grouped under support services even though certain functions are corporate core • HR function influence on manpower and skill set is very limited
 <p>Lack of clear HR & training strategy</p>	<ul style="list-style-type: none"> • No clear HR strategy in place • Hiring follows no strategy and increasing manpower without a clear plan • No clear training/reskilling strategy in place

Source: PWC-Manpower/Organizational Rationalization Review; Strategy& analysis

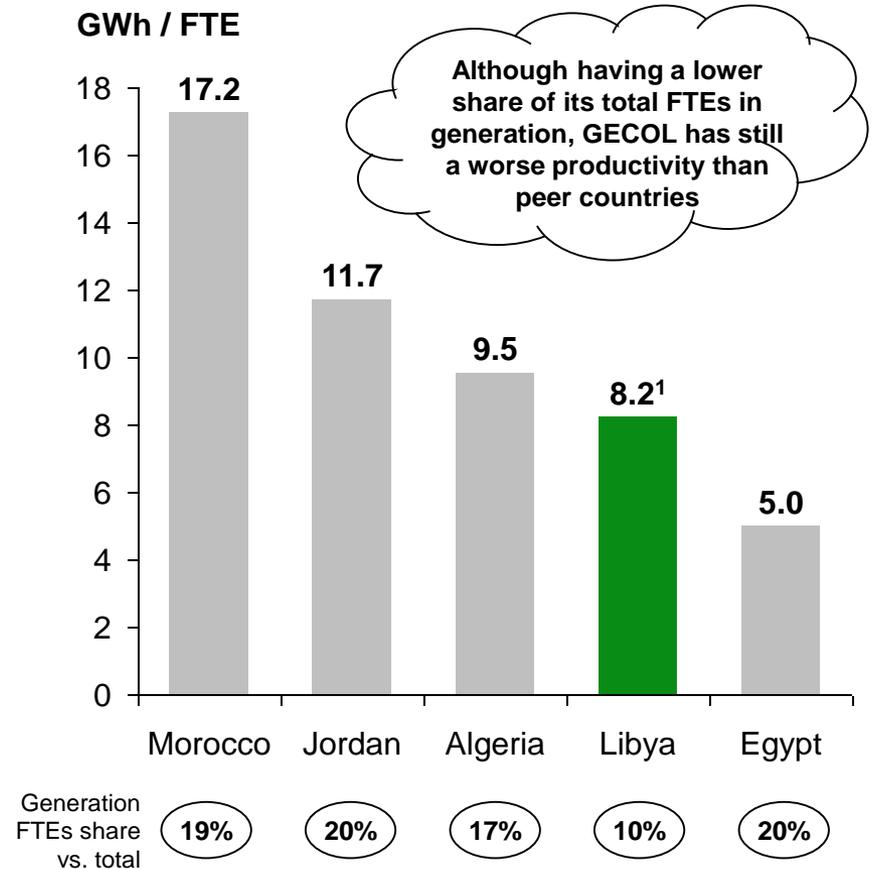


Since 2010, the number of FTEs has been constantly growing leading to a low productivity with respect to regional peers

FTEs evolution (2010-15, '000)



Productivity benchmark (2015)



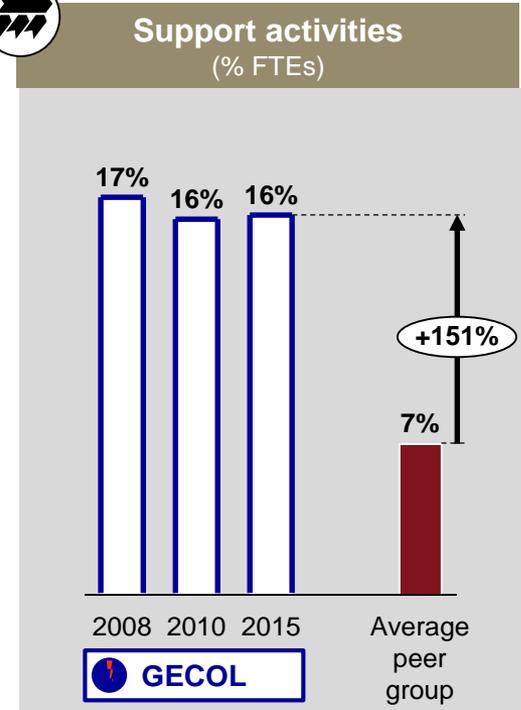
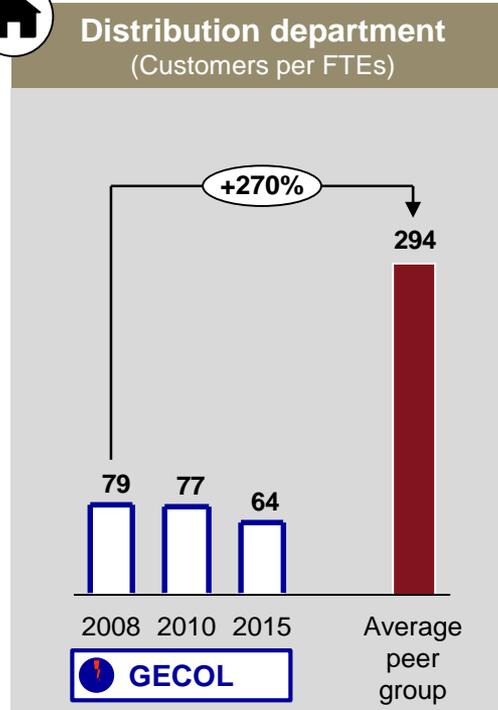
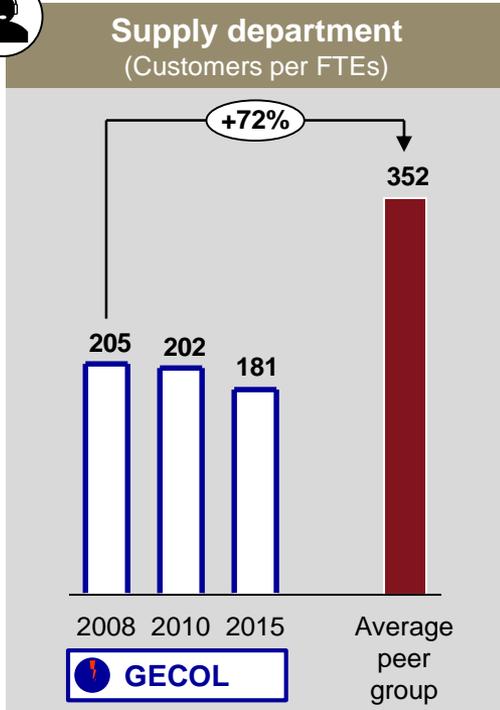
Note: includes Sonelgaz, ERC, CEGCO, SEPGCO, AES, QEPKO, ONEE-BE, Masen, and EEHC Generation Companies; 1) Updated with new data received

Source: GECOL data collection ID13, GECOL data collection ID17, Strategy & analysis



Overstaffing is especially evident in support units, distribution and supply BUs

Results of benchmarked KPIs



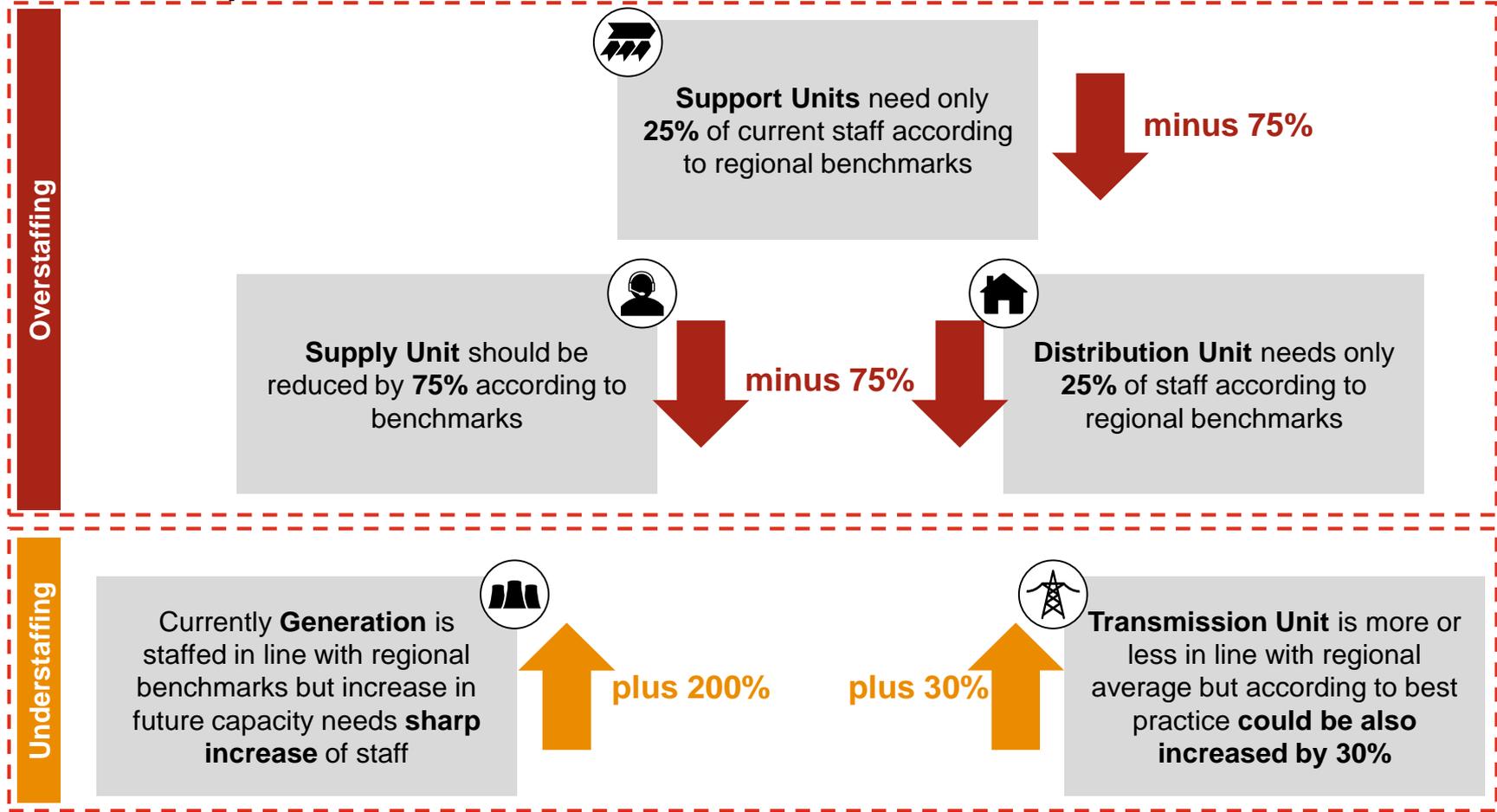
GECOL is highly overstaffed in Distribution & Supply department and it employs double the number of FTEs in support services activities with respect to the average of regional peer companies

Source: PWC-Manpower/organizational rationalization review; Strategy& analysis



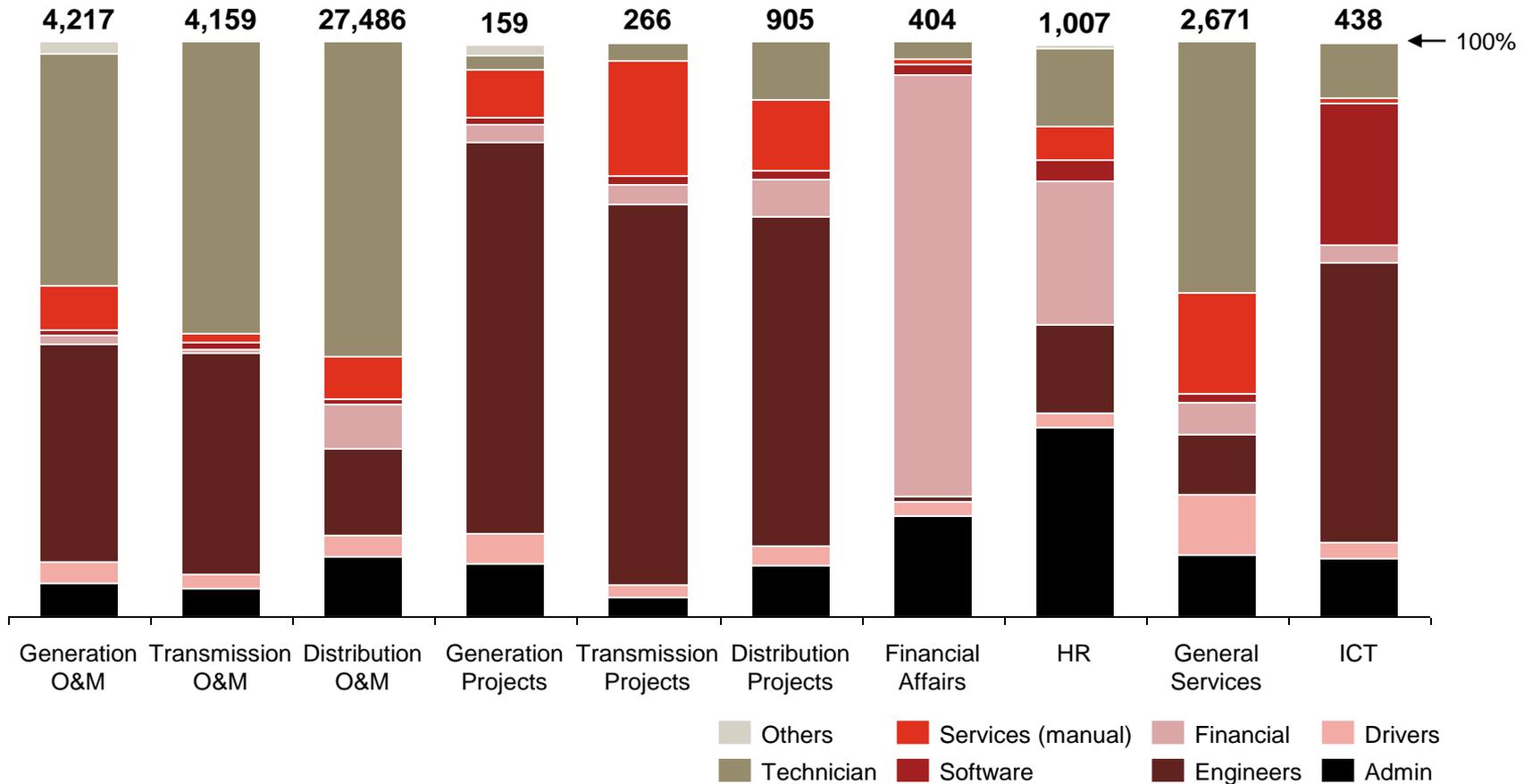
Furthermore, despite the general over-staffing, the analyses at department level has also underlined lack of personnel

GECOL manpower need assessment results



Although the number of technicians and engineers across departments might suggest a proper skills distribution...

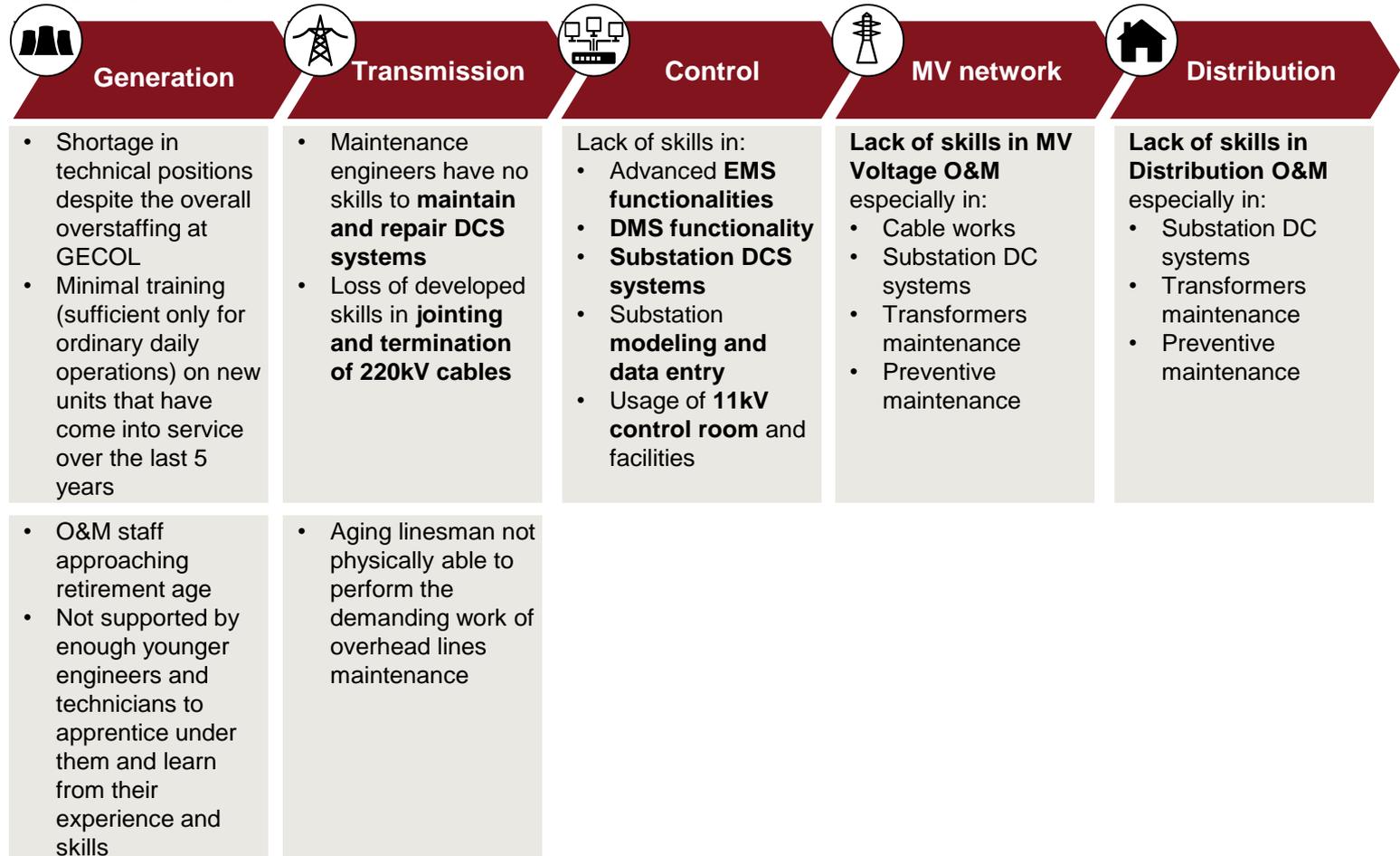
Skills distribution (2015)



Source: PWC-Manpower/Organizational Rationalization Review; Strategy& analysis

...bottom up interviews highlighted skill gaps in all departments and aging staff in generation and transmission

Evidence from interviews

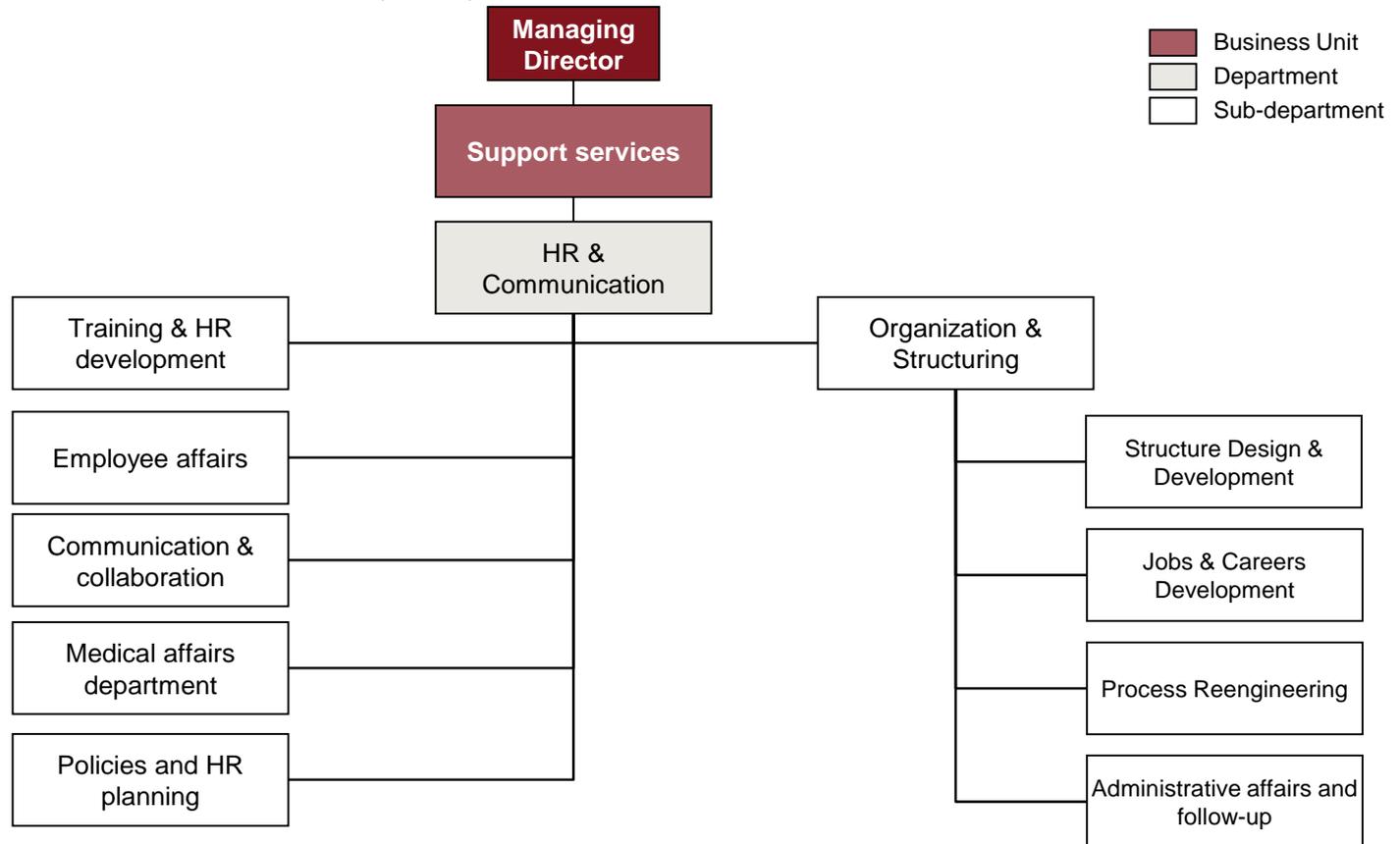


Source: PWC-Manpower/Organizational Rationalization Review; Strategy& analysis



HR and Org. role/importance is limited by their position under support services not responding directly to MD

HR & Communication structure (2017)



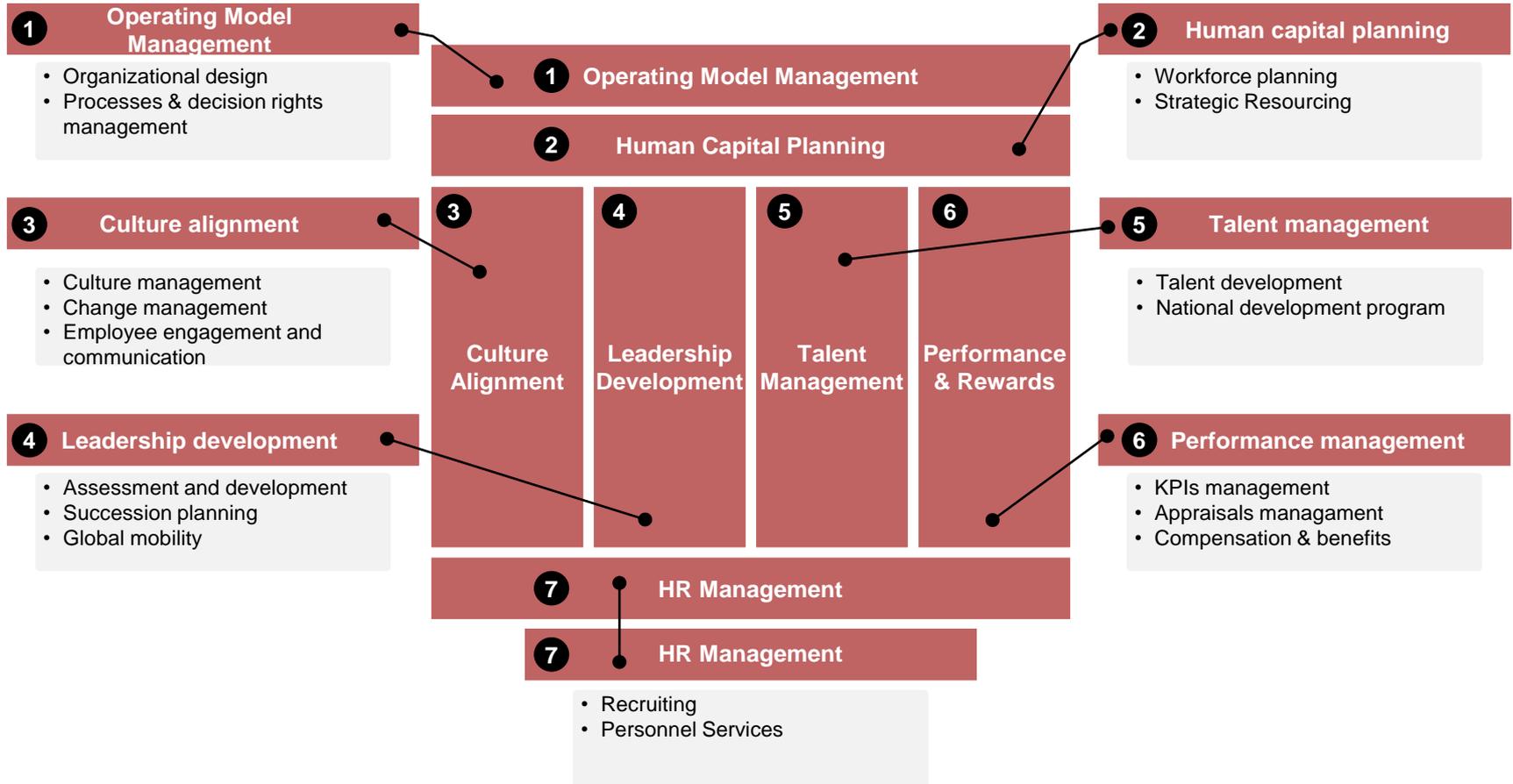
Source: Latest up-date of GECOL company organization chart 2015 (June 2017); Strategy& analysis



HR function and human capital agenda should have a corporate core importance

ILLUSTRATIVE

HC agenda pillars



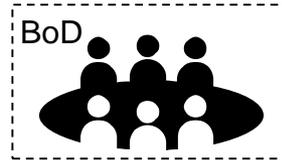
Source: Strategy& analysis



GECOL also lacks of a comprehensive HR strategy cascading from organizational business strategy and culture

HR strategy cascade

ILLUSTRATIVE



Business Strategy and Culture
What the firm wants to achieve and how

Competencies
What firm employees need to know and do

Organization
How to organize in order to achieve strategic goals

Comprehensive HR Strategy
How the firm drives and reinforces desired competencies and behaviors

Organizational capability

Individual engagement

Processes and Structures

Skills and Passion

Talent Acquisition

Learning and Development

Succession Management

Performance Management

Value Propositions

✗ Missing at GECOL

Source: Strategy& analysis



The recommendation has focused on a conservative set of actions rather than a sharp rightsizing

Recommended resizing approaches

Wave I Immediate actions

Immediate actions starting from 2018 focusing on reskilling as top priority

Re-Skilling	Reallocate	Start immediately to reassign especially technicians to other departments like the generation department
	Retrain	Leverage current resources to fill unmet needs in the generation department
	Freeze hiring	Institute a hiring freeze as more than 12% are aged below 30 and more than 40% aged below 40
	Early Retirement	Prepare an early retirement package for employees aged over 60 (2% of total FTEs)
	Start GECOL Academy	Train managers and staff professionals to be hired inside but also outside the company

Wave II Mid-term actions

Mid-term actions starting upon successful completion of immediate actions (i.e. indicatively from 2020 to be completed by 2025)

Incentivize Buyouts	Offer buyout solutions for non core businesses like Health Service, Driver, Translation etc.
Incentivize to leave	Ask employees to take voluntary lay-offs
Dismiss	Temporarily or permanently terminate employment for a group of employees especially in D&S

Source: PWC-Manpower/organizational rationalization review; Strategy& analysis



GECOL shall focus on strengthening its HR role, org. and strategy, preparing to re-balance its manpower situation...

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner
Centralize HR activities	Consolidate in HR&O department (under MD) all the HR-related core functions leaving non-core HR activities within Support Services		 HR department under MD						MD/Head of HR
	<i>Same as institutional development action plan</i>								
HR strategy development	Develop a comprehensive HR strategy including: workforce planning, learning & development, performance management, succession planning, talent acquisition								Head of HR
	Negotiate/ approve HR strategy			 HR strategy in place					BoD
Manpower rebalancing & workforce planning	Freeze hiring								Head of HR
	Reassess manpower needs for each business process		 Critical resource map						Head of HR
	Develop manpower rebalancing plan		 Manpower rebalancing plan						Head of HR
	Assess legal implications and constraints								Head of HR
	Deploy re-sizing plan								Head of HR
	Develop a structured workforce planning process driving the hiring process			 Workforce planning in place					Head of HR

▲ Targets
◆ One shot activity

Source: PWC-Manpower/organizational rationalization review; Strategy& analysis



...and in parallel will need to focus on launching a corporate-wide reskilling and training plan through targeted programs

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner
Corporate reskilling	Assess current employees capabilities and skill-set		■						HR dept.
	Define future skill needs		■						HR dept.
	Match current capabilities with future needs to identify gaps		▲						HR dept.
	Prepare & launch a training and reskilling program to fill identified gaps		▲	■	■	■			HR dept.
	Develop a general training policy		■						Head of HR
	Approve training policy		■						BoD
	Estimate training budget		■						Head of HR
	Negotiate, review and approve training budget		■						BoD
	Centralize training activities in the GECOL training academy			■	▲				HR dept.
	Open the academy to external parties					◆			HR dept.
	Set up an online platform for e-training			■					HR dept.
	Develop executive development plan for executives training		■						HR dept.
	Continuous executive and BoD training		■	■	■	■	■	■	HR dept.
	Introduction of training incentives schemes (e.g. trainee programs, talent schemes)		■	■	■	■	■	■	HR dept.
	Establishment of international exchange training programs		■	■	■	■	■	■	HR dept.

DETAILED TRAINING INITIATIVES FOR SBUs IN THE TECH. IMPROV. ACTION PLANS

▲ Targets
◆ One shot activity

Source: PWC-Manpower/organizational rationalization review; Strategy& analysis



GECOL shall also introduce a performance management and succession planning

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner
Performance management	Set up a clear performance appraisal system			▲					Head of HR
	Annually appraise performance and provide feedback			■	■	■	■	■	All departments coordinated by HR
	Link performance to pay, career development and succession planning			■	■	■	■	■	Head of HR & MD
	Launch mentoring programs (e.g. pairing between experienced employees and more junior ones) to monitor, support and coach performance improvement			■	■	■	■	■	All departments coordinated by HR
Succession planning	Define succession priorities			■					Head of HR
	Design succession program			▲					Head of HR
	Identify key positions and potential successors			■					Head of HR
	Gather performance, potential and aspiration data			■					Head of HR
	Assess and plan development needs of potential Successors for key positions			■					Head of HR
	Assess and plan development needs of the organization			■					Head of HR
	Manage development needs of potential successors for key positions			■					Head of HR

▲ Targets

Source: PWC-Manpower/organizational rationalization review; Strategy& analysis

Institutional development

Processes

Manpower

IT

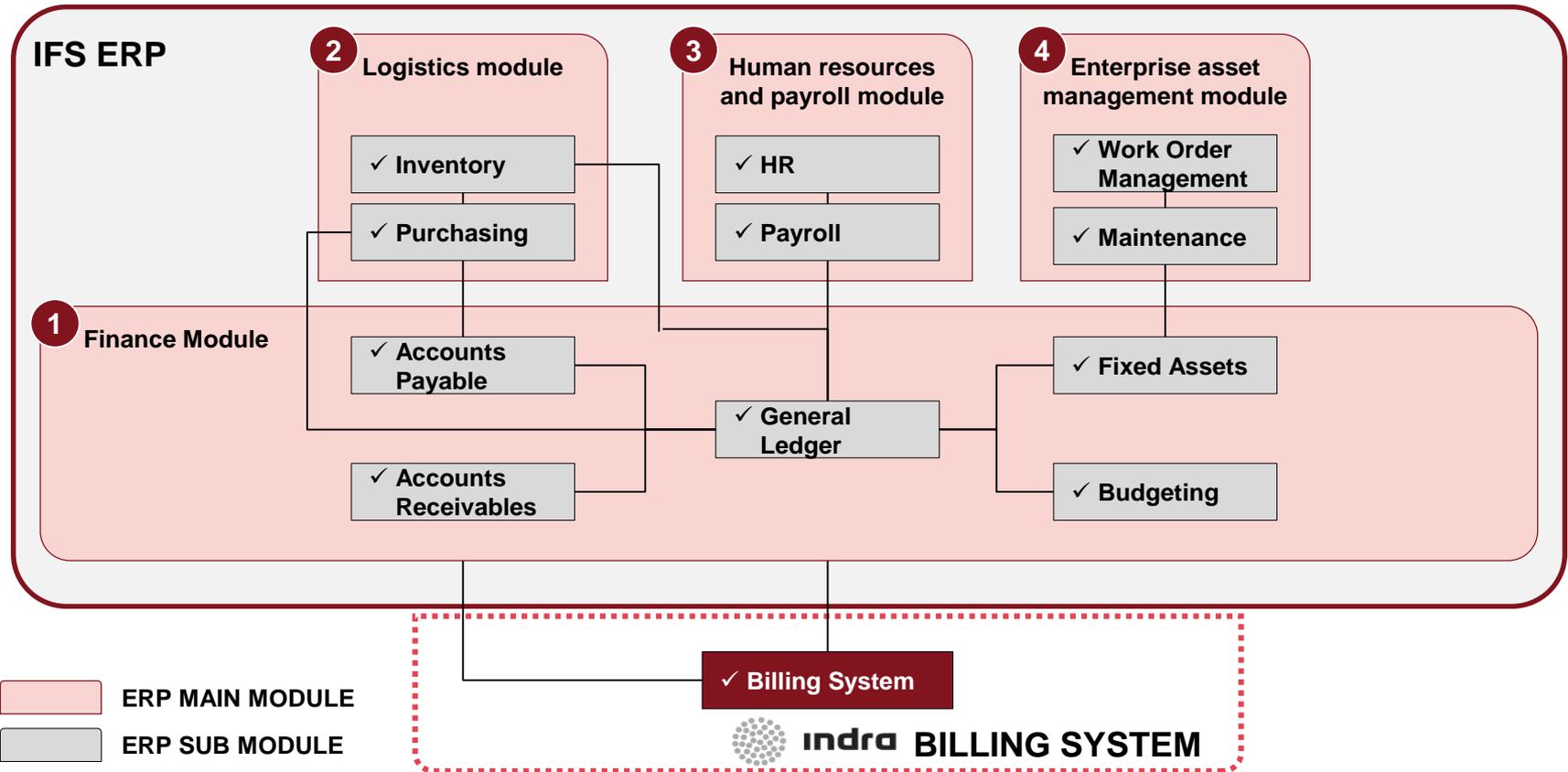
Technical performance

Financial performance

Back-up – Review of 2011-2015 GECOL 6 part strategy

In terms of IT, Task C has focused on the analysis of the functionalities of the ERP system of GECOL

Current GECOL MIS¹



Note: Project Scope of Work did not require the definition of a major IT infrastructure review but only requested the review of the ERP functionalities

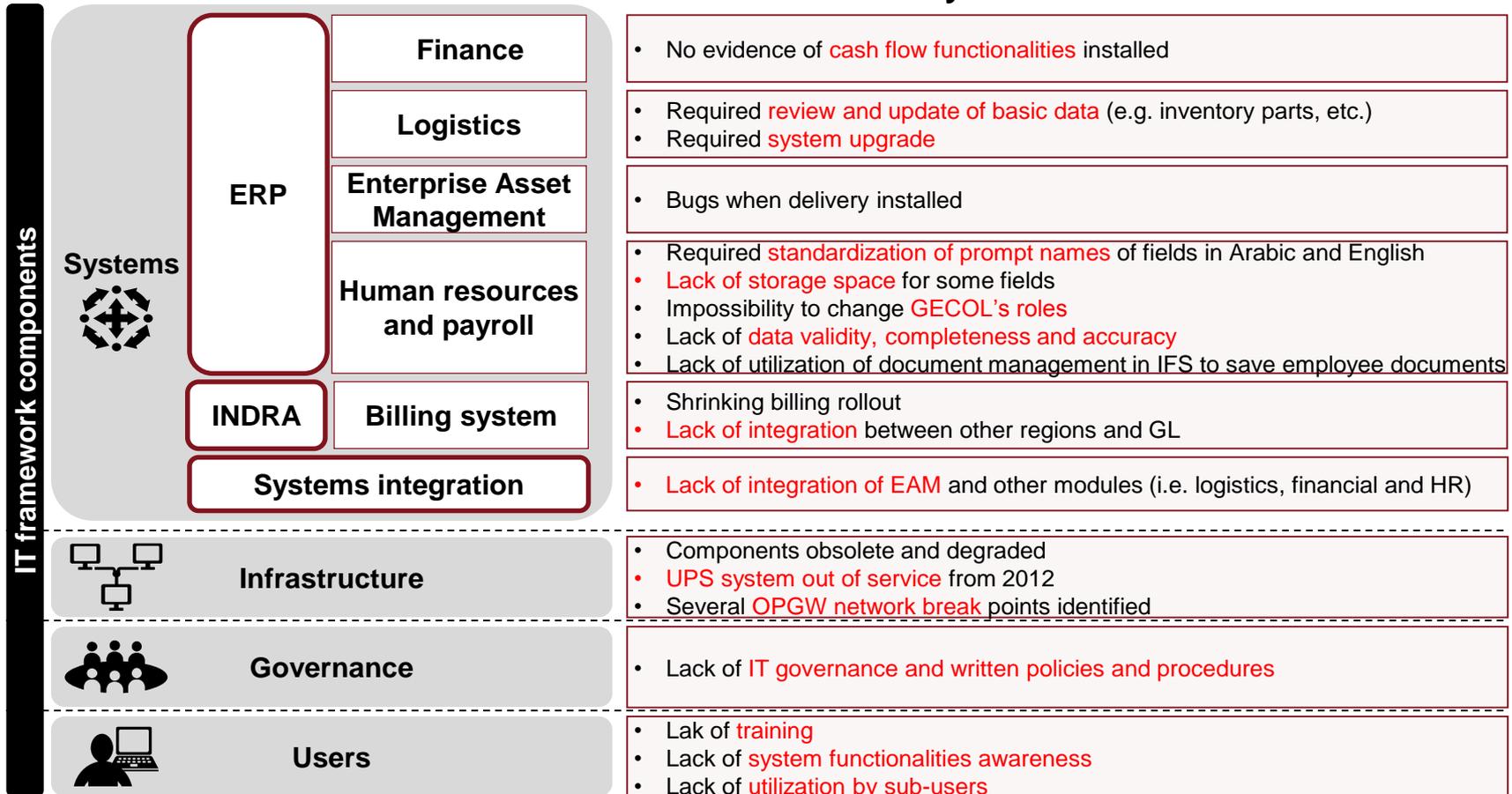
1) Management Information System

Source: PWC-ERP system review; Strategy& analysis

The analyses identified a number of issues where GECOL shall focus going forward

Summary of ICT issues identified

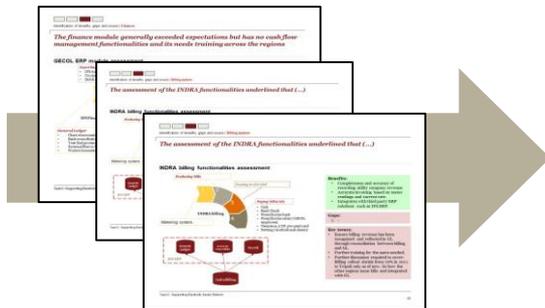
Key issues identified



Source: PWC-ERP system review; Strategy& analysis

The report recommended that GECOL maintains / upgrades its IFS/INDRA, adding (or correcting) some functionalities

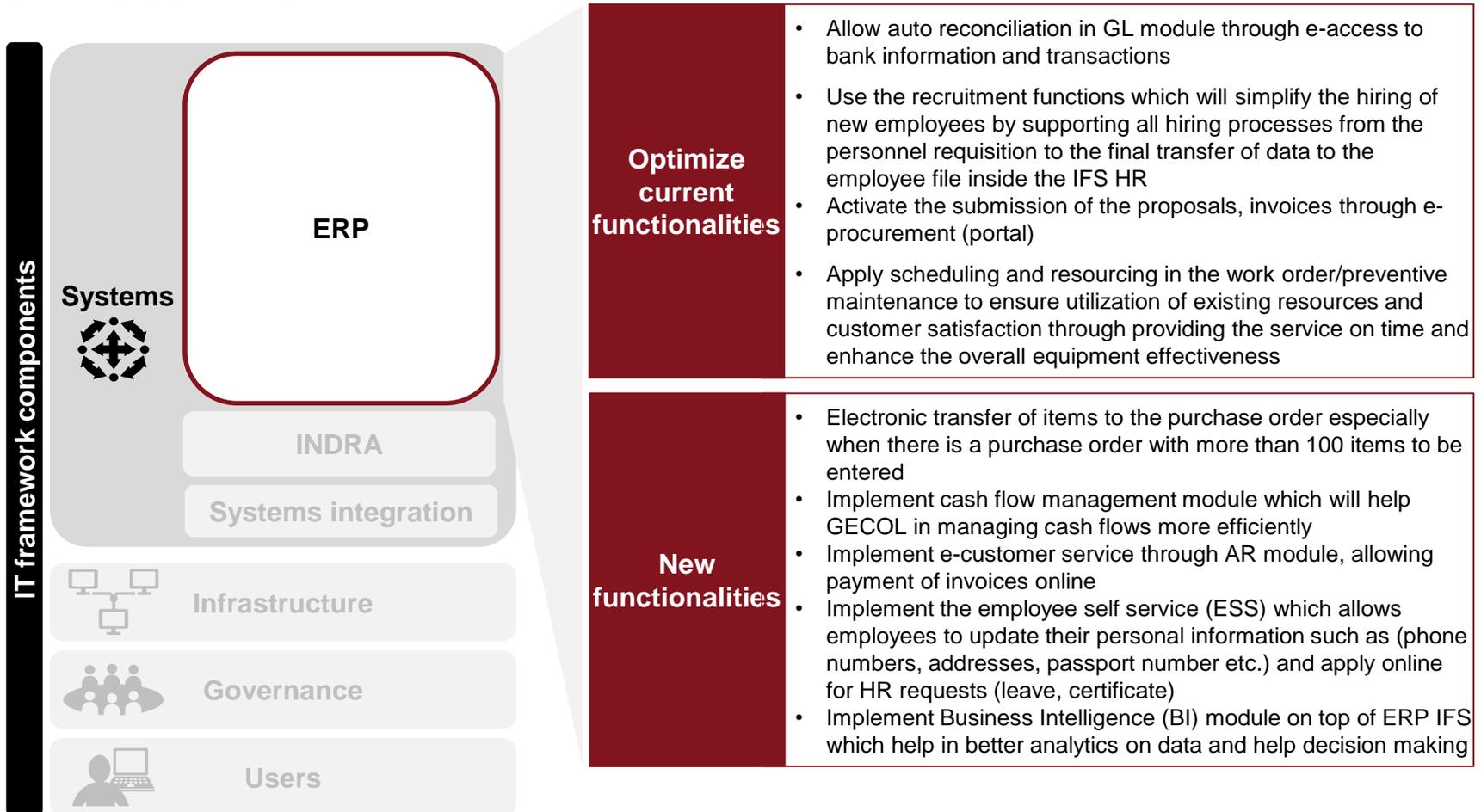
IT Recommendations overview



Our recommendation	Rationale
<ul style="list-style-type: none"> • ERP systems currently in use at GECOL represents one of the best practices in the utilities industry • Our recommendation is thus to maintain the current ERP system and to: <ol style="list-style-type: none"> 1. Upgrade current release of application IFS/INDRA 2. Add more functionalities 3. Correct and develop some functionalities and integration 	<ul style="list-style-type: none"> • The system uses oracle technology, which makes the data structure available and modifications can be implemented • The system has minimum number of bugs and functionality meets requirements to certain extent • The system can be up-graded • GECOL staff has a good knowledge of the systems and can use them • Other skills required to maintain and upgrade the system can (and shall) be obtained through partners and suppliers • The general feedback of GECOL on the different modules meets or exceeds expectations

The recommendation focused on GECOL upgrading its IFS with additional customization

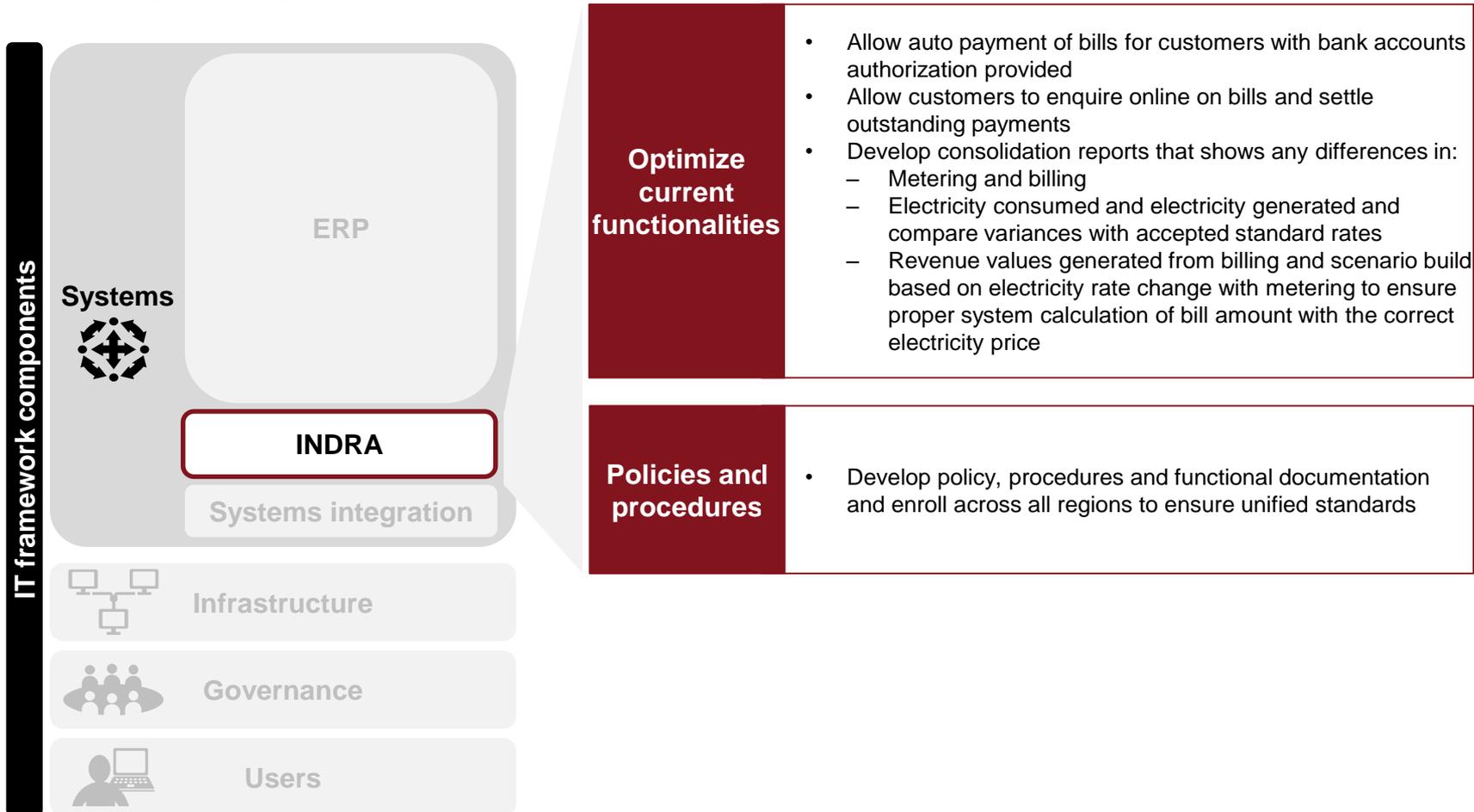
IT recommendations



Source: PWC-Manpower/organizational rationalization review; Strategy& analysis

Task C also suggested an integration between metering and revenue recognition in the billing system

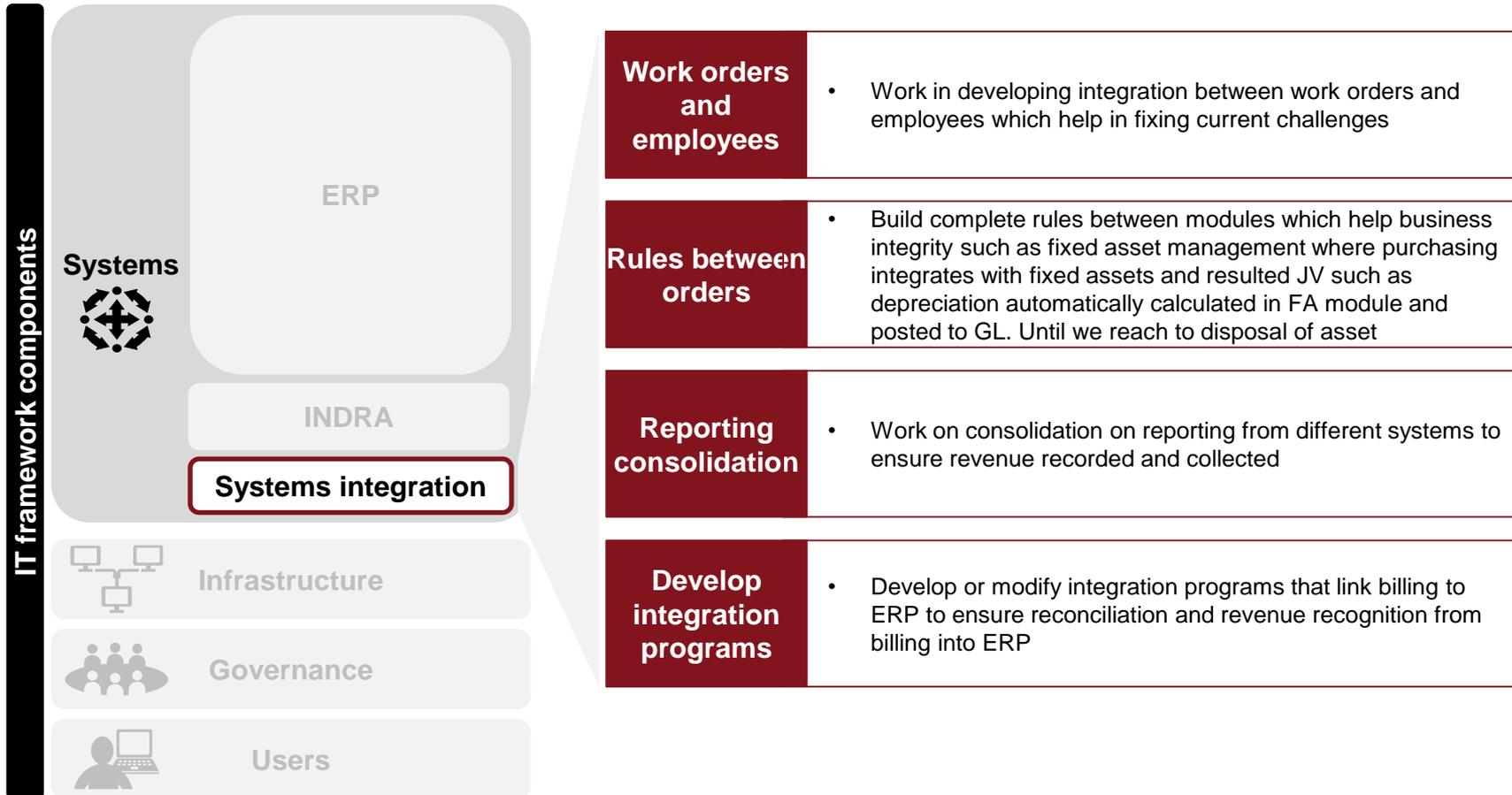
IT recommendations



Source: PWC-Manpower/organizational rationalization review; Strategy& analysis

GECOL shall also solve its integration problems by building all requirements into the system

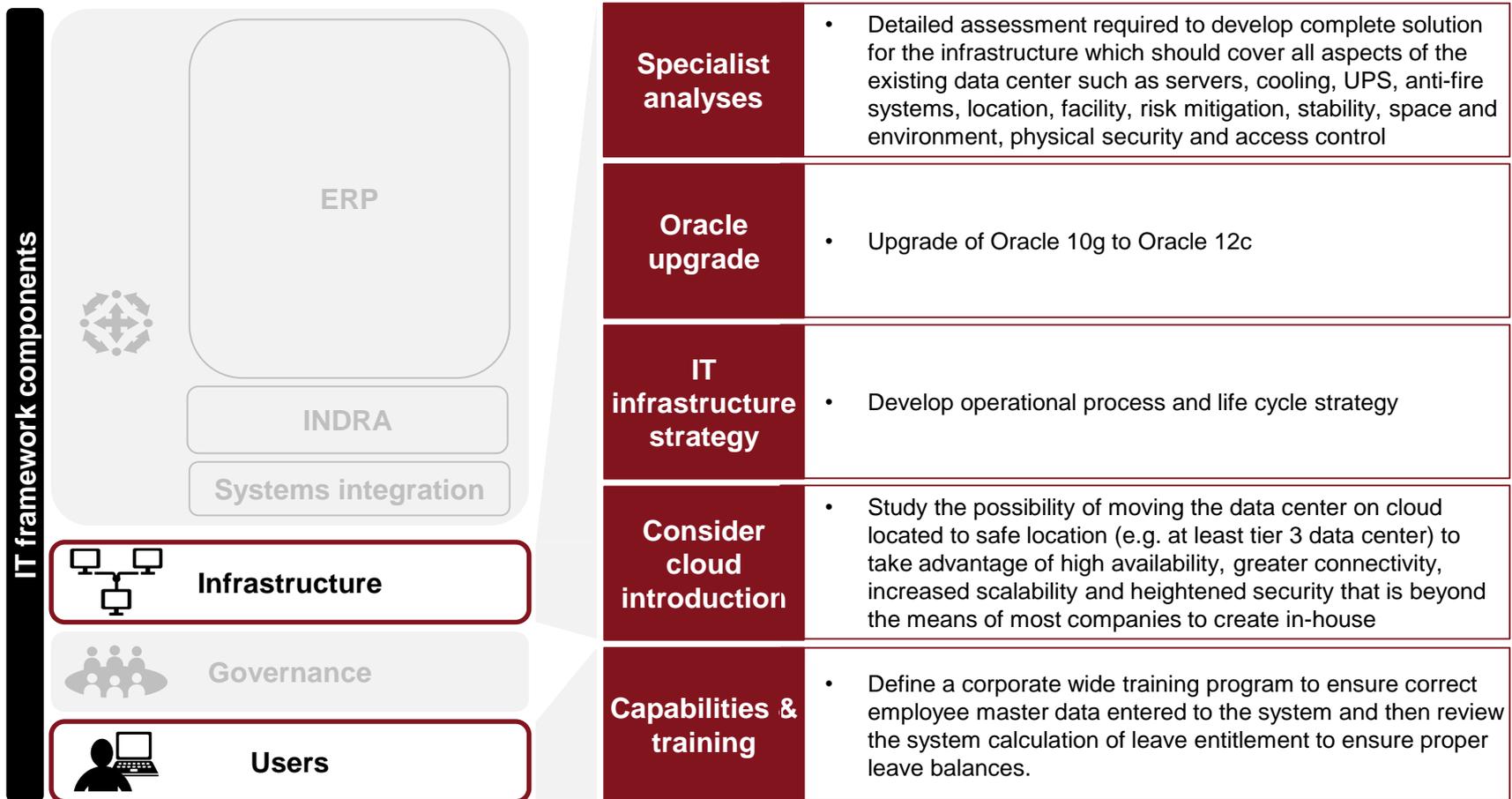
IT recommendations



Source: PWC-Manpower/organizational rationalization review; Strategy& analysis

In terms of IT infrastructure and users, a complete upgrade of the latter and training of the former are required

IT recommendations



Source: PWC-Manpower/organizational rationalization review; Strategy& analysis

GECOL shall first repair existing resources, then upgrade systems and finally add value to the whole infrastructure

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner
Step 1 Fix IT resources	Repair data centers: <ul style="list-style-type: none"> Restore network in the east region Achieve a robust building with certain level of protection 	Data centers repaired							IT dept.
	Introduce a new transmission media network								IT dept.
Step 2 Upgrade IT systems	Upgrade existing data center: <ul style="list-style-type: none"> Provide a suitable environment for equipment (i.e. proper cooling and uninterrupted power supply) Increase performance of DC system Ensure stability by upgrading current servers and storage 	Data center upgraded							IT dept.
	Upgrade current ERP applications(e.g. provide latest functionality and proper support on IFS ERP and INDRA)	ERP upgraded							IT dept.
	Deploy ERP training program to achieve proper use of the system and increased productivity								IT dept.
Step 3 Add value to IT structure and governance	Invest in new access layer (new branches, 120 nodes)								IT dept.
	Develop a new disaster recovery site to: <ul style="list-style-type: none"> Ensure business continuity Ensure future stability and proper awareness of new systems or modification on existing processes or functionalities 							IT dept.	
	Revise IT governance	New IT governance							IT dept.

Milestones

Source: PWC-ERP system review; Strategy& analysis

Institutional development

Processes

Manpower

IT

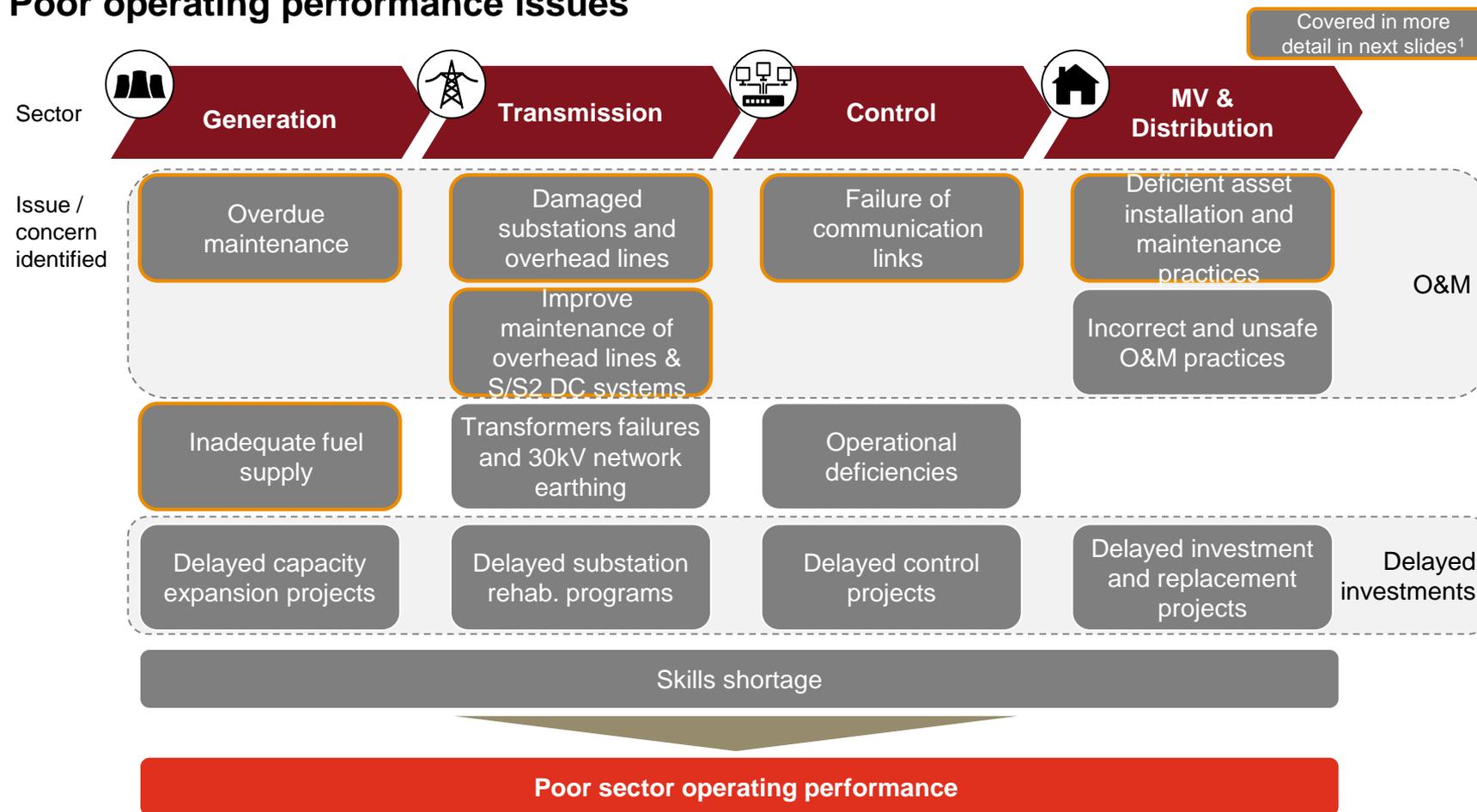
Technical performance

Financial performance

Back-up – Review of 2011-2015 GECOL 6 part strategy

In terms of technical performance, Task C carried-out a review of GECOL performance and identified several issues

Poor operating performance issues

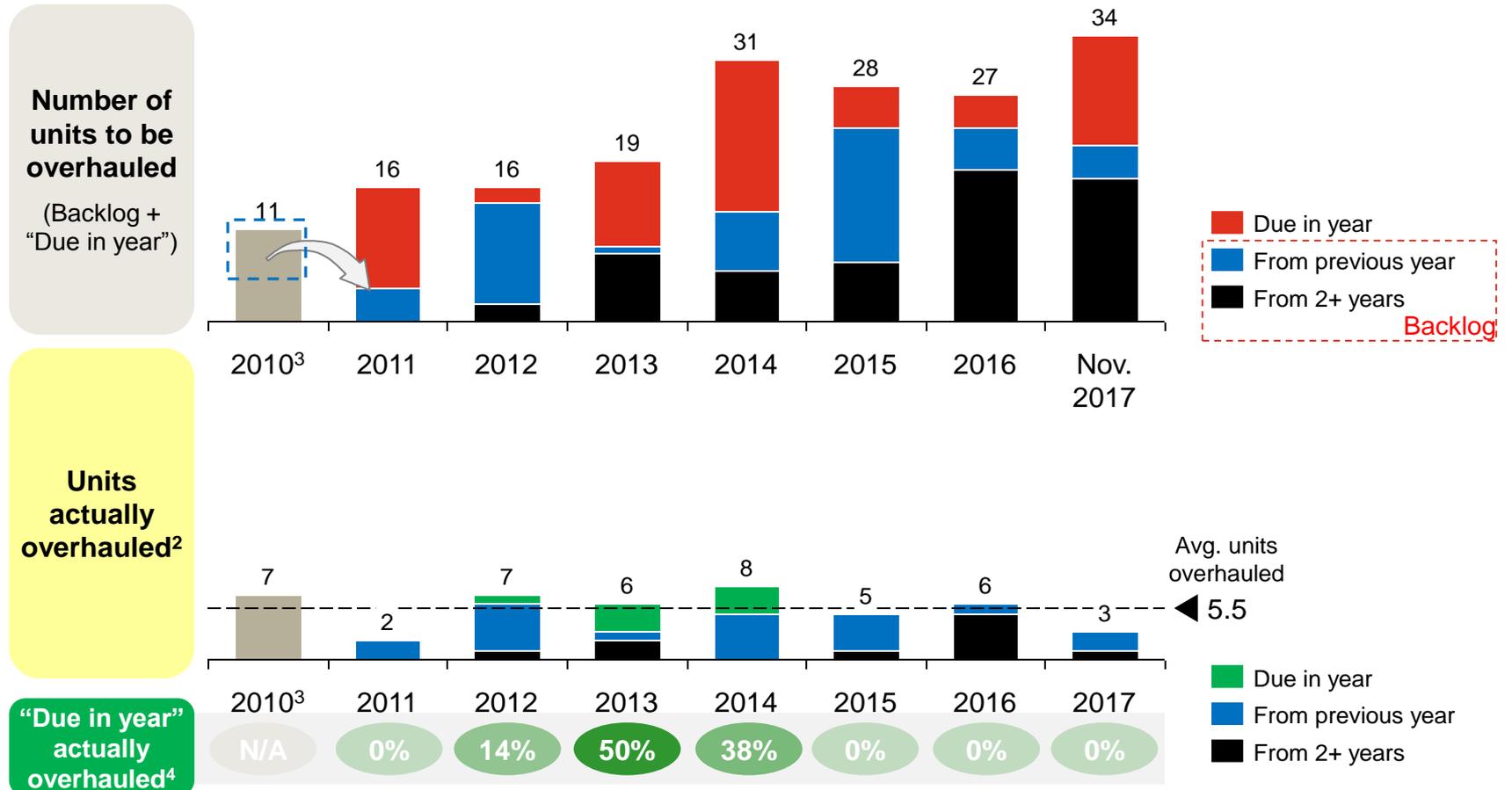


1) For further detail, see "Task C – 4.2. Improving GECOL technical performance report; 2) Substations (S/S)

Source: Improving GECOL technical performance report, Strategy & analysis

In the past years, GECOL was unable to cope with its plants maintenance needs: in '17, 34 units were pending overhaul...

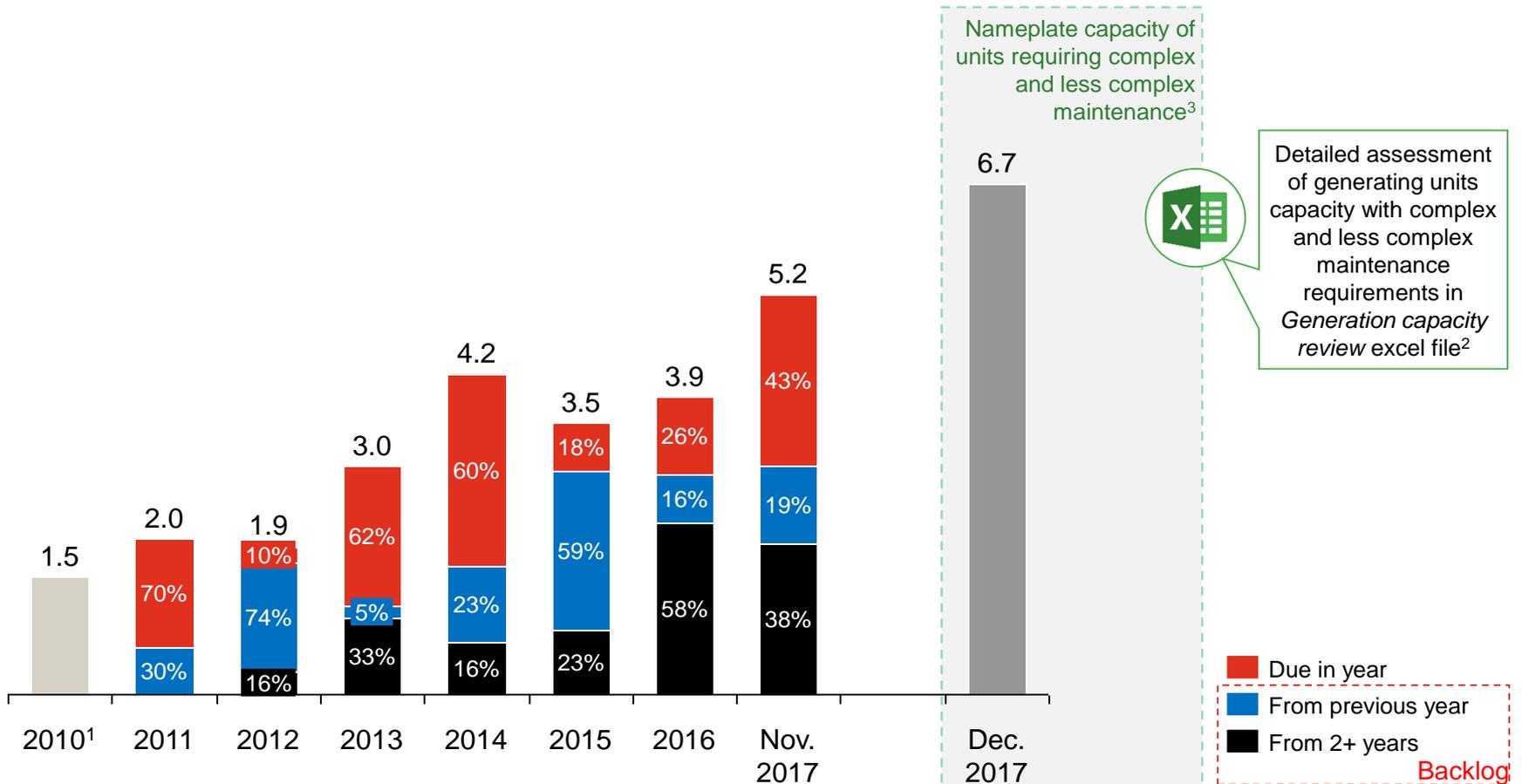
Generating units overhauls (2010-2017¹)



1) Generating units overhauls up to November 2017; 2) Overhauls are considered in the year of their completion; 3) No clear identification of backlog was available for 2010; 4) "Due in year" overhauled units divided by total overhauled units; Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

...accounting for a total installed capacity with maintenance issues ranging between 5.2 GW and 6.7 GW

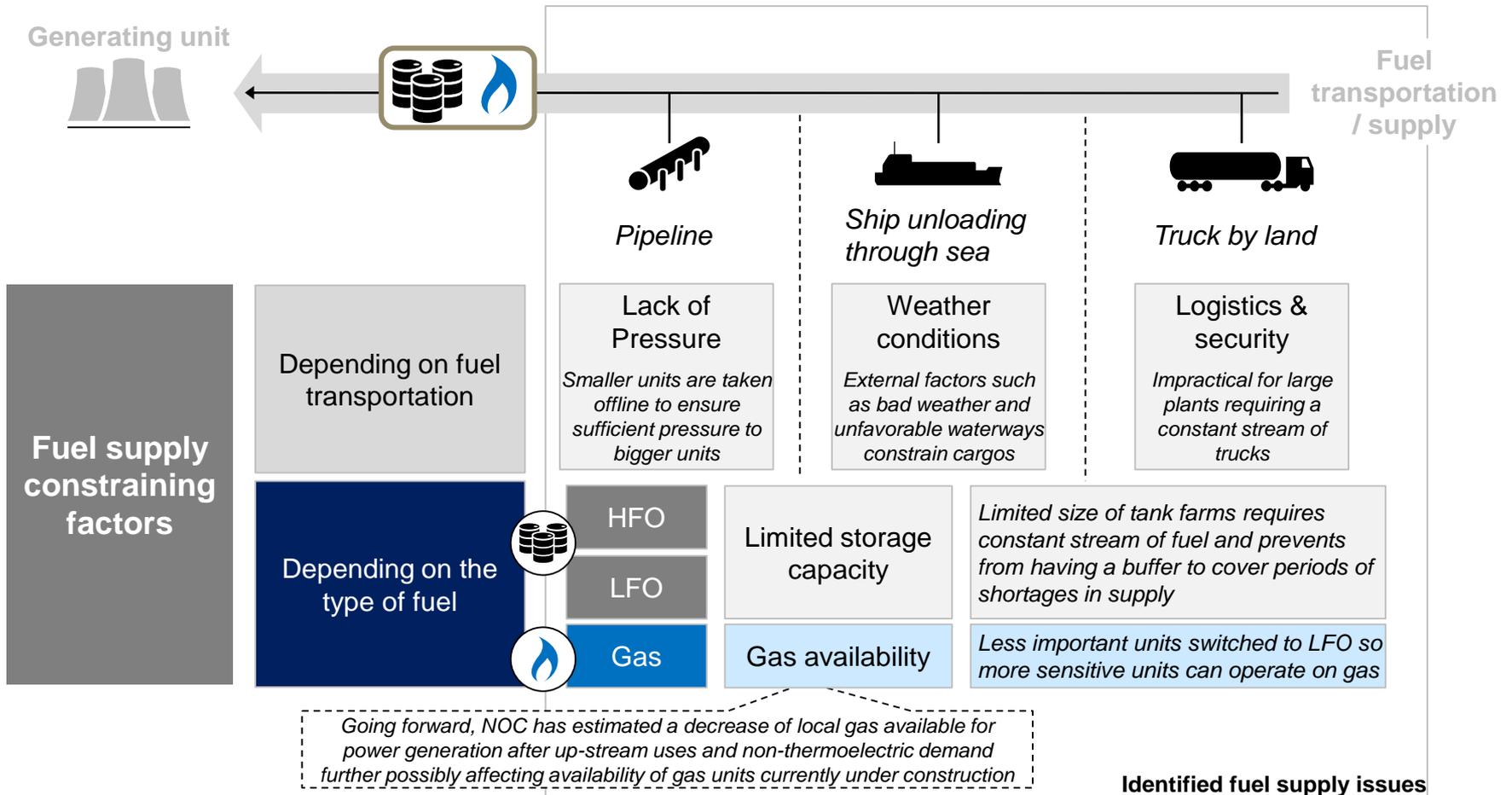
Evolution of due for overhaul units nameplate capacity (GW, 2010-2017)



1) No clear identification of backlog was available for 2010; 2) Data provided in December 2017 by GECOL generation department task force created ad hoc for the capacity assessment of the generation fleet; 3) Less complex maintenance includes both overhauls and units that require replacement of parts but not a complete overhaul (replacement of pumps, bearings, etc.); Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

GECOL's P/S is also adversely affected by several fuel supply constraining factors

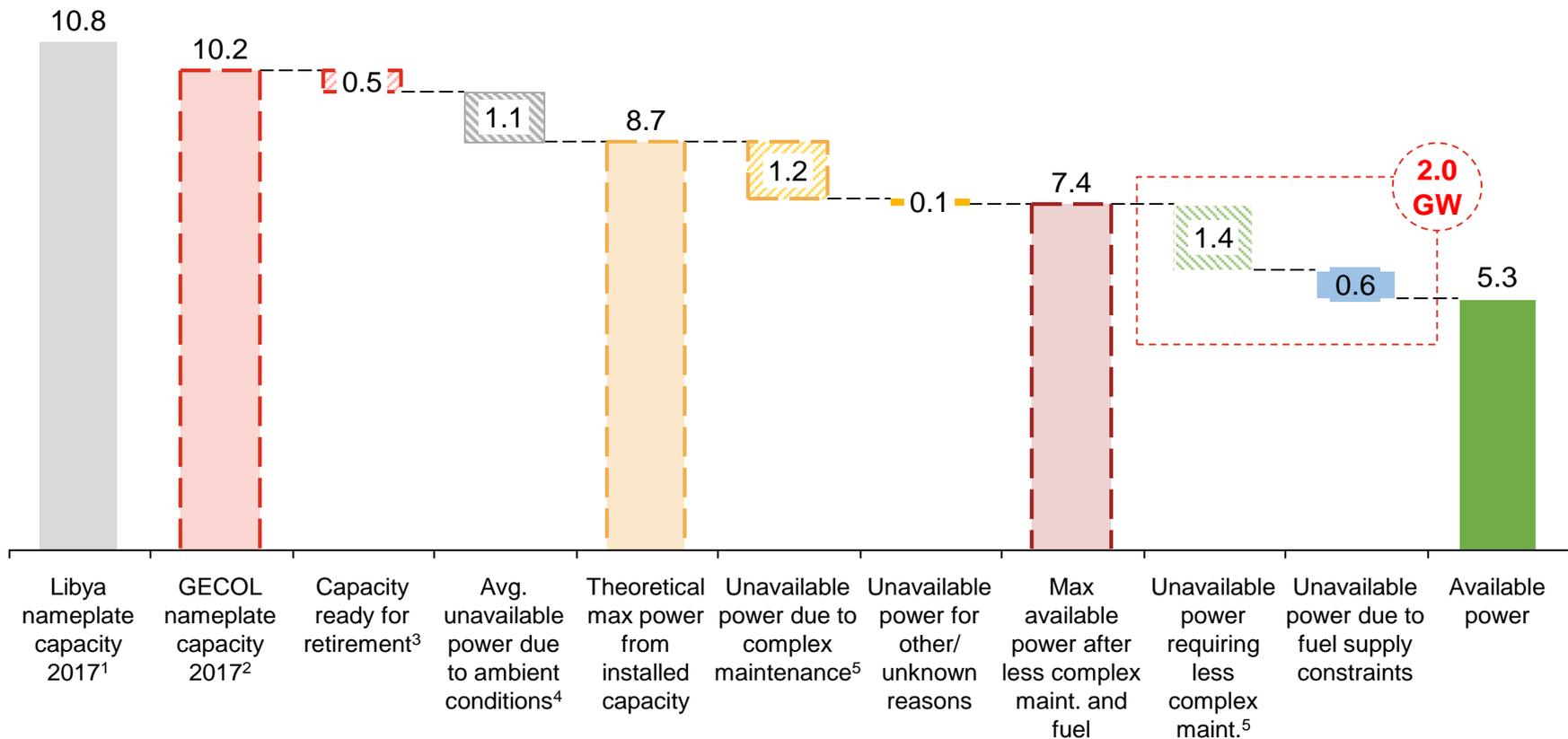
Fuel supply constraining factors today



Note: Improving GECOL technical performance report has identified in 600MW the available capacity directly connected to fuel supply constraining factors today
 Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

Combined overdue less complex maintenance and fuel constraints are the cause of 2.0GW unavailable power

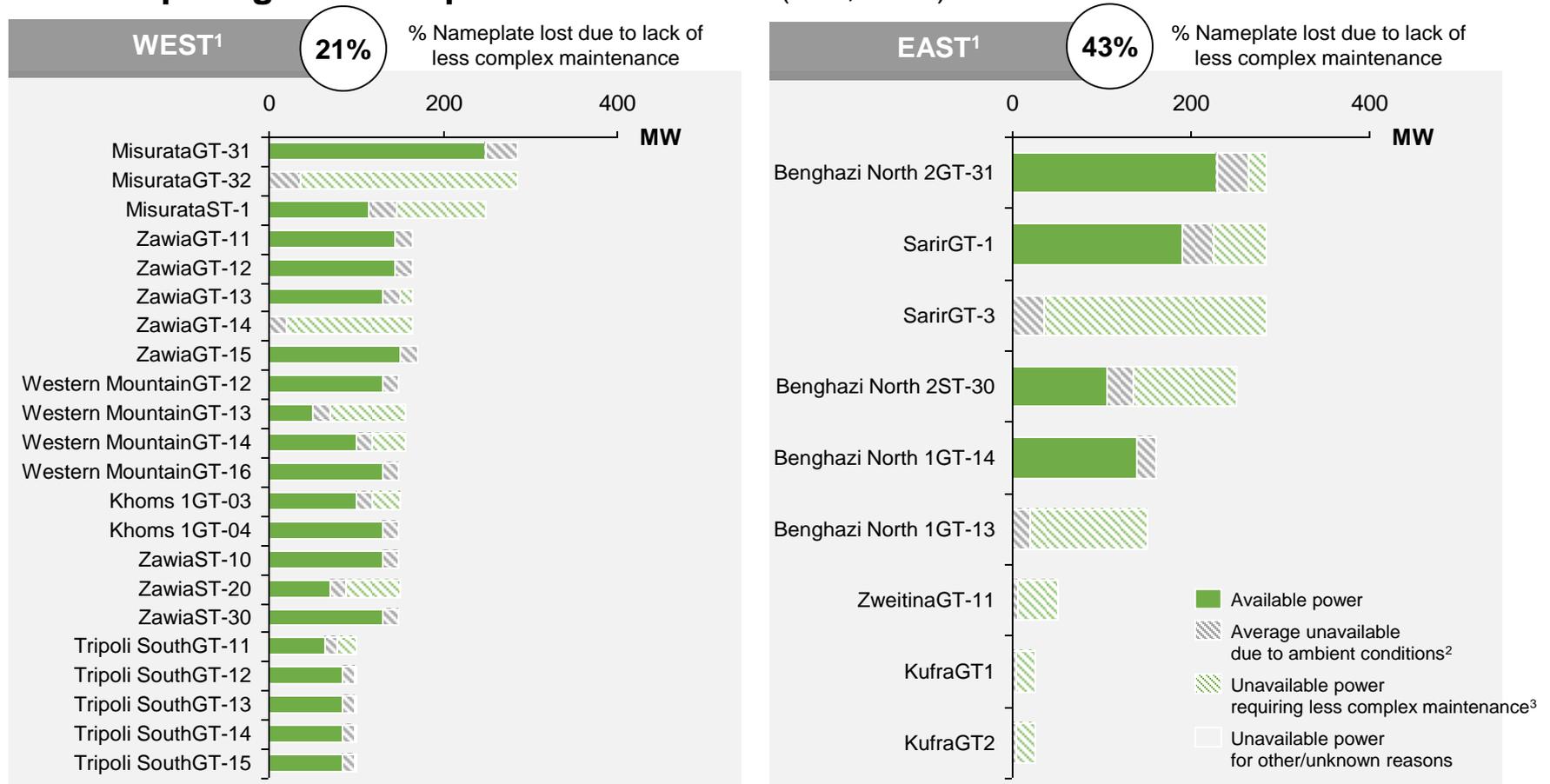
Breakdown of GECOL unavailable capacity¹ (GW, 2017)



1) Includes third party power stations: Sarir MMRA and Misurata Steel; 2) Includes GECOL main power stations and ready for retirement units; 3) Updated ready for retirement capacity agreed with GECOL in December 2017; 4) Unavailable power due to ambient conditions was assumed to be equal to be 0 for steam turbines and equal to nameplate times a derating factor of 12.5% for gas turbines; 5) Maintenance was classified as less complex maintenance if it can be solved within a short period of time (max 4 months; for example gas turbines whose maintenance is recurring every 3-4 months) while overhauls on steam units and all maintenance requiring more than 4 months was considered complex maintenance; Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

With a worse situation in the eastern region since 43% of capacity is lost due to lack of less complex maintenance

Units requiring less complex maintenance³ (MW, 2017)

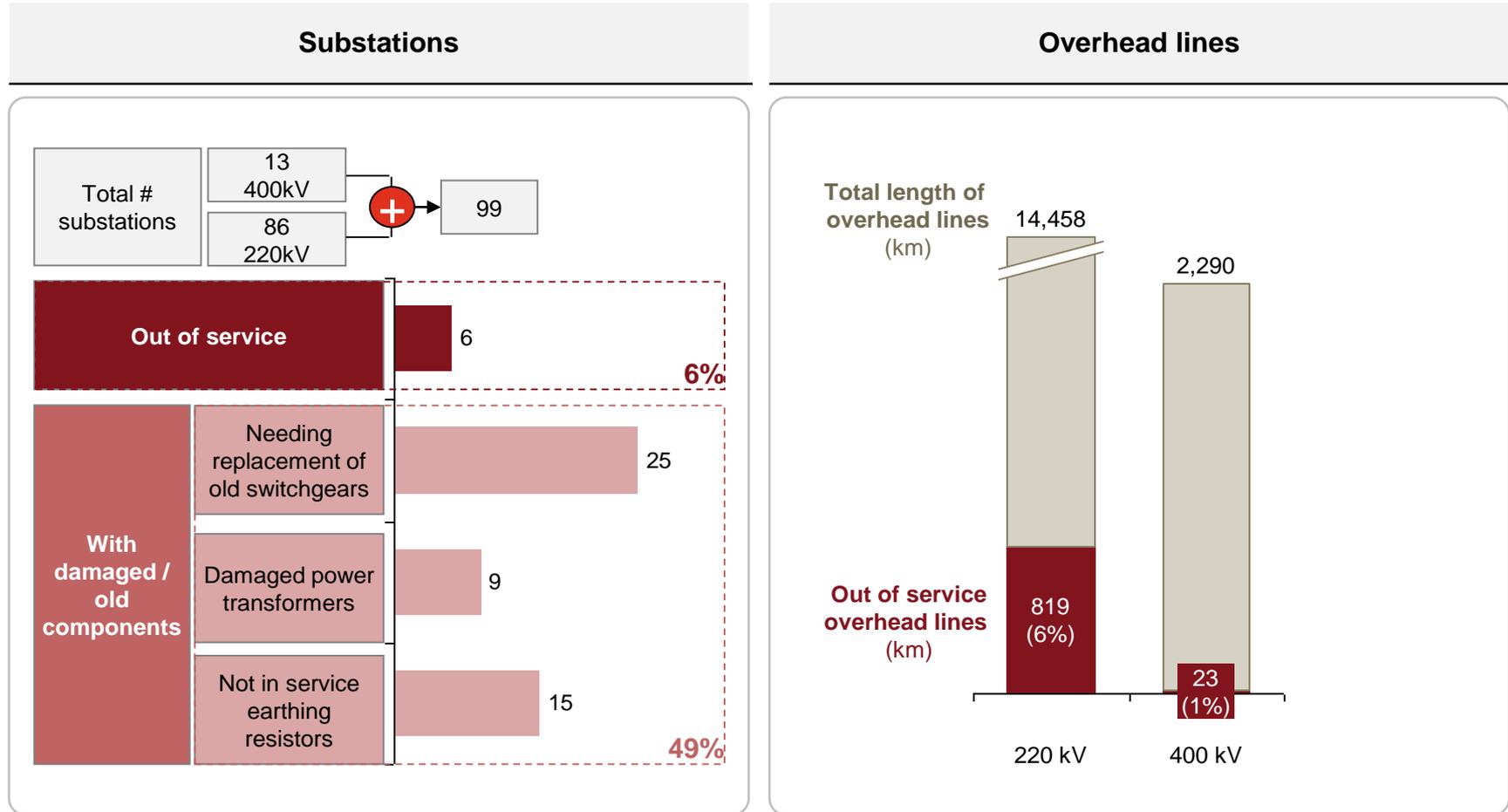


1) West includes Western, Southern, Tripoli and Central regions, while East includes Wahat, Benghazi and Eastern regions; 2) Unavailable power due to ambient conditions was assumed to be equal to be 0 for steam turbines and equal to nameplate times a derating factor of 12.5% for gas turbines; 3) Maintenance classified as less complex if it can be solved within a short period of time (max 4 months); Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis



Damages to transmission substations and overhead lines did also present some issues

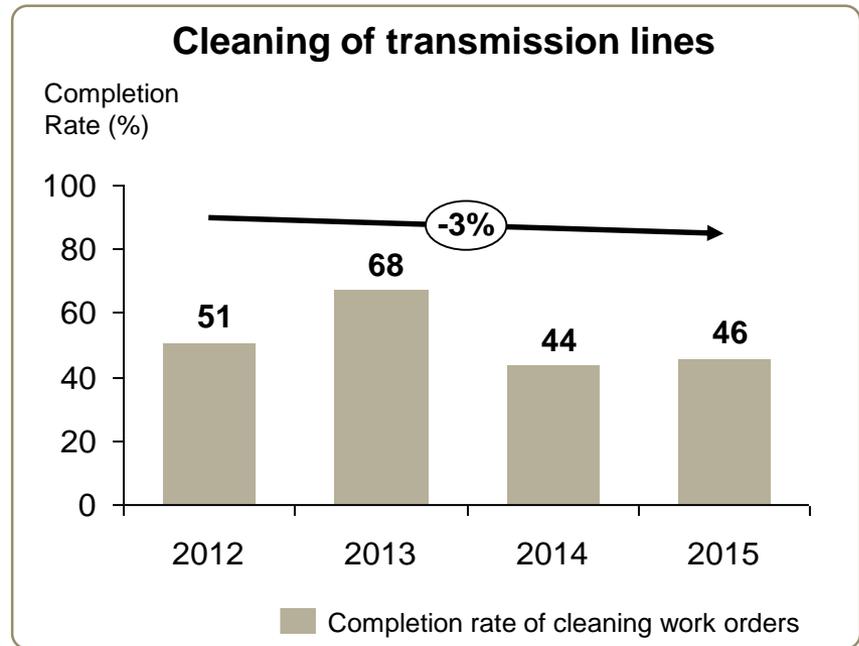
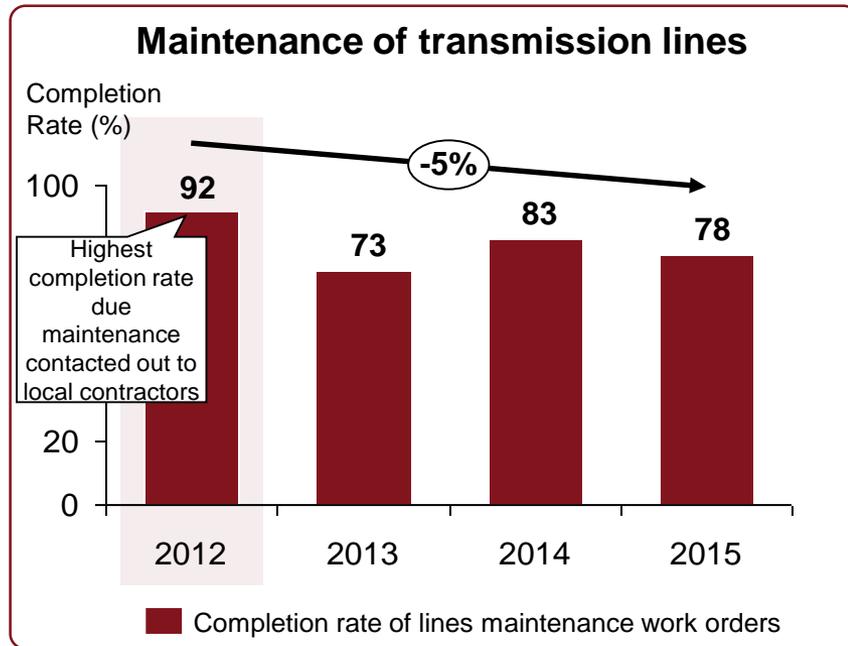
Damaged substations and overhead lines



Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

Execution of the transmission maintenance plan is often interrupted by a large number of unscheduled work orders

Maintenance plan completion rates (2012-2015)



Maintenance of transmission lines was negatively affected by:

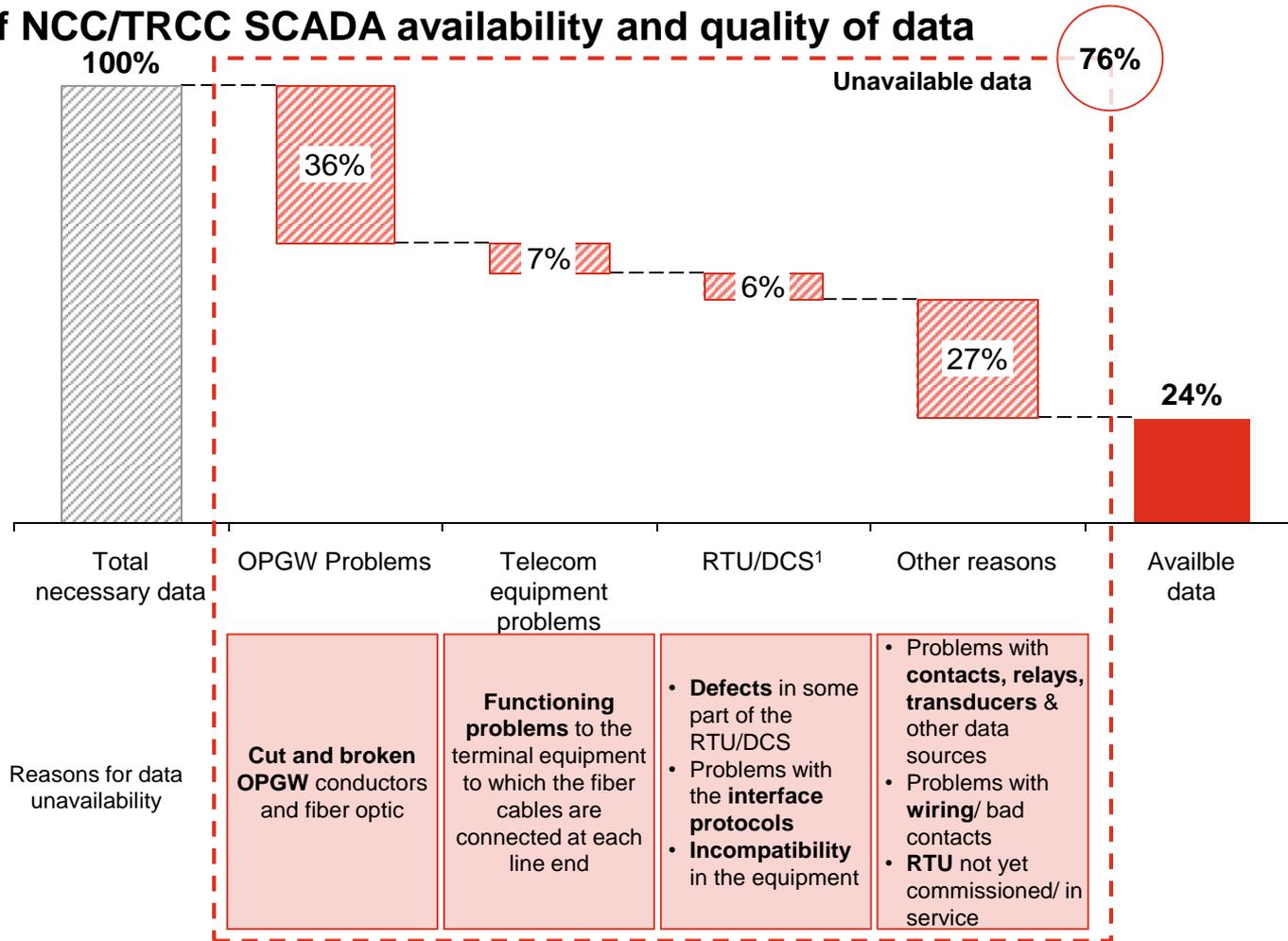
- Threats to security
- Rising number of unscheduled/unplanned maintenance work orders
- Lack of tools in particular service vehicles (cranes, forks utility vehicles, etc.)

Cleaning of transmission lines decreased due to:

- Threats to security
- Aging GECOL's linesmen no longer physically capable to perform the demanding overhead lines maintenance activity
- Lack of required equipment (e.g. water tankers, self propelled or pulled by other vehicles, water pumps and lengths of hosepipe)

Issues with communication links inhibit an effective control of the network, also increasing operational risk

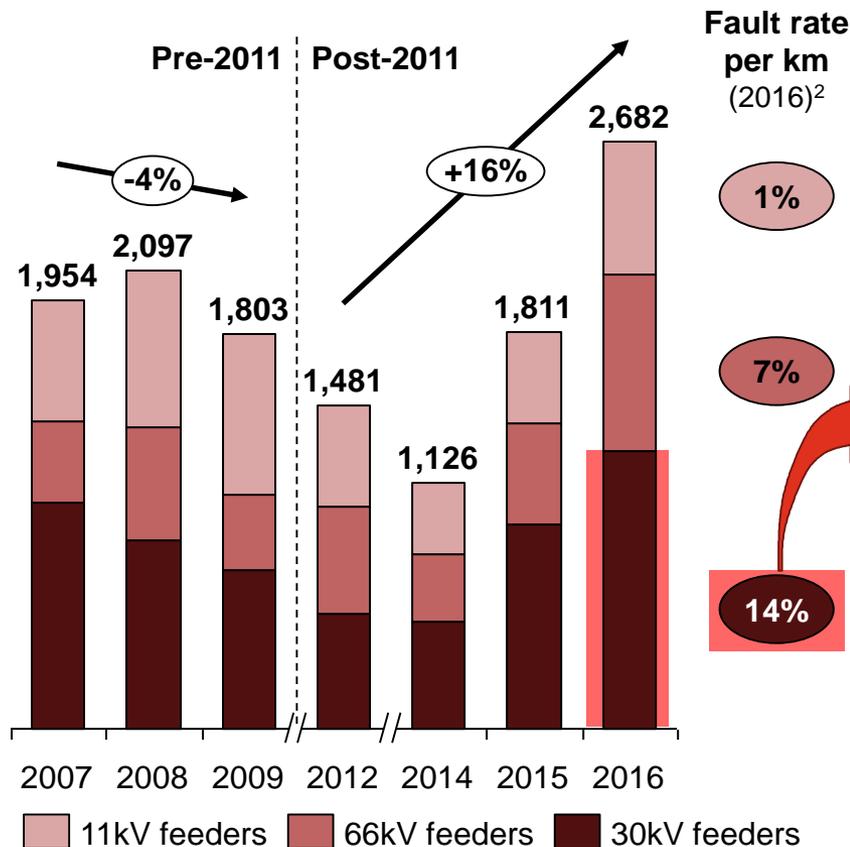
Status of NCC/TRCC SCADA availability and quality of data



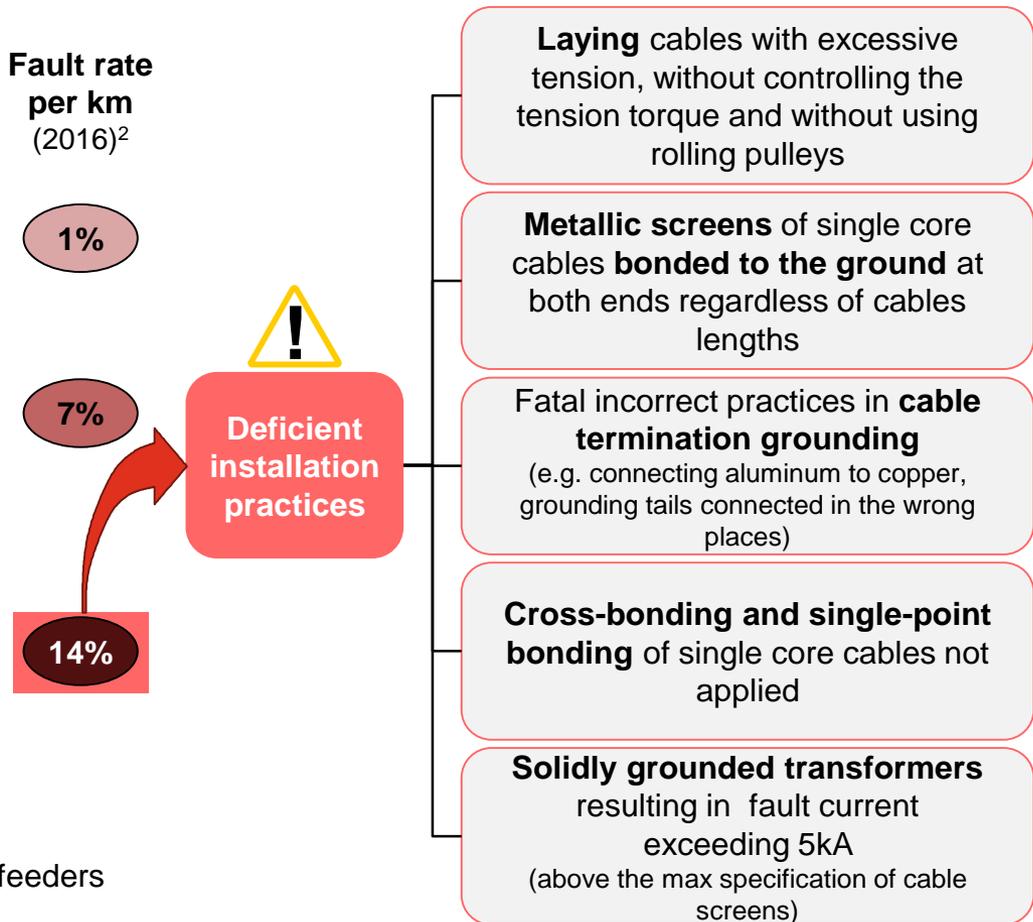
1) Remote Terminal Units (RTU) / Digital Control Systems (DCS); Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

Data show a sharp increase in feeder outages after 2011 mainly due to several installation incorrect practices

Number of feeders interruptions evolution (2007-2016)



Reasons for 30kV cable¹ network failures



1) Single core cables 1x630mm² (N2XSAY 1X630 R/V 18/30 kV); 2) Total length considered: 11kV 51152km, 66kV 8853km, 30kV 12174km

Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

Task C has then proposed a detailed action plan for GECOL to restore its technical performance and service quality

Detailed issues, measures and milestones



GENERATION IMPROVEMENT ACTION PLAN

Generation issues	Measures	Milestones
1 Overdue maintenance	<ul style="list-style-type: none"> Resolve backlog of overdue maintenance Plan maintenance of running units Retire old units Ensure availability of 3rd party plants 	<ul style="list-style-type: none"> 90% of suspended units back in service No new buildup of overdue maintenance List of units to be retirement approved 250 MW added to grid
2 Inadequate fuel supply	<ul style="list-style-type: none"> Protect fuel supplies to P/S and address fuel problems 	<ul style="list-style-type: none"> Zero unavailable capacity due to fuel supply Supply Sarir P/S with gas Full implementation of fuel quality control procedures
3 Delayed capacity expansion projects	<ul style="list-style-type: none"> Complete under construction projects Update load forecast and generation expansion plan Tender new generation capacity Complete EDM system 	<ul style="list-style-type: none"> Updated generation expansion plan RFP for first round of new generation projects issued Obari completed (4x125 MW online) Gulf completed (3x350 MW online) Fully functioning EDM
4 Skills shortage	<ul style="list-style-type: none"> Solve lack of O&M competences Solve Generation BU understaffing 	<ul style="list-style-type: none"> Certification program for P/S O&M personnel in place All P/S operation shifts adequately staffed with qualified personnel

Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

By addressing overdue maintenance, GECOL will increase its capacity availability and recover several “suspended” units



GENERATION IMPROVEMENT ACTION PLAN

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner
Resolve backlog of overdue maintenance	Plan a concentrated 3 year maintenance and overhauling program		■						Generation BU
	Carry out 7 overhauls of GT units, 3 overhauls of ST units, 6 maintenance, repair and replacement activities each year		■			▲			
Plan maintenance of running units	<ul style="list-style-type: none"> Prioritize operating units based on operating conditions, maintenance needs and importance to the grid Draft a comprehensive maintenance program for operating units Allocate the necessary budget 		■						Generation BU
	Execute timely maintenance program for running units (expect 6 GT units per year)		■		▲	■			Generation BU
Retire old units	Review GECOL's power plants retirement policy			■					Generation BU & MD
	Assess the financial viability of old units continued maintenance and upkeep and set retirement dates for non viable old units			■					Generation BU & AFC
	Approve list of units to be retired			▲					BoD/GA
	Retire all very old and unviable units (i.e. ready for retirement units)				■	■	■	■	Generation BU
Ensure avail. of 3rd party P/S	Negotiate with Libyan Steel Co. for overhaul of units (possibly carry out overhauls on their behalf for 2/3 units)		■		▲				Generation BU
	Write off retired assets from GECOL's books				■				AFC dept.
Continue improving O&M	Continue executing the previously established maintenance program for running units					■	■	■	▶ Generation BU
	Continue with timely retirement of old and unviable units					■	■	■	▶ Generation BU

90% of suspended units back in service

No new buildup of overdue maintenance

List of units to be retired approved

250 MW added to grid

▲ Milestones

Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

Securing fuel supply, will allow GECOL to further increase its capacity availability



GENERATION IMPROVEMENT ACTION PLAN

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner	
Protect fuel supplies to P/S and address fuel problem	Work with the Government to protect fuel convoys to P/S especially in remote regions		[Timeline bar from 2018 to 2021]							Generation BU & Government
	Work with local communities to engage in protecting fuel supply lines		[Timeline bar from 2018 to 2021]							Generation BU & Local communities
	Assess which plants could benefit from increased fuel tanks capacity to act as a buffer for delayed or unsuitable fuel deliveries		[Timeline bar from 2018 to 2019]							Generation BU
	Tender and contract additional fuel tanks			[Timeline bar from 2019 to 2021]						Generation BU
	Work with the Government and Gas Transport & Distribution Co. to resolve contractual issues for the completion of Entisar-Sarir pipeline	Supply Sarir P/S with gas		[Timeline bar from 2018 to 2019]						Generation BU, Government & Gas Transport & Distr. Co.
	Provide key P/S with fuel analysis lab equipment and train staff	Full implementation of fuel quality control procedures		[Timeline bar from 2019 to 2020]						Generation BU
	Continuous implementation of fuel quality control procedures				[Timeline bar from 2020 to 2023]					Generation BU
	Establish a joint NOC/GECOL commission to oversee and resolve supply problems to individual P/S			[Timeline bar from 2018 to 2021]						

▲ Milestones

Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

Completing under construction units and tendering for new generation capacity will then enable GECOL to meet demand



GENERATION IMPROVEMENT ACTION PLAN

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner
Complete under construction projects	Complete Obari power station and connect to power network ensuring fuel supply		▲						Generation BU & E&P ¹
	Obari completed (4x125 MW online)								
Update load forecast and generation expansion plan	Complete Gulf Power Station				▲				Generation BU & E&P
	Gulf completed (3x350 MW online)								
Update load forecast and generation expansion plan	Contract to renew 20-year load forecast study and regularly update and extend load forecast study		■	■	■	■	■		Generation BU
	Based on updated load forecast, contract for 20-year generation expansion study considering also optimal generation mix and regularly update and extend generation expansion plans (first annually and later biannually)							▲	Generation BU & E&P
Tender new generation capacity	Tender, contract and execute first generation of new plants (either autonomously or through IPPs)				▲				Generation BU & E&P
	RFP for first round of new projects issued								
Tender new generation capacity	Finalize arrangements for 4 new power stations (ensure funding, finalize contracts, assess local support needs to ensure rapid completion)		■	■	■	■	■	■	▲
	Execute first generation of previously tendered new plants (either autonomously or through IPPs)								▲
Complete EDM system	Procure any remaining materials or replacement for EDM system		■						Generation BU
	Complete installation of EDM meters and telemetry station to ensure new network installation are correctly metered		■						Generation BU
Complete EDM system	Define departments responsibilities for maintenance and servicing and for reporting of operating results			▲					Business Units
	Fully functioning EDM								

▲ Milestones

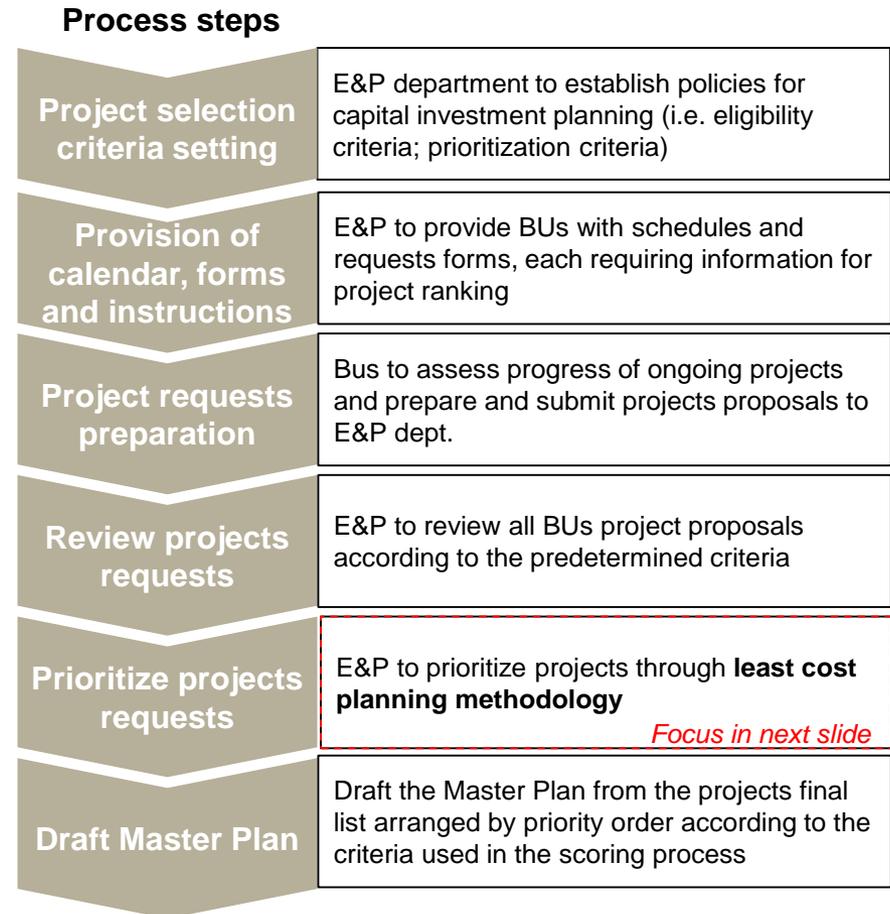
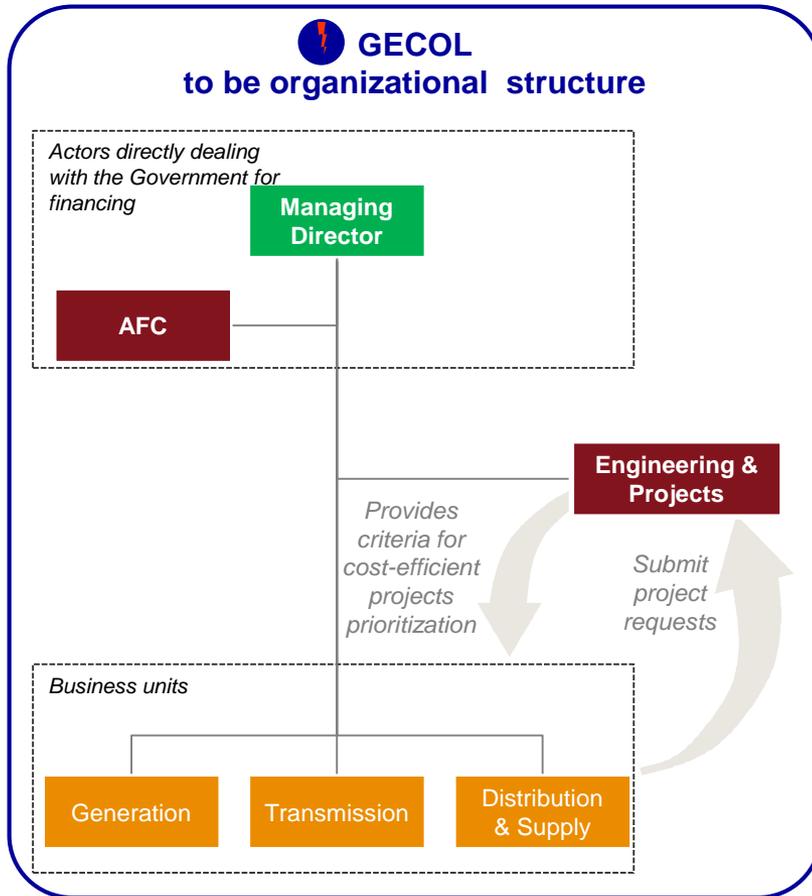
1) Engineering and Projects Department

Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis



To carry-out its investment process, GECOL shall also review and strengthen its investment planning process...

Investment planning process



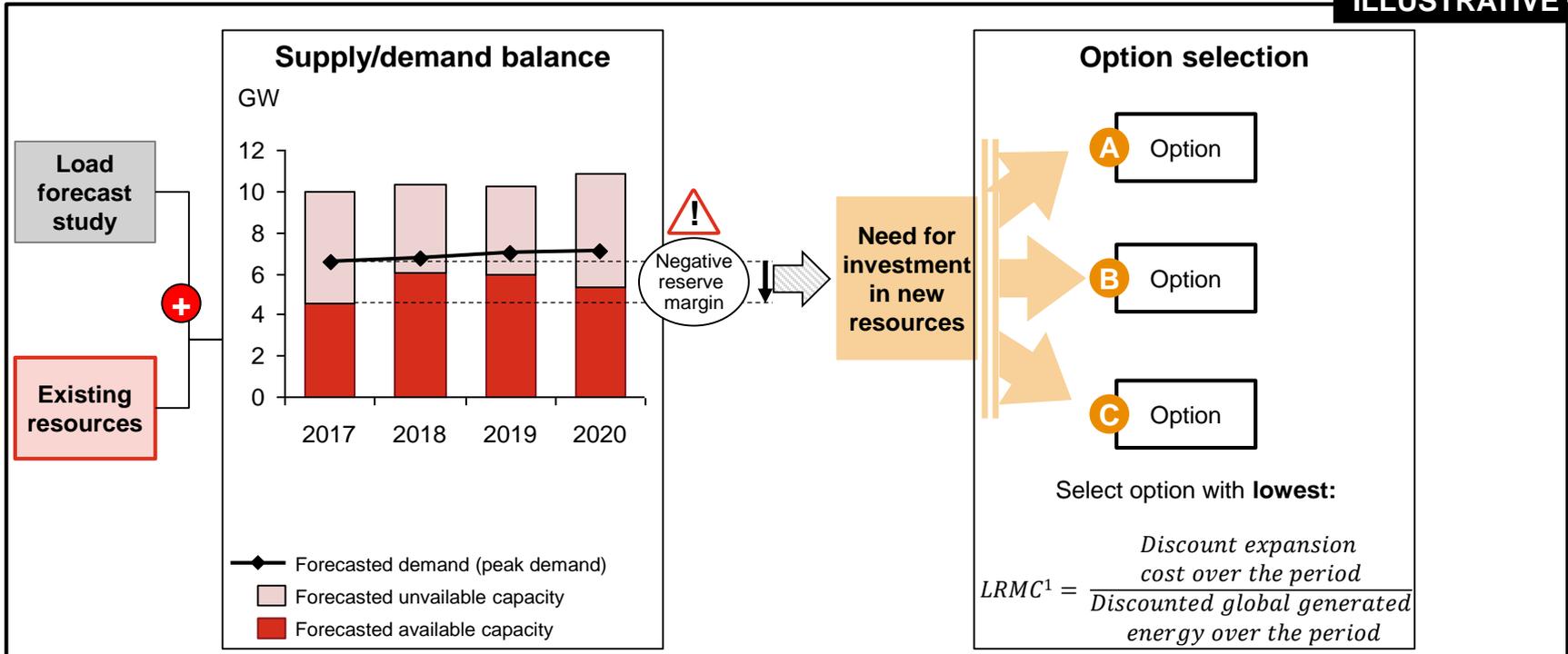
Sources: Strategy & analysis



...Using consistently a least-cost-planning methodology

Least-cost planning methodology

ILLUSTRATIVE

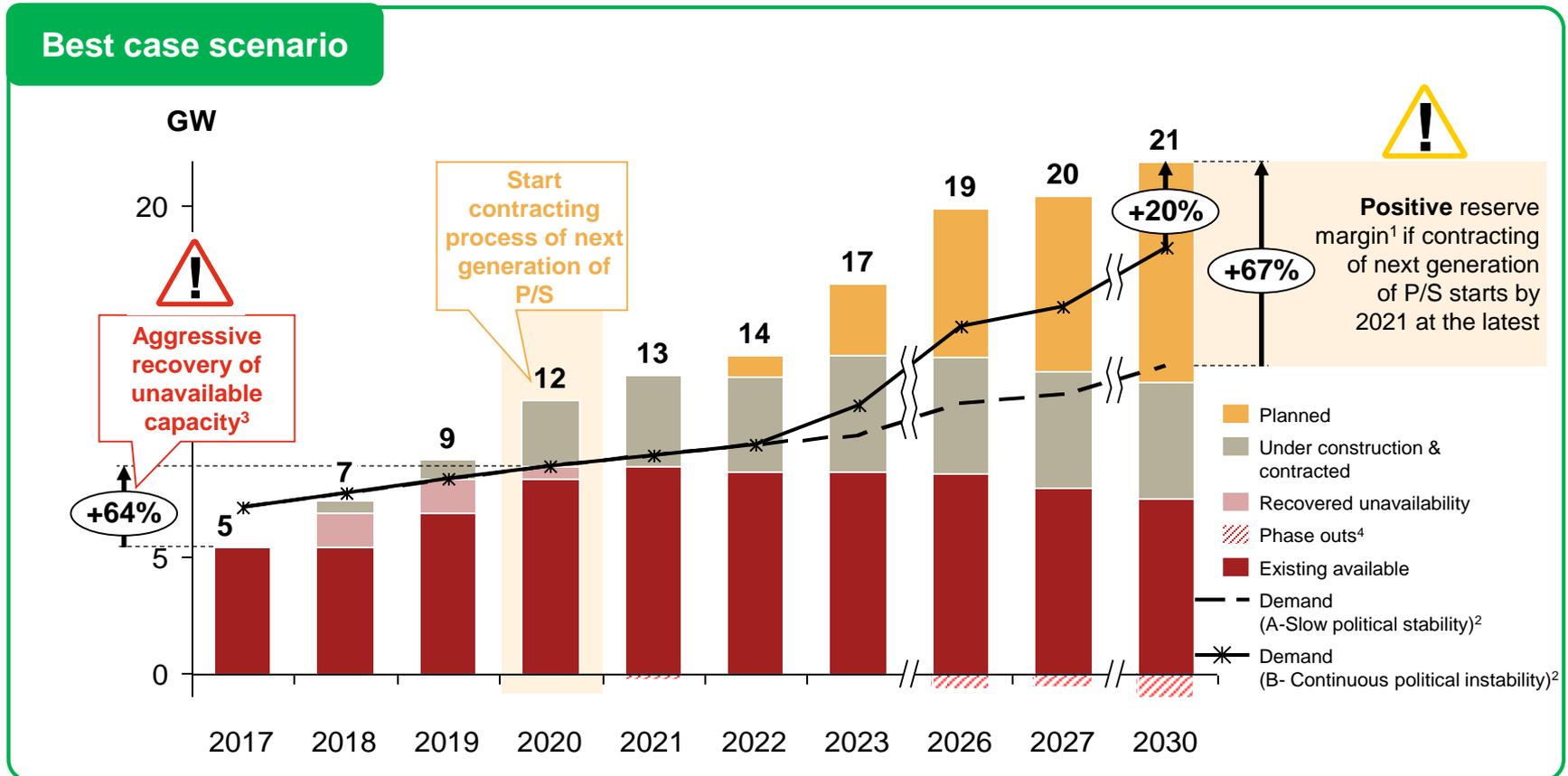


Through least cost planning methodology GECOL shall identify the least cost mix of resources that would deliver sufficient power to meet projected increases in demand for electricity without unplanned terminations (i.e. ensuring a reliable service)

1) Long-run marginal cost including additional investment cost, O&M costs and fuel costs; Sources: Strategy& analysis

Under highly aggressive assumptions GECOL should be able to re-establish an acceptable service quality by 2019 ...

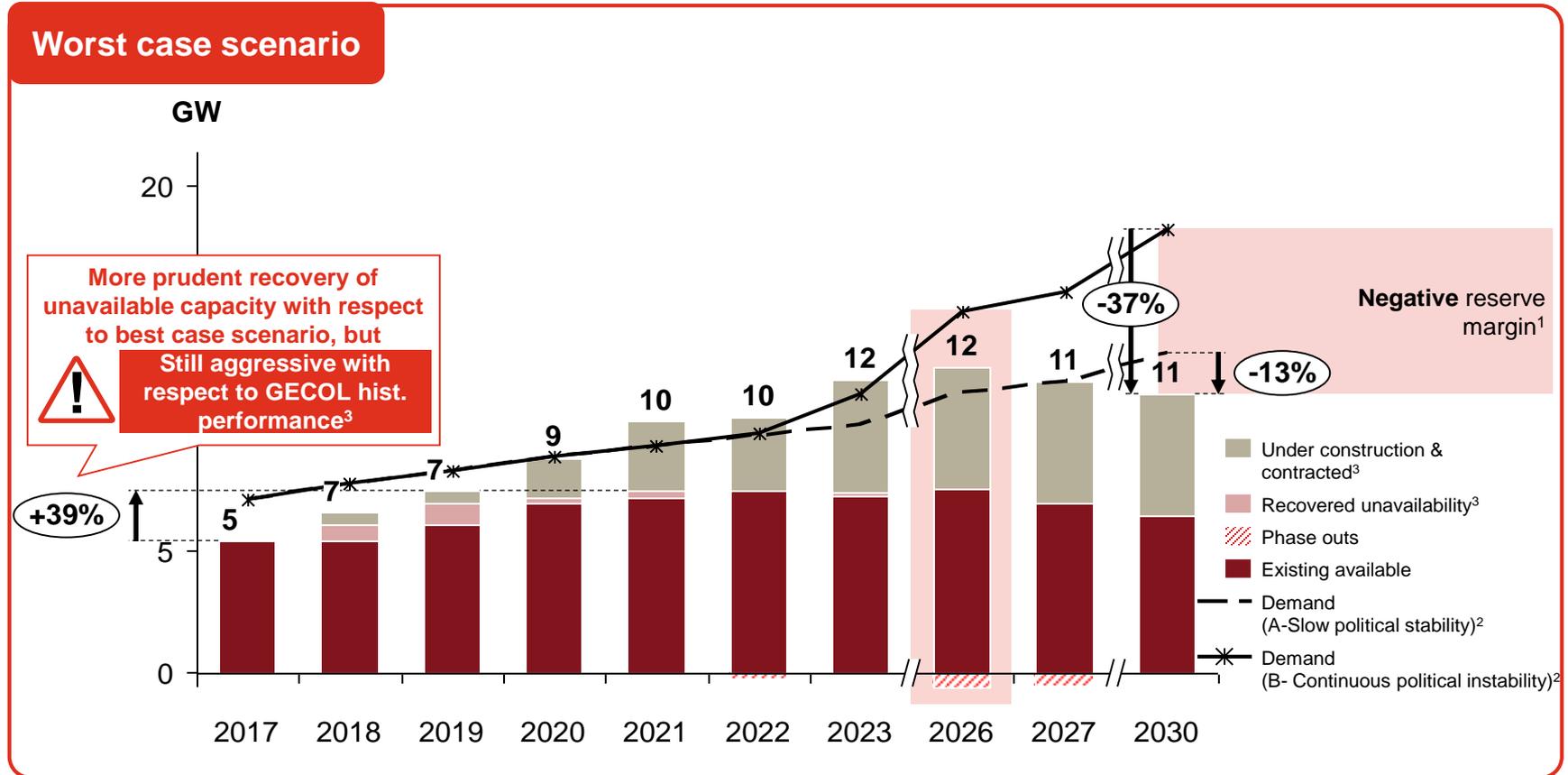
Generation expansion plan (2017-2030)



1) Computed as (Available capacity-Peak demand)/Peak demand; 2) Peak demand at generation; 3) Assuming GECOL will be able to carry out each year 15 overhauls of units overdue from past years + all overhauls of newly due units. All overdue unit overhauls and major maintenance are supposed to be cleared by 2020; 4) Conventional steam turbines that approached their retirement age but have been overhauled are assumed to have an extended life up to 2030, gas turbines to 2025. Other units are retired at their planned decommissioning year; Sources: GECOL data collection ID4, Awardbrand - Improving GECOL technical performance report, Strategy& analysis

...however under more pessimistic (realistic?) assumptions, load shedding will continue to be an issue

Generation expansion plan (2017-2030)



1) Computed as (Available capacity-Peak demand)/Peak demand; 2) Peak demand at generation; 3) Assumes GECOL will be able to carry out each year 4 overhauls of units overdue from past years + all overhauls of newly due units

Sources: GECOL data collection ID4, Awardbrand - Improving GECOL technical performance report, Strategy& analysis

GECOL shall also address its generation dept. understaffing problem through qualification of non-technical personnel



GENERATION IMPROVEMENT ACTION PLAN

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner
Solve lack of O&M competences	Introduce additional local or abroad training for all new P/S and generating units		█						Generation BU & HR
	Agree with gas turbine OEMs of major fleets on establishing dedicated training facilities to provide a certified world class training program for P/S maintenance engineers and technicians			█		▲	▲		Generation BU, HR & OEM
	Include training in scope of overhaul service providers and set up development programs at each related P/S		█						Generation BU, HR & OEM
Solve Generation BU understaffing	Map shortages in generation department staffing		█						Generation BU & HR
	Determine skills and specialization requirements to fulfill identified opened positions			█					Generation BU & HR
	Develop multi-year years training programs to qualify non-technical or unqualified personnel to fulfill workforce needs in generation and other departments			█		▲			Generation BU & HR
	Implement previously developed 1 or 2 years training programs to qualify non-technical or unqualified personnel to fulfill workforce needs in generation and other departments						█		▲

▲ Milestones

Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

Within Wave 1, GECOL will also address its key transmission system issues

Detailed issues, measures and milestones



TRANSMISSION IMPROVEMENT ACTION PLAN

Transmission issues	Measures	Milestones
1 Damaged substations and overhead lines	<ul style="list-style-type: none"> • Repair out of service substations • Repair damaged overhead lines 	<ul style="list-style-type: none"> • All substations back in service • All transmission lines in service
2 Delayed substations rehab. programs	<ul style="list-style-type: none"> • Rehabilitate / replace old assets 	<ul style="list-style-type: none"> • Commission all stations • Overhaul all 220kV substations
3 Transformers failures and 30kV network earthing	<ul style="list-style-type: none"> • Reconnect 30kV earthing resistors • Investigate transformers failures • Improve transformers preventive maintenance 	<ul style="list-style-type: none"> • All resistors connected • Systematic analysis of all future failures of grid components instituted • Oil analysis laboratories fully operational
4 Improve maintenance of overhead lines & S/S ² DC systems	<ul style="list-style-type: none"> • Improve lines maintenance • Improve substation DC¹ system maintenance 	<ul style="list-style-type: none"> • All 220 & 400KV lines regularly inspected and maintained • All DC systems inspected and maintained
5 Skills shortage	<ul style="list-style-type: none"> • Improve O&M staff knowledge and competences • Train new generation of overhead linesmen • Develop capabilities for live line maintenance 	<ul style="list-style-type: none"> • Certified new linesmen

1) Direct Current (DC); 2) Substations (S/S)

Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

Repairing out of service substations and damaged overhead will improve the overall grid reliability



TRANSMISSION IMPROVEMENT ACTION PLAN

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner
Repair out of service substations	Assess the conditions/ requirements of each of the out of service substations		■						Transmission BU & E&P
	Set a prioritized repair, rehabilitation or replacement program for out of service substations		■						Transmission BU & E&P
	Procure materials not available in GECOL stock		■						Transmission BU
	Repair/replace and reconnect to power network			■	▲				Transmission BU
			All substations back in service						
Repair damaged overhead lines	Assess the conditions/ requirements of each of the out of service overhead 220kV and 400kV lines		■						Transmission BU & E&P
	Set a prioritized repair, rehabilitation or replacement program for out of service overhead lines		■						Transmission BU & E&P
	Procure materials not available in GECOL stock		■						Transmission BU
	Repair overhead lines and reconnect to power network		■	▲					Transmission BU
			All transmission lines in service						

▲ Milestones

Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

Old transmission switchgears will need to be substituted, as they require large maintenance and replacement of parts



TRANSMISSION IMPROVEMENT ACTION PLAN

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner
Rehabilitate/replace old assets	Resume replacement program of 6 air blast 220Kv substations		[Bar]		▲	[Bar]		▲	Transmission BU & E&P
	Commission all stations		[Bar]		▲	[Bar]		▲	Transmission BU & E&P
	Replacement completed		[Bar]		▲	[Bar]		▲	Transmission BU & E&P
	Arrange necessary shutdowns with control center		[Bar]	[Bar]		[Bar]			Transmission BU & E&P
	Arrange overhaul schedule for overdue 220kV SF6 substations		[Bar]	[Bar]		[Bar]			Transmission BU & E&P
	Procure required materials		[Bar]	[Bar]		[Bar]			Transmission BU & E&P
	Carry out overhauls		[Bar]	[Bar]		▲	[Bar]		Transmission BU & E&P
	Overhaul all 220kV substations		[Bar]	[Bar]		▲	[Bar]		Transmission BU & E&P
Arrange overhaul schedule for old 220kV overhead lines		[Bar]	[Bar]		[Bar]			Transmission BU & E&P	
Procure required materials		[Bar]	[Bar]		[Bar]			Transmission BU & E&P	
Execute overhauls/outsource works (as needed)		[Bar]	[Bar]		[Bar]		▲	Transmission BU & E&P	
Old 220kV overhead lines overhauled		[Bar]	[Bar]		[Bar]		▲	Transmission BU & E&P	

▲ Milestones

Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

The high incidence of transformers failures shall be investigated and earthing resistors shall be put back in place



TRANSMISSION IMPROVEMENT ACTION PLAN

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner
Reconnect 30 kV earthing resistors	Assess urgency and priority according to use of 30 kV cables in the supplied 30 kV network		■						Transmission BU
	Determine state of earthing resistors		■						Transmission BU
	Procure new resistors as necessary		■						Transmission BU
	Install and connect new resistors		■	▲					Transmission BU
	Educate and train O&M staff on the importance of maintaining and connecting transformers earthing resistors		■						Transmission BU
			All resistors connected						
Investigate transformers failures	Dedicate a highly competent technical team to determine the true causes of transformers failures and to decide action required to mitigate them		■	▲					Transmission BU
			Systematic analysis of all future failures of grid components instituted						
Improve transformers preventive maintenance	Ensure that all transformer maintenance teams are adequately equipped with necessary oil treatment machines and dissolved gas analysis (DGA) instruments to oversee and follow up the number of transformers in the network		■						Transmission BU
	Set up at least two central oil analysis laboratories which can carry out full analyses of transformers (and other) oils		■	▲					Transmission BU
			Oil analysis laboratories fully operational						

▲ Milestones

Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

Overhead line cleaning and well maintained battery systems are very important to maintain the reliability of the system



TRANSMISSION IMPROVEMENT ACTION PLAN

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner
Improve lines maintenance	Schedule a comprehensive transmission lines cleaning program		■						Transmission BU
	Equip overhead lines maintenance teams with necessary tools for lines cleaning		■						Transmission BU
	Execute cleaning program		■	▲					Transmission BU
	Continue executing yearly cleaning program					■	■	■	▶ Transmission BU
			All 220 & 400 kV lines regularly inspected and maintained						
Improve substation DC1 systems maintenance	Prepare an updated procedure for maintenance and operation of substation DC supply system		■						Transmission BU
	Implement newly updated procedure for maintenance and operation of substation DC supply system					■	■	■	▶ Transmission BU
	Establish regional task forces dedicated to inspecting and maintain DC supply systems and recommend actions		■						Transmission BU
	Train staff on DC systems maintenance procedures and incentivize specialization in battery and dc maintenance		■	▲					Transmission BU
			All DC systems inspected and maintained						

▲ Milestones

1) Direct Current (DC)

Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

GECOL will need to improve its O&M staff competences, train new linesman and develop live line maintenance capabilities



TRANSMISSION IMPROVEMENT ACTION PLAN

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner
Improve O&M staff knowledge and competences	Institute a comprehensive skills development program for O&M personnel		■	■					Transmission BU & HR
	Arrange intensive training for new equipment and technologies, especially DCS ¹		■						Transmission BU & HR
	Continue with previously instituted training programs (i.e. training for DCS technologies and O&M development)					→	→	→	Transmission BU & HR
	Set up program to maintain and refresh cable jointing skills through secondment of cable jointists with contracting companies			■	■				Transmission BU & HR
Train new generation of overhead linesman	As part of internal training and development program to fill skills and specialization gaps, train a new generation of linesmen from underutilized GECOL's staff			■	■	▲ Certified new linesmen			Transmission BU & HR
Develop capabilities for live line maintenance	Contract with suitable consultant to develop skills and knowledge in live-line work and procure required tools and equipment				■	■	■	■	Transmission BU & HR

▲ Milestones

1) Digital Control Systems (DCS)

Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

In parallel, GECOL will also need to resolve the four key issues with its control department

Detailed issues, measures and milestones



CONTROL IMPROVEMENT ACTION PLAN

Control issues	Measures	Milestones
 <p>1 Failure of communication links</p>	<ul style="list-style-type: none"> • Repair damaged OPGW links • Solve bad data quality 	<ul style="list-style-type: none"> • Restored damaged OPGW links • 98% of bad data sources solved
<p>2 Delayed control projects</p>	<ul style="list-style-type: none"> • Complete control center projects 	<ul style="list-style-type: none"> • NCC upgrade and back up completed • TRCC maintained and upgraded • BRCC commissioned and operational • TDCC, ZDCC, and BDCC commissioned and operational
<p>3 Operational deficiencies</p>	<ul style="list-style-type: none"> • Utilize SCADA control functionalities • Provide spinning reserve • Form permanent event analysis team(s) • Reinstate AGC¹ functionality • Modernize procedures and codes 	<ul style="list-style-type: none"> • 80% / 90% of SCADA system control functionalities in use • Adequate spinning reserve is maintained • All AGC are operating • Control codes and procedures are implemented
<p>4 Skills shortage</p>	<ul style="list-style-type: none"> • Pursue staff development and training 	<ul style="list-style-type: none"> • All control staff are trained and certified

1) Automatic Generation Control (AGC)

Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

GECOL shall resume its delayed control center projects for the efficient, stable and safe operation of the power system



CONTROL IMPROVEMENT ACTION PLAN

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner
Complete control center projects	Replace 19 RTUs ¹ and 1 DCS ² in Eastern region Transmission substation and 20 RTUs in Western Region		■						Control BU
	Upgrade NCC		■						Control BU
	Upgrade TRCC			■	▲				Control BU
	Install new back-up NCC				■	▲			Control BU
	Complete commissioning of BRCC		■	▲					Control BU
	Complete commissioning of Tripoli, Zawia and Benghazi DCCs			■	▲				Control BU
	Complete S/S adaptation works, installation works and commissioning of Misurata and Sebha DCCs and their telecommunication links, renegotiating, revising, and making new contracts as necessary				■	▲			Control BU

BRCC commissioned and operational

TRCC maintained and upgraded

NCC upgrade and back up completed

TDCC, ZDCC and BDCC commissioned and operational

Control center projects completed

▲ Milestones

1) Remote Terminal Units (RTUs); Digital Control System (DCS)

Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

Utilization of SCADA functionalities and spinning reserve are an important factor to improve system reliability



CONTROL IMPROVEMENT ACTION PLAN

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner
Use SCADA control funct.	Utilize SCADA control capabilities at existing control centers to carry system control functions		■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	▲ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	Control BU
Provide spinning reserve	Provide sufficient spinning reserve to improve network stability and security		■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	▲ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	Control BU
Form permanent event analysis team	Create permanent interdepartmental team(s) of senior and experienced engineers to immediately respond to and investigate network incidents, determine causes and recommend corrective and preventive actions, equipped with necessary tools and authority		■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■			Control BU
	Install new fault or event recorders as required in key points of the power network and put existing recorders back in service at power plants and transmission substations		■ ■ ■ ■ ■ ■ ■ ■ ■ ■						Control, Transmission & Generation BUs
Reinstate AGC1 funct.	Reinstate AGC functions at NCC and power stations			■ ■ ■ ■ ■ ■ ■ ■ ■ ■	▲ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■				Control & Generation BUs
Modernize procedures and codes	Resume work with external consultant on issuing a GECOL grid code, operating and safety rules, and train Control and other staff on these rules and standards		■ ■ ■ ■ ■ ■ ■ ■ ■ ■	▲ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■	Control codes and procedures are implemented				Control BU

▲ Milestones

1) Automatic Generation Control (AGC)

Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

GECOL will the need to set and launch a series of milestones and measures to address its MV & Distribution issues ...

Detailed issues, measures and milestones **MV&DISTRIBUTION IMPROVEMENT ACTION PLAN**

 MV & Distribution issues	Measures	Milestones
<p>1 Deficient asset installation and maintenance practices</p>	<ul style="list-style-type: none"> • Improve cable handling and laying practices • Correct errors in cable jointing and termination works • Put AVRs¹ of transformers with OLTCs² in service • Correct bad practices in installation and O&M of transformers • Use only treated oils in transformers • Establish workshops to repair damaged transformers • Correct errors in erection of wood pole overhead lines • Improve protection against ingress of dust and pollution into substations • Introduce a comprehensive preventive maintenance program • Replace old equipment (old switchgear) • Restore LV switchboards to correct working condition • Install earth fault alarm and indications on existing and future RMUs³ • Incident data collection and management 	<ul style="list-style-type: none"> • All storekeepers trained and certified • All project supervisors and network contractors trained and certified • All cable jointists trained and certified • All AVRs of Transformers with OLTC in service • All regions equipped with oil treatment machines • Transformer repair facilities established • Preventive maintenance system is fully implemented • All old minimum oil circuit breakers replaced • All LV switchboards repaired and maintained • All RMUs' E/F alarm facilities in service • Distribution standards updated and staff is conversant to compliance • Comprehensive incident data and action plan developed to manage and reduce outages

1) Automatic Voltage Regulators (AVRs) ; 2) On load tap changers (OLTCs); 3) Ring Main Units (RMUs)

Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

..tackling the delayed investments problems, and acting on the dangerous operating conditions and the skills shortages

Detailed issues, measures and milestones **MV&DISTRIBUTION IMPROVEMENT ACTION PLAN**

 MV & Distribution issues	Measures	Milestones
<p>2 Delayed investment and replacement projects</p>	<ul style="list-style-type: none"> Restart halted projects Change to Aluminum Bundled Cables (ABC) in both LV and HV rural distribution 	<ul style="list-style-type: none"> Use available project equipment over the coming 2 years 80% of halted projects completed
<p>3 Incorrect and unsafe O&M practices</p>	<ul style="list-style-type: none"> Enforce GECOL technical and other standards Strengthen safety standards enforcement 	<ul style="list-style-type: none"> Safety management systems successfully implemented Rate of serious and fatal accidents reduced by 90%
<p>4 Skills shortage</p>	<ul style="list-style-type: none"> Develop a career training development plan 	<ul style="list-style-type: none"> Career development system implemented

Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

By improving its cable handling, laying and jointing procedures GECOL will reduce MV feeders failures

MV&DISTRIBUTION IMPROVEMENT ACTION PLAN

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner
Improve cable handling and laying practices	Procure the proper tools and equipment for handling cables		■						MV & Distribution BU
	Train and direct GECOL storekeepers on proper handling and storage of power cables		▲						MV & Distribution BU
	Train GECOL staff on correct handling and lying of power cables		■	▲					MV & Distribution BU
	Ensure contractors have sufficient experience and knowledge of cable works and have the correct required equipment		■	▲	■	■	■	■	■
Correct errors in cable jointing and termination works	Procure correct tools and equipment for cable jointing works		■						MV & Distribution BU
	Train cable jointists and supervisors on the correct jointing and termination practices		■						MV & Distribution BU
	Form regional teams to:			■					MV & Distribution BU
	1. Assess and correct (where necessary) <ul style="list-style-type: none"> – Existing bonding status – Existing sheath earthing status – Existing cable termination earthing 			■					MV & Distribution BU
	2. Clean cable trenches in substations from objects that represent a physical and fire hazard to cables								

▲ Milestones

Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysisBS5

By correcting transformers installation practices, GECOL will address the high transformers failures in MV&D



MV&DISTRIBUTION IMPROVEMENT ACTION PLAN

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner
Put AVR¹s of transformers with OLTC²s in service	Train staff on correct settings of AVRs for Transmission and MV transformers and correct maintenance of OLTCs		■						MV & Distribution BU
	Adjust settings of AVRs and test operation with OLTCs		■	▲					MV & Distribution BU
	Put AVRs in automatic mode		■						MV & Distribution BU
	Review and optimize settings of off load tap changers of distribution transformers		■						MV & Distribution BU
Correct bad practices in installation and O&M of transformers	Ensure all ground mounted transformers have temperature and Buchholz protection in service and connected to trip coils		■						Distribution BU
	Ensure all indoor ground mounted transformers have proper ventilation and it is kept in proper condition with clear air paths		■						Distribution BU
	Install barriers and warning signs around bushings of indoor ground mounted transformers		■						Distribution BU
	Ensure all pole mounted transformers have correct surge arrestors in place and in service and that arcing horns are installed and adjusted to 7cm to GECOL standards		■						Distribution BU

▲ Milestones

1) Automatic Voltage Regulators (AVRs); 2) On load tap changers (OLTCs)

Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

GECOL shall also take action to repair transformers and correct errors in erection of wood pole overhead lines



MV&DISTRIBUTION IMPROVEMENT ACTION PLAN

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner
Use only treated oils in transformers	Equip maintenance departments with sufficient numbers of oil treatment machines		■	▲					Distribution BU
	Train staff on dangers of use of untreated oils		■						Distribution BU
	Train staff on use of oil treatment machines		■						Distribution BU
	Carry out survey to determine current status of in-service transformers' oils, treat oils as necessary to protect transformers		■						Distribution BU
Establish workshops to repair damaged transformers	Establish at least 3 transformer repair workshops distributed geographically around Libya			■	▲				MV & Distribution BU
	Train GECOL staff on transformer repair, possibly in partnership with established transformer supplier			■					MV & Distribution BU
Correct errors in erection of wood pole overhead lines	Procure the proper tools and equipment for handling and pulling of distribution line conductors		■						Distribution BU
	Train GECOL staff on correct handling, pulling, stringing, and fixing of overhead line conductors		■						Distribution BU
	Train GECOL staff on the design and calculations of distribution lines		■						Distribution BU
	Ensure contractors must have sufficient experience and knowledge of overhead lines works and have the correct required equipment		■						Distribution BU

All regions equipped with oil treatment machines

Transformer repair facilities established

▲ Milestones

Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

Preventive maintenance and protection of assets from external agents will reduce failures and faults



MV&DISTRIBUTION IMPROVEMENT ACTION PLAN

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner	
Improve protection against ingress of dust and pollution into substations	Ensure proper seals of door and windows in substations		■							MV & Distribution
	Ensure proper operation and filtering of ventilation openings		■							MV & Distribution
	Train staff to keep compartment door closed		■							MV & Distribution
	Train staff not to leave circuit breaker trucks outside their compartments		■							MV & Distribution
	Regularly maintain cleanliness of substations		■	■	■	■	■	■	■	MV & Distribution
Introduce a comprehensive preventive maintenance program	Determine optimal set of preventive maintenance checks for each type of asset		■							MV & Distribution
	Procure all necessary equipment for approved checks		■							MV & Distribution
	Train GECOL staff on preventive maintenance checks		■							MV & Distribution
	Include preventive maintenance checks in annual maintenance programs		■	▲						MV & Distribution
	Conduct an initial condition assessment campaign of key assets, especially transformers to identify any existing critical issues requiring urgent action		■							MV & Distribution

Preventive maintenance system is fully implemented

▲ Milestones

Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

GECOL shall then ensure that all the alarms and protections are installed, repaired and put in service



MV&DISTRIBUTION IMPROVEMENT ACTION PLAN

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner	
Replace old equipment (old switchgear)	Determine substations and equipment that need to be replaced		■						MV & Distribution BU	
	Procure required replacements		■						MV & Distribution BU	
	Remove old equipment, install new replacements			■	▲				MV & Distribution BU	
	All old minimum oil circuit breakers replaced									
	Erect new substations to the minimum extent necessary			■	■					MV & Distribution BU
	Carry out maintenance of old switchgear, including RMU's, to contain risks until they are replaced			■	■					MV & Distribution BU
Ensure sufficient supply of the correct fuses for old RMUs until they are replaced			■	■					MV & Distribution BU	
Restore LV switchboards to correct working condition	Determine where LV switchboards have been modified or bypassed		■						MV & Distribution BU	
	Repair and restore switchboards			■	▲				MV & Distribution BU	
	All LV switchgear repaired and maintained									
Resolve problems of feeder overloads or change rating of MCBs used, as appropriate			■	■					MV & Distribution BU	
Install earth fault alarm and indications on existing and future RMUs1	Form special regional teams to carry out works		■						MV & Distribution BU	
	Ensure CTs and other materials are available for each RMU and procure replacement parts where not available		■						MV & Distribution BU	
	Carry out installation works			■	▲				MV & Distribution BU	
	All RMU's E/F alarm facilities in service									
Train GECOL staff on utilization and importance of the earth fault indications				■	■				MV & Distribution BU	

▲ Milestones

!) Ring main units (RMUs)

Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

And it shall address incident data collection and management



MV&DISTRIBUTION IMPROVEMENT ACTION PLAN

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner
Incident data collection and management	Unify coding system for network assets, apply unified codes to network diagrams		■						MV & Distribution BU
	Enforce use of updated network diagrams as an essential tool by O&M staff			■					MV & Distribution BU
	Develop unified asset and customer database for use By relevant IT systems (SADA, GIS, CSS, NEPLAN/ PSS/E, IRMS/OMS)			■	■				MV & Distribution BU
	Ensure adherence with O&M standards and procedures, review and update standards and procedures			■	■	▲			MV & Distribution BU
	Select and apply suitable incident recording and Management tool, enforce company-wide implementation				■	▲			MV & Distribution BU

Distribution standards Updated and staff conversant to compliance

Comprehensive incident data and action plan developed to manage and reduce outages

▲ Milestones

Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

Resuming halted projects and completing the change to aluminum bundled cables are key to solve voltage problems



MV&DISTRIBUTION IMPROVEMENT ACTION PLAN

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner
Restart halted projects	Form a task force to assess position of projects materials in stores, improve storage conditions and security		■						Medium Voltage BU
	Find alternative solutions to resolve project obstacles (e.g. prefab substation buildings where standard buildings were not constructed)			■	▲				Medium Voltage BU
	Work with contractors to resume project execution			■	▲				Medium Voltage BU
	Train local engineers with suppliers on supervision works		■	■					Medium Voltage BU
Change to Aluminum Bundled Cables (ABC) in both LV and HV rural distribution	Continue with procurement of ABC conductors for new rural connections		■	■	■	■	■	▲	Distribution BU
	Launch a multi-year program to replace existing copper conductors		■	■	■	■	■		Distribution BU
	Salvage value of removed copper conductors		■	■	■	■	■		Distribution BU

Use available project equipment over the coming 2 years

80% of halted projects completed

80% of rural lines replaced by ABC

▲ Milestones

Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

GECOL shall urgently enforce safety rules to avoid fatal accidents and equipment failures



MV&DISTRIBUTION IMPROVEMENT ACTION PLAN

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner
Enforce GECOL technical and other standards	Establish a company-wide training program to ensure staff understand the GECOL standards and their application			█	█				MV & Distribution BU
	Reissue the standards in a more easy to comprehend graphic-centered format		█	█					MV & Distribution BU
	Review and update the standards regularly as technologies develop and GECOL's requirements and conditions change			█	█	█	█	█	▶ MV & Distribution BU
	Engage with suppliers and contractors to properly understand and comply with relevant standards		█	█	█	█	█	█	▶ MV & Distribution BU
Strengthen safety standards enforcement	Review and update all GECOL safety policies and procedures (SPP) and make them available in clear and simple Arabic		█						MV & Distribution BU
	Launch comprehensive SPP safety awareness and training campaigns throughout GECOL that involve all dep		█	█	█	█	█	█	All BUs
	Enforce and motivate compliance with safety rules at all levels		█	█	█	█	█	█	▶ All BUs
	Procure and provide all require personal protective equipment		█						MV & Distribution BU
	Build a safety conscious culture in GECOL		█	█	█	█	█	█	▶ All BUs

Rate of serious and fatal accidents reduced by 90%

▲ Milestones

Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis

Development and career programs shall be established to motivate personnel



MV&DISTRIBUTION IMPROVEMENT ACTION PLAN

Measures and activities

Measures	Activities	Year							Owner	
			2018	2019	2020	2021	2022	2023		
Develop a career training development plan	Update GECOL jobs requirements		■							MV & Distribution BU & HR
	Specify core capabilities requirements		■							MV & Distribution BU & HR
	Develop a career development plan procedures		■	▲						MV & Distribution BU & HR
	Create a platform to enhance the application of the career development plan system			■						MV & Distribution BU & HR
	Continue with MV & Distribution staff development and career building					■	■	■	■	■

Career development system implemented

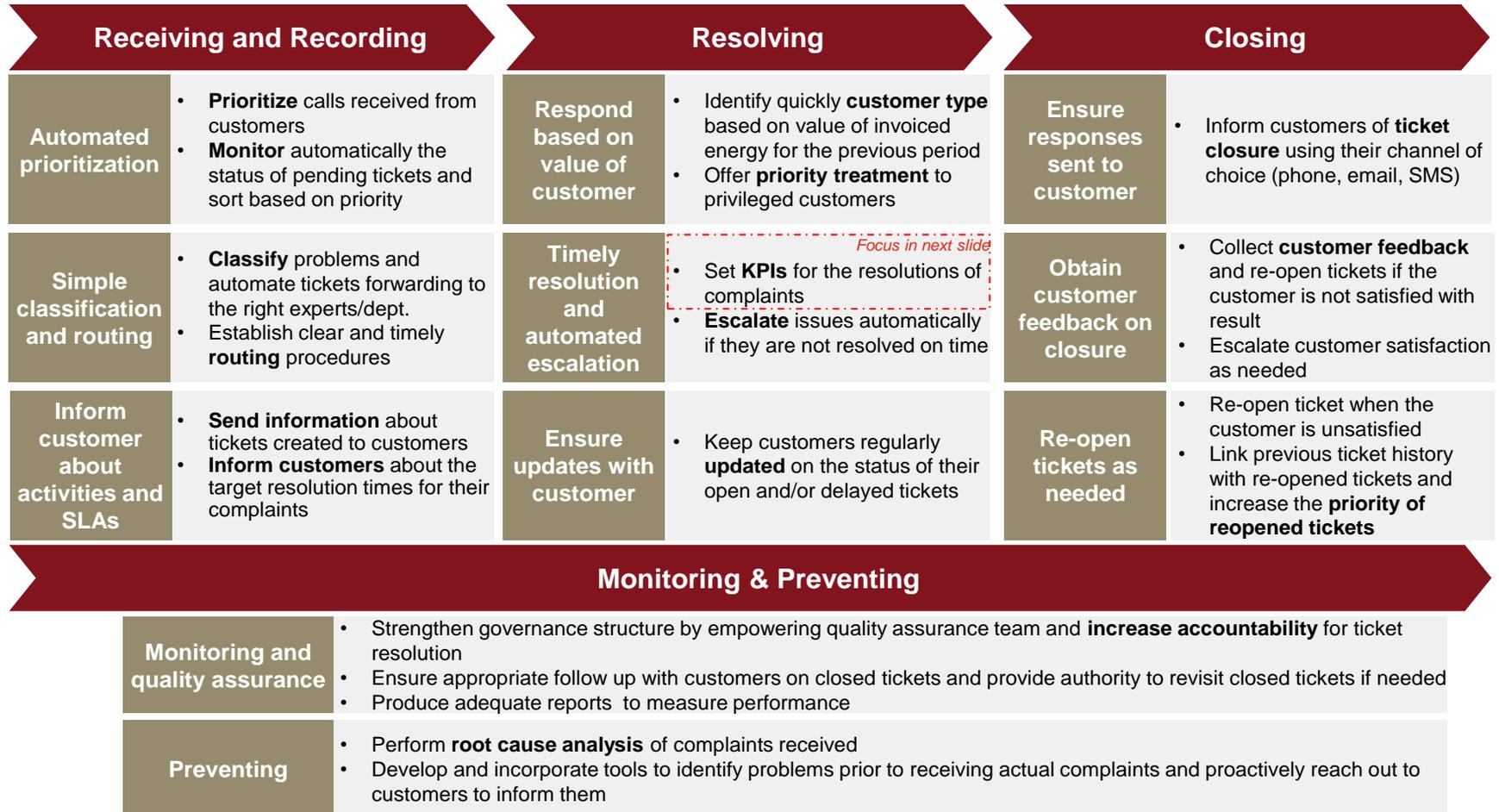
▲ Milestones

Source: Awardbrand - Improving GECOL technical performance report, Strategy& analysis



To upgrade its service quality GECOL shall establish a clear complaint valuation, resolution and monitoring process

Complaint valuation, resolution and monitoring framework



Sources: Strategy& analysis



And in order to track its service quality performance GECOL might track progress against the following KPIs

Complaints resolutions KPIs

KPIs	Description	By customer	By complaint
First time resolution rate	Proportion of calls that are resolved in the first instance	To be computed as an average	
Average customer satisfaction	Proportion of customers that have satisfactory had their complaint resolved	✓	✓
Call handling quality	Quality of conversations between agent and customer	✓	
Service level	Percentage of calls answered on the targeted time	✓	
Average speed of answer	Time taken by agent to answer an upcoming call from the customer	✓	
Call abandonment rate	Proportion of total calls that are abandoned by the customer before the agent reply	✓	
Call duration	Average length of calls between agent and customer	✓	
Financial complaint resolution time	Proportion of financial customers complaints that are resolved in the stated time	✓	
Technical complaint resolution time	Proportion of financial customer complaints that are resolved in the stated time	✓	
Reopened tickets rate	Proportion of tickets that have previously been closed but now reopened due to non-resolution of complaint		✓
Repeated calls rate	Total number of calls received from the same customer during a predetermined time period	✓	

Operational KPIs Customer KPIs

Sources: Strategy& analysis

Institutional development

Processes

Manpower

IT

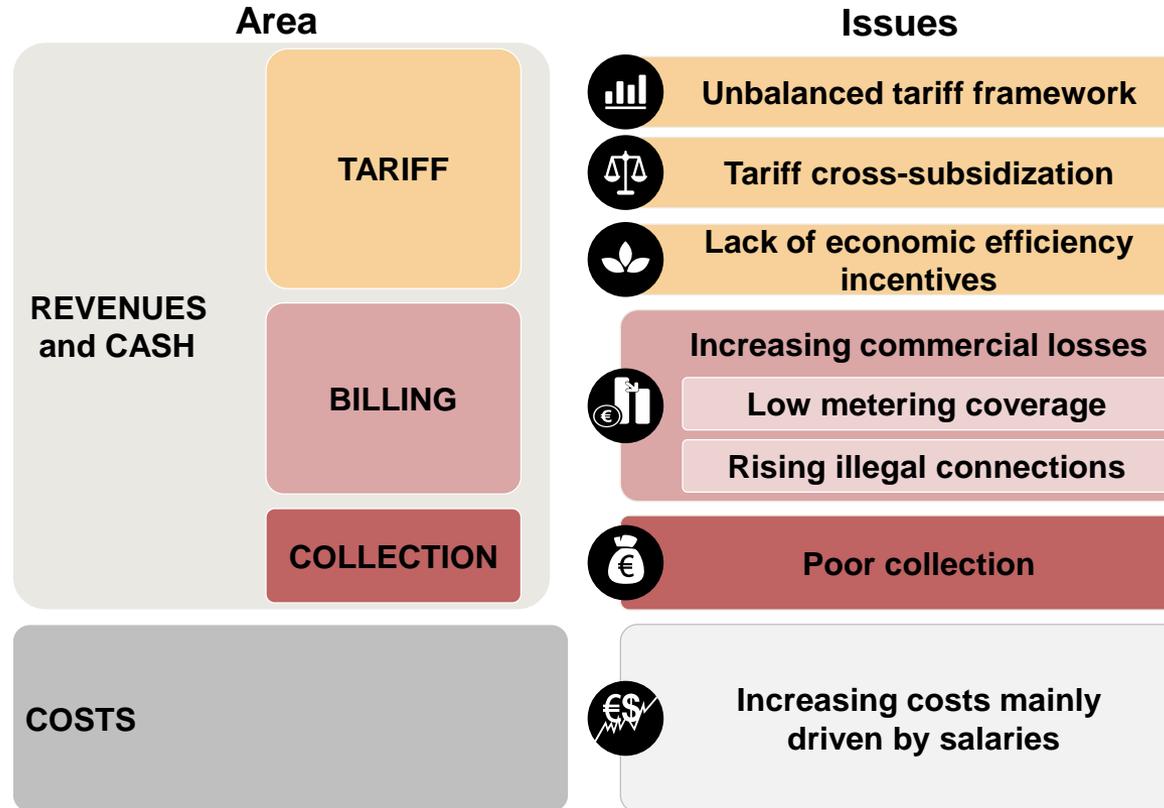
Technical performance

Financial performance

Back-up – Review of 2011-2015 GECOL 6 part strategy

Finally Task C has reviewed GECOL's financial performance & tariff, identifying a number of issues

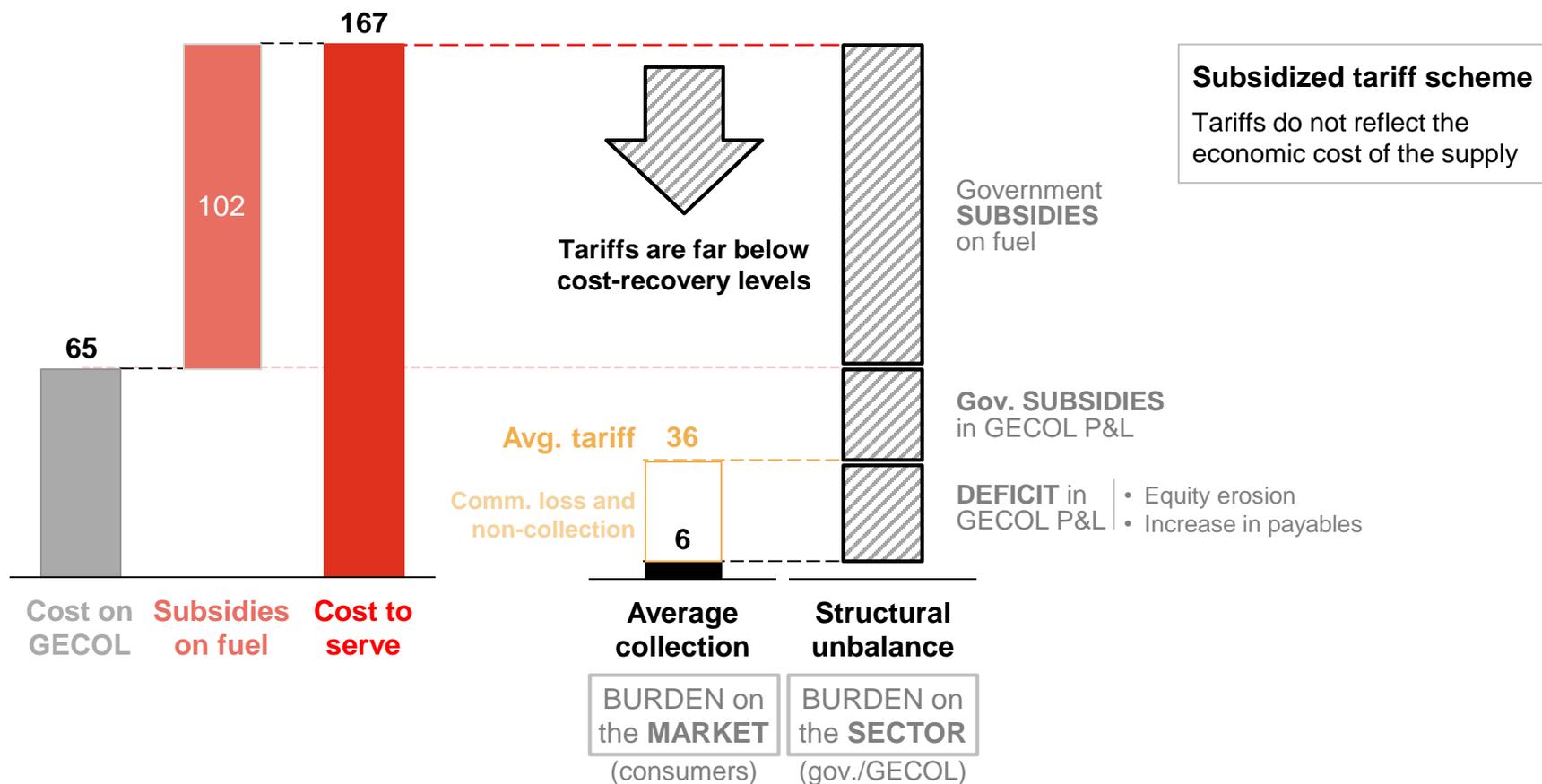
Financial performance issues



Source: PWC- Customer service financial performance; Strategy& analysis

GECOL's revenues today are negatively affected by an unbalanced tariff set far below cost-recovery levels

GECOL's cost-tariff unbalance (Dhs/ kWh, 2015)

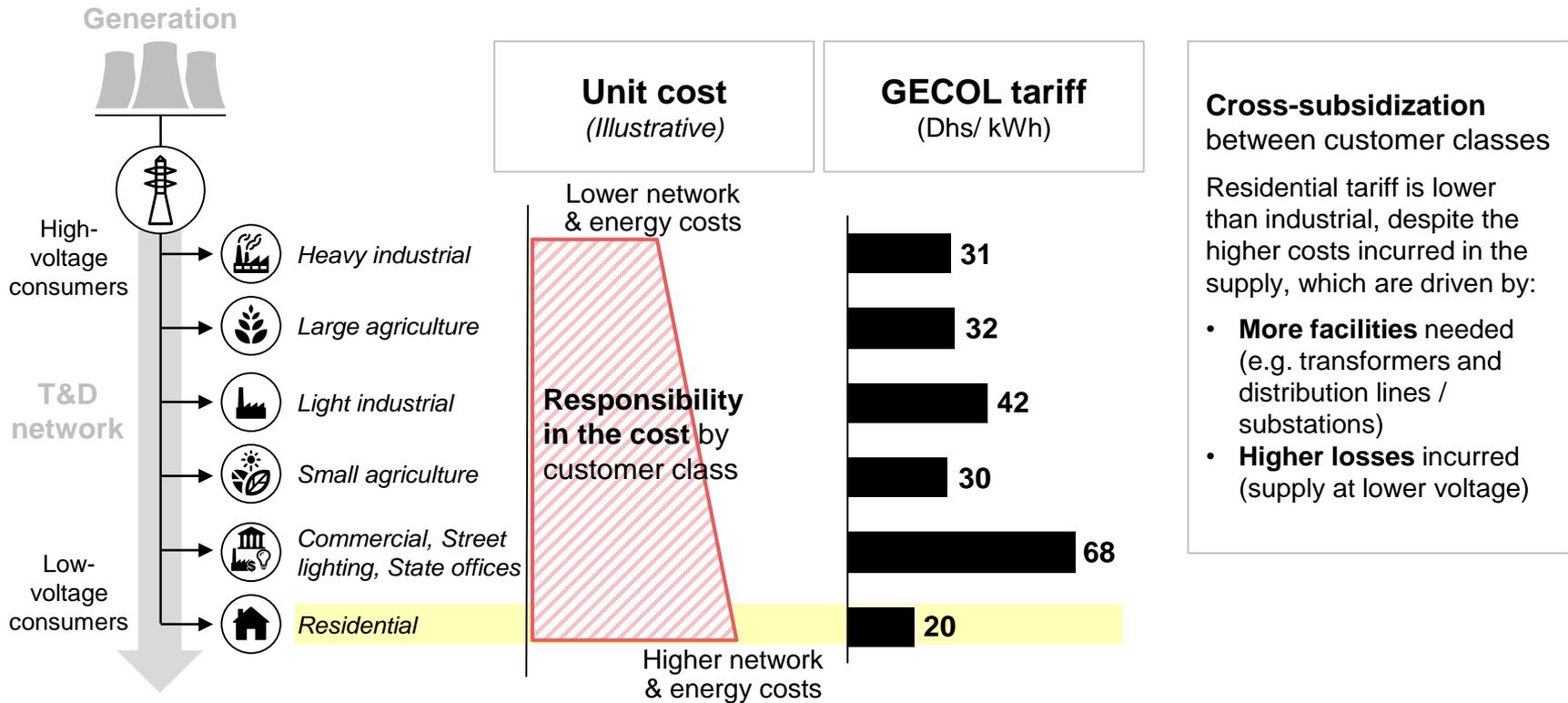


Note: Average tariff weighted by consumption by customer class

Source: Strategy& analysis

Tariffs are also cross-subsidized between customer classes, not reflecting the costs that each class is responsible for

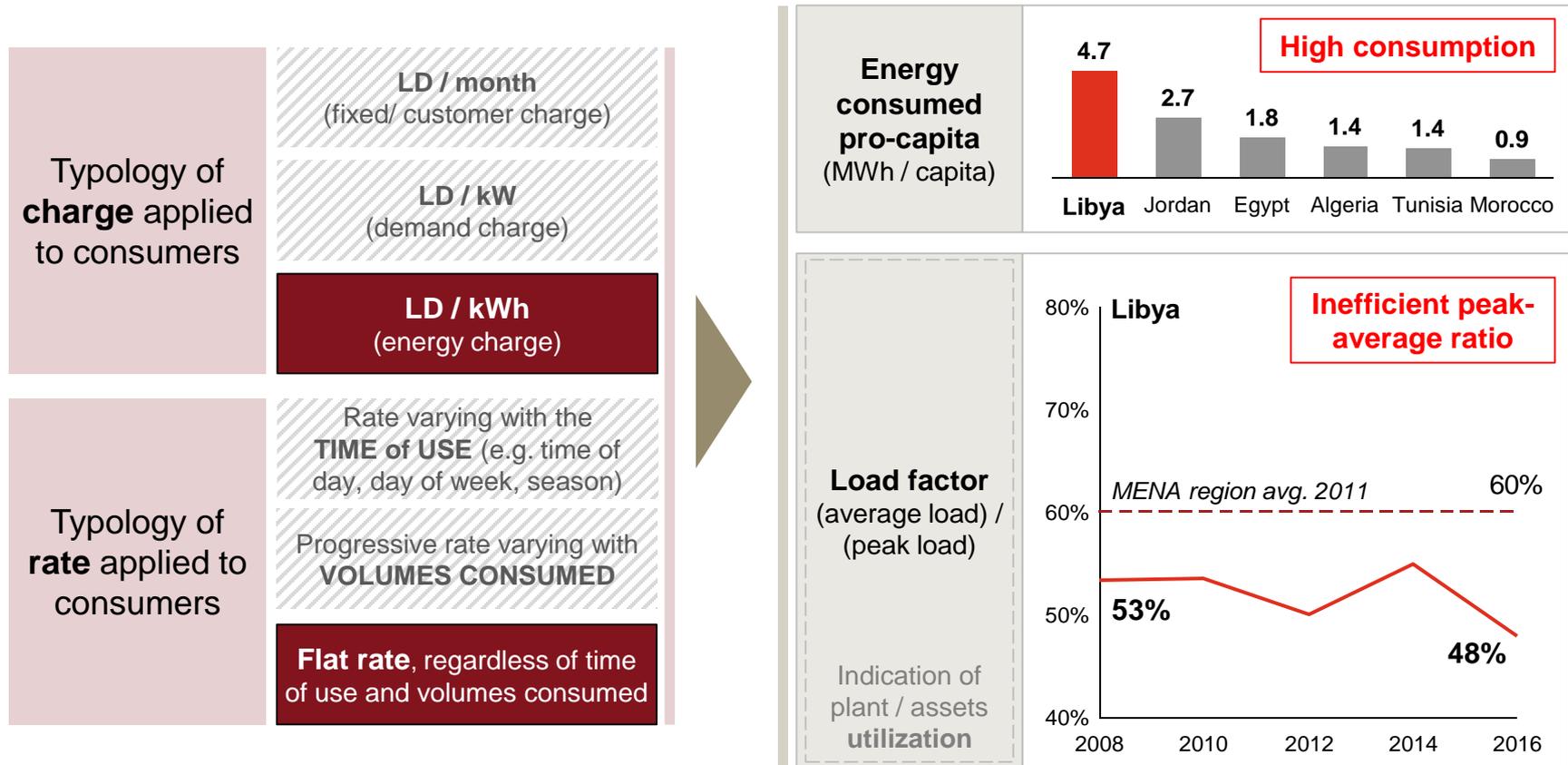
Libyan tariff by customer class (2011-2017)



Source: Strategy& analysis

In addition, tariffs are applied to customers with a flat rate, not incentivizing an efficient use of energy and assets

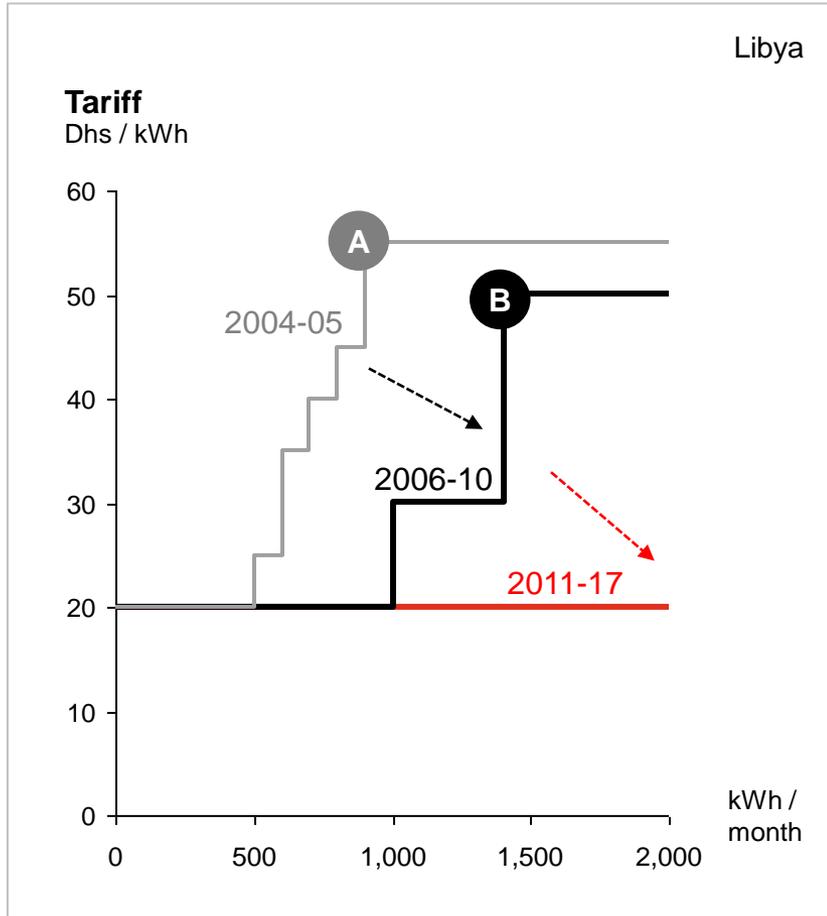
Libyan rate scheme and efficiency indicators (2011-2017)



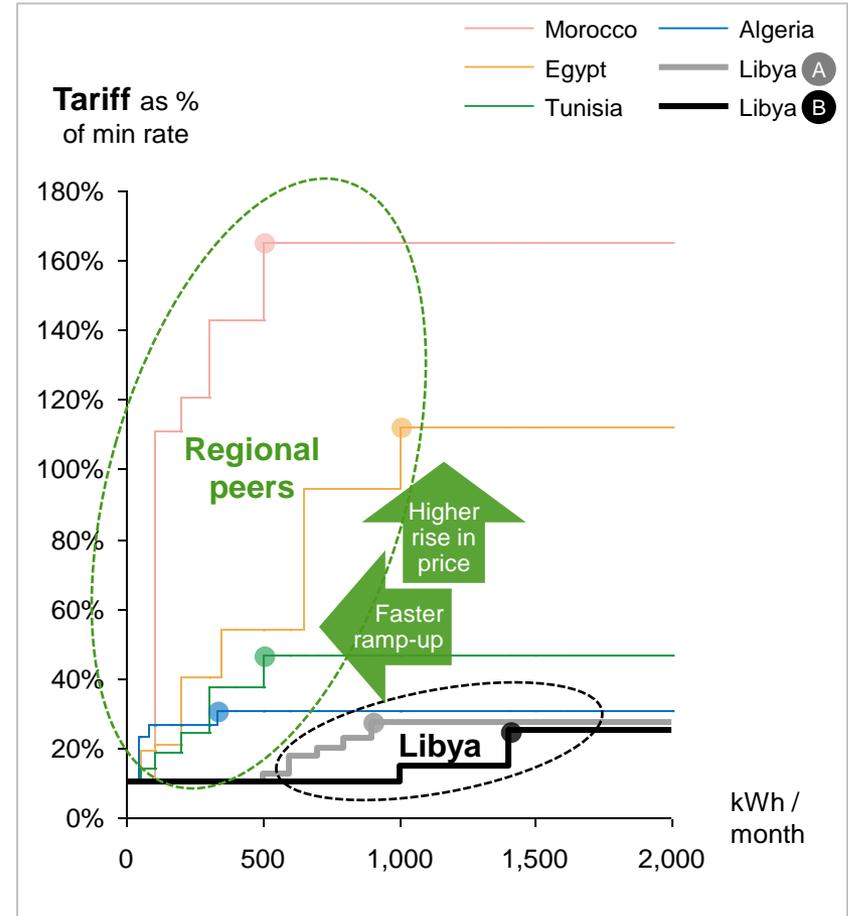
Source: Strategy& analysis

Only residential class experienced volume-dependent tariffs, even though “lighter” than those applied by regional peers

Libyan residential rate scheme



Benchmark vs. regional peers

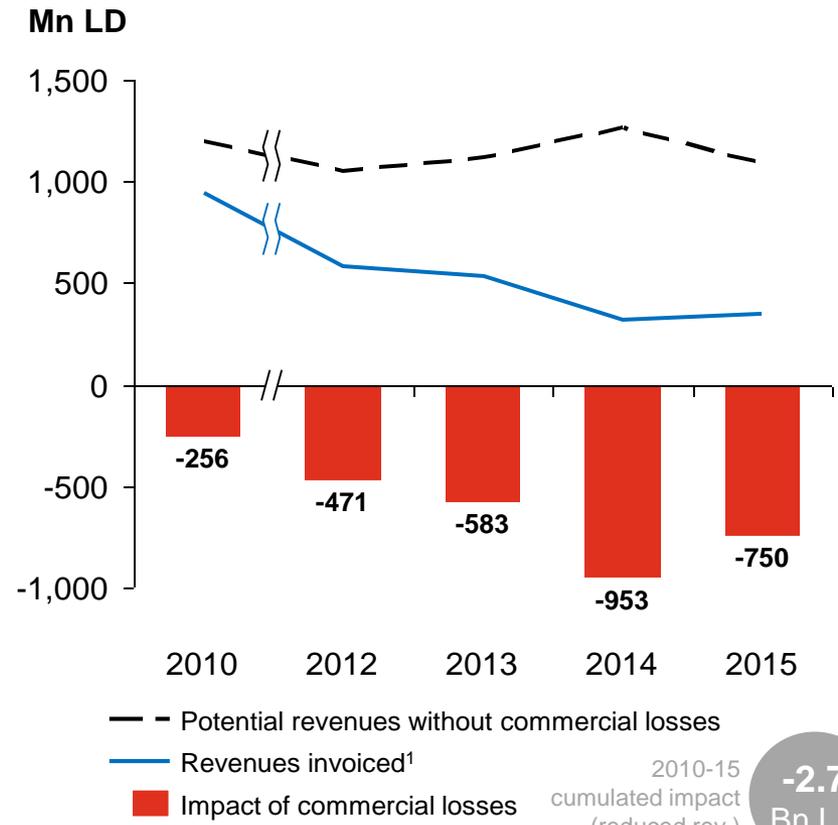
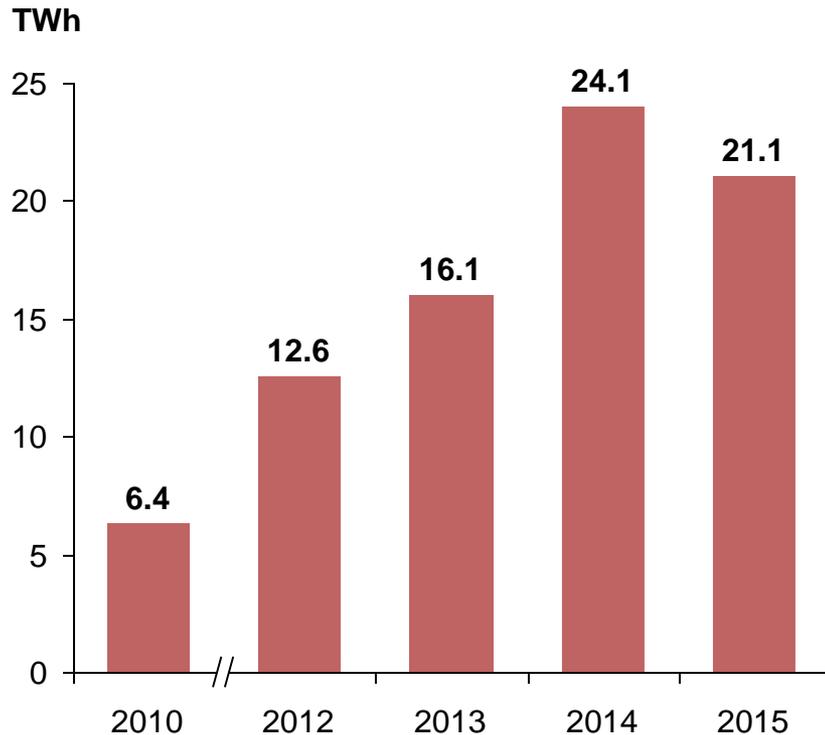


Source: Strategy& analysis

The analysis of customer service highlighted a dramatic impact of commercial losses on revenues

Evolution of commercial losses

Impact of commercial losses on P&L

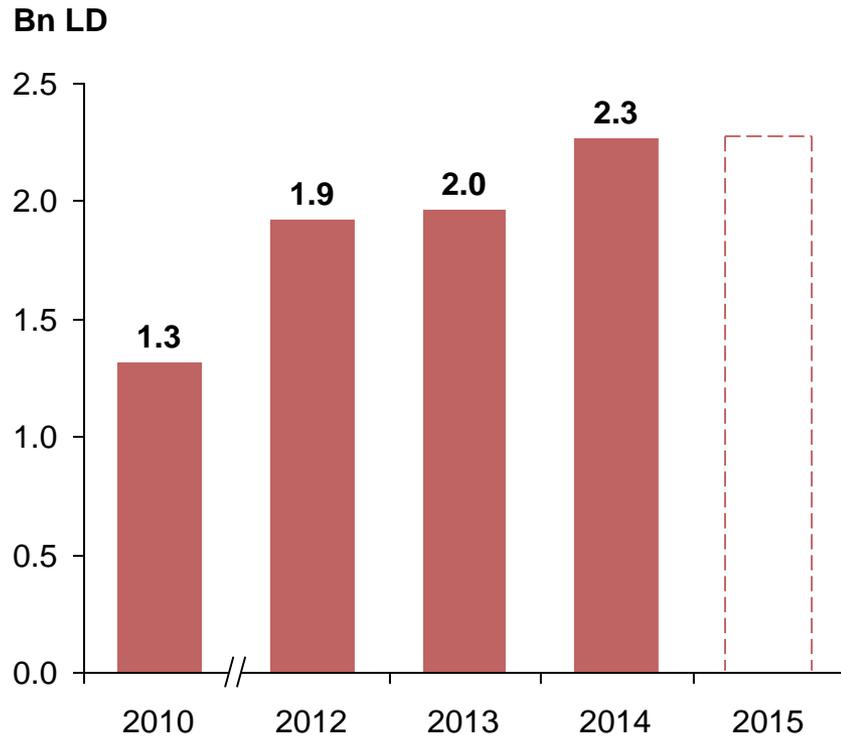


Note: 1) (Consumption invoiced by segment) x (Segment tariff)

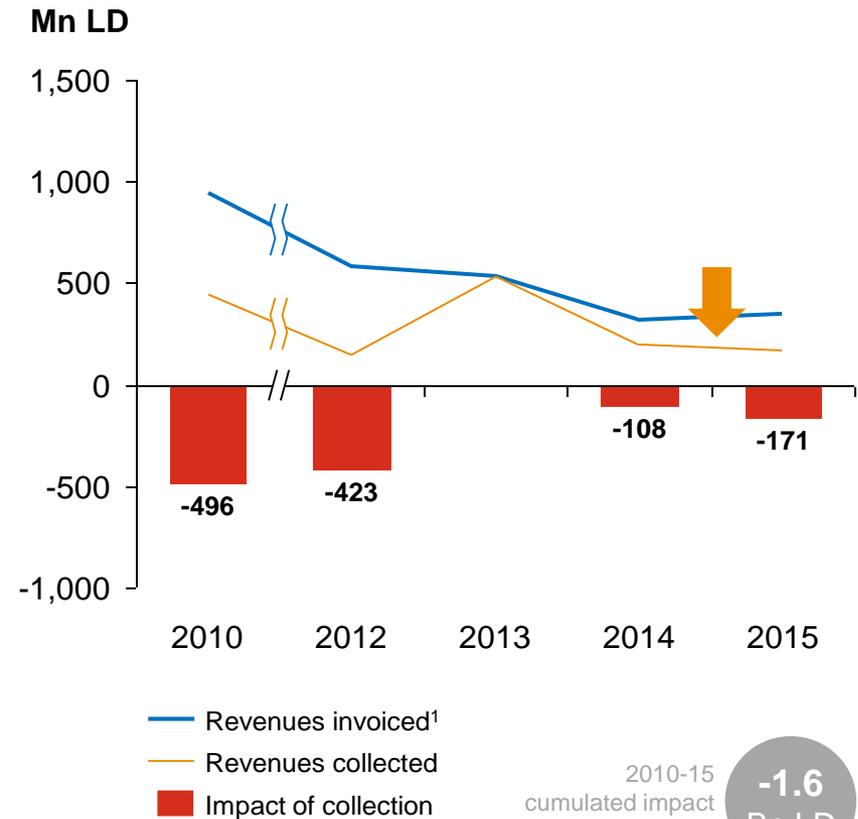
Source: GECOL data collection ID7, GECOL data collection ID21; GECOL data collection ID37, Strategy& analysis

Booming receivables led to a cumulated impact on revenues between 2010-2015 of 1.6 Bn LD

Evolution of receivables



Impact of collection effectiveness

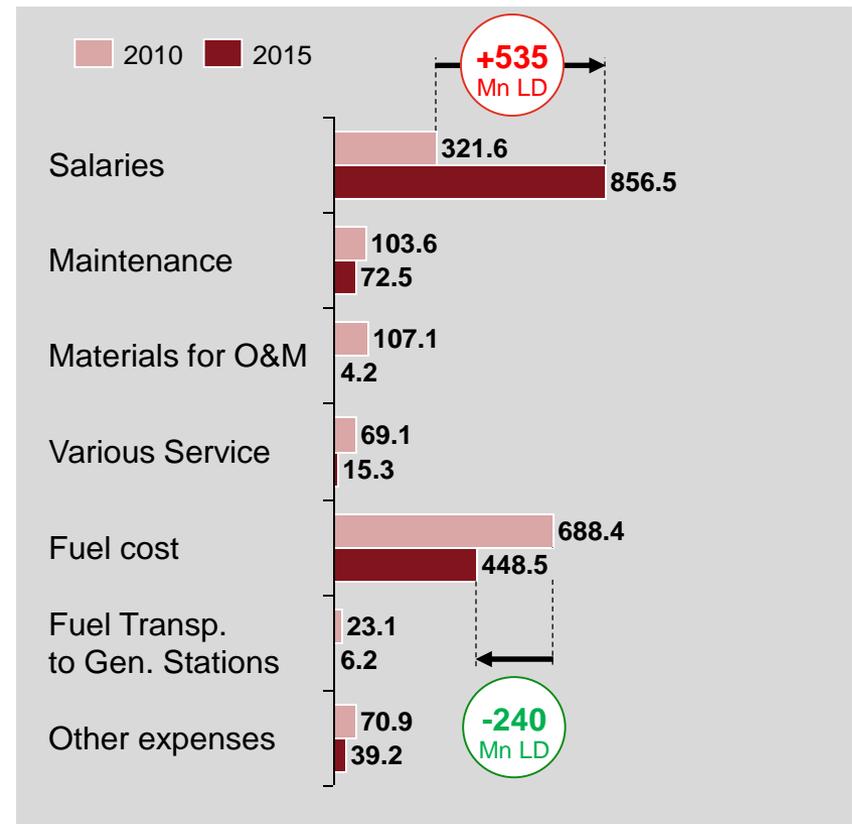
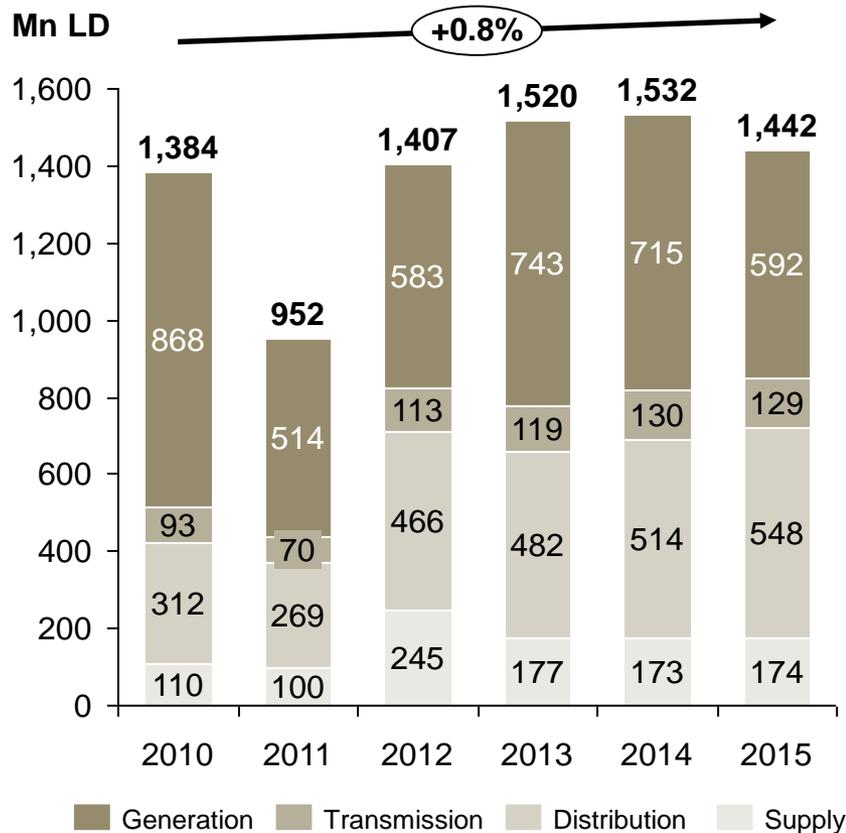


Note: 1) (Consumption invoiced by segment) x (Segment tariff)

Source: GECOL data collection ID7, GECOL data collection ID21; GECOL data collection ID37, Strategy& analysis

At the same time, on the costs side a sharp increase in average salaries led to an increase in the operating costs

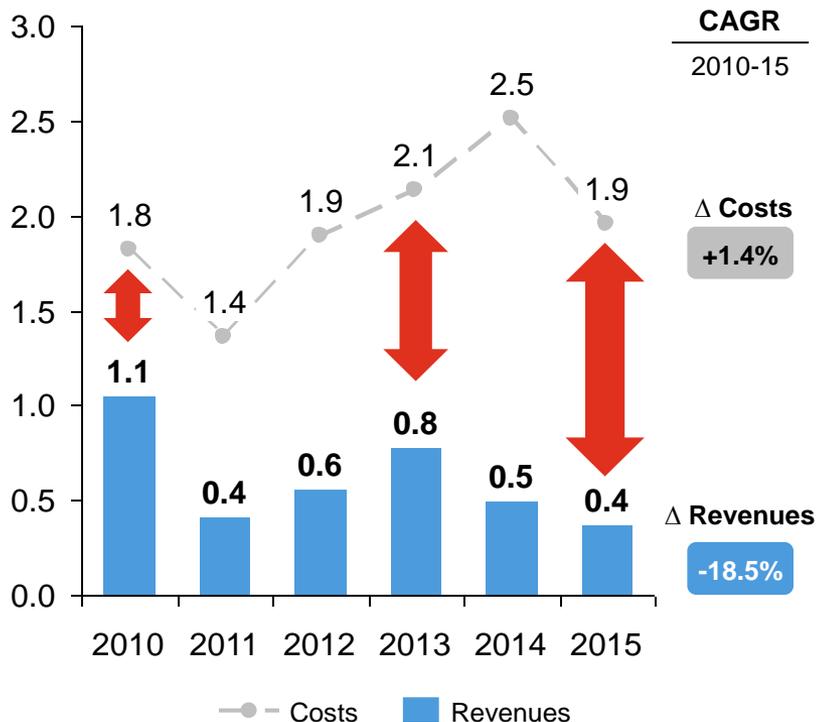
Evolution of GECOL costs



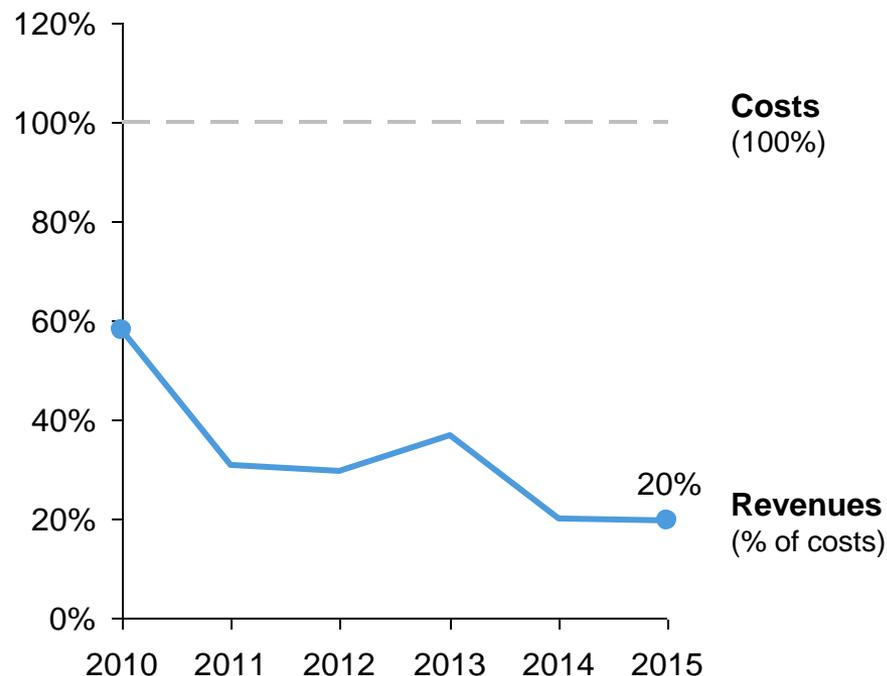
Source: GECOL data collection ID13, Strategy& analysis

Overall decreasing revenues and poor collection, coupled with rising costs, led to a sharp widening of GECOL's deficit

Evolution of GECOL revenues and costs
(Bn LD)



Evolution of GECOL revenues
(as % of costs)



Note: Actual evolution of GECOL revenues (slightly differs from the bottom-up version estimated within the Rapid assessment of the sector performance)

Source: GECOL collection ID13, Strategy& analysis

The recommendations focused first on GECOL upgrading its tariff framework and strengthening the metering system

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner	
Launch new Tariff framework	Plan the tariff change communication program		■						Public relations dept.	
	Implement the tariff change communication campaign			■					Public relations dept.	
	Data collection related to year n-1		■		■	■	■	■	Tariff and cost studies division	
	Data projections for year n+1			■	■	■	■	■	Tariff and cost studies division	
	Preliminary rate design for year n+1			■	■	■	■	■	Tariff and cost studies division	
	Preliminary tariff submission to Regulatory Agency			◆	◆	◆	◆	◆	Tariff and cost studies division	
	Launch new tariff framework				◆	▲	▲	▲	Customer Services dept.	
					Tariff covering part of P&L costs ¹		Tariff covering part of P&L costs ² and cost of fuel subsidies			
Metering roll-out	Identify strategy for metering strengthening		■						Customer Services dept.	
	Metering substitution/installation strategy roll-out			→						Customer Services dept.
	Perform monthly metering reads		■	■	■	■	■	■	→	Customer Services dept.

1) e.g. 90% of P&L costs benefiting from subsidized fuel pricing combined with a lifeline tariff to protect the most vulnerable customer classes (i.e. gradually phase out energy price subsidies through well targeted SSN); 2) e.g. 100% of P&L costs include subsidized fuel pricing charge on GECOL+ 20% of cost of fuel subsidies + Lifeline tariff

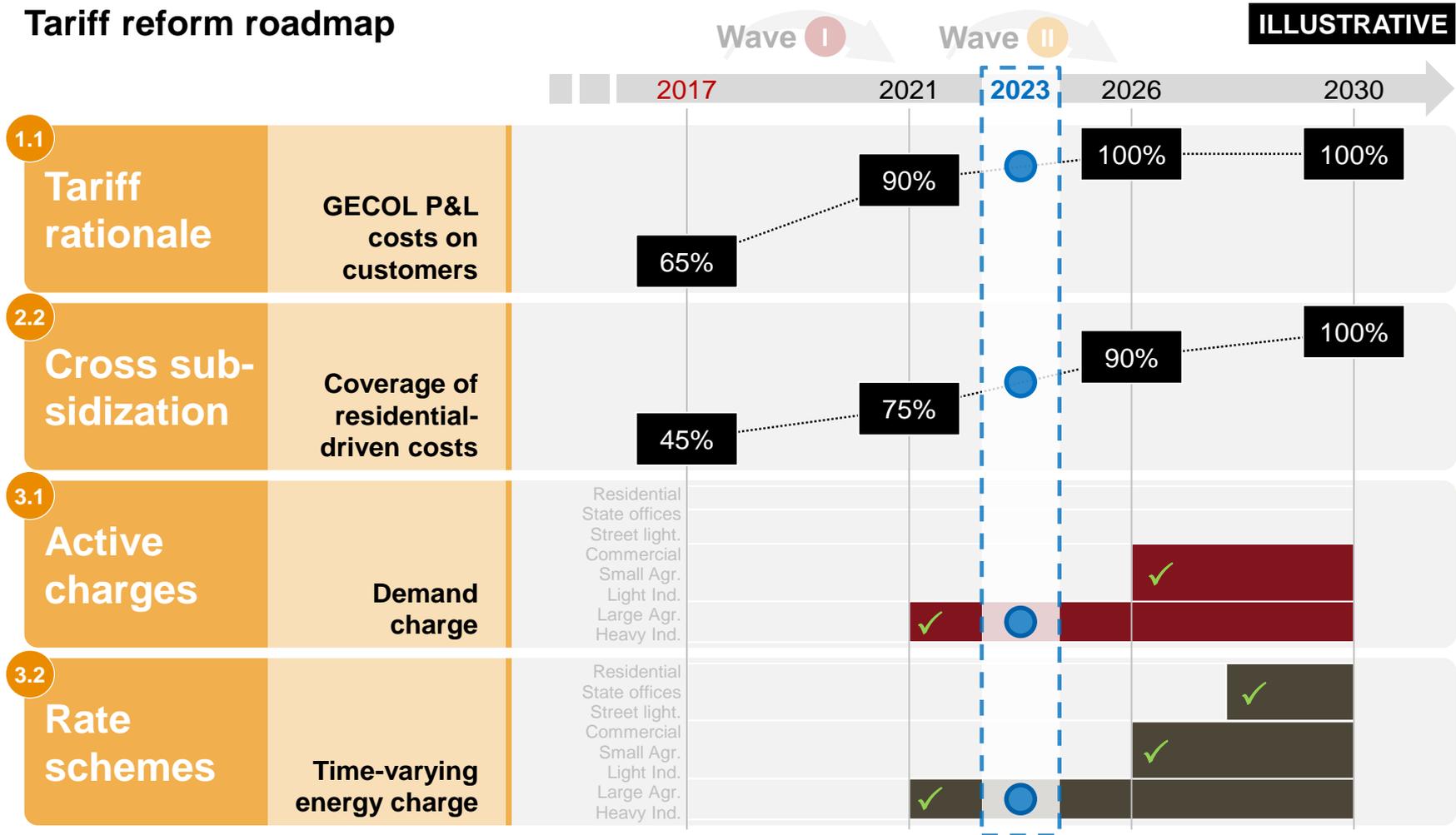
Source: Strategy& analysis

▲ Milestones
◆ One shot activity



GECOL shall set ambitious (but achievable) target milestones through a progressive tariff reform

Tariff reform roadmap



Source: Strategy& analysis



For instance, GECOL may target to increasingly cover P&L costs and start reflecting part of the cost of fuel subsidies

Tariff rationale roadmap

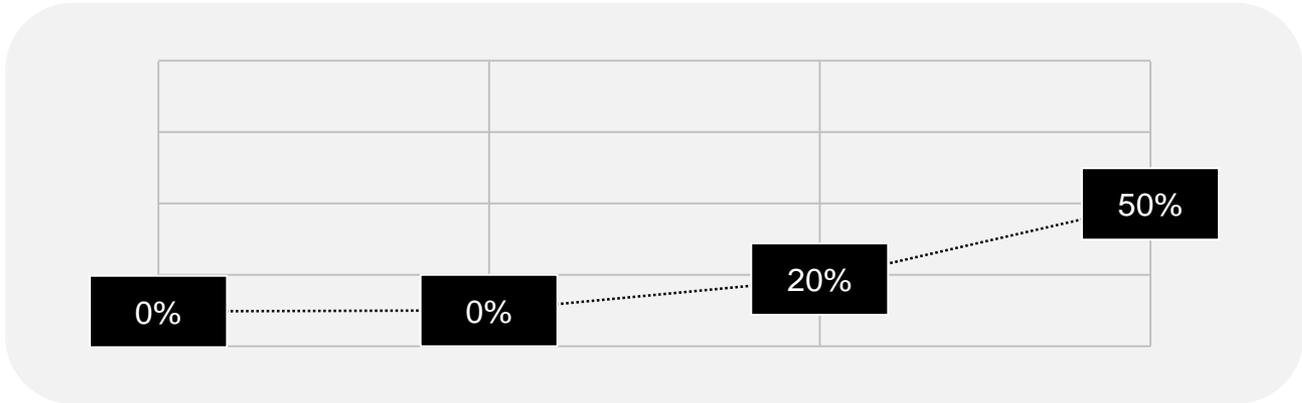
Wave I

Wave II

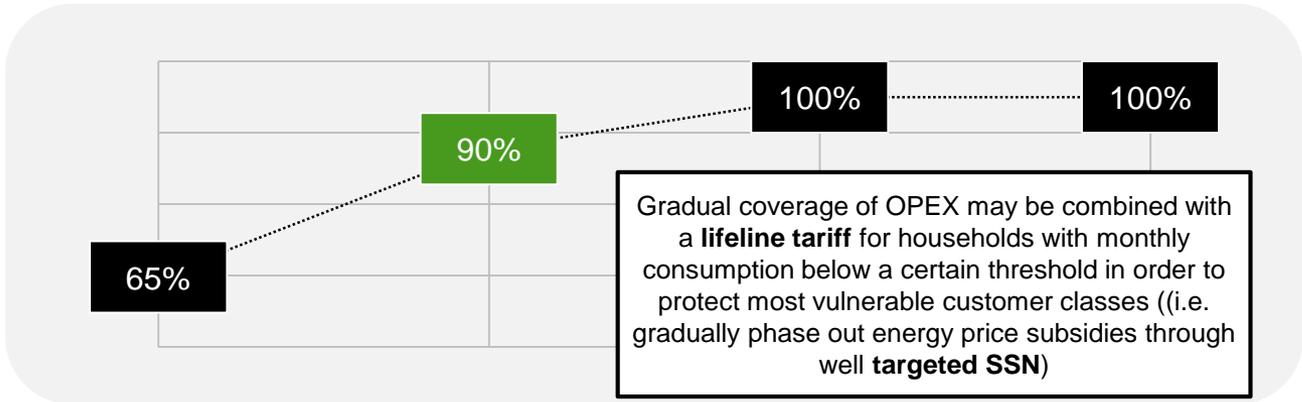
ILLUSTRATIVE



Cost of fuel subsidies on customers



GECOL P&L costs on customers



Gradual coverage of OPEX may be combined with a **lifeline tariff** for households with monthly consumption below a certain threshold in order to protect most vulnerable customer classes ((i.e. gradually phase out energy price subsidies through well **targeted SSN**))

Source: Strategy& analysis



Cross-subsidies between customer classes might be gradually decreased...

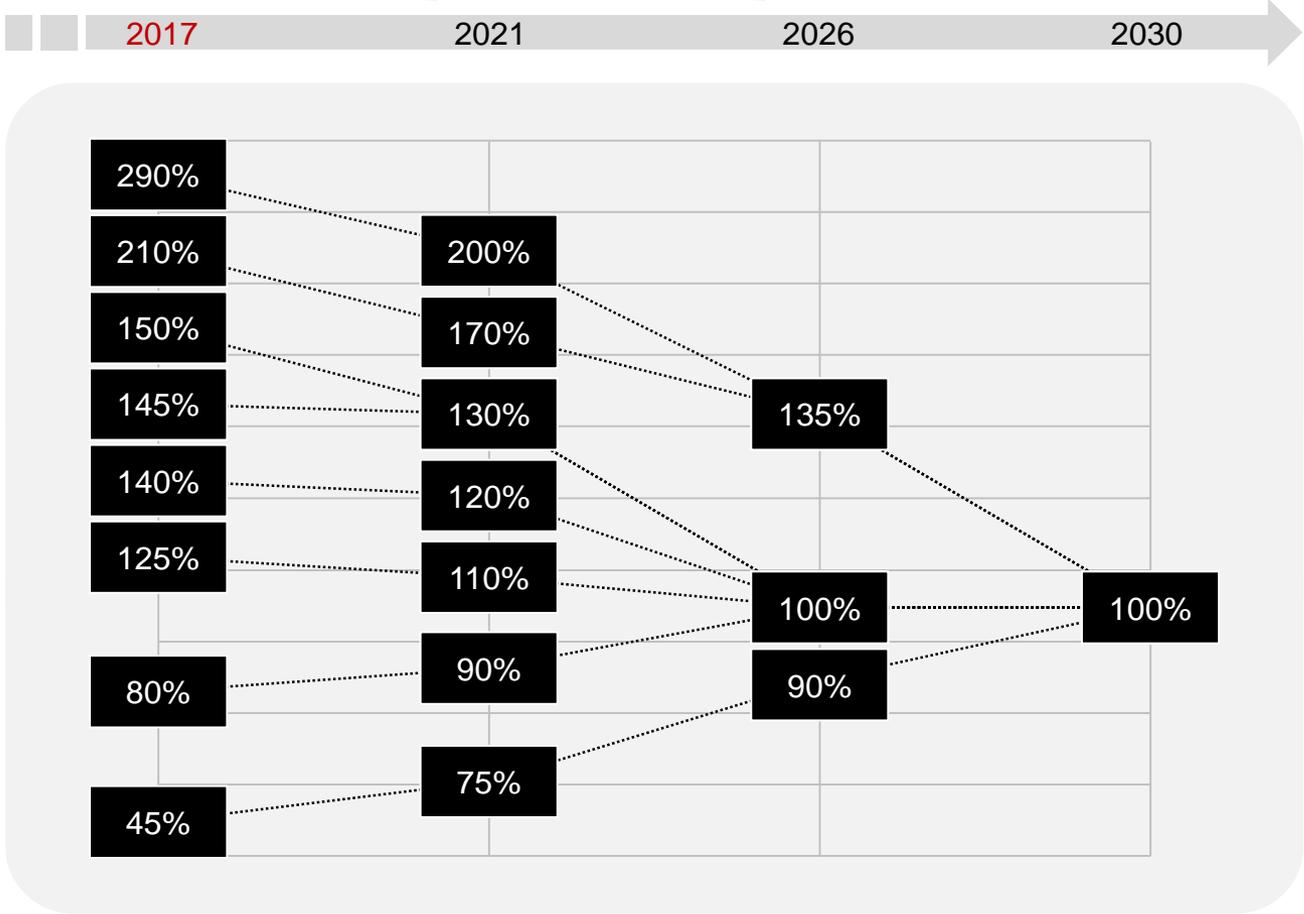
Cross subsidization roadmap



ILLUSTRATIVE

Coverage of class-driven costs⁽¹⁾

- State offices
- Commercial
- Heavy Industrial
- Light Industrial
- Street Lighting
- Large Agriculture
- Small Agriculture
- Residential



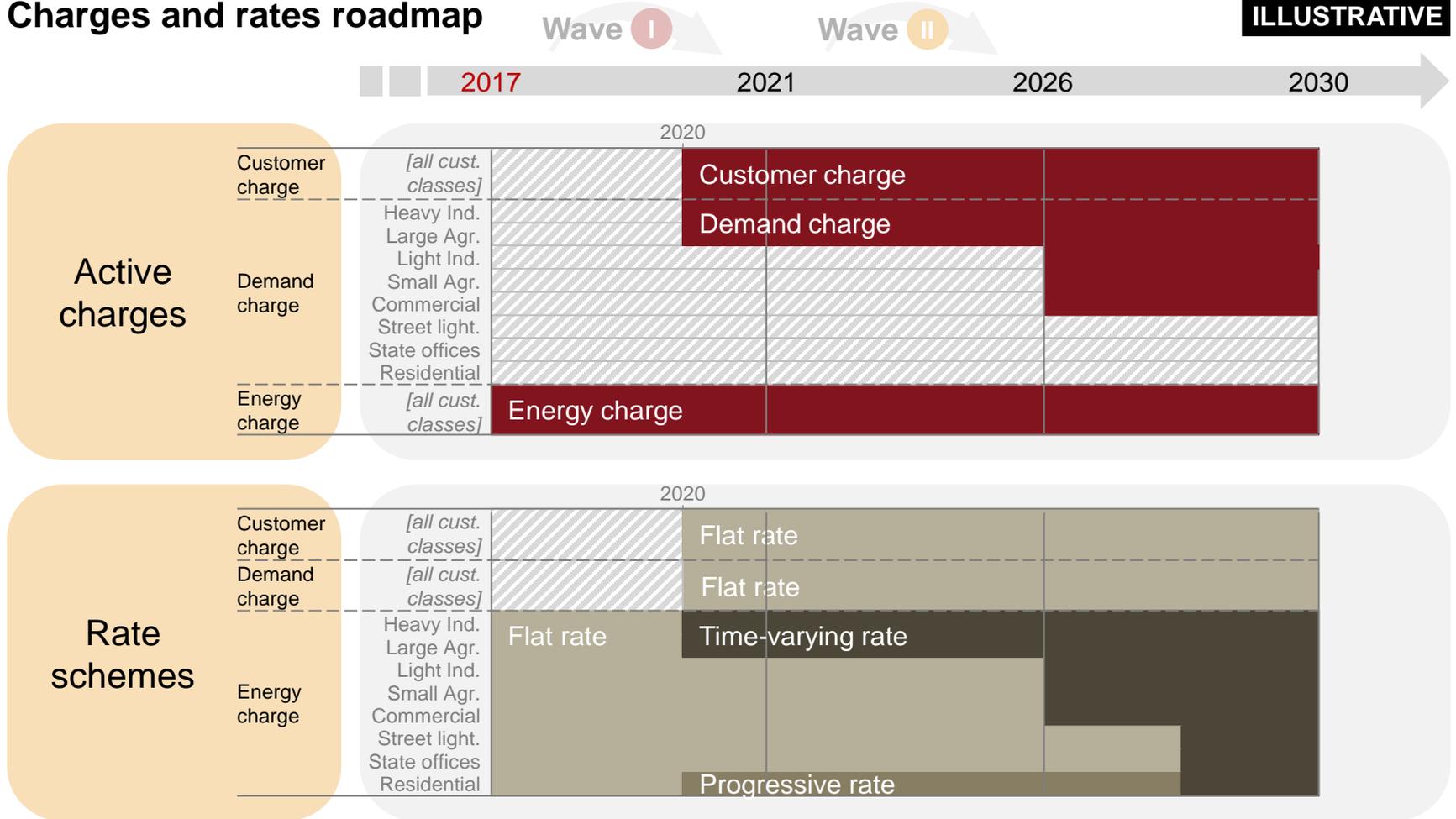
1) Based on allowed costs by customer class (which benefit from subsidies); thus, values higher than 100% do not necessarily imply full coverage of overall class-related costs
Source: Strategy& analysis



...and more advanced charges and rate schemes applied, enabled by metering technology deployment and upgrade

Charges and rates roadmap

ILLUSTRATIVE



Source: Strategy& analysis

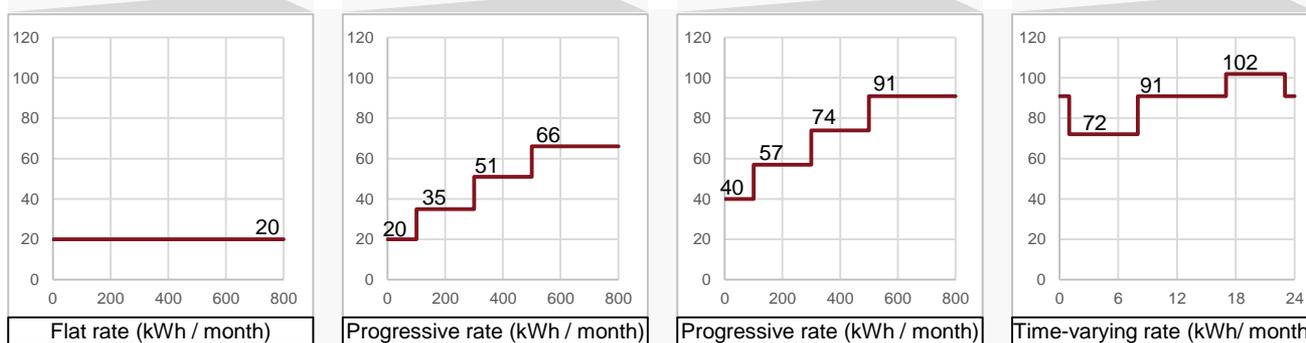
Guided by a gradual and tailored improvement pathway, tariff framework would thus experience a smooth transition

Average tariff evolution

INDICATIVE ⁽¹⁾ ILLUSTRATIVE

	2017			2021			2026			2030		
	Customer charge	Demand charge	Energy charge	Customer charge	Demand charge	Energy charge	Customer charge	Demand charge	Energy charge	Customer charge	Demand charge	Energy charge
Heavy Industrial			31	94	5	14	80	3	32	80	3	60
Large Agriculture			32	37	4	12	32	3	33	32	3	61
Light Industrial			42	22		42	19	4	34	19	4	64
Small Agriculture			30	15		33	19	4	35	19	3	65
Commercial			68	29		60	25	6	46	19	4	64
Street Lighting			68	17		69	16		70	16		94
State offices			68	29		56	22		64	16		75
Residential			20	9		37	13		58	14		90

Focus on Residential - Energy charge (Dhs / kWh)



1) True tariff calculation and design process is enabled by year-by-year financial and technical performance data projection; Source: Strategy& analysis

GECOL shall then urge to address electricity theft through improvements in metering and billing practices

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner
Address electricity theft	Clarify electricity police position as GECOL's employees		■						HR & Communication dept.
	Pursue a systematic field assessment looking for irregular connections, tampered or damaged consumption meters, unmetered customers		■						Customer Services dept.
	Draw a detailed map of potential theft areas		▲						Customer Services dept.
	Perform recurrent inspection of potential theft areas		■	■	■	■	■	■	▶ Customer Services dept.
	Unify billing and meter reading period for all customers		■						Customer Services dept.
	Regularly plan for the assessment of the quality and condition of meters to detect theft and manipulation considering the use of the following measures: • Average age of meter • Meter replacement rate • Frequency of meter calibration • Frequency of meter and seal inspection		■	■	■	■	■	■	▶ Customer Services dept.
	Use of boxes to ensure that the consumption meters are properly sealed and cannot be tampered with		■	■	■	■	■	■	▶ Customer Services dept.

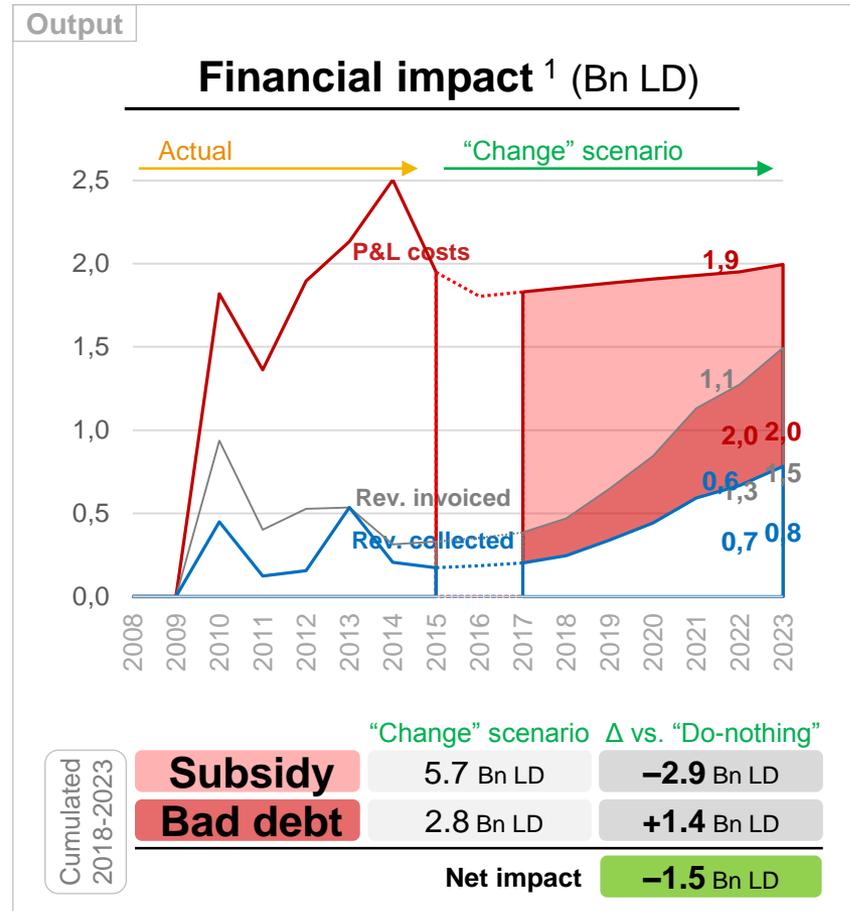
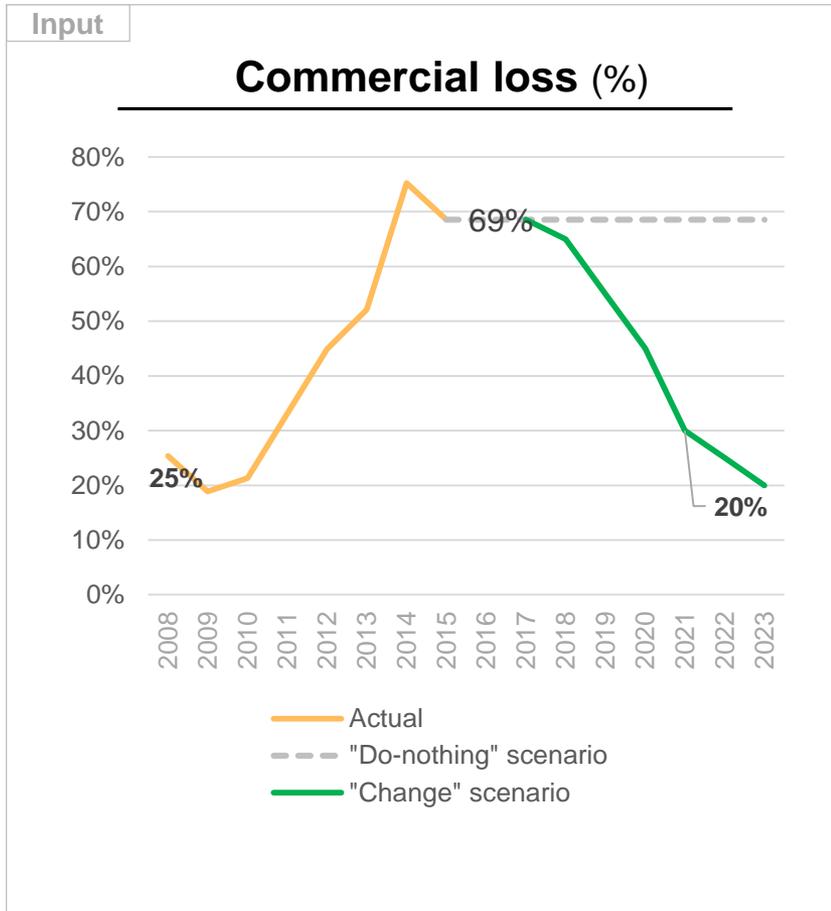
Task A reform will also help GECOL to accomplish electricity theft through a series of regulatory / legal measures

- ▲ Milestones
- ◆ One shot activity

Source: Strategy& analysis

If GECOL were able to reduce commercial losses back to ~20%, it might decrease by 2.9bn LD the state burden

Scenario simulation



1) Provided that all selected variables other than Commercial loss are fixed
 Source: Strategy& analysis

Insolvency shall be fought through the development of appropriate awareness programs and collection facilities

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner
Fight insolvency	Introduce disconnection policy for customers non paying electricity of 3//4 bills in a row or ceiling of accumulated debt and unify these measures across commercial offices to increase transparency and equality across all customers types		◆						Customer Services dept.
	Upgrade invoicing and overdue notifications processes from manual to electronic (i.e. e-mail)		■	■					Customer Services dept.
	Build a database with customers' information (e.g. e-mail addresses, phone numbers)		■	▲					Customer Services dept. & ICT
	Set up SMS and e-mail overdue notification systems ¹			■	▲				Customer Services dept. & ICT
	Develop program to launch GECOL's mobile payment app			■	▲				Customer Services dept. & ICT
	Introduce penalties for non payment or delayed payment of electricity (e.g. payment of bill on time gives customers a 5% special discount)		◆						Customer service dept.
	Launch a media campaign to encourage customers to pay bills on time and raise awareness on the fact that electricity is a commercial good with a price		■	■	■	■			Public relations dept.
	Perform bad debt analysis in line and after cash collection				■	■	■	■	AFC dept.
	Introduce write-off and bad debt policy		◆						Financial affairs dept.

▲ Milestones
◆ One shot activity

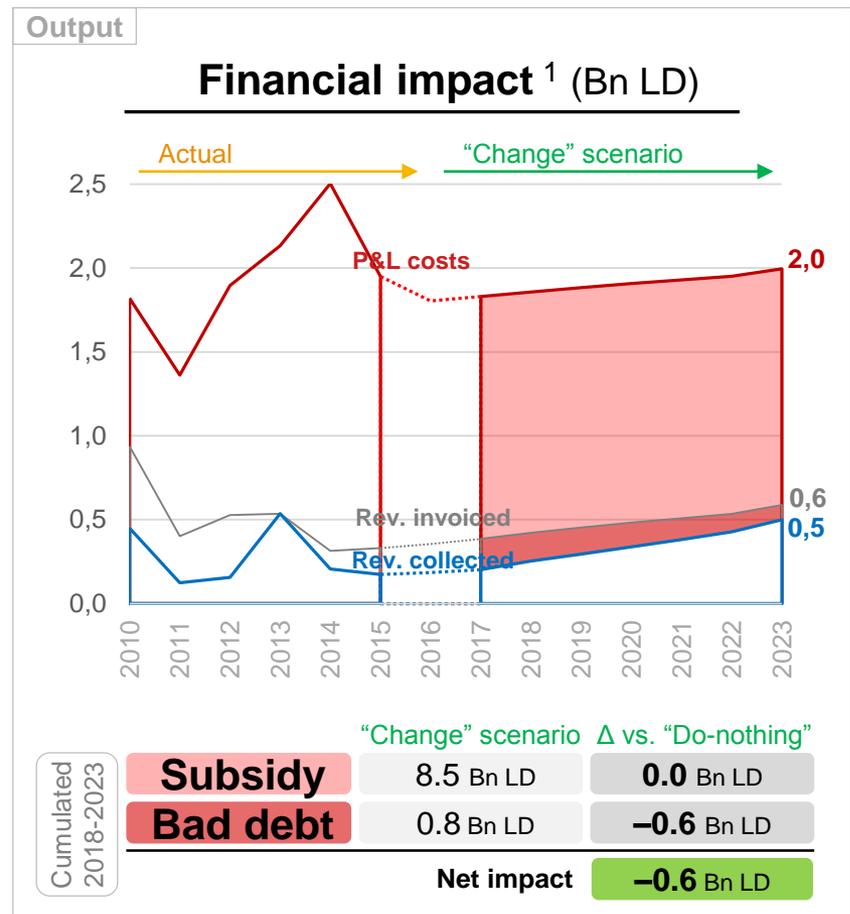
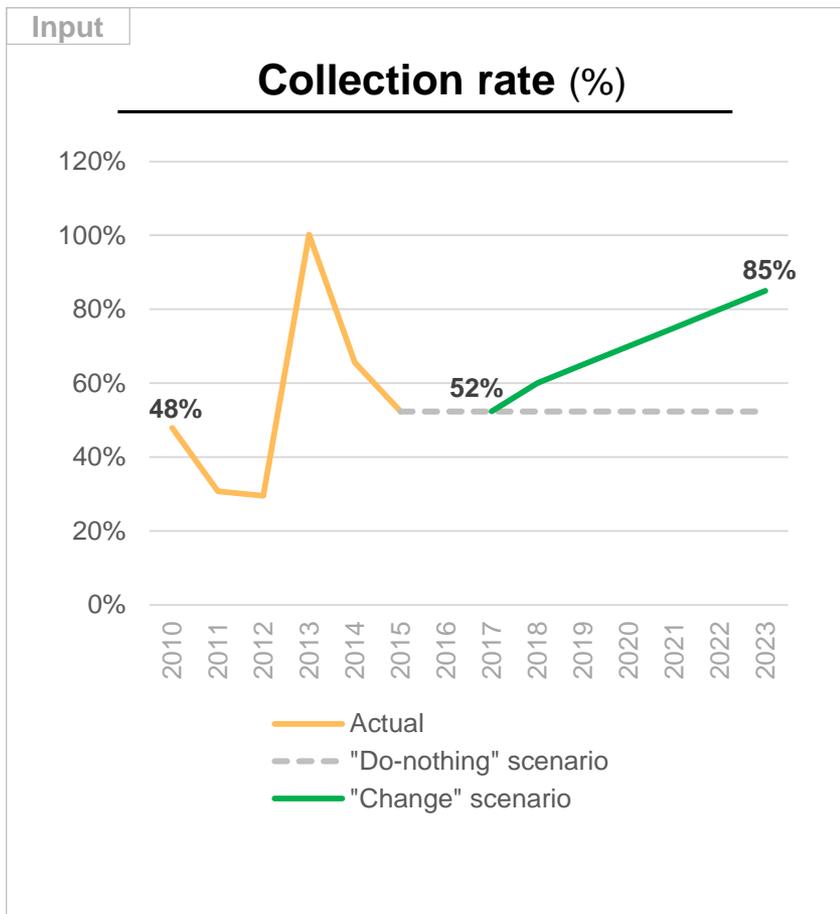
1) Pilot program already launched from GECOL

Source: Strategy& analysis



Succeeding in increase collection to 85% -- even at current low invoicing – it mean to collect an additional 0.6 Bn LD

Scenario simulation



1) Provided that all selected variables other than Collection rate are fixed
 Source: Strategy& analysis

GECOL shall then also consider appropriate solutions to freeze salaries growth and re-design its benefits plans

Measures and activities

Measures	Activities	Year	2018	2019	2020	2021	2022	2023	Owner
Control operating expenses	Baseline current compensation and benefits		■						Employee affairs dept.
	Benchmark local compensation and benefits practices for comparable companies			■					Employee affairs dept.
	Develop compensation and benefits revision plan				■				Employee affairs dept.
	Integrate redesigned compensation and benefits within ERP system					■			ICT dept.
	Implement revised compensation and benefits plan					■	▲		HR&O dept.

Salaries & benefits revised

- ▲ Milestones
- ◆ One shot activity

Source: Strategy& analysis

Institutional development

Processes

Manpower

IT

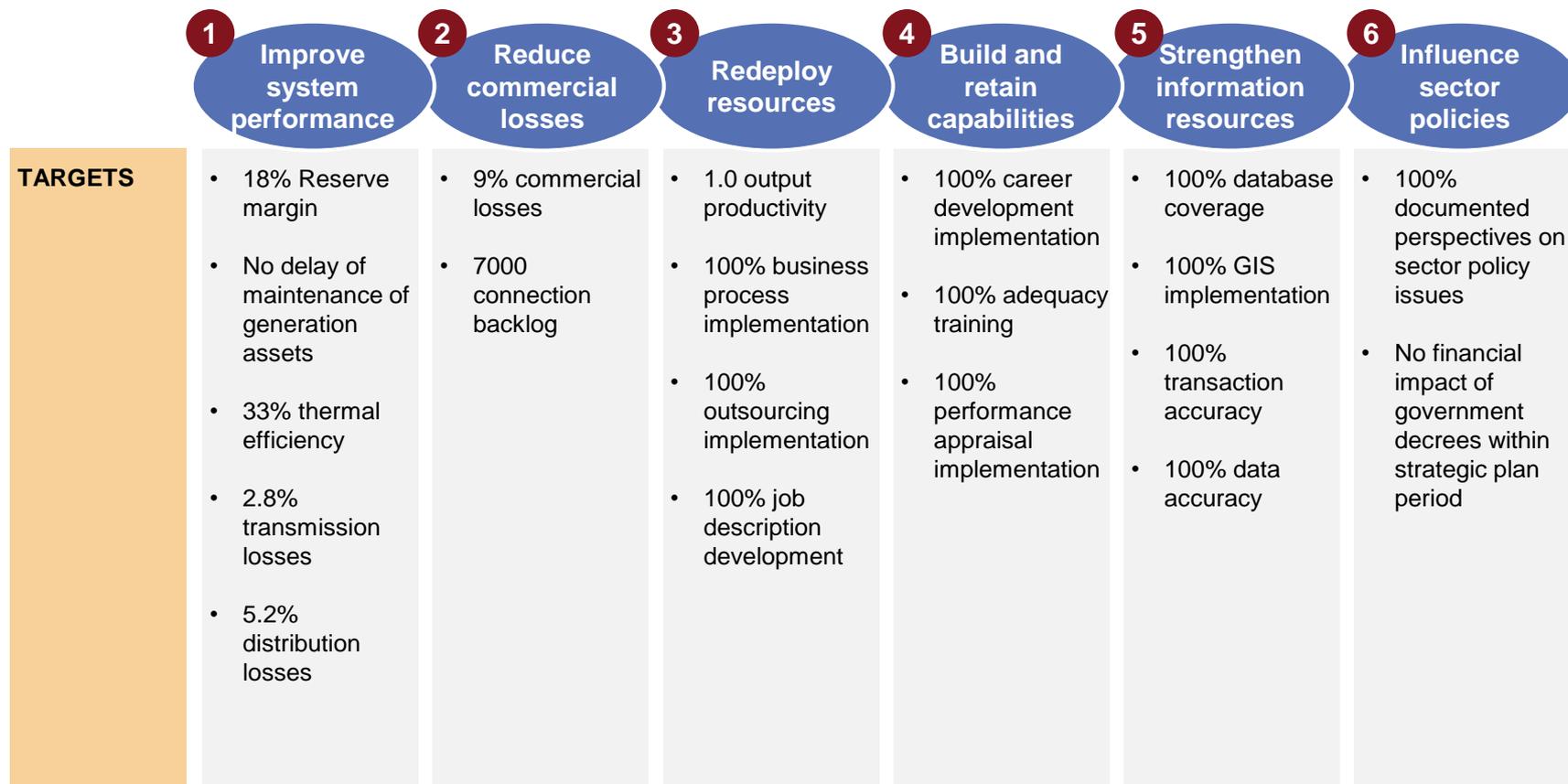
Technical performance

Financial performance

Back-up – Review of 2011-2015 GECOL 6 part strategy

One of the first steps of Task C has been to assess GECOL progress against its 2011-2015 objectives

GECOL's 2010 Six Part Strategy – Targets



Source: GECOL Strategic Plan Update (2009)

The generation expansion plans have only been partially completed ...

Status of strategic plan initiatives

Objective	New plant	Target	Status	
Generation expansion to meet demand	Zwetina	Complete by 2010	2 units completed ¹ in 2010, 3 rd exp. in 2017	
	Western Mountain expansion	Complete by 2010	Completed in 2011-12	
	Benghazi North 2	Complete by mid 2011	Completed in 2013	
	Misurata CC	Complete by mid 2011	Completed in 2015	
	Sarir	Complete by end 2011	2 units completed in 2013, 3 rd exp. in 2017	
	Khaleej	Complete by 2012	1 unit completed in 2015, 3 left exp. in 2019	
	Ubari	Start-up by end of 2013	No units completed, all 4 units exp. in 2018	
	Zwetina ST	Start-up by end of 2013	N/A	
	Tripoli West	Start-up by end of 2013	No units completed, all 4 units exp. in 2020	
	Melitah	Contracted and built by 2013	No units completed, all 4 units exp. in 2021	
	Alhoms II	Contracted and built by 2014	No units completed, all 2 units exp. in 2017	
	Tripoli East	Contracted and built by 2014	No units completed, all 4 units exp. in 2021	
	Benghazi West	Contracted and built by 2014	No units completed, all 4 units exp. in 2026	
New power plant (CCGT)	Contracted and built by 2014	N/A		

Data N/A



Met



Nearly met



Partially met



Negligible progress



No Progress

1) One unit suspended in 2015-2016 due to transformer failure (replaced in 2017)

... which resulted in a reduced reserve margin -- on the other hand, average thermal efficiency improved

Status of strategic plan initiatives

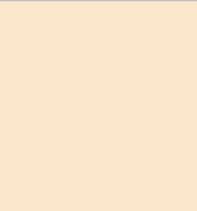
Objective	Initiative / activity for 2011-2015	KPIs	Value 2009/2010	2015 Target	Latest available	Status
Generation Assets Improvement	<ul style="list-style-type: none"> Conduct cost benefit analysis for maintenance of generation assets Develop maintenance plan Execute maintenance / overhaul of generation assets 	Reserve Margin ¹ (%)	-4%	18%	-26%	○
		Availability of Generation Assets ² (%)	86%	89%	N/A	
		Delay of Maintenance of Generation Assets ³ (%)	40%	0%	N/A	
		Derating capacity factor ⁴ (%)	81%	87%	N/A	
		Thermal Efficiency (%)	32%	33%	35% ⁶	●
		Forced Outage Rate ⁵ (%)	5%	2%	N/A	

Data N/A
 Met
 Nearly met
 Partially met
 Negligible progress
 No Progress

1) $(\text{Available capacity} - \text{Peak load}) / (\text{Available capacity})$; 2) $(\text{Average annual number of running hours weighted by nameplate capacity}) / 8760$; 3) $\text{Number of units overdue for maintenance in excess of 6 months} / \text{Total number of units}$; 4) $(\text{Maximum available capacity}) / (\text{Total nameplate capacity})$; 5) $(\text{Average number of forced outage hours weighted by nameplate capacity}) / 8760$; 6) See Rapid assessment of sector performance report for deep-dive

Losses on the T&D network have slightly improved, but are still far from reaching the strategic plan objectives

Status of strategic plan initiatives

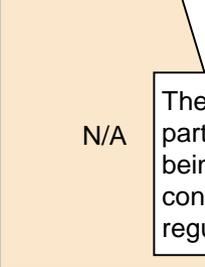
Objective	Initiative for 2011-2015	KPIs	Value 2009/2010	2015 Target	Latest available	Status
T&D System Strengthening	<ul style="list-style-type: none"> Assess ongoing T&D projects Revise and approve T&D expansion plan Monitor and execute transmission projects 	Transmission Losses (%)	15.5%	12.2%	15.2% ¹	
Demand Side Management	<ul style="list-style-type: none"> Conduct demand side management study Deploy demand side management pilot program³ Execute demand side management plan 	Collection Effectiveness ² (LD/MWh)	N/A	35	N/A	

Data N/A
 Met
 Nearly met
 Partially met
 Negligible progress
 No Progress

1) 2015; 2) (Revenues collected) / (Generation) 3) GECOL carried out a DSM study, which stopped just prior to executing the pilot projects. The 2011 events prevented execution of the pilot projects

Commercial losses worsened, growing to an unsustainable ~60% (vs. 9% target)

Status of strategic plan initiatives

Objective	Planned actions & initiatives for 2011-2015	KPIs	Value 2009/2010	2015 Target	Latest available	Status
Reduce Commercial losses	<ul style="list-style-type: none"> Launch a comprehensive analysis program of commercial losses Streamline the customer facing processes Launch a customer services cultural transformation program Launch a commercial loss awareness campaign Commercial loss reduction infrastructure gaps Enforcement of collection 	Commercial Loss ¹ (%)	16.2%	9.0%	59.6%	
		Connection Backlog ² (#)	40,000 (est.)	7,000	N/A	

The increase is (at least partially) due to GECOL being prevented from connecting users w/o regular building permit

Data N/A



Met



Nearly met



Partially met



Negligible progress



No Progress

Note: Libya's urban master-plans have not been updated (last approved versions date to the late 1970's). Therefore many new buildings do not have building permit and GECOL was prevented from connecting consumers that did not have a building permit. This contributed to the increase in illegal connections, adding to the commercial losses. This precondition for a legal connection has now been removed.

1) (Energy consumed – energy invoiced) / (Net generation); 2) Number of customers waiting for connection beyond 2 months

GECOL productivity per FTE did not improve

Status of strategic plan initiatives

Objective	Planned actions & initiatives for 2011-2015	KPIs	Value 2009/2010	2015 Target	Latest available	Status
Redeploy resources	<ul style="list-style-type: none"> Improve organization and processes <ul style="list-style-type: none"> Business processes re-engineering New organization structure roll-out to align organization blueprint to revised business processes Identify and execute manpower rebalancing programs Fast-track outsourcing of non-core activities and SLAs development 	Output Productivity ¹ (GWh/FTE)	0.7	1.0	0.7	
		Business Process Implementation ² (%)	N/A	100	N/A	
		Outsourcing Implementation ³ (%)	0	100	N/A	
		Job Description Development ⁴ (%)	0	100	N/A	

Data N/A



Met



Nearly met



Partially met



Negligible progress



No Progress

1) (Generation) / (# of FTEs); 2) (# of business processes defined and implemented) / (# of business processes identified in process plan); 3) (# of outsourced functions) / (# of identified functions for outsourcing); 4) (# of positions with job description) / (Total number of positions)

No status have yet been reported on GECOL capabilities building, employee satisfaction or training adequacy ...

Status of strategic plan initiatives

Objective	Planned actions & initiatives for 2011-2015	KPIs	Value 2009/2010	2015 Target	Latest available	Status
Build & retain capabilities	<ul style="list-style-type: none"> • Compensation and benefits re-design • Performance appraisal system re-design • Career development plan design • Training program assessment and re-design 	Career Development Implementation ¹ (%)	0	100	N/A	
		Adequacy of Training ² (%)	N/A	100	N/A	
		Performance Appraisal Implementation ³ (%)	N/A	100	N/A	
		Employee Satisfaction ⁴ (%)	N/A	80	N/A	

Data N/A



Met



Nearly met



Partially met



Negligible progress



No Progress

1) (# of employees with career development plans) / (Total # of employees); 2) (# of employees who have completed training assigned in their career development plans) / (Total # of employees); 3) (# of performance appraisals completed) / (Total # of employees); 4) (# of employees giving an overall 'acceptable' response) / (# of respondents to employee satisfaction survey)

... Nor on the IT resources strengthening

Status of strategic plan initiatives

Objective	Planned actions & initiatives for 2011-2015	KPIs	Value 2009/2010	2015 Target	Latest available	Status
Strengthen information resources	<ul style="list-style-type: none"> Improve availability of information for management decisions <ul style="list-style-type: none"> Database improvement Data handling process implementation Acquire needed additional systems <ul style="list-style-type: none"> GIS roll-out e-Management ERP system activation Achieve process discipline embedded in ERP and other systems 	Database Coverage ¹ (%)	N/A	100	N/A	
		GIS Implementation ² (%)	0	100	N/A	
		Transaction Accuracy ³ (%)	N/A	100	N/A	
		Data Accuracy ⁴ (%)	N/A	100	N/A	
		User Satisfaction ⁵ (%)	N/A	80	N/A	

Data N/A



Met



Nearly met



Partially met



Negligible progress



No Progress

1) (# of archives entered into IT DB) / (# of archives identified for electronic archiving); 2) (# of sites connected to GIS) / (# of sites identified as suitable for GIS); 3) (# of fully accurately automated processes) / (# of processes sampled); 4) (# of accurate data samples) / (# of data samples); 5) (# of ERP users giving an overall 'acceptable' response) / (# of respondents to user satisfy. survey)

In terms of sector policy influence, GECOL was negatively impacted by the tariff reduction imposed by the Government

Status of strategic plan initiatives

Objective	Planned actions & initiatives for 2011-2015	KPIs	Value 2009/2010	2015 Target	Latest available	Status
Influence Sector Policy	<ul style="list-style-type: none"> Regulatory strategy development: <ul style="list-style-type: none"> Sector structure & unbundling Tariff adequacy/subsidy mechanism Proposal for electricity theft law and enforcement mechanism Fuel allocation and pricing policy 	Documented perspectives on sector policy issues ¹ (%)	0	100%	N/A	N/A
	<ul style="list-style-type: none"> Development and implementation of stakeholder outreach and communication plan Policy Compliance plan and Mitigation strategies <ul style="list-style-type: none"> Assess impact of potential policy changes Review compliance requirements and identify gaps 	Financial impact of government decrees within strategic plan period ² (M LD)	- 366	0	-0.8bn (cumulated 2010-2015) ²	○

Data N/A



1) (# of documented perspectives on policy issues) / (# of policy issues determined by GECOL to have significant implications); 2) (Gain from changes) – (Loss from changes pre year)

2) See chapter "Issues and implications for GECOL resulted from sector assessment" for detail review