



ENERGY SUBSIDIES

GOOD PRACTICE NOTE 1

Identifying and Quantifying Energy Subsidies

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This is the first in the series of 10 good practice notes under the Energy Sector Reform Assessment Framework (ESRAF), an initiative of the Energy Sector Management Assistance Program (ESMAP) of the World Bank. ESRAF proposes a guide to analyzing energy subsidies, the impacts of subsidies and their reforms, and the political context for reform in developing countries.

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ACRONYMS AND ABBREVIATIONS

ESRAF	Energy Subsidy Reform Assessment Facility
EITI	Extractive Industries Transparency Initiative
FOB	free on board
kg	kilogram
kWh	kilowatt-hour
LNG	liquefied natural gas
LPG	liquefied petroleum gas
OECD	Organisation for Economic Co-operation and Development
SOE	state-owned enterprise
VAT	value added tax

GOOD PRACTICE NOTE 1: IDENTIFYING AND QUANTIFYING ENERGY SUBSIDIES

This note provides guidance on how to approach and assess energy subsidies, quantifying them where possible. It suggests a definition of subsidies and describes options for categorizing and measuring subsidies. It also outlines policy issues to consider in reforming the subsidies in developing countries. These issues include different ways in which subsidies can arise and be delivered, pitfalls in subsidy design and delivery, frequently observed discrepancies between design and implementation, and unintended consequences, including effects on energy suppliers.

The note describes the challenges of quantifying subsidies in both data collection and subjective judgment, and how the magnitude of subsidies so calculated may differ markedly from subsidies received by its intended beneficiaries. It covers fuels, electricity, and district heating. It also touches on non-energy use of oil, gas, and coal, such as naphtha, liquefied petroleum gas (LPG), and natural gas serving as feedstocks to make petrochemicals and fertilizers. ESRAF uses the word “prices” to refer to prices paid for all forms of energy, and “tariffs” to refer to a schedule of prices subject to economic regulation, such as those for electricity, natural gas, and district heating.

This note excludes from detailed discussion subsidies specifically targeting renewable energy, except certain liquid biofuels that are blended with petroleum fuels and renewable energy that is part of the power mix. Because district heating is confined largely to Europe and Central Asia, it is covered in the definition and categories of subsidies, but is otherwise not treated in detail.

1. INTRODUCTION

The typical issues linked to subsidies that call for examination include

- Budgetary transfers to pay for energy subsidies;
- Determination of the energy price increases needed for subsidy removal;
- Consumer price subsidies that are needed to restore energy suppliers' financial viability;
- Forgone government revenue because of fiscal and other concessions granted to energy suppliers to pay for subsidies; and
- How energy prices and subsidies in a given country compare to those in neighboring countries or similar economies.

The economic effects of subsidies are usually negative, but not always. Many subsidies decrease efficiency in the economy, and those that benefit producers may decrease operational efficiency. However, some subsidies are retained on equity grounds or to advance technology, even in countries with mature energy markets. Among the examples are

- The cross-subsidization of rural electricity users by the other users;
- Heating assistance for the poor in Europe and North America; and
- Subsidies to promote the early stages of technology development, such as carbon capture and storage, or the early adoption of new energy sources, such as second-generation liquid biofuels.

In such cases, the policy question for the government is whether the benefits far outweigh the costs. An important policy

challenge is to ensure that these subsidies do not entrench market distortions over the long term.

Although the scale of budgetary support for subsidies attracts attention, some forms of subsidies are less visible or not amenable to quantification without considerable uncertainty. Subsidies that do not directly affect prices paid by consumers or that do not appear as line items in government budgets often escape attention. The underpricing of goods and services provided by the government and the preferential access to state-owned banks granted to state-owned energy suppliers are two examples. They are seldom quantified, nor is their quantification straightforward, but noting the presence of the subsidies and recommending a review alone would be useful. If certain energy suppliers or forms of energy benefit disproportionately from subsidies that are difficult to quantify—and they have been escaping scrutiny as a result—this should be taken into account when assessing the prevalence and distribution of subsidies.

Purely economic analysis of subsidies rarely, if ever, exists. The quantification of oil price subsidies in every case starts with the international prices of crude oil and petroleum products. These subsidies, however, are not economic costs, partly because of market concentration. Nor do they account for the shadow price of a depletion premium or for environmental and other externalities.

Yet using prices other than world prices would make the calculations more subjective and would depart too much from the widely accepted practice in the literature. By contrast,



financial analysis would ignore input subsidies and other forms of subsidies.

What is presented here is not financial analysis of subsidies. Neither is it an economic analysis, as discussed below. Because of wide variation in market conditions, market structure, pricing and subsidy policies, and data availability, most subsidy calculations require case-by-case

approaches. A generalized template to be followed under most circumstances would be unwieldy and prone to large margins of error. The objective of this note is therefore not to provide a universally applicable template for quantification, but rather to lay out general principles and issues to consider in formulating the methodology for quantification.

2. DEFINITION, CATEGORIES, AND QUESTIONS FOR ANALYSIS OF SUBSIDIES

DEFINITION AND CATEGORIES

An *energy subsidy*—as defined in this note—is a *deliberate policy action* by the government that *specifically targets* electricity, fuels, or district heating and that results in one or more of the following effects:

- A** | It reduces the net cost of energy purchased.
- B** | It reduces the cost of energy production or delivery.
- C** | It increases the revenues retained by those engaged in energy production and delivery (energy suppliers).

The definition contains several terms—“deliberate,” “action,” and “specifically targets”—that limit the coverage of subsidies and that may actually exclude certain subsidies. This is because all too often governments provide subsidies without actually saying so in their policy statements through inaction, the “moral suasion” of state-owned energy companies to keep prices low, and other means that are not deliberate actions specifically targeting energy.

Specificity in targeting means that a policy that affects the economy as a whole—for example, lowering the corporate income tax rate or the general consumption tax rate—would not be considered an energy subsidy. Subjective judgment is inevitable, and subsidy analysis in a given country is best carried out by taking the country’s circumstances into account when making that subjective judgment.

It is only in cross-country comparisons that broadly comparable rules must be followed. In comparing subsidies across developing countries, large differences in data availability compound the difficulties encountered in making subjective judgments.

The definition of subsidies in this note is confined to government action—not inaction. Because of this, financial incentives offered by businesses as marketing decisions—such as selling LPG cylinders at a loss as a means of attracting new customers—would not be considered subsidies, unless the marketing decisions cause large financial losses and the government steps in to rescue the energy suppliers.

Unless accompanied by budgetary transfers to make up for financial losses, *not attributing* subsidies to government inaction would exclude from the definition the following situations because they are often not a direct result of a deliberate government policy action:

- Losses suffered by energy suppliers or the government through commercial malpractice and criminal activities (such as theft of energy, reduced or nonpayment by consumers bribing energy company staff, illegal diversion of subsidized fuels for fuel adulteration or smuggling).
- Weak administrative capacity on the part of the government (such as the lack of enforcement of regulations against short-selling or weak tax administration).
- Weak managerial capacity of energy suppliers (such as the failure to bill and low bill collection rates).
- Political difficulties in implementing disciplinary procedures (such as the inability to disconnect government ministries or the military for nonpayment of energy bills).

When tolerance for their consequences becomes an ill-defined *de facto* regulatory policy, what makes sense in the country's context should guide analysts and policy makers rather than literal adherence to the definition in this note.

The definition excludes certain government actions that have the same effects as in A, B, or C above. Examples include the promotion of efficiency improvement along the supply chain and in end-use and of fair and healthy competition in the market, and changing the fuel mix (such as switching from imported fuel oil to domestic natural gas in power generation). Another policy action that is

excluded is one in which the main policy objective is not the provision of energy subsidies. Examples include *unconditional* cash transfers as social safety nets, even if one of the reasons for the introduction of cash transfers is higher energy prices, and generation of fundamental knowledge such as basic research and development, as opposed to support for commercial development of specific technologies.

Subjective judgment and associated uncertainties are unavoidable in calculating subsidies. When the government's inaction (such as persistent failure to act on commercial malpractice or enforce payment discipline) or an unwritten strategy (such as applying pressure on state-owned energy suppliers to keep prices low) becomes a *de facto* deliberate policy is subjective—although if prices of internationally traded fuels are clearly too low on the domestic market because of government pressure on state-owned enterprises (SOEs), analysts usually conclude that price subsidies exist.

The definition of an energy subsidy also raises the question of how to define the reference case—the counterfactual—against which the subsidy is defined and measured. The reference cases for some types of subsidies, such as tax expenditures and non-tax fiscal concessions, can vary significantly from country to country and are therefore difficult to compare internationally (OECD 2014, p. 36).

Identification and quantification of subsidies inevitably entail varying degrees of analyst judgment. Anderson (1990) illustrated this point by examining a major greenfield coal project in Canada to establish whether there were large subsidies. The study found that the results were highly sensitive to the assumptions made about such standard parameters as



costs, selling price, capacity utilization, the project life, discount rate, and inflation, and different but plausible assumptions had led to the opposite conclusions about the presence of subsidies.

At a minimum, to enable sensible interpretation of the results, all assumptions should be transparently documented, so that subsidy quantification will clearly be a function of the assumptions—and not of who has computed the numbers. Specificity in targeting energy could be particularly problematic. It immediately raises the question of how specific—if a tax policy affects only three sectors, including energy, and energy prices fall as a result, is that an energy subsidy? More importantly, a policy may not specifically target energy on paper, but it may be designed to benefit the energy sector disproportionately. If energy suppliers capture the bulk of the benefits of a tax break, not including that tax break in the subsidy calculations on the grounds that the tax relief did not “specifically” target energy, they would underestimate support to producers (effect C above).

Optimal taxation is outside the scope of this note. However, subsidies and taxes would ideally be considered together, because tax policy and subsidy policy actions can have essentially the same effects on fuel prices, but with the opposite effects on economic distortions. For example, reducing the import duty on a fuel has the same effect as providing

a price subsidy—both lower end-user prices—but import duty reduction decreases, while a price subsidy (such as a negative fuel-specific consumption tax) increases, economic distortions. One could also argue that optimal taxation should be taken as the reference case for tax expenditures. However, energy taxation generally and fuel taxation in particular are vast and complex topics, and the rest of this note does not consider optimal taxation.

This note also excludes uninternalized costs of externalities in the definition of subsidies. There are divergent views on whether or not and how to capture uninternalized externalities in subsidy measurement, ranging from not counting them as subsidies to classifying all uninternalized externalities that are in any way associated with energy production or consumption as energy subsidies. Inclusion or exclusion of uninternalized externalities is what accounts for the difference of trillions of dollars in the calculation of global fossil fuel subsidies by different institutions. The International Energy Agency and the Organisation for Economic Co-operation and Development (OECD) consider such externalities to be outside the scope of subsidy measurement. For reasons discussed in box 1, this note follows that approach. By contrast, the International Monetary Fund assigns all externalities associated with fossil fuels to fossil fuel subsidies in its post-tax subsidy calculation.

BOX 1: EXTERNALITIES AND MEASUREMENT OF SUBSIDIES

Because many externalities relate to environmental damage and large associated health costs, environmental economists have long argued for charging corrective taxes as a means of internalizing (pricing) externalities. While appealing from one point of view, inclusion of uninternalized externalities in subsidies poses difficulties, including reconciliation with how practitioners in other sectors understand

box continues next page

the concept of subsidy. For example, in agriculture, which is more advanced than energy in measuring subsidies in a consistent way across countries, uninternalized externalities are not included in the definition of subsidies, so that inclusion of uninternalized externalities in energy would make comparison of energy and agricultural subsidies not meaningful.

Another significant challenge is attribution. Taking vehicular air pollution as an example, pollutant emissions today are determined largely by vehicle technology and driving patterns, not fuel consumption and properties. An accurate corrective tax would therefore be driven far more by vehicle technology (including the state of vehicle maintenance) than fuel. Attributing all externalities to fuel consumption alone would not only be inaccurate, but rather could lead to suboptimal, if not misguided, policies. Linked to the challenge of attribution is source apportionment. Health effects depend on the ambient concentrations of harmful pollutants and human exposure. Estimating how much different emission sources contribute to ambient concentrations is another area of difficulty. The only exception is carbon dioxide emissions from the combustion of oil, gas, and coal, which is a function largely of the carbon content of each fuel (unless carbon is captured and permanently stored).

There could also be double-counting. For example, health and accident insurance premiums cover the costs of vehicle accidents, and therefore where such insurance is mandated or universal, they should not be included in subsidy calculations because these externalities have been internalized.

The question of whether to include uninternalized externalities in subsidy measurement is separate from that of quantifying externalities of subsidies. Good Practice Note 8 suggests steps to compute the economic costs of outdoor air pollution caused by over-consumption of fossil fuels due to consumer price subsidies. The results can be added to the costs of energy subsidies and used to weigh the economic (as opposed to fiscal or financial) benefits and costs of subsidies.

TABLE 1: Fuels and Their Uses

Category	Fuel	Common uses and comments
Oil	Gasoline	Automotive (light and medium duty, including motor bicycles), aviation, ^a and marine transportation; limited use in very small-scale electricity generation.
	Bioethanol	Automotive (usually blended with gasoline).
	Kerosene	Heating, cooking, lighting, aviation. ^a
	Diesel	Automotive (medium and heavy duty), rail, marine transportation, aviation, ^a heavy equipment, electricity generation, irrigation.
	Biodiesel	Automotive and aviation ^a (usually blended with petroleum diesel fuel), electricity generation, heavy equipment.
	Fuel oil	Electricity generation, industrial application, marine transportation.
Natural gas	Natural gas	Electricity generation, industrial application, space and water heating, cooking, refrigeration, automotive, marine transportation.
	LPG ^b	Cooking, heating (water, space, process), lighting, refrigeration, automotive.
Coal	Lignite (brown coal), anthracite, bituminous, sub-bituminous	Electricity generation, industrial heat, space heating, cooking.

a. Aviation fuels are rarely subsidized.

b. Globally more LPG is sourced from natural gas than from oil refining. Because LPG is typically stored under pressure as a liquid, it is treated a liquid fuel here and elsewhere.



The term *fuel subsidies* in this note covers subsidies for fuels in different applications, as well as infrastructure and appliances associated with fuel supply and use. Supply infrastructure includes fuel pipelines, oil refineries, import terminals, and LPG bottling plants. Kerosene and LPG stoves and lamps, as well as LPG cylinders, are examples of appliances using fossil fuels. Among them, LPG cylinders and stoves are most likely to be subsidized. Table 1 describes the fuels covered in this note and their uses.

Subsidies are provided through four primary mechanisms:

- Budgetary transfers of government funds
- Government-induced transfers between producers and consumers
- Foregone taxes and other government revenues
- Underpricing of goods and services

Table 2 presents a framework that categorizes possible policy actions that could yield energy subsidies. A comprehensive examination of energy subsidies would draw up such an inventory of possible avenues for subsidies and investigate each category one by one. Additional examples of different types of energy subsidies, data sources, and the ease of evaluation are discussed in the annex. The categories in the table are not necessarily mutually exclusive. For example, a superfund to clean up contamination caused by legacy projects falls under both budgetary transfers and shifting of risk burdens. A cash transfer scheme is a form of direct transfer of government funds, and may also be associated with government control of energy prices. When to consider which category of subsidies is also explained in more detail at the end of this note in table 4 for fuels and table 5 for electricity.

TABLE 2: Major Mechanisms Used to Provide Energy Subsidies

Category	Explanation or example
Direct transfer of government funds	
<i>Direct transfers of funds to energy producers</i> (whether on- or off-budget transfers).	Budgetary support to compensate producers for price controls. Budgetary support to fund applied research and development, demonstration projects in commercial development of an energy technology, and other types of support for energy or firms engaged in energy trade and transformation.
<i>Cash transfers to consumers</i> , where transfers are directly linked to energy consumption.	Cash transfers to the poor intended to increase affordability of a specific form of energy and linked to its consumption.
Government-induced transfers between producers and consumers	
Government control of energy prices	
<i>Prices or price limits set by government.</i> Direct regulation of prices, price ceilings, or price floors at any point along the supply chain to reduce costs to producers or consumers, or to increase prices paid to producers.	Price regulation in a market where competition is possible (absence of high market concentration and of natural monopoly). High guaranteed prices to attract investment, such as feed-in tariffs. Excludes economic regulation based on prices corresponding to benchmark sector performance prompted by concerns over market concentration.

Category	Explanation or example
<i>Domestic price effects of import or export measures.</i> Import duties or quantitative restrictions that raise the domestic price received by producers and paid by consumers; export duties or quantitative restrictions that reduce the domestic price received by producers and paid by consumers.	Applicable largely to fuels. Excludes import or export duty reduction as part of trade liberalization that does not target a specific form of energy. Import bans or restrictions and high import duties benefit certain domestic producers; export bans or restrictions and high export duties benefit domestic consumers.
<i>Special case of cross-subsidy.</i> Policies that reduce energy costs to particular types of customers or regions by increasing charges to other customers or regions, or by requiring firms to use profits in one segment of the supply chain to reduce prices charged to consumers in another segment of the supply chain.	Lifeline rates for electricity and natural gas, whereby the first block of residential tariffs is priced low and cross-subsidized by higher blocks. Pan-territorial pricing irrespective of cost of delivery to different parts of the country. Underpricing of refined products using surplus profits in upstream oil. Underpricing of oil or natural gas on the domestic market by using export profits and mandating domestic supply obligation. Underpricing of LPG sold to households, compensated by higher unit prices charged to non-residential consumers.
Purchase or supply mandate	
<i>Purchase requirement.</i> Required purchase of a particular form of energy, typically when other choices are more financially attractive.	Requiring every fuel wholesaler to purchase from the monopolistic domestic refinery (which cannot compete with imports). Dispatch order not based on increasing cost and instead favoring certain producers or sources of electricity.
<i>Domestic supply obligation.</i> Required sale of a fuel on the domestic market, typically when domestic prices are kept artificially low compared to export markets or alternatives.	Domestic gas supply obligation with low domestic prices in exchange for a license to export gas. Requirement to blend a certain percentage of biofuel in gasoline or diesel.
Foregone government revenue	
<i>Tax expenditure.</i> Corporate income tax, environmental tax, land tax, import duties, value added tax (VAT), excise tax, general consumption tax, and other taxes reduced or waived. Acceleration of allowable deductions. Additional deductions over and above what is generally allowed.	Reduction on corporate income tax targeting certain firms, such as a tax holidays for a new refinery and a new power generation plant. Differentiation in excise tax between gasoline and bioethanol, or between petroleum diesel and biodiesel. Environmental tax that is not based on environmental outcome, such as taxing gasoline more than diesel. Carbon tax that is not consistent with each fuel's carbon content. Carbon tax exemption for energy-intensive industries. Tax-exempt operating status for SOEs. VAT or import-duty exemption for LPG cylinders. Lower VAT for electricity, and VAT exemption for residential consumers.
<i>Other fiscal revenues.</i> Bonuses for oil blocks, royalties, production share, and other non-tax fiscal payments reduced or waived in upstream oil and gas. ^a	Differences in rates that cannot be traced to costs or profitability, seemingly favoring certain projects or firms.
Government revenue from energy suppliers.	Reduction in government revenue as a result of state-owned energy suppliers—such as national oil companies providing subsidized fuels—deducting subsidies from dividends to be transferred to the government.



Category	Explanation or example
Underpricing of other goods and services, including risk	
<i>Subsidized inputs.</i> Subsidies for large-volume inputs to energy suppliers, such as fuels and water.	A significant price discount for domestic crude oil sold to a domestic refinery. Subsidized or free diesel, fuel oil, or natural gas supplied to power utilities. Subsidies for water charges to biofuel feedstock growers or hydraulic fracturing for natural gas production. Subsidized rail freight for coal suppliers.
<i>Lending and credit.</i> Loan guarantees, below-market provision of loans, and grants for energy production and supply.	Soft loans, typically for SOEs.
<i>Goods and services provided by government.</i> Underpricing of access to land and other goods and services.	Excludes goods and services provided to the broader economy, such as roads and rail used by many sectors.
<i>Permits.</i> Underpricing of permits and licenses.	Freezing of the permit fee for years or decades.
<i>Shifting of risk burdens.</i> Government assumption of price, safety, and other risks; consumer or resident assumption of risks through limits on commercial liability.	Assumption of risks must be specific to the energy supply chain. A superfund to clean up legacy projects (such as coal mines), paid for by taxpayers, would be an example. Government financing of a diesel price insurance in Chile in 2005–06 is another example.
<i>Special treatment of SOEs.</i> Undue risk-taking, soft budget constraints leading to contingent liabilities, debt cancellations.	Benefiting energy producers and suppliers: Implicit government guarantee; state-owned energy suppliers enjoying ready access to state-owned banks. Benefiting SOEs buying fuels from state-owned fuel suppliers: Late or no payment with no penalties or supply termination. Benefiting consumers: Not requiring SOEs to make reasonable profits in order to keep end-user prices low.

a. Fiscal terms for upstream oil and gas need to be considered together in their entirety in the light of their higher tax rates and the existence of other fiscal payments (such as royalties, bonuses, and government's profit share) that are not imposed in other sectors. Because of complexity, upstream oil and gas fiscal terms are excluded from this note, except where they affect or are affected by downstream subsidies. Where there appears to be sufficient evidence of large subsidies, these cases may be flagged as an area for further investigation.

Another useful way of looking at subsidies is to map them to three categories defined by the OECD:¹

- Consumer support
- Producer support
- General services support

They are added to arrive at total support. A in the above definition of subsidies is a form of consumer support and, if end-user

prices are lowered, B is also. C is a type of producer support, and B also represents producer support if suppliers can retain additional revenue over and above what would be considered a reasonable return. General services support, such as government-funded applied research that will ultimately benefit the sector, does not necessarily support current energy supply or consumption. However subsidies are categorized, the goal is to capture all types of subsidies in a unified framework.

PURPOSES OF ANALYSIS OF SUBSIDIES

It would be rare to carry out a comprehensive examination of all the policy options laid out in table 2, nor is doing so a realistic objective in many cases for reasons of costs and data limitations. It is more common to focus on a subset of the subsidy measures in the table to address specific questions that are the focus of policy makers and analysts. Frequently encountered questions for investigation posed by policy makers, researchers, and civil society at large are discussed below. It is important to note that the questions posed are not necessarily confined to subsidies and may have broader scope, with subsidies constituting one of several components of the question being posed, as in the case of the financial viability of energy suppliers below.

Budgetary transfers. Budgetary transfers to pay for subsidies compete with other priorities and attract policy makers' attention, especially when such transfers force other essential spending to be cut. Transfers for subsidies tend to be large particularly when they are not targeted. Two important questions are what determines the magnitude of the budgetary allocation for subsidies and how to reduce them. The factors determining the magnitude include international fuel prices, inter-country or inter-fuel price differences causing substantial out-smuggling and black marketing, operational inefficiencies raising costs unnecessarily, and corruption in subsidy delivery. Information on budgetary transfers should be available from the finance ministry.

Magnitude of price adjustments needed. In countries with large price subsidies, how much official prices may need to be raised to attain cost recovery (which could eliminate the need for budgetary transfers) is an important

policy question closely watched by the public. The price adjustment needed is also referred to as the price gap, defined as the difference (gap) between a likely unit price of energy in a competitive market (called reference price, after adjusting for local costs and quality) and the official or actual unit price on the local market (local price). The total value of the subsidy for a particular form of energy is its price gap multiplied by the total units subsidized. The price gap is positive for consumer support and negative for producer support. Positive and negative price gaps are also referred to as underpricing and price support, respectively.

Financial viability of energy suppliers.

Subsidies may be among the factors threatening energy suppliers' financial viability. In the extreme, energy suppliers are forced to operate at a loss and absorb the subsidies, prompting bankruptcies and withdrawal of investment from the sector. What follows may be energy shortages, unreliable supply of energy, and increasing reliance on fuel imports in countries with domestic fuel resources—further amplifying subsidies, foreign exchange shortages, and budgetary transfers. Energy suppliers may not be financially viable for any one of the following reasons:

- ***The subsidy policy is not implemented as stated.*** The policy may state that energy suppliers will be reimbursed for subsidies, but reimbursements may be delayed for months or years, leading to serious cash flow problems and forcing suppliers to take out bank loans. Reimbursement calculations may favor the government, computing smaller reimbursements than what energy suppliers should get.
- ***The pricing policy is not implemented as stated.*** The pricing policy on paper may



state that prices set by the government should cover costs, but the government may not raise prices when costs in local currency increase (for example, higher costs induced by large currency depreciation).

- **Suppliers suffer from large operational inefficiencies.** Prices may be sufficient for efficient suppliers, but state-owned energy suppliers may be grossly inefficient with large technical and commercial losses.

Data on financial viability may be difficult to disentangle for opaque SOEs, and disaggregating different causes may present a further challenge.

Fiscal losses. Subsidies may be provided through fiscal losses rather than budgetary transfers. Very large fiscal losses—for example, tax exemption in Nigeria for certain oil and gas companies has been calculated to amount to billions of dollars²—could attract the attention of policy makers and prompt re-examination of the policy.

Regional and global benchmarking. A comparison with peers—neighboring countries, similar economies, or similar energy markets—can help gain a better understanding of whether a country’s subsidy policies are reasonable, how they can be reformed, and what is achievable in the short term as well as over a longer time period. The more countries are covered, the more simplifying assumptions are needed because of substantial differences in data availability. There are two approaches to benchmarking at the opposite ends of the spectrum:

- 1 | **Use all the data available in each country.** This will enable detailed calculations in countries with good data, but the calculation methodology will likely differ from country to country.

- 2 | **Use the same assumptions and calculation procedure in every country.** The same methodology is applied across the sample of countries, assuring consistency but also risking “a race to the bottom,” in that the country with least data may determine the assumptions made.

In practice, a compromise approach between the two is likely, in which a broadly consistent methodology is applied and additional simplifying assumptions are made in countries with less available information.

Full landscape. Sometimes governments or researchers wish to understand how many different types of subsidies there are, who benefits from them, and how large they are. That is to say, the goal is to understand how many of the subsidy categories in table 2, elaborated further in the annex, are found in the energy sector or any of its sub-sectors, and assess their relative importance.

Practitioners are not faced with two mutually exclusive approaches to examining subsidies: price gap or inventory. The two most commonly used methods for measuring subsidies are the price-gap approach—quantifying departures from prices that would have prevailed in a competitive market—and the inventory approach, which constructs an inventory of government actions benefiting production and consumption of energy. Practitioners do not have to choose between the two. An inventory based on a full accounting framework for producer and consumer support estimates in fact captures price gaps as market transfers to producers or consumers. The two methods are complementary, and ideally should be used together.

Price gaps create distortions with ripple effects throughout the economy and

arguably represent the most serious form of energy subsidies. This would be the case even if the subsidies take the form of cross-subsidies and there are no net subsidies; economic distortions can still lead to economic inefficiency. Therefore, price gaps are described

in more detail in this note than other means of delivering subsidies. The next section discusses issues related to pricing. Because there are significant differences between fuels and electricity, they are treated separately.

3. PRICING AND RELATED ISSUES SPECIFIC TO FUELS

This section covers the following:

- Policies that cause fuel price distortions, such as price controls, trade restrictions, and purchase or supply mandates
- An outline of the procedures and data requirements for calculating so-called price gaps
- Price subsidy delivery mechanisms and what to watch out for
- Examples of the unintended consequences of fuel price subsidies

DRIVERS OF PRICE DISTORTIONS

Policy actions that affect fuel prices can cause price distortions. The most common and direct policy action is government control of fuel prices, which can occur at different points along the supply chain. Government influence over prices may be justified where there are natural monopolies, such as pipeline transportation of gaseous or liquid fuels. Government influence over pricing may also be needed if there are multiple fuel suppliers but competition among them is inadequate. In both cases, economic regulation is required. Economic regulation typically sets prices or price ceilings for fairness. The price levels chosen are intended to enable the dominant companies to earn reasonable returns on their investments but not exorbitant profits.

All too often, however, governments control prices even when market determination of prices would be less distorting. Indirect forms of policy action include trade restrictions and purchase or supply mandates.

PRICE CONTROLS

Analysis of price controls can begin with identification of fuel prices the government controls officially or unofficially, whether the government sets price ceilings or price levels, where along the supply chain prices are controlled, and how large an area each price or price ceiling covers (entire country, state or province, city).

Official price controls take the form of the government's setting price levels or price ceilings somewhere along the supply chain: wellhead for natural gas and mine mouth for coal; the refinery gate for crude oil or refined products and LPG, district heating plant gate for coal and natural gas, gas separation facility for LPG, and central gas processing facility for natural gas; the fuel supply point for certain intermediate consumers, such as the power plant gate for fuel oil, natural gas, coal, diesel fuel, and biomass; ex-depot for refined products and LPG; wholesale; and end-use. Prices of liquid biofuels may be controlled by decisions outside the energy sector. Price ceilings allow the level of competition to be



gauged—if the prices observed are all at the price ceiling, either the price ceiling is too low or there is inadequate competition. Provided the price ceiling is set at a level that would allow efficient fuel suppliers to compete on price, the degree of departure from the price ceiling suggests the degree of price competition in the market. Another form of price control is freight equalization, whereby transport costs are equalized throughout a certain geographical area through a complex system of cross-subsidies, sometimes accompanied by a small fee to pay for freight. To that end the government may set up a freight equalization fund, which is often open to abuse.

Price controls may be restricted to certain grades of the same fuel (for example, the price of low-octane gasoline may be controlled and subsidized, whereas that of high-octane gasoline may be deregulated), the size of individual sale (the price of LPG sold in 12-kg cylinders may be set but not that of LPG sold in larger cylinders), or consumer category (prices of natural gas for the fertilizer industry and district heating utilities may be subsidized but gas sellers and buyers may be allowed to negotiate over prices of natural gas for petrochemicals, and similarly diesel fuel for public passenger transport, agriculture, and fishing boats may be offered subsidized diesel fuel but not other purchasers).

Prices may be deregulated in principle but controlled in practice (box 2). Identifying these cases requires a detailed examination of price history at several points along the supply chain. Unofficial price controls usually take the form of government pressure on fuel suppliers, especially SOEs. If fuel suppliers have to obtain authorization for price increases, the government can influence price levels by delaying authorization. Even the requirement to seek authorization in the first place acts

as a disincentive to following market prices in a timely manner.

BOX 2: PRICE CONTROL IN AN OFFICIALLY DEREGULATED MARKET

Without any overt government intervention, prices may still be unofficially controlled. An example is freezing of the producer price of LPG sold in 13-kilogram (kg) cylinders in Brazil between December 2002 and September 2015, fixed at R\$0.87 (varying between US\$0.25 and US\$0.55 depending on the exchange rate) per kg before tax—significantly below the import-parity level for this net LPG importer.

Pricing principles for fuels may be imprecise, vague, or absent, leading to ad hoc pricing. The pricing formula may be generic, open-ended (with many unspecified cost elements), or both. Even if there is a well-defined pricing formula, pricing principles may be subject to socioeconomic considerations. Such considerations are usually invoked to depart from the stated pricing principles or regulations to forgo price increases, leading to revenue shortfalls for fuel suppliers.

One issue common to all fuels is the question of pass-through: whether fluctuations in international fuel prices and exchange rates are automatically passed through to end-consumers. This is important for internationally traded fuels that are sold on the domestic market, including fuel inputs for electricity and district heating. It is not uncommon for the pass-through principle to be stated but not implemented in times of rising international fuel prices in local currency.

While adoption of an automatic pricing mechanism based on a formula that covers reasonably and prudently incurred costs may

be a step in the right direction in subsidy reform, it does not fully “depoliticize” price-setting. As long as a government agency is applying the formula and announcing prices, the government can still come under political pressure to stop applying the formula in times of rising world fuel prices. Automatic price adjustment mechanisms have been abandoned in a number of countries for this reason, such as in the first half of 2015 when some fuel prices on the world market rose by as much as 50 percent.

TRADE RESTRICTIONS

Trade restrictions benefit consumers or producers. Trade restrictions tend not to be based on quantitative rules, although there are exceptions.

- **Import duty.** Relatively high import duties protect domestic fuel suppliers from competition and benefit the government budget. A country with inefficient and high-cost domestic refinery (typically partly or fully state-owned) may impose a higher import duty on petroleum products than on crude oil to protect the refinery. Consumers pay through higher domestic prices.
- **Import ban.** An import ban on all firms other than the fuel producer is another form of producer protection. The most common example is the government’s granting import licenses only to the refiners in the country, so that they do not face competition from independent importers. A historical example is Mexico, although the August 2014 Hydrocarbons Law stipulates that gasoline and diesel imports be liberalized by no later than January 1, 2017.
- **Export duty.** An export duty that is large and out of line with those on other goods is a consumer subsidy. Until the oil price

collapse of 2014, Argentina imposed high export duties on crude oil; in 2015 the government unusually kept domestic crude oil prices artificially high to make up for past losses and attract investment. The Russian Federation has historically imposed relatively high export duties on crude oil and refined products, especially gasoline, to keep domestic prices artificially low. The duties are changed once a month, based on well-defined formulas—an exception to the non-quantitative rules commonly employed elsewhere. In both cases, this consumer subsidy increases government revenue and punishes producers. A very large export duty is tantamount to an export ban, and can have a larger effect on domestic prices than an outright ban.

- **Export ban.** An export ban is designed to keep domestic prices low. Absent the ban, fuels would be exported in search of higher prices on the world market. Kazakhstan has made extensive use of an export ban on diesel fuel and other petroleum products in the recent past, and China had a temporary ban on diesel fuel in 2011.

PURCHASE OR SUPPLY MANDATE

A domestic purchase requirement is intended to guarantee a market for domestic producers, and introduced when buying from the specified producers is more costly. A blanket requirement that only fuels from domestic suppliers be purchased is a form of producer support. Kenya used to have such a requirement for its (now defunct) refinery.

A domestic supply obligation is common for natural gas and is imposed typically in a country where the government keeps domestic gas prices below export parity. There are also similar cases with coal in coal-exporting



countries. The domestic supply obligation may be written into the license to produce hydrocarbons, and an export license may be granted only on condition that the supply obligation is met. In imposing a domestic supply obligation, the government is often most concerned to keep gas prices to the power sector low. The net result is a cross-subsidy, whereby domestic consumers benefit from artificially low prices, cross-subsidized by export profits and, in the case of natural gas, possibly by upstream oil profits in addition.

PRICE GAP

The foregoing section covered how fuel prices may be higher or lower due to government intervention than if they are determined by market forces in the presence of adequate competition, resulting in price subsidies for consumers or producers. Arguably the most commonly applied method in quantifying price subsidies is the so-called price-gap approach. It attempts to quantify the difference between the price set by the government or the price charged by the fuel seller (depending on the circumstances) and the price prevailing in a competitive market (without government intervention in pricing, price collusion, and market concentration). The price gap multiplied by the total units subsidized gives the total value of subsidies:

This note uses net-of-tax unit reference and local market prices to compute price gaps. Net-of-tax prices are the relevant metrics so as to distinguish price subsidies from tax expenditures, and to enable like-with-like comparison with prices in comparator countries. Taxes being netted out do not include corporate income tax and other direct taxes paid by fuel suppliers (or else calculations would become intractably complex), but capture such indirect taxes as import duties, excise duties, VAT, and general consumption tax.

Where there is a flourishing black market, the official price gap could be considerably larger than the actual price gap. The official gap affects the subsidy bill, while the actual price gap faced by consumers could be substantially smaller or even negative, decreasing the adverse impact of price subsidy reform on end-users. Positive price gaps signal consumer support, while negative price gaps could denote producer support. For fuels, artificially high prices are much rarer than artificially low prices. It is important to note that the number of units subsidized is not the same as that consumed by the intended beneficiaries. Fuel consumption may occur even outside the country: official prices that are lower than those in neighboring countries can lead to out-smuggling, sometimes conducted on a large scale, resulting in a portion of subsidized fuel being consumed outside the country.

Subsidy= (adjusted net-of-tax reference unit price – local net-of-tax unit price) x units subsidized

= (Price gap) x units subsidized

There are several factors that illustrate how complex these calculations may become.

- The fewer the number of places where prices are controlled, the easier the calculations. If there is only one refinery in the country, and prices are controlled only at the refinery gate, reference and local prices need to be calculated only at the refinery. Accurate information on the quantities sold should also be available. By contrast, if end-user prices are controlled and are location-specific, there will be multiple local unit prices. Data on quantities sold at each location may not be available.
- Even if there is a single price for the entire country, reference unit prices differ by location. Remote areas lacking economies of scale, for example, will be much more costly to supply than concentrated urban centers, especially if such urban centers are close to sources of supply. Information on volumes associated with different reference prices may be difficult to obtain.
- Freight equalization requires estimation of transportation costs, which are location-specific, and volumes transported.
- If the government sets price ceilings rather than price levels, the actual prices charged may be different from the ceilings. In a subsidizing environment actual prices may be at the price ceilings, but it is also possible that some firms, such as state-owned fuel distributors, come under political pressure to sell below the price ceilings, possibly suffering even larger financial losses. A more likely situation is that price ceilings are not adjusted frequently enough, resulting in sporadic periods of price subsidies.
- Fuel taxes may be difficult to net out. If there is only an ad valorem tax or one specific

tax, computing net-of-tax prices may be straightforward. If, however, several taxes are levied, complications can arise. If there are local taxes that differ significantly from location to location, computing net-of-tax prices back from end-user prices may become very complex.

- Fuels with multi-tier pricing (different prices depending on end use) require volume differentiation by end use, for which credible information may not be available.
- Calculations have to be repeated if there are several grades of a given fuel, such as three different octane numbers for gasoline or viscosity and sulfur levels for fuel oil. Complications are amplified if prices are further differentiated by end use.

In most studies, it is likely that many simplifying assumptions will have to be made. Uncertainties in calculation results are likely to be correspondingly large, suggesting caution in interpreting the calculated price gaps. One implication is that small price gaps maybe within calculation uncertainties and do not necessarily denote consumer or producer support.

If producers are cross-subsidizing across different fuels, negative price gaps for certain fuels may be used to offset losses from price subsidies for other fuels. In such cases, negative price gaps may not represent producer subsidies. Judging where such cross-subsidies exist requires some knowledge of the fuel sector.

Where subsidized fuels are diverted to black markets or smuggled out of the country—two forms of commercial malpractice that primarily affect liquid fuels—estimation of actual units consumed is virtually impossible by the very clandestine nature of these illegal activities.



The total value estimated using the official price and officially reported consumption therefore exaggerates the actual value of price subsidy received by the intended beneficiaries on two accounts: higher prices actually paid by these beneficiaries, and a smaller volume actually purchased. However, the (overestimated) total value may match the budgetary transfers to fuel suppliers. In extreme cases, subsidy reimbursement bills are submitted to the government by firms that did not sell subsidized fuels, resulting in fictitious consumption inflating apparent demand.

The next sections discuss the issues to consider in calculating price gaps for liquid fuels, natural gas, and coal, and appliances and equipment needed to use fuels.

REFINED PRODUCTS, THEIR ALTERNATIVES, AND LPG

Liquid fuels are global commodities with only minor differences in quality and free-on-board (FOB) prices across different regions of the world. As such, computing price gaps calls for less subjectivity than for coal or natural gas.

For importing countries, the reference price estimation starts with import-parity prices, and conversely it starts with export-parity prices for net exporters. FOB prices of major refined products (gasoline, kerosene, diesel, and fuel oil) and LPG in major markets (U.S. Gulf Coast, northwestern Europe, Persian Gulf, and Singapore for petroleum fuels; and Persian Gulf, Algeria, North Sea, and U.S. state of Texas for LPG) can be obtained through public and industry sources, such as the U.S. Energy Information Administration, which makes spot prices in the United States available for free, and Platts and Argus, which require paid subscriptions to the publications containing

price data. It is important to identify the net trade status of each fuel—several large net crude oil exporters are net importers of refined products (almost always because of a long history of fuel price subsidies), for which import-parity prices, and not export-parity, should be used. Prices should be adjusted for fuel quality, importantly octane number for gasoline and, if possible, sulfur content for fuel oil, diesel, and gasoline (listed in order of decreasing importance).

Quite a few papers speak of domestic retail prices being below “international” prices. Such statements reflect a misunderstanding of world fuel markets. FOB prices are the only international fuel prices. Calculating the rest of the costs along the supply chain is market-specific and can be challenging.³ Costs to be added include profit margins in addition to costs for shipping, storage, pipeline/rail/road transportation, retail, and, in the case of LPG, bottling and cylinder management costs. All of these costs depend on economies of scale, the state of infrastructure (roads, rail, pipelines, ports), terrain, distances, and other factors. Unless detailed studies are carried out, simplifying assumptions will have to be made, making it likely that only relatively large price gaps can be identified. There are, however, qualitative indications of price subsidies, which could help identify areas for further investigation:

- Relative prices may be inconsistent with economies of scale (for example, LPG sold in small cylinders having a unit price that is the same as, or lower than, that for LPG sold in larger cylinders or bulk LPG sale). This would signal cross-subsidies in addition to overall subsidies that may be present.
- The same fuel may have different prices depending on end-use that cannot be

explained by economies of scale alone, signaling cross-subsidies.

- A given fuel may have prices that are the same or similar, independently of the distance from the source of supply, signaling spatial cross-subsidies.
- Freezing of prices for weeks or months on end at one point in the supply chain, such as ex-refinery or wholesale, would signal temporal cross-subsidies at a minimum.
- Very large differences in fuel prices that are out of proportion to the quality differences (such as regular gasoline being considerably cheaper than premium gasoline) would signal a price subsidy for the cheaper fuel and a cross-subsidy provided by the more expensive grade.
- A “self-financing” fuel price stabilization fund should be investigated as a matter of routine, as described in more detail on page 25. In Thailand, where the government exercises a measure of control over retail prices using an oil fund, the government began heavily subsidizing fuels in the run-up to the presidential election in 2011, and when it came under criticism, it stopped publishing the fund balance, which it had previously made public every month (Kojima 2013).
- Domestic refineries may be too small and lack conversion capacity to be competitive. Small hydroskimming refineries⁴ may be uneconomic and require protection for survival. The presence of such refineries may suggest producer support for the refinery.

Some countries add biofuels to gasoline and diesel. Calculating their benchmark prices needs to take into account the fact that feedstocks used to produce first-generation biofuels have alternative markets. For

sugarcane-based ethanol, the alternative market for the feedstock is sugar. For maize to ethanol, the alternative market is food and animal feed. For plant oil to biodiesel, the alternative markets are food, detergents, and pharmaceuticals. Their costs should be based on these economic opportunity costs, and not only the actual production costs. Not factoring in their economic opportunity costs would be equivalent to not considering international prices of crude oil and refined products in countries that are net exporters of petroleum oil, and instead using production costs—which could be much lower in times of high world oil prices. Because biofuels blended in gasoline and diesel are almost universally subsidized (through mandates, price support, and tax expenditures), examination of consumer and producer support for biofuels is important for many governments.

NATURAL GAS AND COAL

Natural gas and coal are traded across borders less frequently than liquid fuels, making computation of price gaps more challenging. Where there is cross-border trade, import- or export-parity prices would be a good starting point, as with liquid fuels. In such cases, significant trade restrictions—such as a ban on exports without meeting a domestic supply obligation first—are likely to signal domestic prices being kept artificially low.

Although growing, cross-border trade in natural gas—using pipelines or in the form of liquefied natural gas (LNG)—is still much less common in developing countries than trade in oil products, and globally cross-border trade in coal is even less common. In countries with no cross-border trade, one indication of price support may be a substantial supply shortfall in the presence of consumers who are willing and able to pay more than the



official price. To estimate the price gap in such circumstances, there are several options for the reference price.

- **Price of a most likely lowest-cost alternative.**

For example, if natural gas is consumed primarily in baseload power generation, and the cheapest alternative for comparable service delivery is coal, the equivalent gas price that would make a power producer indifferent between coal and natural gas could be taken as the reference price of gas. Calculations to arrive at the price should take all costs into account—capital and all operating costs, and not just fuel costs. In this example, the calculated cost is the price of gas at the power plant gate that would make a power generation company indifferent between coal and natural gas. The wellhead prices can be calculated on a netback basis, subtracting pipeline and processing costs from the power plant gate price. Prices elsewhere along the supply chain can be similarly computed.

- **Likely price of imported natural gas or coal.** Even if there are no imports today, a likely import price presents another option.

- **Cost-plus.** The reference price may be set at a level that would cover efficiently incurred costs. Cost-plus from the lowest-cost gas fields or coal mines represents the floor, or else no gas or coal would be delivered to the domestic market. One problem with cost-plus alone is that it removes market signals that might have told investors when to stop investing in projects that would not be economic if left to market forces.

Which reference price would make most sense depends on how these prices compare. For example, if the price of a most likely lowest-cost alternative is too low to recover costs (that is, lower than cost-plus), there

are two possible conclusions: either it does not make economic sense to develop and use that domestic fuel, or pricing the fuel at the level of the most likely lowest-cost alternative is not appropriate. The risk with selecting the first approach is the possibility of creation of a single-fuel economy (namely the least-cost fuel) with no diversification and hence exposure to a significant price risk. For example, the first approach could be interpreted as suggesting that any gas price above the coal-equivalent alternative is a subsidy and that subsidy reform would mean turning away from domestic gas to coal, while there may be many reasons to keep domestic natural gas in the portfolio: diversification, supply security, and environmental benefits of natural gas over coal, to name a few.

Pipeline tariffs are subject to economic regulation for natural monopolies. Main cost drivers include the pipeline diameter, distance, terrain, and utilization factor. Calculating price subsidies for pipeline tariffs is likely to require a dedicated study. Information on rail tariff subsidies for coal is best obtained from the rail authorities.

SUBSIDY FOR START-UP COSTS

Subsidies for the initial uptake of a fuel—most commonly natural gas and LPG—can also be quantified using price gaps. Many households cannot pay the cost of the initial connection to natural gas, and to a lesser extent the cost of the LPG cylinder deposit fee and the purchase price of an LPG cook stove. The cost of a high-pressure kerosene stove, which can burn as cleanly as an LPG stove, is also a barrier for many households. There are fundamental differences between start-up subsidies for natural gas and those for LPG or kerosene (box 3).

BOX 3: START-UP COSTS FOR DIFFERENT FORMS OF ENERGY

Because they are not recurring costs, start-up subsidies are generally considered more sustainable than fuel price subsidies. However, they are not efficient if the subsidized consumers cannot afford to pay for the operating costs; the relationship between start-up costs and monthly fuel bills can affect the efficiency of the subsidy.

For natural gas and electricity, many households who find consumption of natural gas or electricity affordable find the initial connection fees unaffordable. This is because the upfront cost is considerably higher than the monthly payment for consumption, sometimes being orders of magnitude larger than monthly bills. As a result, connection subsidies can be effective in enabling consumption of gas or electricity. One option is to include assets associated with new connections in gas distribution companies' regulatory assets and recover costs from all customers, especially since there is no compelling argument for separating network assets and service connections.

By contrast, the relationship between start-up costs and monthly fuel bill is quite different for LPG. The cost of an LPG cylinder deposit fee may be only 2-4 times higher than the monthly cost of cooking with LPG. A household that cannot pay US\$35 for the cylinder deposit fee may have trouble paying US\$15 a month for LPG refill. The much smaller difference between the start-up cost of LPG and monthly fuel costs substantially reduces the number of households that can benefit from the start-up subsidy, as experience with one such subsidy program (called the Deepam scheme) in Andhra Pradesh, India, has shown (Rajakutty and others 2002).

Some governments provide free start-up kits, such as a single burner that sits atop a small-size LPG cylinder (say, 3–6 kg). The companies subsidizing start-up costs are best placed to provide the data. As mentioned earlier, subsidized cylinders and stoves offered as loss leaders to attract new customers on a strictly business basis are not considered subsidies.

PRICE SUBSIDY DELIVERY MECHANISM

How price subsidies are delivered affects the extent of subsidy effectiveness and leakage. There are also unintended consequences, ranging from criminal activities to the fuel sector languishing for investment and falling into disrepair.

HOW MANY SUPPLIERS RECEIVE COMPENSATION?

The smaller the number of suppliers on whom the direct subsidy incidence falls, the easier it may be to administer the subsidy, but possibly at the expense of growing market concentration. Consider two contrasting cases. In the first, there is one national oil company through which all price subsidies for refined products are channeled. The company is reimbursed for the price gap, and any other company wishing to enter the market has to compete with subsidized fuels. In such circumstances, the national oil company will be a monopoly supplier. Not facing any competition, there is little incentive to maximize efficiency and minimize costs. Worse, market concentration tends to perpetuate price subsidies, because price deregulation would be undesirable if there is inadequate competition, as a result of which the government feels compelled to maintain price control. In the second case, any licensed



importer is authorized to apply for subsidy reimbursement and participate in the market. This approach potentially reduces market concentration, but confirming delivery of subsidized fuel to the intended end-users arguably becomes more challenging when the government has to monitor dozens of firms (box 4).

BOX 4: RAPID GROWTH OF CERTIFIED FUEL SUPPLIERS

The number of eligible importers entitled to reimbursement for the gasoline subsidy in Nigeria increased sharply from six in 2006 to 140 by 2011 (Nigeria 2012), prompting several government investigations after charges of fraud had been brought. Firms with no access to import terminals, storage facilities, and retail outlets managed to register officially, made claims, and received reimbursements.

HOW IS COMPENSATION TO PRODUCERS DETERMINED?

How the reimbursement amount is calculated can be a gray area. Even where there is a precise mathematical formula, certain cost elements are location-specific and likely to be self-reported by the suppliers. This is all the more so when there is only one or just a handful of companies involved in the subsidy delivery. It would also not be in the interest of any fuel supplier to suggest that current reimbursements are adequate, let alone generous, lest the government starts cutting back on reimbursements. Where there are serious questions about reasonableness of the costs cited by fuel suppliers, a dedicated study may be needed. Reimbursements are often contested for a number of reasons, some examples of which follow. (a) The exchange rate used to convert to local currency units is

unfavorable to the importer, resulting in losses. If foreign exchange is rationed, fuel sellers may not have ready access to the official rate and the parallel market rate may make imports much more expensive. Even a small difference can lead to a large loss if the volume involved is large. (b) Benchmark prices are lower than what the fuel supplier paid in practice—for example, if benchmark prices are based on large cargos while the country imports in small parcels. (c) Payment arrears owed by the government cause cash-flow problems and increase total costs to fuel suppliers. (d) Costs allowed for reimbursement have been fixed for years in nominal terms, not adjusted for inflation, and are now too low.

In some cases, producers are not compensated. If private producers are not compensated for long, they eventually leave the market—uncompensated losses suffered by oil companies led two private firms, Reliance and Essar, to shut down all their retail outlets in India at one point, because the government policy was to compensate only state-owned oil firms. Because SOEs do not have the option of leaving, and even they are not necessarily adequately compensated, contingent liabilities can grow. In some countries, free or heavily discounted fuels, cross-subsidized by upstream profits, are provided as intermediate goods. For example, the Egyptian General Petroleum Corporation has historically received free crude oil and natural gas as part of its production sharing contracts (Kojima 2016). Diesel fuel for power generation, which accounted for one-fourth of total diesel consumption, was free in Angola as of 2015 (IMF 2015). The power sector in Côte d'Ivoire receives free natural gas based on the government's 15-percent equity share in domestic gas fields (Trimble and others 2016). The state-owned refineries in Algeria and Tunisia have been purchasing domestic crude oil at heavily discounted,

fixed prices (Kojima 2016). These prices can be compared to economic opportunity costs to arrive at the scale of price subsidies. It is important not to count these subsidies twice: as fuel input subsidies for the power sector or crude oil subsidy for refining first, and then as power subsidies or refined product subsidies the second time.

IS COMPENSATION SELF-ADMINISTERED BY FUEL SUPPLIERS?

A unique case of compensation occurs when a state-owned fuel supplier, say a national oil company, provides subsidized fuels for which there is no budgetary allocation, and then deducts the subsidy amount from the dividends the company is supposed to transfer to the government. The budget may show zero fuel subsidy, and there may be no tax expenditure. The government revenue is reduced, but because calculation of the national oil company's dividends is not part of the budget or tax analysis, this self-administered compensation largely escapes scrutiny, with few in the government even being aware of the subsidy delivery mechanism.

IS SUBSIDIZED FUEL RATIONED?

Rationing of subsidized fuels is another policy decision. Subsidized kerosene and LPG used for cooking and lighting fuels are usually restricted: only households are eligible, in some cases only poor households, and there could also be monthly limits. While intended for pro-poor use of limited government budget, rationing also creates lucrative opportunities for black marketing.

Rationing enables targeting of subsidies, making them more efficient in principle. At the same time, rationing adds to the

implementation challenges, because restricting the quantity of subsidized fuel makes diversion all the more financially attractive. And the more complicated the allocation of the subsidized fuel (for example, the quantity depending on several household-specific factors), the more difficult the verification and subsidy delivery. There are many approaches, some examples of which are given below.

- Universal price subsidy for households, irrespective of income status, with or without quantity limits per household or per person.
- Price subsidy only for certain consumers. Eligibility criteria may be classification as officially poor, disabled, historically disadvantaged, or living in a remote and economically depressed area; no connection to electricity (for kerosene subsidy); no connection to a gas pipeline (for LPG subsidy); fishing boats; taxis and buses; automotive fuel subsidy for certain engine sizes (say small ones belonging to less well-off consumers); power plants, fertilizer manufacturers, petrochemicals, and any other industry considered strategic.
- Price subsidy for appliances used by the lesser well-off, such as a kit consisting of a small burner on top of a small LPG cylinder.
- Subsidies only for those consuming less than a capped amount per month (administration of which is possible with natural gas).

In the past, paper vouchers and cards were used to ration subsidies. More recently, electronic forms of record keeping and delivery have been increasingly used. They should be better at reducing leakages, although implementation challenges remain, especially for liquid fuels (box 5). Smart cards combined with electronic banking can be used to reduce



government interference in the market by lifting price control and enabling targeted subsidies to be delivered directly to consumers (say through direct bank deposits) for their fuel purchases. However, the knowledge that consumers are being compensated for high prices would affect the behavior of fuel suppliers, who feel less pressure to keep prices as low as possible.

BOX 5: SMART CARDS FOR RATIONING

Paper vouchers and cards are susceptible to large-scale fraud. Thanks to advances in technology, smart cards can tackle many problems associated with a system based on paper. But where there are powerful financial incentives, people have been known to find ways to defraud the system. The government of Malaysia, one of the earliest adopters of smart cards, has openly and repeatedly acknowledged abuses at every level of the supply chain in the form of diversion of low-price fuels for illegal uses. Smart cards are used to control sales of subsidized fuels to public transport operators and fishers, but the government has admitted their ineffectiveness. In June 2014, for example, the Public Accounts Committee said in a press conference that the fleet card for diesel for public transport operators could be used by anyone to buy an unlimited supply of diesel fuel (*Bernama Daily* 2014).

There is an important difference between liquid fuels and energy distributed through a network (natural gas, district heating, and electricity). As long as each consumer is accurately metered, rationing can be precisely targeted with the latter, because, unlike liquid fuels, it is essentially impossible to store and transport subsidized natural gas for diversion. The two main challenges are the high upfront costs of the initial connection to the network, deterring the poor from connection in the

absence of subsidies, and the political pressure to increase the size of the lifeline block.

IS THERE A FUEL PRICE STABILIZATION FUND?

Price stabilization funds often develop large deficits, which are eventually filled by budgetary transfers. The idea of charging more when world fuel prices are low and using the savings to subsidize prices when world fuel prices are high has an intuitive appeal. It suggests the possibility that the government can moderate the transmission of world price volatility to the domestic market at little or no budgetary cost. The basic idea is to have a floor and a ceiling for the domestic price. When the world price is low, the difference between the market-based price and the floor (over-recovery) is set aside. The savings so accumulated are used to subsidize domestic prices when the market-based price exceeds the ceiling (under-recovery). The premise of such a scheme being self-financing rests critically on fuel prices (typically refined products) reverting to a mean on a fairly regular basis, so that under-recoveries are followed by over-recoveries frequently. If, instead, there is a long period of steady price increases or high prices, punctuated by periodic price collapses, there would be a long period of a growing deficit, which has to be paid for by other means.

The movement of the oil price level over the past 15 years indicates that a mean-reversion model has not held, and price stabilization funds have virtually universally failed to achieve their original objectives without incurring large fiscal costs. This confirms the experience of developed countries earlier in the aftermath of the first oil price shock of 1973, when many governments tried to dampen price volatility. These governments soon found that their

interventions to smooth price volatility on the world market were costly, and abandoned them.

If there are budgetary transfers to top up the fund, it is likely to receive scrutiny. An alternative scenario is that there are no budgetary transfers but the fund is not doing much to smooth price volatility, and in some cases it effectively serves to amplify it—in times of high world oil prices, the fund is already exhausted; in times of low oil prices, as the fund starts building reserves, they are drawn down to subsidize prices and make low prices even lower on the domestic market, as in Vietnam in 2015 (Kojima 2016). These observations suggest that there are large opportunity costs associated with government interventions targeting significant price smoothing, if not creation of more market distortions. Costs and the perceived benefits of such smoothing schemes should be weighed against those of other alternative uses of the same financial resources.

UNINTENDED CONSEQUENCES OF FUEL PRICE SUBSIDIES

Declining Sector Performance

Price subsidies discourage investment because investors fear that there may not be a level playing field (such as the government's favoring state-owned fuel suppliers over private companies) and reimbursements may be late, inadequate, or both. The whole sector may decay over time if subsidized prices are below economic opportunity costs, let alone supply costs; if reimbursements are perpetually late, inadequate, or both; and if subsidies are channeled through one or only a handful of companies facing no effective competition.

Faced with financial losses, fuel suppliers may cut spending on required maintenance. It is not unusual for there to be a large gap between installed nameplate capacity and actual operational capacity in refining and pipelines, and this is one reason some large crude oil exporters with historically large subsidies and large-enough markets to enjoy economies of scale (such as the Islamic Republic of Iran, Iraq, and Nigeria) have become net importers of refined products. In upstream oil and gas, facing an unattractive investment environment, investors may increasingly shift funding to other countries. Oil and gas exploration and development decline. In some cases former hydrocarbon net exporters with substantial remaining reserves have turned into importers.

Because of the inability of refineries to invest in unit upgrades to produce cleaner fuels and policies in place to protect them from competition from imports, fuel quality standards can lag behind those in developed countries by years or even decades. In some countries the octane number of gasoline is markedly lower than what is acceptable for modern ignition engines. Similarly, fuel sulfur levels may be high enough to deactivate catalytic converters and other exhaust control devices.

Commercial Malpractice

Diversion to black markets and smuggling is financially attractive as long as prices are kept low, and especially easy for liquid fuels. Fishing boats are ideally suited for smuggling subsidized fuels provided to fisheries. The government of Malaysia announced in 2012 that state inspectors would start verifying catch from time to time to ensure that the operators of fishing boats were fishing and not smuggling diesel fuel (Kojima 2016). Illegal financial gains also create powerful



vested interest groups determined to entrench price subsidies so that they can continue to benefit (illegally). And seeing poor governance in the sector (if not a race to the bottom), respectable firms do not enter the market, perpetuating corruption and inefficiency. These financial incentives are so powerful that various schemes designed to prevent illegal diversion are seldom successful.

Kerosene is a nearly perfect substitute for diesel fuel, and a price difference between the two in favor of kerosene can lead to widespread adulteration of diesel by kerosene. Subsidized LPG is an attractive fuel for restaurants and hotels, prompting some to engage in large-scale diversion from the residential to commercial sectors. Subsidized low-octane gasoline may be sold as unsubsidized higher-octane gasoline or used to adulterate it, and subsidized gasoline and diesel for public passenger transportation may similarly be sold on the black market.

Higher Prices

Late subsidy reimbursements combined with diversion to black markets and smuggling have created serious fuel shortages in some countries. Fuel shortages raise prices and harm the economy, while subsidies are captured by criminal elements. In the extreme, fuel importers cannot raise letters of credit and have to pay cash upfront, exacerbating fuel shortages further. The National Bureau of Statistics in Nigeria conducts surveys of gasoline, kerosene, and diesel prices in every

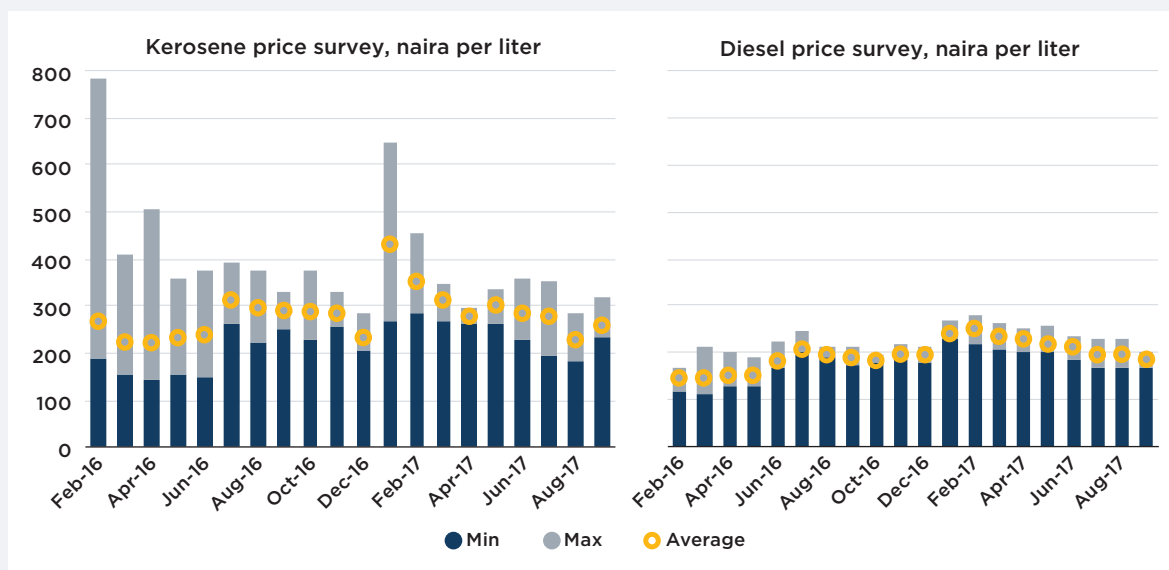
state in the country, and provides concrete evidence that consumers are paying prices far in excess of the official subsidized price (box 6). The gasoline price survey data collected helped push for gasoline pricing reform in May 2016.

Amplification of Fuel and Power Sector Subsidies

Where fossil fuels are used in power generation, power sector subsidies combined with fuel subsidies can aggravate an already precarious financial viability for both sectors. As an illustration, if power tariffs are too low for cost recovery, generation companies may not be able to pay gas producers even when gas prices are kept artificially low. A combination of growing payment arrears and low gas prices discourages investment in the gas sector, leading to gas shortages. Gas shortages in turn reduce the load factor in electricity generation, thereby increasing the unit cost of generation. The unit cost of electricity supply and the price gap in the power sector rise further, making it even more difficult to pay gas producers. This scenario has played out in Nigeria, which has the ninth largest natural gas reserves in the world (*Oil and Gas Journal* 2016). Despite plentiful gas, Nigeria suffers from chronic and acute gas shortages, caused in part by growing nonpayment for gas (World Bank 2015). Gas shortages in turn have caused severe power shortages throughout the economy and further reduced the power sector's financial viability.

BOX 6: COMMERCIAL MALPRACTICE IN KEROSENE TRADE IN NIGERIA

For years, the price of kerosene for household use was set at N50 (US\$0.17) per liter, until it was raised to N83 (US\$0.42 at the time, but now US\$0.26) per liter in January 2016. The government deregulated the price of diesel several years ago. The National Bureau of Statistics has been conducting monthly price surveys of gasoline, kerosene, and diesel in the 36 states and the Federal Capital Territory. Because world prices of kerosene and diesel are very close, it is informative to compare the actual prices paid for the two fuels. The results are shown below.



Source: <http://www.nigerianstat.gov.ng/>.

It is immediately clear that if the kerosene subsidy were to be abolished, consumers would pay less than they are paying today, and virtually all price subsidies are captured by those engaged in illegal diversion of subsidized kerosene, creating severe kerosene shortages and pushing up prices paid by households to levels markedly above what a free market might deliver.

4. PRICING AND RELATED ISSUES SPECIFIC TO ELECTRICITY

The word subsidies tends to be used more loosely in the power sector, often interchangeably with a lack of cost recovery. The inability of a company to recover costs alone does not automatically signal the existence of subsidies. As an analogy, in a competitive market in which companies are free to set prices, some firms do not recover costs and go out of business, but consumers who have purchased goods and services from

firms that have gone bankrupt are usually not considered to have been “subsidized” by them. But the need for economic regulation for electricity transmission and distribution—and hence government control of prices—raises the question of whether the regulated tariffs may have been too low for the utilities to recover costs, subsidizing consumers. A clear example is when tariff adjustments do not allow utilities to pass through fuel price



increases and currency depreciation (both of which are beyond the utilities' control) to consumers.

Cost recovery and affordability are two important price-related policy questions in the power sector. A typical scenario is that of a power utility not recovering costs for a number of reasons, resulting in increasing power shortages, a need for budgetary transfers (today or in the future), or both. Where utilities are not recovering costs and power outages are frequent and long-lasting, the economy-wide effects can be substantial. In countries where many people still live without electricity, how to make electricity affordable is at the heart of the effort to achieve universal access, including how to make subsistence electricity consumption affordable to all poor people and the degree to which their consumption can be cross-subsidized by others.

Many governments are less concerned about whether the inability to achieve cost recovery is a result of subsidies as defined at the beginning of section 2 than understanding what factors are responsible for the lack of cost recovery. There also tends to be greater subjectivity in identifying subsidies in the power sector than for fuels, because some factors that make power utilities not financially viable do not neatly fit the definition, "a deliberate policy action by the government that specifically targets electricity ... [that reduces] ... the net cost of [electricity] purchased." For example, a power utility is most unlikely to cut off electricity to the military or the ministry of power for nonpayment, but forbidding disconnection in such cases is usually an unspoken policy and not a "deliberate policy action by the government."

If the focus is on fossil fuel subsidies, isolating them in the power sector poses additional challenges:

- If the power sector as a whole receives a net subsidy, it could be difficult to assign the net subsidy to different stages of the supply chain (generation, transmission, distribution, auxiliary services, overhead administrative costs). Fuels consumed in the power sector are used primarily in electricity generation. If generation is fully recovering costs, but transmission or distribution is not, is there no subsidy for fossil fuels, or should the subsidies for transmission and distribution be prorated according to the share of fossil fuels in generated power?
- If power generation consists of fossil fuels, hydropower, solar power, and wind power, with feed-in tariffs for solar and wind power, disaggregating subsidies becomes all the more challenging. Some subsidies could make other forms of power generation uneconomic. An example is the guaranteed access to the grid granted to solar and wind power with guaranteed prices, making natural gas uneconomic in certain European countries. Restoring financial viability to those forms of generation that have become uneconomic as an unintended consequence of certain subsidies may call for creation of additional subsidies.
- If generation using fossil fuels is not recovering costs because the transmission capacity is limited and power generation plants have to cut back on generation, lowering the load factor and raising the unit cost of power generation, there may be little that generation companies can do to achieve cost recovery. Does this situation create a fossil fuel subsidy?

Governments typically wish to gain a better understanding of the subsidies for the entire power sector, inclusive of all forms of generation. The question of fossil fuel subsidies in the power sector tends to arise more in an international setting—such as the Group of Twenty or Asia-Pacific Economic Cooperation—than in domestic policy discussion.

PRICE DISTORTIONS

Price distortions for electricity typically arise from deficient economic regulation in design, implementation, or both, and deficiencies in metering practices. Electricity is subject to economic regulation much more frequently than liquid fuels and natural gas. Electricity transmission is a natural monopoly and is always regulated. Some countries have a single vertically integrated state-owned utility, requiring economic regulation across the supply chain. The regulation of distribution varies greatly across countries, but in the developing world there tends to be much tighter economic regulation than, for example, Finland.⁵

Along the supply chain, power generation comes closest to delivering a market reference price, which is the price that would prevail in the absence of government intervention in pricing, price collusion, and market concentration. As one illustration, market reference prices for generation could be energy and capacity charges at which investors would be willing to invest in the sector through auctions.

The failure to meter each individual consumer accurately results in consumers paying for electricity not consumed, not paying for electricity consumed, or paying prices they would not have paid had they been metered individually and accurately. All of

them are examples of price distortions. A lack of accurate metering that is a result of the utility's operational inefficiencies would not be considered a deliberate government action. However, where the practice of charging a fixed amount not linked to actual consumption is accepted by the regulator, it would be reasonable to consider such practice a deliberate government action. For example, there may be only two meters measuring electricity consumption for an entire village, one for all households and the other for all farming activities. Even if tariffs recover costs—which frequently they do not—this means widespread cross-subsidization at a minimum.

TARIFF SETTING

The dual question of whether tariffs are too low to recover costs, and why costs exceed revenues, is important for assessing whether there are price subsidies in the power sector. In virtually all countries, tariff reviews are conducted periodically, ranging from several months to several years. Utilities make a submission, there may be a public hearing and comment period, and decisions are announced by the regulator. The documents submitted for tariff reviews vary in the level of detail; in some countries detailed spreadsheets showing costs and calculations are submitted and posted on the utility's or the regulator's Web site.

No regulator sets out under-recovery of costs and eventual financial bailouts of power utilities as a stated policy goal. Utilities are intended to be financially viable, but many are not. They may be inefficiently run, making costs higher than necessary and revenues lower than what they could be. In addition, tariffs are frequently not at the cost recovery level:



- The tariff reviews may not be conducted at the specified intervals, delaying the needed tariff increases.
- The review may conclude that tariffs need to be raised, but the regulator may nevertheless decide that, for a variety of socioeconomic reasons, this is not the time to be raising tariffs.
- If tariff increases are subject to cabinet or presidential approval, even if the regulator recommends tariff increases with ample justification, tariff adjustment could become politicized and the recommendation may be rejected.
- There may even be a provision for automatic price adjustments for fuel price and currency changes with regular frequency, but just as with liquid fuel pricing, the so-called automatic price adjustments may not be so automatic and not implemented if they point to large tariff increases.

COST RECOVERY

Cost recovery arguably attracts the most policy attention and analysis in developing countries. If costs are not being recovered, the funding gap may eventually have to be filled somehow through debt forgiveness, budgetary transfers, and other means. However, it is important to bear in mind that under-recovery of costs by itself does not automatically translate to there being an energy subsidy. In the rest of this section, whether the under-recovery of specific costs is an energy subsidy will need to be assessed in the light of the definition of energy subsidies at the beginning of section 2 and the subsidy categories outlined in table 2 and the annex.

The question of which costs should be recovered through revenue collection influences tariff

setting. International experience suggests that the degree of cost recovery from consumer payments depends largely on the level of development of the power sector. Where the sector is far from mature, the medium- to long-term goal is to reach tariff levels that fully cover all reasonably and prudently incurred costs. If revenues fall far short, the first priority for the utilities in the sector is to meet all cash obligations, which may be reduced by subsidies provided to the sector by various means. These subsidies in turn may help improve the financial health of the utilities, but if significant subsidies are provided by the government's budget, they will threaten provision of other essential services and the government's fiscal sustainability.

Different levels of costs to be recovered may be characterized as follows:

- **Level 1: Operating cost recovery.** The lowest level of cost recovery considers only operating costs and minor repair expenses, but not capital costs (including major repairs). The threshold level above which repair expenses become capital costs is situation-specific. In most cases, level 1 excludes depreciation, debts, bad debt allowance (allowance for collection losses that will not be recovered), and other similar revenues and expenses that do not directly affect the utility's cash flows. Operating cost recovery is appropriate when the policy question is whether the utility is financially sustainable for the purpose of operating its business in the short term. However, it does not capture the full scope of price subsidies as defined in this note.
- **Level 2: Operating and limited capital cost recovery**
 - 2a. Inclusion of ongoing capital costs and taxes. Also called the cash-needs

approach, level 2a considers taxes and the financing of ongoing capital costs in addition to operating costs. This approach requires information about debt and equity financing, including debt repayment schedule. Ongoing capital costs alone may not enable continuing operation of currently operating assets if major repairs are needed in the near term.

- 2b. Inclusion of ongoing capital costs, taxes, and near-term major repairs. Level 2b adds to level 2a capital costs associated with major repairs that are likely to be undertaken in the near to medium term to keep on operating important existing assets.
- 2c. Inclusion of full replacement value of existing assets. In the absence of information about debt and equity financing, costs of major future repairs, or both, an alternative is to calculate the full replacement value of the existing assets. In a country where supply falls far short of demand, as in every country in Sub-Saharan Africa, level 2c approximates the annual funding required to maintain the current stock of assets. In countries where demand is stagnant or falling and some units need to be decommissioned, level 2c needs to be modified to capture decommissioning costs as well as the replacement value of assets that will be maintained in the future to match demand.

- **Level 3: Full cost recovery of operating and capital costs, including future investments.** Level 3 adds to level 2c the capital and associated operating costs associated with planned new investments for system expansion and modernization, prioritizing investment projects as needed. Ideally,

long-term system-wide optimization analysis is carried out to identify new investments. In the absence of such analysis, utility investment plans, the government's strategic documents, and other relevant plans may be used.

- **Level 4: Full cost recovery and capture of unpaid externalities.** Level 4 includes externality costs of producing and delivering electricity, such as the economic costs of local air pollution and emissions of greenhouse gases. Because uninternalized externalities are excluded in this note for the reasons cited in box 1, level 4 is not applicable.

In summary, cost recovery at level 3 is the subject of this note. Who pays for the various cost components at level 3, what is the magnitude of the costs not covered by the utilities, and how much of that gap is the government covering or will the government eventually be asked to cover are the three key questions in subsidy analysis. Costs that need to be covered by the utilities (net of subsidies provided) are computed using utility financial analysis, and what the government is covering or may eventually cover is computed using fiscal analysis. The sum of costs covered by the utilities and the government do not usually cover opportunity costs of goods and services, external concessional financing, subsidized goods and services provided by foreign governments, and tax expenditures not captured in fiscal analysis, all of which are captured in full analysis, as described below.

- **Utility or power sector financial analysis.** This financial analysis considers only the costs that the utility or the power sector needs to cover. Any subsidies provided by the government are not captured because the subsidies are funded out of the



government's budget, and not the utilities' revenue. The analysis excludes depreciation, bad debt allowance (for routinely uncollected revenue), and revaluation of assets. This type of financial analysis is undertaken when the policy question is whether the utility or the power sector is financially viable.

- **Fiscal analysis.** Fiscal analysis addresses the overall cost of the power sector to the state, with the magnitude of the burden that the power sector is imposing on the government budget being an immediate priority. Fiscal analysis captures all budgetary transfers to the utilities, forgone revenue (from providing subsidized goods and services), and contingent liabilities (such as risks borne by the government on behalf of the power sector or state-owned utilities). However, while it may be significant, fiscal burden represents only one aspect of subsidies.
- **Full analysis.** Full analysis considers all costs, including opportunity costs and provision of loans at below-market rates provided by international donors. Full analysis is appropriate when the policy question is the scale of the real cost of utility service provision to the economy without donor support and trade restrictions (for fuels and other goods sold at prices that are below opportunity costs). Full analysis is what is needed to estimate subsidies. However, externally provided subsidies (subsidized interest rates provided by donors) are sometimes omitted for the purpose of policy analysis.

Table 3 summarizes the foregoing categories (excluding level 4). If cost recovery is used to set tariffs, A2 and A3 in table 3 reduces the short-term impact of capital expenditure on

tariffs, requiring the utility to seek concessional financing (grants, low-interest loans, long grace periods, partial risk guarantees) or budgetary transfers for major capital expenditures. The reality is that available concessional financing and budgetary transfers to meet future demand for electricity in most developing countries are far from sufficient. The hope is that future economic growth will increase consumers' ability to pay and eventually enable full cost recovery defined in column C.

By definition, costs are not recovered when they are higher than revenues, but it does not necessarily mean that tariffs are too low. Cost recovery can be attained by lowering costs, increasing revenues, or doing both. Sustainable means of lowering costs (optimizing the power system, and increasing the efficiency of procurement, project execution, and operation) and alternative means of increasing revenues (such as by increasing the bill collection rate and ensuring accurate metering and billing) can minimize the need for tariff increases. Therefore, for all of the nine possible sets of calculations in table 3, two sets of calculations can be performed. The first is to use costs and revenues as they are today. The second is to compute costs and revenues at benchmark performance. The benchmark performance may assume, amongst others, a 100-percent bill collection rate, minimal commercial losses, total technical losses of (say) 8 percent, proper maintenance of all units and equipment, replacement of aging units in line with good industry practice, and developing the power infrastructure in line with long-term system-wide optimization. Where to set the benchmark performance varies by country and the maturity of the power market.

TABLE 3: Types of Analysis for Cost Recovery

	A. Financial analysis	B. Fiscal analysis	C. Full analysis
Level 1 Operating cost recovery	A1: Only those operating costs that are covered by the utility (excluding various reserves, such as depreciation, bad debt allowance, and revaluation of assets)	B1: Operating costs that are covered on behalf of the utility by the government through budgetary transfers and provision of subsidized goods and services	C1: All operating costs, irrespective of who bears them, valued at opportunity costs
Relevant context	Level 1 would not be analyzed in detail unless the utility or the sector is in poor financial state and cannot even meet its cash needs (A2a below). Correspondingly, in such situations, government subsidies are provided for even the most basic of costs through budgetary transfers or provision of subsidized inputs, such as fuels.		Examination of input subsidies valued at opportunity costs—such as domestically produced fuels—is important in nearly all cases, but other subsidies (such as external concessional financing or tax expenditures) are unlikely to attract attention in the face of the urgent need to cover basic operating costs.
Level 2 Operating and limited capital cost recovery	A2: A1 plus taxes and any capital costs as defined in levels 2a, 2b, and 2c above that are paid for by the utility, such as debt service, required equity payments, and internally funded investments, assessed at the expected weighted average cost of capital for the utility or the sector	B2: B1 plus the capital costs covered through sovereign funding/guarantee, assessed at the expected weighted average cost of capital incurred by the government (which may include concessional finance)	C2: C1 plus capital costs at market-based rates
Relevant context	Also referred to as cash needs, A2a is the minimal revenue requirement for the utility's financial viability. Level 2 would be relevant where the utility or the sector is already covering operating costs, and are at varying stages of meeting costs of asset maintenance, renewal, acquisition, or enhancement.		C2 would be the relevant metric for near to medium-term analysis of subsidies in many developing countries.
Level 3 Full cost recovery of current and future costs	A3: A2 plus all omitted capital and associated operating costs, including the cost of financing new investments	B3: B2 plus all omitted capital and associated operating costs, including the cost of new investments	C3: C2 plus all omitted capital and associated operating costs, including new investments
Relevant context	Level 3 is relevant for long-term planning, or in countries with mature power sectors where most costs are already adequately covered by utilities with possible gaps for significant new investments (which may be needed to adapt to new technology even in markets where demand is stagnant or falling). Level 3 would also be relevant in a financially healthy sector with rapidly rising demand. However, there is subjectivity in deciding when to charge customers for major new investments.		C3 would be the relevant metric for full subsidy analysis.



HIDDEN COST ANALYSIS

A useful concept in analyzing the gap between revenue and expenditures in the power sector is a quasi-fiscal deficit, which is the difference between the net revenue of an efficient utility (where revenue is designated by $R_{\text{benchmark}}$) and the net current revenue (R_{current}). Quasi-fiscal deficits can help distinguish between subsidies that can be reduced only by raising tariffs and those that could be avoided by optimizing the power system and minimizing operational inefficiencies (box 7).

In the illustration in box 7, quasi-fiscal deficit is equal to underpricing plus transmission and distribution losses + bill collection losses + overstaffing. At benchmark performance, the last three terms are zero, leaving only underpricing. Underpricing as calculated

in hidden-cost analysis is a subsidy. Other hidden costs—corresponding to operational inefficiencies—are not necessarily subsidies, unless they are covered using budgetary transfers and other types of subsidies described in table 2. That said, governments are generally not concerned about what these factors contributing to quasi-fiscal deficits are called. Their main interest is to eliminate quasi-fiscal deficits so as to set the power sector on a financially sustainable path over the long run. Elimination of subsidies is one of the steps toward cost recovery, but not necessarily the only one.

In carrying out the calculations, it is important to include reasonable returns on equity. One way of keeping power tariffs artificially low is to limit the rate of return at a level so low as not to attract investment, such as 1 percent

BOX 7: COMPONENTS OF HIDDEN COSTS

A simplified example illustrates how the gap between revenue and expenditures may be decomposed into avoidable and unavoidable revenue shortfalls. Let *capex* designate benchmark capital expenditure, *opex* designate benchmark operating expenditure, and *Q* designate dispatched kilowatt hours (kWh). If the benchmark performance is defined as having combined system losses (technical and non-technical losses in transmission and distribution) of 10 percent and a bill collection rate of 100 percent, the tariff at benchmark performance, $\text{tariff}_{\text{benchmark}}$, becomes $(\text{capex} + \text{opex})/0.9Q$ and the revenue of an efficient utility is $\text{tariff}_{\text{benchmark}} \times 0.9Q$, where 0.9 takes into account combined transmission, distribution, and billing losses of 10 percent. The revenue at current performance by contrast is $\text{tariff}_{\text{current}} \times Q \times (0.9 - \text{TDL}) \times (1 - \text{BL})$, where *TDL* is transmission and distribution losses in excess of 10 percent and *BL* is bill collection losses. Consider a simplified case where the only additional cost of current performance is overstaffing (that is, capital costs are the same and the operating costs are higher than *opex* by the cost of overstaffing only). The current cost is then $\text{capex} + \text{opex} + \text{overstaffing cost}$. Using Δ to designate unit tariff shortfall ($\text{tariff}_{\text{benchmark}} - \text{tariff}_{\text{current}}$), the quasi-fiscal deficit becomes

$$\begin{aligned} R_{\text{benchmark}} - (\text{capex} + \text{opex}) - \{R_{\text{current}} - (\text{capex} + \text{opex} + \text{overstaffing})\} = \\ \text{Overstaffing} + \text{tariff}_{\text{benchmark}} \times 0.9Q - \text{tariff}_{\text{current}} \times Q \times (0.9 - \text{TDL}) \times (1 - \text{BL}) = \\ \text{Overstaffing} + \text{tariff}_{\text{benchmark}} \times 0.9Q - (\text{tariff}_{\text{benchmark}} - \Delta) \times Q \times (0.9 - \text{TDL}) \times (1 - \text{BL}). \end{aligned}$$

The quasi-fiscal deficit can be decomposed into four hidden-cost components, defined as

$$\underbrace{\Delta \times Q \times (0.9 - \text{TDL}) \times (1 - \text{BL})}_{\text{Underpricing}} + \underbrace{\text{tariff}_{\text{benchmark}} \times Q \times \text{TDL}}_{\text{System losses}} + \underbrace{\text{tariff}_{\text{benchmark}} \times Q \times (0.9 - \text{TDL}) \times \text{BL}}_{\text{Bill collection losses}} + \text{Overstaffing}.$$

in the distribution segment in one developing country.

While the last three terms are zero at benchmark performance, elimination of these and other operational inefficiencies is not costless. Setting aside underpricing, utilities have to incur additional expenditures to move from their current quasi-fiscal deficit position to the deficit position they would experience at benchmark performance. Identifying the most cost-effective ways of doing so—starting with low-cost/high-return investments—would require a separate study. Another cause of under-recovery is high costs of purchase when utilities are not creditworthy. If the utility is asked to pay cash upfront for fuels and has to borrow money to do so, financing costs could push up fuel prices considerably, widening the gap between current and benchmark quasi-fiscal deficits.

DATA SOURCES

Financial statements issued by utilities should provide information on capital, operational, and maintenance expenditures, although some utilities, and especially SOEs, have only scant, unaudited financial statements that are several years out of date. Moreover, financial statements are on an accrual basis, introducing complications especially when the calculations are intended to be linked to budgetary transfers, cash transfers, and other payments assessed on a cash basis. Utilities' annual reports and the database of the regulator or the ministry in charge of the power sector can provide additional information, such as bill collection rates and system losses. Utilities' submissions for tariff increases to the regulator can be another useful source of information.

- Amounts billed and amounts collected should be available in financial statements. Subsidies in the form of direct transfers from the government or international donors may be reported. It is important to separate revenues specifically tied to electricity from such unrelated items as revenues earned from the sale of water for utilities that provide both services.
- Fixed and variable operational and maintenance expenditures as reported in financial statements may not represent what should have been spent. The utility may have growing payment arrears for fuels or other goods and services, may be skipping essential maintenance and repair to cut costs, or the government may be paying directly for certain goods and services, bypassing the utility. Frequent, unscheduled power outages due to equipment failure may be an indication of inadequate expenditures on maintenance and repair. As explained in table 2, indirect taxes should be excluded from the calculations but direct taxes paid should be considered costs to the utilities.
- What assets capital expenditures should cover is arguably the most challenging. One simplified approach is to compute new replacement values of current assets found in utilities' annual reports or the government's database for the sector, annualized by amortizing the asset value over a chosen period of time, such as the economic life of the assets. However, especially in developing countries, it is unlikely that all assets (especially generation) would be replaced in the future as they exist today—nor should they be if asset allocation is suboptimal. Changes are likely, but it may be difficult to tell today whether four 50-megawatt diesel power plants will be replaced and absorbed by a single 500-megawatt combined-cycle



gas power plant, especially if that decision hinges on parallel development of fuel supply infrastructure, such as the start-up of a floating storage and regasification unit for LNG. Further, detailed information on distribution assets for lines below 1 kilovolt is usually not available, requiring further simplification or else use of the findings from a detailed analysis elsewhere. Economies of scale influence the unit capex, as do the asset location and creditworthiness of the investor. Taking each of these factors into account increases data requirements.

IMPACT OF SECTOR STRUCTURE

The structure of the sector affects the risk of double counting and the ease of estimation.

- If there is a single vertically integrated utility, all assets and costs are with that utility. Generation, transmission, and distribution should be disaggregated to see where subsidies and operational inefficiencies may exist.
- If the sector is unbundled to varying degrees, care should be taken to avoid double counting. For example, the cost of power purchase by a transmission company should not be added to the cost of generation of the power purchased. Only additional costs incurred in that segment of the supply chain should be captured at each point along the chain.
- If the sector is partially deregulated—some customers can choose electricity suppliers and pay deregulated prices, while others have no choice and pay regulated prices—comparison of regulated tariffs with deregulated prices may give an indication of the degree of subsidization of regulated tariffs. However, this comparison is limited by the fact that deregulation applies primarily

to large customers in most developing countries, making like-with-like comparison difficult.

CROSS-SUBSIDIES

In the power sector, cross-subsidies are far more common than for liquid fuels. Cross-subsidies such as lifeline rates for the poor may enhance equity, but they can also cause economic distortions and even threaten the long-term sustainability of the users being cross-subsidized (such as low electricity tariffs for agriculture leading to excessive use of irrigation and causing permanent water depletion). In a partially deregulated sector, cross-subsidies are generally confined to regulated customers—deregulated customers can switch suppliers because they have a choice, whereas regulated customers have no choice, even if they know that they are paying higher tariffs to cross-subsidize others.

Cross-subsidies may be across different tariff categories (agriculture and households cross-subsidized by industry) as well as within the same consumer category (low-consumption households cross-subsidized by high-consumption households). In completely deregulated markets, large-volume consumers purchasing power at high voltage are charged lower unit prices than low-volume consumers at low voltage, and at the same voltage economies of scale would imply decreasing unit price with increasing consumption. Affordability for the poor is better addressed through means other than tariff manipulation, such as cash transfers or energy assistance programs. By contrast, tariff schedules in a number of developing countries depart from the relative tariff levels in deregulated markets. In some countries, large-volume consumers with electricity supplied at high voltage are charged higher

unit prices than low-volume, low-voltage consumers. Developing countries also make extensive use of volume-differentiated or increasing block tariffs⁶ with lifeline rates for residential consumers, who as a group may also be cross-subsidized by other consumer categories.

In countries that export electricity, export revenues may be used to cross-subsidize domestic supply. This is similar to natural gas pricing in many developing countries. The presence of such cross-subsidies can be checked by comparing export tariffs with domestic tariffs.

Quantifying cross-subsidies requires cost calculations for different volumes of consumption and voltage levels. Looking at broad patterns in the tariff schedules can help prioritize areas for further analysis by identifying where large cross-subsidies are likely to be found. For example, if average residential and agricultural tariffs are the lowest tariff categories, it is virtually certain that these two consumer categories are cross-subsidized.

START-UP SUBSIDIES

As is the case with natural gas, connecting a building to the grid for the first time can be costly, and extending the grid to a new location certainly is. The start-up costs of rural electrification are similarly costly. Charging newly connected customers fully for the start-up costs would exclude many poor households from access to electricity. Some countries, such as Mozambique and South Africa, waive the initial connection fees altogether for the poor. In other countries, the initial connection cost can be several times the average household income and much more for the poor. Unaffordable connection

fees lead to multiple connections to a single meter, making several poor households appear rich to the utility and depriving them of the benefits of lifeline rates (box 8).

BOX 8: MULTIPLE CONNECTIONS IN SUB-SAHARAN AFRICA

Practice of connecting several houses to a single meter is widespread in Sub-Saharan Africa. In Ethiopia, the lowest connection charge represents 130 percent of average monthly household income. Multiple connections are the norm: comparison of the findings from a recent national household survey and the utility's annual report found that there were two and a half times as many grid-connected households as utility customers.

Source: Kojima and Trimble 2016.

If the initial connection fees for some customers are explicitly subsidized, calculating total connection subsidies would be straightforward. If, however, the regulator decides that isolating installation of new connections from other components of a network enhancement project is economically inefficient, that there is no compelling argument for separating network assets and service connections, and that it is more efficient to build all infrastructure needed to connect new users in a single project to optimize technical and financial arrangements, then it is probably not worthwhile trying to “unbundle” the integrated project in an attempt to estimate start-up subsidies.

UNINTENDED CONSEQUENCES OF POWER SECTOR SUBSIDIES

Commercial malpractice in the power sector is much less linked to subsidies than for liquid fuels, because, just as with natural gas, it is essentially impossible to store low-priced



electricity and sell it to a customer in a higher-price category or “smuggle” it to a country with higher electricity prices. Undermetering, collusion between large customers and utility staff to underbill, and other forms of commercial losses occur largely independently of subsidies. The financial incentives to conduct these activities are only indirectly linked to subsidies, for example if cross-subsidies raise prices for certain customers markedly above what they would have been in the absence of cross-subsidies. Otherwise, price subsidies reduce, not increase, the financial incentives for commercial losses because the lower the prices, the smaller the financial gains.

Underpricing, late subsidy reimbursements, and inadequate subsidy reimbursements have the same impact on investment and sector performance as with fuel price

subsidies (see page 26). They all reduce returns on investment, and can even lead to negative returns. Companies that are already operating in the power sector cannot invest for modernization and expansion, and often cash-strapped utilities struggle to maintain existing assets. The assets fall into disrepair, the quality of service declines (or has never been good to begin with), power shortages become the norm, and households and businesses do without electricity or pay much more for private diesel generation.

In most circumstances, the poor performance of the power sector cannot be blamed only on underpricing. There are many other factors that contribute to such a state, and that is the subject of a much larger literature on power sector reforms.

5. TAX EXPENDITURES AND OTHER SUPPORT MEASURES

TAX EXPENDITURES

Tax expenditures are less transparent than subsidies financed out of the budget because tax expenditures seldom appear as line items in the budget and are therefore not subject to annual budgetary scrutiny by the legislature. Tax expenditures take a variety of forms, including tax-rate reductions, tax allowances, tax credits, and tax deferrals (through accelerated depreciation and other means). Budgetary transfers can achieve the same outcome as tax expenditures, but unlike direct government spending, tax expenditures are almost always deliberated outside of the budgetary framework. The assessment of tax expenditures is hampered

by inadequate reporting and accounting practices, particularly in developing countries. In contrast to the scrutiny to which government spending is usually subjected, tax expenditures do not usually have to be approved by the legislature year after year, and many have no expiration dates. While there are ceilings on direct expenditures, tax expenditures often escape such spending discipline. Some high-income countries have laws that require annual reporting of tax expenditures.

Tax expenditures may or may not affect prices. For example, accelerated depreciation—or even corporate tax exemption, say for the first five years of operation—granted to a domestic refinery may not affect domestic fuel

prices if they are based on import- or export-parity prices. In such cases, tax expenditures represent producer support with no benefits to consumers. In other cases, tax expenditures are used primarily to lower domestic prices. An example would be a market in which domestic gas prices are kept artificially low with no budgetary support, providing little incentive to engage in natural gas production. To provide incentives to upstream gas producers, the government may grant sweeping fiscal incentives—such as allowing all costs associated with gas production and delivery to offset oil revenue, corporate tax exemption for gas, zero royalty rates, and so on—in the hope that investors could still earn reasonable returns on investment despite low gas prices. Quantifying the subsidy in such a case would entail fiscal modeling without concessions to compute the wellhead price of gas that would deliver the same return as with concessions, and computing the price gap accordingly.

Some governments reduce or waive indirect taxes for certain fuels or electricity and equipment associated with them. Examples of this practice include corporate income tax holidays and tax-rate reduction for new power generation projects in Vietnam, exemption from excise and special petroleum taxes for premix (fuel for fishing boats) in Ghana, VAT exemption for LPG and locally-produced LPG

appliances in Kenya, and exemption from the 6-percent goods and services tax for lower-octane gasoline, diesel, and LPG in Malaysia. Inter-fuel tax differences to keep prices low for certain fuels—higher tax on diesel fuel than kerosene being a common example—are intended to make household fuels affordable, but provide powerful financial incentives for diversion of lower-taxed fuel to alternative markets. Tax expenditures in such cases can be quantified by multiplying the difference between the standard rate and the reduced rate by the volume sold.

A special case of tax expenditures through tax-rate adjustment is when indirect taxes are reduced or eliminated only when world prices soar in local currency so as to minimize price increases. Vietnam has historically used import duty adjustment to smooth domestic prices of petroleum fuels, but trade liberalization in the form of declining import duties has largely ended this approach to smoothing prices.

OTHER SUPPORT MEASURES

Other support measures include provision of free water, cash transfers conditional on energy purchase, underpricing of other inputs and licenses (box 9), implicit government guarantees for SOEs, soft loans, and shifting of risk burdens. Cash transfers financed by the budget can be quantified—it is a matter of

BOX 9: UNDERPRICING OF PERMITS

Underpricing of inputs (such as government-owned land) and licenses or permits can be difficult to quantify, not least because it may not be immediately obvious what the “right” charge should be. As one example, the minimum bid for coal leases in the Powder River Basin in the United States, which is on federally owned land, has been frozen at US\$100 per acre since 1982. Any freezing of a price would suggest underpricing. Accounting for inflation alone would more than double the bid price. General inflation cannot be the only driver of the permit price, suggesting considerable underpricing for the coal lease in this basin.



finding the data sources—but others present larger challenges. In some cases, quantification may not be possible, but noting that a form of subsidy is provided (typically in the form of producer support) is important in assessing the overall subsidy policy framework and examining options for subsidy reform.

Provision of free fuels to end-users is rare. Turkmenistan took the decision to end provision of free natural gas to households only in June 2017 (*Energo* 2017). Provision of free electricity to the poor is more common. Examples include free electricity given to households consuming less than 50 kWh a month in Thailand, and varying amounts up to as much as 150 kWh a month given to the poor in South Africa.

Cash transfers may be conditional or unconditional, and can be implemented in several different ways:

- Cash is transferred to energy purchasers upon confirmation of energy purchase by the seller (LPG in India).
- The amount of cash for transfer is deducted from some other purchase, such as the electricity bill for LPG in Peru for eligible poor households.
- A fixed amount is transferred every month (monthly bill for 30 kWh at the lifeline rate transferred to two categories of eligible poor households in Vietnam).
- Cash is transferred to a target population whether they purchase energy or not, in response to energy price increases (cash transfers to the poor in Indonesia in 2005, 2008, 2013, and 2014; cash transfers to nearly all households in the Islamic Republic of Iran starting in 2010 when energy and other prices were raised significantly).

In all cases, the amount of cash transferred is normally available from the finance ministry, budget documents, or other government agencies and documents.

New support measures may be introduced even as governments embark on subsidy reform. For example, very large price increases are more likely to prompt governments to offer unconditional cash transfers, especially when many basic goods and services are affected. In the Islamic Republic of Iran in 2010, the price of fuel oil was raised 20-fold, diesel fuel nine-fold, natural gas five-fold, water and electricity nearly three-fold, and kerosene two-fold; the price of bread was also increased. The government transferred US\$80 a month to each *individual* (not household) (Amuzegar 2011). Unconditional cash transfers, as those implemented in Indonesia and the Islamic Republic of Iran, do not specifically target purchase of energy, even if the rationale for introducing them was to compensate for higher energy prices, and hence they are not considered energy subsidies as defined in ESRAF. Unconditional cash transfers are treated in detail in Good Practice Note 5 on social safety nets.

Contingent liabilities arising from implicit government guarantees can be calculated as quasi-fiscal deficits (see a detailed discussion on quasi-fiscal deficits starting on page 35). Calculation of costs of efficient operations to arrive at quasi-fiscal deficits at benchmark performance is likely to require a combination of costs from comparable markets with efficient operation and location-specific cost estimation. Efficient comparators may be difficult to find, however, because efficient, low-cost markets tend to be in countries with more developed infrastructure and economies of scale. Isolating net-of-tax costs

in examination of fuel subsidies for proper comparison also presents a challenge.

Quantification of subsidies provided by concessional loans entails identifying market terms and rates for an enterprise of similar risk. Such terms may not exist if, for example, the SOE is perceived to be sufficiently risky

that no bank would provide a loan without an implicit government guarantee. It would also be difficult to quantify the SOE's ease of access to state-owned banks. These are likely to be quantified primarily when banks are burdened with non-performing loans, threatening the banks' viability.

6. CONSIDERATIONS FOR SUBSIDY POLICY REFORM

This note has described various ways in which subsidies may be delivered as well as diverted from the intended beneficiaries, and reimbursed (or not) to subsidy providers. Being aware of different possibilities for these mechanisms is critically important in assessing energy subsidies and developing a subsidy reform policy. In the extreme, policy makers may not even be aware that subsidies are being provided—for example, a national oil company without audited financial statements may simply deduct what it considers to be its subsidy burden from the dividends due to the national treasury, escaping attention and scrutiny.

Given the diversity of situations in which subsidies can arise, it would be useful to ask

a series of questions that can help diagnose subsidies, determinants of their effectiveness, and factors contributing to their retention, so as to help design sustainable reform measures. Based on international experience, table 4 (for fuel subsidies) and table 5 (for electricity) suggest a sequence of questions, akin to a check list, that policy makers and analysts examining subsidies can go through to ensure that key issues to consider have not been left out in developing a subsidy reform policy. The tables also refer to other ESRAF notes where more detailed discussion can be found. All the questions are also relevant in considering the political economy of subsidy reforms, which is the subject of Good Practice Note 9.



TABLE 4: Considerations for Fuel Subsidy Policy Reform

Consideration	Specific issues
Starting conditions in the fuel sector	
Gap between current price and market-based price levels	Is the gap becoming an important fiscal concern? If the gap is large, what time period for bridging the gap is likely to find public acceptance, and how large a price increase could be taken at a time? Is there an appetite for making a small, fixed increase every month (or any other short time interval) until the gap is substantially narrowed or eliminated? If the gap is relatively small, how soon could a formula-based market pricing mechanism be adopted or resumed?
How prices are set and who sets them	Price levels or price ceilings? At retail, wholesale, refinery gate, import terminal, wellhead or mine mouth, or elsewhere? Pan-territorial pricing or geographical variation? Is there a formula for setting prices? Is the formula being followed, or has it been suspended in practice? Is there an agency in charge of setting prices, is the decision to change prices a cabinet decision, is it subject to parliamentary approval, or is it made by different political groups depending on the state of politics at the time? Are price increases subject to approval by different levels of the government depending on the magnitude of the price increase (for example, by the ministry in charge up to 10 percent, and by the prime minister above 10 percent)?
Who determines under-recoveries, who pays for them, and how	Is the size of under-recoveries based on self-reporting of costs by fuel suppliers, a combination of international benchmarks with self-reported local cost elements, or benchmark costs only? If only benchmark costs, was there adequate consultation with fuel suppliers to obtain their buy-in to a reasonable extent? Does the government reimburse fuel suppliers fully or partially, and in a timely manner or often with long delays? Is the fuel supply infrastructure languishing for lack of investment because of price controls? Are reimbursements for under-recoveries channeled through state-owned fuel suppliers? Is the government's share of subsidies clearly shown in the budget, or are there off-budget transfers of funds, obscuring the magnitude of the subsidies? Are tax expenditures used to cover under-recoveries? Are there caps on returns on SOEs' investments to keep prices low? Are oil and gas exports used to cross-subsidize downstream subsidies?
Tax expenditures and other forgone government revenues (Good Practice Note 2)	How widespread is the use of tax expenditures to provide producer or consumer support? How frequently are they quantified, re-assessed, and subject to scrutiny as part of the budget preparation? A complex web of tax expenditures obscures transparency and makes it difficult to monitor and track them. Are state-owned fuel suppliers subsidizing prices, and then deducting the subsidies from dividends due to the government? This makes for even more opaque subsidy delivery, because subsidies are internally managed by SOEs.
Competition in the market	How concentrated is the market at various points along the supply chain? Are there regional monopolies, even if there is an appearance of there being a sufficient number of suppliers? Does a national oil company or any other state-owned fuel supplier dominate the market? Are inefficient refineries, state-owned oil companies, or state-owned coal suppliers protected by trade restrictions, subsidy delivery mechanisms, or other means? Is hospitality or third-party access encouraged to facilitate new entry, avoid duplication of infrastructure, and reduce costs?
Subsidies in place	Are these universal or targeted subsidies? Who is targeted and how? Are subsidized fuels rationed, and if so, how? Do some firms receive subsidies and not others?
Subsidies vs. government revenue from upstream oil and gas	If the country is a major oil or gas exporter, what is the relative size of subsidies compared with government revenue from upstream oil and gas? In times of collapsing world oil prices, as in 2015 and 2016, the loss of government revenue from oil and gas could far exceed any potential savings from subsidy reduction or even elimination, leaving little "savings" to redirect to essential social services for compensation, limiting what the government can offer in return.

Consideration	Specific issues
Who uses which fuel and for what purpose	Is there widespread use of gasoline or diesel for standby electricity generation? If so, higher fuel prices could threaten electricity supply. Is gasoline used primarily by the better-off, or is there widespread use of gasoline in motorbikes by small businesses and lower-middle class families, making gasoline a fuel of the lesser-off as well as the rich? Is kerosene or LPG widely used for cooking? There is more resistance to raising cooking fuel prices that affect a majority of households. Is there widespread use of kerosene for lighting? If so, pro-poor arguments could be used to argue against raising kerosene prices without compensation.
Commercial malpractice	Are there flourishing black markets? Are actual prices paid by consumers markedly higher than official prices due to fuel shortages? If so, raising official prices would have much less adverse impact. Is short-selling (selling less than the stated quantity) routine? Where short-selling is rampant, enforcing rules against it would lower the effective price increases when official prices are raised. Is fuel smuggling widespread? Is there diversion of subsidized fuels to consumers who are not eligible? Is there adulteration of higher-priced fuels with subsidized fuels?
Perception of the fuel sector	Is it considered opaque, corrupt, politically well-connected, or a state within a state (an issue primarily with national oil companies)? Are there scandals to do with large leakages in subsidy delivery? Raising prices could be difficult if the public is angry about corruption. On the other hand, it might be possible to persuade the public that higher prices get to the source of the corruption and help stamp it out. If the state is a large oil producer, is the country a member of the Extractive Industries Transparency Initiative (EITI; for more information, see eiti.org)?
Social protection (Good Practice Note 5)	
Safety nets	Is there an up-to-date database of beneficiaries? Is there an administrative system in place to deliver benefits? Does the government have a national identity and smart card system for cash transfer to the needy? Does the government have safety nets that can be scaled up in terms of benefits, coverage, or both, to compensate the vulnerable for higher fuel prices in a way that would be consistent with medium- and long-term goals for social protection? Or will deployment of sound social safety nets require considerable preparatory work and development?
Delivery of essential social services	What is the state of primary education, primary health, access to safe water, access to sanitation, pension, unemployment benefits, and other social services? Is the track record of delivery such that the public would consider credible the government's promises of putting the savings from subsidy reduction to better uses?
Reform steps	
Sector structure and regulation	Is the market sufficiently large, capable of becoming competitive over time, making price deregulation a realistic goal? If the market is concentrated, what are the physical assets that protect the market power of the incumbents—import terminals, refineries, depots, or pipelines? How can their market power be broken? Are there laws or regulations on supply that need to be amended? Do regulations and standards reflect current international good practice, or do they need to be updated? Is there monitoring and enforcement, and if so, how can they be strengthened? How is commercial malpractice tackled and is there a plan to reduce it further?
Who will set prices and how	Will there be an independent regulatory agency in charge of setting prices? Are there laws or regulations on pricing that need to be amended? If there are large price subsidies, what transition steps are needed before an automatic, formula-based pricing mechanism can be adopted or prices deregulated?



Consideration	Specific issues
Parliamentary scrutiny	<p>Is information on tax expenditures made available and debated on a regular basis? Aside from budgetary transfers, how aware are members of the parliament about off-budget transfers, implicit government guarantees, and contingent liabilities (Good Practice Note 2)? If such information is not readily available, a team may have to be set up to gather the information so that the parliament has a good understanding of the scale and nature of fuel subsidies.</p>
Timing	<p>Are there events outside the fuel sector that could affect timing—national elections, natural disasters, food crisis, power crisis, large-scale agricultural crop failure, domestic or international financial crisis, soaring unemployment, or collapsing prices of other commodities, such as coffee or minerals, that the economy depends on? Most of these would call for greater social protection measures in response to fuel price subsidy reforms. Is there a time when fuel consumption is higher—major national holidays, winter in cold-climate areas, summer travel period—that should be avoided for raising official fuel prices?</p>
Beneficiaries, losers, and link to other sectors	<p>Is there a reasonable understanding of effects of subsidy reforms on different segments of society and income groups, including likely effects on inflation and which sectors would be particularly affected (Good Practice Notes 3, 6, and 7)? What are the relative effects of higher food prices, higher transport fares, and higher energy prices on the poor (Good Practice Note 3)? If food prices are more important because of the expenditure patterns of the poor, that would argue even more for moving away from sectoral approaches and combining safety nets for all risks under one umbrella.</p> <p>Are fuel suppliers currently benefiting from producer support (such as tax reduction and deferrals or import restrictions) likely to be able to cope with their elimination, or are they inefficient and not in a position to compete with imports and other (unsubsidized) suppliers? Is there a credible roadmap for helping them to stand on their own? Or should the government help with orderly closure of some fuel supply companies?</p> <p>Does the financial viability of some businesses depend on fuel price subsidies (Good Practice Note 6)? If so, they will lobby to oppose subsidy reforms through industry associations, trade unions, and other groups. Are some of them likely to cease to be viable if subsidies are eliminated, and if so, is there a need for managed closure of these businesses and retraining of staff? Would it be possible to make small, regular, incremental price increases that minimize adverse effects? Would it make sense to provide support for fuel switching or fuel efficiency improvement?</p> <p>Does the electricity sector rely on subsidized diesel, fuel oil, natural gas, or coal? Is underpricing of electricity a problem? Can electricity utilities pass on fuel price increases to consumers, or will the utilities have to bear financial losses until large electricity tariff increases are eventually effected? Are there large payment arrears for fuel purchases? If fuel price increases will significantly increase electricity supply costs, affect the financial viability of electricity utilities, or do both, careful consideration needs to be given to coordination between the fuel and electricity sectors, and to the political economy of electricity tariff reforms. Otherwise, fuel pricing reform may merely serve to aggravate poor payment discipline in the power sector.</p> <p>For regulated transport fares (taxis, buses, some freight rates), do the authorities tend to freeze them for a long period at a time, raising them only when fuel prices are raised? If so, the public may have come to equate transport fare hikes with fuel price hikes. Such a perception grossly exaggerates the effect of fuel price increases on transport fares and gives fuel pricing reform a bad name. Transport and fuel sector policies need to be better coordinated.</p> <p>Are there powerful groups benefiting from subsidies that can exercise their influence to block subsidy reforms? A powerful national oil company that is a state within a state could be one such example. Are some groups benefiting illegally from subsidies by engaging in smuggling, black marketing, diversion, and fuel adulteration? Do they include high-level government officials and high-level oil-company officers? If so, building a broad-based coalition of supporters for price reforms would be all the more important (Good Practice Note 9).</p>

Consideration	Specific issues
Immediate, tangible benefits	Would it be possible to deliver immediate benefits of the subsidy reform? In the oil sector, such benefits could be no more queues, much less fuel adulteration, much lower or elimination of black market prices, and a crackdown on short-selling. For natural gas and coal, elimination of fuel shortages would similarly be a possible benefit, although it would be difficult to increase the supply of natural gas over the short run because ramping up production or imports takes much longer than for liquid fuels. Outside the fuel sector, are there existing administrative systems in place that can deliver compensation immediately and is visible to the public? If not, is there something that could be set up quickly, and could the start of any large price adjustments be postponed until that setup is nearly, if not fully, operational (Good Practice Note 5)?
Longer-term assistance	Aside from initial compensation to help consumers adjust to higher prices, is there a need for longer-term compensation or assistance, such as an energy efficiency improvement fund or tax expenditures for acquisition of more efficient equipment and appliances to reduce fuel consumption, increases in food assistance, and long-term cash compensation to the poor? Similarly, if producer support is being withdrawn, what assistance is appropriate and realistic?
Communication (Good Practice Note 10)	
About the current state	Is the public aware of the size of subsidies, who is benefiting, the distortions caused by the subsidies, their opportunity costs, and the scale of corruption spawned by the subsidies? Is information on current and past subsidies accessible to the public? Is there a national dialogue on the pros and cons of the current subsidy policy?
About future options and plan	Are options or a proposal for subsidy reform being communicated effectively and accurately? Or are rumors causing panic buying and hoarding? Is there a mechanism to consult different stakeholders and include them in deliberation and decision-making to the extent possible? Is communication about compensation plans undertaken far in advance of the implementation of the subsidy reform, so that the public is well prepared?
Means of communication	Are all forms of communication being exploited? Is consideration being given to a Web-based national conversation, giving many people an opportunity to be heard? Are all segments of society being reached, including those without access to the internet or TV? Is electronic communication being complemented by face-to-face stakeholder meetings?
Communication about the fuel sector	Is there a plan to make price, production, and consumption information available regularly and in a timely manner so that consumers and potential investors can take informed decisions? As competition begins to emerge, could the government make price information readily available to further promote price competition? The government of Chile requires that all fuel marketers post all prices at all times on the Web and make them readily available on smart phones. Is there a mechanism for registering complaints? Are companies found in violation of rules named with specific charges outlined? Are all regulations and rules, announcements about pricing policy, calculations of controlled prices, the magnitude of the remaining subsidies and how they are channeled, and any other information related to prices consolidated in one place so that they can be easily found? Where tax expenditures are large and being reduced, is the public being informed about the loss of fiscal revenue? Is information provided in plain language and comprehensible to many, if not most, people in the country?



TABLE 5: Considerations for Power Subsidy Policy Reform

Consideration	Specific issues
Starting conditions in the power sector	
Cost recovery	Does cash collected cover all costs? If not, which level of cost recovery in table 3 does the sector achieve? Is there a reasonable understanding of the relative importance of the contributing factors (for example, using hidden-cost analysis)?
Quality of service	Is electricity reliable, or are blackouts and brownouts frequent, forcing those who can afford it to resort to private electricity generation? Is there an accessible mechanism for reporting outages and other complaints? Are utilities responsive to complaints?
How tariffs are set and who approves	Are relative tariffs by consumer category broadly in line with costs of service, or are some categories clearly cross-subsidized? Are tariffs too low for cost recovery across the board (generation, transmission, and distribution), or is generation more deregulated than transmission and distribution? Is there geographical variation or is there nationally uniform pricing? What are allowed losses for tariff-setting? Are there caps on SOEs' return on investment or equity to keep prices low? Is there an automatic mechanism for passing through higher input costs due to currency depreciation or higher fuel prices? Is automatic pass-through implemented as stated? How frequently are tariffs reviewed? Are the reviews transparent, with sufficient public disclosure? Are tariff increases subject to approval by different levels of government depending on the magnitude (for example, by the regulator for up to 5 percent, the power ministry between 5 and 10 percent, the cabinet between 10 and 15 percent, and the prime minister above 15 percent)?
Who determines under-recoveries, who pays for them, and how	Are the rules for calculating reimbursements for under-recoveries clear? Does the government make payments fully or partially, and in a timely manner or often with long delays? Is the power supply infrastructure languishing for lack of investment because of cost under-recovery? Are the reimbursements by the government clearly shown in the budget, or are there off-budget transfers of funds, obscuring the magnitude of the subsidies? Are tax expenditures or power exports used to cover under-recoveries?
Tax expenditures (Good Practice Note 2)	How widespread is the use of tax expenditures to provide producer or consumer support? How frequently are they quantified, re-assessed, and subject to scrutiny as part of the budget preparation? A complex web of tax expenditures obscures transparency and makes it difficult to monitor and track them.
What consumers pay for	Are consumers charged for electricity individually consumed, or is consumption estimated? In some countries consumers are charged based on estimated consumption. Where there are daily blackouts, estimated consumption could routinely exceed actual consumption. Where every consumer is charged the same fee, some may be consuming large quantities for almost nothing. Where there are lifeline rates and several poor households share a single meter, they appear to the utility as one rich family and cannot take advantage of low rates set for the poor. Are there many electricity customers benefitting from underbilling, tolerance of nonpayment, or both?
Perception of the power sector	Is it considered opaque, corrupt, or incompetent? Raising tariffs could be difficult if the public is angry about corruption or does not believe that service quality could improve measurably on account of incompetence.

Consideration	Specific issues
Social protection (Good Practice Note 5)	
Cross-subsidies or generalized safety nets	Would it make sense to rely primarily on cross-subsidies to help the poor use electricity (such as lifeline rates) for the foreseeable future? If so, are poor households individually, accurately, and regularly metered? Will there be sufficient revenue from medium and large consumers to cross-subsidize the potential pool of poor consumers? If social protection is well developed and the decision is to help the poor through safety nets, is there an up-to-date database of beneficiaries? Is there an administrative system in place to deliver benefits? Does the government have safety nets that can be scaled up in terms of benefits, coverage, or both, to compensate the vulnerable for higher electricity prices in a way that would be consistent with medium- and long-term goals for social protection?
Delivery of essential social services	What is the state of primary education, primary health, access to safe water, access to sanitation, pension, unemployment benefits, and other social services? Is the track record of delivery such that the public would consider credible the government's promises of putting the savings from subsidy reduction to better uses?
Reform steps	
Sector structure and regulation	Is the sector partially deregulated, does the deregulated power market account for a sizable portion of total consumption, and are regulated customers heavily subsidized? If so, tariffs for regulated customers may have to rise appreciably before reaching cost recovery.
Who will set prices and how	Will there be an independent regulatory agency in charge of setting prices? Are there laws or regulations on tariff-setting that need to be amended? If there are large price subsidies, what transition steps are needed before reaching cost recovery? If approval for tariff increases currently depends on different levels of government depending on the size of the increase, would it make sense to change the approval process to depoliticize tariff adjustment more?
Parliamentary scrutiny	Is information on tax expenditures made available and debated on a regular basis? Aside from budgetary transfers, how aware are members of the parliament about off-budget transfers, implicit government guarantees, and contingent liabilities (Good Practice Note 2)? If such information is not readily available, a team may have to be set up to gather the information so that the parliament has a good understanding of the scale and nature of electricity subsidies.
Timing	Are there events outside the power sector that could affect timing—national elections, natural disasters, food crisis, fuel crisis, large-scale agricultural crop failure, domestic or international financial crisis, soaring unemployment, or collapsing prices of other commodities, such as coffee or minerals, that the economy depends on? Most of these would call for greater social protection measures in response to power tariff reforms. Is there a time when electricity consumption is higher—heating in winter in cold-climate countries and air conditioning in summer in warm-climate countries—that should be avoided for raising tariffs, if possible?



Consideration	Specific issues
Beneficiaries, losers, and link to other sectors	<p>Is there a reasonable understanding of effects of subsidy reforms on different segments of society and income groups, including likely effects on inflation and which sectors would be particularly affected (Good Practice Notes 3, 6, and 7)?</p> <p>Does the financial viability of some businesses depend on power tariff subsidies (Good Practice Note 6)? If so, they will lobby to oppose subsidy reforms through industry associations, trade unions, and other groups. Are some of them likely to cease to be viable if subsidies are eliminated, and if so, is there a need for managed closure of these businesses and retraining of staff? Would it be possible to make small, regular, incremental tariff increases that minimize adverse effects? Would it make sense to provide support for energy efficiency improvement?</p> <p>Alternatively, if there is a realistic possibility of markedly improving service reliability as a result of subsidy reform, what will be the magnitude of net savings for those currently using private diesel generation?</p> <p>Are there consumers who are benefitting from the corruption and inefficiency in the sector, such as large industrial consumers colluding with utility employees to engineer underbilling, free riders taking advantage of deficiencies in metering, and consumers with large payment arrears that they have no intention of paying? All of them will lose from more accurate metering and billing, and improvement in bill collection efficiency. If poor households who are currently connected to a neighbor's meter can be given individual meters or pre-paid meters, they may end up paying less than at present.</p>
Immediate, tangible benefits	<p>Would it be possible to deliver immediate benefits of the subsidy reform? In anticipation of higher revenue, utilities may spend money to set up call centers and respond to reports of power outages, reducing the duration of each outage. Outside the power sector, are there existing administrative systems in place that can deliver increased social services immediately in a way that is visible to the public (Good Practice Note 5)?</p>
Longer-term assistance	<p>Could affected consumers benefit from longer-term compensation or assistance, such as an energy efficiency improvement fund or tax expenditures for acquisition of more efficient equipment and appliances to reduce electricity consumption, and could such assistance be offered cost-effectively?</p>
Communication (Good Practice Note 10)	
About the current state	<p>Is the public aware of the size of subsidies, who is benefiting, the distortions caused by the subsidies, and their opportunity costs? Is information on current and past subsidies accessible to the public? Is there a national dialogue on the pros and cons of the current subsidy policy? Where tax expenditures are large and being reduced, is the public being informed about the loss of fiscal revenue? Is information about service quality being provided and updated regularly? Is information provided in plain language and comprehensible to many, if not most, people in the country?</p>
About future options or plan	<p>Are options or a proposal for subsidy reform being communicated effectively and accurately? Are programs that will benefit consumers—especially for improving service reliability and customer service in general—being communicated? Is there a mechanism to consult different stakeholders and include them in deliberation and decision-making to the extent possible? If compensation is to be offered for higher electricity tariffs, is communication about such plans undertaken far in advance of the implementation of the subsidy reform?</p>
Means of communication	<p>Is information about the power sector accessible to the public, including tariff schedules, conclusions of tariff reviews, and grievance redress mechanisms? Are all forms of communication being exploited? Is consideration being given to a Web-based national conversation, giving many people an opportunity to be heard? Are all segments of society being reached, including those without access to the internet? Is electronic communication being complemented by face-to-face stakeholder meetings?</p>

ANNEX: EXAMPLES DATA SOURCES AND EASE OF EVALUATION

This annex provides additional details on table 2. Effects A, B, and C listed in the third column are those found in the definition of an energy subsidy:

- A** | Reducing the net cost of energy purchased.
- B** | Reducing the cost of production or delivery of fuels, electricity, or heat.
- C** | Increasing revenues retained by resource owners, or suppliers of fuel, electricity, or heat.

The table starts with potential concerns that are applicable to all forms of energy, followed by sector-specific concerns.

Sector	Potential subsidy	Nature of subsidy and subsidy delivery mechanism (effect A, B, or C)	Common data sources and ease of data acquisition	Ease of evaluation if data are available
All sectors				
	Budgetary and off-budget transfers to producers or consumers	1. Transfers of government funds to compensate producers for price controls that keep prices below cost-recovery or trade-parity levels (A), or for producer's inefficiencies (C). Examples include transfers to an oil price fund to keep end-user prices low (A), to a rural electrification fund (A), to utilities to upgrade transmission and distribution lines to reduce technical losses (B, C), to refineries for modernization to produce cleaner fuels (B), and to any energy company to install new capacity (B).	For budgetary transfers, budget as executed, and in its absence, budget as presented; company financial statements; EITI audit reports for upstream production. Off-budget transfers are generally difficult to obtain. The level of disaggregation in the government budget may not be sufficient. Publicly traded companies are more likely to have detailed financial statements, but if numerous companies are involved, such as in the downstream petroleum sector, it may become difficult to keep track. Although not covered in this version of Good Practice Note 1, district heating is often subsidized by municipalities, making data collection across the country challenging.	For SOEs not operating on commercial principles (for example, an SOE that is not allowed to retain earnings and is funded through the budget), separation of transfers for legitimate business expenditures from support over and above them can be difficult.

Sector	Potential subsidy	Nature of subsidy and subsidy delivery mechanism (effect A, B, or C)	Common data sources and ease of data acquisition	Ease of evaluation if data are available
		<p>2. Transfers of government funds to enable consumers to purchase specific energy items where the compensation cannot be used for other purposes. Heating degree-days, the energy share of expenditures exceeding a threshold level, and energy price levels (possibly combined with monthly consumption) are examples of parameters determining the level of compensation.</p>	<p>For budgetary transfers, budget as executed, and in its absence, budget as presented. Ministry Web sites and press releases. Off-budget transfers to consumers would be rare.</p>	<p>If data are available and disaggregated sufficiently, evaluation is straightforward.</p>
		<p>3. Applied research and development benefiting largely energy suppliers (B).</p>	<p>Government sources, but level of disaggregation may not be sufficient except for very large grants (such as for demonstration projects for carbon capture and sequestration).</p>	<p>Research grant amounts may be easy but financial benefits would be difficult to quantify.</p>
Forgone government revenue		<p>4. Reduction of taxes paid. Examples include exemptions or reductions from taxes normally applied, such as VAT (A), tax holidays for corporate income tax (C), land tax (C), and tax credits (C); special rules to accelerate or increase deductions from taxable income (C); and access to special tax-favored corporate forms (C).</p>	<p>Finance ministry; ministry or regulator in charge of the sector; laws, decrees, regulations, notices, circulars; EITI audits for upstream oil, gas, and coal. Costs and revenue data, and all tax terms with and without tax concessions, may be needed. Tax concessions often target specific investments without public disclosure in developing countries. Sub-national tax expenditures are particularly challenging to collect. Where taxes are frequently adjusted, it may be difficult to ensure the accuracy of time-series data.</p>	<p>A good fiscal specialist should be able to compute the loss of government revenue. A significant challenge that requires analyst judgment is the definition of the reference tax structure, which depends on the reference time period and other factors (such as estimation of costs). Tax expenditure estimation can vary, depending on how the reference tax structure is selected.</p>
	<p>5. Lower government revenue due to state-owned energy suppliers deducting the subsidy burden from dividends to be transferred to the government (A, C).</p>		<p>Financial statements of state-owned energy suppliers. Many state-owned energy suppliers do not have adequately audited financial statements, disclosure of financial statements may be years behind in schedule, and the level of detail provided may not allow identification of withholdings for subsidies.</p>	<p>If the amount withheld is a separate line item, the subsidy can be easily calculated.</p>

Sector	Potential subsidy	Nature of subsidy and subsidy delivery mechanism (effect A, B, or C)	Common data sources and ease of data acquisition	Ease of evaluation if data are available
	Shifting of risk burdens	<p>6. Limits on commercial liability and ability of injured parties to sue energy suppliers for compensation (B, C).</p> <p>7. Government assumption of risks and damages, including assumption of legacy or current health, safety, and environment problems in violation of regulations and standards, such as environmental damage associated with field abandonment, oil spills, and mine closure (B). Other examples include severance package for employees for mine closure (B), oil price hedging for refineries (B), and insurance against price surges (A).</p> <p>8. Soft budget constraints for companies with partial or full state ownership, leading to contingent liabilities for government (C).</p> <p>9. Debt cancellations and clearance of arrears, typically for SOEs (C) but can also be for consumers (A), especially if consumers are themselves SOEs or government agencies.</p> <p>10. Subsidized water, fuel (crude oil for refineries, fuels for power or heat producers), electricity (for energy suppliers other than power), heat (for energy suppliers other than heat), rail freight transport of coal and oil, trucking of refined products (B).</p>	<p>Government sources for statutory limits. Damage costs covered by government or citizens would require compilation of all such cases, which would be difficult. Information on the ability to sue may be difficult to obtain.</p> <p>Government sources. For large remediation projects, the total cost may not become known for a long time, making data collection difficult.</p> <p>Government sources and SOE financial statements.</p> <p>Government sources; company financial statements.</p> <p>Various government ministries and agencies. If the sectors involved are opaque, it may be difficult to obtain data on subsidized crude oil sold to a state-owned refinery, subsidized fuels sold to state-owned utilities (power, heat), or subsidized rail freight fares offered by a state-owned rail company to a state-owned coal company.</p>	<p>Quantifying the ability to sue would be difficult. Value of liability caps can be estimated by extrapolating from required coverage or comparable liabilities in related sectors.</p> <p>If data are available and disaggregated sufficiently, evaluation is straightforward.</p> <p>Difficult to quantify across each sub-sector, and virtually impossible where the eventual effect is to increase the sovereign borrowing rate on account of contingent liabilities lowering the government's credit rating.</p> <p>Relatively straightforward.</p> <p>Difficult to keep track of various sources of subsidized inputs. Quantification may require calculating subsidies in other sectors, such as water and transport.</p>

Sector	Potential subsidy	Nature of subsidy and subsidy delivery mechanism (effect A, B, or C)	Common data sources and ease of data acquisition	Ease of evaluation if data are available
		<p>11. Underpricing of goods and services provided by government, such as access to land (B).</p> <p>12. Subsidized loans, guarantees, and other forms of concessional financing or financing support for exploration, development, production, transport, delivery, or export. Examples include support for rural electrification, development of unconventional oil and gas, and establishment of filling stations for rural consumers or for compressed natural gas⁷ (B).</p> <p>13. Underpricing of permits, such as allowances for carbon dioxide or sulfur dioxide emissions in a market with emissions trading and license to operate (B).</p> <p>14. Maintenance of low domestic end-user prices by export restrictions on crude oil, refined products, natural gas, or coal (export ban, export quota, domestic supply obligation, high export tariffs) (A); or of high prices paid to producers enabled by import restrictions (import ban, import quota, high import tariffs) (C).</p>	<p>Various government ministries and agencies. Data difficult to obtain, although a review of leasing or sale procedures may highlight whether subsidies are likely to exist.</p> <p>Government sources. Total amounts may be available, but disaggregation by sector or sub-sector is not common, making data collection difficult.</p> <p>Ministry or regulator in charge of the permits and licenses.</p> <p>Ministry of trade, finance ministry, or ministry or regulator in charge; press releases and announcements. Data are generally available, but there may be a long time lag for data on quantities sold.</p>	<p>May be difficult to quantify market values of some items, such as land.</p> <p>Subsidized interest rates and loan terms can be quantified, although assumptions must be made about risk-adjusted market rates for the companies involved. Challenges to quantifying loan guarantees are similar.</p> <p>Relatively straightforward at the market price of the permit; but calculating what the price might have been is not straightforward for emissions trading.</p> <p>Note that high tariffs represent additional government revenue, not government spending. Estimating the counterfactual may not be straightforward, especially for fuels sold on long-term contracts.</p>
Upstream oil, gas, and coal				
	Licensing and contract award	15. Overly generous fiscal and other terms offered in contract award (C).	Typically no data except where information is leaked to the media or there is some type of a commission of inquiry.	Difficult except where market-tested analogous situations exist, but even so consideration of the impact of geopolitical and other risks unique to the country makes quantification challenging.

Sector	Potential subsidy	Nature of subsidy and subsidy delivery mechanism (effect A, B, or C)	Common data sources and ease of data acquisition	Ease of evaluation if data are available
	Non-tax fiscal concessions	<p>16. Concessions on non-tax fiscal terms, such as production share in production sharing contracts, royalties, and bonuses (C).</p> <p>Note: Royalties and bonuses are not taxes.</p>	<p>Finance ministry; ministry or regulator in charge of the sector; EITI audit reports. These concessions tend to be investment-specific and often not disclosed. Sub-national fiscal concessions are particularly challenging.</p>	<p>If royalties and bonuses depend only on gross revenues, production, physical characteristics of fields (such as water depth), or some combination of these, they are relatively easy to calculate.</p>
	Price controls and support	<p>17. Government control of crude oil, gas, or coal prices on the domestic market at levels lower than trade parity (A).</p>	<p>Finance ministry; ministry or regulator in charge of the sector; government announcements; company financial statements. Data on controlled prices are generally available. Trade parity prices are difficult to obtain for gas and coal purchased on long-term contracts. Data on quantities involved may become available with a time lag, which can be long. Obtaining information on dates of bills of lading and exchange rates realized presents additional challenges.</p>	<p>Once controlled and trade-parity prices and quantities are known, subsidies are easy to calculate.</p>
		<p>18. Cross-subsidization of domestic downstream end-user prices using upstream oil and gas earnings, often from exports⁸ (A).</p>	<p>Government sources for end-user prices, and company financial statements for cross-subsidies. Level of disaggregation may not be sufficient to enable estimation.</p>	<p>Benchmark market prices of downstream prices, which are always location- and time-specific, will need to be calculated.</p>
		<p>19. Price support for producers, such as for unconventional gas in a sector with regulated gas prices (for example, where the price of conventional natural gas is low, and government sets a higher price for unconventional gas) (C).</p>	<p>Ministry or regulator in charge of the sector. Usually information available.</p>	<p>Quantification is straightforward.</p>
	Supply mandate	<p>20. Mandate to supply a fuel, setting both prices and quantities. The price is typically at a lower price than in the absence of the mandate.</p>	<p>Ministry or regulator in charge of price and quantity regulation. The price in the absence of the mandate may not be obvious in the absence of international trade.</p>	<p>Calculation is straightforward if prices and quantities are known.</p>

Sector	Potential subsidy	Nature of subsidy and subsidy delivery mechanism (effect A, B, or C)	Common data sources and ease of data acquisition	Ease of evaluation if data are available
Midstream oil, gas, and coal				
	Pricing policy	21. Regulated transport and storage fees that do not allow for reasonable earnings (A).	Fees from asset owners or operators; ministry or regulator in charge. Fees at long-run cost recovery in a sector with growing demand require data to estimate the cost of capacity expansion.	Calculation of long-run cost recovery is likely to require dedicated studies.
		22. Government policy, explicit or implicit, of keeping ex-refinery prices low in part through financial losses that are not covered by budgetary transfers (A).	Finance ministry; ministry or regulator in charge; cabinet decision; company financial statements. If the price control is at the ex-refinery level, data may be more difficult to obtain than at ex-retail. In addition to ex-refinery price levels, the cost of transport to or from ports is needed to derive reference prices from international benchmark prices.	It may be difficult to distinguish between losses from normal business cycles—refining losses are common even in completely deregulated markets—and producers' lack of competitiveness on the one hand and losses due to prices that are set artificially low on the other.
	Purchase mandate	23. Mandate imposed on oil marketing and other companies to purchase certain quantities from domestic refineries (C).	Ministry or regulator in charge. Financial statements and annual reports of companies involved. The text on the mandate is generally available.	Quantification is straightforward if alternative free-market sources also exist.
		24. Mandate on power companies and others to purchase domestic coal and refined products, especially if both sellers and buyers are state-owned (C).	Ministry or regulator in charge. Financial statements and annual reports of companies involved. The text on the mandate is generally available.	Quantification is straightforward if alternative free-market sources also exist.
Downstream oil, gas, and coal				
	Pricing policy	25. Price controls at wholesale or retail to keep end-user prices lower than in a competitive market, with losses not covered by government compensation to oil or coal marketers. Variations in government control of prices include cross-subsidies across fuels (such as gasoline sales cross-subsidizing kerosene sales), and differentiating prices for the same product by consumer category or geographical locations (A).	Finance ministry, or ministry or regulator in charge of controlling price levels. The counterfactual requires largest data collection at the end of the supply chain because of all the costs incurred in the different stages in the chain. Data on transportation and storage may be difficult to obtain.	Because of the large number of suppliers involved, assumptions will have to be made to arrive at reference retail prices. This may not be straightforward where costs vary significantly from location to location.

Sector	Potential subsidy	Nature of subsidy and subsidy delivery mechanism (effect A, B, or C)	Common data sources and ease of data acquisition	Ease of evaluation if data are available
Downstream oil, gas, and coal				
	Access	26. Priority access to the grid, equivalent to a purchase mandate, such as electricity from certain plants to help with their capital cost recovery rather than dispatch based on merit order (C).	Ministry or regulator in charge, and utilities. “Must-run” power plants are usually renewable or nuclear energy but fossil fuel plants in financial trouble can be among them.	Estimating the utilization factor in the absence of the mandate may require some work.
	Tariff structure and connection charges	27. Tariffs and other charges below cost recovery (A).	Government policies and regulations; ministry or regulator in charge of tariffs and other charges; utilities; cost-of-service and financial viability studies. Tariffs for residential and other small to medium-size consumers are usually available, but connection charges and tariffs for larger consumers are often bilaterally negotiated and not publicly available. Long-run recovery costs in an expanding market need data on expansion costs, which requires a study.	Dedicated studies likely required.
	28. Cross-subsidies across consumer categories and geographical regions ⁹ (A).		Government policies and regulations; ministry or regulator in charge; utilities; specialized commissioned studies. Tariffs are easy to obtain for residential consumers, but for larger consumers they are often bilaterally negotiated and undisclosed.	Dedicated studies required.

ENDNOTES

- 1 It is important to note that not all forms of support studied by the OECD are subsidies as defined in this note.
- 2 For example, see NEITI (2013, p. 100) for a discussion of the Pioneer Status granted to a dozen oil and gas companies.
- 3 An example of a detailed formula with examples can be found on the website of the South African Department of Energy (www.energy.gov.za/files/petroleum_frame.html). Working rules can be found at www.energy.gov.za/files/esources/pdfs/energy/liquidfuels/annexure_A_05.pdf.
- 4 A short introduction to refinery economics in two four-page parts can be found at <http://documents.worldbank.org/curated/en/695521468015275586/World-Bank-Cambodia-oil-gas-special-supplement-refining-crude-oil-part-1> and <http://documents.worldbank.org/curated/en/547781468017980604/World-Bank-Cambodia-oil-gas-special-supplement-refining-crude-oil-part-2>.
- 5 The Finnish Electricity Market Act (386/1995) specifies only that distribution pricing be reasonable and that distribution companies operate efficiently.
- 6 Increasing block tariffs apply rising unit prices to incremental consumption, whereas volume-differentiated tariffs apply a single unit price to the entire consumption depending on the volume of consumption. Increasing block tariffs benefit the rich and the poor alike, making the subsidies inefficient. Volume-differentiated tariffs can be punishing for the poor because exceeding the lifeline block size by even 1 kWh would catapult the household into the next block, which could have a much higher unit price.
- 7 The government may decide to subsidize establishment of retail outlets in rural areas that might otherwise not be served, or to kick-start establishment of a network of filling stations for compressed natural gas—which is much more costly than those for liquid fuels—to promote fuel diversification.
- 8 Governments seldom explicitly order upstream companies to subsidize downstream consumers. One exception is India. The presence of upstream operations in the country, however, is an important consideration in the government's decision, formal or otherwise, to set low domestic fuel prices. Further, these low prices may be “voluntary” on paper, as in Argentina and Brazil in the recent past.
- 9 Cross-subsidization is an important component of an electrification program to achieve universal access, one of the three goals of *Sustainable Energy for All*.

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Energy Subsidy Reform Assessment Framework

LIST OF GOOD PRACTICE NOTES

- NOTE 1** Identifying and Quantifying Energy Subsidies
- NOTE 2** Assessing the Fiscal Cost of Subsidies and Fiscal Impact of Reform
- NOTE 3** Analyzing the Incidence of Consumer Price Subsidies and the Impact of Reform on Households – Quantitative Analysis
- NOTE 4** Incidence of Price Subsidies on Households, and Distributional Impact of Reform – Qualitative Methods
- NOTE 5** Assessing the readiness of Social Safety Nets to Mitigate the Impact of Reform
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- NOTE 8** Local Environmental Externalities due to Energy Price Subsidies: A Focus on Air Pollution and Health
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