



Models for engaging the private sector in electricity provision in Yemen

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- The war in Yemen has placed the country's public finances under considerable stress. As a result, a key challenge facing electricity services is that the government and electricity sector authorities have limited resources for investment in improvements to electricity generation, transmission, and distribution.
- The fragile security situation, regulatory uncertainty, lack of payment guarantees, and highly subsidised tariffs currently applied in the Internationally Recognised Controlled (IRG) areas make the private sector reluctant to invest in the distribution sector in Yemen.
- This policy brief and its underlying report explore innovative models for private sector involvement in distribution (PSID) and find that a utility concession could be an effective approach in Yemen and should be piloted in a specific city or region to assess its suitability.
- Piloting a concessions programme in a particular area is recommended in situations with high levels of uncertainty, such as in Yemen, where it is not possible to know in advance precisely what approach or model would be successful. This policy brief provides a short set of criteria for choosing an appropriate area and proposes a framework for initiating the pilot.
- If such a concession is to work, it will require strong political support from the central government, as well as from the political leadership in the pilot area. It will also require a robust and enforceable regulatory framework, a spirit of collaboration, flexibility, and a willingness to experiment.

Overview

A key challenge facing electricity services in Yemen is that the government and the Public Electricity Corporation (PEC) have **limited resources for investment in the rehabilitation and improvements of generation, transmission, and distribution infrastructure**. It is also difficult for the Internationally Recognised Government (IRG) to move towards cost-reflective tariffs in the current economic situation. Consequently, it is important to explore the idea of **encouraging greater engagement of the private sector in the provision of electricity services in particular local areas**. This might enable the government to harness new investment from the private sector in generation, as well as in distribution and service delivery.

The war in Yemen has placed the country's public finances under considerable stress. **Electricity generation and revenues from oil and gas are much lower than before the war, while costs have dramatically escalated**. Consequently, in Yemen, even a sovereign guarantee may not be sufficient to make a power purchasing agreement (PPA) bankable since investors or lenders may lack confidence that the government will have the resources to deliver on the guarantee, if called upon. Therefore, in addition to exploring feasible models for private investment in generation, the focus of this policy brief is to examine mechanisms by which the private sector might engage in the **distribution sector** as well. If a bankable model can be found for involving the private sector in distribution, this would generate its own flow of revenues from electricity sales to customers, obviating the need for a guaranteed source of financing from the government.

This policy brief explores four alternative models for private sector involvement in distribution (PSID) and finds that a **utility concession, piloted in a specific city or region, is likely to be the best approach in Yemen**. If such a concession is to work, it will require **strong political support** from the central government and **political leadership in the pilot location**. It will also require **a robust and enforceable regulatory framework** alongside **collaboration between PEC and the concessionaire, flexibility, and a willingness to experiment**.

Alternative models for PSID

There are a variety of ways in which the private sector can be involved in electricity distribution, and each has its own set of advantages and disadvantages. The success or failure of these models is largely driven by the context in which they are implemented, as well as the motivation of the key actors involved. Four alternative models for PSID are briefly discussed below.

Management contract

This is an arrangement where **a private company is invited by the government to run a utility in return for a fee**. Typically, a management contract lasts for several years (often five, but it can be shorter or longer) and performance is assessed based on a set of Key Performance Indicators (KPIs) agreed in advance between the concerned institution and the contractor. Usually, the contractor has complete control over the way in which the utility is run, subject to compliance with existing laws and regulations and the terms of the management contract. The contractor may also have the authority to change the size and skillset of the workforce of the utility by **injecting international expertise into the management of the utility**.

Distribution services contract

This is a more limited version of a management contract where the government or a utility gives a **contract to a private company to manage the distribution elements of an electricity service**. Typically, a distribution service provider will be responsible for **billing and collection of revenues**, as well as **routine maintenance of the distribution network and customer service**. In return for providing this service, **they are paid a fee** (sometimes linked to performance). The ownership of the assets remains with the utility and the private contractor does not invest in the network. The revenue that it collects is given to the utility.

This model is currently being employed in Iraq, mainly for bill collection services, where private companies are granted a share of 12.9% of the overall revenue collected.

Distribution concession

This is similar to a distribution services **contract**, but where **the entire distribution service is handed over to a private company**. The concessionaire is responsible for **billing and collection**, but keeps all the revenue raised, giving it a strong financial incentive to improve performance. Moreover, it is typically required to **invest in the distribution network** to meet performance targets for loss reduction and service improvement (although the assets remain under the ownership of the utility). Distribution concessions often purchase their electricity from the utility at a contractually agreed price. The contract or the regulator usually imposes limits on the tariffs which can be charged to consumers, with these limits being designed so that, if the concessionaire meets their targets for billing, collection, and loss reduction, it is able to make a commercial return.

Utility concession

This is the same as a distribution concession, except that **the concessionaire is also allowed to generate electricity**. This is an important distinction because it

means that the concession effectively runs an **integrated utility** in the concession area. Generation is possible from the concessionaire's own generation capacity or through contracting with private providers of electricity to supply the distribution network, which is then sold on to customers. A utility concession also has the advantage that it is possible to **combine two different forms of tariff regulation**. Specifically, when electricity is being sourced from the utility, it can be sold at a low or subsidised tariff specified by the regulator. This model has been used to provide an improved electricity service in some cities in Lebanon, in an environment where the public utility is only capable of supplying a few hours of electricity each day.¹ Utility concessions have also served as the primary driver of electrification in countries such as Cameroon and Uganda, where a key reason for success is due to the utilities having a high-level of political support and commitment.

TABLE 1: Advantages and disadvantages of alternative models for PSID

Model	Advantages	Disadvantages
Management contract	Enables injection of international expertise in the management of the utility	May run into sensitive political challenges, e.g., on tariffs, procurement, and staffing
Distribution services contract	Simple contracting out model and can improve the bill collection rate	Few incentives for good performance, particularly where security is poor
Distribution concession	Strong incentive for concessionaire to improve billing and collection	Concessionaire relies on the utility to provide power needed
Utility concession	Provides strong incentives for improved performance and the autonomy to delivery	Requires long-term contractual commitment and potentially a big change of role for the utility

Key challenges for PSID in Yemen: Stakeholder perspectives

A series of interviews and a short survey of stakeholders (including senior official in government ministries, PEC, private sector actors, financiers, lawyers, etc.) were conducted to gather insight on the suitability of different approaches to PSID in Yemen. The responses from the questionnaire and results from the interviews were analysed to gain a deeper understanding of the knowledge, interest, and concerns of sector actors about the introduction of PSID in Yemen. **Six key challenges were**

¹ Ahmad et al., 2022.

identified from the stakeholder responses and are summarised in Figure 1 below:

FIGURE 1: Key concerns that emerged from stakeholder perspectives



Please refer to the report underlying this policy brief, “*Models for engaging the private sector in electricity provision in Yemen*” for a more a detailed discussion on these stakeholder concerns.

The legal and regulatory environment

The legal environment in Yemen reflects the challenging context that has prevailed in the country, particularly since the start of the war in 2015. In most countries, the legal and regulatory context is of paramount importance because it determines what is and is not possible in a given context. In Yemen’s case, the laws that exist are supportive of private investment, including in the electricity sector. However, the very difficult environment facing the country has meant that **the laws have not yet been implemented.**

This poses a difficult dilemma for the government, which can be tackled in two ways. Firstly, the government can attempt to ensure that existing legislation and decrees (notably, Electricity Law No.1 of 2009 and associated decrees) are implemented and that suitable new legislation is put in place, as is happening with the draft Public-Private Partnerships Law and the draft Renewable Energy Law and can improve the ability of government to enforce the application of laws. Second, the government could attempt to make progress in reforming the electricity sector by using ‘**regulation by contract**’. That is, in addition to attempting to pass new legislation and implement existing laws to provide a general framework, the government could attract investment into the sector more rapidly by **tendering for and then negotiating detailed contracts with key private sector actors to provide electricity distribution services.** The detailed, legally binding undertakings of each party can then be written into the contract. As long as the terms of these contracts are compatible with existing

laws, there is no need to wait for new legislation before progress can be made. Since the process of drafting and passing legislation is lengthy, and the challenges of implementing existing laws have only worsened in the intervening years, the first option is inevitably a slow one. Thus, pursuing the second option might make more sense in the given context.

Design principles for PSID in Yemen

There are numerous factors that need to be considered in order for a model of PSID to work in the Yemeni context. This includes the **rehabilitation of generation and network infrastructure** and the need for a **financially sustainable system**, bearing in mind the key **design principles** identified below.

Rehabilitating generation and network infrastructure

Yemen is suffering from a crisis of electricity supply and the government is right to focus, in the short-term, on **boosting supply within the existing system**. The fastest way of achieving this is through rehabilitation of existing generation and network assets. Numerous donors and foreign governments are keen to explore ways of encouraging private sector investment in new generation infrastructure through a mix of grants, concessional lending, and guarantee instruments.

PEC officials in governorates should be given **greater autonomy to experiment and innovate in their local areas with alternative models of supply** and to identify the most important investments to be made. For example, some areas have weak public generation and a weak distribution performance (e.g., Aden and Hadramout); other areas have good public generation facilities but a weak distribution network (e.g., Marib); other areas have no public generation and a poor distribution network (e.g., Al-Dalea and Taiz); in some areas there is a need to rehabilitate existing, unused power plants (e.g., Ossifera); and in off-grid areas where there is no public infrastructure, mini-grids can be installed to meet local demand. Giving greater authority to local PEC officials allows them to prioritise resources in the most effective manner, while the central government can support by coordinating requests for assistance with donors and other funders.

Developing a financially sustainable system

In addition to seeking immediate support for essential rehabilitation and restoration of electricity supply and network infrastructure, it is important to build a system which will be financially sustainable for the medium- and long-run. Eventually, this must entail a **customer-focused system that delivers a good quality service and, in return, collects sufficient tariff revenue to provide a commercial return on the assets deployed**. However, achieving this is

challenging as raising tariffs is politically contentious and would likely be met by strong opposition from citizens.

Although there is no realistic prospect of moving tariffs to a cost-recovery level in the near future, there is a (partial) solution to this challenge. It is possible to start moving Yemen's electricity system to a more financially sustainable, long-term footing because there are some customers – mostly large businesses and industries – who are currently paying extremely high prices for self-provided diesel power. It is likely that these customers would be willing to pay commercial rates for power, as long as they are lower than the cost of supplying power themselves. Since such customers consume a relatively large amount of electricity (compared to households), it may be possible to design a financially sustainable system that serves these customers, and which uses the surplus from doing so to **cross-subsidise households**. The feasibility of such a model is location specific and dependent on the distribution and type of customers in the service area.

Other design principles for effective PSID in Yemen

For an effective PSID in Yemen, there are four key issues that have a major influence on the design of the system and must be factored into planning:

- **Security** – if security is paramount for the success of PSID, then it is essential that any local reform has the **backing of both the *de facto* and formal authorities** of the area.
- **Regulation** – since changing legislation and regulation is complex and time-consuming, it may be best to consider **regulation by contract**, at least in the first instance.
- **PEC** – the dominant position of PEC and its deep contextual knowledge of the sector means that reforms should be **complementary to the work of the PEC** and should benefit it as an organisation. Reforms which threaten the interests of PEC are unlikely to be successful.
- **Tariff** – commercial viability (and therefore private investment) is only possible if it is possible to **reform tariffs 'at the margin'** i.e., if it is possible to distinguish between customers who are willing to pay a higher tariff for a greatly improved service and charge them differently from other customers.

Models of PSID for Yemen

Taking into account the responses from the interviews and survey, this policy brief identifies three potential avenues for private sector engagement in the distribution sector in a manner that would be both commercially viable and beneficial to the sector as a whole.

Advisory services within PEC and international management contracts

A full management contract is unlikely to be effective in Yemen because such contracts require **external management teams to take over the national utility**. Nevertheless, **PEC could benefit from an injection of external expertise**. The task of rehabilitating generation and the transmission and distribution network is an immense one. A lot of technical expertise is needed to identify the failings of the existing capacity and the least-cost technical solutions and to write the necessary specification for restorative work or for new investments that can be presented to potential funders. Donors are well placed to fund such expertise, which could be drawn from other Arab countries with similar electricity challenges.

Embedding such individuals in an advisory role within PEC could support PEC to implement their own reform plans in a constructive way. For example, donors could support PEC to obtain expertise to deal with the chronic issues that threaten the sector's financial sustainability, especially those relating to bill collection and electricity losses. They could also help to re-establish the expertise that was provided by the central PEC in Sana'a before the war to better manage generation and transmission activities. Such expertise could be hired to work either in the central PEC or in regional PEC branches. In addition to supporting PEC, international expertise is also needed to help formulate electricity sector reforms, including establishing competitive procurement processes (for both traditional and renewable energy projects), better engaging the private sector in electricity sector activities, and improving the financial management and governance of the sector.

Utility concession – the Zahle model

A more ambitious approach would be to **pilot a utility concession in a designated area**. Unlike a distribution concession, a utility concession would enable a private sector company to both generate and distribute electricity within a license area. Several factors need to be considered for this approach to work:

- The area must have **strong demand** with a variety of different types of customers, including major businesses.
- The concession must be allowed to **use the existing PEC infrastructure and be compensated for investments** and improvements which it makes to such infrastructure.
- The concession must be allowed to **invest in generation** (or purchase from other providers). When PEC is not producing power, the concession must be allowed to **provide power from its own generators (or power that it purchases from independent power producers) at a commercial tariff that reflects the cost of supply**.
- The concession should be allowed to **operate as a distribution concession when PEC electricity supply is available (i.e., when there is no load-shedding or blackouts)**.

This model is similar to that deployed in the city of Zahle in Lebanon (see Box 1) and has been shown to be effective in providing electricity to a city in an environment where the ability of the state utility to provide power is limited.²

² Ahmad et al., 2022.

BOX 1 – The Zahle Model³

Zahle is a city of approximately 150,000 inhabitants in the Beqaa region of Lebanon. The local electricity concession for the city and surrounding area, Electricité du Zahle (EDZ), was established in 1923 under the Ottoman era, and provides the concession holder the right to use the transmission and distribution networks on behalf of the national utility, Electricité du Liban (EDL). After the civil war of 1975-1989, EDZ effectively operated as a distribution company for EDL, with virtually no generation of its own. Because of the deteriorating performance of the national utility, a set of private diesel generator owners expanded their own neighbourhood-level networks in the city, reaching 'around 120 generators, operated by 50-60 owners'. This cartel of diesel generator owners earned large profits by imposing high flat tariffs on subscribers for a generally poor quality of service. This situation led the management of EDZ to get involved in power generation. In late 2014, EDZ struck a deal with Aggreko, a UK-based company that specializes in temporary power rentals, to install a diesel-based generation with initial capacity of 35 MW. EDZ leveraged the terms in its concession contract and its historic role in power generation to justify its move. The power plant supplies EDZ with electricity during EDL outages; it is owned and operated by Aggreko with EDZ acting as an 'offtaker' and distributor. By September 2020, the total installed capacity by Aggreko was 59.4 MW. This additional capacity enabled EDZ to provide 24/7 electricity to those in its concession area and has displaced almost all of the small private generators who had been providing back-up power. EDZ's model was profitable for two reasons. First, when EDL was supplying power, it was allowed to purchase power from the utility for a discounted rate and distribute it at the low, nationally regulated tariff rate. Second, when EDL failed to deliver power, Aggreko would run its diesel generators. EDZ would sell this electricity to consumers at a much higher, commercially competitive tariff rate which enabled them to pay Aggreko according to the terms of its PPA with the company. The Zahle model was successful for over five years but has recently suffered from the consequences of the economic collapse (e.g., currency collapse and removal of fuel subsidies) which has made accessing diesel difficult and expensive, reducing the quality of the electricity service provided, and dramatically raising costs and prices.

³ Ahmad et al., 2022; Ayoub et al., 2022.

Approaches to electricity provision elsewhere in Yemen

There is another approach to the engagement of the private sector in delivering electricity which is commonplace in the central and northern areas of the country, notably in Sana'a and other areas including Taiz. After the war broke out in 2015, a significant part of the electricity infrastructure in Sana'a was damaged or destroyed. A large number of private actors immediately set up generators and started to supply households within neighbourhoods (or squares) nearby. Initially, these private actors were able to charge whatever tariff they chose, ensuring that tariffs covered the full commercial cost of operation.

After fuel subsidies were abolished, the costs of electricity provision were extremely high. As a result, there was a dramatic boom in the provision of solar power, particularly solar home systems (SHSs).⁴ It is estimated that the household penetration of solar PV systems was 75% in urban areas and 50% in rural areas with around USD 1 billion spent on solar energy systems in the 2014-2017 period by citizens and communities.⁵ In 2018, the MOEE in Sana'a issued a decree aimed at regulating the sector more effectively. This included granting licenses for private producers to supply electricity in specific geographical locations and clearly defining the role of the PEC (e.g., the PEC is supposed to provide energy meters and is entitled to charge a fee against using the infrastructure as per a contract with private producers).

The result is a complex, costly, hybrid system of provision. There are over 200 licensees in Sana'a alone. Most run diesel generators and serve one or more local neighbourhoods, although some larger operators serve several areas. In some cases, where public PEC generators are functioning, operators purchase electricity from PEC. In other cases, operators pay for using PEC infrastructure to distribute their electricity. Notwithstanding the earlier boom in SHSs, generation is primarily from diesel generators and, consequently, very costly. Although maximum tariffs are now regulated, tariffs still cover costs, making the sector financially sustainable.

The model adopted in these parts of the country is interesting because it is occurring within Yemen and therefore faces very similar challenges to other parts of the country. By liberalising the sector entirely, the authorities have ensured widespread provision of electricity and that the sector no longer represents a financial burden on the authorities. The regulation of private sector activities is beginning to rationalise the use of public infrastructure while attempting to protect customers. The result is a system that sustainably supplies electricity to the

⁴ Ansari et al., 2019.

⁵ Mahmoud et al., 2017.

population, but does so at great cost, making electricity unaffordable for many. For example, residential tariffs in Sana'a are more than 300 YER/kWh compared to less than 30 YER/kWh in Aden.⁶ A key challenge going forward will be to encourage investment in lower cost generation – including using heavy fuel oil and renewables – to reduce the financial burden on the population.

Assessing feasibility in a pilot location

To move from theory to practice, it is important to conduct a **pilot programme in a clearly designated area**. This is particularly important in situations with high levels of uncertainty, such as in Yemen, where it is not possible to know in advance precisely what approach or model would be successful. There is a range of economic, political, and social factors that might make implementation of any model for electricity provision more (or less) difficult, and these are not predictable in advance. The evidence collected from a pilot programme can help inform whether it makes sense to expand it to other areas and generate lessons which can be applied to rolling out a broader programme.

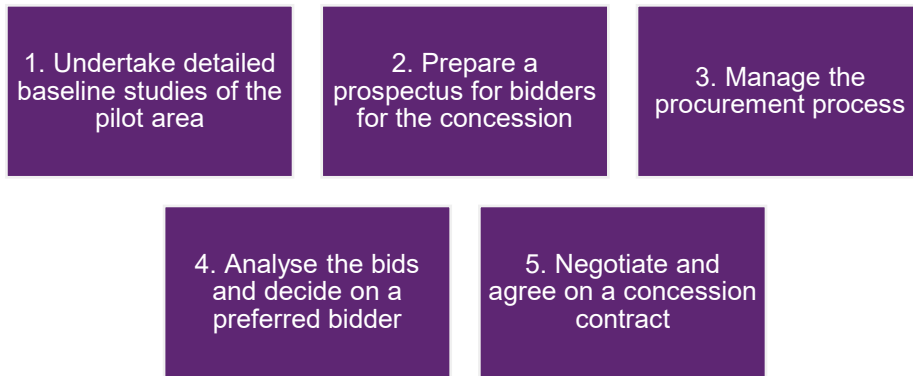
There are **two key criteria for the selection of a pilot area**:

1. The area chosen must have **good security**, both in terms of *physical security* (i.e., no conflict and the application of the rule of law) and *political security*, in the sense that the political leadership of the region must be reasonably stable so that decisions made by the local government are enforced.
2. It is important that the area or region chosen for the pilot has a **political leadership that is willing to experiment, innovate, and solve problems as they arise**. To be successful, the local government must have a strong sense of ownership of the pilot and a desire to put in whatever effort is needed to safeguard its success.

If an area that fulfils these criteria can be identified, then the following **five practical steps need to be undertaken to implement a pilot programme**:

FIGURE 2: Steps for implementing a pilot programme

⁶ MoEE, 2022.



Please refer to “*Models for engaging the private sector in electricity provision in Yemen*” report for a detailed explanation of the steps involved in implementing a pilot programme.

Policy recommendations

Evidence suggests that **a utility concession could be an effective approach in Yemen** and should be **piloted in a specific city or region to assess its suitability**. If such a concession is to work, it will require **strong political support from the central government, as well as from the political leadership in the area of the pilot**. It will also require a spirit of **collaboration between PEC and the concessionaire** and a **willingness to experiment**. Finding the right approach will take time and flexibility from all those involved. Key recommendations for how to proceed are:

Communicate the idea and agree on the approach

Introducing the private sector into distribution is a new concept and a new approach for Yemen. It is important that the idea is well explained and comprehensively discussed among all key stakeholders, including regional actors, so that any decision does not come as a surprise. If it is felt that PSID is an appropriate approach to pilot, this decision must be a formal one made at the highest level, so that there is no ambiguity.

Identify potential locations for a pilot and choose the most suitable one

Suitable locations for a pilot of the approach require the support of both formal and informal political authorities in the chosen area. The government should therefore enter discussions with potential regions, assess their suitability both from a political and a technical perspective and agree a final choice with the selected area.

Prepare for implementation of the pilot

As discussed above, preparation for conducting a pilot concession involves the following steps: baseline assessments, preparing a prospectus, procurement, analyses of bids, and negotiation of a contract. These can start immediately after a pilot area has been selected and agreed. Donors can be invited to support this process.

Study models of mini-grid concession for off-grid areas

The above model is suitable for a **utility concession serving a diverse urban area**. But many Yemenis live far from the grid and will not benefit from this approach. The current approach of **electrifying key public facilities with donor support** is a good one. However, it would be useful for further research to study the viability of mini-grid concessions in off-grid areas to explore whether the reach of the private sector can support electrification in these areas as well.

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