Financing Energy Supply

The Role of the Private Sector

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At 202 GW, the installed generation capacity of Arab countries constitutes only 4 percent of international installed capacity. Demand growth rates in the past decade ranged between 5 and 10 percent per annum and are anticipated to continue to hold at levels between 4 and 8 percent in the coming decade. Meeting the demand for electrical power of a growing consumer base requires the installation of approximately 24 GW of capacity per annum for the next 10 years. This translates into the mobilization of investments in excess of US$ 31 billion per year representing 1.5 percent of the GDP of Arab countries. This funding requirement comes in addition to capital investments in transmission and distribution (T&D) network infrastructure as well as operation and maintenance (O&M) expenditure and fuel subsidies. Under a scenario of continuing economic growth and socio-economic development, the funds required to grow and sustain the power supply infrastructure will exceed the public sector's ability to outlay funds and manage capital projects. It is necessary to attract funding from other sources through innovative approaches that can leverage limited public funds to attract significant private investments.

Our chapter examines the experience of Gulf Cooperation Council (GCC) and North African countries to answer three questions:

- *What form do Public Private Partnerships in power supply infrastructure investments take in the Arab region?*
- *What challenges and barriers arise under current private sector financing models?*
- *What measures should be deployed to overcome current challenges and barriers?*

Recommended policy measures build on the already established IPP model. These include establishing prudent long-term government liabilities management, building capable regulatory institutions and deploying methodical project tendering processes. Policymakers also need to act to facilitate the mobilization of local equity and debt financing through supporting the establishment of third-party investment funds, developing more flexible legal instruments, and granting infrastructure developers better access to corporate bond/Islamic Sukuk markets.

Furthermore, policymakers should enable comparability across projects and countries through transparency regarding factors influencing investment decision including projected investment plans, fuel supply allocations, and remuneration mechanisms. Finally, the long-term financial viability of the power sector as a whole and of renewables in particular, hinges upon the ability of governments to reform electricity tariffs so that they reflect the full economic cost of generating and delivering a kilowatt-hour.

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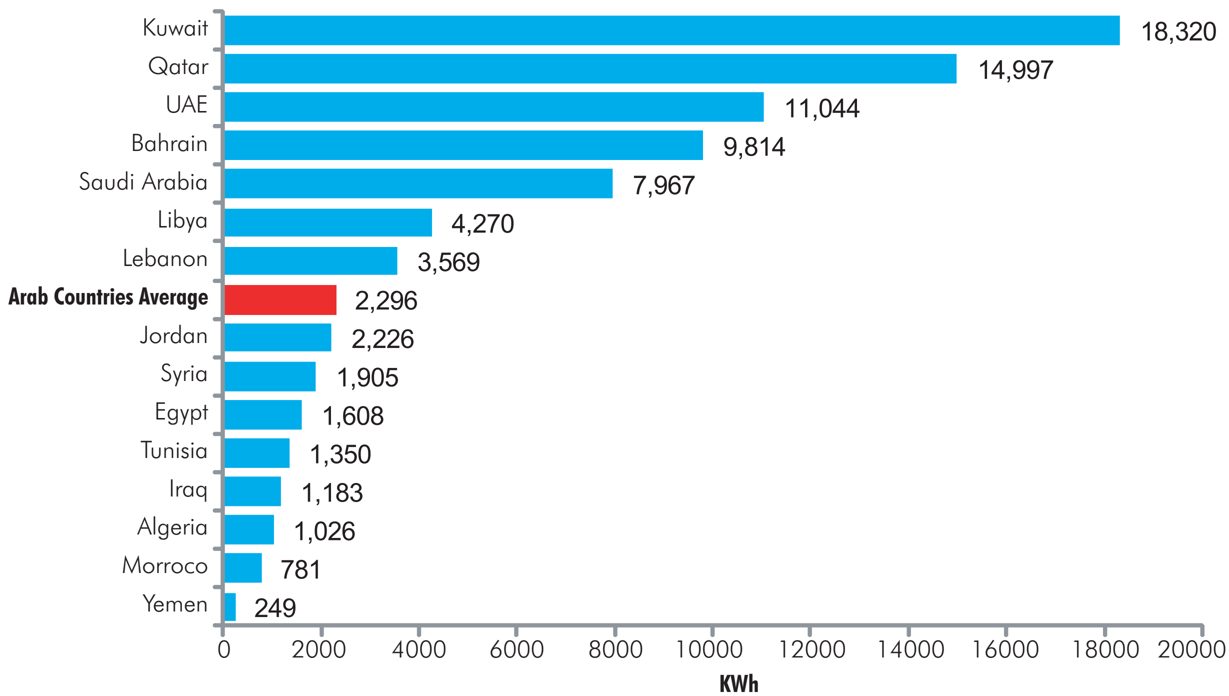
I. INTRODUCTION

At 202 GW, the installed generation capacity of the 22 members of the League of Arab States constitutes only 4 percent of international installed generation capacity (less than the combined generation capacity of the Italy and Spain) (World Bank, 2013 and Global Energy Observatory, 2013). Annual electricity consumption per capita in Arab countries averaged 2,396 kWh in 2010, reaching as high as 18,319 kWh in Kuwait and as low as 248 kWh in Yemen (See Figure 1). Demand growth rates in the past decade ranged between 5 and 10 percent per annum and are anticipated to continue to hold at levels between 4 and 8 percent in the coming decade (World Bank, 2013, and Kharbat, 2012). Meeting the demand for electrical power of a growing consumer base — both in terms of size and consumption per capita — requires the steady installation of approximately 24 GW of capacity per annum for the next 10 years. This translates into the mobilization of new investments in excess of US$ 31 billion per year representing 1.5 percent of the GDP of Arab countries. This funding requirement comes in addition to capital investments in transmission and distribution (T&D) network infrastructure as well as operation and maintenance (O&M) expenditure and fuel subsidies. Under a scenario of continuing economic growth and socio-economic development, the funds required to grow and sustain the power supply infrastructure will exceed the public sector's ability to effectively outlay funds and manage capital projects. It is necessary to attract funding from other sources through innovative approaches that can leverage limited public funds to attract significant private investments.

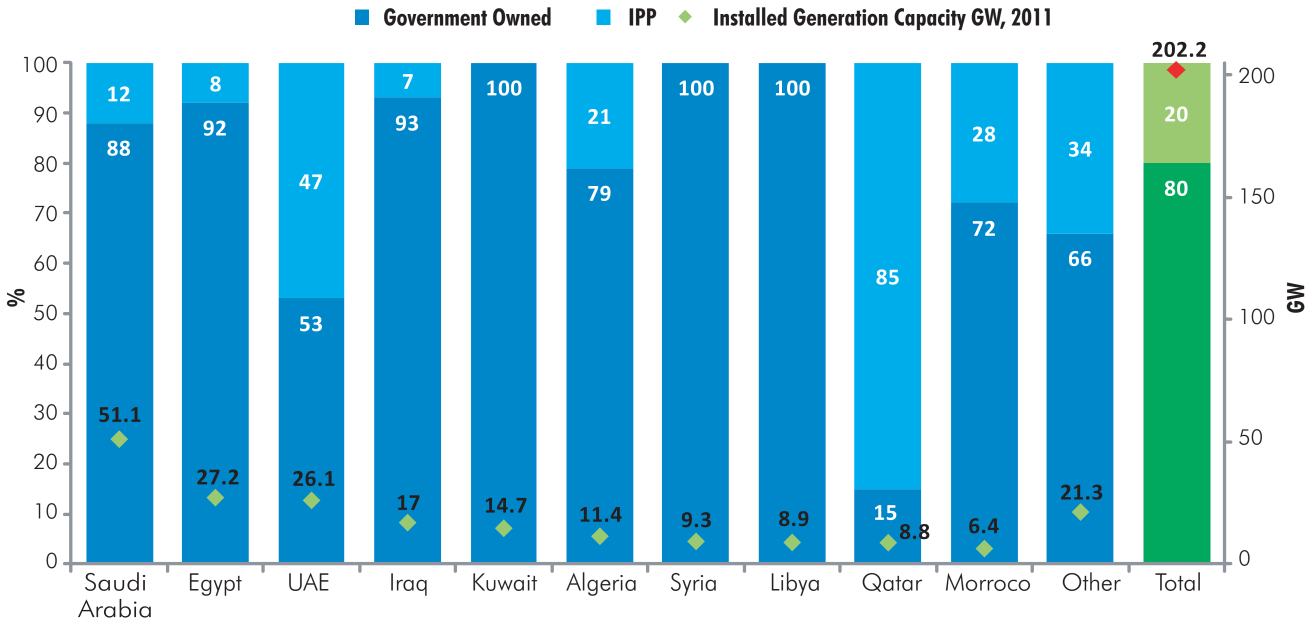
Public Private Partnership schemes range from simple management contracts with limited risk exposure for the private investor, to concessions, divestitures, and GreenfieldBuild Operate Transfer/ Build Own Operate Transfer (BOT/ BOOT) projects where the private investor assumes significant development, construction, and operations risk. In recent years, independent power production (IPP) has emerged as the most prominent PPP scheme in the region; In 2010 Arab countries had about 40 GW of operating IPP capacity representing more than US$ 50

FIGURE 1 ARAB COUNTRIES PER CAPITA ELECTRICITY CONSUMPTION (KWH-2008)



Source: World Development Indicators 2012 Data and Booz & Company analysis

FIGURE 2 SHARE OF IPPS IN INSTALLED POWER GENERARTION CAPACITY IN ARAB COUNTRIES



Source: Arab Union of Electricity Data 2011, and Booz & Company analysis

Billion of private investments and financing. The experience of the past decade in the Saudi Arabia, Abu Dhabi, Qatar, Oman and Morocco present a solid track record for private sector participation in developing generation capacity. Recently, local IPP developers and commercial banks in these countries have built sufficient capabilities to take a leading role in financing and delivering large scale generation projects across the entire Arab region and beyond.

In this context, this chapter aims to provide a holistic perspective on the current situation of energy supply infrastructure investments, the challenges faced by the sector, and different courses of action to meet the requirement of sustainable economic development. It will examine three key questions in turn:

- What form do Public Private Partnerships in power supply infrastructure investments take in Arab region and what are the common themes and variations across countries?
- What challenges and barriers arise under current private sector financing models?
- What measures should be deployed to overcome current challenges and barriers?

II. FINANCING ENERGY SUPPLY INFRASTRUCTURE PROJECTS IN ARAB COUNTRIES[(1)]

A. Electricity Generation

Greenfield independent power projects (IPPs), and independent power and water projects (IWPPs) have attracted the bulk of private sector investments in the energy supply infrastructure of Arab countries. In particular, GCC countries have increasingly turned to IPPs as an alternative to the traditional government-financed Engineering Procurement and Construction (EPC) turn-key contracting model for developing power plants. Since the construction of the 270 MW Al-Manah power plant in Oman in 1996, IPPs have expanded to Abu Dhabi, Qatar, Bahrain, Saudi Arabia, and recently Kuwait. Across the GCC, more than two dozen IPPs and IWPPs, with a combined installed capacity of more than 20 GW have been financed, built and operated by the private sector. Current expansion plans will bring the privately developed share of aggregate electricity generation in the GCC to about 34 percent (Sarraf, 2010).

NOOR 1: 160 MW CSP PLANT IN MOROCCO

ACWA Power and the Moroccan Agency for Solar Energy (MASEN) are partners in the development of Noor 1, a US$1billion160 MW Concentrated Solar Power (CSP) plant being built in Ouarzazate, Morocco. The project is currently the largest of its type in the world using parabolic trough technology to generate renewable energy, and will be augmented with 3 hours of thermal storage to enable thedispatch of electricity during early evening. The plant, based on a 25 year power purchase agreement, is scheduled to start operation in late 2015.

Noor 1 is a greenfield CSP parabolic trough Independent Power Project (IPP) project, to be developed as the first project for MASEN in a series of several planned developments at the Noor Solar Complex. This complex is set to develop into a 500 MW solar park, incorporating several utility-scale solar power plants using various solar technologies, all of which will be developed on the basis of Build, Own, Operate and Transfer (BOOT). Having achieved financial close in May 2013, the project was inaugurated by His Majesty King Mohammed VI of Morocco who renamed the project “Noor 1”.

ACWA Power, as the lead developer, assembled an international consortium that comprises several European organisations which will engineer, procure and construct the plant. The operation and maintenance will be undertaken by NOMAC, a subsidiary of ACWA Power with a portfolio of experience equating to 10,127 MW of power and of 2.216Mm3/day of desalinated water.

The process for selection and funding was managed by MASEN under the scrutiny of the World Bank and other international financing institutions (IFIs). The Project debt is completely financed by IFIs. Loans and grants to MASEN are being provided by the African Development Bank, the French Agency for Development, the European Union, the European Investment Bank, the International Bank for Reconstruction and Development acting as an implementing entity of the World Bank Clean Technology Fund and the German Development Agency.

The electricity tariff offered by the ACWA Power consortium was 28.8% lower than the one offered by the second bidder. Noor 1CSP IPP therefore represents a milestone for CSP parabolic trough technology by demonstrating thatsolar power can be produced at a commercially competitive rate. The tendered bid of USD 0.19/kWh is significantly lower than what has been achieved to date and at the same time narrows the gap between the cost of solar power produced using photo voltaic technology and that of solar thermal technology.

Morocco currently relies heavily on coal and other conventional sources, alongside hydro and wind power parks to meet its energy needs. With the CSP technology used, the project will serve to abate approximately 470,000 tons of CO2 emissions for every year of operation. This project will be a positive factor in offsetting the Moroccan grid peak power demand period, in particular due to its thermal storage. The overall

The basic features of the IPP model are similar across all GCC countries. The state owned utility, ministry of electricity or in some cases an independent authority/single buyer defines the generation capacity expansion plan specifying the location, size, technology and fuel supply for IPP power plants. Private developers compete to for the right to finance, build, and operate the power plant in return for a fixed price long-term power purchase agreement (PPA). Such agreements typically run for 20-25 years on a take-or-pay basis and are backed by either a sovereign guarantee or the credit rating of the off-taker. The government typically retains an equity stake in all IPPs which helps mitigate country and regulatory risks. The risk of fuel price volatility is either mitigated through contractually fixed prices or altogether eliminated from variable O&M costs through energy conversion agreements (ECAs). IPP developers have limited risk exposure under this model, assuming only the risk of financing, constructing, and operating the power plant. Consequently, such projects have ready access to limited-recourse high-leverage project financing from international, regional and local banks with debt ratios reaching as high as 80 percent (Sarraf, 2010).

Within the general framework described above, GCC countries exhibit some variations. For example the government-owned equity stake in Saudi IPPs can be as low as 20 percent whereas projects in Abu Dhabi are typically 80 percent government-owned. Differences also exist in the guarantees provided as well as in the rules for share transfers, public offerings, and termination.

MASEN program is focusing on the sustainable support and integration of local industries. A targeted system of local recruitment and investment in human capital of the local workforce by the project will increase the benefit to the local economy with up to 1,000 workers employed during construction and 60 during operation, in addition to R&D collaboration platform and human capacity development program.

ACWA Power, a privately owned company incorporated in Saudi Arabia, is a developer, investor, co-owner and operator of plants with a contracted gross production capacity of 15,731MW of power and 2.37 million cubic meters of desalinated water per day. ACWA Power is a corporate AFED member.

Based on material provided by ACWA Power, which is AFED member.

Outside the GCC, the private sector has developed generation capacity in several countries including Morocco, Algeria, Tunisia, Egypt, Jordan, and Iraq's Kurdistan region. In Morocco, for example, the IPP program commenced in 1994, resulting in 3 privately owned power plants that supplied 54 percent of total power production in 2010. Compared to other regional IPPs, the Moroccan IPP experience is remarkable for the absence of the sovereign guarantee requirement. Moroccan PPA's provide security arrangements to developers through escrow facilities and letters of credits covering a few months of billings. Another notable feature of Moroccan projects is the diversity of the technologies and fuel mix: Jorf Lasfar is a 1,360 MW coal-fired steam plan, Energie Electrique de Tahaddart is a 384 MW combined cycle power plan running on transit Algerian natural gas, and Compagnie Eolienne de Detroit is 50 MW on-shore wind farm. The IPP program has allowed the Moroccan authorities to divert significant funds and attention to the rural electrification program. Since the inception of the IPP program in 1995, the Moroccan Rural Electrification Program (PERG) increased the rural electrification rate from 18 percent to more than 97 percent in 2011 (ESMAP, 2012).

Although the overall IPP experience in the Arab region has been generally positive – in some countries the results have been mixed. In Egypt, for example, the IPP program started early with three gas-fired steam power plants, with a combined capacity of more than 2 GW, developed in the period between 1996 and 2003 on the basis of 20-year off-take agreements with

TABLE 1 **SELECTED PRIVATE POWER PROJECTS IN ARAB COUNTRIES**

Name	Country	Capacity	Technology	Fuel	Type*	Completion Date
Arzew IWPP	Algeria	318 MW	Steam Turbine	Natural Gas	Greenfield	2005
Hadjret En-Nouss IPP	Algeria	1,260 MW	Combined Cycle	Natural Gas	Greenfield	2010
Skikda IPP	Algeria	880 MW	Combined Cycle	Natural Gas	Greenfield	2005
Addur 1 IWPP	Bahrain	1,234 MW	Combined Cycle	Natural Gas	Greenfield	2011
El Ezzel IPP	Bahrain	950 MW	Combined Cycle	Natural Gas	Greenfield	2007
Hidd IWPP	Bahrain	962 MW	Combined Cycle	Natural Gas	Brownfield	1999/2006
Benha IPP	Egypt	750 MW	Combined Cycle	Natural Gas	Greenfield	TBD
Dairut IPP	Egypt	2,250 MW	Combined Cycle	Natural Gas	Greenfield	TBD
Port Said East IPP	Egypt	682 MW	Steam Turbine	Natural Gas	Greenfield	2003
Sidi Krir IPP	Egypt	682 MW	Steam Turbine	Natural Gas	Greenfield	1999
Suez Gulf IPP	Egypt	682 MW	Steam Turbine	Natural Gas	Greenfield	2003
Erbil IPP	Iraq	1,550 MW	Combined Cycle	Natural Gas	Greenfield	2009
Sulaimaniyah IPP	Iraq	750 MW	Gas Turbine	Natural Gas	Greenfield	2009
Dohuk IPP	Iraq	500 MW	Gas Turbine	Natural Gas	Greenfield	2011
AES IPP	Jordan	380 MW	Combined Cycle	Natural Gas	Greenfield	2009
Amman Asia IPP	Jordan	600 MW	Diesel Engine	Diesel	Greenfield	TBD
Amman Levant IPP	Jordan	250 MW	Diesel Engine	Diesel	Greenfield	TBD
Aqaba Thermal IPP	Jordan	656 MW	Steam Turbine	Heavy Fuel Oil	Brownfield	1985/2007
Hussein IPP	Jordan	363 MW	Steam Turbine	Heavy Fuel Oil	Brownfield	1975/2007
Qatranah IPP	Jordan	380 MW	Combined Cycle	Natural Gas	Greenfield	2011
Rehab Gas IPP	Jordan	357 MW	Combined Cycle	Natural Gas	Brownfield	1994/2007
Risha Gas IPP	Jordan	150 MW	Gas Turbine	Natural Gas	Brownfield	1984/2007
Jorf Lasfar IPP	Morocco	1,360 MW	Steam Turbine	Coal	Greenfield	1994
Compagnie Eolienne de Detroit	Morocco	50 MW	Onshore Wind	N/A	Greenfield	2000
Tahaddart IPP	Morocco	384 MW	Combined Cycle	Natural Gas	Greenfield	2005
Al Ghubra IPP	Oman	484 MW	Combined Cycle	Natural Gas	Brownfield	1995/2006
Al Rusail IPP	Oman	661 MW	Gas Turbine	Natural Gas	Brownfield	1985/2006
Al-Kamil IPP	Oman	273 MW	Gas Turbine	Natural Gas	Greenfield	2002
Barka 3 IPP	Oman	744 MW	Combined Cycle	Natural Gas	Greenfield	2013
Barka 2 IWPP	Oman	728 MW	Combined Cycle	Natural Gas	Brownfield	2007/2009
Barka 1 IWPP	Oman	427 MW	Combined Cycle	Natural Gas	Greenfield	2003
Al Manah IPP	Oman	270 MW	Gas Turbine	Natural Gas	Brownfield	1996
Salalah IPP	Oman	445 MW	Gas Turbine	Natural Gas	Greenfield	2012
Sohar 2 IPP	Oman	744 MW	Combined Cycle	Natural Gas	Greenfield	2013
Sohar 1 IWPP	Oman	585 MW	Combined Cycle	Natural Gas	Greenfield	2007
Mesaieed IPP	Qatar	2,007 MW	Combined Cycle	Natural Gas	Greenfield	2010
Ras Laffan A IPP	Qatar	756 MW	Combined Cycle	Natural Gas	Greenfield	2004
Ras Laffan B IPP	Qatar	1,025 MW	Combined Cycle	Natural Gas	Greenfield	2008

TABLE 1 **SELECTED PRIVATE POWER PROJECTS IN ARAB COUNTRIES**

Ras Laffan C IPP	Qatar	2,730 MW	Combined Cycle	Natural Gas	Greenfield	2011
Sadaf IPP	KSA	250 MW	Gas Turbine	Natural Gas	Greenfield	2005
Tihama ISPP	KSA	1,704 MW	Combined Cycle	Natural Gas	Greenfield	2006
Hajr IPP	KSA	3,927 MW	Combined Cycle	Natural Gas	Greenfield	TBD
Jubail IWPP	KSA	2,743 MW	Combined Cycle	Natural Gas	Greenfield	2010
Rabigh IPP	KSA	1,204 MW	Steam Turbine	Heavy Crude Oil	Greenfield	2013
Rabigh IWSPP	KSA	660 MW	Steam Turbine	Heavy Fuel Oil	Greenfield	2008
Riyadh PP11 IPP	KSA	1,730 MW	Combined Cycle	Natural Gas	Greenfield	2013
Shuaibah IWPP	KSA	900 MW	Steam Turbine	Light Crude Oil	Greenfield	2009
Shuqaiq IWPP	KSA	850 MW	Steam Turbine	Heavy Crude Oil	Greenfield	2010
El-Biban IPP	Tunisia	30 MW	Gas Turbine	Natural Gas	Greenfield	2003
Rades II IPP	Tunisia	471MW	Combined Cycle	Natural Gas	Greenfield	2002
Fujairah 1 IWPP	UAE	881 MW	Combined Cycle	Natural Gas	Brownfield	2004/2006
Fujairah F2 IWPP	UAE	2,000 MW	Combined Cycle	Natural Gas	Greenfield	2010
Shuweihat 2 IWPP	UAE	1,500 MW	Combined Cycle	Natural Gas	Greenfield	2011
Shuweihat 1 IWPP	UAE	1,615 MW	Combined Cycle	Natural Gas	Greenfield	2004
Taweelah A1 IWPP	UAE	1,650 MW	Combined Cycle	Natural Gas	Brownfield	1997/2003
Taweelah A2 IWPP	UAE	780 MW	Combined Cycle	Natural Gas	Greenfield	2001
Taweelah B IWPP	UAE	2,266 MW	Combined Cycle	Natural Gas	Brownfield	1995/2008

* The dates shown for brownfield projects indicate both commissioning and privatization dates
Source: Global Energy Observatory 2013, and Booz & Company analysis

the Egyptian Electricity Holding Company. The program faltered in the wake of the rapid devaluation of the Egyptian pound between 2000 and 2003, which saw the monthly payments by the Egyptian off-taker on the dollar denominated power purchase agreements (PPAs) more than double over the same period of time. This lead Egypt to scrap plans to tender out more than 15 IPP projects; and consequently to the withdrawal of the initial international power plant developers who had invested under the assumption of exploiting economies of scale across multiple power plants. In 2012 Egypt suffered its worst power cuts in decades as a result of a shortfall in generating capacity and bottlenecks in fuel supply. Recent power shortages and concerns about the continuing availability of soft loan from multi-lateral development finance institutions—such as the European development bank, the Arab Fund for Social and Economic Development, and the World Bank–have lead the Egyptian government to revisit the IPP model at least as captive supply for large industrial users. Given previous IPP experience and the currently prevailing business environment in Egypt, investor appetite for IPPs is uncertain (Khamis, 2012).

The IPP model has allowed governments in the region to spread investment expenses over 25 to 30 years through capacity payments, freeing up public funds for investments to reinforce/expand the T&D network, electrify remote rural areas, and pay for other development priorities. Despite higher financing costs compared to government funded plants, the IPPs appear to yield cost structures that are competitive with government funded plants once fuel, O&M, capital expenditure efficiencies are taken into account. Moreover, in contrast to the funding delays, design changes, and overlapping authorities that slow down government developed power plants, IPP developers tend to have better discipline in expediting construction processes to begin generating power – and revenue – as soon as possible. In countries that are constantly trying to keep up with rapidly growing demand, the predictable and short development cycle for IPPs is a significant benefit. Finally, IPPs

COMMERCIALIZING WIND ENERGY IN EGYPT

Ibrahim Abdel Gelil

Egypt enjoys one of the best wind regimes in the world. Since 1988, several pilot and demonstration projects have been installed to gain and accumulate the necessary experience. The first commercial wind farm (5 MW) was established and interconnected with the local grid of Hurghada in 1993, generating about 9 GWh/year. The farm includes 42 wind turbines of different types and sizes. Some components were locally manufactured (towers, blades, other mechanical and electric components).

The first Wind Atlas for the Gulf of Suez was finalized in 2003, identifying 13 sites of high wind speed. In 2005, the Wind Atlas for Egypt was released covering Egypt's entire land area. The purpose of the Wind Atlas was to establish a meteorological basis for assessing Egypt's wind energy resources in six designated regions: the northwest coast, the northeast coast, the Gulf of Aqaba, the Gulf of Suez, the Red Sea, and the Western Desert. Accordingly, the western part of the Gulf of Suez was found to be home to some of Egypt's and the world's best wind resources, with average yearly wind speeds surpassing 7 meters per second, and a potential for some 20,000 MW of wind capacity.

In 2007, Long-Term Plan for Wind Energy Development was announced by the Supreme Council of Energy (SCE), as a comprehensive plan to increase the share of renewable energy (RE) to reach 20 percent of the total electric energy demand by year 2020. According to the plan, it is anticipated to have an installed wind capacity of around 7,200 MW by the year 2020/2021, amounting to 12 percent of the total electricity generated. The objectives of the plan would be achieved through government and private investments. The state-owned projects implemented by the New and Renewable Energy Authority (NREA), the government's entity responsible for promoting RE in Egypt, will have total capacity of 2,375 MW (representing 33 percent of planned total installed capacity). The private sector projects will have total capacities of the remaining 76 percent (4,825 MW). Participation of the private sector will be through the Build, Own, and Operate (BOO) scheme. Although the NREA has traditionally monopolized the development of wind farms through donor-funded projects, the national target has spurred private investments in large wind turbines, and the first prequalification for private-sector developers was under way in late 2009 to build a 250 MW wind farm on a BOO basis. A short list of 10 qualified bidders was identified.

The government offers a package of incentives to attract private investments to the wind energy market. These include exempting renewable energy equipment and spare parts from customs, duties & sales Taxes, signing and guarantying a long term Power Purchase Agreement (PPA) for 20-25 years, and benefiting from carbon credits generated by wind power plants.

So far, wind energy in Egypt has been limited to donor-sponsored projects preceded by a handful of demonstration projects. All of these projects involve grid-connected wind power plants, and the NREA played the role of local project developer. Additionally, plans for two wind farms of 120 MW each, and one 200 MW plant, are being pursued in Zafarana and Gulf of El-Zayt with assistance from Germany, Japan, and Spain.

Currently, Egypt generates about 550 MW of energy from wind power plants, of which 545 MW are generated from the Zafarana wind farm and the remainder from the Hurghada wind farm. The largest project is the Zafarana wind farm located on the West Coast of the Gulf of Suez. The farm houses several wind projects that were developed in several stages and financed in cooperation with development banks from Germany, Denmark, Spain, and Japan.

Despite the high technological specificity of the wind-energy supply chain, Egypt has the infrastructure, existing facilities, and level of technological maturity, readiness, and positioning to support local production of wind-turbine components, such as the gearbox and blades. This is because of accumulated experience as well as the presence of well-established industries for manufacturing transformers, cables and other electrical auxiliaries, and to a much lesser extent gear boxes and converter/inverter units.

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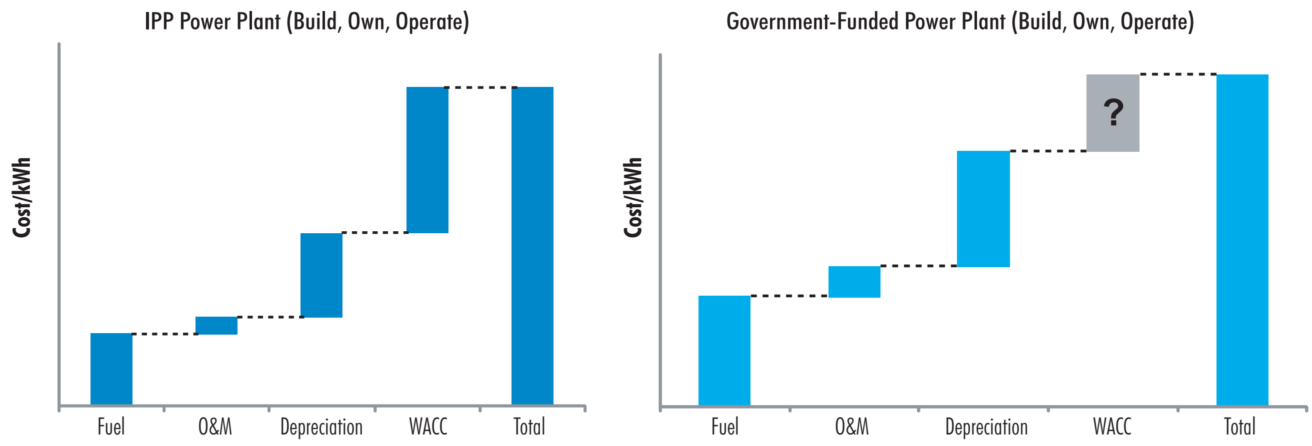
FIGURE 3 **DIFFERENCES IN COST COMPONENTS BETWEEN IPPS AND GOVERNMENT FUNDED PLANTS**



Source: Sarraf et al., 2010

DIFFERENCES IN COST COMPONENTS: IPPS VS. GOVERNMENT-FUNDED PLANTS

Fuel	• IPPs tend to control their heat rate degradation
O&M	• IPPs show slight advantages as a result of lower manpower, more qualified staff, and better procurement practices, which are partially offset by lower salaries in government-funded plants
Depreciation	• IPPs have tighter control over capital expenditures, with specifications designed to serve the life cycle of the IPP. Comparisons are often difficult due to the increase cost components of IPP tender packages (e.g. jetty and transmission substations)
WACC (Weighted Average Cost of Capital)	• IPPs have higher financing costs, but benchmarking government-funded plants is difficult
Other	• Indirect benefits to the economy are typically not factored into analyse. In the case of an eventual sale, a plant's terminal value would lower the costs of the IPP

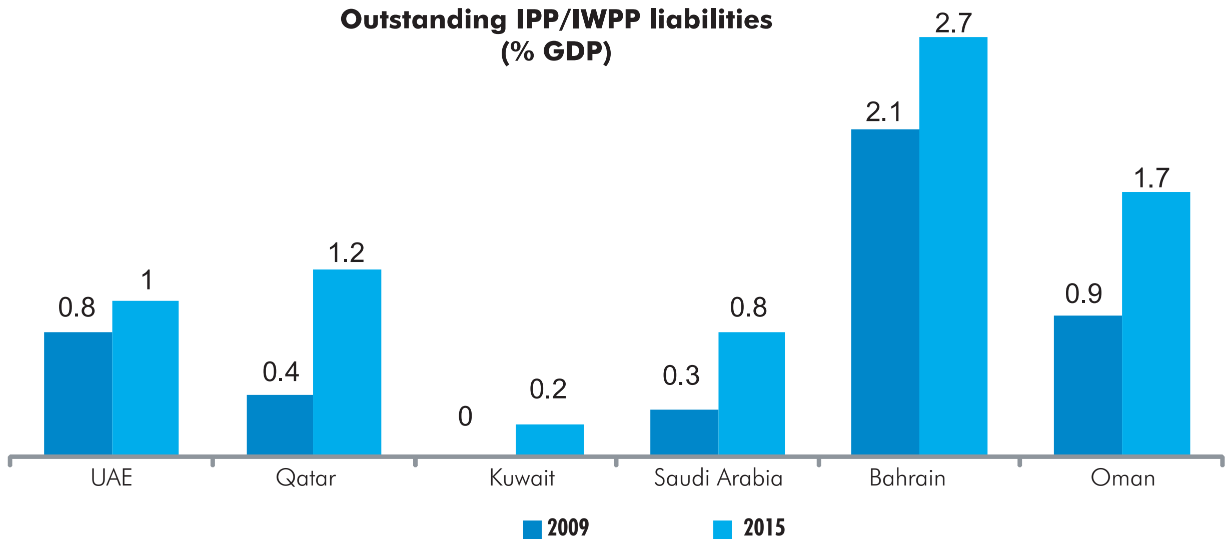
provide governments with operational and financial benchmarks against which to assess the performance of the exiting power plants built and operated by the state-owned utility (Sarraf, 2010).

B. Transmission and Distribution

Unlike power generation, private sector participation in T&D infrastructure investments has been very modest in scale and limited to a few countries. Jordan and Morocco have the most advanced experiences among all Arab countries. Oman has announced tentative plans to privatize Oman Electricity Transmission Company as well as the three distribution companies: the Muscat Electricity Distribution Company, Majan Electricity Company and Mazoon Electricity Company.

Starting in 1999, Jordan horizontally unbundled its centralized electricity utility company and gradually privatized the generation and distribution activities retaining transmission and system control under public ownership. Today three privately owned companies have electricity distribution concessions: Jordan Electric Power Company (JEPCO), Irbid District Electricity Company

FIGURE 4 **CONTINGENT IPP/IWPP LIABILITIES OF GCC GOVERNMENTS**



Source: Sarraf et al., 2010

(IDECO), and Electricity Distribution Company (EDCO). These companies are responsible for developing, maintaining and operating the LV and MV networks to meet subscriber's needs in their area of concession. Electricity tariffs in Jordan range from 8 to 9.5 US cents per kWh which is sufficient to cover the wholesale purchase price of electrical power, as well as the full economic costs of transmission and distribution (Al Amri, 2012, and World Bank, 2013).

Morocco awarded private concessions for providing municipal services including water supply distribution, wastewater collection and electricity distribution for Casablanca in 1997, Rabat in 1999, and Tangiers/Tetouan in 2002. The concessionaires made significant capital investments, increased access to water and electricity, and rolled out an extensive training program for employees. To generate the necessary revenues tariffs were increased to levels more reflective of the economic cost of service inducing customers to conserve their consumption. The concession contract in Morocco protected employees against layoffs or reductions in benefits (World Bank, 2013).

Arab governments are inclined to retain transmission assets and system operations under government control due to strategic and national security considerations. However, high quality transmission infrastructure is a key enabler of private sector participation in power generation and distribution. Power sector reforms and a transition towards an open market depend on the existence of densely interconnected transmission network that gives electricity consumers a choice of multiple suppliers. Transmission infrastructure will also play a role in the transition to a more sustainable economy where renewables for a significant part of the energy mix. Upgrading the existing infrastructure and building new transmission infrastructure that can accommodate solar and wind technologies represents a major challenge to Arab utilities in the coming decade.

While many Arab governments desire private sector participation in distribution they are reluctant to push unpopular electricity tariff reforms. Thus private sector interest in distribution investments is undermined by the inadequate electricity tariff structures prevailing in most Arab countries, as well as a lack of payment discipline and prevalent electricity theft. The risk of politically motivated government intervention in end-user tariff setting makes this sector unattractive for private investors.

III. PRIVATE SECTOR FINANCING CHALLENGES AND BARRIERS[2]

Careful alignment of the goals and incentives of public and private stakeholders is a necessary condition for increasing the participation of private investors in projects to upgrade and expand energy supply infrastructure. The fundamental risk of the Public Private Partnership model, from a government perspective, stems not from any individual project but from the aggregate effects of multiple projects over an extended timeline. An ostensibly rational choice at the project level, can lead to suboptimal outcomes at the sector level, especially in cases where private schemes are used to cover a significant portion of infrastructure investments. From a private sector perspective risks stem from uncertainty around currency exchange, fuel supply, dispatch, default on financial obligations, renegotiation of contractual terms and expropriation. Finally, attracting private investments into renewable energy projects must overcome a unique set of sector-specific hurdles in addition to all the challenges and barriers to investment in conventional infrastructure.

The following sections describe the key challenges and barriers to increased private participation under the currently prevailing conditions:

A. Long-Term Implications of Existing Financing Models

As IPPs take hold in the region and account for an increasingly significant share of installed generation capacity, policymakers need to be prepared to handle three long-term implications that threaten to curtail the advantages provided by private sector involvement.

The first and most straightforward implication is the accumulation of substantial contingent liabilities under the PPAs. Amortization of infrastructure investments through capacity payments spread over 20-30 years will tie up increasing shares of future GDP in implicit off-balance sheet obligations. If governments succeed in investing the freed up capital to create long-term growth in the national wealth that exceed the accumulating liabilities, this strategy can yield great prosperity. However, taken with other long-term liabilities, including public sector salaries, pensions, healthcare, and food/fuel subsidies, PPA obligations may become heavy burdens in a future economy with an abundance of installed generation capacity (Sarraf, 2010).

The second limitation is the bias demonstrated by the current IPP development model towards building base-load power plants that need to run virtually fulltime to provide cheap electricity. Such a trend may cause system operators to struggle to meet daily and seasonal variations in power demand, satisfy network constraints, optimize dispatch, and satisfy contractual commitments to IPPs. An efficient electrical system must strike a balance between multiple technology and fuel types that allows for flexibility in meeting base-load, intermediate and peak demand. Such a balance cannot achieve by exclusively adding IPP units optimized to run at very high capacity factors (Sarraf, 2010).

Finally, the proliferation of IPPs can lock-in the regulatory reform agenda and impede the journey towards a liberalized power market. If the majority of generation assets are covered by long-term PPAs, there will be little room left for open market trading of electricity or bi-lateral agreements between generators and consumers of electricity. Any future reforms to the electricity market will need to first deal with the contractual legacy of IPPs.

B. Infrastructure Project Investment Risk Landscape in Arab Countries

Energy infrastructure investments are long term plays requiring private investors to anticipate and mitigate risks across the span of several decades. Investors attempt to manage these risks through a set of project documents (e.g., power purchase agreement, interconnection agreement, engineering, procurement and construction or engineering, procurement and construction management agreements, land lease agreement, fuel supply or energy conversion agreement and disbursement agreement). They also mitigate risk of contract breach by the government through equity stakes by the host government and local developers and through involving local and international commercial banks as well as in some cases multi-lateral financing agencies in financing the project.

Non-GCC countries are generally perceived by investors as higher risk compared to GCC countries and hence there has been limited appetite for infrastructure investments in these countries by commercial banks. This risk perception leads to prohibitively high returns expectations by investors and financiers reducing the benefits of private sector participation. However, some off-takers in non-GCC countries have demonstrated the effectiveness of creditworthiness and a business friendly environment in attracting foreign investors (e.g., Morocco and Jordan). Moreover, multilateral agencies and development banks have played a strong role in backing private financing of energy infrastructure in Non-GCC countries through non-commercial risk guarantees (e.g., expropriation, breach of contract, war and civil disturbance) (ESMAP, 2012).

From an IPP investor's perspective, fuel is another major area of vulnerability as IPPs are often caught between the primary fuel supplier and the electricity off-taker. GCC countries, that have access to abundant hydrocarbon resources, typically shield the IPP from fuel risk by making the electricity off-taker assume responsibility for securing fuel supply from the primary fuel supplier. This is often formalized through an energy conversion agreement or a fuel supply agreement that removes both fuel price and volume uncertainty. Outside the GCC, in countries where IPP projects usually rely on fuel imports, fuel-supply risk is allocated to the fuel supplier through a "ship-or-pay" delivery guarantee. Fuel-price risk can either be allocated to the off-taker via an indexed pass-through provision or shared between the developer and the off-taker. The Jorf Lasfar IPP in Morocco is an example where the developer has succeeded in securing a reliable and cost competitive supply of imported coal. The formula for compensating reimburses 80 percent of the coal procured by the developer at cost and 20 percent of the coal at the average price of coal imports in the European Union thus providing the developer with a strong incentive to buy coal at a competitive rate.

In the absence, however, of a strong IPP track record, making the private sector developer responsible for securing fuel through direct coordination with the primary fuel supplier typically increases risk perception and delays the financial close of IPP development contracts. For example, in 2010 the Iraqi Ministry of Electricity launched a program to tender out the development of four IPPs with a total capacity of more than 2.7 GW. The ministry contemplated a model where the fuel supply risk was allocated entirely to the project developer. This risk allocation approach proved untenable given the scale of the planned IPP program, and the absence of a track record of successful power purchase agreements (Ministry of Electricity of Iraq, 2010). The Egyptian Electricity Holding Company (EEHC) encountered similar challenges in its recent attempts to reawaken the Egyptian IPP program after a decade long hiatus through schemes that minimize the Egyptian government's exposure to market risk. These schemes include opening up the grid for third-party access and allowing for merchant IPPs to supply large customers by wheeling their production through the national electrical grid. IPP developers would be responsible for securing their own fuel supply and bilateral power purchase agreement; their relationship with the EEHC would be fully defined by an Interconnection and Use System Agreement and a Transmission Use of System charge set by the board of the Egyptian Electricity Regulatory Agency .

C. Renewable energy supply challenges

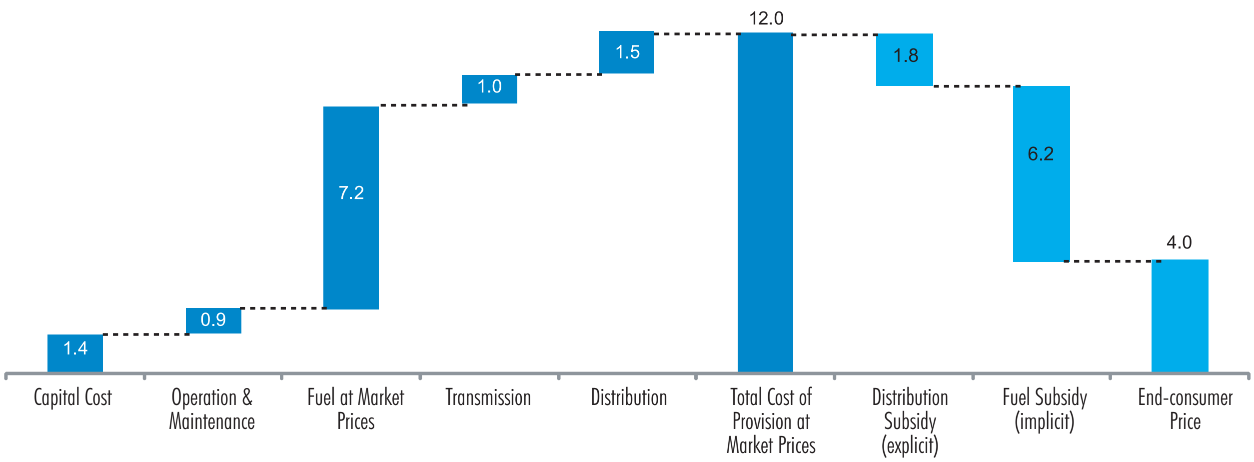
Globally, the renewables sector witnessed a record breaking US$ 257 Billion of investment in 2011, up 17 percent from 2010. In terms of capacity, renewables accounted for 44 percent of new generation capacity added worldwide. Despite this global boom in renewable energy investments, most programs to establish renewable capacity in Arab countries do not have access to adequate funding. In fact only US$ 5.5 Billion, or 2 percent, of global renewables investments were made in the Middle East and Africa region, down 18 percent from 2010. The only exception among Arab countries is Morocco, which invested US$ 1.12 Billion in renewable energy projects in 2011 (McCrone, 2012).

Such limited renewables investment activity stands in stark contrast to the region's ample endowment of solar and wind resources. Arab countries have the world's greatest potential for renewable power generation. Almost 45 percent of the world's potential resource endowment resides in the region; these resources, if tapped, are sufficient to cover more than 3-times the current global demand for electrical power (El-Husseini, 2011).

Arab governments use fuel subsidies to reduce the cost of conventional power generation in order to stimulate economic growth, increase access to affordable electricity, and spread the wealth from oil and gas production. Utilities in the region typically pay around US$ 1 per MMBTU for natural gas, which is roughly equivalent to buying oil at US$ 10 per barrel – a mere fraction of world market prices. As result of this and other direct and indirect subsidies, regional utilities can maintain the cost of conventional electricity generation, transmission and distribution at an artificially low level of 5 to 6 US cents per kWh. Furthermore, in most Arab countries the electricity tariffs, particularly for residential customers, tend to be inadequate to cover even the subsidized costs of production (El-Husseini, 2011).

Private sector participation in the development of renewable energy is critical for accessing the required expertise and capabilities. Private interest is, however, unlikely under current market conditions; Arab governments need to take the lead to make renewables a viable investment. In the absence of an equalizing incentive mechanism that balances the distortions caused by conventional power subsidies, large-scale private investment in renewable energy projects will remain unlikely.

FIGURE 5 COST AND INCOME STRUCTURE OF A TYPICAL ARAB UTILITY (US CENT PER KWh)



Source: El-Husseini et al., 2011

IV. A NEW POLICY FRAMEWORK FOR ENERGY SUPPLY[3]

To systematically address the challenges and overcome the barriers described above, ministries, regulators, and public utilities must undertake a series of initiatives to improve the regulatory environment, facilitate equity and debt financing conditions for energy supply infrastructure projects, promote renewable energy supply investments, and build regulatory capabilities.

A. Improving the regulatory environment

Regulatory reform to introduce private sector participation requires strong political will and commitment, integration with other reform initiatives, and a fair approach to maintaining balance between the interests of investors, the government, and the public. To systematically improve the regulatory environment action is required in four primary areas: Long-term liability management, integrated infrastructure planning, project tendering process,and increasing transparency and comparability across projects The following sub-sections describe a course of action to reform the regulatory environment for Arab countries in each area.

i. Long-Term Liability Management

As a starting point, ministries of finance should develop an indicator to track the contingent liabilities of IPPs and other energy supply financing schemes as proportion of government revenues and of national GDP. Total exposure to capacity payments as well as other long-term off-balance sheet financial obligations like public sector salaries and benefits, pensions, fuel and food subsidies should be closely monitored under alternative economic growth scenarios to set deliberate boundaries on the accumulation of future liabilities and the use of sovereign guarantees. Governments need to define limits that they feel are appropriate, but decision making should be data-driven and conscious (Sarraf, 2010).

As demonstrated by Saudi Electricity Company and by the Office National de l'Electricité of Morocco, a sovereign guarantee is not required when the off-taker is creditworthy and has a positive contracting track record; other schemes like escrow accounts to cover a few months of billing or third party guarantees/letters of credit are possible (Al Barak, 2013, ONE, 2011, and SEC, 2011).

Allowing long-term bi-lateral agreements between IPPs and large industrial customers and enabling fair third-party access to the transmission network, commonly referred to as "Wheeling," can help contain long-term government liabilities. Incumbent state-owned utilities in Arab countries oppose wheeling since they are loath to relinquish large industrial customers that pay the highest tariffs and cost the least to serve to private operators. However, a win-win value proposition can be devised setting up a system of wheeling charges as well as a contractual obligation to supply excess capacity to serve the system's peak requirement as needed at tariffs that are close to the marginal variable cost of power production. Such a system would pave the way for market liberalization and private sector financing of transmission infrastructure (Sarraf, 2010).

ii. Integrated Infrastructure Planning

The impact of IPPs on the overall economics of the electrical system is strongly dependent on the robustness of system planning, including supply-demand forecasting and transmission system reinforcement/expansion planning. In times of strong growth in the demand for electrical power such issues are masked by chronic shortages in supply that allow for near-full utilization of assets. Poor planning choices only surface in times of overcapacity when the demand for electrical power experiences slower growth rates or shrinks. IPPs become targets for political criticism as their per-unit costs of production increase as contractually fixed capacity payments are spread over a shrinking output. Similarly, transmission constraints combined with the need to run IPP capacity in base-load mode can limit the ability to optimize dispatch across the national system. (Sarraf, 2010)

Arab system planners need to consider the development of intermediate-load and peak-load capacity in addition to building IPPs suited only for base-load operation like the 1,360 MW coal-fired power plant in Jorf Lasfar (Morocco), the 900 MW HFO-fired steam plant in Shuaibah (Saudi Arabia), or 2,007 MW gas-fired combined-cycle plant in

Mesaieed Industrial city (Qatar). An imbalance favoring base-load plant designs will result in rising costs over time and risk of creating stranded generation assets in case electricity demand growth slows down or reverses. Some GCC countries specify particular load-categories and load-service requirements in IPP tenders allowing developers to design the plant and commercial bid that is most appropriate for a particular load-regime (Al Barak, 2013, ONE, 2011, and SEC, 2011).

Moreover, system planners need to develop and publish 5-7 year outlooks on investment requirements in generation, transmission and distribution infrastructure that provide reliable signals to private developers. Clarity on future opportunities will allow developers to plan for the long-term and arrange the necessary financing and technical alliances well in advance. This particularly important to attract investments in transmission infrastructure which typically has longer payback durations and lower returns.

iii. Project Tendering Process

A well designed, transparent bidding process must both allay concerns of corruption and improper awards as well as provide sufficient flexibility to yield projects that are highly competitive in terms of value for money, allocation of risk, promotion of innovative solutions, and reduction of tendering costs. When tendering out concessions, regional utilities need to remain within the accepted boundaries of existing procurement procedures while using more comprehensive evaluation techniques that allow some measure of flexibility in harnessing private sector innovation and efficiencies. The tendering process should be sufficiently flexible to treat a BOOTproject with a highly defined scope and well known cost structure differently from a first-of-a-kind Design Build Finance Operate (DBFO) project that introduces a new or unfamiliar technology.

Utilities should provide information upfront to developers regarding the scale of the tender, the scope of bid evaluation, performance expectations and competition rules. This allows developers to decide a priori whether tendering is in their best interest or not. Utilities should also constantly sound the market through informal consultations with developers. In addition to ensuring that tenders will attract sufficient and diverse interest, such informal communication channels can provide invaluable feedback for reassessing project parameters or reexamining the tendering process.

Finally tenderers should be allowed to submit, if appropriate, variant solutions in their bids that allow them present innovative approaches and technologies. Under such a scheme bidders would submit in effect two bids: one that meets the original conditions and an alternative approach. In order to successfully implement this approach it is important to define the desired outcomes carefully and set minimum required standards for all bidders.

iv. Increasing transparency and comparability across projects

To ensure that PPPs realize gains that are in-line with government and public stakeholder expectations, Arab governments should mandate a Public Sector Comparator that applies for all major government projects. This analytical tool will allow the comparison of life cycle costs, both upfront capital costs as well as ongoing O&M costs, of PPPs to government funded infrastructure and services. The comparator should include a consistent estimate for the cost of capital for government funded projects perhaps based on an estimate of the cost of risk avoided by the government (e.g., the risk of potential project delays), or the opportunity cost of investing in power supply infrastructure instead of other development priorities. Such a tool would be even more powerful if applied consistently to projects across a group of countries in the region as it would give better visibility on investor risk appetites and risk/reward expectations (Sarraf, 2010).

B. Facilitating Equity and Debt Financing Conditions

Sustainable investments in energy supply infrastructure require the mobilization of considerable local equity and debt financing. On the equity side there is limited room for government action besides providing targeted grants to develop strategic projects that are inherently unattractive to private investors due to long maturities or unusually high risks (e.g., transmission infrastructure, and renewables technologies). These grants should be used

sparingly and only as a means for attracting funds from additional sources. Through careful deployment of these grants and other fiscal incentives, Arab governments could encourage long-term institutional investors like large pension funds, insurance companies and development banks to establish funds that specialize in infrastructure investments.

On the debt side, public utilities and private developers need better access to corporate bond and Islamic Sukuk markets. Despite having higher transaction costs, longer lead times and less flexibility than commercial loans, bonds typically offer longer maturities and lower interest rates. More importantly, bonds allow access to considerably larger volumes of funds than commercial lenders can possibly offer. Corporate and project-level bonds would complement corporate and project level commercial loans and allow developers greater flexibility in arranging the most competitive financing for IPPs and other infrastructure investments. For highly strategic transmission projects that face challenges in attracting commercial debt due to an average economic life of 50 years and low returns, governments can intervene on a targeted basis to increase the credit quality of the debt. This can be achieved either through a contingent credit line to guarantee debt service or through creating an additional buffer of subordinated debt by a government lender (Al Barak, 2013).

Public utilities and regulatory authorities should consider giving developers and other investors the flexibility to use creative legal instruments that can vary the risk allocation between majority and minority project partners based on either achieving project milestones or a certain yield threshold (e.g. partnership flips and sale leasebacks arrangements). Such schemes allow the optimal allocation of risk to the private partner that is most capable of managing it at each phase of the project.

C. Promoting Renewable Energy Supply Investments

Unlocking private investments in renewable energy supply starts with a demonstration of political will and commitment to sustainability at the highest level. Arab governments must articulate a clear national strategy for deploying renewable technologies and establish clear and realistic national targets for developing renewable generation capacity. An effective strategy would provide certainty to investors, reduce regulatory risk, and enhance the credibility of any subsequent incentives framework (El Husseini, 2011, and Razavi, 2012). To date only Morocco, Algeria, Tunisia, Egypt and Jordan have officially defined renewable energy targets (REN21, 2013).

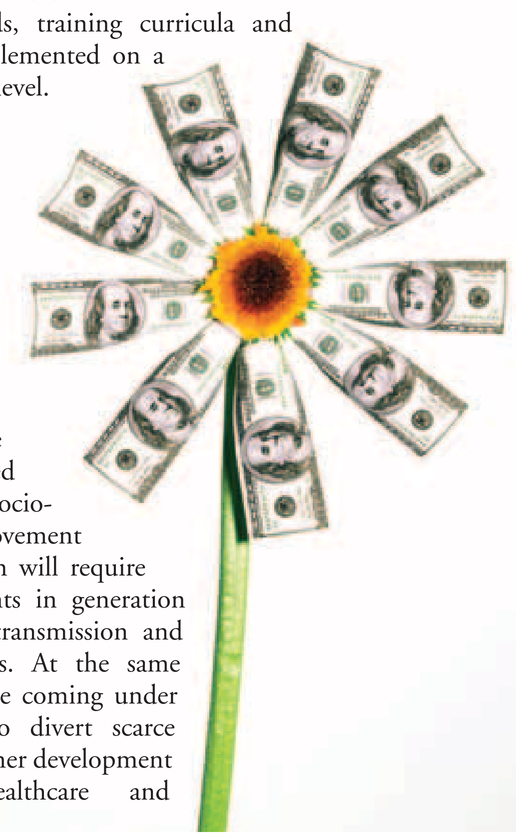
Arab governments need to introduce feed-in tariffs, a proven renewable energy incentive mechanism that has had a global track record of success. In contrast to volume setting quota policy tools like renewable portfolio standards (RPS), Feed-in tariffs address the underlying structural distortions by diverting the flow of subsidies from fossil fuels to private sector-lead development of renewable energy. Developers should be encouraged to access international funds like the Green Climate Fund and to leverage the international carbon market to supplement project revenues through Clean Development Mechanism credits (CDM CERs) (Razavi, 2012). Typical international benchmarked feed-in tariffs for utility-scale wind are between 8.7 and 29.4 US cents per kWh and for large Solar PV between 14.2 and 53.4 US cents per kWh (REN21, 2013).

D. Building the capabilities of regulatory authorities

The separation of policymaking, regulation and operations is a relatively recent phenomenon in Arab electricity sectors. Implementation of the initiatives mentioned in the previous subsections requires the development of capabilities and competencies among power sector regulatory authority employees necessary to bring about and sustain significant performance improvement including technical/economic analysis, strategic planning, and management. The foundation of a successful capabilities building program is the establishment of power sector regulation as a profession through continuous training, and standardized formal qualification and certification of employees. This professionalization of the regulatory activities would be more effective if competency standards, training curricula and certifications are implemented on a regional or pan-Arab level.

V. CONCLUSION

The past-decade has profoundly reshaped the energy supply sector in Arab countries; the pace of change will only accelerate in the coming years. Elevated aspirations for socio-economic improvement and economic growth will require substantial investments in generation capacity as well as transmission and distribution networks. At the same time, governments are coming under increased pressure to divert scarce public resources to other development priorities like healthcare and education.



Policymakers in the Arab region must play a fundamental role in establishing the appropriate enablers for private sector participation in energy supply infrastructure investments, including well-defined policies and a sound regulatory framework. They should build on the already established IPP model with modifications to address a few key limitations. By establishing prudent long-term government liabilities management, building capable regulatory institutions and deploying methodical project tendering processes, Arab governments can leverage limited public funds to attract significant private sector investments into building an energy supply infrastructure that can support their long-term economic growth and sustainable development objectives. Policymakers need to act to facilitate the mobilization of local equity and debt financing through supporting the establishment of third-party investment funds, developing more flexible legal instruments (e.g. partnership flips and sale leasebacks), and granting infrastructure developers better access to corporate bond/Islamic Sukuk markets.

Furthermore, policymakers/regulators should enable comparability across projects and countries through increased transparency regarding factors influencing investment decision including projected investment plans, fuel supply allocations, and remuneration mechanisms. Finally, in order to promote the development of renewable energy generation, Arab policymakers need to put in place incentive mechanisms that level the playing field between renewables and conventional technologies that run on heavily subsidized fossil fuels. Indeed, the long-term financial viability of the power sector as a whole and of renewables in particular, hinges upon the ability of governments to phase out subsidies and reform electricity tariffs so that they reflect the full economic cost of generating and delivering a kilowatt-hour.

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NOTES

1. Section II. Financing Energy Supply Infrastructure Projects in Arab Countries
   Sidi Krir IPP was developed jointly by Edison International SpA and InterGen, whereas Port Said and Suez IPPs were developed by EdF. These developers, who had their sights set on taking part in a large IPP program, opted to sell their assets to international investors (respectively to Globeleq and Tanjong Public Limited Company) after less than two years of operations.

2. Section III. Private Sector Financing Challenges and Barriers
   Forecast of contingent IPP/IWPP liabilities, shown in Figure 4, was based on announced IPP / IWPP programs, Booz & Company estimates of capital and operating cost and an average weighted cost of capital WACC of 8 percent

   The analysis of typical utility cost structure, shown in Figure 5, assumes a newly built natural gas combined cycle (NGCC) plant, a fuel price paid by the utility of US$ 1 per MMBtu, a market fuel price of US$ 7 per MMBtu, plant life of 25 years, overnight cost of US$ 700 per kilowatt, and a real cost of capital of 4.5 percent

3. Section IV. A New Policy Framework for Energy Supply
   Saudi Electricity Company, which has a corporate credit rating of AA- from Standard and Poor's, AA- from Fitch, and A1 from Moody's, has had significant success in raising financing through corporate Sukuk. Since 2007 the company has raised more than US$ 5 Billon through multiple 20 year issuances with Coupon rates between SAIBOR + 0.45 percent and SAIBOR +1.6 percent. (SEC, 2011)
   The discussion of renewable energy project financing applies to a large degree to energy efficiency project financing. Such shared and guaranteed savings energy performance contracts involve paying back investment costs for more efficient equipment and technologies through cash flow from energy savings. These technologies are proven and economic if the true cost of fuel and/or electricity is taken into account. However, governments could, for example, contract a private Energy Services Provider, to finance and install solar water heating systems for a public school or group of schools. The private Energy Services provider would have to guarantee that the resulting energy savings will meet or exceed the annual payments to cover capital and operating expenditures. The method for measuring and calculating savings needs to be explicitly defined and agreed upon a priori. The private investor bears the risk of the savings not materializing.