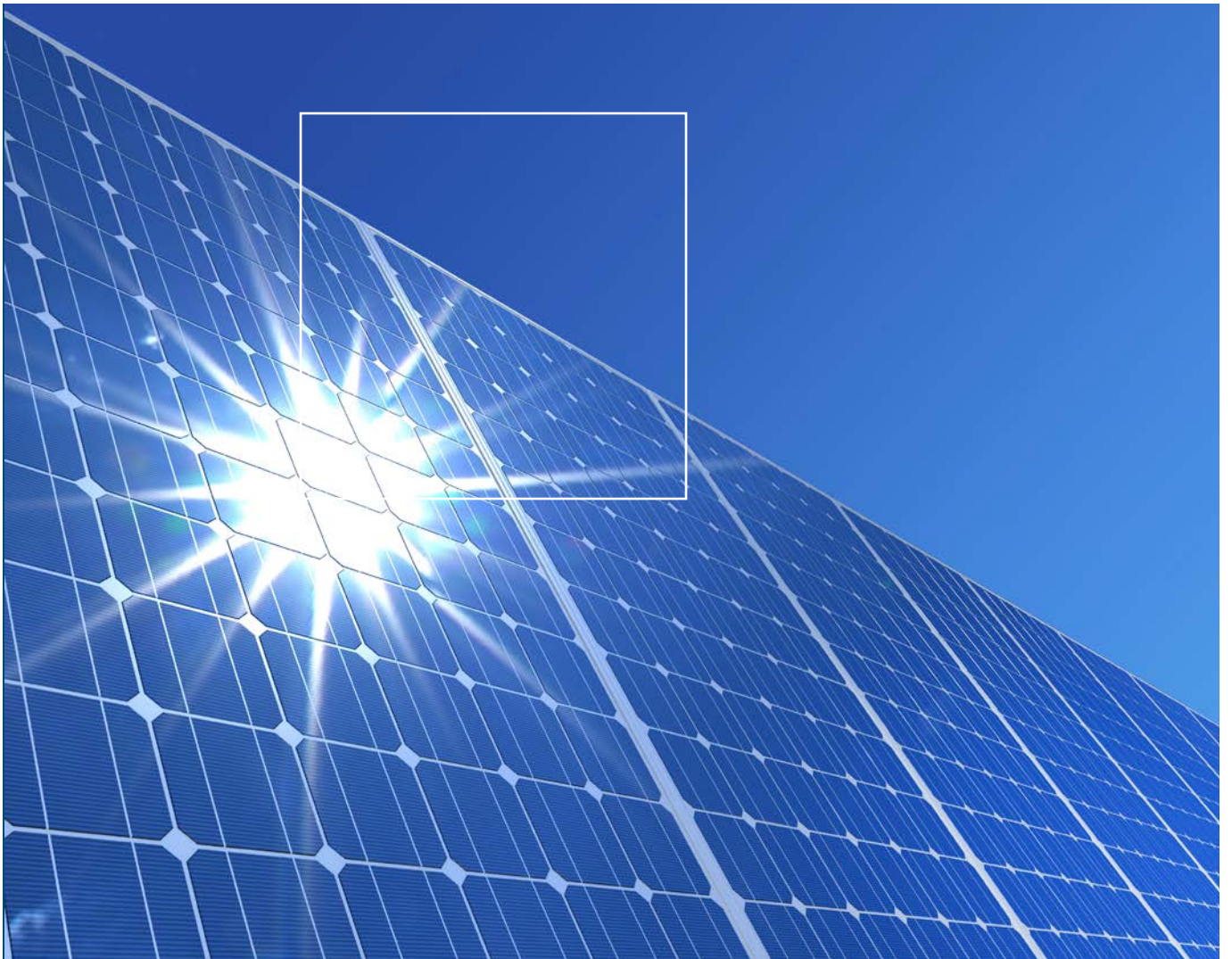


GCC Solar Energy: Turning plans into reality

How to renew the lost momentum?



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Acknowledgement for their support and valuable input: Salman Ali, Dr. Robin Francis, Browning Rockwell (SASIA) and Grant Greatrex (expert advisor)

Executive summary

The potential for solar energy in the Gulf Cooperation Council (GCC) is indisputable. Underpinned by the acute need to find alternative energy sources to reduce the opportunity cost of burning fossil-fuels, as well as the requirements to drive economic development, employment and technology intensive industries, the “solar industry” is no longer a sector this region can afford to ignore and not develop. Acknowledging this, the region has announced ambitious plans to exploit the solar-energy opportunities in the last half-decade. However, these ambitions have not yet been realized into action. Despite the announcements in the past to kick-start the sector, actual deployment is still at its nascent stage, and the share of the GCC’s solar-energy capacity remains paltry (only < 0.5% of the installed generation capacity in the GCC in 2014). Saudi Arabia’s conspicuous absence in this sector, despite the country’s high potential, is particularly noteworthy. In this article, we provide a report on the GCC’s progress, identify root causes of the delayed deployment and suggest steps to turn the ambition into reality.

The lack of a clear policy framework is one of the main reasons for limited solar activity in the GCC. Most of the deployment to date in the GCC has been state sponsored. However, going forward, if the GCC is serious about developing a sustainable solar-energy market that draws significant investment from the private sector, then a clear and transparent solar-energy policy needs to be communicated to build market confidence in the industry. Furthermore, there is an acute need for clarity regarding the role of the public sector power industry stakeholders to inspire private sector investor confidence. Other factors that should be immediately addressed, include a clear implementation of value chain development strategy, human capital development and innovative solutions through focused R&D on technical challenges such as harsh climatic conditions, water scarcity and power supply variability.

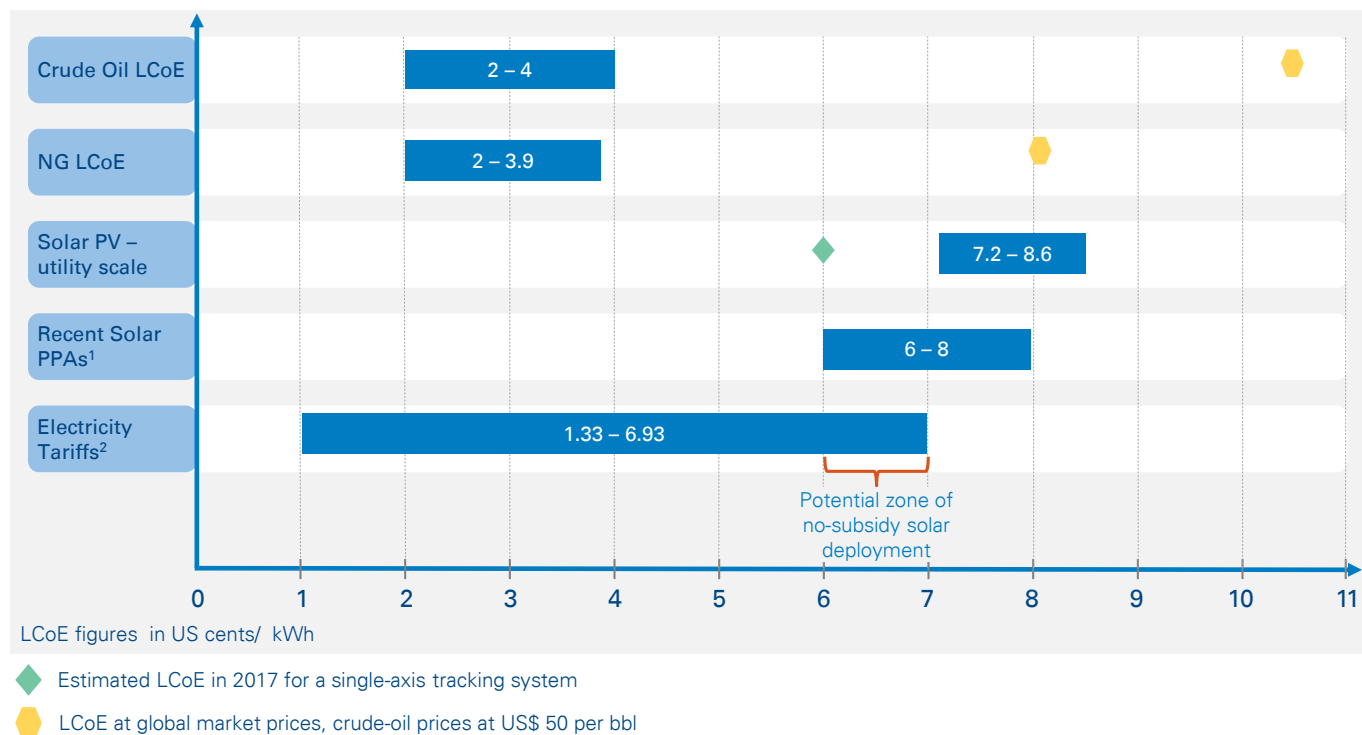
Above all, a renewed political push and communicating solar energy as a high-priority sector among internal and external stakeholders will certainly help put a new lease on life to the solar energy market in the GCC.

Global Solar Energy Landscape

Globally, solar energy continues to gain traction as an alternative source of energy with high potential. Originally reserved for developed countries such as the USA and those in Western Europe, solar energy is fast becoming a preferred choice for emerging countries' growing energy demands, including South America, India and China. The most important driver for this trend is the rapid decline of prices in solar generation costs. The costs of solar PV modules and systems have declined

by 65–70% in the last half-decade, reducing solar PV's LCoE dramatically – which, in high-solar-irradiation regions, now lies well below 100 USD/MWh. This has improved solar energy's competitiveness, making it far more affordable for emerging countries such as the GCC to develop their markets without resorting to costly subsidies. (see Figure 1).

Figure 1: Unsubsidized deployment of Solar Energy in the GCC can become a reality by 2017



Source: Lazard Levelized Cost of Energy Analysis – September 2014, ADL analysis

1: DEWA Solar PV Project, India First Solar Project








2: KSA electricity tariff sliding scale. The avg. unit cost of electricity in KSA is US cents 3.89 per kWh which includes T&D costs

The GCC – A Case of Lost Momentum?

With one of the highest rates of insolation, the GCC has ample resource potential to develop solar power as a primary energy source. With the need to find alternative energy sources to reduce the opportunity cost of burning indigenous fossil-fuel resources, as well as the need to drive economic development, employment and technology industries, the “solar industry” is

a sector few can afford not to develop. However, despite major plans announced in the past by the region’s governments to kick-start the sector, actual deployment is still at its nascent stage, and the share of the GCC’s solar-energy capacity remains paltry (only < 0.5% of the installed generation capacity in the GCC in 2014. (see Figure 2).

Figure 2: GCC solar deployment: 'to-be' vs. 'as-is' situations

GCC	Target Deployment, in MW (Target Year)	Year of Announcement	Cumulative Installation till 2014, in MW	Under Construction, in MW	Target Technology Portfolio
 Saudi Arabia	41,000 (2040)	2012	~50	50	CSP, PV
 UAE – Dubai	1,000 (2030)	2011	13	200	PV
 UAE – Abu Dhabi	1,600 (2020)	2009	110	-	CSP, PV
 Oman	200 (2020)	2012	-	-	Not decided
 Kuwait	2,000 (2030)	2012	-	50	CSP, PV
 Qatar	1,800 (2020)	2012	4	-	PV
 Bahrain	No Announcements	-	5	-	PV
Total	~ 48,000		~ 180	~300	

Source: Public Information

Almost all the GCC countries have announced plans to deploy significant volumes of solar-power generation capacity within the next decade. Saudi Arabia intends to be the single most important market in solar-power generation, with its target of deploying 41 GW of solar energy in the long term, which translates into ~86% of the GCC market share. Thus, Saudi Arabia's market development efforts will drive the pulse of the GCC solar market in the coming decade. But when it comes to actual deployment, Saudi Arabia's report card has not been remarkable. Since its announcement of its ambitions in 2012, no major projects have been approved or started construction. In fact, the country recently announced plans to extend its solar-energy deployment milestone by eight years. This suggests that aggressive national ambitions do not necessarily translate into aggressive market development.

One may point out that solar projects have been successfully deployed in countries such as the UAE (e.g. Abu Dhabi's 100 MW Shams 1 CSP power project, launched in 2013). However, the solar ambitions of countries outside Saudi Arabia remain relatively small and limiting to creation of a long-term sustainable solar-industry value chain and economy in the region.

We assessed the current solar-energy markets across the six GCC countries and identified root causes for the apparent loss of momentum. Consequently, specific recommendations have been identified, which, if implemented, will bring a new lease on life to this sector.

The GCC’s Solar Industry Report Card

Policy support

A clear policy framework is imperative for market development. However, not a single country in the GCC has rolled out its own set of solar policies since the announcement of plans to develop a strong solar energy market. Most of the deployment to date in the GCC has been state sponsored, which does not require policy support. However, going forward, if the GCC is serious about developing a thriving solar-energy market that draws significant investment from the private sector, then a clear and transparent solar-energy policy needs to be communicated to build market confidence in the industry.

Unlike in the past, when policies were mainly directed towards subsidizing the high costs of solar energy, certain countries have recently been pushing for a “non-subsidy” solar-policy paradigm (see Figure 3). The GCC can derive valuable lessons by assessing these new policy initiatives from emerging countries that have faced similar issues to those of the GCC. For example, instead of providing expensive direct subsidies, countries are now focusing on providing structured and ample financing to solar projects, either through national banks or by collaborating with international development banks. This is because priorities have shifted from providing subsidies (due to reduction in the deployment cost) towards development of attractive financing options (to ensure bankability of the long-term projects).

Figure 3: Learning from South America to foster a non-subsidized solar market



Source: Arthur D. Little

Emerging countries always aspire to develop new economic activities by maximizing local content. However, some countries have realized that this motive acts as a deterrent to active participation from experienced international players that would, in the short term, wish to utilize their existing capacities to leverage economies of scale in order to drive costs down








further. Therefore, emerging countries such as Brazil, Chile and Mexico have either minimal or no local content rules in their policies in the short term. Other countries, such as India, are mindful that high levels of local value-add need to be built up over the medium to long term.

Implementation vehicles

Different GCC countries have identified different implementation agencies – in some cases, multiple agencies – to execute their

solar development strategies (see Figure 4). The agencies range from dedicated implementing agencies (MASDAR, K.A. CARE) to state-owned utility players (DEWA) and research institutes (KISR).

Figure 4: Implementation vehicles for solar-market development in the GCC

GCC	...	Key Implementing Agencies
 Saudi Arabia	K.A. CARE	Special vehicle to implement the national renewable-energy programs
	SEC	Utility provider
	Saudi Aramco	Oil & gas player
 UAE – Dubai	DEWA	Public sector utility provider
 UAE – Abu Dhabi	Masdar	SPV to invest in renewable-energy projects
 Oman	PAEW	Public sector utility provider
 Kuwait	KISR	Government-supported science and research institute
	PTB	SPV for implementing PPP programs
 Qatar	Qatar Foudnation	Semi-private, government-supported organization
	Kahramaa	Public sector utility provider
	QSE	Government-supported local manufacturing player
 Bahrain	EWA	Public sector utility provider
	BAPCO	Oil & gas player

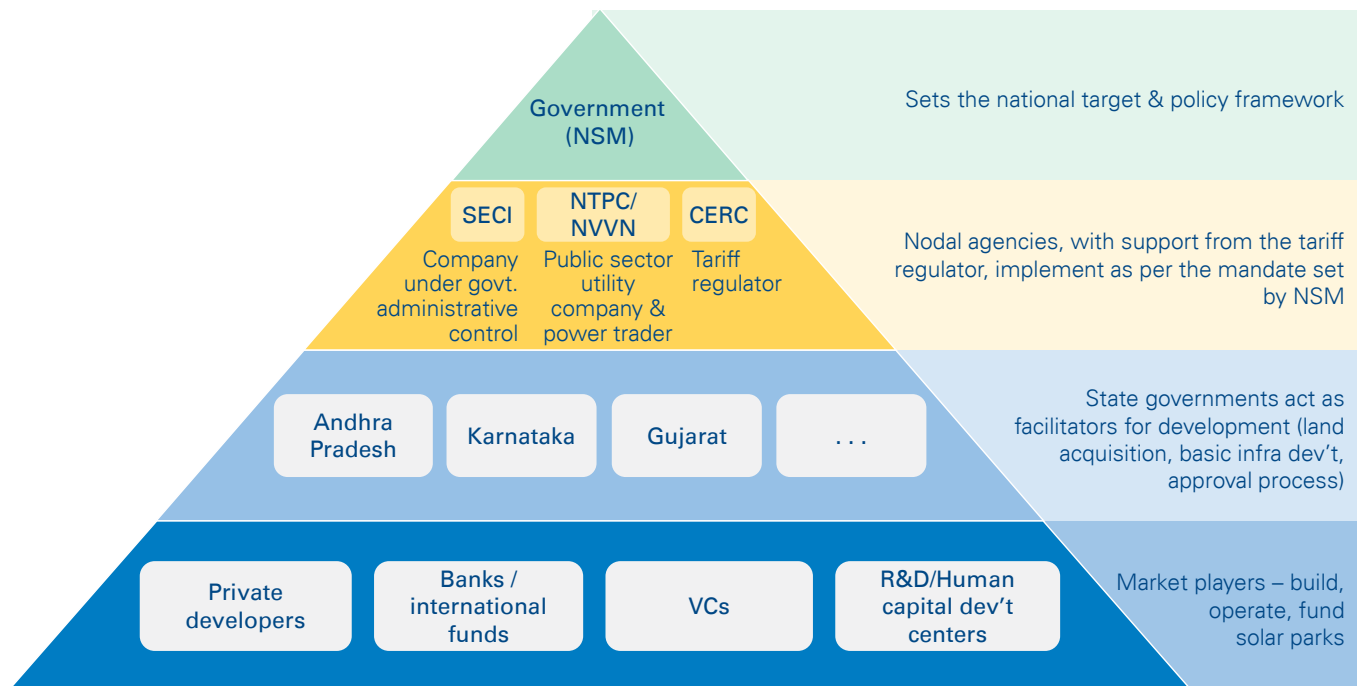
Source: Public Information

Creating an effective implementation agency is critical. Besides being given a clear mandate and equipped with the right capabilities, the government-backed agency must have the influence to drive national stakeholders to overcome implementation challenges. A case in point is India's National Solar Mission, in which the government realized that developing a nationwide market for solar energy could happen only with concerted effort from all the key stakeholders. (see Figure 5). These challenges are further intensified if the country has an ambitious target to achieve.

Such has been the case with Saudi Arabia's K.A. CARE. K.A. CARE, a quasi-government agency dedicated to implementing alternative energy, has faced substantial stakeholder

management issues since its onset in 2010. Since K.A. CARE was created through the issue of a Royal Decree, it does not necessarily have direct influence over the Ministry of Finance and other important stakeholders to drive them towards a common goal. Its mandate does not specify the manner of collaboration with existing stakeholders that have influence over matters on energy and utilities. For example, K.A. CARE's role of managing solar project tenders, evaluating proposals and issuing PPAs overlaps with SEC's current role, as the principal buyer, Saudi Aramco, the national oil & gas company, is involved in developing and managing solar power projects in the KSA. K.A. CARE's implementation model does not specify how Saudi Aramco would participate during the deployment of the solar projects.

Figure 5: India's National Solar Mission: An example of a top-down national implementation system



Source: Arthur D. Little

Industrial Strategy

Development of a robust national solar strategy must be articulated in terms of the target value-chain segments the GCC wishes to develop (e.g. power generation, components manufacturing, polysilicon manufacturing, roof-tops installations), the technology pathways it wants to follow (PV versus CSP, c-Si versus thin-film, parabolic trough versus central tower), the deployment model (utility scale, distributed generation, co-generation), and a clear investment and policy roadmap. The strategy must also delineate other economic development objectives, such as employment generation and R&D, as well as the implementation plan by which the nation wishes to achieve these objectives

In the GCC, a majority of countries are yet to develop clear visions for developing the domestic and regional solar sector industry chain necessary to support local value-add from the solar-energy investments. Saudi Arabia, the most important market, has yet to come out with its strategy to achieve its ambitious targets. A draft document of a competitive procurement process (CPP) by K.A. CARE gave the industry a preview of the strategy, but fell short of expectations and is yet to be finalized.

However, analyzing the solar-energy initiatives of certain GCC nations throws light on the underlying strategic themes of

the region. For example, MASDAR's effort to diversify in all three mainstream solar technologies – CSP, c-Si and thin films – to reduce technology risks¹ indicates the hesitation of the region to bet on a single technology as yet. Qatar's foray into manufacturing² confirms the suitability of the GCC to develop a manufacturing sector.

Importance of Private Sector Participation

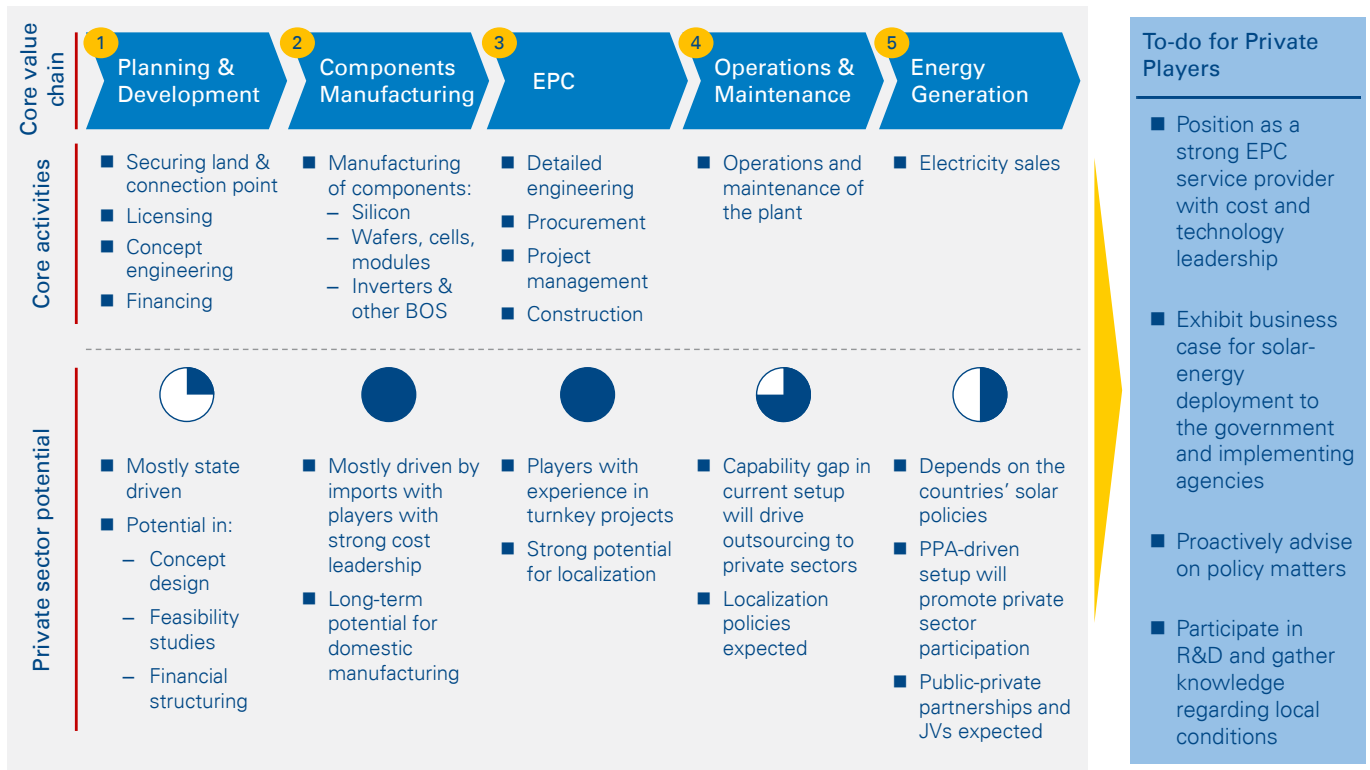
The importance of private sector participation in solar energy cannot be ignored. The private sector is expected to contribute to the manufacturing and EPC space in at least the short to medium term (see Figure 6). In the long run, the GCC will throw opportunities in the energy generation value chain to the private sector as well. In fact, DEWA's awarding of a 100 MW IPP model solar project to ACWA Power is a major development towards that. However, it should be noted that the long-term feasibility of a thriving private sector requires high and sustainable regional demand, which can only emerge if Saudi Arabia is able to foster its own solar-energy programs. The implicit subsidy in the energy and electricity sector is a major deterrent to this.³ With global energy prices going below KSA's break-even point, the government is facing higher pressure to reduce these subsidies. This may mean an increase in electricity prices and a more attractive business case for private players to enter the solar market.

¹ Sham 1 is a 100 MW Parabolic Trough CSP plant while Noor 1 will have 80% TF and 20% c-Si modules in its 100 MW PV solar farm

² Qatar Foundation (QF) arm, has invested in an 8000 tons p.a. poly-silicon manufacturing plant; Qatar Solar Energy (QES) has established a 300 MW PV module production facility.

³ Please refer to ADL's view point on energy subsidy reforms in the Middle East for a detailed discussion on this subject. [adlittle.com/Reforming the energy subsidy systems in the Middle East](http://adlittle.com/Reforming%20the%20energy%20subsidy%20systems%20in%20the%20Middle%20East)

Figure 6: Strong private sector participation in manufacturing and EPC is expected in the short to medium term. Solar-energy policies will drive energy generation opportunities



Source: Arthur D. Little Analysis

Research & Development, Human Capital Development and Investment Funding

The development of a long term sustainable energy ecosystem requires strong R&D support and robust human capital development. In the immediate term, R&D in the GCC should focus on obtaining accurate local data on the solar-energy potential to support the developers in deploying cost-efficient and reliable projects, developing solar-energy technologies, design and construction techniques suited to the harsh operating conditions of the Gulf region, and sponsoring innovation in solar technologies for thermal applications (e.g. desalination, district cooling, enhanced oil recovery). Such initiatives are already being taken up in the GCC, such as the Renewable Resource Atlas by K.A. CARE, which provides pre-project data on solar patterns, dust levels and other meteorological data, which will provide optimal information to developers and investors during project planning.

Strategic partnerships between international communities and local R&D centers are yet another method for propelling technology development. Existing R&D centers in the GCC,

such as Solar & Photovoltaics Engineering Research Center, Masdar (Masdar institute of Science and Technology) and KISR (Energy & Building Research Center) have all been active in conducting R&D activities in the renewable energy sector and will be an integral part of progress going forward.

Furthermore, tapping into the venture-capital investments side is an important route to accelerating technology deployment in the GCC. Towards this, initiatives such as Saudi Aramco Ventures and Masdar CleanTech Fund will play an important role in the future of the GCC's solar development.

However, international private sector venture capital (e.g. Kleiner, Perkins Claufield and Byers), private equity (e.g. Riverstone) and infrastructure funds (e.g. Maquarie Infrastructure), which have been instrumental in driving the boundaries of innovation and growth in global renewable energy markets, have been conspicuous in their absence in the GCC and wider MENA region. Special government investment funds to support private sector investment, such as the UK's Climate Change Capital and Green Investment Bank, have yet to be put into practice.

Conclusion – Renewing the Lost Momentum

In summary, the GCC wields indisputable potential to be a pivotal growth engine of the global solar energy sector. This reality has been recognised by the bold ambitions that have been set for the industry by various GCC governments.

However, the ambitions have not been supported by effective actions. In particular, Kingdom of Saudi Arabia has been guiltier than others in this regard (see Figure 7).

Figure 7: Saudi Arabia – performance score card

E.g. Saudi Arabia	What has been achieved?	What needs to be achieved?
Ambition Building	<ul style="list-style-type: none"> ■ Ambition of deploying ~40 GW by 2040 announced in 2012; target date has been postponed to 2040 ■ In 2013, K.A. CARE announced short-term target of deploying ~ 7 GW in three years 	<ul style="list-style-type: none"> ■ Communication of the strategy and implementation framework to achieve the ambitious targets
Strategy Development	<ul style="list-style-type: none"> ■ In 2013, draft document of K.A. CARE's Competitive Procurement Process (CPP) was circulated for public feedback 	<ul style="list-style-type: none"> ■ Finalizing the CPP document – which will provide details of the technology, scale and milestones of solar energy development in the KSA
Implementation Agency Identification	<ul style="list-style-type: none"> ■ K.A. CARE has been mandated by the Royal Order to lead the RE market development 	<ul style="list-style-type: none"> ■ Articulation of clear roles and responsibilities of the key players (SEC, Aramco, K.A. CARE) ■ Defining the role of ECRA
Policy Environment Creation	<ul style="list-style-type: none"> ■ Limited policies to develop the solar energy market have been announced by K.A. CARE to date 	<ul style="list-style-type: none"> ■ Finalizing the policy requirements related to: <ul style="list-style-type: none"> – Power purchase agreements – Financing – Saudization – Private sector involvement – Local content generation
R&D/Human Capital Development	<ul style="list-style-type: none"> ■ Creation of solar-energy data collection programs ■ Presence of R&D centers such as SPERC (KAUCST) and KACST ■ VC investments by Aramco Ventures 	<ul style="list-style-type: none"> ■ Fostering international players' participation in R&D ■ Implementation of cluster development ■ Leveraging VC investments for local development

Source: Arthur D. Little Analysis

GCC and in particular Saudi Arabia could renew this lost momentum by:

1. Clarifying the role of each stakeholder in the solar energy ecosystem: At present, there is confusion regarding the role of various utility players, oil and gas companies and SPVs regarding their respective mandate to participate in this sector. Clear responsibilities need to be outlined among these stakeholders to leverage individual capabilities and ensure implementation efficiency.
2. Developing policies to foster industry participation: Taking effective policy initiatives applied by emerging markets successfully, the GCC should usher in new policies that foster industry participation without resorting to costly subsidies. These should range from provisioning of project

financing support, disbursement of competitive PPAs to application of less stringent local content rules.

3. Encouraging large scale capability building: A regional level R&D initiatives need to be undertaken which focuses on local technical issues and promote innovation in locally relevant applications. Similar focus needs to be made to prepare the human capital for new technologies in renewable energy. Venture capital funds, which are pivotal in fast-tracking new technology development, need to be tapped pro-actively in the region.

Additionally, it is imperative for solar energy to emerge as a key focus area in government narrative and communication. For any sector to emerge, political will and government backing is essential. Re-energizing the renewable energy narrative will give a new lease of life to the solar energy industry in the GCC.

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