Renewables in GCC countries: the next frontier?

Marianne Haug

More than 20,000 people attended the 7th World Future Energy Summit in Abu Dhabi earlier this year. The buzz and excitement is understandable in view of the many initiatives announced. Are national and international investors, contractors, technology providers, and suppliers ready to scale up renewables in GCC countries? Are they ready to shoulder the learning and localization challenges? As most renewable technologies require subsidies for years to come, will the GCC policy makers deliver the expected markets AND incentives? The article briefly summarizes the GCC countries' initiatives. It explores the challenge of sharing equitably the costs and risks of renewables technology development, market uptake, and local industrial development, with industry participants. The GCC countries may find that long-term commitment, flexibility, and localization of policies may offer cost effective or efficient solutions to this dilemma.

Existing targets and policies

Among the most noteworthy initiatives are those in Saudi Arabia (KSA). The Kingdom established the King Abdullah City for Atomic and Renewable Energy (K.A.CARE) in 2010 to encourage innovation, the use of alternative energy technologies for power generation and water desalination, and to build a world-class alternative energy sector. The K.A.CARE programme set a 54 GW renewable energy target – of which 41 GW is to come from solar (16 GW from PV and 25 GW from Concentrated Solar Power (CSP)), 9 GW from wind, 3 GW from waste-to-energy, and 1 GW from geothermal – to generate 23–30 per cent of the Kingdom's electricity through renewable resources by 2032. A 2013 KSA White Paper sketches the framework for its implementation. Earlier this year, K.A.CARE presented the Renewable Resource Atlas for Saudi Arabia as part of its Renewable Resource Monitoring and Mapping Program (RRMM). K.A.CARE established the government-backed Sustainable Energy Procurement Company (SEPC) to handle the tendering for renewables projects. An introductory, competitive procurement round of 5–7 wind and solar Independent Power Producers, for 500–800 MW on pre-identified sites, is expected later this year. In parallel, the Saudi Electricity Company (SEC) invited Expressions of Interest (EOI) to build, own, and operate a 550 MW Integrated Solar Combined Cycle (ISCC) plant with a 20–30 MW parabolic trough CSP booster.

'WHILE THE KSA HAS THE MOST AMBITIOUS RENEWABLE DEVELOPMENT PLANS, THE UAE HAVE BEEN AT THE FOREFRONT OF RENEWABLES INVESTMENT IN THE GULF TO DATE.'

R&D programmes for renewable technologies have also been initiated by other KSA scientific centres, in collaboration with top international research centres, not just by K.A.CARE and the King Abdullah University of Science and Technology (KAUST). Localization and value chain development from human capacity building, education and training, technology development, R&D to industrial investment, and job creation is at the core of the KSA effort in the non-hydrocarbon sector. Completed PV installations in the KSA include, for example, the KAUST solar rooftop (2MW), the King Abdullah Petroleum Studies and Research Center (KAPSARC) Riyadh 3.5 MW PV plan, the 17 MW Princess Nora University solar water heating plant, and a polysilicon manufacturing facility at Jubail II. Solar desalination plants, off-grid village solar networks, street lighting and control panels powered by PV, and the 100 MW PV Makkah project are in the planning stage. Saudi companies, such as ACWA Power have been active internationally as developers and EPCs (Engineering, Project management and Construction) for CSP projects in Morocco and South Africa; and Sun & Life, now TAQNIA Solar has acquired Flabeg, the German high-technology glass and mirror provider. SunEdison, Saudi Arabia's Public Investment Fund (PIF), and Sanibel Investments are jointly financing a feasibility study to establish a 3 GW polysilicon-to-modules manufacturing facility in Wa'ad Al Shammel.

While the KSA has the most ambitious renewable development plans, the United Arab Emirates (UAE) have been at the forefront of renewables investment in the Gulf to date. Abu Dhabi adopted a 7 per cent target for installed electricity capacity equivalent to 1.5 GW by 2020. Abu Dhabi hosts IRENA, the International Agency for Renewable Energy with 160 member states, and has used Masdar, a subsidiary of the state-owned Mubadala Development Company and the Abu Dhabi Fund for Development (ADFD), to fund and develop renewable energy, at home and globally. Masdar's initiatives include the Masdar Institute of Science and Technology, Masdar Power (that invests in utility scale renewable power projects), and Masdar City, the sustainable city powered by renewable energy with a 10 MW PV installation. Masdar Power, in a Joint Venture with TOTAL and

Abengoa, completed the Shams 1 CSP 100 MW plant in Madinat Zayed and sponsors the 30 MW wind installation at Sir Bani Yas. Overseas, Masdar Power has invested in tower and parabolic trough CSP power plants in Spain, and a thin film PV modules production facility in Germany. The 100 MW Noor 1 PV plant, Taqa's 100 MW waste-to-energy plant, and a 500 MW solar rooftop programme are in the planning stage. Dubai plans to generate 5 per cent of its power from renewables by 2030. A 13 MW thin film PV plant is in operation, and bids for a 100 MW extension will be tendered later this year by the Dubai Water and Electricity Authority (DEWA) for an Independent Power Producer (IPP) with a 49 per cent private sector stake. More ambitious are plans for a floating solar island project (1 MW) and the Mohammed bin Rashed Solar Park of 1 GW by 2030.

'SOLAR IRRADIATION LEVELS ARE SOME OF THE BEST IN THE WORLD.'

Kuwait announced a target of 1 per cent of electricity generation to come from renewable sources by 2015, 10 per cent by 2020 and 15 per cent by 2030 (equivalent to 2 GW). The Kuwait Institute for Scientific Research (KISR) has been supervising research on solar energy systems, drafted the renewable energy strategic plan to 2030, and launched the bidding process for the 70 MW Shagaya Renewable Energy Complex. This (initial) project of 10 MW wind, 10 MW PV, and 50 MW thermal energy with 10 hour energy storage has been planned to assess the performance of different renewable technologies under Kuwaiti climatic conditions. Preparation for a 280 MW Integrated Solar Combined Cycle (ISCC) plant with a 60 MW solar booster field at Al Abdaliya continues.

Oman has set itself a target of 10 per cent of its electricity to come from renewables by 2020. A 6 MW PV demonstration plant and Glasspoint's 7 MW CSP plant for Enhanced Oil Recovery (EOR) have been completed, and Power Purchase Agreements for a rural solar PV project in the Al Mazyunah State has been signed by the Omani Rural Areas Electricity Company (RAECO). Further initiatives await the completion of an overall strategy for renewable generation, which is expected later this year. Qatar expects to generate at least 2 per cent (640 MW) of electricity from solar resources by 2020. One of the immediate projects is a group of solar installations to help cool and power the stadium and facilities for the FIFA World Cup to be held in Qatar in 2022. More ambitious programmes to develop Qatar as a solar industry leader – to build a 3.5 GW ISCC plant with 500 MW of CSP and a 1.8 GW PV plant – have been under discussion. Bahrain announced a 5 per cent renewable energy target, to be achieved by 2020 with a focus on mature technologies. Wind turbines are installed at the Bahrain World Trade Center and projects such as a 25 MW waste-to-energy plant are in the planning stage.

World-class solar resources… and a strong case

The KSA White Paper, the academic literature, and energy analysts all agree on the strategic and economic case for renewable energy in GCC countries. Solar irradiation levels are some of the best in the world. Space is no constraint for utility-scale solar PV or CSP installations, and both on-grid and off-grid, decentralized installations for power, cooling, and water desalination are needed. Robust population, economic, and industrial growth increase electricity demand, which the IEA estimates will grow at 2.5–3 per cent a year in the next two decades. If this electricity is generated using oil and gas, this will limit exports of hydrocarbons, reduce export revenues at international oil and gas prices, and lead to early resource depletion.

The GCC countries are among the highest per capita carbon emitters in the world. Thus, adding renewable technologies to the energy mix will bring environmental benefits, or positive externalities. Last, but not least, the GCC economies have considerable public and private expertise in the funding, building, and operation of energy and construction projects. Bringing this expertise to bear on the emerging renewable sector can create jobs and new industries locally, while extending the role of GCC countries as leading energy producers and exporters.

A difficult business case

The business case, however, is more difficult to make: first, the highly subsidized electricity and water tariffs, together with a production cost based on domestic fossil fuel prices, fail to give price signals to consumers and producers, and burden government budgets. Second, the current levelized cost of electricity (LCOE) using solar is estimated by Bloomberg/BNEF at 9–24 US cents/kWh, with a cost of 6–14 US cents/kWh for wind and waste-to-energy, a multiple of the financial cost using conventional fuels. As funding will have to be guaranteed under 20 year Power Purchasing Agreements or other long-term incentive schemes, the renewables diversification and industrialization strategy will inevitably add a financial burden on the treasuries and public/private funding resources of the GCC economies – even if some international equity and non-recourse loan financing can be mobilized. Third, the adaptation of solar technologies to the climatic conditions of the GCC countries is still a work in progress. Dust, humidity, and extreme temperature variations will impact

efficiency levels, requiring further R&D and location-specific adaptation with as yet unknown financial costs.

Can IPPs deliver?

The GCC countries have a long (and successful) tradition of public investment in the power and water sector, national and international public/private partnerships, and joint ventures. Thus, competitive tendering has been the preferred process to source renewable expertise and award contracts for Independent Power Producers (IPP) with agreed off-take and remuneration under Power Purchase Agreements. The K.A.CARE White Paper envisages substantial local content requirements to localize services and manufacturing, special R&D and training surcharges, equity contributions, and project-based loan financing for the winning tenders.

Observers and potential investors question whether such a competitive tendering process is a sufficient policy framework to scale up an industry by the proposed factor. They call for electricity market liberalization and renewable policy frameworks similar to the support policies in the USA, Europe, or Japan. Caution is called for here, at this early stage of deployment. Policy frameworks for renewables vary widely among countries; they grew out of the fiscal and regulatory traditions of each country and are subject to change, often according to budgetary limitations and political changes. Localization pertains not just to (a) adapting technologies to local conditions, or (b) developing jobs, technologies, and skills along the entire value chain, but (c) calls for policies that are anchored in local institutions, the national public/private business environment, and the industry structure of the technology in question.

Others wonder whether Independent Power Producers (IPPs) will deliver competitive technologies AND the local value chain development that is an integral part of the diversification strategy of GCC countries. Will technologies chosen now under 20 year Power Purchase Agreements become obsolete, and ultimately rather costly? Will manufacturing facilities become stranded assets within a few years as lower-cost solar technologies are developed elsewhere? Indeed, the challenge of the GCC countries' renewable strategy lies NOT ONLY in the details and sequencing of tendering processes and policies but (a) in the nature of the still emerging and fragile renewables industry structure, and (b) the early development and deployment stage of solar technologies. The following three examples of the role of IPPs in emerging technologies and the evolving market structure of PV and CSP illustrate these points.

Renewables industry too uncertain for IPPs?

Typical localization and transfer of technology strategies rely on established national and international firms, functioning markets, and relatively mature technologies. None of these conditions exists in the potential deployment of renewables technologies in the Gulf. Energy companies, utilities, conventional power plant EPCs, and equipment suppliers have entered the renewables space – left, re-entered, and often left again. They are themselves still in a learning phase with limited deployment experience and appetite for major equity, risk, and guarantee commitments. Few solar developers or technology providers have the financial strength, international experience, or long-range commitment to act as Independent Power Producers. As incentives for renewables have been, or will be, further curtailed in Europe and the USA, and the Japanese, Chinese, and Indian markets remain difficult to penetrate, the international renewable industry is looking at the GCC countries as being the market that can bankroll further deployment. At best, this is a joint learning process.

'… THE ADAPTATION OF SOLAR TECHNOLOGIES TO THE CLIMATIC CONDITIONS OF THE GCC COUNTRIES IS STILL A WORK IN PROGRESS.'

Challenges facing the solar PV industry

The GCC countries plan to install more than 20 GW of solar PV by 2032. Worldwide installed capacity reached 135 GW by the end of 2013 and is estimated to reach 1000 GW by 2030. Thus, GCC plans are only a fraction of the present and anticipated global market (IEA, 2013). The global PV manufacturing industry is in the middle of a consolidation phase with high-cost producers and developers exiting. After overcapacities are absorbed, the industry expects further technology push and cost reduction after 2015. Thus, the localization of competitive EPC and O&M services for PV installations is an obvious and achievable first priority. The development of a niche market for PV panels specific to the climatic conditions in the Middle East would require substantial R&D commitments, in competition with established panel manufacturers. In contrast, the localization of an internationally competitive PV manufacturing sector is a more costly and risky endeavour.

The potential of CSP technology

While the Gulf States' share in the present and future global PV market is relatively small, the 25 GW planned KSA investment in CSP with storage could account for as much as 50 per cent of the estimated global CSP market by 2030, according to IEA and CSP Today figures. Tower, parabolic trough, linear Fresnel technologies for

power, industrial steam and ISCC booster production have been demonstrated and are in commercial operation, inter alia, in the USA, Europe, Morocco, and India. However, global, capacity is less than 3.5 GW. The KSA investment in CSP will be crucial for testing the comparative advantages of the competing CSP technologies, driving down their cost, scaling up the most promising technologies, and taking advantage of local expertise. This is a dynamic process that requires flexibility, but it offers global technology and market leadership along the entire value chain However, success is not a forgone conclusion; more rapid, cost competitive development of PV and storage technologies may ultimately limit the future, global importance of CSP despite its dispatchability.

Conclusion

Currently standing at a total of 4 per cent of the world's electricity generation, power from solar, wind, waste-to-energy, and geothermal resources is still a vision. The technologies need to be developed further, adapted to local conditions, costs drastically reduced, and industries scaled up. Experience shows that this process is messy and lasts for decades, with stranded assets and companies failing until dominant, internationally competitive technologies and mature companies emerge, and incentive schemes fade away. The decision of GCC countries, in particular the KSA, to join the USA, Europe, Japan, and China in financing and supporting the R&D, learning, and scaling-up process for renewable electricity is both economically justified and welcome. It requires long-term commitment and flexibility to adjust policies and partners to changing circumstance. Last, but not least, it requires a hard-nosed and realistic assessment of what it takes and costs to build a world-class alternative energy sector – no hypes, no green-washing.