THE FASTEST PATH TO IMPLEMENT RENEWABLES: DISTRIBUTED STORAGE

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Huge arrays of solar rooftop panels in the Middle East

Summary

Imagine an Arab country that has successfully reached its renewable energy targets by 2020. Then, all of a sudden, during a hot summer night when stable energy supply is essential to keep humidity and temperatures within limits, city lights go out and air conditioning in residential buildings start to falter. That might happen in some areas when this country, due to pressure on its governmental budgets for energy and water, doesn't pay enough attention to distributed energy storage, a critical yet affordable tool to secure a smooth transition from fossil fuels to renewable energy sources.

'During super storm Sandy in 2012, many houses in New York and New Jersey that had PV panels went dark due to lack of batteries.'

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DISTRIBUTED STORAGE

Recently, Middle Eastern countries are embarking on a sustainable energy path. Saudi Arabia is taking the lead with ambitious targets for renewable energy generation. The United Arab Emirates (UAE) is also following a strategy of increasing renewable energy in its energy mix. Recently, both Dubai and Abu Dhabi have launched tenders for two large-scale solar plants, each 100 Megawatts in size, while Abu Dhabi will submit a recommendation for a solar rooftop panel programme for 500 MW this year. According to experts, it's not a matter of 'if' but 'when' ground mounted solar plants and solar rooftop panels will start to penetrate Middle Eastern consumer markets.

Depletion of fossil resources and increased environmental awareness are lesser reasons, though. As former US president Bill Clinton said, 'it's the economy, stupid'. This century, levelised costs – i.e. the costs of production, operation and maintenance - for renewable energy have been steadily declining, setting them on par with the generation costs based on fossil fuels. Moreover, during the last eighteen months, PV panels have hit rock-bottom prices; making grid parity for some USA states and EU countries to come within reach (i.e. for electricity consumers pay just as much for renewables as for fossil fuel based electrical energy supplies).

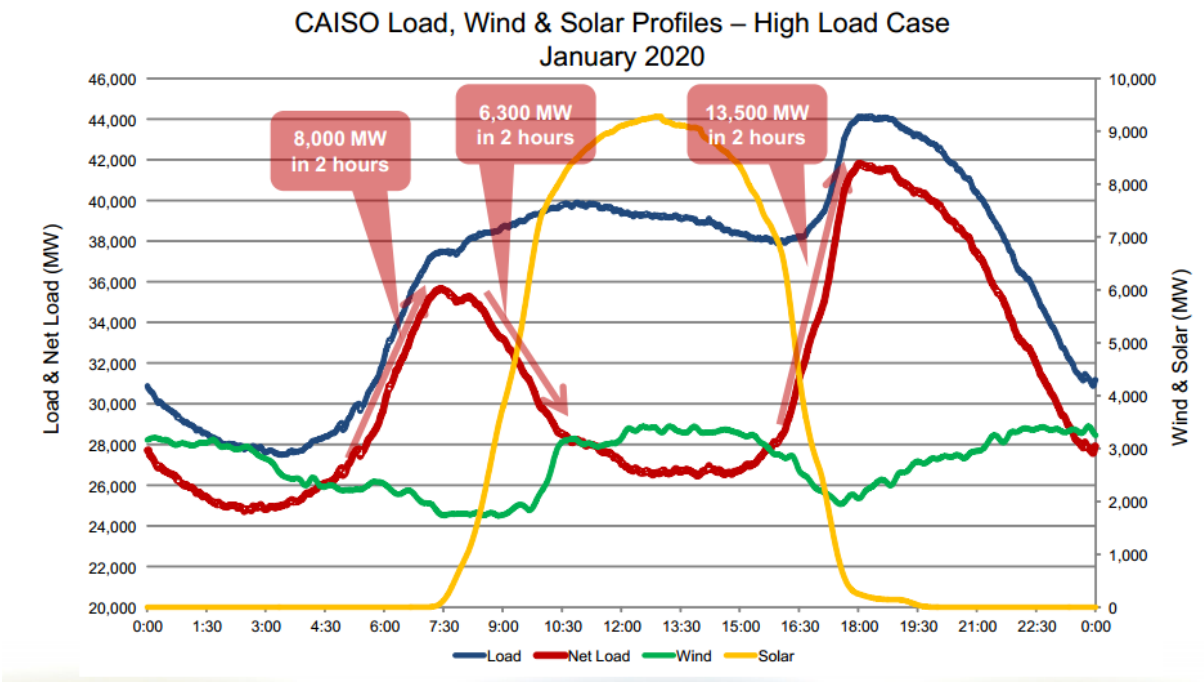
THE EDGE OF THE GRID

These developments will not only change the energy mix but they'll also create tremendous opportunities for trade and industry and Middle Eastern governments alike. When consumer prices of PV panels drop even further, solar power may soon undercut the costs of wind energy installations, thereby becoming the major force in energy transition worldwide.

Double-digit growth of photovoltaic energy - year after year – is just the beginning. Electricity demand in the Middle East is expected to rise by 75 percent by 2020, thus placing governments and utilities for a dilemma: how to secure a safe, reliable network when pressure on the grid increases whilst, at the same time, more energy at the customer side of the meter is generated?

Without appropriate backup, solar energy generation may cause complex integration issues for utilities: they fail to optimise the grid, leading to lower utilisation and higher network supplied electricity prices for all customers In turn, these customers also start to purchase independent solar panels, thus leading to a further reduction in network optimisation and utilisation by utilities. This tendency is already emerging in several EU countries with significant levels of solar power penetration in their networks. Governments in Germany and California have recently drawn up legislation for distributed storage (see box).

The camel and elephant



When a significant amount of solar electricity is fed into the grid, it can take sizeable portions of mid-day peak load off the grid. Traditional sources (such as fossil and nuclear) do not work well with such fluctuations… Distributed storage is the answer to limit the impact on the system from variations of demand and extend the availability of solar energy.

DISTRIBUTED STORAGE

Fortunately there are solutions to secure a safe and reliable network while simultaneously keeping track with renewable energy objectives and the vision of smart self-sufficient cities Middle Eastern countries start to embrace. The answer is energy storage in batteries close to load centres, in effect decoupling supply and demand on the grid. Although present-day costs per kilowatt-hour of distributed storage still outweigh those of fossil fuel generation, experts expect they'll drop rapidly, making battery storage competitive with gas-fired plants within eighteen months. Options of storage depend on the chosen location, application and size.

Distributed storage has several key advantages, as well as for the grid as behind the meter. By using this kind of storage, utilities in the Middle East have three additional sources of revenue. The first and most obvious is on capacity: energy storage will reduce demand charges, monetising its capacity value. Far more important though, is its size, low up-front investment and scalability. Storage units can easily be placed in those areas of the grid that require the most attention but where traditional solutions are either too expensive or impossible to install.

Last but not least, modularity of distributed energy storage provides an excellent opportunity for governments and utilities in the Middle East alike to grow in par with the rollout of large-scale solar rooftop programs without placing too much pressure on already constrained budgets. This considered growth facilitates the time to develop or facilitate business models in an emerging new

landscape in which utilities are about to deliver services for distributed energy storage while customers provide intermittent solar electricity to the grid.

LEAPFROGGING

To highlight the risks of the emerging landscape without appropriate preparation, one can look to the change in the transportation and telecommunications industry. At the dawn of the industrial age in Europe as well as in the US, trains between cities (like transmission lines) and inside these cities (like distribution feeders) were sole means of transport. With the advent of gasoline-driven automobiles their heydays were over. Within a generation, cars and trucks, not so rigid to schedules, transformed our mobility. Half a century later, though, the growth of distributed transportation (vehicles) backfired. While employees were coming from ever-farther distances, highways within cities weren't made bigger in time. Consequently, the western world is dealing with chronic traffic jams, over-utilised infrastructure and complex planning issues as a result.

Fortunately, electric networks have the option to avoid similar congestion related issues and the resulting curtailments, i.e. fortifying the grid with strategically located distributed storage. Just as the development of mobile phones in Africa has allowed rural communities access to a plethora of services, Middle Eastern utilities have the possibility to leapfrog their way into a sustainable future, skipping obsolete stages and bypass, in many cases, the need to expand the grid or defer their construction or upgrade.

Regulations ahead

California

The State of California has adopted a comprehensive legislative package for energy storage, to be effective this year. By 2020, three electricity companies and energy service providers in California must store 1325 MW while service providers have to do the same with at least one percent of their annual peak load by 2016. The law paves the way for mechanisms, monitoring and evaluating energy storage. Depending on their use and application in the value chain and without specifying capacity that directly impacts storage costs, more than twenty types can be chosen.

Until recently, there was no clear way to evaluate applications and results. Therefore, DNV GL Energy has launched some innovative analytics tools tailored to utilities' growing need to assess storage. These tools shows if, when, where and how large distributed energy storage systems have to be in order to reach the optimum return on investment. The California Public Utility Commission is already using one of these tools, ES-GRID. According to Greentech media, the 81-page legislation is considered as 'a bold first step into untested waters of combining new energy storage technologies, regulatory structures and economic models into a working whole'.

A prerequisite for implementing distributed storage is awareness. Up to now, governments and utilities in the Middle East are unprepared for storage as a solution or mix in future power system designs. Geographic and geological conditions are favourable. In the medium term, large amounts of energy can be stored as compressed air in depleted gas caverns, competing with and acting like gas turbines. But just like large scale pumped hydro this technology requires huge investments and years to prepare and deploy. Until then, distributed storage in batteries is, by far, the smartest and most sustainable way to mitigate the adverse impacts of electricity generated from decentralised intermittent sources. It will give utilities the ability to reduce peak demand and provide for spinning reserve, thereby safeguarding the reliability of critical infrastructure that may erode flexibility on the grid (in case nothing is done).

COMMUNITY STORAGE

In fact, while solar rooftop panels are expected to provide for five to ten percent of renewable sources by 2020, distributed energy storage is the other side of the coin to realise smart cities some Middle Eastern countries are aiming for. In theory the combined effects of energy storage and distributed renewable generation could reduce some of the investment needs in future transmission lines. In fact, it's all about stepping into smart combinations, selecting secure operations and appropriate energy management for a greener and more sustainable society.

In an ideal situation, systems and procedures between customers and utilities will become intertwined. Distributed energy units with smart controls, close to load centres, provide flexibility as well as back-up and energy savings for the benefit of communities. Storage, depending on type and size, can provide for energy for many hours. In case of an emerging outage caused by a major weather event, distributed units may recover the grid in such a way that consumers won't be exposed to a disruption in service. It's time right now to monetise 'plug 'n play' solutions for energy storage and renewable energy sources to the benefit of all communities in the Middle East.

Regulations ahead

Germany

Though the EU is lagging behind the US in applications, the market for energy storage over there is changing rapidly. Germany may take the lead, just as it did with the feed-in-tariff system seven years ago. Growth of rooftop solar systems is staggering; now the country has scaled down its subsidy support levels recently. The market is starting to move away from large investors and pure feed-in-tariffs towards more self-consumption driven regulatory frameworks. A prime example is the relatively new solar storage subsidy program of the Bundesrepublik, covering up to thirty percent of the cost for residential storage equipment when it's added to a new PV system.

Under influence of the boom in rooftop solar panels, large European utilities are starting to alter their corporate policies. Because of a massive erosion of wholesale prices, huge problems for many in the EU have arisen. Some of them will therefore refocus from present-day large-scale solutions to more 'capital light' versions in which they position themselves as a retail provider and a system integrator for solar prosumers (producing consumers).

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