Dubai Energy Outlook 2020

Once again, Dubai has beaten the odds. This time it’s by winning the right to host the World Expo in 2020, becoming the first Middle Eastern city to win a bid for this 162-year old event. This will have wide ranging implications for Dubai and its 2.2 million inhabitants.

For one, it means they need to prepare to host up to 25 million visitors; a twelve fold increase in the city’s population. It also means Dubai has to build a vast complex able to welcome delegates and visitors from 182 countries. The futuristic-looking exhibition site of the Expo is expected to stretch over 438 Hectares, equivalent to more than 900 football pitches. How Dubai will power this ‘mega event’ and the infrastructure associated with it becomes a paramount question.

Energy demand growth

Even before the Expo was secured, Dubai was already on the path for rapid growth. Earlier in 2013, Sheikh Mohammed Bin Rashid Al Maktoum, the Ruler of Dubai, announced that the emirate will target 20 million visitors by 2020, almost double the 11 million visitors that graced the streets of Dubai in 2012.

Accommodating this many visitors will require a significant expansion in infrastructure. Indeed, Dubai has earmarked an estimated $7 billion in infrastructure spending as part of its overall capital investment program worth $20 billion over the next seven years. This will result in a corresponding jump in electricity consumption.

According to Access’ calculations, the expansion of Dubai’s economic activity over the next seven years will result in a growth in electricity demand of 4-6% per annum. This means that by 2020 Dubai’s electricity consumption will reach 9.6 GW, a 50% jump from 2012 levels.

Although this increase may appear high, it is still modest compared to the past 10-year period when demand grew by 224% (see Table 1).

Dubai’s Electricity and Water Authority (DEWA) has already increased its annual budget for 2014 to $5.6 billion, up 49% from 2013. Of this amount, $1.9 billion is expected be invested in new projects in areas of clean coal, solar and smart grids. There will also be additional investments made in the years ahead to increase power generation capacity, improve power transmission and distribution networks, and expand smart meters across the 600,000 residential units in Dubai.

<table>
<thead>
<tr>
<th>Year</th>
<th>Dubai Electricity Demand (GW)</th>
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<tbody>
<tr>
<td>2010</td>
<td>1.0</td>
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<tr>
<td>2011</td>
<td>1.5</td>
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<td>2012</td>
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<td>2020</td>
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Source: DEWA
**Capacity expansion**

Fortunately for Dubai, DEWA has already built a very strong power generation network. According to official figures, Dubai’s total power generation capacity stands at 9.65 GW. This gives the emirate a spare capacity of approximately 3 GW over Dubai’s 2013 peak demand levels of 6.67 GW (see Table 2). This implied 31% spare capacity ratio is among the highest in the world.

To satisfy the projected 3 GW growth in peak demand by 2020, DEWA will need to bring online an additional 1.15 GW of new capacity in order to maintain a minimum spare capacity of 11%. This capacity expansion would be equivalent to an increase of 13% from current levels.

Access anticipates that some 600 MW of existing capacity will be decommissioned over the next seven years and replaced with more efficient power generation units. In total, there will be some 1.65 GW of fresh capacity by 2020. This involves a capital investment of approximately $2 billion in power generation capacity, notwithstanding the added cost of modernizing the transportation, distribution and metering networks. If however DEWA adopts a strategy of maintaining a 30% spare capacity level it will mean that by 2020 it will need to install 2.9 GW at a cost of at least $3.5 billion.

**Fuel requirement**

Having sufficient capacity units is one thing, making sure there is sufficient fuel to power those units is another. This is particularly sensitive for Dubai. The emirate already imports 99% of its fuel requirement. Almost all of that fuel is natural gas which is imported from Qatar via the Dolphin pipeline at very favourable prices (below $2.00/mmbtu). During the summer months, the incremental peak demand is met with liquefied natural gas (LNG) which is imported at international market prices, currently at $17.50/mmbtu.

The additional fuel required for the anticipated 3 GW of new demand by 2020 will be satisfied in large part by natural gas. 100 MW of it will come from solar PV with the introduction of Phase 2 of the Sheikh Mohammed Bin Rashid Al Maktoum Solar Park, scheduled for 2016-17. And by 2020, an additional 600MW will could from coal with the introduction of the Phase 1 project of DEWA’s Hassyan clean coal project. However, the final decision on the Hassyan project or its fuel mix has not yet been taken.
Electricity Trading
There is a strong possibility that Dubai imports electricity its GCC neighbours, notably Qatar, in the next 3-4 years. By then we expect the integration and harmonization of the grid between the six GCC countries to further strengthen, allowing for active trading between the members. Although their demand patterns are relatively similar, their cost of production is not. For example, Qatar’s Water and Electricity Corporation (QWEC) cost of electricity production is between $0.03 and $0.04/kWh whereas Saudi Electric Authority’s cost is twice that figure during the summer months when the Kingdom has to rely on imported diesel at over $120/barrel to cushion its fuel requirement. Therefore, we expect to see trading take place as the GCC members strive to reduce their electricity production costs.

Expo 2020 demand
During the 2020 Expo itself, we expect demand to be relatively modest. For one, the organizers have decided to host the event during the cooler months of the year, between October 20th and April 10th. This means that air conditioning, which represents roughly 60% of the electricity usage in the UAE, will be relatively low.

Moreover, the Expo organizers have adopted an aggressive demand-side management strategy aimed at reducing demand during the Expo period. These measures include the deployment of innovative solutions for environmental and facilities management. For example, the design and construction of the pavilions, buildings and public realm will incorporate energy efficient technologies which will minimize their energy consumption. Additional sustainability criteria have been set to monitor carbon footprint, achieve neutral water balance and manage material recycling and reuse. As a result of these protocols and systems, energy consumption is anticipated to drop from 350,000MWh to 250,000MWh over the 6-month World Expo period (see table 3).

These efforts will not only cut down energy consumption but will also serve as a living demonstration of how energy efficiency can be practically and cost-effectively applied on a large scale, both in Dubai and across the Middle East.
Renewable Energy & Expo
Of the estimated 250,000MWh that will be required to power the Expo, the organizers plan on producing 50% of the operational energy requirements from renewable sources on site. This is a bold move. In no previous mega event, be it the summer Olympics or the World Cup, has such ambitious target been set, let alone achieved.

To reach this target, the organizers will need to deploy high efficiency photovoltaic (PV) solar panels for roof-top installations as well as paper-thin solar layer that will be incorporated into the walls of the various buildings, also known as Building Integrated Photovoltaic (BIPV).

According to current projections, some 200,000 solar panels will be installed, covering an area of roughly 350,000 m² with a total installed capacity of 50 MW, generating 100,000MWh of clean energy per year. This is more than 10 times the capacity installed at the 2010 Shanghai World Expo (4.7MW).

This commitment to solar energy will help validate the expansion of solar power across the Middle East, adding new momentum to the region’s drive to achieve sustainable development. Domestically, this energy strategy will help raise awareness about sustainability and serve as a hands-on tool to test new solar innovations and technologies.

Conclusion
Winning the rights to host the World Expo in 2020 is a major achievement for Dubai. It carries with it important responsibilities. Notably, Dubai will have to absorb the rapid expansion in its infrastructure sector. This includes making sure there is enough power generation capacity to sustain that growth.

Access expects DEWA to bring on at least 1.15 GW of power generation capacity during the next seven years in anticipation of the 50% increase in demand over the next seven years. This will expand DEWA’s capacity to 10.8 GW, sufficient to absorb the anticipated peak demand of 9.6 GW in 2020. This will carry an investment of at least $2 billion and possibly more in DEWA opts to maintain a spare capacity level above 11%.

During the Expo itself, demand will be modest at around 250,000MWh. This will be satisfied by 50MW of solar systems installed on the Expo site and further supplemented by the 100 MW solar PV facility which will come online in 2016-2017 as part of Phase 2 of the Sheikh Mohammed Bin Rashid Al Maktoum solar park initiative.

There is not likely to be a ‘bubble’ in the power sector post Expo 2020. The added capacity will be absorbed by sustain levels of visitors from growing hubs in Asia and Africa. We anticipate that post-Expo, demand will grow at 3-4% per annum.

About Access
Access is a Dubai-based project development and advisory firm specialized in the power & water sector in the Middle East and Africa. Access’ team consists of industry experts with a combined projects experience in over 100 power and water projects. Access is currently involved in 90% of all large-scale power projects in the Middle East. For more information about our services please email Vahid Fotuhi or kindly visit our website: www.access-power.com