

Wind energy as export hit



La Rumorosa, Baja California, has a wind potential of 2.5 GW.

Baja California, Mexico, wants to become the first Mega Region energy warehouse – producing, storing and exporting renewable energy to the US and Canada.

Discovering the incredible potential for wind power generation was like finding gold for Mexico, starting right on the Northern border to California, in the Sierra de Juárez mountain range, stretching from northern all the way to central Mexico. The estimated capacity for Baja California, the northernmost state, is 10 GW and more.

To profit the most and fastest from the wind resources, the state and national planners decided to encourage foreign investors to build wind and solar parks to generate electricity for export exclusively to the US and Canadian market. Baja California already started to produce electricity as an export product in the last decade, when Sempra Generation built a 625 MW liquid gas based power plant near Mexicali. Sempra is a subsidiary of Sempra Energy in San Diego (California), and active in the Mexican market.

A nine mile-transmission line was added, just to enable the delivery to the US.

“Private developers such as Sempra Generation, Cannon, Asociados Panamericanos and Wind Power de Mexico, are all developing projects to export power to California through power purchase agreements with utilities,” says David Muñoz Andrade, Director General of the Baja California Energy Commission. Just Sempra Generation alone wants to deploy a total of 125 MW wind power in its first phase near the town of La Rumorosa, right at the border, 70 miles east of San Diego, installing close to 100 wind turbines with a capacity of 1.5 to 3 MW each. The public hearing period ended on November 1st 2010, construction is planned to start this year, with a launch in 2012. Electricity will be delivered via the existing Southwest Powerlink transmission line. According to Sempra, the “potential future phases could result in a total output of 1,000 MW.”

The first state wind project, comprising five 2 MW Gamesa G87 turbines, was launched in January 2010, also in La Rumorosa. The wind farm currently supplies the public lighting for Mexicali, a 650,000 people municipality. Within the first 11 months, the turbines

produced 21 MW. The state government wants to add another 50 MW capacity by 2013. The total is expected to reach 100 MW, "all of which will be consumed within Baja California," according to Muñoz Andrade.

"Too large for local consumption"

The calculated potential for La Rumorosa, an area with the second highest winds, is 2.4 GW, which would be "too large for local consumption," says Nicolas Puga, partner at Bates White, who wrote a report on the resources in the area. "Even 100 MW would be too much," because the existing grid to deliver electricity to customers in Baja California cannot tolerate a high load of highly fluctuating power like wind power. Unless the grid is upgraded, the best solution for fast deployment is cross-border delivery to the US, agrees Puga.

In California, currently 27 % of the consumed power comes from out-of-state, according to Jeffrey Byron, California Energy Commissioner. In 2009, California generated about 206,000 GWh and imported 91,000 GWh. "We will in all likelihood continue to import," says Byron. Within the WECC network (Western Electricity Coordinating Council), which connects 14 western US states plus two Canadian provinces and Northern Baja California (Mexico), California uses 30 % of the electricity. "We are a big consumer," emphasizes Byron.

In 2009, 14 % of the in-state produced electricity came from renewable resources. Only this year, the California air board started to request from all out-of-state power generators to reveal the source of the delivered electricity. Since electricity imports make up almost one third of the total consumption, the share of consumed renewable energy could be much lower than the RPS target of 20 % renewables by 2010.

From that perspective, wind power from Baja California is one step ahead and should be a favourable candidate to be added to a green portfolio, which per law dictates 20 % renewables by 2010, and per energy commission policy 33 % by 2020. The goal is to keep 70 % of the additionally needed power production in-state, explains Commissioner Byron.

One reason for the high need of electricity imports is an underdeveloped net of distributed electricity, says Ted Ko, Associate Executive Director at the FIT Coalition, which has been running a campaign for a national feed-in tariff. Distributed electricity does not depend on an extension of the transmission grid and can be implemented fast if the conditions for investors are right, like a guaranteed feed-in tariff, argues Ko. Power fluctuations from small wind and solar producers can also be evened out easier than the same kind of power coming from central stations.

Ko fears that a strategy which continues large electricity imports will work against the intention of the Renewable Portfolio Standards. The reason why state legislators support aggressive RPS is to reduce emissions and support the green business in California. If the electricity is imported, the effects of it will

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be exported, meaning emissions within the state will not go down, there won't be new jobs, and the goal of the RPS is missed. The California Governor elect, Jerry Brown, has promised to support 12 GW of feed-in tariff power by 2020. The FIT coalition is also working on an energy bill to be introduced in February. "In the best case scenario this will reduce the need for imports," says Ko.

Struggling with fluctuation

Energy companies on both sides of the border are participating in the process of building up capacity, like the utility company San Diego Gas & Electric, which will construct and operate a new substation near Jacumba, California, to support the reception and transfer from Mexico to the US. But if indeed

10 GW wind power will flood into the Western US grid within the next five years, energy experts warn of one obstacle: the high fluctuation of renewable power. A growing penetration of renewable energy starting at 10 % without compensating for variability or sudden drops due to the elements, for example in case of wind loss if or clouds cover the plant, can have such an impact on the existing grid that the system might not be capable to recover. "Integrating 5,000 MW plus of Baja wind may require regulation resources not readily available in southern California or Baja California," writes Puga in his report. Via the "regulations" generators are kick started within minutes, when available electricity unexpectedly goes down helping to balance out the system. Typically gas powered generators, which are standing by as peaking power plants, provide this service, or existing plants are cycling, ready to power up again.

In a study for the Southwest Power Pool (SPP) published in "The Electricity Journal" (August 2010) Puga emphasizes the importance of combined cycle generation plants when integrating large levels of wind power. The good news is that wind power during minimum-load hours can take over one third to one half of electricity generated by coal plants in the SPP area. The downside is when the coal plants are not needed, they go into cycling or stand by until demand goes up again. During that time they are not running in their optimal conditions, and cause drastically higher emissions of NO_x and SO_x levels. "I never understood why coal plants are used to back up wind power. Just by nature they are slow, and they create high pollution," criticizes Puga. And regarding green house gas, the process of cycling "can negate most or all of the CO₂ reduction benefit of wind generation." Puga in his report favours the employment of combined cycle gas turbine plants (CCGT), which can be ramped up or down more frequently with less impact. An even better solution are hydroelectric power plants, when the resources like reservoirs are available. Puga, who recently joined a newly built US-Mexican cross-border electricity task force which was initiated in May 2010 by both Presidents as an advisor, knows of two hydroelectric power projects in the planning in Mexico, which combined with wind power can help delivery steady and reliable power. Right now, neither the Mexican nor the Californian side have enough resources in place to smoothen out the fluctuation of a high penetration of wind power.

According to a report by the Department of Energy from 2008, the penetration of wind power starting as low as 10 % will cause extra deployment of peaking power. This means, when integrating 300 GW of wind energy into the US grid, 50 GW of new peaking plants gas turbines would be needed to supplement or compensate for the variability of the wind power's output. The same obstacle will apply to large solar power penetration, unless another form of energy reserves is established to overcome the variabilities.

The first five wind mills, a 10 MW wind farm built by the Mexican government in La Rumorosa went online at the beginning of this year.

Photos (2): State of Baja California's Energy Commission



Large scale storage on Mexican ground

At the current state of technology, peaking plants are not using renewable resources, but cause emissions and use up resources. It appears counterproductive having to compensate for the flaws of renewables with non-green power and it diminishes the success of the industry drastically besides raising the costs per MWh produced. Some states successfully implemented wind storage in the form of compressed air or flywheels.

Rubenius recently announced a US\$ 4 billion investment of 1,000 MW electricity storage on Mexican ground in the Silicon Border science park, near Mexicali. Just 100 miles east of San Diego, basically right next to the projected wind parks, it will use the existing power grid and connect to US and Mexican customers. Mexican President Felipe Calderón himself made the announcement, hoping to turn the area into the "world's first Mega Region energy warehouse." Sodium-sulphur batteries will be stocked in warehouse type facilities on 350 acres (140 hectares) of land, which Rubenius just purchased.

"We chose Mexico because of California's strong Renewable Portfolio," says Jacob Rikard Nielsen, Vice President of Business Development at Rubenius.

Nielsen says if 33 % renewables will be in the grid by 2020, there will be a lot of challenges which are not easy to control. California has aggressive targets, but not all the solutions are in place yet. "Storage alleviates these problems," says Nielsen. Costs for electricity storage are now close to generating power from peak plants because less capacity is needed, but with zero emissions. Once electricity gets stored, it can be released back to the grid almost instantly.

The Mexican project will be Rubenius' second large scale storage unit after the company started a 1.34 GW facility in the U.A.E. two years ago, which is planned to be completed within 5 to 7 years. The Silicon Border unit will start with a 50 MW warehouse next year. Besides that Rubenius will open an R&D office in San Diego at the beginning of this year, says Nielsen. "We are seeking to hire local experts."

The second reason why Rubenius chose Silicon Border is that the Mexican government showed a high interest and works closely with the company to proceed on a fast track. "Everything seems to be executed faster in Mexico than in California," says Nielsen. California Energy Commissioner Byron adds, "California will be very interested, if Mexico offers competitive rates for electricity."

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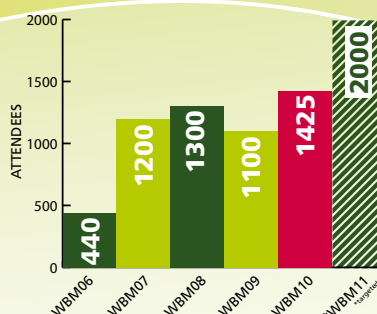
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