Microgrid development japan

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Microgrids consist of interconnected distributed energy resources, grouped into single, controllable entities. They can act both as part of the wider grid system or separately, and so are particularly useful during grid outages. Grids such as this are being built around the world to combat a number of energy dilemmas, as well as easing the introduction of renewable energy sources, and are usually deployed together with smart grid technologies such as blockchain.

"Japan faces multiple challenges that require smart planning," says Andrew DeWit, Rikkyo University, Tokyo"s, professor of energy policy. "Its energy self-sufficiency is dangerously low at only 8% of all primary energy. And its ageing and depopulation mean that locational choices have to be shaped, in order to maintain viable communities that have sufficient density to deal with rising costs of infrastructure maintenance, energy and other resources."

For Japan, a particular draw is the flexibility of microgrids. In the wake of the 2011 earthquake, the country established the National Resilience Programme, predominantly to build backup capabilities should another disaster befall Japan. This has led to the development of several microgrids, the most notable being the first microgrid community, Higashi Matsushima.

The first microgrids in Japan were New Energy and Industrial Technology Development Organization-financed projects initiated in Aichi, Kyoto and Hachinohe in 2003. A variety of energy sources were tested, in particular gas engines, and their success was demonstrated in the years that followed.

"[Microgrids] were firstly demonstrated in Aichi Expo in 2005," says Takao Kashiwagi, microgrid designer and Tokyo Institute of Technology professor at the International Research Centre for Advanced Energy Systems for Sustainability. "This demonstration is very important following the increasing share of renewable energy."

The total number of microgrids in use in Japan is currently unclear, though Kashiwagi puts the number of areas using the technology at close to 40. According to DeWit, "nobody seems to know, because there is poor governance on the PR side. This is complicated by the tendency to label every microgrid project as "first" in order to attract attention."

Despite the confusion, the number of grids has undoubtedly been growing. particularly since the 2011 disaster. The 9.0 magnitude earthquake, which hit off the coast of Sanriku, caused vast amounts of damage to Japan"s energy infrastructure, increasing the need for the project roll-out.

"It has been accelerated due to the 2011 Great East Japan disaster, and about JPY45bn of funding has been granted" for further development of microgrids, says Kashiwagi.

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Japan"s energy sector was decimated as the tsunami caused the meltdown of the Fukushima Daiichi nuclear power plant leading to the shutdown of all of Japan"s 50+ nuclear plants. The country is currently reliant on fossil fuel imports for 94% of its power and despite plans to restart many of its reactors, progress has been slow.

One of the most notable projects to rise from the devastation of 3/11 is the decentralised microgrid in Higashi Matsushima. Situated on the north-east coast of Japan, in the Miyagi Prefecture, Higashi Matsushima was badly damaged by the tsunami with 65% of the city flooded and 1,130 residents killed.

From the ruins, Higashi Matsushima City Smart Disaster Prevention Eco Town was built and officially opened in June 2016. Using concepts first put forward by Kashiwagi, who is head of the New Energy Promotion Council, the town was built jointly by the city and housing developer Sekisui House. It was funded by the Ministry of Environment as part of the National Resilience Programme.

The town consists of 70 houses and 15 apartment buildings that were used to rehouse those who lost their homes in 3/11. All the buildings are earthquake-resistant and it will be a Net Zero Energy City by 2022.