Power Sector Roundtable 5th Workshop

Electric Vehicle and Power Grid Integration toward a Decarbonized Power Sector

April 2016

NRDC successfully held a Power Sector Roundtable on electric vehicle and power grid integration on April 21, with support from WWF and Energy Foundation China. This international workshop explored the potential of EV's role in decarbonizing China's power sector as demand-side resource. International and domestic experts participated and engaged in discussions on utility and automaker's perspectives on EV and power grid integration pilot project, EVs' charging behavior in China and the application of solar energy storage system in charging infrastructures. Participants found the roundtable and NRDC's initiative forward-looking and inspiring.

Background

The Chinese government has introduced a set of policies and regulations to accelerate the low-carbon transformation of its energy structure. As a result, we see deepening power sector reform and thriving renewable and new energy vehicle industries. However, challenges remain in large-scale renewable energy integration, especially when it comes to the intermittency of wind and solar power generation. Meanwhile, as fossil fuels are still the main power source in China, the contribution of electric vehicles (EVs) to air quality is limited. Furthermore, large-scale unmanaged charging and especially charging at peak hours could threaten the reliability of the power grid, increase the peak-valley difference and increase regional power generation marginal cost.

A feasible solution to this problem is to integrate EVs with other demand-side resources, utilize regulated charging and V2G technologies, as well as use more clean energy as a power source in order to smooth the grid load curve, improve operation and efficiency and integrate more renewable energy. The recently released 13th Five-Year Plan clearly listed, among other things, smart energy system, distributed energy, demand-side management, and smart power grid as the energy sector development priorities. The government also specified energy storage, distributed energy, and new energy vehicles as strategic emerging industries. Under this context, NRDC and WWF collaboratively organized the Fifth Power Sector Roundtable on electric vehicles and power grid integration. We hereto invited international and domestic experts to participate and engage in this critical discussion.

Takeaways and Outlook

This workshop looked at the role that EVs could play in renewable energy development and power sector reform. First, the current growth in renewable energy is set to continue in the

future. To cope with the intermittency of large-scale renewable generation, the grid will need to develop more flexible demand-side resources. EVs can be used as just such a resource, providing low-cost demand response – and, in some cases, even low-cost storage – to help the grid integrate higher levels of renewable energy.

Second, one of the core goals of China's power sector reform is to establish a competitive power market. Electric vehicles, through the use of controlled charging technologies, can be a part of this market. They can provide demand response and participate in future markets for ancillary services, playing a potentially large role as China's power market continues to develop. In the presentations and discussion at the workshop, a number of noteworthy ideas and points were discussed that warrant further research. These include:

- The differences in driving pattern and charging behavior among regions should be taken into account when doing research. International research findings might not be the case for China.
- EV charging infrastructure development does not follow the pace of EV's development. If this situation continues, EVs are likely to have significant impacts on the power grid as they boom.
- A few countries and regions are piloting EV and power grid integration projects. China has done quite some research on this matter. It will be favorable if the government, enterprises and other players work together to launch a few pilot projects, in line with the new energy vehicle development in China.
- **Is there sufficient infrastructure to support EVs' role as a demand-side resource?** The technologies that enable EVs to become a demand-side resource are available. Nevertheless, as such resource scales up, infrastructure such as charging station, charging poles and their integration with the power grid needs to be developed and deployed accordingly so as to fully support EV's role as a demand-side resource.
- **Time-of-use (TOU) pricing vs. real-time pricing, and TOU pricing's viability in China.** Participants were highly interested in TOU pricing mechanism and its performance in countries such as the U.S. and Japan. Some were also interested in the viability of real-time pricing in some areas of the U.S. Furthermore, a major question to be explored was the applicability of using pricing signals in China to encourage EV users to charge their vehicles during off-peak hours, as EVs scale up.
- **How to ensure the power used for EV charging comes from renewables rather than fossil fuels?** EV manufacturers and charging infrastructure companies can only contribute to this issue through building renewable charging stations and enabling smart charging technologies from the power distribution angle. It is crucial to work with all segments of the power industry, including generation, transmission and distribution, to ensure the use of clean energy for EV charging and to achieve true zero-emission.