Microgeneration, Storage and the Smart Grid

By Gaia Stigliani*

Microgeneration technologies such as Solar PV, wind turbines and micro-CHP allow consumers to generate electricity on-site. The installation of such technologies gives consumers in many EU countries the benefits of receiving financial incentives from feed-in-tariff payments as well as significant bill savings from not having to import electricity from the grid. Over the past few years, Solar PV in particular, has enjoyed enormous success. Latest cost projections1 show that as the market enlarges, PV installation costs are set to decrease further, making the Solar PV investment even more attractive. However, with electricity prices set to rise and feed-in-tariffs to decrease over time in many EU countries, consumers will have to increase their independence from the grid in order to obtain the same level of financial benefits from microgeneration. How?

Storage recently appeared in the top 10 list of disruptive technologies that will transform life, business and the future global economy2. Financial benefits for consumers that install PV systems are currently limited to the amount of electricity that consumers can utilize from in-house generation. PV panels generate electricity during daytime, when most consumers would be outside their houses and would therefore have to rely on electricity imported from the grid during the evenings. Storage batteries in combination with Solar PV could allow consumers to store the surplus electricity generated during the day for later use or export, reducing consumers reliance on the electricity imported from the network. In a smart grid world, where decentralized energy generation prevails, consumers would be able to generate their own electricity, store it but also trade it on the market at community level. Generating and consuming electricity at community level would also reduce the costs associated with electricity transmission losses.

Benefits of installing microgeneration technologies in combination with batteries will not be limited to consumers that install such technologies. Electricity generation is predicted to become increasingly more intermittent and inflexible, while electricity demand from the heat and transport sector is set to increase further, suggesting that the electricity grid may incur more periods of system stress. Microgeneration technologies in combination with storage would alleviate this by making consumers grid independent. In addition to this, distributed generation would reduce the need to replace old generation plants.

Feed in tariffs are designed to give Solar PV installations rate of returns in the range of 4.5% to 8%3, depending on the PV system and on the amount of electricity that is consumed on-site. Due to high battery costs, rates of return from installing Solar PV and storage would be insufficient and unable to attract market interest. Germany has seen the potential of storage batteries and in May 20134 introduced a grant and loan scheme to accelerate deployment of storage devices up to 30 kW. The scheme is planned to cover up to 30% of battery costs and should encourage consumers, both at the domestic and commercial level to rely on electricity self-consumption.

Storage is a capital intensive technology and as such it requires different income streams in order to make financial sense at this stage, but has the potential to become cost-effective in the future. Grants and loan facilitation schemes can point the market in the right direction but could be more effective if coupled with radical changes in the way electricity tariffs are set. Time-of-use tariffs that reflect the real cost of generating electricity at different points in time could provide a strong signal to the market while reducing the need to rely on subsidies over the longer term. Initial trial5 results have demonstrated that consumer electricity bills could be reduced if time-of-use tariffs were introduced on the market.

Switching to time-of-use tariffs has the potential to enhance the value of self-consumption and storage, increasing consumers' 'independence from the grid. An alternative solution would be to implement changes in current European feed-in-tariff schemes, which currently do not reflect the real value of feeding electricity into the network. Under new arrangements, storage should allow consumers to gain from exporting electricity to the grid when its value is above average or to increase the value of domestic generation.

Storage is set to become a key enabler of the smart grid. However, consumers remain at the core of the electricity market and as such their ability to interact with the grid should remain at the center of market development. Several trials5 are currently testing consumers' reaction to time of use tariffs, with most trials suggesting that introducing electricity tariffs would need to be simple and explained to consumers in non-technical language in order to obtain positive effects on consumer behavior.

Footnotes

[1] Parsons Brinckerhoff. (2012). Solar PV Cost Update. Available: https://www.gov.

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uk/government/uploads/system/uploads/attachment_data/file/42912/5900-update-of-nonpv-data-for-feed-in-tariff-.pdf. Last accessed 8th August 2013.

[2] McKinsey Global Institute. (2013). Disruptive technologies: Advances that will transform life, business, and the global economy. Available: http://www.mckinsey.com/insights/business_technology/disruptive_technologies. Last accessed 8th August 2013.

[3] DECC. (2012). Feed-in Tariffs Scheme. Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/43085/5386-government-response-to-consultation-on-comprehensi.pdf. Last accessed 8th August 2013.

[4] PV-magazine. (2013). Germany's PV storage incentive program will come into force on May 1. Available: http://www.pv-magazine.com/news/details/beitrag/germanys-pv-storage-incentive-program-will-come-into-force-on-may-1_100010946/#axzz2bU3ZRI4u. Last accessed 8th August 2013.

[5] Ofgem. (2013). Customer Engangement Workshop. Available: http://www.ofgem.gov.uk/Networks/SGF/work-stream-6/Documents1/Low_Carbon_Networks_Fund_Slides_from_Domestic_LearningEvent.pdf. Last accessed 8th August 2013.

[6] EU. (2013). Europe's Energy Portal. Available: http://www.energy.eu/. Last accessed 8th August 2013.

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wider challenge of energy decision-making. Beyond a carbon-oriented comparison, a more exhaustive look would need to consider still elusive environmental issues in, say, gas- and shale-oil fracking; land disturbance and coal dust in mining and transportation; and, on the nuclear side, risks associated with safety, waste-management, and proliferation.

How the balance of advantage would shake out in that wider interfuel context can't be predicted. What is certain is that such a broader framework would expose issues of monetizing externalities which, if not on the scale of greenhouse warming, would present their own set of imponderables. This ensures, in turn, a burden on public decision-making that makes the best use of what we know, while humble about the gaps in knowledge that aggressive pursuit of research needs to help fill.