

Examining the impact of distributed generation

On April 23, Cornwall Energy and Menlo Energy Economics hosted a seminar that examined the impacts that a rise in distributed generation could have on the traditional business models of the incumbent utilities. Here, Cornwall Energy's Alison Forbes summarises some of the main contributions to the day.

A new world order

The rapid rise of distributed generation (DG) has caught many in the electricity supply industry by surprise. Advances in technology, coupled with rapidly falling costs, are allowing a growing number of customers to self-generate some or most of the electricity they need at prices that rival those offered by the incumbent energy suppliers. This phenomenon can be expected to spread as the cost of small-scale power generation technologies continues to fall and the cost of grid-supplied electricity rises. While many in the industry think that the rise in small-scale generation is tomorrow's problem (or, for the optimists, tomorrow's solution), it is already having a profound impact on market participants.

Setting the scene, Cornwall Energy's Nigel Cornwall noted that at the end of 2013 there was some 10.7GW of embedded generation (connected at distribution voltage) in Britain. National Grid estimates this will grow to 13.6GW by 2020 (+2.9GW). Additionally, feed-in tariffs (FiTs) for micro-generation have added 2.2GW, which National Grid has said could grow to 7.5GW by 2020 (+5.3GW). Even allowing for reduced load factors from predominantly intermittent technologies, these estimates suggest that over 15% of supply is presently being met from local sources. This figure could increase to over 20% by 2020.

Three drivers are behind this change, according to Menlo Energy Economics president Fereidoon Sioshansi: slowing demand growth, high and/or rising retail tariffs and ambitious renewables targets, supported by government policies favouring decentralised generation. The outcome is that the traditional utility business model, based on centralised, thermal power generation and a one-way flow of power to end-users—charged based on volume of power consumed—is being challenged “on a number of fronts”. Instead, a “new order” of decentralised, intermittent generation, bi-directional flows of power and “transactive” energy systems will develop, supported by a network of “prosumers” feeding power into the grid and changing demand patterns based on effective price signals.

Sioshansi further suggested that these prosumers and the incumbent energy companies will be “intertwined” and must find a way to co-exist. It will, according to Sioshansi, be up to utilities to find out (and deliver) what prosumers want at a cost that is seen as acceptable.

Under pressure

Paul Nillesen, PwC, agreed that the power sector is under “severe financial pressure”, demonstrated by the fact that share prices are currently only up 75% on a decade ago, despite demand increasing, investments having been made, and markets having been liberalised. One of the main drivers of this has been a decline in the margins available for gas-fired power stations; baseload gas plants have seen negative clean spark spread since 2011 and peaking gas plants close to zero since 2013. On the other hand coal-fired power plants have experienced the opposite. These plants have seen steadily increasing margins since 2011, driven by relatively low coal and carbon prices. Coal in many ways, Nillesen said, has become renewables' “best friend”.

Christoph Burger from the European School of Management and Technology in Berlin said that Germany's decentralised energy revolution (Energiewende), which is encouraging small-scale renewables, is already bringing about fundamental changes in the value chain. This transformation means grid resiliency has become both a threat and an opportunity. Taking a regulatory perspective, this risk can be mitigated through the introduction of capacity markets or a strategic reserve. But from a business sense he advocated the development of energy efficiency, demand-side response, flexible supply and/or energy autonomous regions. But the question for utilities, he said, is which road to travel?

The pricing paradox

One of the main obstacles for incumbent utilities looking to make the transition to this new order, according to Malcolm Keay from the Oxford Institute for Energy Studies, is the way in which electricity is paid for. At present, most of the cost of electricity production is variable and can be reflected in a price structure based on kilowatt hours. But in

a decarbonised industry, most of the costs will be capital. As most renewable producers have zero marginal costs, the current pricing structure does not give these plants useful signals about whether to operate or not. Subsidies for renewables complicate the matter further and “consumers pay the price”, Keay said. He also argued that consumers do not receive meaningful price signals to demonstrate the value of demand-side response. This landscape is creating “an increasing wedge between the costs of producing electricity and the prices on electricity markets”. Recent (and planned) government interventions are doing nothing to help here. For an effective demand-side market to flourish, Keay said consumers must understand the value of reliability.

One option, Keay suggested, was to separate demand and generation markets. Under this system “as-available” power from intermittent sources would be accepted automatically by the system operator (SO) (or in the case of excess, curtailed using auctions). These plants would receive a relatively low, government or regulator-set price (eventually to be decided by the market) in addition to market support for low-carbon technologies. These plants would be supported by “on-demand” generators, which would be dispatched by the SO and receive income from the market (including capacity and energy payments). Suppliers could then choose how much (if any) power is purchased under each market, taking advantage of the two options. Subject to the regulatory system, suppliers could offer a dual pricing approach to consumers, allowing them to decide how much flexible, “on demand” power they want, and the price they are willing to pay for it. Another option could be a centralised dispatch system, where “as available” customers get market-based prices when below a certain threshold. Alternatively, volumes of “as available” power could be identified and available to relevant customers. Transactive pricing, Keay said, is a long-term goal, “but we will not get there overnight”.

Innovation is key

Nigel Cornwall then provided an update on a project on models for peer-to-peer (P2P) energy trading—in particular the notion of a local tariff offering in the GB electricity market. Under current market arrangements, renewables generators typically sell their power under feed-in tariff (FiT) arrangements or under Power Purchase Agreements. Revenues from under both FiTs and PPAs are usually at a discount to traded market prices (before any incentive payments or embedded benefits are taken into account). In both cases it is the supplier who acts as a shipper across the public network and provides supply to the end customer. It is also the supplier that captures the supply margin and a significant share of any avoided costs that can arise from local trading. This, Cornwall said, means that huge value is lost by renewables generators each year.

But a “properly structured” local trading model could enable a more favourable distribution of value and benefits to developers and local consumers. Cornwall said that, if generators could cut out the offtaker and sell directly to end consumers at traded market prices, these companies could see increased revenues of up to £10/MWh and dramatically reduce imbalance charges by achieving a closer physical balance or improve scope for netting their supply and demand.

Michael Pollitt from the Judge Business School, Cambridge University, noted that new technologies and innovations are already giving consumers more control over time and place of consumption. Incumbents, he said, are not normally the players to introduce business model innovation or new value propositions. This is because new models and innovations often emerge in a “disorganised and chaotic way”, championed by new entrants, appearing in niches of the existing market. But he warned that the companies that fail to change their business model to accommodate this trend risk failure. Rather than developing wholly new business units, he advised companies to nurture a community of other businesses, particularly in the technological sectors, allowing them to leverage new opportunities.

Copies of the slides presented at the event are available to download [here](#). Sioshansi will also be publishing a book later this year, looking in more depth at DG and the impact on industry business models. More information can be found on the [Menlo Energy Economics website](#). The book can also be pre-ordered from the [Elsevier website](#).

