Radical Change for European Power Utilities

Innovative responses to the renewables glut – transformation or extinction?

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The large-scale disruption caused by the large-scale development of renewable power generation capacity in Europe continues to change the industry. For European Power Utilities the question remains how they can react to these changes. In this article the authors update a previous article in Prism on the topic. They examine more closely the specific sector trends and identify future opportunities by which utilities can best respond to the fundamental changes currently underway.

Power utilities are currently facing major challenges due to the disruption caused by the large-scale development of renewable power generation capacity. A previous Prism article (Future of Energy Utilities, 2/2013) discussed the broad strategic approaches that utilities may take. In this article we update and examine more closely the specific sector trends and identify future opportunities by which utilities can best respond to the fundamental changes currently underway.

The current challenge: Disruption of the centralized power generation model

Governments worldwide have spent the past 10 years changing the status-quo in the power sector. In response to the carbon emissions agenda they have provided lavish subsidies for the large-scale development of wind and solar power generation capacity. These are likely to exceed £9 billion per year in the UK alone by 2020. Together with improved energy efficiency, and lower carbon and coal prices, this change has led to lower European wholesale power prices, and has changed the market so that traditional, particularly gas-fired, thermal generation assets are now often loss-making.

In Germany, for example, some 40% of generation capacity is now either wind or solar, but less than 18% of electricity is generated from these intermittent sources. This "must-run" plant has displaced thermal power capacity, much of

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which is now highly under-utilized, and/or able to earn only very narrow margins. Indeed, much thermal capacity operates essentially as back-up plant. It is no longer able to run for sufficient hours in the year to ensure its profitability and, as a result, has been mothballed. This is particularly so for gas-fired plant, due to high gas prices, with the result that much of the thermal generation plant that does run is coal-fired, rather than being a cleaner, more CO_2-friendly, gas-fired capacity.

An additional challenge is that much of the new renewable capacity is increasingly held by non-utility owners, with millions of solar panel owners supplying power into low-voltage distribution grids which, in the past, lacked the means to govern this two-way power flow. Upgrading transmission and distribution grids, to enable them to respond to these challenges, will involve considerable investment, but not necessarily lead to higher revenues. In fact, "auto-generation", with improved energy efficiency, is leading to reduced overall power sales, lower overall grid receipts, and thus higher charges for remaining grid users.

This disruption of traditional, centralized power generation is severely undermining the business models of many traditional power utilities, with Europe's top 20 energy utilities having lost over half of their 2008 shareholder value. This transition is putting the future existence of these venerable businesses into question and is leading to a profound transformation of the traditional utility company landscape. The rising share of renewable capacity is a global trend, meaning that power utilities in similar markets will face this same obsolescence challenge. Companies must be flexible and radically innovative if they are to survive and benefit from the substantial opportunities available.

Key trends for power utilities

Against this backdrop a number of key trend areas can be identified to which power utilities are responding. These are summarized below:

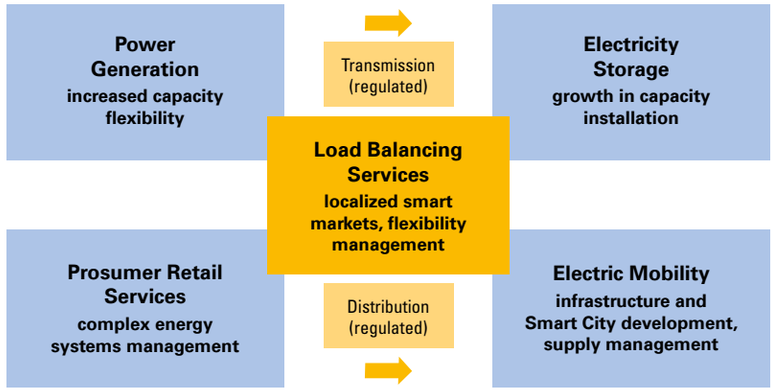

Table 1 **Potential new markets for utilities**
Source: Arthur D. Little

Trends in power generation: More renewables and flexible gas-fired capacity

Several countries are introducing (or considering) capacity-pricing schemes to incentivize providers to add sufficient generation capacity to keep the lights on. While this may incentivize owners to take old plant out of mothballs, these schemes are unlikely to stimulate the immediate construction of significant new generation capacity. The risks for such new plant are generally too high and the rewards too low with utilities, in any case, often no longer having the capital to invest. Those that do have capital may choose instead to invest in growth markets outside Europe, where continued demand growth means that opportunities to build profitable new thermal generating plant may still remain.

Some governments, faced with persistent budget deficits, may cap their renewable generation subsidies. It is also likely that technical limits, related to grid-stability, may be reached for the level of renewable capacity that can be integrated into some grids. However, it is also likely that technology improvements will continue to drive down the delivered costs of renewable power, possibly eliminating the need for subsidies locally, enabling further expansion of renewables and securing a dominant share of generation.

In consequence, the enhanced provision of highly flexible, mainly gas-fired, generation capacity will become increasingly important, as will the provision of new services, products and mechanisms, and improved incentives for generators to meet grid requirements. Indeed, with a possible decline of European and Asian gas-prices by the end of this decade, driven by the export of large volumes of low-cost shale gas from the United States, there may in fact be renewed incentive for owners to develop and operate more flexible, gas-fired generating plant, displacing coal-fired plant, and leading to real gains in efficiency and reductions in carbon emissions.

Trends in load-balancing: Localized smart markets

Whatever their generation portfolio, utilities will increasingly need to provide sophisticated load-balancing, due to the growth in distributed "prosumer" generation plant. Millions of small power generators are increasingly producing highly volatile output. With storage sets and widely varying offtakes there will be a much greater need for more localized load-aggregation and supply flexibility management. This will aggregate renewables supply profiles, integrate "prosumer"-owned capacity with embedded storage, customer "load-shedding" and perhaps a "virtual power plant" to smooth out otherwise highly volatile renewable power supplies. This more complex balancing and flexibility management, optimizing a portfolio of distributed renewable assets, will increasingly be needed in localized "smart markets" where fully automated "prosumer" "smart building" systems will operate through utility-managed, cloud-based "micro-market" platforms.

Trends in retail service provision: Servicing the new "Prosumers"

Retail supply margins are under intense pressure, due to both competition and tight regulation. To compensate for these persistent, slender commodity margins, some utilities are finding new ways to engage with customers, whose own needs are also rapidly changing.
German utility RWE, for example, has been among the first to recognize that future household and commercial/industrial end-customers will be "prosumers", i.e. both producers and consumers. Companies in Germany can cut their electricity bills by up to 50% in this way, through a mix of subsidies and tax avoidance, with 16% currently producing off-grid in this manner and another 23% considering taking the same approach. Consumers in the USA and Australia are also starting to go off-grid.

The energy system of these customers increasingly combines electricity and gas consumption (lighting, electric motors, radiators, boilers, heat pumps etc.), and power producers such as micro-CHP plant, solar panels and wind-turbines. Such customers need to improve energy efficiency, requiring advisory services, better energy management and control systems, intelligent homes/buildings, and perhaps more structural changes such as efficient end-use equipment, system maintenance or factory automation.

Such "prosumers" increasingly have much more complex energy infrastructure than they have previously been used to and usually lack the know-how to operate and maintain it. A market need is therefore developing for a more sophisticated energy services provider, combining energy supply and demand management with the ability to act as an industrial and building automation expert, facilities manager and turnkey contractor for small energy investment projects. As well as enhanced margins, a key benefit of this approach is a significant improvement in customer retention.

Some utilities already provide limited energy services, but the organizations and capabilities of most are still focused on commodity sales; they lack the necessary customer insights and have only limited experience of customer equipment. The custom utility engineering and design services involved in servicing a "prosumer" need many new business processes and capabilities, new sales approaches and new pricing models.

Most utilities lack the strength to compete effectively in this space while other, established services players (such as Siemens, Techem, Bilfinger and Cofely) are already developing many of the necessary capabilities, whether in metering, facilities management, buildings management or factory automation. In fact, as

these new competitors are often pure service and technology players, not burdened by historic commodity businesses, they may tend to have an advantage. Indeed, utilities also need to overcome longstanding customer preconceptions about what they do and what their customer relationship should be. Previous paternalistic relationships need to change into something more collaborative to prevent customers moving to alternative providers. Utilities are therefore faced with the need to radically transform themselves, probably in part through joint ventures, if they are to secure incremental future margins from the industry's developing "prosumption" model.

Trends in electricity storage: Technology-led capacity growth

A key disadvantage of wind and solar renewable capacity is the intermittent nature of their electricity generation, but combining them with power storage could eliminate this disadvantage. Indeed, linking solar PV with batteries is already well established for remote, off-grid locations, particularly in the developing world, or as grid-back-up. To date, storage costs have been too high to make an impact on connected, Western grids, but these have been dropping rapidly and, as battery technology advances, there is likely to be significant, wide-spread growth in the sector, particularly given synergistic opportunities with electric/hybrid vehicles. Most current interest is around conventional battery technology (i.e. lead-acid, Li-ion etc.), but there is also considerable interest in advanced Li-ion, flow batteries, compressed gas storage and thermal storage.

Electricity storage technology has the potential to become a major future disrupter of both grid use and generation capacity utilization. It is expected to reach "grid-parity" within 5 -8 years, even without the need for subsidies, substantially accelerating the move to distributed power provision and requiring utilities to build joint ventures and relationships with a whole new range of external partners.

In the longer term, other new technologies, including fuel cells for home or vehicle micro-generation, may also have a role to play, as part of the gradual, 30-year transition towards fully green solutions.

Trends in electric mobility: Emerging infrastructure and mobility service roles

While renewable power has made significant penetration into stationary applications, it has made almost no impact on road energy usage, although transportation consumes roughly a third of all energy. During the early stages of electric mobility many European utilities invested heavily in electric car fleets and infrastructure. However, although nearly half a million plug-in, battery operated cars are on the roads worldwide, this early momentum has not been maintained. As long as battery-operated cars have premium prices and limited range, they are likely to remain a niche technology. The main penetration of power-use in transportation is yet to begin.

Nevertheless, electric cars may still become an important part of the distributed energy system and a key aspect of a utility's future business model. Government subsidies or regulatory controls, such as exceptions from road-tax, may well be applied to give a further impetus to e-mobility growth in road transport. Additional demand is likely to be triggered when autonomous or semi-autonomous vehicles enter the mass market. This is expected within 10 years and will require a substantial expansion of charging station and billing service infrastructure from utility providers, who will also need to provide widespread virtual storage and grid-balancing services.

Furthermore, as personal, multi-modal mobility becomes increasingly integrated, particularly with train-bus-car journeys in urban settings, there will be significant opportunities for utilities, especially municipal ones, to become a full "mobility service provider". "Smart City" projects currently being planned in various parts of the world anticipate this new infrastructure business.

What responses can utilities make?

The good old days of utility businesses, offering secure, high margins from large, long-term, centrally planned assets, are now over, probably never to return.
Some utilities seem, as yet, to have no clear strategies and seem stuck, like a rabbit in the headlights. Others, having recognized the need for change, are starting to develop the partnerships and adapt to successfully grasp the available opportunities. Each potential strategy brings significant risks and challenges, but utilities must find ways to improve the earnings quality of their asset-base and market position, mothballing or divesting low-return assets, and focusing on higher return opportunities through fundamental and pervasive transformation of their businesses.

Although the current environment for large, vertically-integrated utilities is challenging, with stagnant or declining overall demand and increasing levels of asset redundancy, there are a number of attractive future areas into which these beleaguered utility businesses can grow, with two main axes of development, one primarily asset-led, the other mainly customer-led:

- **New renewables and thermal capacity:** In the short term there may be opportunities to bring old, flexible generation capacity out of mothballs under local capacity pricing schemes. In the longer term there will be opportunities to build more renewable generation capacity, particularly as costs decline, reducing the need for subsidies, and there will still be opportunities to build large thermal plant in growth markets.

- **Flexible generation, storage and load-balancing services:** In markets with high levels of renewable power generation, there will be significant and increasing need for the provision of short-term, highly flexible peak generation capacity. This will often be small-scale, localized and mainly gas-fired. Power storage systems and local load-shedding capacity will also be coordinated to meet this need.

- **Smart market platforms:** The nature of load-balancing will also change, presenting opportunities for integrating "prosumer" portfolios through much more localized "smart-market" platforms.

- **Meeting the needs of prosumers:** In parallel to this change there are growing opportunities for the provision of more sophisticated energy services management for "prosumer" clients with increasingly complex energy infrastructure needs.

- **Supporting technology development:** Electricity storage is currently too costly to have much of an impact in a European, grid-connected, setting, but costs are dropping and (subsidy-free) grid-parity is expected within 5-8 years. This will present a fundamental disruption to both grids and the existing generation fleet, as well as to the transportation market, with the development of relationships and joint ventures with external providers being fundamental to successful management of this transition.

- **e-mobility services**: In the longer term utilities will also be presented with e-mobility related opportunities, specifically for charging station and billing service infrastructure, linked to both virtual storage and grid-balancing services, as well as possibly to "smart-city" mobility provision in municipal settings.

In conclusion: The need for transformation

The major disruption affecting the power utility industry poses threats but also creates opportunities. To capture these opportunities however, power utility companies need to evolve from being asset-centric commodity providers to becoming much more de-centralized, customer-centric, asset-backed service managers. To succeed, they will need not just to re-organize and apply various innovative, new technology solutions, but also to introduce profound cultural changes at all levels of the business. Their traditional, value-chain organizations will not be appropriate for the customer-led positioning needed for the future. An often radical transformation of business models and business cultures will instead be required. Those businesses that cannot adapt, by acquiring these new capabilities, will face being left behind.

Picture by Markus Gann / dreamstime

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