Stephen Browning - Electricity Systems

"The Future is out there somewhere; we just have to make sure we get the best one"

"There are an infinite number of ways of running an Electricity Supply system badly"

Electricity delivery is Unique as an Energy vector. There are no appropriate analogies. It requires that you get it to the Right Place at the Right Time and that will be (Laws of Conservation of Energy) at the Exact Rate (Power) required.
Thus tight matching of Generation Power to Expected Demand Power is required.
While maintaining Security (MW flow limits), Stability and Voltage (MVAr provision) at all points. While covering for any one of the large number of Credible faults occurring at any instant.

The way in which electricity is to be supplied is subject to radical change. Distributed and Renewable Generation, together with Demand Management, is being promoted to reduce the use of central fossil fired plant, increase efficiency in delivery of energy and reduce emissions.

However, this will only be achieved if all resources are properly monitored and controlled within a new framework for electricity supply management. Any electricity supply system is always in instantaneous Power balance; the wires hold no storage and electricity moves at the speed of light from Alternator to Appliance across the system. We need to recognise the need for continuous tight matching of generation power to demand power, the associated requirement for accurate prediction. Both power and time are crucial factors. You need to get Electricity to the Right Place at the Right Time at the Exact Rate (Power) required.
And cover for any one of the large number of Credible faults occurring at any time. To maintain Security and Stability.

When the GB System Demand Peaks at 60GW, we are pushing 85 million Brakehorsepower through a quite fragile set of wires. Each AC system is a giant interlocked machine.

The future system, comprising Central Generation (Big) and Distributed Resources (Little), needs to work as a disaggregated but co-ordinated unit to make major improvements. This is a combination of the Wholesale (Big) and Retail (Little) Markets, with System Operator functions, to reduce the output requirement from fossil fired main plant while at the same time making sure the remaining output of such plant is generated at the most efficient level (full load). This will ensure an effective reduction in fuel burn and emissions.

All in all what we require is not just a ‘Smart Grid’ but a ‘Smart Enterprise’.

The latest versions of my 22 articles on Future Power Systems are up in the ether at http://eleceffic.com/Future Power Systems

FPS 1-3 look at the basics of matching and generating plant characteristics. FPS 1 now has a Gas Power demand diagram which shows the awesome level of storage they have, as against Electricity which has none.

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FPS 4 covers renewables impact and has a new diagram to show the effect of forecasting uncertainty on the big ramps caused by wind variability (Page 7). This is crucial to demonstrate that these movements are much more difficult (if not impossible) to handle than the regular demand ramps.

FPS 5-7 tackle future distribution (esp active), FPS8-14 the customer to utility interface while FPS15-19 examine customer data and participation issues.

The potential for storage and the ability of ICT to provide effective monitoring and trading/control of distributed resources (DER - covers customer demand, generation and storage) and maintain network security is covered here.

FPS 20 looks at the Smart Enterprise as regards Objective (flatten the fossils) and Forecasting impact (existing Top-Down methods rendered useless)

In FPS 21 I go through Customer Engagement in some detail where I develop a proposal for 'empathic constructive dialogue' and a staged approach to introducing more dynamic pricing. Go to the end first to see the salient points.

Finally, FPS 22 asks the big question; what is the value of each Future Electricity and Future Energy strategy.

Document List

Future Power 01 - the Balance principle, Frequency and the Grid.

Future Power 02 - Matching - Monitoring and Predicting Generation and Demand.

Future Power 03 - Main Plant characteristics.

Future Power 04 - Renewable and Distributed Generation.

Future Power 05 - Classic Passive Distribution.

Future Power 06 - More Distributed Generation.

Future Power 07 - Active Distribution management.

Future Power 08 - The Active customer.

Future Power 09 - Configure for DER management.

Future Power 10 - The customer and the industry.

Future Power 11 - New data from the customer to the Industry.

Future Power 12 - New data from the Industry to the customer.

Future Power 13 - Intelligent Buildings and Processes.

Future Power 14 - Premises Power Profile and DER control.

Future Power 15 - Data Logistics.

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Future Power 16 - Data Structure.

Future Power 17 - Market and Matching.

Future Power 18 - DER Participation in the Market.

Future Power 19 - DER Participation with the Operator.

Future Power 20 - The Smart Enterprise

Future Power 21 - The Smart Customer

Future Power 22 - Strategy and Value

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Retired, but still being a nuisance and open to contracts

Ex CEGB and National Grid UK

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Previous Exec member - IET Professional Network - Engineering for a Sustainable future.

Contributor to EU Smart Grids Technology Programme WG 2 - Network Operations

Email address – Graphic format