Brunel University London

Decarbonising the energy system: new digital infrastructure

Professor Gareth Taylor

Policy Context: BEIS and Ofgem are committed to digitalising the energy system for Net Zero. This involves more data being exchanged between all actors across the energy system.

Research: New digital infrastructure for this data exchange can provide the scalability, security and interoperability which the Smart Grid requires for decarbonisation. Standardising approaches to developing this digital infrastructure enables actors from across the energy system to work together well.

Advice: Speed up the development of standardised approaches to Smart Grid data exchange. Otherwise we will not achieve the flexibility required across the whole energy system for Net Zero.

Key research findings

Professor Taylor's research project on Smart Grid data exchange between Transmission System Operators (TSO) and Distribution System Operators (DSO) **defines new information systems tools and techniques which improve**:

- **Scalability:** the ability to deal with the new users and increasingly larger volumes of data involved in lower carbon energy technologies
- **Security:** protection against external threats and attacks, and
- **Interoperability**: the ability for new applications and processes to be easily integrated with a 'plug in and play' approach, based on open standards.

The project has designed and field-tested scalable and secure information systems infrastructure that gives a wider range of actors access to Smart Grid data. This enables wider participation in the energy sector from all actors, including commercial and residential users. This means they can be incentivised to support business and system processes needed to achieve decarbonisation targets. For example, users can be incentivised to use services which allow them to demand energy more flexibly. This shift of flexibility from generation, with conventional fossil fuels, to demand is less costly financially and environmentally.

The project also showed that following the process of formal Use Case analysis and International Electrotechnical Commission (IEC) standards or tools gave different actors a common language which allowed them to work in a coordinated manner. This allowed actors from across the energy sector to address Smart Grid interoperability at a whole system level.

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Policy advice

- **Invest more in speeding up the development of standardised approaches to Smart Grid information and data exchange.** Standardised approaches will build the scalability and security needed for all the relevant actors to participate in the Smart Grid. These should improve the adoption and cost-effectiveness of Smart Grid processes. If standards continue to develop at the current pace, then we will not achieve the flexibility required across the whole energy system for Net Zero.
- **Base these specifications on formal Use Case analysis and IEC standards.** This methodology enables all actors across the energy sector to coordinate and collaborate on the required business and system processes.
- **Support and engage with innovators' demonstrations of the benefits of new technologies.** Tell innovators that you are looking for Proofs of Concept linked to real systems in field tests. These demonstrations can help show you how specifications may need to develop in the future, though they must also adhere to current relevant industry specifications.
- **Set policy which supports energy sector participants to have access to the Smart Grid data which is appropriate to their role.** This should enable the open access and whole system participation needed for lower carbon technologies, while maintaining appropriate levels of security. Approaches to role-based information and data access control exist, but they may need to be enhanced for the energy sector. Ensure these controls enable information and data to be securely accessed and shared only by the appropriate participants. Build these controls on open standards so that the energy sector is not locked into proprietary standards with single vendors.
- **Promote and support the participation of UK industry expertise** in national and international development of novel information systems standards for Smart Grids. For example, ensure innovation funding includes provision for experts to contribute to standards development. Otherwise, the UK could become dependent on knowledge from other countries. Also, international standards' suitability for the UK may be reduced, as our synchronised island system has different requirements from that of Western Europe or the US.

Work with me

Gareth Taylor is a Professor of Power Systems at Brunel University London, Director of the Brunel Interdisciplinary Power Systems (BIPS) Research Centre and Head of the Department of Electronic and Electrical Engineering. Over the past two decades his research has made a major contribution to understandings of information systems design across the energy sector.

Contact Professor Taylor at gareth.taylor@brunel.ac.uk to learn more about his research, invite him to speak, or collaborate with him to improve your plans for developing novel information systems infrastructure and standards for Smart Grid applications.