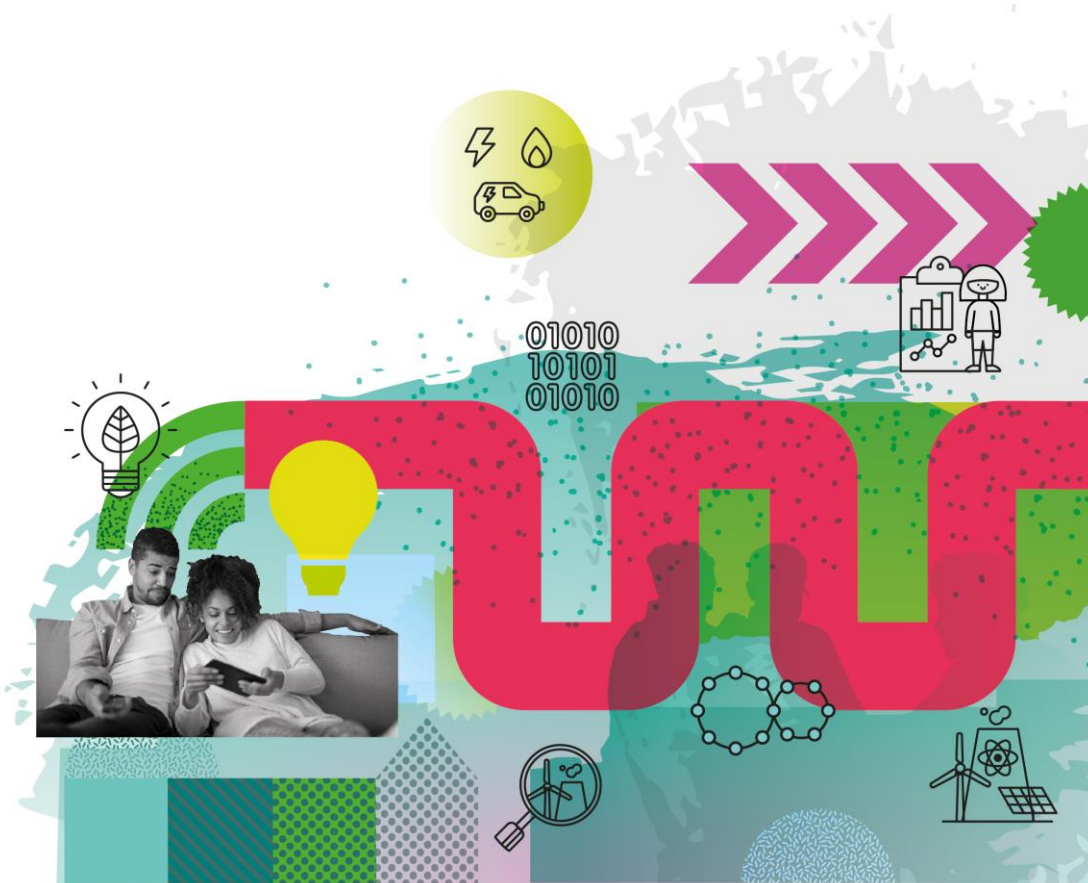
Digital System Map

Energy Data Taskforce Appendix 4

Energy Data Taskforce

13/06/2019



Contents

1. Digital System Map

Recommendation 5: Visibility of Infrastructure and Assets

A unified Digital System Map of the Energy System should be established to increase visibility of the Energy System infrastructure and assets, enable optimisation of investment and inform the creation of new markets.

Developing a Digital System Map is crucial if we are to unlock the opportunities of a decentralised, digitalised and most importantly decarbonised energy system at the best cost to consumers. The position of network operators as regulated monopolies has reduced the effect of market-based incentives to reduce the gap between incumbent companies with data and 3rd party innovators seeking data.

For many actors in the GB energy system, data relating to infrastructure is already available. However, it exists in a multitude of formats with varying levels of completeness. It is currently impractical or impossible for innovators to access network data to support projects or test new business models effectively. From the data sets that currently exist, the taskforce recommends a Digital System Map of current energy infrastructure is developed, crowding in system data and encouraging third parties to share data to further inform the map.

The Taskforce recommends the development of a Digital System Map that will help unlock the opportunities of a Modern Digitalised Energy System. This recommendation builds on those put forward by the Centre for Digital Built Britain, Digital Framework Task Group and supported by the National Infrastructure Commission which recommend that work begins on a digital system map of UK network infrastructure with the overall goal of developing a full digital twin of Energy System infrastructure.

The Taskforce recommends that Energy System actors use existing data sets to build a map of current energy infrastructure and that third parties share other data to further inform its enhancement and evolution towards a digital twin.

1.1. The opportunity of a digital system map

A **Digital System Map** is within reach

- Majority of data sets exist but sit in disparate silos
- Registration of assets entering the system is sporadic but could be coordinated
- License requirements for gathering and sharing data could be added
- Useful third-party data exists across government departments which could be integrated
- Australian map was mandated and funded by Government (and backed by industry)

The Digital System Map will be initially static with periodic updates. However, this creates the basis for a digital system model and is an integral step in moving towards the ultimate goal of a full Digital Twin. This recommendation is supported by the Government's industrial strategy, the national infrastructure commission and the Digital Framework Task Group.

Longer Term Industry Targets

- The energy sector should converge towards standardised, machine readable infrastructure and operational data to ensure the industry can benefit from the value that digital twin projects can offer
- A digital model (non-connected digital twin) of the energy system should be built using existing data to increase visibility of the system and enable greater levels of investment and operational optimisation to take place

1.2. The benefits of a digital system map

A digital system map offers the following benefits:

- Lower time to identify and plan renewable energy projects
- More efficient planning of future infrastructure across energy vectors
- Better visibility of adjacent sectors such as housing, heavy industry, waste, water etc.
- Greater investor confidence in projects from highlighting network needs
- Greater system resilience achieved through better system visibility
- Enables faster testing of new business models for innovators

Not only are these benefits key for consumers and hitting decarbonisation targets, but society as a whole.

1.3. The Case for Intervention

There are a number of good reasons for intervention. The cost to achieve a Digital System Map fall on the incumbent network operators who only benefit indirectly. Additionally, successful innovation or disruption of the current business model could see fewer benefits for the incumbent despite the cost to them. However, the acceleration of innovation and the reduction in time to plan renewable energy projects is crucial to meeting the UK's decarbonisation targets. Not only is this key for consumers, but society too.

The Taskforce's recommendation to implement a Digital System Map draws from consideration of other countries' energy asset visibility platforms, including the experiences of Australia, Germany, Estonia and France. Other countries that have developed Digital Maps of their Energy System have been driven by the pursuit of greater system resilience and lower security risks made achievable through better visibility of the system and its assets and networks.

2. The Solution

Our recommendations have been drawn from other countries energy asset visibility platforms, learning from the experiences of Australia, Germany Estonia and France. By building on the lessons from these platforms, the UK has an opportunity to be a world leader in how infrastructure data enables innovation and guides more effective asset deployment in energy systems. There are three key steps that are required to deliver an effective Digital System Map of the System.

- **The Platform**: Government and the regulator should commission an open and interoperable digital system map of the energy system.
- **New Standards**: Network and asset data should be made available in a machine-readable format – See approaches in Appendix 6
- **Sharing Mandate**: Through the license changes and new obligations there should be a progressive roadmap to show what sources will be added, how quality will be improved and how the model will mature.

2.1. Australia

The AREMI mapping tool was developed by Data61, a data analysis arm of the Commonwealth Scientific and Industrial Research Organisation (CSIRO), in partnership with Geoscience Australia and the Clean Energy Council. Hosted by the Australian Renewable Energy Agency, "…focused on supporting Developers, Financiers, and Policy Makers in evaluating spatial renewable energy information. "

It integrates and displays a range of energy system data such as

- Transmission network map,
- Distribution network map (Western Australia),
- Generation assets,
- Network capacity availability and
- Renewable energy insights.

The portal display data which is submitted to the system via data files but also integrates with existing APIs which are offered by organisations such as Western Power (WP). In addition to 'core' energy system data the portal allows non-energy data such as environmental, topography, population and other infrastructure to be plotted alongside energy data.

The model, crucially for innovation, allows users to upload their own data into a sandbox to cross-reference with the existing platform data. A data use case frequently cited by the AREMI developers is the planning of a new solar farm. In a few minutes a user can see average solar coverage, local transmission infrastructure, grid capacity and local buildings. This enables a user to quickly narrow down suitable sites that can then be assessed in more detail.

2.1.1. Platform

The technology on which AREMI sits, Terria, was developed by Data 61 with funding from the Australian Clean Energy Council, Geoscience Australia and the CSIRO. Moreover, a key advantage of using this tool as a basis for a UK Digital System Map is that the platform is open source, the governance sitting with an independent research organisation.

The tool is available to download on Github for free for users to experiment with.

2.1.2. Governance

Data 61 is responsible for executing on proposed projects, but the governance of the projects sits with the Australian Clean Energy Council, Geoscience Australia and the CSIRO. The renewable energy map part of the project had a budget of 1 million AUD (about £600k). and was 50% funded by Commonwealth Scientific and Industrial Research Organisation. AREMI is not the only project that is hosted on this platform, with each project adapted for specific use cases.

2.1.3. Australian Model Analysis Matrix

	Strengths	Weaknesses	Lessons
Functionality	• Ability to display many data sets /combinations of data sets • Full featured data mapping portal • Great range of datasets	• Visualization clashes • Organization of data layers • No interaction between data sets /on the fly analytics	• User friendly, geographical visualization is powerful • Cross dataset visualization or 'on the fly' analytics need to be considered
Software Architecture	• Open Source development • Reliant on existing modules with bespoke additions	• Performance slow down with many layers (possibly due to local compute / connectivity limitations)	• Open source options could greatly reduce setup and ongoing costs • Be mindful of performance of impacts from more complex data
Data Architecture	• Data pulled via API where possible • Data stored on server where not • Ability to add data 'in browser' so private data can be compared	• Dataset loading can be disrupted leading to incomplete visualization without warning	• API integration enables lots of data to be integrated without governance issues • Source APIs need to be performant
Dataset Curation	• Wide range of data • Good use of open data	• Some data sets are old / outdated • Inconsistent / limited data granularity (Western Australia is the most detailed) • Limited 'cross dataset' insight	• Bootstrap with existing open data • Curation is needed to increase cross dataset insight / value • Data quality roadmap (old data)
Governance	• Data sets owned by source • Software development managed by research organizations	• Liability waver suggests lack of confidence in data accuracy and limits usability	• APIs make governance easier • License / liability waver needs to inspire more confidence in the data

2.2. France

An example of a model built on mandated release of data, the French model builds on a standardised set of data that had to be released by late 2017. The French government dictated the format and structure the data was to be released in and it is hosted in multiple places.

The Open Data Réseaux Énergies (ODRÉ) platform was developed by a consortium of energy system operators: RTE, GRTgas and Teréga (all gas and electricity TSOs). They were joined by other energy actors and Weathernews.

Hosted by Etalab, a governmental body promoting open government data "aims to enrich itself with new multi-energy, multi-operator and multi-network data but also to expand with new partners wishing to share a transparency "

It integrates and displays a range of energy system data such as

- Energy Generation assets
- Infrastructure locations,
- Regional production and consumption,
- Storage capacity
- Energy Import/ Export

The portal displays data which is submitted to the system via data files. These can be viewed on a map or downloaded in raw formats.

In addition to 'core' energy system data the portal allows non-energy data such as environmental, population, EV charge point density and other infrastructure to be plotted alongside energy data.

2.2.1. Platform

Hosted on opendatasoft https://www.opendatasoft.com/open-data-solution. This is an enterprise solution with public sector clients in Europe and the US. The client that owns the solution is Etalab, a subsidiary of the Directorate of Digital and Information System and Communication (DINSIC), which has a wider remit to "coordinate… the actions of state administrations and supports them in facilitating the dissemination and reuse of their public information.".

Etalab also hosts data.gouv.fr, the repository for all of the public data across the French government. ODRE is then an energy specific tool for the visualisation of energy related datasets that are available through data.gouv.fr.

2.2.2. Governance

Public access to information has been and continues to be a cornerstone of French digital policy. Standardisation and release of energy data via the data.gouv.fr portal is mandated by legislation passed in 2015. ODRE is developed and hosted as a way to collect those datasets in

2.2.3. French Model Analysis Matrix

	Strengths	Weaknesses	Lessons
Functionality	• Data orientated. • Clear and extensive filter. • Easy download in multiple format. • Quick analysis.	• Map representation lacking (incomplete / static) • Dataset not linked to map • Lack of data crossing / combination	• User friendly, geographical visualization is powerful. • Data filter and targeted visualization to be considered.
Software Architecture	• Focus on Energy data. • Data organization and filtering.	• Slow development and integration of new partners.	• Data relevance and quality governed by the software architecture. • Cost and development time can be reduced using Open source options.
Data Architecture	• Organized by dataset • Table / Analysis / Export / Map / API • Ability for developers to export data using provided API.	• Data cannot be imported.	• API integration to import and export data are both valuable.
Dataset Curation	• National consistency • Focus on Energy Data • Data organization by keyword / function / theme	• Slow addition of new datasets. • Cross analysis with other dataset (energy related or not) difficult	• Bootstrap with existing open data • Curation is needed to increase cross dataset insight / value • Data quality and preservation
Governance	• Governance agency (agence ORE) • Ethical use of data (commercial, personal) • Data quality (Technical committee)	• Delay in adding new datasets.	• APIs make governance easier • Data quality

3. Conclusions

The Taskforce has concluded, based on the research and analysis above, that a Digital System Map is within reach. As the examples from the other countries have shown, the Digital System Map is an enabling tool rather than a commercial product. Such a tool is unlikely to emerge by market forces alone. Furthermore, the fact that the regulator and innovators would see benefits from the work done by the incumbents also reduces the incentive, making a clear case for intervention.

AREMI and ODRE both received government funding and were commissioned to enable innovation for the public good rather than as direct commercial benefit. Both have a range of useful capabilities for speeding up the accessing of geographical data to accelerate innovation, reduce network costs and improve grid flexibility. Both of these tools are also hosted by 3rd parties with no commercial interest to make access fair and equitable to both incumbents and to innovators.

Although initially static, the Digital System Map, developed together with the other recommendations in this report, will become a powerful tool to enable innovation with a rich view of the opportunities and constraints on the energy system. As the above examples show, Digital System Maps are essential to a decentralised and decarbonised energy system, with information and data that is discoverable, searchable and understandable.

3.1. Recommendations

The Taskforce recommends that the Government and Ofgem commission an open and interoperable Digital System Map of the Energy System. The project should utilise learning and reuse resources, including data and software, from projects such as the Geospatial Commission Underground Asset Register, Network operator capacity maps and AREMI.

The Taskforce recommends that Energy System actors use existing data sets to build a map of current energy infrastructure using the resources in the above recommendation and that third parties share other data to further inform its enhancement and evolution towards a digital twin.

The Taskforce recommends that the digital system map should be a public good project to enable greater competition and drive investment into the sector. It therefore should be owned by an organisation with no commercial interest in the energy sector such as a university, not for profit organisation or independent IT consultancy.

It is additionally proposed that this project is seen as a driver of interoperability between datasets held across the sector. By adopting an agile development process and best practice from related projects it should be possible to deliver a Minimum Viable Product with limited granularity of data relatively quickly. This can be evolved over time as datasets become more detailed and more information is made openly available.

LICENCE/DISCLAIMER

Energy Systems Catapult (ESC) Limited Licence for 'Digital System Map: Energy Data Taskforce Appendix 4'

ESC is making this report available under the following conditions. This is intended to make the Information contained in this report available on a similar basis as under the Open Government Licence, but it is not Crown Copyright: it is owned by ESC. Under such licence, ESC is able to make the Information available under the terms of this licence. You are encouraged to Use and re-Use the Information that is available under this ESC licence freely and flexibly, with only a few conditions.

Using information under this ESC licence

Use by You of the Information indicates your acceptance of the terms and conditions below. ESC grants You a licence to Use the Information subject to the conditions below.

You are free to:

- copy, publish, distribute and transmit the Information;
- adapt the Information;
- exploit the Information commercially and non-commercially, for example, by combining it with other information, or by including it in your own product or application.

You must, where You do any of the above:

- acknowledge the source of the Information by including the following acknowledgement:
- "Information taken from 'Digital System Map: Energy Data Taskforce Appendix 4', by Energy Systems Catapult";
- provide a copy of or a link to this licence;
- state that the Information contains copyright information licensed under this ESC Licence.
- acquire and maintain all necessary licences from any third party needed to Use the Information.

These are important conditions of this licence and if You fail to comply with them the rights granted to You under this licence, or any similar licence granted by ESC, will end automatically.

Exemptions

This licence only covers the Information and does not cover:

- personal data in the Information;
- trademarks of ESC; and
- any other intellectual property rights, including patents, trademarks, and design rights.

Non-endorsement

This licence does not grant You any right to Use the Information in a way that suggests any official status or that ESC endorses You or your Use of the Information.

Non-warranty and liability

The Information is made available for Use without charge. In downloading the Information, You accept the basis on which ESC makes it available. The Information is licensed 'as is' and ESC excludes all representations, warranties, obligations and liabilities in relation to the Information to the maximum extent permitted by law.

ESC is not liable for any errors or omissions in the Information and shall not be liable for any loss, injury or damage of any kind caused by its Use. This exclusion of liability includes, but is not limited to, any direct, indirect, special, incidental, consequential, punitive, or exemplary damages in each case such as loss of revenue, data, anticipated profits, and lost business. ESC does not guarantee the continued supply of the Information.

Governing law

This licence and any dispute or claim arising out of or in connection with it (including any noncontractual claims or disputes) shall be governed by and construed in accordance with the laws of England and Wales and the parties irrevocably submit to the non-exclusive jurisdiction of the English courts.

Definitions

In this licence, the terms below have the following meanings: 'Information' means information protected by copyright or by database right (for example, literary and artistic works, content, data and source code) offered for Use under the terms of this licence. 'ESC' means Energy Systems Catapult Limited, a company incorporated and registered in England and Wales with company number 8705784 whose registered office is at Cannon House, 7th Floor, The Priory Queensway, Birmingham, B4 6BS. 'Use' means doing any act which is restricted by copyright or database right, whether in the original medium or in any other medium, and includes without limitation distributing, copying, adapting, modifying as may be technically necessary to use it in a different mode or format. 'You' means the natural or legal person, or body of persons corporate or incorporate, acquiring rights under this licence.

Energy Systems Catapult supports innovators in unleashing opportunities from the transition to a clean, intelligent energy system.

Energy Systems Catapult
7th Floor, Cannon House
18 Priory Queensway
Birmingham
B4 6BS

es.catapult.org.uk
info@es.catapult.org.uk
+44 (0)121 203 3700