Making a positive difference
for energy consumers

To network and system operators,
Flexibility providers, generators
and other interested parties

Direct Dial: 0141 7901 7000
Email: flexibility@ofgem.gov.uk
Date: 10 January 2022

The Common Information Model (CIM) regulatory approach and the Long Term Development Statement

Dear colleagues,

The energy system requires significant digitalisation to meet the needs of current and future energy consumers, users and stakeholders. The transition to an energy system characterised by an increase in low-carbon and distributed energy resources requires the digitalisation of other, more centralised parts of the system. We believe that there is a need for data standardisation for network and system operator datasets, to avoid duplication of efforts and minimise barriers to entry for new participants, innovators, and service providers.

This open letter sets out our regulatory approach and intent to use the Common Information Model (CIM) as the expected data standard in our data related licence requirements and for it to be used more broadly for data exchanges in the energy industry.

Following consultation, we have been chairing an industry-wide working group on reforms to the Long Term Development Statement (LTDS) since August 2021.[1] The LTDS will adopt the CIM as its data standard. Based on the working group findings to date, and wider policy development, we have reached several decisions on our regulatory approach to the CIM, set out below:

1) Where the need case is suitable, we will mandate the use of the CIM for network data exchanges under Ofgem managed standard network licences, starting with the LTDS;

[1] Standard licence condition 25, the Long Term Development Statement (LTDS) governs the data that DNOs are required to share with stakeholders, allowing them to evaluate the status of the distribution network. This informs where they can provide flexibility services to the network and establishes their business case. Data includes: network utilisation and headroom; network development plans; network heatmaps. Ofgem consultation decisions can be found here: https://www.ofgem.gov.uk/publications/next-steps-our-reforms-long-term-development-statement-ltds-and-key-enablers-dso-programme-work

2) All GB CIM implementations should use the current version of the Common Grid Exchange Specification (CGMES),[2] augmented by any appropriate IEC CIM standards. This is currently CGMES v.3 as the core data standard version of the CIM, with extensions in the current Common Distribution Power System Model (CDPSM) for unbalanced network models as required. This should be the basis for future data exchange architecture; and,

3) We expect a national governance body will be required to manage the GB CIM profiles and any bespoke extensions required; however, we do not regard the lack of such body to be an impediment to the use of the CIM for licence conditions and grid code modifications. We will continue to explore possible options with industry.

We anticipate that the above decisions will provide clarity for stakeholders on our regulatory approach; our expectation on the implementation of the CIM as the basis for future data exchange architecture in GB; and will inform and secure vendor support for the expected use of the CIM in GB.

CIM is already used in parts of the GB industry. It is used for exchanging network models, data and information across transmission operators in Europe through the European Network Transmissions System Operators for Electricity (ENTSO-E). We note that all the Distribution Network Operators (DNOs) have committed to improving data quality in their RIIO-ED2 Final Business Plan submissions, and the use of the CIM is already apparent in several submissions. Our policy work supports and further progresses the use of the CIM.

This letter contains two annexes. *Annex 1: Evidence base for our regulatory approach to the CIM* contains information on the need for data standards and the role of the LTDS in driving standards forwards, wider evidence for adoption of the CIM, and CIM governance. *Annex 2: Background to the CIM* contains background history on the CIM and alternatives considered.

The work to deliver these reforms is being progressed through the LTDS working group. Stakeholders interested in further participation or information on the LTDS reforms or the adoption of the CIM should contact flexibility@ofgem.gov.uk.

Yours faithfully,

Steve McMahon
Deputy Director, Electricity Distribution and Cross-Sector Policy

[2] See page 10 for more detail

Annex 1: Evidence base for our regulatory approach to the CIM

Why have data standards?

Distribution System Operation (DSO) represents the efficient and effective development and use of the distribution system in a context of increasing technology, digitalisation, and flexibility, with due regard for system and cyber security, and resilience. In the context of a more active and complex decentralised distribution system, digitalisation is imperative to meeting the Government's climate change ambitions and supporting the transition to a low carbon energy system at lowest cost to energy consumers. For the benefits of digitalisation to be realised, data exchanges must be able to transfer information effectively and simply to data users, in order that they can make informed decisions. Digitalisation is optimised through the standardisation and interoperability of data. In the RIIO-ED2 price control period, we expect Distribution Network Operators (DNOs) to enhance their data capabilities to support DSO functions including the planning and forecasting of the networks.

Interoperability is the ability of two or more systems to exchange and utilise information and requires compatibility between technology interfaces.[3] This exchange and utilisation of information across and amongst Distribution Network Operators (DNOs), Transmission Operators (TOs) and the Electricity System Operator (ESO), among others, facilitates innovation, competition, and increases the efficiency of system operations.

Data standards enable interoperability by defining common ontologies for data exchange. An absence of recognised standards would leave network and system operators to either define their own information model – a time consuming alternative that is highly complex due to the inter-related information – or to adopt a vendor's proprietary standard that may tie the utility to the vendor, a potentially costly approach, with potential for the infringement of intellectual property. Defined data standards with vendor compatibility help mitigate these issues.

The ambition of the LTDS reforms as a means to digitalise energy networks and systems operations

The LTDS reforms will enhance DNOs network planning data sharing. They will be designed to enable network users, such as flexibility providers, to better understand and evaluate opportunities to join and provide services to distribution networks. They will also inform the work of other stakeholders, such as local authorities, gas and heat networks, and emerging users like hydrogen authorities, in their design and strategy planning.

We see the benefits of the reforms going well beyond the LTDS dataset. The LTDS requires digitalisation, not only to increase the volume and content of data, but to meet the

[3] Definition as according to the Institute of Electrical and Electronics Engineers (IEEE).

interoperability needs of data users. The reforms present a clear opportunity not only to improve this dataset, but to use a mature and futureproof data standard that will set the course for wider adoption for the energy system.

The LTDS reforms are therefore a means to drive tangible changes for network data users and to embed the core use of the CIM as the base standard for data sharing for other datasets in the future, such as TSO and DNO, DSO data sets.

The benefits of this approach include:

- **Provide regulatory certainty**
  By defining a CIM model and giving clarity on the future regulatory treatment of data standards, we provide regulatory certainty to data owners, data users, and support vendors.

- **Drive commonality, standardisation, and interoperability across network planning data.**
  The CIM is an open standard that allows models of the network to be shared with users in a common and interoperable format.

- **Specify the core CIM information model and remove the risk of data fragmentation**
  Specifying a core CIM information model, as well as any GB specific extensions, will be needed for the LTDS reforms. Undertaking this task through an industry working group will allow for consensus and clarity on the CIM model.

- **Further application of the CIM**
  The use of the CIM for data exchanges beyond this standard should become progressively easier, since they will be based on the known CIM model. Profiles for different instances of data exchange, such as Grid Code Modification 0139,[4] can be built on the same CIM core model.

- **DNOs improve data management**
  DNOs will be required to share the LTDS data in the CIM data standard, which we expect to necessitate enhancements of the DNOs internal digital estates, making future enhancement simpler.

We recognise that this ambition has a series of challenges to overcome. However, we have developed a clear programme of work on the LTDS reforms to meet these challenges. These challenges are briefly outlined below:

[4] https://www.nationalgrideso.com/industry-information/codes/grid-code-old/modifications/gc0139-enhanced-planning-data-exchange

- **Cost**
  The DNOs will all need to adopt the use of the CIM. Some have already begun the process, with associated expense in some cases. However, we note that there are examples of the use of CIM both domestically and internationally through both innovation and business as usual activities. Whilst these are for varying implementations, we expect DNOs to harness these examples to efficiently adopt the CIM.

- **Expertise**
  Adoption of the CIM as a GB energy data standard will require coordinated work to enhance the CIM through the design of specific extensions required. Ofgem have contracted with a delivery partner in the LTDS reforms to undertake this work.

- **Timeliness**
  The CIM is an evolving data standard. The LTDS reforms are designed to improve a specific instance of data sharing, whilst enhancing the underlying data model. We believe these improvements can be delivered in a timely and agile manner, rather than seeking to adopt CIM across all dataset concurrently.

- **Governance**
  There will be a need for future CIM governance in GB, however, this is not a requirement for progress in the near-term. The *CIM Governance* section provides further detail.

Evidence on the application and maturity of the CIM

Based on our consultation, working group progress, and wider industry initiatives, we believe that there is overwhelming evidence and far-reaching support for energy data being managed and shared in the CIM format. We also recognise that there is some work required to fully adopt the CIM at the distribution level in GB, but that fundamentally, it should be adopted, and we are now progressing the work for regulatory implementation of the CIM.

There is overwhelming evidence that the CIM is the de facto energy data standard. Since its establishment in the United States, the CIM has grown in reach to become an internationally recognised standard adopted by various projects and across multiple aspects of the energy industry.[5]

Multiple Ofgem funded innovation projects have completed demonstrations of the use of the CIM at distribution level, including WPD's £14.5m Network Innovation Competition Falcon Project[6] - 'Flexible Approaches for Low Carbon Optimised Networks'. This project utilised the

[5] For example, see EU Bridge project, 'European Energy Data Exchange Reference Architecture' https://ec.europa.eu/energy/sites/default/files/documents/bridge_wg_data_management_eu_reference_architcture_report_2020-2021.pdf
[6] https://smarter.energynetworks.org/projects/prj_395/

CIM format to combine data for the 11kV network from key systems to produce an Integrated Network Model, facilitating a network simulation and model in the CIM format. WPD's £750,000 Network Innovation Allowance CIM project[7] analysed and produced CIM format 33-132kV data. UKPN's Active Response project aimed to release available and underutilised network capacity to support the uptake of LCTs, using network models based on CIM to transfer topology information between different internal systems. These projects have demonstrated a clear application of the CIM, and under the Ofgem funded innovation stimulus, are required to share all findings and conclusions openly with industry.

Multiple international CIM demonstrator projects have also provided key insights into the adoption of the CIM. Two Horizon 2020 projects, Flexiciency and TDX-Assist,[8, 9] have developed the use of CIM as a data model for metering data exchange, and for DSO-TSO data exchanges respectively. These projects have sought to leverage the extensible and scalable nature of the CIM to increase interoperability and data availability. The TDX-Assist project designed interface specifications for DSO-TSO data exchange that includes and builds upon the three CIM IEC standards: IEC 61970; IEC 61968; IEC 62325. The projects demonstrate uses of the CIM, and the value of adopting common data standards.

CIM projects, are however, no longer innovations, but are business as usual, and no longer require an innovation fiscal stimulus to create a positive return on investment.

The most mature use of the CIM in GB is in transmission, where the ESO regularly exchange network models with other European TSOs using CIM-based data exchanges.[10]

The Energy Networks Association (ENA) acknowledge the CIM as the data standard that they wish to adopt for DSO-ESO data exchanges. The ENA's 2020 Open Networks Project Report "Proposals for implementation of Electronic Exchange of Network Planning Data"[11] notes that the CIM is the most appropriate means of sharing DNO data to the ESO, with the report being taken forward through Grid Code Modification GC0139.[12] This Grid Code found a positive cost-benefit analysis of adopting the CIM, providing further clear evidence supporting its adoption in GB.

Our Data Best Practice highlighted the value of data standards, however, did not specify the CIM. We will continue to work with industry on data best practice and may seek to update the Data Best Practice principles in the future if required.

[7] https://smarter.energynetworks.org/projects/nia_wpd_016/
[8] https://ec.europa.eu/inea/en/horizon-2020/projects/h2020-energy/grids/flexiciency
[9] http://www.tdx-assist.eu/
[10] https://www.entsoe.eu/digital/common-information-model/cim-for-grid-models-exchange/
[11] https://www.energynetworks.org/assets/images/Resource%20library/ON19-WS1B-P4%20Data%20Exchange%20Report%20(PUBLISHED).pdf
[12] https://www.nationalgrideso.com/industry-information/codes/grid-code-old/modifications/gc0139-enhanced-planning-data-exchange

Work still to do

Based on the above sections, it may be possible to be misled that the CIM is ready for adoption immediately, and that no further work is required. This is not correct; what is clear, is that there have been numerous projects considering the CIM, so there is clearly industry appetite, but there is also an accompanying risk of data landscape fragmentation, should there be inconsistencies in the base use and application of the CIM.

Work to define the GB CIM profiles and model is required, as well as consolidating GB specific extensions to the CIM. As noted above, we will be starting on this work in our LTDS reforms.

CIM Governance

The CIM is a constantly evolving energy data standard. This means that it aims to meet the needs of current and future users, and is the principal reason behind the mature and robust IEC governance arrangements. These arrangements are fit for purpose for the centralised core CIM models. However, the adoption and application of the CIM in a country or jurisdiction requires a series of further bespoke local considerations to be managed and governed.

As described above, there are implementations of the CIM, and we expect the use of CGMES v3 for sub-transmission and CDPSM for unbalanced modelling to form the basis of any GB CIM profiles. The evolving nature of the CIM means that CGMES v3 and CDPSM need to be 'drawn down' from the IEC for use in GB, and a manager agreed to administrate any variation to these implementations and the CIM.

Such variation may take the form of extensions to the canonical model within CGMES v3 and CDPSM to most appropriately reflect the GB distribution networks. Such variations will require agreed ownership and management. Extensions should be coordinated to limit potential data fragmentation and to optimise the adoption of extensions into the CGMES and the CIM.

Whilst the above points meet the needs of the GB energy system, there is a clear imperative to move in coordination with the IEC CIM standards, not least so that future updates to the IEC CIM standards can be adopted in GB, but also so that relevant GB specific CIM extensions can be integrated to the IEC CIM to ensure wide vendor support.

For effective use of the CIM, extensions to the modelling of the GB network, and for alignment with the IEC, a coordinating governance body is clearly required to maintain suitable governance of the standard and its application. We do not see this as a role for Ofgem, but rather for an independent body.

Timelines

Whilst we have highlighted a clear need for a governance body, this is not a requirement that should restrict progress towards use of the CIM in GB now. In fact, we believe that the clear intention to use CGMES v3 and CDPSM provides sufficient clarity that CIM projects (such as the LTDS reforms and GC0139 which require the development of specific profiles) can

continue in GB, and that the development and agreement on a suitable governance body is not required at this time.

We expect to use the LTDS working group to work with industry and stakeholders to further define a suitable governance body. To assist this, our proposed characteristics, and some possible options, are outlined below.

Characteristics of a suitable governance body

We propose that a GB governance body should meet the following principles:

- **Allow equitable access for all stakeholders**
  It is important that data users and the vendors that support CIM have the opportunity to feed into the governance process in an equal way to the network licensees. We do not want to see a situation where the licensees are able to arrange profiles and information exchanges solely in their best interest.

- **Allow for agile updates**
  The IEC process for updating the CIM is not quick. The time and complexity is necessitated by the need to ensure that any updates and extensions are able to meet the needs of all users and do not result in multiple versions of the CIM. The GB governance body should be able to be responsive and to manage proposed extensions during this process, ensuring that duplications do not proliferate.

- **Be reflective of open governance**
  To be representative of open governance, it is important that the governing body offers transparency in its decision-making processes, including a clarity of evidence, and the ready availability of information for interested parties. This transparency contributes to the equality of stakeholder interaction, facilitating the most effective development of the GB implementations of the CIM. The body should also hold itself democratically accountable for decisions made.

Possible options for a suitable governance body

We consider that there are a range of options that incorporate the above principals and merit further consideration:

- **A Standards body**
  A standards body could be an existing body (i.e. British Standards Institute, the Institute of Engineering and Technology etc.) or a new bespoke body. Either way, such a body would provide clear independence from participating stakeholders, allowing for an equitable and objective process for updates to the GB CIM implementations to be proposed and managed. However, such a regime would require a suitable funding model to manage this position, which could act as a barrier for data users to engage with the processes for any required extensions and profile management.

- **The Energy Networks Association**
  The Energy Networks Association (ENA) already maintains a set of engineering recommendations, reports and guidance, and technical specifications relating to the networks to ensure they comply with relevant statutory obligations as set out in their Licence Conditions, and the Distribution Code. As such, their potential governance of the GB CIM profiles has good foundations to effectively build upon. However, the ENA's membership is entirely made up of the gas and electricity network licensees, meaning that any governance arrangements they oversaw would have to ensure that data users and vendors had sufficient representation for it to be an equitable process.

- **The Future System Operator**
  In our July 2021 consultation, Ofgem and BEIS jointly set out the proposal for an independent Future System Operator (FSO) with responsibilities across both the electricity and gas systems.[13] Responsibilities proposed include strategic network planning, long term forecasting, and market strategy functions, alongside:

    - coordinating and maintaining data standards across the electricity and gas sectors;
    - delivering coordinated data exchange, which may involve responsibilities that include having sight of the cleaning, categorising, and analysis of data from across various relevant industries

  A possible Future System Operator could provide an independent and impartial overseer for a governance process that allows industry stakeholders and network licensees equitable access to the data standardisation process.

  We anticipate that an FSO would be able to leverage the previous experience of the ESO in the management of the CGMES CIM data exchange, and therefore be in a strong position to facilitate the evolution and governance of the GB CIM profiles and any bespoke extensions required.

13 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1004044/energy-future-system-operator-condoc.pdf

Annex 2: Background to the CIM

History and Background of the CIM

The CIM was developed in the 1990s in North America by the Electric Power Research Institute (EPRI) as an open standard for representing power system components, responding to insufficient interface compatibility across different software vendors' tools. The CIM's development is also credited to the desire to remove traditional 'vendor lock in' that resulted from utilities adopting vendor's data formats in the absence of recognised standards.

The CIM transitioned into International Electrotechnical Commission (IEC) standards in the mid 1990s. The CIM gained force when it was adopted by the Electricity Reliability Council of Texas (ERCOT) to manage its nodal market's network model data requirements in 2009. It was further expanded and improved when it was adopted by the European Network of Transmission System Operators for Electricity (ENTSO-E).

The CIM is comprised of three families of standards maintained under IEC Technical Committee 57 by three different Working Groups (WGs):

- **IEC61970 family** (maintained by WG13) supports software interfaces and data exchange between systems involved with operation and planning of the overall interconnected electricity grid, and facilitates the exchange of power system network data between organisations;
- **IEC61968 family** (maintained by WG14) supports software interfaces, data exchange, and enterprise business processes for systems that support the power system operations including: asset management, work management, geographic information systems and engineering design. This allows the exchange of data between applications within an organisation; and,
- **IEC62325 family** (maintained by WG16) supports software interfaces and data exchange for systems involved with the communication of data to support deregulated electricity markets.

Given the constantly evolving nature of the power sector, it is inevitable that updates to the CIM are required, thus positioning it as forward facing in its ability to evolve to changing industry positions. Because the CIM is not static, but rather is adaptable to new and evolving data sets, the CIM users group was established in 2005 with the ambition of helping members utilise the CIM whilst developing new iterations of the model.

The above standards are the basis for technical specifications that are developed to meet specific requirements and applications in the power sector. One of the most used technical specifications is the CGMES which was originally developed to meet European TSO requirements for data exchanges in the areas of system development and system operation. It allows grid models to be exchanged and can describe an electrical network model suitable for running balanced power flow analysis. The ENTSO-E undertakes annual interoperability tests to ensure the compatibility and transferability of the CGMES implementation of the CIM. In addition to this, the CDPSM profile is being developed to facilitate data exchange between TSOs and DSOs, and support studies of unbalanced network behaviour at lower voltage levels.

Alternatives to the CIM

In supporting the CIM as the energy industry information standard for GB, alternative options were considered. However, it was clear that no other options were as extensive, applicable, or as widely adopted as the CIM. Nor did any standard aimed at enterprise data architecture in the electricity utility world embrace the notion of providing a shared model for data exchange to the same degree. There are other standards that govern information exchange, but they were developed for differing use cases.

MultiSpeak is an information model developed through collaboration between the National Association of Rural Electric Cooperatives of the United States (NRECA) and software providers in the electricity sector.[14] The specification addresses data incompatibility issues by providing a standard for data exchange through interface adapters. In an assessment of meter-related data conducted by EPRI into the harmonisation of the CIM and MultiSpeak, it concluded that many aspects of the IEC 61968-9 variables are correlated to their MultiSpeak v4.15 counterparts.[15] MultiSpeak is largely considered to be a 'lite' version of the CIM and is generally adopted by smaller utilities with a less established IT catalogue, and so its usage is largely associated with data exchange between two vendors cooperating to harmonise their different tool suites, and so is arguably more static.

Dublin Core is often associated with data standards and is a vocabulary used in the describing of resources. It is comprised of fifteen elements, including: title, subject, format, source, and language. The Energy Data Task Force endorsed Dublin Core in its 2019 Data and Digital Strategy Paper,[16] where it recognised Dublin Core as well established in the description of data sets – enabling a 'minimum level of standardisation without being overly burdensome'. It is additionally used by the UK Energy Research Centre. However, Dublin Core is not designed to provide a standardised ontology for the exchange of grid models, but instead is designed as a metadata standard. This means that it provides a standardised vocabulary for describing what data *is*, which is an important function and can support the use of CIM, though is significantly different to the purpose and scope of the CIM.

[14] https://www.multispeak.org/what-is-multispeak
[15] https://www.epri.com/research/products/1026585
[16] https://esc-production-2021.s3.eu-west-2.amazonaws.com/2021/07/Catapult-Energy-Data-Taskforce-Report-A4-v4AW-Digital.pdf