System Services Future Arrangements
Scoping Paper

A consultation response from Eaton
October 14, 2020

About Eaton

Eaton's mission is to improve the quality of life and the environment through the use of power management technologies and services. We help our customers effectively manage electrical, hydraulic, and mechanical power – more safely, more efficiently, and more reliably. Eaton's 2019 revenues were $21.4 billion, and we sell products to customers in more than 175 countries. We have approximately 95,000 employees.

Eaton has been present in Europe since 1946 and directly employs around 15,000 people across the European Union in high-tech manufacturing, R&D and administrative functions. Key locations include: Espoo (Finland); Bonn, Soest and Baden-Baden (Germany); Hengelo (Netherlands); Dublin (Republic of Ireland); Budapest (Hungary); Nanterre and Montbonnot (France); Sarbi and Busag (Romania); Gdansk, Warsaw, Bielsko-Biala and Tczew (Poland); Prague and Suchdol (Czech Republic); Turin and Milan (Italy); Schrems and Vienna (Austria). Our R&D groups have consistently engaged with various countries, European and global standardisation bodies to help with standards-setting in the various areas of industries in which we play.

Eaton and its partners are key providers of a range of flexibility products and services including: electric vehicle charging infrastructure, battery energy storage systems for homes and commercial buildings and 'EnergyAware' UPS as a reserve technology that enables data centres to participate in frequency and demand response markets. Eaton's factory in Hengelo was also the world's first company to manufacture SF6-free medium voltage switchgear in 1960 using vacuum and solid state insulation, which is perfectly suited for high frequency switching commonly needed for managing the bi-directional electron flows to renewable generation assets. More information can be found on our website here: www.eaton.com/energytransition

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Questions

1) Are there additional requirements in EU legislation or national policy that should be considered as key guidance for the project?

The key criteria to consider is the Energy Efficiency first (E1st) Principle by EU Energy Policy. The intention of the European union is to widen this principle to a system wide level.
Furthermore, the Electricity directive set rules to switch to a TOTEX approach, this approach should be implemented. The current CAPEX approach does hinder the investment in decentralized energy resources and flexible assets.

2) What should the role of DSOs be in development of the new arrangements?

The existing energy market were designed for the needs of a centralized system and this had to be adapted to a now decentralized nature. System stability is more and more handled on distribution level and transmission is a mere backbone. DSOs need to understand and accept their new role quickly and market design has to reflect this new role and enable citizens and other local players to participate actively in these markets.

3) Should any further assessment criteria be included in this workstream?

Ireland´s electricity system is rapidly approaching renewable tipping points where the low cost of those technologies makes their ever-increasing share in the mix of electricity supply both unavoidable and rapid, meaning it is essential to start work now on the creation of a transparent and non-discriminatory markets without delay to accommodate the time it takes to plan, finance and deploy flexibility assets at scale. The technologies exist today to solve the essential need for system services, but despite Europe's early global technology leadership in this area, the needed private investment is severely curtailed across mostly due to extreme regulatory flux and uncertainty.

We are already experiencing local congestion today with the addition of new load centers such as large data centres and concentrated deployments of EV charging points. Systemic problems that will arise due the greater uptake of renewable energy and the rising, local demand for electricity will rapidly lead to the local exhaustion of existing infrastructure, especially over predictable periods of overload such as the early evening peak.

Enabling existing but under-utilised reserve power in data centres could play a major role supporting these changes. This combines digital and electrical developments and leads to a more efficient overall system, as well as turning the build-up of the digital economy into an asset that

would facilitate increased renewable penetration in our energy mix. The usage of existing assets would follow the rules of a circular economy and therefore opimise resource allocation.

Electrical vehicle charging infrastructure (EVCI), another key programme supported by the European Commission, can largely benefit from such market design. It is important to understand that the rollout of EVCI is strongly dependent on regulation and will be deployed at scale within the next few years as EV adoption explodes. Technology needs for one- or bi-directional charging infrastructure are different and any delay in the development of short-term electricity markets could lead to implementation of a charging infrastructure that would not allow for the development of functioning flexibility markets.

Due to the decentralised nature of the new electricity grid, stabilization must be managed on a lower level than before. It is key to match consumption and production of electrical energy on lowest possible system level to avoid the need for distribution system overbuild, however implementation is still in early stage as reliable frameworks are missing today.

4) Is the general approach to the Project appropriate and complete?

Transparent service markets are essential to solve the missing money problem of a high renewable energy system - the crowding of spot markets at times of high synchronous generation.

Currently flexibility assets are not able to participate in system service markets or frame conditions are not sufficiently economically attractive to encourage market participation.
Following the fundamental changes that our infrastructure is currently experiencing and the incorporation of millions of new assets into the electricity system, it is easy to understand that the cornerstones of the future electrical infrastructure will be provided by a multitude of participants.

Short-term electricity markets based on local needs will unlock necessary private investment and lead to a lower overall cost of operation of the electrical grid. Flexibility will reduce the overall cost of investment towards the electricity grid and will trigger necessary private investment, once a clear set of rules is defined. It is particularly notable that retrofitting buildings with flexibility assets may require substantial civil work, including the deployment of heat pumps, photovoltaic systems, battery-based storage and extensive addition of mid-speed EV charging points in parking lots. However, this all represents a limited addition to the building's cost, does not require oversizing the distribution network and can provide very good returns when flexibility generated by those assets can be monetized. An additional possibility to offer system service will enhance the business case.

Equally, clarity on the potential returns will incentivize competing cloud and co-location data centre operators controlling multi-hundreds of megawatts of data data centre real estate to leverage their under-utilised backup power assets to provide at first frequency regulation, then deeper energy services to the grid including intra-day flexibility. Maximising the return on fixed assets will not only enable environmentally responsible digital growth, but also decrease the total cost of data centres and therefore provide an edge to the first region to achieve this in the global economy.

Furthermore, most of the newly connected assets will be connected at the medium voltage level, the domain of the Distribution System Operators (DSOs) and energy suppliers. Short-term electricity markets give them the necessary tools to significantly reduce network costs. It will help the DSOs and energy suppliers to unlock new potential business models and help them embrace their future system role within the electricity grid.

It is essential to understand that the future electricity market will be largely based on a capacity design. Dominated by renewable energy, with almost no marginal cost, wholesales prices are likely to decrease. It is therefore important to implement regulations that anticipate such market changes and encourage investment in the electricity sector, taking into account the long investment horizons of such assets.

5) For which products is a market based approach appropriate? What sort of market based approach is most appropriate?

A market based approach is appropriate when they can create long-term cash flow visibility and therefore enable financing of those assets, for example via a combination of multi-annual contracts and annual auctions guaranteed to run for several years, or futures on markets where standard flexibility products would be traded such as Nord Pool's NODES market.

Furthermore Eaton believes Ireland should look to create localised market based on continental regulations for the trading of behind-the-meter flexibility. This could look similar to Nordpool's pioneering NODES flexibility market. Consumers, either on their own or through associations (i.e., for social housing) should be able to monetise their flexible assets in order to control their energy bills and benefit from the energy transformation. This could be mediated either by aggregators or energy distributors offering favourable conditions to flexible consumers. In all cases, transparent market pricing would strongly benefit consumers. This will enable businesses and consumers, including low income households, to fully realise the potential economic benefits of storage, on top of self-consumption and grid stabilization services.

6) For which products is a market based approach not appropriate? Why is a market based approach not appropriate for these products? Will an alternative approach be more economically efficient? What sort of alternative approach should be considered?

See above

7) Do stakeholders believe the current qualification process, is the most efficient approach? Do stakeholders have any alternative proposals?

The current qualification process, that the DNO/ DSO require assessment and approval of each IDS, is effectively blocking smaller, aggregated assets from the market and therefore needs to be reviewed. It should be considered as well that asset operate in different markets and revenue stacking is needed.

8) **What are stakeholder views on the overall current governance arrangements including the contractual principles, the Protocol Document and the market ruleset? Should these be modified into an overall protocol document which captures all of the rules for providing and procuring System Services with increased regulatory oversight?**

Good progress has been made and market rules has been simplified. A central protocol document could grant even easier access and should be considered.

9) **Should System Services continue to be funded through network tariffs? Are there views on any alternative arrangements?**

Yes, however, providers of potential flexibilities, like intelligent data centers should have reduced network charges.

10) **Should all services be procured through a single daily auction framework or should bespoke arrangements be developed for the separate products?**

It should be ensured that there is good mix between long term contract and single daily auction. Participating assets need a base from were they can operate in other markets.

11) **What are stakeholders' views on the timing of auctions?**

If long term contracts are not available, then day ahead market would be the best option.

12) **Do stakeholders have any proposals on how best to ensure commitment obligations are met?**

No

13) **What are the significant interactions within potential System Services product markets and between Systems Services markets and the energy and capacity markets? How should issues arising be addressed?**

System services, energy & capacity markets are heavily interconnected. In fact, Eaton thinks that the electrical system should be based on a cellular approach trying to balance demand and load on the most localized level. These cells would balance their own environment and be interconnected with other cells to form clusters and provided system services. With this technical setup the need for system services would be reduced and therefore network charges would be

reduced, leading to more efficient system. A system design like this would enable local energy & capacity markets and reflect the actual fundamental change of the grid´s nature.

And the change towards distributed renewables of generation are occurring during a time when the grid is set to undergo a digital transformation, dominated by electric mobility and evolving into a software defined network enabled by 'power routers', allowing prosumers to participate and generate in the trading of the power that they generate. Buildings will become energy hubs, intelligently balancing a range of generated and stored energy sources with various loads to reduce peak demand and optimise use of renewable sources. Electric vehicles will be charged to avoid peak periods, and balance demand over the 24-hour cycle.

Electric vehicles can be major providers of flexibility and provide system services via demand response. The ramp up of electrical vehicle infrastructure is ambitious and covered by different key European initiatives. The deployment of a charging infrastructure optimized to support sector coupling and the energy transition will require common technical standards for bi-directional charging, regulation such as the EPBD and AFDI mandating the readiness of all sites, and a fair remuneration of the flexibility created by wide-spread smart and bi-directional charging for both the infrastructure and vehicle owners -crudely put, why degrade your battery without compensation. The rewards for getting it right are potentially massive: a 26% decrease of CO2 emissions in 2040 vs. a non-optimized EV charging baseline.

14) Do stakeholders have further views or proposals in relation to auction design?

Providing a way for investors to monetize the flexibility created by assets such as heat pumps, battery-based storage or flexible EV charging deployed within the frame of the green new deal will ensure a high take-up and rapid transformation of the energy efficiency landscape and carbon footprint of buildings and transport throughout Europe through sectors coupling, contributing to clean growth, strong employment and the electrification of the economy.

15) Do stakeholders believe there would be benefit in maintaining the Fixed Contract Arrangements for future procurement runs?

Yes, this can create a good baseline for investments, especially "new" technologies like energy storage systems or hydrogen can largely benefit from such multiyear contracts.

16) Do stakeholders have views on the list of additional considerations above? Are there any further issues to consider?

Eaton believes data centres can play an essential role in supporting grids dominated by variable renewable generation by providing fast response when the system loses suddenly a large amount of production. Smaller grids in Ireland and Nordics have already moved to design an FFR product to compensate reducing inertia in the grid (which is a result of renewable power replacing traditional generation).

Data centres can charge and discharge batteries depending on the balance between production and consumption. April 2020 has been very interesting month in Western European energy system: Due to Covid-19 grid utilisation has decreased and at the same time there has been a surfeit of renewable generation. This has resulted in negative production prices (also daily average) in multiple European countries at the same time, and the need to pay traditional producers to decrease production as seen in the UK with EDF nuclear assets (See Reuters article here). Such scenarios will only become more frequent as renewable deployment increases.

Data centres can offer flexibility cost efficiently as they are using mainly the same data centre infrastructure for flexibility as they are using for their normal business (with only some small extra investment needed in batteries). This should easily make data centres competitive with grid scale storage. UPS within data centres are composed of battery storage systems which can provide energy in case of a system outage, and during their idle time (that is, most of the time in Europe) they can be integrated to stabilise the electricity grid. In this case not only the grid itself would benefit but also the data centre operators who could maximise use of their assets. This is a very good example of best practice in a circular economy.

Already today we see local congestion with the update of new load centres. This is especially true for data centres which rely on a few physical connection points. In the EU this is the case for example in Ireland and Amsterdam. In both locations the local load demand cannot be met by existing infrastructure. Flexibility can help here to reduce necessary grid infrastructure investment. Offering flexibility from data centres during peak hours will help DSOs to save in distribution network investments.

17) What are stakeholders' views on the potential existence of, and options for mitigation of, market power?

To avoid market power concentration, it is necessary to enable as much market participants as possible market access on a level playing field. New technologies should be enabled with a facilitated qualification process. Regulation should generally protect smaller market participants, and an open market access will grant this. Generally market transparency will help as well.

Further information

For more information or background on Eaton's submission to this consultation, please contact Eaton's EMEA Distributed Energy Management Segment Leader, Dirk Kaisers on dirkkaisers@eaton.com or call him on: +49 160 645 9127.