



RedoxBlox comments on SEM-24-046

**Demand Side Units: A Revised Phase 1 Solution for
Energy Payments and Other Issues**

4th October 2024

Introduction

RedoxBlox welcomes the opportunity to participate in this Consultation process. We recognise that this is a highly complex area with potential for multiple un-intended consequences and appreciate the SEM committee taking leadership in attempting to identify detailed answers that will be workable and achieve overall policy goals. In that regard it is understandable that the paper seeks to resolve many long standing issues. However, we believe this could be a very significant missed opportunity to set appropriate rules that facilitate the future efficient operation of the electricity market.

The needs of the market in the period 2026-2030 and beyond will be different in certain key ways from the needs over the past. As RES penetrations continue to rise the role of the demand side in delivering flexibility and system services will also need to increase. It will be crucial that the DSU structure is enabling to these needs. In particular it is crucial that at times where this surplus RES on the grid and the increase in demand from a DSU would not drive an active network constraint that the DSU sees an economically efficient price signal.

There has been remarkable technological progress in the past number of years in solutions to electrify and decarbonise heat. We believe this offers the opportunity to radically increase Northern Ireland and Ireland's ambition and targets for decarbonisation of industrial heat and that this can bring many complementary benefits to an electricity system with a high penetration of renewables. However, this will only happen if there are proper pricing and operational structure put in place that reflect overall system conditions rather than legacy industry regulations.

Electrification of Heat and Transport

The policy should also very carefully consider the impacts of increasing electrification of transport and heat. Many estimates that this will result in a doubling to tripling of electricity demand between now and 2050. This new demand will differ in many ways from the majority of existing demand, for example it will be more technologically enabled and will often have a degree of storage and ability to rapidly flex to changing system circumstances. It is crucial that this demand be properly dispatchable and eligible for capacity and system services revenue streams. This dispatch capability should also include visibility of real time network conditions on distribution and transmission grids so that the TSO can confidently dispatch increased consumption at times of high RES and no binding constraints.

As this could represent a very significant portion of overall demand and can play a fundamental role in the efficient operation of the future market and grid we believe the issue warrants very significant regulatory attention.

Appendix 1 provides more detail on the scale and impacts of large scale electrification of heat.

Network Issues

We welcome the attention this paper pays to distortions that arise in the pricing provided to demand sites by suppliers. It appears to us that network charging issues are outside the scope of this consultation, however, they will have a major impact on demand consumption incentives, particularly at times of low wholesale prices. We believe it is essential that any initiative to improve the efficiency of price signals to demand consider network charges and other flat pass through charges as they can be highly distortionary.

Consider a case of a demand site that has a dual fuel capability of electricity and gas for heat. There will be many hours per year (we estimate around 2000 hours by 2030) where there is renewable curtailment on the grid but that the price at the demand site for electricity will be higher than that for natural gas because of network and other flat rate tariffs. This is clearly a distortion in favour of fossil fuels against renewables.

If this issue is not structurally resolved it would be appropriate for such a customer to bid a negative decremental price to signal a cost neutral position between gas and electricity (including network costs).

Electricity Grid Impacts of large-scale Electrification of Heat

If the electrification of additional demand, such as heat, is encouraged in a policy framework that incentivises efficient outcomes it has the potential to increase the stability and ease of operation of a highly renewable based electricity system. We believe the following benefits can be realised and should be incentivised in the financial signals observed at the customer's site.

- **Flexibility to balance supply and demand.** If the new demand has one or more of:
 - i. a storage component;
 - ii. flexibility in the time it consumes; or
 - iii. ability to efficiently use a secondary fuel that has no higher carbon emissions than the solution in place before electrification,

it can allow demand to be moved to times when RES is abundant and to reduce relative loadings at other times. This could be particularly valuable if a substantial volume of new demand with these characteristics is added (15TWh industrial heat, for example). In this case the overall ease of operation of the power system, including meeting peak needs would be improved as the ratio of uncontrolled peak to average demand would be significantly reduced.

The policy signal should also recognize the quantum of service provided. Solutions which deliver multi day or longer storage or flexibility should be strongly encouraged.

- **Ability to meet scheduled system ramping needs.** Many technologies that electrify demand can adjust their electricity consumption quickly and with little notice. They can also schedule consumption patterns to reduce the need for fast ramping of other resources on the power grid. If a significant block of new electricity demand with these characteristics is added it could play a substantial part in resolving this challenge.
- **System stability at times of high SNSP.** As new processes electrify there is an opportunity to encourage investment in solutions that will have the ability to provide essential services to the power grid. Most of the solutions to electrify heat and transport are capable of changing and/or ceasing consumption with minimal notice, small fractions of a second in some cases. By adding additional demand that has these characteristics at times of high RES generation the overall stability and controllability of the system is greatly improved.
- **Improve grid utilisation.** Controllable demand with flexibility and storage is often considered through the lens of its ability to support bulk system supply and demand balance.

However, the flexibility can also support increased network utilisation and reduction of the need for investment in new conventional grid assets. This idea is gaining significant momentum in the UK where multiple DNOs now run flexibility tenders to secure services from demand customers to defer or avoid new grid needs.

We note that EirGrid's shaping our electricity future strategy makes reference to techniques such as Dynamic Line Rating and Power Flow Control. Adding flexibility in the demand as a controllable resource will act as a force multiplier with these techniques in enabling higher grid utilisation. This reduces costs for all users (same network more kWhs) and reduces the impact on the environment and communities.

- **Synergy with new generation locations.** We note that SEAI has published a map of existing heat needs in Ireland (<https://gis.seai.ie/heatdemand/>). A casual inspection indicates there is a high degree of correlation between many regions of large heat need and regions with large volumes of existing or planned RES.
- **Long Duration Storage Potential.** As we approach very high levels of renewable generation the importance of longer duration storage solutions will increase. There is an opportunity to deliver these services through new technology solutions on the demand side. Where electrification solutions include a degree of storage this has the same net effect as directly adding storage on the electricity grid.

It is also possible to configure the same core technology that delivers storage in the heat system to discharge its energy into a turbine and generate electricity. This can very economically add significant volumes of electricity to electricity storage to the power grid.

Appendix 1 Overview of potential for Electrification of Heat

We note that this is a SEM consultation and apologise for using Ireland only numbers in this section. However, the same underlying matters will arise in Northern Ireland and the numbers are intended to be illustrative.

SEAI's heat in Ireland survey identified that there is circa 15TWh of annual industrial heat demand in Ireland currently using non-renewable fossil fuels. We also note that EirGrid's Shaping Our Electricity Future Roadmap identifies the potential availability of a significant surplus of renewable electricity emerging as new installations of wind and solar are added in line with 2030 targets.

We believe that recent technical advances in electrification of heat, made by our company and others in the area, means there is potential for a step change in ambition for electrification of heat in Ireland. Where these electrification solutions incorporate storage, they can deliver flexibility and move the current industrial heat demand from fossil fuels to electricity demand at times of high RES. This would mean that Ireland's surplus renewable electricity could be used to substantially decarbonise Ireland's industrial heat sector. We believe that Ireland could achieve 50% electrification of industrial heat by 2030 (7.5TWh) and 100% by 2035. We believe these targets are achievable and will deliver:

- Reductions in Ireland's carbon emissions by 2Mt per annum by 2030 and 4Mt per annum by 2035 as we make industrial heat carbon free.
- Provision of substantial flexibility, storage, ramping, frequency response and other services to the electricity system.
- Increased energy security by reducing Ireland's exposure to imported fossil fuels.
- Increased attractiveness of Ireland as a location for industrial investment by providing easy access to efficient low cost carbon free heat.

We are aware that adding 15TWh of additional electricity demand will have a profound impact on the operation of the electricity market. We believe that this consultation needs to consider the impacts of this radical and rapid increase in dispatchable demand.

Recommendation 1: We recommend that the mechanism for charging customers for use of the network does not penalise customers for availing of surplus RES when available where that consumption is not creating a binding network constraint.

Recommendation 2: We recommend that there is no pancaking of additional charges onto customers at times of surplus RES.

Recommendation 3: We recommend that the structure of demand connection agreements becomes more flexible and encourages additional consumption at periods of low system stress. The static MIC nature of connection agreements should be removed. This should also be applied to sites using electricity to electricity storage to enable fast charging at times of high RES.

Recommendation 4: We recommend that the TSO develops the ability to dispatch qualified demand sites in the same manner as generation.

Recommendation 5: We recommend that the network charging methodology be reviewed to incentivise increased demand side flexibility and the ability to integrate additional RES.

The solutions proposed are technology neutral and would benefit wider efficiency and electrification initiatives. They would also increase the efficiency of the electricity market for all customers by reducing the costs of RES curtailment.