Flex Power Solutions
INDUSTRIAL DECARBONISATION

Dear Department of Environment, Climate and Communications,

Thank you for giving us the opportunity to give our feedback to Offshore Renewable Energy (ORE) Future Framework Policy Statement.

Wind is Irelands best natural resource to help tackle climate change as part of the energy revolution. Ireland's success in wind generation is unmatched anywhere in the world. This low-cost indigenous energy will benefit our economy as we move towards a net zero carbon future. In time, the gigawatts of offshore power will be used to produce green fuels and we will become an exporter of energy on a huge scale. In the meantime, towards 2030, our resource can be used to support Irish jobs in cities and rural economies alike. Zero carbon industrialisation is possible in Ireland based on the success of our wind and solar generation potential. The fast deployment of flexible electric boilers will give the dairy, pharmaceutical, food, drink and other Irish industries a competitive advantage, thereby securing jobs in Ireland while also reducing our reliance on imported fossil fuels.

To support delivery of offshore wind we need wider policy and regulatory realignment towards shared goals. ESBN and Eirgrid (and their Northern Ireland counterparts) will be the vectors to the decarbonisation of our whole economy; scheduling and dispatch reform, flexible import capacity and flexible demand procurement are of utmost importance. In addition, the work by the Regulators on Demand Flexibility and reform of the legacy network tariffs is of the utmost importance in removing the barriers to renewable led electrification.

Flex Power Solutions agree with Minister Ryan that secure, clean and affordable energy is possible in Ireland. By adopting a collaborative approach and removing any technology bias Ireland can sustainably grow our economy and go further to share our abundant indigenous resources with Europe and beyond.

I am available discuss further how our core technology can help sustainably decarbonise the Irish economy by 2025 and beyond. Overleaf are more details.

Kind regards,

[redacted]
[redacted]
[redacted]
W: www.flexpowersolutions.com

1(a). Has this section adequately identified the general key priorities for ORE delivery in Ireland? Are there additional priorities that should be integrated into the holistic, plan-led approach?

Flex Power Solutions fully support the point that *Domestic utilisation of the greatest possible proportion of indigenous ORE should maximise climate, economic and social benefits for Ireland*. In consideration of this point we believe a technology option which is available now to decarbonise our economy fast and at scale was missed in the Components Section. In addition, this is the lowest cost opportunity to use ORE to decarbonise Irelands industrial heat sector.

Electric boilers:
Flex Power Solutions are specialising in electrification of high temperature heat in Irish Industry (277°C and 70barg). In our opinion, electric boilers are the most sustainable tool to reduce GHG emissions and fossil fuel use in industry and district heating. We will install numerous low voltage electric boilers[1] and high voltage electrode boilers[2] that convert excess renewable electricity into useful heat, only in times of ample generation. By operating these boilers flexibly to follow renewable generation from wind and solar, we can displace TWh of imported fossil fuels while reducing costs to our society. Using our proven technology in new ways we maximise the use of existing grid infrastructure to minimise dispatch down of wind turbines, while providing valuable zero carbon grid services to the System Operators.

Electric boiler technology, when rolled out smartly to industry, can deliver over 1GW of renewable led flexible demand. The boilers are available now and are proven in the field. Due to the reduction of dispatch down of wind generators, future wind turbine investors will be able to enter the RESS/ORESS auctions at more competitive prices. Ireland will reach it's 2030/2040 targets with less assets built, faster and with a reduced cost to the electricity consumers of the island.

The industrial heat sector is sometimes seen as hard to decarbonise. But with capacity factors of 60% from ORE combined with solar delivery the path is clear and it is cheaper than remaining on fossil fuels.

Path to Industrial heat decarbonisation			
Technology	**Cost**	**Technology Decarbonisation**	**Cumulative Decarbonisation**
Energy efficiency	Low	5%	5%
Direct electrification (Electric-boiler)	Low	60%	65%
Direct electrification (heat pump)	Medium	5%	70%
Thermal storage	Medium	25%	95%
Other technology or demand flexibility	High	5%	100%

[1] https://www.flexpowersolutions.com/low-voltage
[2] https://www.flexpowersolutions.com/high-voltage

Most all heat demand in Ireland can be addressed with existing simple technology combined with our abundance of indigenous renewable electricity.

The SEAI Heat Demand Map of Ireland[3], see below, can be used to identify the multitude of industrial sites in Ireland who need heat. Many of these sites are distributed around the island and in areas of the electricity grid which are most constrained by excess renewable generation. Each site currently relies exclusively on fossil fuels. The inclusion of a renewable led electric steam boilers will allow such sites to deploy hybrid electrification. Massively reducing Ireland's fossil fuel dependence and reducing dispatch down of our renewable generation fleet.

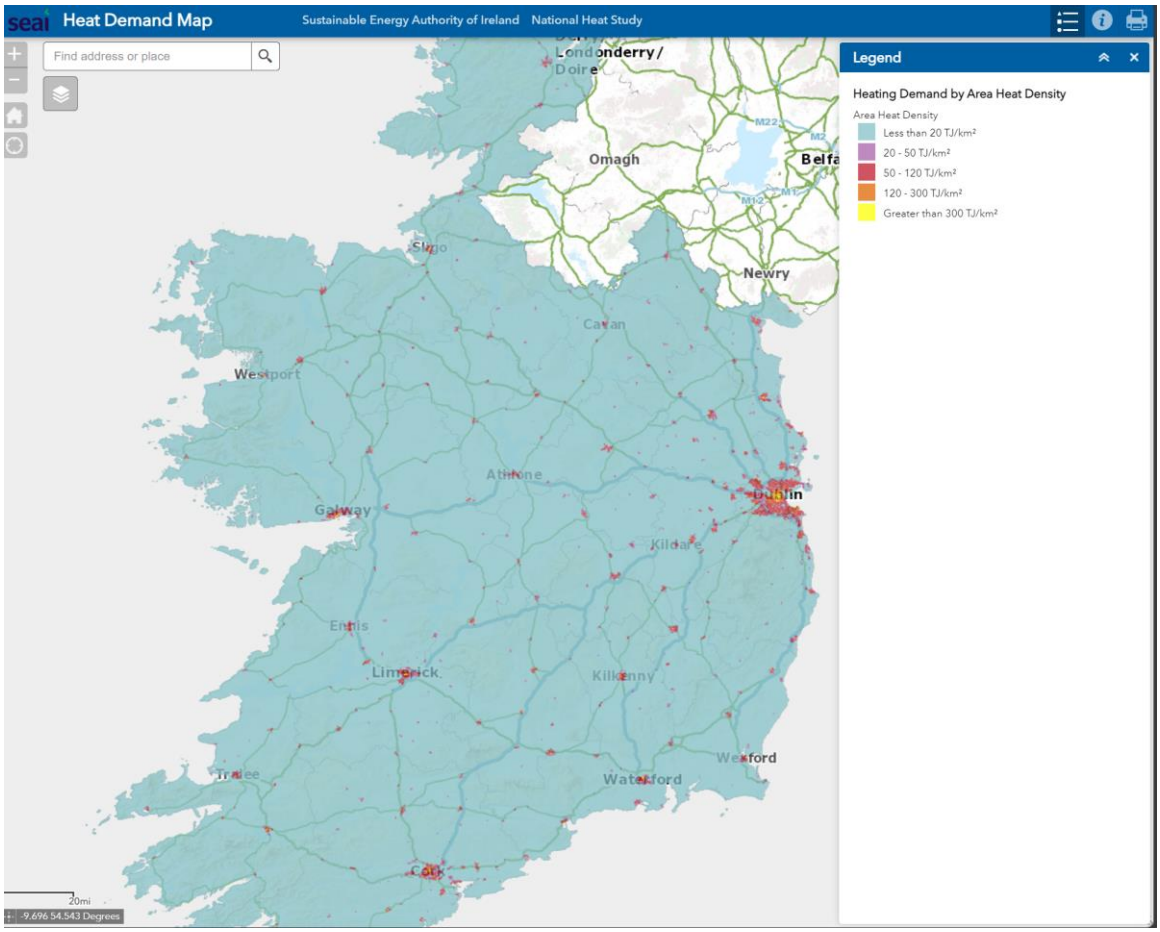


Figure 1 SEAI heat map https://gis.seai.ie/heatdemand/

As district heating develops, the same renewable led electric boilers will provide demand flexibility to the electricity grid.

Following deployment of volume-unlimited electric boilers then the best use of grid capacity would logically be deployed towards thermal storage on the same sites. Combined industrial heat offers the potential for TWh's of sustainable low-cost demand flexibility.

There will be little need for expensive Hydrogen decarbonising Irelands heat sector if policy remains technology neutral and focused on least cost carbon abatement.

[3] https://gis.seai.ie/heatdemand/

1(b). Has each key priority been adequately described and considered all relevant components?

The Storage section has omitted the potential for electrification of heat and thermal storage.

Battery storage:
This, https://www.seai.ie/documents/research-projects/RDD-000326.pdf, SEAI funded study looking at curtailment mitigation options for high RESe System in 2030 & 2040 finds:

> *"Conclusion 8*
> *Energy limited storage technologies, such as batteries and pumped storage, have limited direct curtailment mitigation benefits on a high wind system. While conventional storage (battery and pumped hydro) has very little direct impact on curtailment, these technologies do have other potential system benefits that should be explored further, including providing fast frequency response, reserves, ramping and reactive power services, as an alternative to fossil fuelled peaking capacity and as a potential solution to local grid constraints."*

It is unsure if there are limits to the need for currently available electrical storage. They are ideally suited to DS3 system service reserve but already in 2024 Eirgrid's need is near satisfied in matching the largest single generator infeed (700MW). The RESS, the capacity market and DS3 market have been successful in funding the batteries delivered to date. Care should be taken to ensure the stated aims of the ORE policy are prioritised:

1)decarbonisation and
2)improve our energy security of supply

Thermal Storage
This, https://www.seai.ie/documents/research-projects/RDD-00719.pdf, SEAI funded study, 'Poolbeg Sector Integration - Investigating synergies between the electricity, heat and hydrogen sectors' published Dec 2023, supports the use of curtailed renewable wind energy to deliver heat to the Poolbeg area. It found that electric boilers with storage was cost competitive with using waste heat from a powerplant. Its comparison finds battery energy storage is 38 to 153 times more expensive than large scale tank thermal storage with flexible electric heating.
In addition to cost benefits, they found that thermal storage has a much smaller foot print than battery storage and it has a 50year lifespan compared to 5 - 15-year range.

Direct renewable led electrification
FlexPower promote the use of direct electrification without the need for storage, this would logically be even lower cost than thermal storage, smaller footprint and have a similar long lifespan.

1(c). How best should the 2GW of non-grid limited offshore wind capacity be procured?
No reply

1(d). What are your views on the design parameters for the successor scheme to ORESS, what else should/should not be considered?
No reply

1(e). What frameworks and/or supports are required for alternate routes to market such as CPPAs, Power-to-X projects, interconnector-hybrid projects and export projects?

Irish industry want to be leaders in our decarbonisation journey. Unfortunately, most users cannot offer the 20year contractual certainty needed by ORE developers. One option is where the State, through the ORESS auction design, procure the investment and then re-sell the same contracts to industrial buyers in smaller clip sizes, maybe 10MW in 1year commitments. The state could offer less penal contractual risks to the buyers and at a price closer to the market price. This would facilitate fast deliver and allow industry to reduce the burden on the PSO paying public without risking their company's viability.

1(f). What additional capacities and responsibilities should be held by industry in the context of the plan-led approach?
No reply

1(g). How can Government facilitate a more comprehensive and streamlined engagement process with developers to ensure national ORE targets are delivered?
No reply

2(a). What grid infrastructure should be of particular focus in facilitating the build-out of capacity to support ORE generation targets?
No reply

2(b). In relation to National Security/Department of Defence interaction with ORE development, are there any issues you would like to highlight?
No reply

4(a). What structures, measures, and interventions can the State and State agencies implement to assist in the development of a long-term, sustainable skills and workforce pipeline? Provide any recommendations on what the State can do to promote careers in ORE across a range of educational backgrounds and movement from other relevant sectors.
No reply

4(b). Are you aware of initiatives in other jurisdictions or at a European level that would be relevant to Ireland's ambition of building a sustainable skills and workforce pipeline for offshore wind?
4(c). To what extent should an emphasis be placed on multipurpose sites for ORE delivery, including the colocation of devices? What Government structures should be developed to encourage and facilitate progress in this aspect?
No reply

4(d). How can Government ensure policy is kept in line with evolving technological innovation and developments in ORE devices? What structures and government procedures should be implemented to future-proof the ORE planning process and account for technological shifts?

Challenges and Barriers to Renewable-led electrification of industrial heat

Topic 1: Dispatchable direct electrification of heat	
Barrier	Solution
Renewable led direct electrification of heat is not included in the planned use of ORE.	Include direct electrification of heat in the planned use of ORE. For example, use electic steam boilers co-located with fossil fuel boilers in existing industrial boiler houses

Topic 2: Scheduling and Dispatch software	
Barrier	Solution
Currently flexible consumers are excluded from participating in the real-time balancing market due to out-of-date software. The TSO Scheduling and Dispatch software cannot give a signal to flexible consumption units, it can only schedule generation units. This excludes electric boilers, batteries, thermal storage & Hydrogen from the real-time Balancing Market.	System Operators to update software to allow a signal to be given to demand-turn-up units.

Topic 3: Non-firm grid import capacity	
Barrier	Solution
Non-firm electricity grid import capacity is not available. In times of ample renewable generation there is a saturation of zero carbon power in our existing grid. This is not currently available to Irish industry who are willing to substitute fossil fuel boilers with electric boilers for high temperature heat during these times.	System Operators to make non-firm electricity grid import capacity available

Topic 4: Network & market charges	
Barrier	Solution
Legacy charging structures and levies are compounding Ireland's reliance on imported fossil fuels, and exacerbate dispatch down of our wind fleet. They hide the true wholesale price of electricity from new renewable-led consumption.	Regulators to realign charging structures with the Government's 2030 ambitions.

Topic 5: Tariffs	
Barrier	Solution
Network tariffs currently focus on day/night consumption trends rather than SNSP levels (levels of renewable generation) which will not support delivery of RESe generation targets. In the future, the biggest variable in the electricity market will be the hourly amount of wind/solar generation. Current government targets aim to have over 22GW of RESe generation capacity by 2030 with only a small fraction of that needed for existing consumption.	Network tariffs must focus more on SNSP (System Non-Synchronous Penetration or the percentage of renewable power generation in any given hour) rather than historic day/night consumption trends. We suggest that new Use of Service (DUoS and TUoS) charges be designed for flexible consumption who do not need firm grid import capacity and who will provide services to the ESBN and Eirgrid. DG7, DG8, DG9, DG10 and TCON connection should be complemented with flexible counterparts: DG7 f (flexible) DG8 f (flexible) DG9 f (flexible) DG10 f (flexible)and TCON f (flexible) The facilitation of non-firm capacity would allow better utilisation of our existing grid. The lower tariffs should reflect the lower burden on the grid and the useful services flexible consumption can provide. For the industrial flexible power users, the cost of zero carbon electricity would be lower than that of natural gas in hours of abundant generation when the non-energy tariffs are realigned with Government targets.

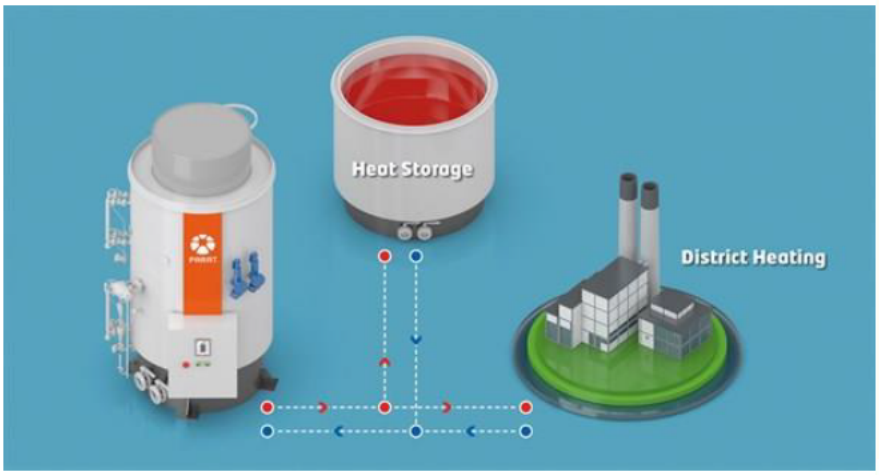
Topic 6: Sector Coupling	
Barrier	Solution
Inadequate alignment between the relevant entities	Further alignment between the relevant entities is needed. Specifically, ESBN need to work with the SEAI, the TSO and the CRU to understand how the heat sector can be a service provider to solve the problems Ireland is trying to overcome in delivering 80% renewable power generation on a poorly connected island. Sector coupling and hybrid delivery of heat will accelerate Ireland's decarbonisation with the least cost to our citizens.

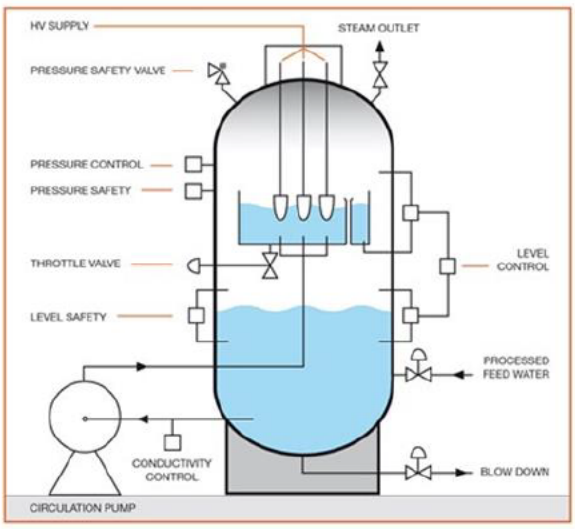
Topic 7: Policy Supports	
Barrier	Solution
Support schemes are prescribing technologies rather than awarding based on Euro/tCO2 abated Policy makers should not be burdened by having to pick the best technology. If the incentives are correctly aligned with government ambitions, then industry will deliver the most sustainable technology.	Government supports should be technology neutral and be awarded based on Euro/tCO2 abated.

Appendix 1: Electrode Boiler Specifications:

- Flexible operation
- Dispatchable by the System Operator
- Zero Carbon Steam
- High pressure steam up to 85 barg
- 0MW up to 60MW (90tph steam) in one unit
- From cold to full load in less than 5 minutes
- 0.2Second POR turn down
- Compact foot print
- Minimum maintenance required
- Steam and/or hot water (combined in one unit)
- Low load capability
- 6 kV - 24kV
- Pure resistance load
- Superheater option
- Electrical grid regulation

Brochure here





Capacity (MW)	0-5	0-15	0-30	0-45	0-60
Steam (t/h)	7,5	22,5	45	67,5	90
D (mm)	2.100	2.350	3.000	3.600	3.700
H (mm)*	4.800	5.800	6.700	7.000	7.400
Transport weight (kg)	6.500	8.000	13.500	20.000	23.000
Operating weight (kg)	8.500	11.000	21.500	34.000	38.000
Test weight (kg)	13.800	21.000	38.500	60.000	66.000

Weight data is given for 16 barg design pressure. Size based on 10kV. Steam based on 100°C Feedwater temperature. Changes may occur.