ELECTRICITY ASSOCIATION OF IRELAND

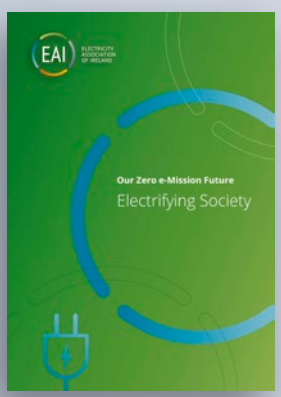
## Our Zero e-Mission Future

# Electrifying Society

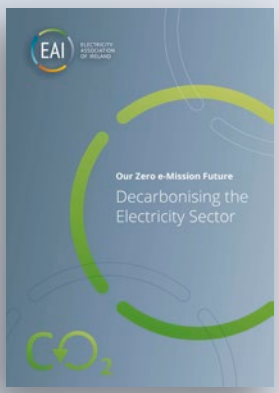
# Contents



This report is part of a series of three reports from EAI. They are available at:
Our Zero e-Mission Future – Electricity Association Ireland







# Foreword

## The Electricity Association of Ireland (EAI) is the representative body for the electricity industry and gas retail sector operating within the Single Electricity Market (SEM) on the island of Ireland.

Our membership comprises utilities that represent over 90% of generation and retail business activities and 100% of distribution within the market. We believe that a decarbonised electricity system will decarbonise society in a cost-effective manner and move transport and heating away from fossil fuels. We are fully committed to leading this vital journey of transition and working with others to accelerate the rate of decarbonisation and electrification.

Electrifying our economy will help build a more comfortable and healthier living environment with less noise, better air quality and increased energy efficiency. We know that the energy transition of society will require genuine support from all stakeholders – from policymakers and regulators to consumers to ensure it happens. Our aim is to provide insights that are authoritative, evidence based and constructive.

In 2020, the Electricity Association of Ireland commissioned the MaREI SFI Research Centre for Energy, Climate and Marine research and innovation to investigate what the all-island electricity system needs to look like in 2030 on the way to fully decarbonised electricity generation. Uniquely they examined a quarter of a million hours of historical weather data to determine the extremes that our future weather-dependant electricity generation system will have to flex to.

The study found that moving to a Zero e-Mission Future post 2030 will require grid flexibility and different technological options, all of which come with implicit uncertainty, but share a requirement for early investment decisions, significant capital commitment and long lead times for construction.

Since the publication of our Zero e-Mission Future[1] in 2020, government ambition has increased significantly and with a little over five years to go to 2030, now is the time to turn our attention to achieving a post-2030 Zero e-Mission Future and ensure that the correct policy signals stimulate appropriate market incentives and the right investments for a cost-effective transition. The EAI has prepared several policy papers to outline the collective view of the electricity sector on achieving our post 2030 zero e-Mission Future.

1 Our Zero e-Mission Future – EA Ireland

# Executive Summary

The goal of this paper "Electrifying Society" is to identify barriers to electrification across sectors and to promote policy measures that will contribute to increased electrification rates in Ireland and reduce greenhouse gas emissions.

**Electrification means replacing technologies or processes that use fossil fuels with electrically powered equivalents. This could be switching from an internal combustion engine car to an electric vehicle or installing a heat pump instead of a fossil fuel boiler. These replacements are more efficient, thus reducing energy demand and emissions as electricity generation decarbonises with more renewable energy sources[2].**

The EAI views electrification as the key to unlocking a low carbon emission future. In 2022, electricity made up 21.9% of final energy consumption in Ireland [3], with oil providing 55% and natural gas 15% of energy consumption. By continuing to increase the share of renewable energy supplying electricity to the grid, and with increased electrification, particularly in heating and transport, Ireland can achieve its emission reduction targets.

Increasing electrification of new loads has better climate outcomes, but is also cheaper for our homes and businesses, provides system benefits for the electricity network operators and will support security of supply in Ireland as we rely less on fossil fuel imports to meet our demand.


2 IEA Electrification Data
3 SEAI Statistics

In order to promote this transition, the EAI makes the following policy recommendations, with further detailed recommendations within the paper:

### Set a target of 35% electrification in industrial demand by 2030

This ambitious target is an increase on the 27% expected under existing CAP actions.

### Introduce a Carbon Contracts for Difference (CCFD) scheme

Allowing difficult to decarbonise demand to remain competitive while lowering carbon emissions. This should be included in the next State Aid proposal.

### Build a tool kit for industry to model investment decisions to electrify

Utilising projected carbon price, carbon intensity and electricity price.

### Introduce flexibility to the Energy Efficiency Obligation Scheme

This would reflect customer preference for substantive but less invasive work in homes, which is affordable and counterbalances current skills shortages.

### Include electricity under the Renewable Heat Obligation (RHO) Scheme and the Renewable Transport Fuel Obligation (RTFO) Scheme.

### De-risk EV investment

By providing direct easy access to the public charging network, through the RTFO, and facilitate dynamic EV charging and vehicle to grid charging facilities.

### Conduct a network tariff review

To explore the means of passing on the value of high renewable penetration to end consumers, while recovering investment into the network.

### Expedite a comprehensive review of projected electricity fixed costs

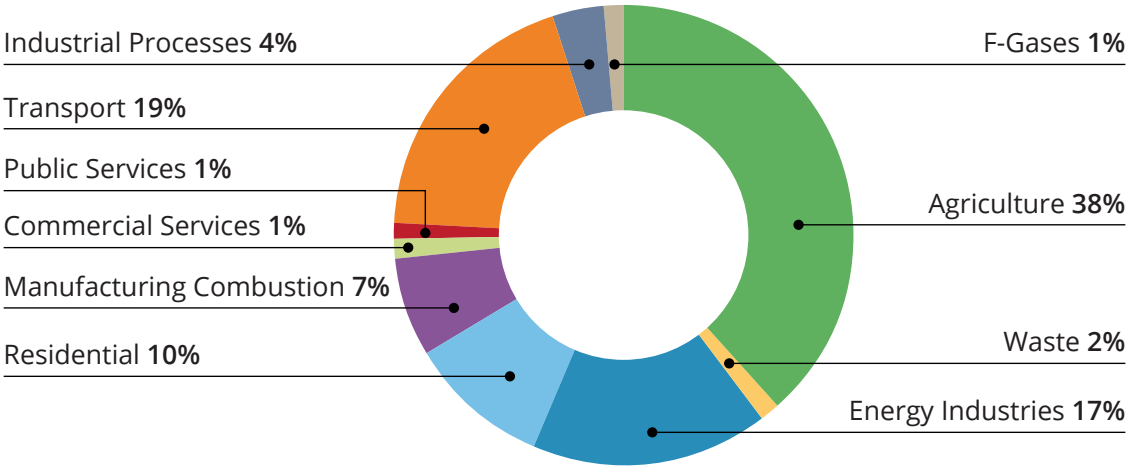
### Evaluate existing support schemes to determine how targeted support can be given to customers

Especially to those most exposed to future electricity costs.

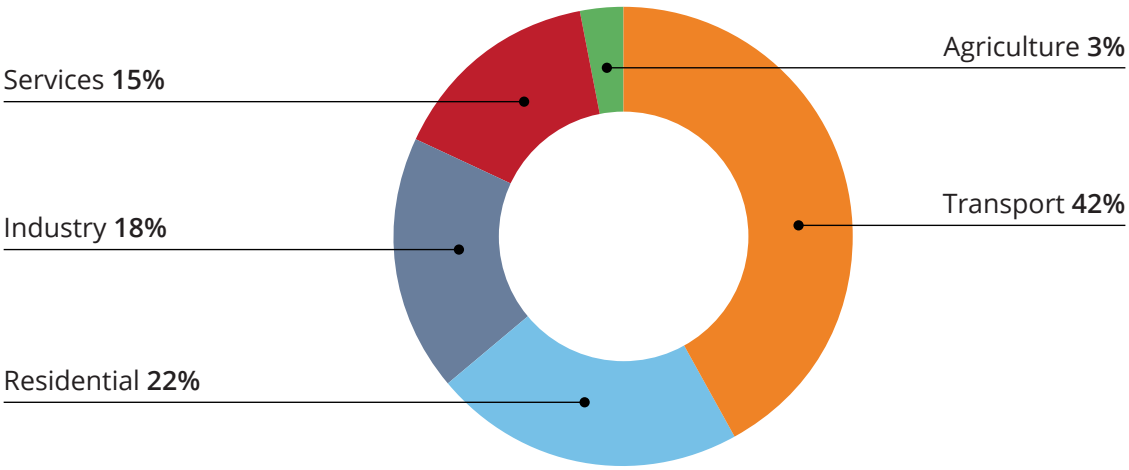
# Targeting Electrification

Looking at Ireland's greenhouse gas emissions share by sector in 2022, 50% of our emissions are accounted for through energy industries, residential, transport, commercial services, and public services.

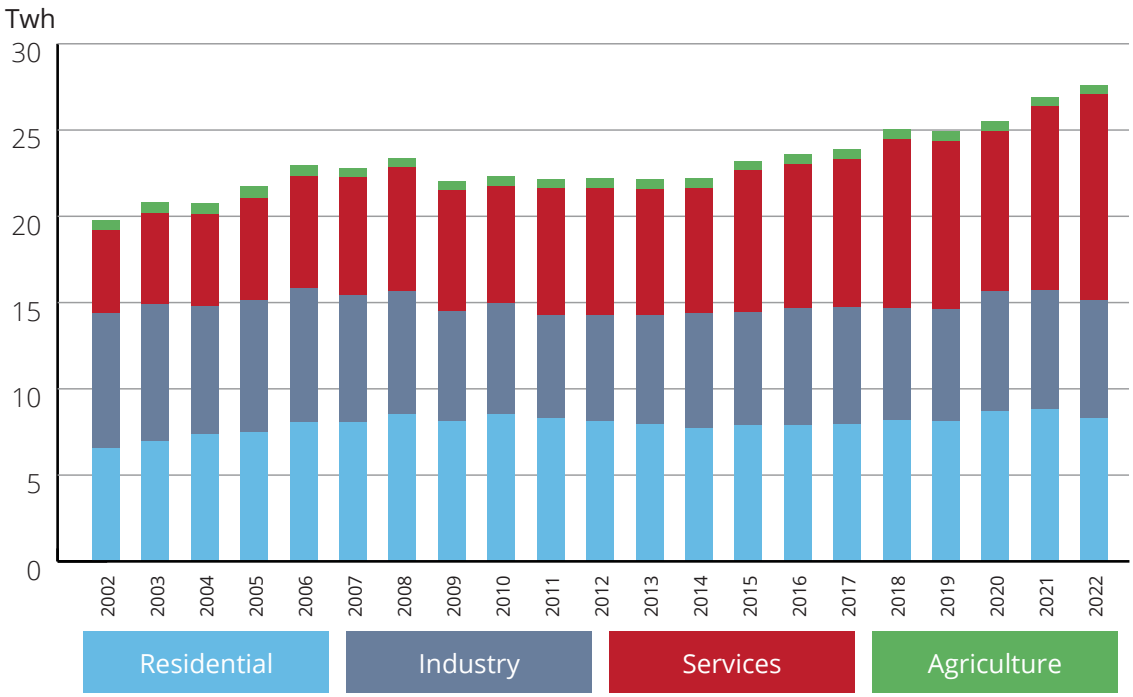
### Figure 1: GHG Emissions Share by Sector




### Figure 2: Share of Energy Demand by Sector



## Figure 3. Final Consumption of Electricity by Sector (Energy in Ireland 2023)




Final electricity demand in Ireland as a percentage of energy consumed is consistent with the European average of 23%. Electricity demand is growing, primarily due to data centres, and will increase further as more large energy users are connected to the electricity grid[4].

Agriculture accounts for 38.4% of greenhouse gas emissions whilst only creating 2.5% of final energy demand and therefore is not considered further in this paper. Electrification of residential and industry sectors has not increased significantly over the last decade while the share of the transport sector in electricity demand remains negligible. Due to the high level of electrification in services, over 70%, the greatest gains to be made are in the residential, transport and industry sectors. The following sections identify barriers to electrification within these sectors, which contribute to the low level of penetration to date.

By implementing Climate Action Plan 2023 policies, Ireland will reach 35% electricity usage in final energy demand by 2030; however, this will be primarily due to growth in data centre demand. The share of electricity in final energy demand for industry is only projected to grow from 26% in 2022 to 27% in 2030 under measures in CAP23[5]. As Ireland scales its renewable energy generation, the rate of switching from high-carbon fossil fuel, must keep pace, if not, the wider energy system net emissions and costs[6] will increase. Policies needed to electrify this sector are outlined in the Electrifying Industry section.

4 Energy in Ireland, SEAI 2023
5 SEAI Statistics Using figures under the High_WAM_CAP23 Scenario.
6 National Heat Study, SEAI

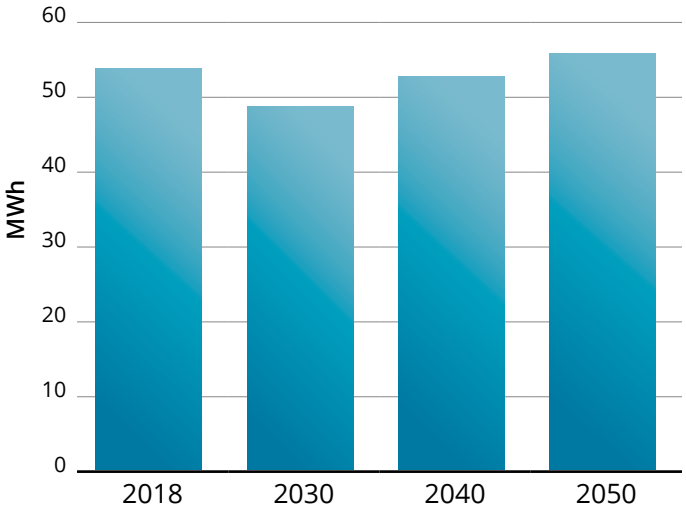
# Grid

The electricity grid will undergo significant development to accommodate increased electrification. Ireland will need to spend €1.1 billion annually from now to 2050 on the distribution system alone, according to estimates by EY and Eurelectric. €450 million of this will be driven by increased demand.[7]

Through electrifying new loads of heat and transport, efficiency gains from direct electrification and increased overall electricity consumption distributes this estimated cost of investment among more electricity customers. This ensures that electricity distribution fees stay flat to 2050[8]. This is shown in figure 4.

Similarly, the SEAI, in a 2022 report, indicated that in most scenarios, due to the significant electrification of heat and transport, the costs to end users of upgrading and operating the network are likely to reduce over time on a per unit basis[9].

**Figure 4. Estimated Distribution Fees – EU**




Investment in grid development will provide for the connection of new demand and more renewable energy to meet that demand. Currently renewable generation experiences dispatch down, either due to a constraint on the network or curtailment due to lack of demand. So far in 2024 (September), 27.6% of wind in Northern Ireland and 7.9% of wind produced in Ireland was not used to meet demand due to dispatch down[10]. This results in higher carbon emissions, higher costs and reduces the investment case for new demand in Ireland, as was seen in the recent refusal of a data centre in Dublin[11].

7 Grids For Speed, Eurelectric 2024
8 ibid
9 SEAI Electricity Infrastructure Report
10 Wind Dispatch Down, EirGrid, August 2024
11 Rte.ie, 2024

# Demand Management

The National Energy Demand Strategy Ireland sets out to achieve between 15-20% demand flexibility by 2025. This may be in the form of behavioural change from customers, flexible products to deliver volume shift, mandatory requirements from large energy users and interoperability requirements of EVs and other appliances[12].

Flexible demand can react to signals and adjust consumption based on the dual factors of a) shifting away from peak demand and b) adjusting demand to the emissions intensity of the supply within half hour periods. ESBN has initiated a procurement process for demand flexibility products to support Ireland's generation capacity and manage intermittent renewable generation through energy storage. Similar to procuring storage, electrified loads need clear incentives to use electricity at times of high renewable energy production and away from peak demand.

The wholesale electricity market offers real time electricity pricing signals that should promote consumption in times of high renewables and discourage electricity consumption when the grid is reliant on fossil fuels. However, consumers of power are insulated from these price signals due to the current regulated charging structure (market, networks, PSO (Public Service Obligation)) that can exceed €60/MWh[13], while the average cost of natural gas for the last 12 months was less than €40/MWh. Rebalancing these charges would create clearer investment signals for electrification.

As demand begins to track renewable generation we will see decreases in Ireland's carbon emissions, as well as less curtailment of renewable generation, improving the cost effectiveness of the energy transition and facilitating electrified loads to decarbonise in advance of the energy generation portfolio.

12 National Energy Demand Strategy, CRU, 2023
13 Electricity Transmission Network Revenues, CRU 2024

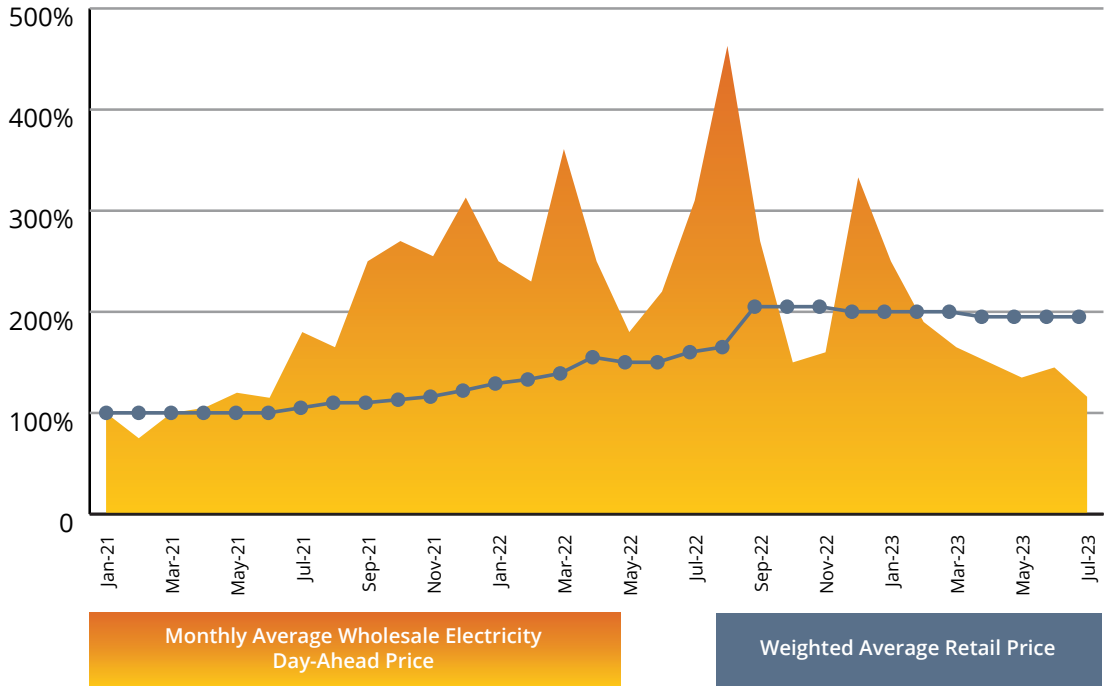
# De-Risking Energy Costs

Currently, Ireland is a net importer of energy, with a reliance on importing fossil fuels in the form of gas, oil, and coal. According to SEAI, Ireland is 80% reliant on imported energy to meet our total demand, much higher than the EU average of 55%[14].

This energy is used in electricity production, petrol and diesel for transport and heating. Fossil fuel prices are highly volatile and are the result of a combination of supply and demand factors across global markets such as pandemics, wars, political movements, and investment strategies[15].

Electricity suppliers manage this volatility through hedging practices, absorbing much of the shock increases which can be experienced on wholesale markets as shown in figure 5. This protects electricity customers from sudden price increases. The Commission for Regulation of Utilities (CRU) noted in a 2023 report that 'supplier hedging significantly reduced the impact to consumers of the sustained high and volatile prices in the wholesale market, during the period in advance of and during Russian invasion of Ukraine'[16].

### Figure 5: Correlation of Wholesale and Retail Electricity Price 2021-23




Electrification offers the opportunity to de-risk our energy system costs through effective hedging strategies, competition among electricity suppliers, and investment into indigenous renewable energy generation thereby reducing exposure to volatile fossil fuel prices.

14 Energy in Ireland 2023, SEAI, pg. 43
15 What is behind soaring energy prices and what happens next? – Analysis – IEA
16 Report on Retail Energy Markets, CRU 2023

# Funding the Transition

The transition to a low carbon future powered by renewable energy requires investment into a range of infrastructure and technologies. This includes transmission and distribution grids, wind and solar farms and system services which will help manage more variable generation.

Whilst this has many benefits as discussed in this paper, it will require increases in fixed costs for customers, recovered through network tariffs, the Public Service Obligation (PSO) levy, and other 'pass through' charges.

Assessing these costs and model how they are to be met out to 2040 should be prioritised. This is to ensure that energy poor and vulnerable customers are fairly protected during the energy transition and share in the benefits of renewable electricity system. On foot of this assessment, existing support schemes such as the Household Benefits Package should be evaluated to determine how targeted support can be given to energy poor and vulnerable customers that are most exposed to future electricity costs. Government communication to raise awareness of the costs and benefits of the energy transition will play a key part in successful implementation.

## Policy Recommendations

1. **Conduct a network tariff review** to explore means of passing on the value of high renewable penetration to end consumers, while recovering investment into the network.

2. **Expedite a comprehensive review of projected electricity fixed costs** which are to be met out to 2040. This study should prioritise how energy poor and vulnerable customers are fairly protected over this period and share in the benefits of renewable electricity system.

3. **Evaluate existing support schemes to determine how targeted support can be given to vulnerable customers** that are most exposed to future electricity costs.

# Electrifying Industry

EPA data for the year 2022 illustrates that the industrial sector comprised 12.1%[17] of Ireland's GHG emissions. This sector, which represents a broad category of activities, makes up over 35% of Ireland's GDP[18], and will play a significant role in transitioning to a low carbon future.

In 2022 the sector made up 17.8% of overall final energy consumption with natural gas by far the greatest component representing over 42% or 10,000 GWh; growing from 7,000 GWh in 2012[19]. Meanwhile, the share of electricity in industrial energy consumption has remained stagnant in the same period representing 29.2% (6140 GWh) in 2012 compared to 27.5% (6859 GWh) in 2022. Under existing measures, industrial demand is not projected to electrify out to 2030.[20] While other parts of the economy are electrifying (households from 26% to 35% and transport from 0% to 7%), industry is lagging.

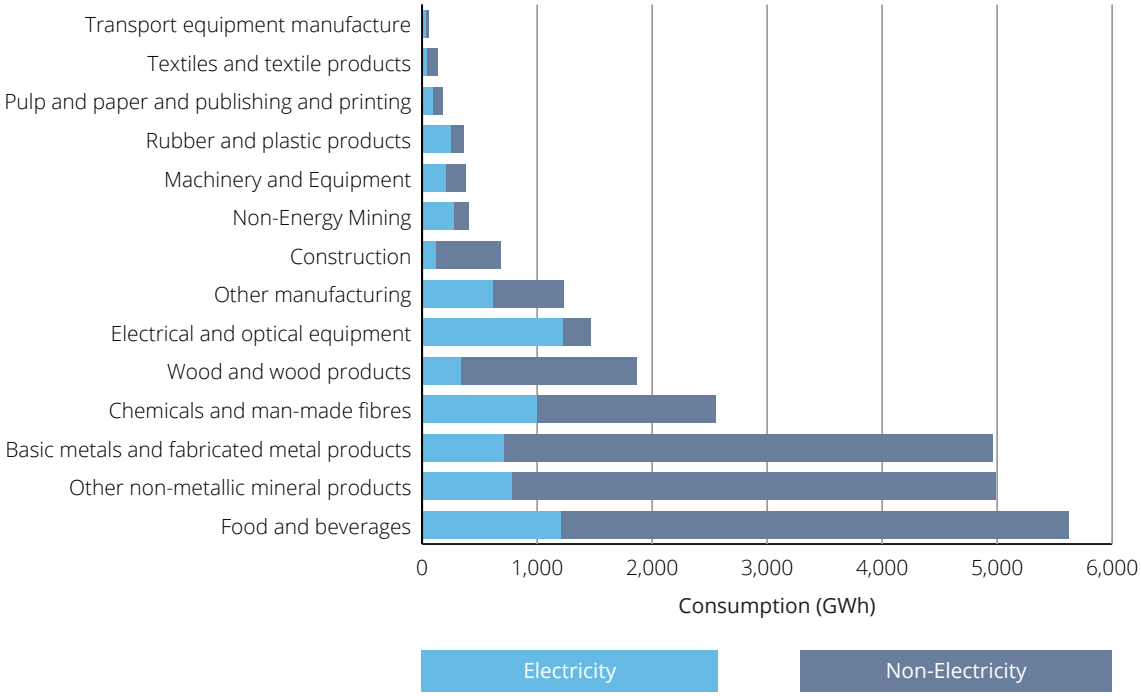
The key trend is that industrial processes have transitioned from predominantly oil (and its derivatives) to natural gas consumption delivering GHG emission reductions[21] but locking in fossil fuel dependence.


17 Manufacturing & Industry Emissions, EPA
18 GDP by Sector Data, CSO 2023
19 Energy Data | SEAI Statistics | SEAI
20 Energy Data | SEAI Statistics | SEAI
21 Study on Natural Gas, IEA 2017

Energy consumption across the industrial sector is not uniform. While some activities have electrified their processes successfully, the three greatest consumers of energy in the sector: metal production, mineral production, and food production, have the poorest levels of electrification as shown in figure 6.

Based on global industrial heat demand in 2022, 45% of industrial heat demand is below 200°c and can be electrified through currently available technologies[22]. Applying this 200°c threshold to Irish industries, an estimated 55% of industrial heat demand can be met by industrial heat pumps.[23]

## Figure 6: Comparison of Final Energy Consumption within Industrial Activities 2022[24]




While industrial activities such as the cement and metal industries currently have a very limited scope to be electrified there is a strong argument for investigating the role of indirect electrification. Indirect electrification can take many forms including using decarbonised electricity to power the production of various fuel molecules such as green hydrogen and ammonia. This pathway towards wider industrial decarbonisation is highly promising although more expensive than readily available fossil technologies.

22 Liebreich: The Next Half-Trillion-Dollar Market – Electrification of Heat | BloombergNEF (bnef.com)
23 Industrial Heat Pumps Insights, ESB
24 SEAI Data Insights Tool

# Electrifying Industry (continued)

A current proposal by the German Government to introduce a Carbon Contracts for Difference (CCFD) sets one such pathway for low carbon industrial heating demand to be competitive in the market. Using a CCFD industrial users will submit an artificial price for carbon that would allow them to develop clean production technologies. This 'strike price' seeks to address the price gap between higher cost low carbon production, such as using green hydrogen, and lower cost fossil fuels. When the carbon market price is lower than the strike price, the Government will pay the difference to the industrial user. When the carbon market price is higher, the user will pay back to the Government.[25] This measure will require approval from the European Commission in Germany's state aid proposal in 2027. IBEC in their 2025 pre-budget submission called for €400 million to be designated to first round contracts over 12 to 15 years with a further €60 million in 2025. This would create an incentive for industry to electrify.[26]

Existing incentives for industry to reduce emissions include the IDA Go Green Scheme[27], the Enterprise Ireland Green Transition Fund[28] and the EU Emissions Trading Scheme[29]; however, further mechanisms will be needed to achieve electrification at scale, particularly if these industries are to remain competitive.[30]

**Barriers**

- Limited access to finance to invest in the significant upfront costs of restructuring processing plants to purchase and assimilate low carbon technologies.
- Tension between maximising product output and operating electrified assets flexibly to take advantage of high renewables with inefficiency costs arising.
- Uncertainty regarding electricity prices, carbon price and the ETS (Emissions Trading Scheme) slowing investment decisions to electrify.

25 Berlin launches €50 billion 'climate contracts' for industry – Euractiv
26 Sharpening our Edge
27 IDA 'Go Green' Offer | IDA Ireland
28 Improve Sustainability, Enterprise Ireland
29 EU Emissions Trading System (EU ETS) – European Commission
30 Antwerp Declaration

## Policy Recommendations

1. **Set a target of 35% electricity share in industrial final energy demand by 2030 using existing technologies**. This is an increase from the projected 27% in 2030 under existing CAP actions. Publish and report on the share of electricity in final energy demand in Climate Action Plans.

2. **Set out a glide path to phase out fossil fuel industrial heating** particularly in industrial activities where research illustrates that there are viable commercial options. In support of this glide path develop

    a. a tool kit for industry to support investment decisions to electrify utilising projected carbon price, carbon intensity and electricity price.

    b. funding mechanisms to de-risk pathfinder clean technology projects for new and innovative technologies (electric boilers, plasma) adopted by industrial participants. i.e. a Carbon Contracts for Difference (CCFD) scheme to allow difficult to decarbonise demand to remain competitive while lowering carbon emissions.

# Electrifying Buildings

## Electrification of building heat through heat pumps has a key role to play in achieving decarbonisation. Heat pumps are an efficient heating source for new build houses, retrofitted dwellings, and as a direct replacement for fossil fuel boilers.

Heat pumps have a coefficient of performance of 4-5x higher than typical gas boilers as they extract significant renewable energy from the external environment[31], this reduces both the carbon emissions associated with heat pumps and the final energy demand.

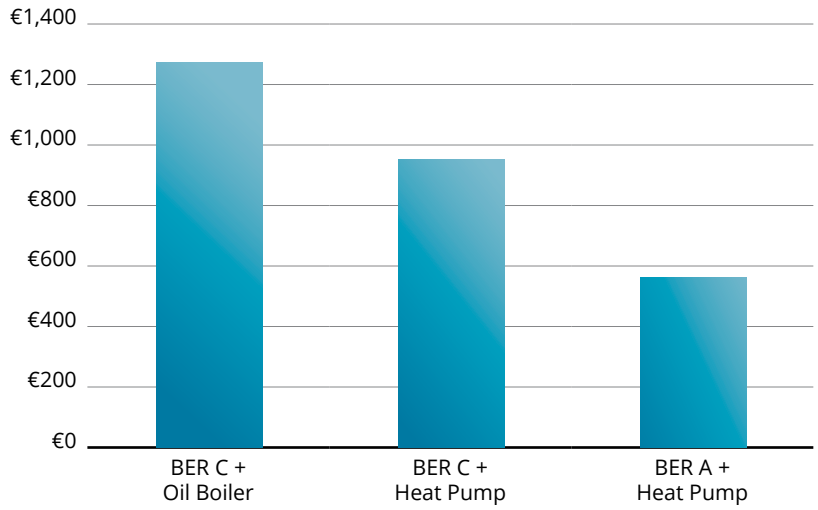
There has been growth in the use of heat pumps in residential homes for new buildings. CSO data from 2022 shows that just under 1 in 4 houses in 2022 used renewable energy sources, with over 71,000 households using heat pumps[32]. Nationally nearly half of the occupied housing stock built between 2016 and 2022 used electricity as the main type of central heating, compared to just 10% of older dwellings built from before 1919 up to 2015[33].

Gas boilers were used in approximately 1/3rd of homes for heating, and oil in 41% of older homes. Converting these homes from fossil fuels to electricity, where appropriate, will be essential to meet CAP targets in the coming years.

Deploying heat pumps at scale, and utilising district heating needs to be incentivised through the Renewable Heat Obligation Scheme (RHO). The RHO has omitted renewable electricity due to overlapping supports for generating renewables through the Public Service Obligation (PSO). However, due to the efficiency gains from installing heat pumps or electric boilers and the high capital costs associated with these technologies – suppliers should be encouraged to meet their heating obligation through electricity by installing large heat pumps, supporting district heating schemes and installing electrode boilers where feasible. This will deliver long term value for customers through fuel cost savings from switching to a heat pump (figure 7).

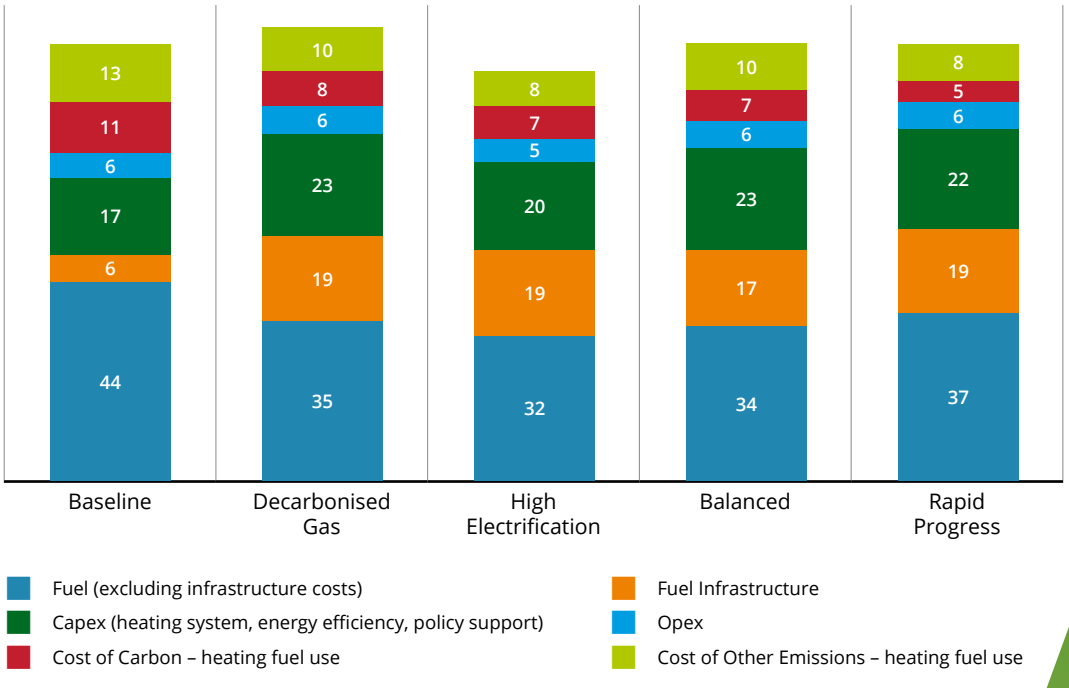
31 McKinsey Report, Decarbonisation Pathways – Electrification Scenario, McKinsey
32 Occupied Dwellings – CSO – Central Statistics Office
33 ibid

## Figure 7: Annual Heating Fuel Costs (see Annex for data)




High electrification of heating yields the lowest net present cost to decarbonised heating as was found in SEAI's National Heat Study. The results show (figure 8) that due to high efficiency, emissions reductions and fuel cost savings, electrification is €6bn cheaper than the business-as-usual scenario which does not achieve net zero emissions by 2050[34].

## Figure 8: Cost Benefit Analysis – Net Present Cost (€bn) Across Scenarios




34 SEAI National Heat Study

**Barriers**

- High upfront costs – although heat pumps are far less expensive to run for households, replacing a broken oil or gas boiler with a fossil boiler is cheaper than installing a heat pump.
- Customer acceptance and understanding of this new technology is limited. Access to reliable information about heat pumps is essential for customers to adopt this technology. Similarly, applying for grants and funding for heat pumps creates a barrier to installations.
- 'Retrofit first' – customers are hesitant to install heat pumps which may require further works to be carried out on their houses. Similarly, although the most value from heat pumps are derived in energy efficient homes, our analysis shows that the annual fuel costs for heat pumps are cheaper than for an oil boiler household.
- Split incentive for landlords and tenants – in rented properties the onus is on the landlord to install renewable energy technologies however the tenant receives the benefit.
- Lack of skilled workers available to meet heat pump installation targets.

## Policy Recommendations

1. **Introduce flexibility to the Energy Efficiency Obligation Scheme** to reflect customer preference for substantive but less invasive work in homes, that is affordable and counterbalances current skills shortages.

2. **Include electricity under the Renewable Heat Obligation Scheme** as a viable fuel source for heating, allowing energy suppliers to install heat pumps and electrode boilers to meet obligations.

3. **Set a glide path to phase out fossil fuel boilers in the residential sector** to avoid locking in fossil fuels for 10-15 years in our residential heat demand. Grants and a public information campaign should remain in place until all homes have availed of electric solutions where viable to ensure a just transition.

# Electrifying Transport

Transport has the highest fossil fuel dependency, the lowest degree of electrification and the lowest share of renewable energy compared with other sectors. Furthermore, emissions from transport are one of the main causes of pollution in cities.

Whilst other technologies are being implemented for buses and heavy goods vehicles[35] such as hydrogen fuel cells, liquid biofuels, and natural gas vehicles (biogas in future), battery electric vehicles are a proven technology for cars which address both pollution and fossil fuel dependency. The carbon emissions associated with EVs are linked to the carbon intensity of electricity generation, which will decrease over time and their greater efficiency[36].

Ireland's National Development Plan includes the target of one million electric vehicles on the road by 2030, with additional charging infrastructure to cater for growth. The National Development Plan includes commitments to prohibit the sale of new non-zero emission cars beyond 2030, and the issuance of NCT Certs for non-zero emission cars after 2045. The plan sets out the transition of the bus fleet to low emissions with no diesel-only buses purchased from 1 July 2019. Ireland aims to have at least 500,000 private electric vehicles on the road by 2030.

The rate of EV adoption is non-linear[37], and customer confidence has been a key factor in adoption. EVs, like any other technology, follow an adoption lifecycle which must move from early adopters to an early majority, followed by a late majority and laggards[38]. Ireland, like many other countries is moving from early adopter to early majority, and significant energy from policy makers and communicators is needed to overcome this latent stage. Customers need to be convinced of the value of an EV and the reliability in the infrastructure to encourage investment.[39]

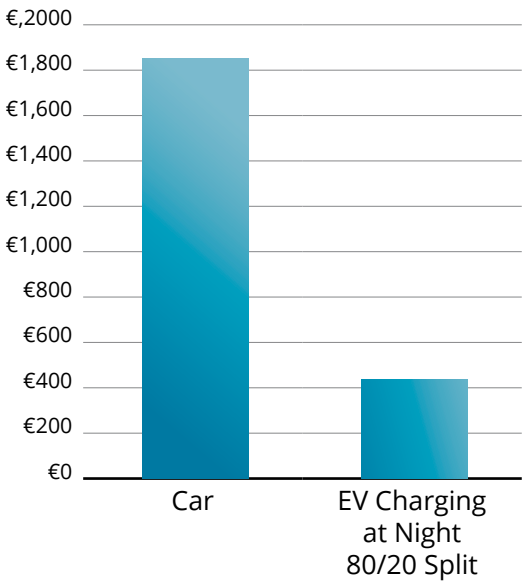
35 Ireland's Low Carbon Future, ESB
36 Energy Ireland, 2023
37 New electric vehicle sales drop over 40% in April (rte.ie)
38 Why Has the EV Market Stalled? (hbr.org)
39 EV sales slide accelerates, Simi figures show – The Irish Times

# Electrifying Transport (continued)

Although EVs are more expensive to purchase, the fuel cost savings associated with switching to EVs needs to be emphasised. Based on 2024 prices for diesel and electricity, including smart tariffs, EVs can be almost 80% cheaper to run annually than an ICE vehicle as shown in the graph. EVs are a more attractive investment over the lifetime of the asset due to cheaper fuel costs and lower servicing requirements.

Customer confidence in EVs is gained through a reliable charging infrastructure network. This infrastructure must consider home charging, on-street charging, location, and fast charging which accommodates all EV owners, including those without access to a private driveway in their home[40].


## Figure 9: Annual Car Fuel Costs




40 Decarbonisation Speedways Report (eurelectric.org)

**Barriers**

- Purchase Price – EVs are on average 27% more expensive than ICE across Europe creating a significant barrier to entry for those who may be willing to adopt an EV.
- Customer behaviour must adapt to a new model of transportation. This is likely the most pressing barrier to move from early adoption to a majority buy-in on EVs.
- Charging Infrastructure reliability and rollout, particularly for those who do not have a private car parking space or driveway needs improvement. More on-street charging and flexible charging mechanisms are needed to increase EV penetration. Public charging is approximately 50% more expensive than private charging, for people without private parking.
- Lack of a competitive second-hand market.
- Limited roll out of innovative digital energy solutions for customers that will unlock further value for EV users.

## Policy Recommendations

**De-risk EV investment** by

1. Including electricity in the Renewable Transport Fuel Obligation scheme, allowing suppliers to meet their obligation through installing charging infrastructure.
2. Developing dynamic EV charging and pricing arrangements to facilitate grid management through incentives that unlock value for EV users.
3. Providing Direct easy access to the public charging network. i.e. Contactless payment card readers.

# Annex

## Data Used for Graphs

| Heat Source | Oil Boiler | Heat Pump | BER A + Heat Pump |
|---|---|---|---|
| Efficiency of Heat Source | 0.9 | 3 | 3 |
| Annual Heat Demand of home kwh | 12000 | 12000 | 7130 |
| Price of kerosene in Euro/Litre | €1.00 | | |
| Kerosene kwh eq | 10.35 | | |
| % of Nighttime use of Heat Pump | | 70.00% | 70.00% |
| **Car** | **Diesel Engine** | **EV** | |
| Kilometres Travelled | 20000 | 20000 | |
| Efficiency of Car litre or kwh/100km | 5.5 | 18 | |
| Cost of Diesel | €1.70 | | |
| % on Day rate | | 20.00% | |
| Nighttime | | 10% | |
| EV Boost time | | 70% | |
| Annual Fuel Costs | €1870 | €453.60 | |
| **Electricity Tariff** | **Standard Day Night** | **Smart** | |
| Day Rate | €0.36 | €0.36 | |
| Night Rate | €0.18 | €0.18 | |
| EV boost rate (2am-4am) | | €0.12 | |
| Peak Rate (5pm-7pm) | | €0.40 | |

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