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Addressing Trade-Offs in the Energy Transition

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Introduction[1]

There has been much progress made on Ireland's energy transition. Harmful emissions have fallen, there are record levels of power being generated from renewable sources, and home solar energy adoption and retrofitting are happening at scale and at pace. Key structural, institutional, and legislative changes have progressed, and significant capital investment continues.

However, Ireland's energy transition is not happening fast enough. Additional policy action and investments on numerous fronts are required, and any steps that can accelerate decarbonisation must be taken. This discussion paper argues that one of those steps should be a greater emphasis in the policy system on understanding, confronting, and resolving key trade-offs.

Policy trade-offs arise when the pursuit of one policy objective or outcome involves sacrificing or negatively impacting the achievement of another. Failure to resolve trade-offs, when setting or progressing policy, increases ambiguity, uncertainty, incoherence, risk, and other negative effects which harm progress. In contrast, addressing trade-offs can accelerate progress.

In the absence of agreed non-negotiables, a trade-off between sustainable, secure, and affordable/competitive supply (the trilemma) sits at the heart of Ireland's energy transition. A successful transition depends on an energy system which has a cumulative emissions trajectory towards national targets, is secure, is reliable, is viable, is affordable, is competitive, and is socio-politically acceptable. An evidence-based pathway to achieving Ireland's ambitious energy targets which reconciles national environmental, social, and economic objectives has never been settled on.

The consequences of this are clear, not just from the frustrating pace of progress and missed targets, but also from the gaps in our knowledge and strategy for power sector decarbonisation, offshore renewable energy, energy security, and digitalisation. There is a resulting absence of clarity and certainty which is harmful for policy, progress, and narrative. Policy-makers may know what to do, but not how to do it in a way which simultaneously achieves multiple, valid national objectives.

A secondary impact of not fully reconciling trade-offs has been the raising of public expectations via a narrative of cheap, reliable renewable electricity, where Ireland becomes a net exporter of energy. The transition narrative often looks to the longer-term, to the horizon where trade-offs have been resolved. In the near-to medium term, electricity is likely to be more expensive, reliability is uncertain and may worsen, and the export model is incomplete. Any shift in the narrative must be carefully managed to maintain Ireland's currently strong buy-in and legitimacy for action.

1 The author wishes to acknowledge the insights provided by NESC colleagues and other experts during the preparation of this discussion paper. The content, and any errors or omissions, are the author's alone.

Finally, Ireland must be ever-vigilant for 'the obstructionist wolf in pragmatist sheep's clothing', while also encouraging and supporting constructive critique which is aimed at progressing decarbonisation. If key trade-offs can be addressed and are seen to be so, this can insert impetus into the transition and help defeat obstruction and delay. The challenge of doing so must not be underestimated, and five initial steps are proposed:

1. Work hard to better understand transition trade-offs: Complete the important research underway, and address the knowledge gaps out to 2030 and in the heat and transport sectors.
2. Place a new emphasis on feasibility: Move beyond technical readiness and the availability of measures, to reflect a tetralemma of ensuring sustainability, security, affordability, and socio-political acceptability; and set out an agreed, credible pathway.
3. Enhance energy transition modelling: Encapsulate a wider set of considerations and data which have been deemed important to Ireland e.g. with reference of the National Well-Being Framework.
4. Tell a story of transition that isn't only looking to the horizon: Refresh the energy transition narrative in light of developments at home and abroad. Ireland needs a story of energy transition that isn't told looking 30,000 feet away, to the horizon. It must speak to the lived experience of individuals, households, firms, and communities today.
5. Supplement the Accelerating Infrastructure Action Plan: Use this new policy architecture to address unresolved trade-offs in strategic infrastructure delivery more broadly, not only in the energy transition, and to improve future policy-making and target-setting.

These proposals are expanded upon in this discussion paper. Making progress on these actions, alongside the many other necessary ones, can bolster the energy transition and help Ireland realise national environmental, social, and economic objectives.

Chapter 1: The Centrality of Policy Trade-Offs

1.1 Introduction

A policy trade-off is a situation where the pursuit of one policy objective or outcome involves sacrificing or negatively impacting the achievement of another. Resolving trade-offs has long been at the heart of policy, politics, and governance, for example reconciling tensions between liberty and security, economic efficiency and social equality, globalisation and national sovereignty, and in recent years, economic growth and environmental sustainability (Raworth, 2018; NESC, 2023b; Cahill and FitzGerald, 2023). Everything can't be had: limitless spend and low tax; relentless consumption and ecological sustainability; and as the saying goes, 'to govern is to choose'. Reframing policy trade-offs has been core to the work of the National Economic and Social Council (NESC) since its establishment in 1973 (NESC, 2025d).

The trade-off framing is used in this discussion paper, not to advocate for it or because it is in some way optimal, but to illustrate the extent to which critical decisions have or have not been taken by the policy system, and non-negotiables agreed. There are drawbacks to the 'trade-off' framing. For example, the framing of policy as a trade-off between social, economic, and environmental factors is viewed by some as not being objective, but rather as having 'a structural imperative for economic growth at its core' (Jackson, 2024).

One enhancement of the *trade-off* framing is the *synergy* concept, whereby goals are complementary rather than in opposition (Blair, 2017). Examples of synergies include active travel policy which reduces emissions while also improving health outcomes, and retrofitting initiatives which reduce emissions while also helping alleviate energy poverty. In the longer term, energy independence can enhance national resilience and competitiveness. The failure to leverage synergies can occur when siloed policy-making fails to identify synergies, or where policy solutions that maximise synergies are further away from existing practice. At the same time, a synergistic outcome in the near term to Ireland's energy trilemma seems implausible, and caution is always needed in regard to win-win narratives i.e. 'we would have done this anyway regardless of cost, emissions, or security concerns'. In the longer term, decarbonisation is an energy security strategy.

One useful example of an alternative to the trade-off framing is an *energy-needs hierarchy* frame (McMullin, 2018). This approach argues that energy policy is not a trilemma of relatively equal sustainability, security, and competitiveness aspirations to be balanced against each other, but rather is a strict hierarchy with a rigorous priority order, similar to Maslow's hierarchy of human needs. Needs lower in the hierarchy must be satisfied before higher ones can be attended to. At the bottom of the energy-needs hierarchy is sustainability, above this is security, with cost of supply at the top. There have been calls for over the years for the policy system to clearly set out what the order of priorities is, say between sustainability, security, and competitiveness, as this has significant implications for decisions made and actions (Forfás, 2011; FitzGerald, 2019).

Despite its limitations and the presence of alternatives, the trade-off framing has strong illustrative power and moreover, remains prominent in policy discourse. The trade-offs facing policy-makers in any specific area change over time. Since the 1980s, the trade-off between social, economic, and environmental factors has been a prominent feature of policy discourse, and the search for an 'elusive' resolution is the subject of much of modern day policy making (Elkington, 2013; Campbell 1996; Carter and Rogers 2008; Jackson, 2024).[2] At a macro-level, Ireland has stated national policy objectives for the environment, society, and economy which it pursues in parallel:

- The *national objective for the environment* and climate is evident in the legally binding commitment to reduce emissions by 51 per cent on 2018 levels by 2030, and to become a climate neutral economy by no later than 2050. A system of carbon budgets and sectoral ceilings, linked to cumulative emissions and the Paris 1.5 degrees commitment is connected to this (Government of Ireland, 2021).
- *National social policy objectives* include making Ireland one of the most socially inclusive States in the EU and reducing the national consistent poverty rate to 2 per cent or less of the population. This means extending employment opportunities to all who can work, ensuring work pays, providing income security for older people, supporting families and reducing child poverty, reducing poverty among people with disabilities, building inclusive communities, and ensuring that all people have access to quality services (Government of Ireland, 2020b).
- *National economic objectives* include:
    - 'Growing Ireland's economy' through on a strong enterprise base, openness and free trade, exporting, competitiveness, productivity, and innovation (Government of Ireland, 2025i); and
    - Making Ireland the world's leading location to work, do business, and visit. This involves, among other things, driving competitiveness, prosperity, and higher standards of living; cost-effective strategic investment in innovation, productivity, digitalisation, decarbonisation, and infrastructure; and minimising cost burdens and mitigating the cost of doing business (Department of Enterprise, Trade and Employment, 2025).

While these objectives are not explicitly set in opposition to each other, the persistent challenge for policy-makers has been resolving inherent trade-offs between them. Even within the national objective for the environment, a trade-off is evident as the goal of 'climate neutrality' is defined with reference to a 'sustainable economy and society' (Government of Ireland, 2021).[3] Another important trade-off in this context is the intertemporal trade-off. Policy-makers must confront the trade-off between 'cost' now and longer-term benefit (e.g. mitigation investment), and 'benefit' now and longer-term cost (e.g. fines related to missing 2030 targets). This issue is most acute for elected policy-makers. At a more micro level, there currently are live, impactful national policy trade-offs to be reconciled within and between policy areas, for example:

- In infrastructure delivery policy, between individual rights and the common good.
- In land use, between socioeconomic, climate, biodiversity, and water and air quality objectives.

2 The 'trade-off' framing of policy has its critics. See section 2.3 for discussion of this point.

3 Furthermore, as was recently confirmed by the Supreme Court, the Climate Act's instruction that public bodies must perform their functions in a manner consistent with the national climate objective, is "in so far as practicable", thus allowing for competing factors.

- In social policy between sustainable long-term funding and pension arrangements.
- In technology policy, between innovation and regulation, and utility and privacy; and between computational power, digitisation, and resource use.
- In free trade policy, between economy wide effects, sectoral impact, public health concerns, international reputation and influence, domestic electoral concerns, and domestic political stability.
- In transport infrastructure and housing policy, between the need for a large number of workers from abroad required to complete large infrastructure projects, and providing homes for those workers.
- In housing policy, between protections for rental tenants and the need for private investment.

Many more examples are evident in almost every policy area, of course.

1.2 The Cause and Impact of Unresolved Trade-Offs

The failure to confront policy trade-offs can occur when setting policy and targets, or later when progressing the policy. In many ways avoiding trade-offs is understandable, and should not be simply seen as ignorance or negligence. The primary reason may be that **successfully reconciling trade-offs is exceptionally difficult.** This is discussed further in chapter 3. In summary, successfully resolving trade-offs requires the capacity, structures, and time for comprehensive analysis, and for effective engagement on specific policies and projects between policy-makers, experts, interest groups, local communities, and politicians. It requires strong politics and politicians, and legitimacy from the public to act. Vast quantities of data may be required to begin to understand the trade-offs inherent in any specific policy area. Complex analytical work must be steered by key actors, may involve contracting external expertise, and involve extensive stakeholder consultation exercises. The complexity and intensity of contested issues means translating trade-off analysis into trade-off resolution requires political will and authority.

Additional reasons for avoiding difficult trade-offs and rushing to outcomes and targets include:

- Where the policy **issue is particularly pressing** (e.g. the climate/biodiversity and housing emergencies), setting ambitious policy and targets to show determination is rational and to be expected. There is understandable **public expectation.**
- Moving quickly to ambition and targets can be done to **drive ambition and to foster co-ordinated action.**
- Creating a binding system of **laws and fines can viewed as a way to compel action,** without having to confront difficult choices.
- In **complex and contested areas,** policy-makers will naturally strive for consensus via win-wins in order to make progress as quickly as possible.
- Expediency is an incentive for **strategic use of ambiguity,** leaving trade-offs unconfronted.

- For elected policy-makers, the **dynamics of political competition** encourage the setting of ambitious policy and targets without first resolving the key trade-offs. They are easier to ignore where vision does not (need to) extend beyond the electoral cycle.
- Policy and targets can emerge from **vote-seeking political party manifestoes,** where trade-offs may be of lower concern, and which are then collated in a relatively short and intense timeframe into a Government programme.
- In policy-areas where progress has been difficult over a long period, ambitious policy and targets might be used to **counter systemic cynicism,** and any view that progress can't or won't be made.
- The often **siloed nature of the policy-making system** makes reconciling objectives across areas of Departmental/Agency/Regulator responsibility extremely difficult.
- **Behavioural factors** such as risk/ambiguity aversion, cognitive dissonance, and groupthink all make trade-offs more difficult to confront.

Whatever the reason or the rationale, the impact of failing to understand, confront, and reconcile trade-offs can be negative: poor policy and progress. It increases ambiguity, incoherence, uncertainty, and risk. It can result in short term, more (politically) palatable decisions, and even 'placebo policies' (Mazey and Richardson, 2022). The failure to reconcile trade-offs can hinder strategic vision, and lead to 'successful failure' whereby some output is delivered, but the core problem is not addressed. Problems can be 'stored up for the future', making subsequent policy decisions even harder. The persistent failure to address problems can generate disillusionment and cynicism, reduce faith in the policy-making system, and polarise debate.

In a competitive political and electoral environment, disillusionment and cynicism can be responded to with increased political ambition and 'stretch' targets. The failure to recognise, tackle, and resolve trade-offs can contribute to cognitive dissonance whereby targets are adopted, maintained, and repeated despite a strong sense that they are unlikely to be reached. Stretch targets also emerge in response to the scale of the challenge, side-stepping trade-offs i.e. focusing on 'what is needed' as opposed to 'what can actually be delivered'. This is where trade-offs and feasibility interact.

When ambitious stretch targets are adopted, there can be insufficient action to also increase capacity for what can be delivered i.e. it is not that (all) stretch targets are undeliverable but rather that targets are stretched without also stretching the policies, capabilities, and measures required to attain them. While ambitious targets are not of themselves a barrier to delivery, the setting and restating of targets which have not confronted trade-offs and are more difficult or unlikely to be achieved, can mitigate against necessary adjustments to policy.

The failure to understand, tackle, and resolve trade-offs ultimately means that policy challenges are not seen fully and lack a 360-degree lens. It reduces the ability of the policy system to fully anticipate the complexity of delivery, and when problems do arise, the required whole-of-government capacity, systems, and willingness to engage and respond can be lacking. In short, it reduces the ability to achieve what needs to be achieved.

The corollary of the above is that being honest about and reconciling trade-offs is helpful to policy and progress. Policy-making must consider the broader suite of costs and benefits across the multiple objectives being pursued in parallel. This can decrease ambiguity, incoherence, uncertainty, and risk, and result in more medium-to-long-term decisions and more impactful policies. Giving greater attention to trade-offs can improve policy especially when a 360-degree, longer-term view is taken which resists status quo bias by considering future 'winners and losers' i.e. *cathedral thinking* (NESC, 2025d).

The successful resolution of trade-offs, coupled with greater, evidence-based risk appetite, can improve strategic perspective and lead to meaningful successes whereby output is delivered as the core problem is addressed.

The resulting success in addressing problems can generate confidence and optimism, increase faith in the policy-making system, and de-escalate polarisation by (re)introducing complexity to a perceived zero-sum game. Addressing trade-offs reveals the benefits of a policy, but also the costs which must be mitigated by secondary policy. This can allow political ambition and targets to be met despite both losers and winners potentially emerging from confronting the trade-offs. Overall, understanding, confronting, and reconciling trade-offs will contribute to the foundations of sound policy by providing evidence, feasibility, and legitimacy, and give politicians and advocates a truly robust policy to present to citizens and voters.

1.3 Evidence, Legitimacy, and Feasibility

In the *Policy Handbook: A 'Real World' Guide to Policy Development*, Ireland's policy system has adopted a three-pillar framework as the touchstone for the development of policy in Ireland (Government of Ireland, 2025h). The three pillars are:

- Data and evidence;
- Legitimacy; and
- Feasibility and implementation.

Combined, this tripod is to provide the base for good policy making in the Irish context. Reconciling trade-offs can help build each pillar, though as will be discussed later, it is a task in its own right. In the first instance, understanding the trade-offs necessitates the gathering and analysis of sufficient data and ***evidence.*** The policy system must have the time, resources, and expertise to complete this work, as it is a key input to the analysis, appraisal, and the weighing-up of competing objectives.

Ireland's sophisticated and impactful energy transition modelling exercises play an important role in energy transition policy. However, as will be described later in this discussion paper, even beginning to understand the trade-offs inherent in decarbonising the power sector will involve an entirely separate process to generate, analyse, and weigh up-over 2,000 data points. The policy system needs the capacity to complete this type of extensive work in a timely manner as many of the strategic projects are urgent. At the same time, nothing - including the gathering

and analysis of data - should delay or obstruct vital action. Further, addressing trade-offs must be more than a technocratic, data-focused endeavor. Policy-makers may have sufficient data to underpin action, yet delivery may not always follow.

A second consideration then is how addressing trade-offs can help to build, maintain, and grow ***legitimacy*** and the necessary public buy-in, as well as true political buy-in. Evidence and facts alone do not necessarily win minds.

Debating and negotiating trade-offs, what we do and do not need, what we can and cannot do etc. in an open and inclusive manner, with trusted intermediaries and messengers, can secure a mandate and buy-in from the public for strategic infrastructure and related policies (NESC, 2014). The centrality of legitimacy and narrative to the energy transition, and the present challenges to it, are detailed in chapter 3.

To complete the tripod of good policy as called for in the Handbook, resolving trade-offs contributes to the ***feasibility*** of a policy or project. Confronting trade-offs can provide clarity, make priorities explicit, support delivery, produce realistic expectations, and reduce assessments of implementation failure. It can highlight decisions that might solve one issue, but cause others, and inform further policy to mitigate possible negative effects.

Resolving trade-offs should be seen as part of developing good policy and assessing options, and feasibility is a pressing concern in relation to the energy transition. Ireland's *Policy Handbook* highlights some of the issues (Government of Ireland, 2025h; 21-23).

Complex energy transition policy issues are sometimes encapsulated in relatively simple statements of abstract policy objectives, such as *what if 80 per cent of Ireland's electricity came from renewable sources by 2030? What if Ireland had five gigawatts of offshore wind capacity by 2030? What if Ireland achieved a climate-resilient, biodiversity-rich, environmentally sustainable, and climate-neutral economy by 2050?* As the Handbook explains, while this is legitimate, good policy demands that such objectives are accompanied by some assessment of the feasibility of how these objectives will be achieved. 'Failure to associate valid policy objectives with an informed consideration of how these objectives might be delivered often results in unrealistic expectations. This, in turn, gives rise to assessments of 'implementation' failure, which, in turn, call into question the policy and delivery capacity of the civil service' (*ibid*:, 21).

Therefore, the Handbook calls for work to, among other things, fully understand the challenges and trade-offs associated with implementing the policy, together with the capacity and costs involved, the benefits to be derived, and the implementation timeline. This is a significant challenge in the case of establishing the feasibility of energy transition policy targets.

Deep analysis and engagement will 'allow all sides the time and space to elaborate on the complexities of policy choices, potential trade-offs, and what data and evidence is or isn't telling us'. Those who will implement the policy should, the Handbook indicates, sign-off on choices that are made about trade-offs- 'to help us translate and tailor policies into concrete outcomes

we must engage with everybody involved in the delivery process'. Again this is a challenge in energy transition policy (and others) where funding and delivery is by private sectors actors, who may be unknown *ex ante*.

The Handbook calls for feasibility to also be built via processes that will ensure the policy achieves the desired policy solution. For example, the benefits of generating renewable electricity will only accrue if the grid has the capacity to take and deliver it to homes and businesses.

Overall, the Handbook states, a well-designed policy should be feasible, based on a proper assessment. This assessment will 'help to inform the choice of policy instruments and to identify and mitigate against the inevitable risks that will be faced in translating policy choices into practice'. As will be discussed in chapter 3, the excellent energy transition modelling used by the policy system does not encapsulate the full range of trade-offs which the policy system must tackle. Further, in that modelling, feasibility is a function of the technical readiness, as opposed to whether 'it can be done' or socio-political acceptance.

1.4 Conclusion

Resolving situations where the pursuit of one objective involves damage to another has long been central to the work of policy-makers. The failure to reconcile such trade-offs is harmful to policy and progress, while resolving them can bolster the chances of success. Side-stepping trade-offs often results in stretch targets being adopted and maintained despite a sense that they are unlikely to be reached, a form of cognitive dissonance which harms credibility and delays policy course-correction.

Ireland rightly has valid national objectives for the environment, society, and the economy that policy-makers must pursue. Today, the elusive search for a resolution to associated trade-offs looms large in policy-making. Ireland's Policy Handbook advocates for the 'tripod of good policy': evidence, legitimacy, and feasibility. Negotiating trade-offs in an inclusive manner based on extensive and comprehensive analysis builds the legitimacy and public buy-in necessary for strategic infrastructure.

Finally, confronting trade-offs can support feasibility by providing clarity and realistic expectations, preventing the implementation failure that arises when abstract objectives are not matched by delivery capacity. It can also identify and lead to more 'policy package' approaches, rather than considering policies, trade-offs, and impacts in isolation.

The next chapter details the significant progress made on Ireland's energy transition. Such progress, considered on its own, suggests that Ireland's overarching policy is underpinned by sufficient evidence, legitimacy, and feasibility, and has negotiated trade-offs. It suggests that transition policy has avoided the implementation failure that arises when objectives, analysis, and modelling and are not matched by feasibility and the capacity to deliver. However, the chapter goes on to detail some of the challenges surrounding decarbonisation which suggest otherwise, and sets out some conclusions we might draw.

Chapter 2: Energy Transition Trade-Offs

2.1 Introduction

Ireland's energy transition – the decarbonisation of Ireland's power, heat, and transport systems – must happen and must be successful. The NESC Council has stated its collective and resolute support for this energy transition on many occasions (see NESC 2020, 2021a, 2021b, 2023a, 2025a, and 2025c for examples).

The core elements of Ireland's approach to achieving its decarbonisation goals include:

- Communicating the climate and biodiversity emergency message.
- The work of key, respected institutions as the Climate Change Advisory Council, the Environmental Protection Agency, the Sustainable Energy Authority of Ireland, various research and innovation centres, and others.
- Fact-based reporting of the global and national impacts of harmful emissions, and reiterating the cost of inaction.
- EU and national commitments (e.g. 51 per cent reduction in GHG emissions by 2030; climate neutrality by 2050).
- The Climate Action and Low Carbon Development Act which makes legally binding commitments.
- Increasing the share of electricity generated from renewable sources to 80 per cent in 2030, including a total of 22 GW of clean energy infrastructure generating capacity.
- A renewable heat target of 24 per cent in 2030.
- A renewable energy share in the transport sector of 29 percent by 2030.
- The rolling up of these renewable electricity, heat, and transport targets into an overall target.
- Undertaking modelling and analysis to underpin an evidence-based approach to decarbonization.
- Statutorily-embedded carbon budgets and sectoral emissions ceilings.
- The linked NDP/NPF with ten investment-backed National Strategic Objectives (including transition to carbon neutrality, climate resilience).
- Delivering annual Climate Action Plans and related strategies, plans, investments, incentives (e.g. grants and taxation), communication efforts, and demand-side action.
- Reiterating the co-benefits of the transition (e.g. in clean energy: 'green jobs'; 'more reliable power'; 'cheaper electricity'; 'net exporter of energy', 'Saudi Arabia of Wind').
- Creating the optimal conditions for the market to develop and deliver the clean energy infrastructure necessary to meet commitments and targets, including through enterprise and related policies.

2.2 Two Sides of the Transition Coin

2.2.1 Encouraging Progress

There has been much progress made on Ireland's energy transition. Harmful emissions fell by almost 7 per cent in 2023, and by almost 2 per cent in 2024 (with reductions in emissions evident in all sectors except the Built Environment sector) leaving emissions now at their lowest in thirty years (CCAC, 2025). There are now record levels of power from renewable sources on Ireland's grid, and home solar energy adoption and retrofitting are happening at scale and at pace. The proportion of electricity coming from renewable sources has risen from 7 per cent in 2005, to over 40 per cent in 2024. In 2025, Ireland reached over 5 GW of installed onshore wind, national solar capacity surpassed 2 GW for the first time, and there are now over 150,000 roof top-solar panels installed across Ireland.

Key structural, institutional, and legislative changes have progressed (e.g. the Marine Area Regulatory Authority, An Coimisiún Pleanála, and the Planning and Development Act). Also, record capital investment of €558m has been announced by the State for residential and community energy upgrade schemes to support the National Retrofit Plan (DCEE, 2025).

Overall, emissions have fallen as the economy and population have grown substantially:

> In 2023, Ireland achieved its most substantial single-year emissions reduction on record, falling by 6.8 per cent. This is clear evidence that our policies are delivering tangible results. We are successfully demonstrating that a thriving economy and a growing population can go hand in hand with climate action. Since 1990, we have achieved a more than threefold increase in national income in real terms and supported population growth of nearly 50 per cent. This was accompanied by a significant increase in energy use, particularly until the mid-2000s. The subsequent years continue to post strong growth figures, although now with far greater efficiency in our energy use – *Minister for Climate, Energy and the Environment statement to the Joint Committee on Climate, Environment and Energy, July 2nd 2025* (Houses of the Oireachtas, 2025a).

This progress presents Ireland's energy transition as an example of successfully understanding, tackling, and resolving trade-offs. This level of progress suggests that ambiguity, incoherence, uncertainty, and risk are low enough to facilitate medium-to-long-term decisions and to deliver impactful policies, whereby output is not only delivered, but the core problem is addressed. All of which should mean high levels of confidence and optimism, high faith in the policy-making system, and little polarisation.

2.2.2 Frustrating Delays

Notwithstanding the progress outlined above, the energy transition also illustrates problems which arise from failing to fully identify and address trade-offs. Ireland is not making progress quickly enough and our current approach is not on track to deliver all that it needs to or has targeted (NESC, 2026). Progress must not be dismissed, but it does not equal success. There is no doubt that implementation lags far behind commitments and immediate goals, with latest data suggesting:

- Ireland missing its 80 per cent renewable electricity target in 2030, reaching 67 per cent in an ambitious scenario (IEA, 2025a).[4]
- Delivering in the order of 14 GW of renewable electricity generation capacity, not the 22 GW targeted by 2030 (SEAI, 2025a).
- Power system reliability operating outside of standards by a factor of four in 2030 with 12 hours annually where supply can't meet demand versus a target of 3 hours (EirGrid and SONI, 2025).
- Electricity sector emissions of 5.1 Mt in 2030, exceeding the average 2026-2030 sectoral emission ceiling of 4 Mt per Year (IEA, 2025a).
- At 8 per cent, Ireland ranking lowest in the EU for share of renewable energy used in heating and cooling (EU average is 27 per cent, Sweden is 69 per cent (Eurostat, 2025).
- Transport-related emissions flatlining at 11.5 Mt in 2025, and likely to exceed their sectoral ceiling, when net reductions are needed (SEAI, 2025a).
- Missing the Energy Efficiency Directive target for future energy demand, with measures to reduce final energy consumption not sufficient to outpace projected growth in energy consumption (SEAI, 2025b).
- Ireland falling behind on targets set in the *Clean Air Strategy* for 2026 and not yet meeting air pollution health guidelines from the World Health Organization (EPA, 2024).
- Ireland missing the most crucial objective with an expected a 9 per cent reduction in emissions by 2030 with existing measures and a 23 per cent reduction with additional measures – 'falling well short of the legally binding 51 per cent reduction required under the Climate Act 2021 and Ireland's EU Effort Sharing Regulation commitments' (CCAC, 2025:9).[5]

In addition, the Council has concluded that electricity costs are likely to be higher not lower in the coming years (NESC,2025b). The findings of the United Nations Special Rapporteur on Environmental Rights in relation to the Dublin Airport passenger cap, the importation of liquefied natural gas, prolonging the nitrates derogation, and the cumulative climate impact of new data centres, suggest that unresolved trade-offs may have stored up problems: 'economic revenue must not come at the expense of protecting the environment and human rights…' (O'Doherty, 2026). Further, Ireland could not stay within the 295 Mt CO_2 eq budget for the period 2020 and 2025, and emitted 305 Mt CO_2 eq of harmful gasses over those five years (CCAC, 2025).

More impetus will be needed to meet the (now even more restrictive) carbon budget of 190 Mt CO_2 eq for 2025 to 2030. Reducing emissions by the 115 Mt CO_2 eq required under legislation over the next five years presents a daunting challenge:

- NESC's recent examination using an *economic resilience* lens[6] found that Ireland's policy is currently 'headed into fog and that key actors are not on the same page from a strategic standpoint'. Among other things, a detailed decarbonisation pathway is required which sets out the logical, evidence-based staging posts and other parameters of a successful

4 The importation of Guarantee of Origin Certificates into the all-island market by suppliers may be inflating the annual market share of renewable electricity from its true value to an artificial, higher value.

5 Ireland has the second highest emissions of greenhouse gases per capita in the EU. Note, some ambiguity emerged during this research around the legally binding nature of the 51 per cent reduction target. There is a view that the legal requirement under the Act is only that the carbon budgets proposed by the Advisory Council provide for a 51 per cent reduction in emissions, not that the 51 per cent reduction target itself is legally binding.

6 In that NESC research, *economic resilience* refers to four key aspects of Ireland's energy transition: enterprise opportunities, the export of energy, the reliability of power supply, and the cost of energy.

transition; the progress to be completed by those staging posts; and the roles, responsibilities and expected outcomes from all those with responsibility for delivering the various elements of the shared plan. Rather than starting with an end-goal target, the approach should be to detail a feasible path, from existing renewable power generation capacity to an agreed midpoint on the way to domestic net zero, and if viable and valuable, on to surplus production (NESC, 2025b).

- NESC's recent examination of the energy transition using a *household resilience* perspective concluded that 'it is not clear if people's experience and role in the energy system now and into the future is fully understood. There is little sense of what a new energy system will bring people in terms of their wellbeing, their economic and social development, and their role in it (NESC, 2025a: 2).
- NESC's examination of the energy transition using *systems analysis tools and techniques* found that there are currently disparate objectives and constraints placed on the energy sector and its transition to a future sustainable system, meaning opportunities are being missed, some elements are 'falling between stools', and frictions are being created between the multiple diverse pathways to a decarbonised future; this confusion leads to uncertainty among investors, increasing costs, and reduces support among the public as contradictory messages lead to loss of confidence (NESC, 2026).

Overall, there is evidence that not all of the trade-offs inherent in the energy transition have been fully understood, confronted, and reconciled.

2.3 Trade-offs and Targets in Energy Transition Policy

As discussed above, the trade-off between social, economic, and environmental factors has been to the fore in policy discourse internationally for over forty years. The increased prominence of the sustainability/security/competitiveness energy trilemma has coincided with global and national developments in climate action ambition. For example:

- In 1997, Ireland adopted the Kyoto Protocol and its targets to reduce collective greenhouse gas emissions by 5.2 per cent (compared to 1990 levels) by the end of 2012.
- In 2007, a Government White Paper named the main strands of energy policy as energy security, competitiveness, and sustainability; and, the EU agreed a greenhouse gas emissions reduction target of 20 per cent reduction by 2020 (from 1990 levels), targeted a 20 per cent increase in energy efficiency by 2020, and adopted a goal of 20 per cent of energy consumption from renewable sources by 2020.
- In 2009, the EU Renewable Energy Directive set Ireland a legally binding target of meeting 16 per cent of energy demand from renewable sources by 2020. Ireland's National Renewable Energy Action Plan NREAP, consistent with the Directive, set targets of 40 per cent of electricity consumption from renewable sources by 2020, 4 per cent of road transport fuel consumption from biofuels, and 12 per cent renewable heat by 2020.
- In 2012, the Doha Amendment to the Kyoto Protocol established a second commitment period (2013-20), and extended the list of greenhouse gases covered.
- In 2015, the Paris Agreement provided a framework for action to limit global temperatures well below 2°C above pre-industrial levels, and to work to limit the increase to 1.5 degrees.

These developments, and the adoption of ambitious targets, made the trilemma real for policy-makers. While the 2006 White Paper detailed the sustainability/security/competitiveness energy trilemma, the issues crystallised in 2015.

First, the Climate Action and Low Carbon Development Act was passed which placed Ireland's climate policy in legislation. Second, the White Paper published that year, *Ireland's Transition to a Low Carbon Energy Future 2015-2030*, included a vision where, among other things, energy sector emissions would be reduced by 80-95 per cent, compared to 1990 levels, by 2050, and fall to zero or below by 2100.

The White Paper positioned this target firmly within the energy trilemma, describing the need to 'strike a balance' between three 'core objectives' – environmental, economic, and social (DCENR, 2015).

Box 2.1: Trade-Offs Central to Ireland's Energy Transition Policy under White Paper 2015

Ireland's energy policy must address three core objectives – the three energy pillars:

- sustainability;
- security of supply; and
- competitiveness – leading to affordable energy for domestic and business consumers.

Sustainability is the provision of energy that meets current demands without compromising the future – in terms of energy security and long-term damage to the environment. It is essential to reduce our dependence on imported fuels and to combat climate change through the reduction of energy-related GHG emissions in the transition to 2050. Security of supply is necessary to the functioning of our society and economy. Price competitiveness is needed both for business (which provides employment and creates wealth) and for households (which need affordable energy and protection against energy poverty).

Our new energy policy framework seeks to strike a balance between the three pillars to ensure a sustainable, secure and competitive energy system for Ireland.

Source: *Ireland's Transition to a Low Carbon Energy Future 2015-2030* (DCENR, 2015:27).

A decade on from the White Paper, the trilemma framing remains to the fore, and not just for policy-makers in Ireland. Speaking at a recent meeting of EU Climate Ministers, the representative from Poland said: 'We don't want to destroy the economy. We don't want to destroy the climate. We want to save both at the same time'.[7] In agreeing to a binding 90 per cent reduction of net GHG emissions by 2040, the EU Council 'made some adjustments to reflect concerns about the EU's competitiveness [and] the need for a just and socially balanced transition…' (European Council, 2025).

7 Polish Deputy Climate Minister, Krzysztof Bolesta. November 8th 2025.

At that EU gathering to agree the 90 per cent emissions reduction target, the Irish representative said that Ireland agrees on 'the opportunity that ambitious climate action brings for boosting competitiveness, but we should not underestimate the challenges it will mean for individuals, households, and businesses. Maintaining social cohesion is essential, but it will not be easy' (Connelly, 2025). This is just the latest example of the need to align national environmental, economic, and social objectives as Ireland adopts ambitious new targets.

There have been significant energy policy developments during the six-year journey from the White Paper to the adoption of legally binding climate and energy emissions targets in Ireland. In 2017, the Citizen's Assembly on Climate Change issued its report which included a recommendation for national sectoral targets for emissions reductions, and two years later the Joint Oireachtas Committee on Climate Change issued its call for new legislation which would set ambitious climate and renewable electricity targets (Houses of the Oireachtas and Joint Oireachtas Committee on Climate Action, 2019). In 2020, the Programme for Government committed to a new Climate Action Bill to set emissions targets in law (Government of Ireland, 2020a).

Next, in 2021, the *Climate Action and Low Carbon Development (Amendment) Act* established a legally binding framework for Ireland's targets. These now include:

- Increasing the share of energy from renewable sources to 43 per cent by 2030, with:[8]
  - 16 per cent renewable energy in heat;
  - 29 per cent renewable energy in transport; and
  - 80 per cent renewable energy in electricity.
- A 51 per cent reduction in greenhouse gas emissions in 2030, compared to 2018.
- Transition to a climate resilient, biodiversity rich, environmentally sustainable and climate neutral economy by no later than the end of the year 2050.

Connected to this, these targets form part of the European Union's (EU) collective efforts to become carbon neutral by 2050, and failing to meet these commitments could result in substantial costs (e.g. a requirement to purchase compliance from other EU Member States; potential financial sanction).

The penultimate step in the journey from the ambition of 2015's Energy White Paper to today's challenging targets was the adoption of legal requirement to agree a series of five-year carbon budgets (starting in 2021), including sectoral emission ceilings. The first two carbon budgets, proposed by the Climate Change Advisory Council, are to lead to the targeted 51 per cent reduction in emissions by 2030. The final step was the requirement that annual Climate Action Plans include actions to comply with the carbon budgets and sectoral emissions ceilings (see section 3.2 also). For example, in 2023 the Climate Action Plan set out additional renewable power generation targets for 2030:

- 9 gigawatts (GW) from onshore wind;
- 8 GW from solar; and
- at least 5 GW of offshore wind energy.

8 Based on the EU's Renewable Energy Directives, RED II and RED III.

Overall, the ambitious targets emerging from the Climate Act, the carbon budgets, the sectoral emissions ceiling, and the Climate Action Plan(s) must be achieved while reconciling the trade-off between the delivery of: clean, sustainable, and renewable power; secure, reliable, and resilient supply; and affordable and internationally competitively priced energy. However, while 2015's Energy White Paper clearly named the trilemma (but did not move to resolve it),[9] it is clear that at no point in the timeline above were the key trade-offs successfully known, understood, confronted, and reconciled. It could be argued that this is an example of the 'Jurassic Park' critique, but in reverse: much time and thought was given to concluding what *should* be done, compared to fully understanding what *could* be done.

2.4 Unresolved Trade-Offs and Knowledge Gaps

2.4.1 Failure to Agree a Pathway

To govern is to choose, but no consensus, evidence-based pathway to Ireland's targets has ever been agreed, though the targets have. Whether the commitment is to reduce energy sector emissions by 80-95 per cent, to increase the renewable share of energy to 43 per cent by 2030, to reduce emissions by 2030, or to become climate neutral, an energy system configuration which provides the required or optimal environmental, economic, viability, operational reliability, and socio-political outcome was never settled on.

In the context of finite resources and variable impacts, what is to be invested in and what is to be ruled-out? Which system configuration of power generation, energy storage, and sector coupling technology has a cumulative emissions trajectory towards Ireland's targets? Which configuration is secure, reliable, viable, affordable, competitive, and socio-politically acceptable? Where no simple answer is possible, which system configuration and pathway is best?

The trade-offs inherent in Ireland's energy transition goals, legally-binding targets, carbon budgets, sectoral emissions ceilings, and penalty-related commitments, have never been fully understood, confronted, and resolved. There is an absence of clarity (rather than, simply, political will alone) which is harmful for policy, progress, and narrative. The reasons for this and the consequences seem clear, and energy transition policy appears to have all the hallmarks set out in section 1.2 above, to a lesser or greater extent:

- The policy issue is particularly pressing; ambitious policy and targets are expected; co-ordinated action is needed; consensus via win-wins, rather than confronting trade-offs, might expedite progress; laws and fines are installed as an alternative; there is strong political competition; progress has been difficult and cynicism exists; policy actors can be siloed; behavioural factors are likely to be at play; and, successfully reconciling trade-offs is exceptionally difficult.
- Progress has not been what is needed or promised; there has been a focus on 'what is needed' as opposed to 'what can actually be delivered'; political ambition at EU and national level has led to 'stretch' targets; targets are adopted, maintained, and repeated despite a

9 For example, the White Paper was assessed as not quantifying the expected contribution of energy efficiency, renewable energy, and fuel switching to the achievement of decarbonisation, and not being prescriptive with respect to the technologies that will be adopted (Byrne - Ó Cléirigh, 2016). It was also described as being 'long on ambition, but desperately short on detail as to how this radical transition can actually be delivered' (An Taisce, 2015).

> strong sense that they are unlikely to be reached; ambiguity, incoherence, uncertainty, and risk are issues; some output is delivered, but the core problem is not addressed; problems have been 'stored up for the future'; and there is some disillusionment, cynicism, and polarised debate.

There can be an assumption that in passing the Climate Act in particular, the policy system had resolved the trade-off between environmental, social, and economic objectives. The Government recently stated, '… the legally binding framework is so critical. It removes the option of deferring action and forces us to confront the gap between our ambition and our delivery'.[10] Some non-negotiable is implied.

Ireland continually restates a commitment to climate action and decarbonisation, and the passing of the Act is a manifestation of this. However, there is a question over the extent to which the policy and political system has truly adopted the constraint which is built into legislation and all that has flowed from it with regard to the achievement of legally committed-to emissions reduction targets, and the trade-offs it presents. Especially if it is not clear who is accountable.

Recent expert testimony to an Oireachtas Committee on Climate, Environment and Energy put key trade-offs in stark relief:

> … what we can see in the discussions regarding Dublin Airport, data centres, and the agricultural sector is that there are tensions, if not outright conflicts, between economic goals and climate goals. For too long we have pretended that there are no conflicts and cannot be any conflicts, and that it must be possible to simultaneously pursue our economic and climate goals without any interference between the two. That may have been true 20 or 30 years ago. In my view, it is no longer true. We can no longer delay acknowledging that and having an honest discussion about how to prioritise appropriate economic goals while at the same time, absolutely and in a precautionary way, achieving our climate goals – *Prof Barry McMullin* (Houses of the Oireachtas, 2025c).

There are cases being taken in the courts arguing that the failure to reduce Ireland's emissions is a breach of legally binding national (and EU) requirements, and a decision and any implications are awaited.

The Council's energy systems analysis work concluded that while the Climate Act provides a clear objective for the country as a whole, 'it does little to build common understanding of what long-term action will be required in individual sectors such as energy' (NESC, 2026: 14).

Accepting that legislation does not necessarily reconcile trade-offs is an important consideration as the State acts to tackle wider infrastructure deficits. Legislation to accelerate critical infrastructure and provide for emergency powers alone will not resolve trade-offs.

10 Minister for Climate, Energy and the Environment statement to the Joint Committee on Climate, Environment and Energy, July 2nd 2025.

In addition, as noted earlier, there are the significant financial penalties facing the State for not meeting commitments, which also might imply that the trade-off resolution needed to reach those targets is complete.[11]

The Irish Fiscal Advisory Council (IFAC) and the Climate Change Advisory Council (CCAC) have estimated that Ireland may have to pay out between €8bn and €26bn to its EU partners if it does not meet the targets it has agreed to (IFAC and CCAC, 2025).

The relevant Minister is reported as saying that, in relation to Ireland's commitment to reducing harmful emissions by 51 per cent between 2018 and 2030, this target will be missed by the 'somewhat significant amount' of around 15 million tonnes of CO_2 equivalent (Maguire, 2026). It is reported that Ireland has argued at EU level that 'member states had to be reassured that they will not be unfairly penalised when faced with significant challenges and that in complying with the 2030 targets, there cannot be a diversion of EU funds that could otherwise be spent on decarbonisation' (Connelly, 2025).

In short, these staggering, legislation/target-related sums have not prompted action sufficient to deliver what was promised or needed. Coupled with doubt about whether the penalties will ever actually be levied and what the sums might be, there is the issue of the intertemporal trade-off (see chapter 1). On the face of it, costly action today should be set beside the cost of inaction and fines, but for (elected) policy-makers those costs are not very salient. There is the problem of today's budgetary constraints and expectations, and a NIMTO - Not In My Term of Office – problem (FitzGerald, 2019).

While legislation and budgets set the preferred direction, and very large financial penalties appear to provide a significant incentive, their presence does not mean that the detailed work of reconciling trade-offs and the alignment across objectives has been completed.

It is also fair and important to say that there have been broader, significant policy developments in the decade since the publication of the White Paper. From Brexit, to major policy shifts in the US, to the pandemic, to war in Ukraine, to a cost of living crisis, to trade policy uncertainty, and general geopolitical upheaval- there have been head-winds to progressing the energy transition, aside from the issue of trade-offs. Yet in the intervening years, the impact of failing to fully resolve trade-offs before settling on policy and targets has become clear.

Over a decade on from the White Paper's trilemma-wrapped emissions reduction objective, and five years on from Climate Act's legally binding targets, the failure to resolve trade-offs is clear, not just from the frustrating pace of progress and missed targets, but also from the gaps in our knowledge and strategy. These can be found in a number of areas of energy policy including: power sector decarbonisation, offshore renewable energy, energy security, and digitalisation. These are detailed below.

11 The energy transition is shaped a legally binding commitment to reduce emissions by 51 per cent on 2018 levels by 2030, and to become a climate neutral economy by no later than 2050, and by EU policy. Efforts to reduce emissions from the electricity generation sector are governed under the Emissions Trading Scheme (ETS), which will require a 61 per cent reduction below 2005 levels by 2030 for the ETS sector. Participating entities will be able to trade emissions units to reach compliance. Similarly, emissions targets under the Effort Sharing Regulation (ESR) will require reductions for Ireland of 42 per cent below 2005 levels by 2030 in the non-trading sector, encompassing emissions principally from agriculture, transport, non-ETS energy industries, and heating buildings in the commercial and residential sectors. Again, the State can purchase emissions units from other EU member states to reach compliance if domestic reductions are not achieved.

2.4.2 Trade-Off Related Knowledge Gaps

Power Sector Decarbonisation Data and Pathway

Regarding power sector decarbonisation – despite the expert modelling process summarised in chapter 3 – to confront the key trade-offs, the policy system still needs to know:

- The required or optimal combination of power generation, energy storage, and sector coupling technology to achieve decarbonisation;
  - within power generation, the combination of solar, onshore wind, offshore wind, open-cycle gas turbines, or interconnection required;
  - within energy storage, the combination of short, medium, long term, or seasonal storage (or types) required; and
  - within sector coupling, the required combination of short-term flexibility (e.g. EV Vehicle-2-Grid, heat pumps, district heating), long-term battery (e.g. sand), indigenous hydrogen, or grid-enhancing industrial loads.
- The total expected emissions, land-use requirement, biodiversity impact, the fixed cost, the variable cost, the technology readiness, the physical constraints, the annual availability, or the security of supply of any one specific combination of the above.
- The expected environmental, economic, viability, operational reliability, and socio-political impacts of any one particular combination of the above.

In short, there are hundreds of data points required to begin to assess the environmental, social, and economic trade-offs inherent in the choice of technology associated with decarbonisation, for which the policy system has no agreed data yet. At a more strategic level, NESC's recent analysis found that key questions about power sector decarbonisation remain unanswered, despite the adoption of ambitious policy and targets e.g. when Ireland's 2030 targets would actually be delivered; Ireland's power reliability beyond 2034 despite targets out to 2050; the total systems costs of achieving targets; the power capacity required for net zero, when it might be reached, and what generation mix should be used; whether surplus energy be produced and what it should be used for; and how Irish energy exports could be competitively priced and transported (NESC, 2025b).

Offshore Renewable Energy

In relation to offshore renewable energy specifically, for which ambitious targets have been set for 2030 and on which much of the energy transition narrative depends, the Sustainable Energy Authority of Ireland (SEAI) have called for a 'decarbonised electricity system pathway, setting out Ireland's long-term ambitions for offshore renewable energy technologies and their place within the wider energy system and addressing security of energy supply, cost-effective energy for consumers, local jobs and economic benefits, climate and environmental benefits and attracting foreign investment' (SEAI, 2024: 9). This call came after ambitious targets were adopted in 2023.

Energy Security

Ireland is facing strategic decisions on how to align its climate, energy, social, and economic objectives with secure power supply to 2035. The International Energy Agency (IEA) report *Powering Ireland's Energy Future* states that there is a clear need to establish a unified cross-sectoral energy strategy to set a vision that guides Ireland's energy transition, supported by a detailed security study on the electricity supply mix (IEA, 2025a). It's analysis illustrates how Ireland's various national objectives coalesce around the power sector, highlighting the trade-offs between energy security, decarbonisation, and affordability that need to be managed.

In a specific example, the IEA report flagged the trade-off between: high renewables penetration, the viability of necessary back-up gas generators, reliance on imported natural gas, potential supply disruptions, and the volatility of fossil fuel markets. The report states that 'to manage this trade-off, Ireland will need financing mechanisms that can help guarantee that there is sufficient thermal capacity to ensure electricity security, but investments do not exceed what is needed' (*ibid*,: 8).

Digitalisation

The Programme for Government commits to allow data centres that contribute both to economic growth and efficient grid usage, by enhancing the use of renewable energy sources, energy efficient technology and energy effective solutions. As it stands, the policy system does not have the data to help resolve the inherent environmental, social, and economic trade-offs. For example, there is, as yet, no agreed evidence on the likely development scenarios and the associated employment, economic contribution, and emissions associated with each, or some agreed multiplier for sectoral dependence, which might be needed to understand and reconcile the trade-offs. Also the conundrum, if not contradiction, identified by NESC inherent in the current 'drive demand to drive supply' policy approach to renewables development seems unresolved (NESC, 2025b).

Further, the recently published Large Energy User Action Plan names unresolved trade-offs related to energy system planning including 'demand forecasts by sector (including industry), spatial development assumptions, generation mix requirements, and consistency of gas and electricity infrastructure objectives' (Government of Ireland, 2026: 9).

2.5 Conclusion

Ireland's energy transition must be progressed, and there are concrete signs that it is. Onshore wind and solar capacity, home solar energy adoption, and retrofitting are making huge in-roads, and harmful emissions reached their lowest level in thirty years, despite significant economic and population growth. This progress suggests that unresolved trade-offs, ambiguity, incoherence, and risk are not a major drags on policy and progress.

However, the energy transition is not the example of successfully managed trade-offs it might first appear. No consensus, evidence-based pathway to Ireland's transition goals has ever been agreed, though ambitious targets have. The most secure, reliable, viable, affordable, competitive, and socio-politically acceptable decarbonisation pathway has never been identified.

Implementation lags far behind commitments, and Ireland is not making progress quickly enough. Latest data suggests the 80 per cent renewables target will not be met without faster progress, and Ireland is expected to fall well short of its primary goal: a 51 per cent emissions reduction required by 2030. Carbon budgets, sectoral ceilings, and demand-reduction targets will be missed along the way.

High-profile implementation failures (e.g. renewables deployment, planning delays, stalled grid development) contribute to frustration among industry and the public about progressing the energy transition.[12] Targets that will not be reached have been restated and ambition has been increased instead of addressing key delivery mechanisms. A 90 per cent GHG reduction target by 2040 is being introduced even as Ireland's 2030 targets remain off-track. Successive plans have promised accelerated delivery, yet immediate structural barriers remain regarding planning, grid capacity, supply chains etc.

Given the competitive political and electoral environment, the response has been increased ambition and 'stretch' targets. In fact, it could be argued that this characterisation applies to areas of infrastructure delivery beyond the energy sector. Raising the bar on long-term goals has merit but as the Council has argued, the focus must be on action now, next, and later, and the achievement of imminent objectives (NESC, 2025b).

Despite the Energy White Paper setting out both the trilemma and the emissions reduction ambition in 2015, the Climate Act making targets legally binding, and the adoption of carbon budgets, emissions ceilings, and renewables targets, the failure to resolve trade-offs is evident today - from slow progress to knowledge and strategy gaps in the areas of power sector decarbonisation, offshore renewable energy, energy security, and digitalisation.

All of this is evidence of the failure to fully recognise, take on, and resolve key trade-offs in the energy transition. Despite the complex legislative, policy, penalty, and investment architecture, ambiguity, uncertainty, incoherence and risk are impacting progress.

The *status quo* is that, while policy-makers may know 'what to do', they do not necessarily know how to do it in a manner that resolves key trade-offs i.e. aligns valid national goals for society and the economy, as well as the environment. Political will alone is not the missing factor. Short-term decisions have led to 'successful failure' whereby some output is delivered (e.g. record levels of power from renewable sources), but the core problem is not adequately addressed (e.g. the electricity sector and overall emissions failing to meet targets). Emissions reductions are happening at a greater pace than previously, but are happening at a much slower pace than targeted or needed. This can generate disillusionment and cynicism, reduce faith in the policy-making system, and polarise debate. An approach which is primarily technocratic, legalistic, or

12 It is reported that in November 2025, thousands of people from over 60 groups representing environmentalists, students, families, faith-based groups, workers and unions, healthcare professionals, and many more gathered in Dublin calling on the Government to deliver more ambitious climate action policy (O'Donnell, 2025).

procedural may avoid difficult choices and the need to secure true (public) buy-in, but such avoidance risks creating a vacuum which can be filled by those less supportive of the policy and progress.

As discussed in chapter 1, complex energy transition policy issues are sometimes encapsulated in relatively simple statements of abstract policy objectives. Evidence, legitimacy, feasibility, and progress might be in greater supply today if 'what if?' had been replaced by 'how can?' earlier in the process- How can 80 per cent of Ireland's electricity came from renewable sources by 2030? How can Ireland have five gigawatts of offshore wind capacity by 2030? How can Ireland achieve a climate-resilient, biodiversity-rich, environmentally sustainable, and climate-neutral economy by 2050? How can we do this in a manner that balances Ireland's important national environmental, social, and economic objectives? Failure to confront these trade-offs, to assess the feasibility of how these objectives will be achieved, has not resulted in good policy. Unrealistic expectations, assessments of implementation failure, and the questioning of the policy-making system's ability to deliver has followed.

Ireland's energy transition is not where it needs to be, but it must be pursued with determination. The ideal time to confront and resolve the key trade-offs was prior to or during the adoption of the White Paper in 2015, or in 2017 around the Citizens' Assembly on Climate Change, or in 2019 at the Joint Oireachtas Committee on Climate Change, or in 2021 as the Climate Amendment Act was debated, or when the five-year carbon budgets sectoral emission ceilings were devised and agreed, or in 2023 when the Climate Action Plan adopted additional renewable power generation targets. The next best time is now, and this work should progress in parallel to policy action on many fronts. A number of steps to accelerate the energy transition in this manner are described in next chapter.

Chapter 3: Five Steps to Accelerate the Energy Transition

3.1 Introduction

Ireland's current energy transition pathway is headed into fog due in part to unresolved trade-offs, and we must work to decrease (not eliminate) uncertainty. The previous chapters have described the slow progress of the transition overall as well as gaps in our knowledge and strategy for power sector decarbonisation, offshore renewable energy, energy security, and digitalisation. While there is no silver bullet, if the key trade-offs outlined in the previous chapter can be addressed, this can insert impetus into the transition, help defeat obstruction, and fill key gaps. The pursuit of a greater understanding of trade-offs is not an exercise in obstruction or delay but rather is an exercise in propulsion and urgency, in the absence of agreed non-negotiables.[13]

It is important to note that policy-making for the energy transition can be akin to 'repairing the plane, while flying the plane'. The policy system can never have the full suite of data necessary to understand all the elements of a process that runs for decades, amid the complexity of energy systems. Energy transition policy action must be taken in the presence of uncertainty, and uncertainty and trade-offs must be addressed while action is taken. We must never drop ambition or innovation, or the pursuit of game-changing actions. Yet we must continue to do what we can, when we can. Five suggested steps in this regard are detailed in the sections below:

1. Work hard to better understand transition trade-offs;
2. Place a new emphasis on feasibility;
3. Enhance energy transition modelling;
4. Tell a story of transition that isn't only looking to the horizon; and
5. Supplement the Accelerating Infrastructure Action Plan.

3.2 Five Steps to Speed-Up Progress

3.2.1 Work hard to better understand transition trade-offs

This discussion paper has outlined some of the reasons why important policy trade-offs are not confronted, and the impact of this on policy and progress. These reasons are not an argument or excuse for delaying urgent action. The policy system may not yet know all that it could or should in terms of a decarbonisation pathway, but this is an inherently complex and uncertain policy area. No amount of data-gathering or analysis can provide certainty, but what we do know with certainty is that without pursuing decarbonisation, Ireland will not achieve it.

The State is working hard to gather the information required to understand and resolve the trade-offs in important aspects of the energy transition. The research currently underway must be completed and acted upon, and known gaps should be addressed.

13 'Obstruction' here refers to intentional actions and efforts to slow or block energy transition or decarbonisation policies that are commensurate with the current scientific consensus of what is necessary. See the *Climate Social Science Network* at www.ccsn.org for further discussion.

Complete and Respond to Current Research

There are initiatives underway across the policy system which are a recognition that the trade-offs inherent to the energy transition have yet to be fully understood, confronted, and reconciled, and are an example of the policy system doing something about it. For example:

- The Climate Action Plan includes a request to SEAI to lead on developing an evidence-based pathway, or choice of robust alternative pathways, for decarbonising the electricity system after 2030. The development of pathways is to include assessing technologies based on economic, technical, environmental, and social trade-offs. This *Decarbonised Electricity System Study* (DESS) is expected to be concluded by the end of 2026 (SEAI, 2023).
- The Department of Climate, Energy, and the Environment engaged the International Energy Agency to provide an independent assessment of Ireland's electricity security as the country transitions its energy system through 2035. It highlights policy considerations to weigh, based on their costs and benefits (IEA, 2025a).
- The Department of Enterprise, Tourism, and Employment (DETE) has commissioned a study on the economic and societal impacts of data centres in Ireland and on scenarios for developing the data centre landscape beyond 2030 with a view to optimising the future benefits to Ireland. This includes estimating economic and environmental impacts to better understand policy options (Houses of the Oireachtas, 2025b).
- DETE has published Large Energy Users Action Plan which, among other things, names trade-offs inherent in energy system planning (Government of Ireland, 2026).

These, and similar, analyses across the policy system must be completed and acted upon. If they fail to adequately address trade-offs, they will have to be added to.

The availability and use of real-time data can have a positive impact on policy-making (NESC, 2022). However, the initiatives above make plain the hard work involved in identifying and gathering the evidence required to assess trade-offs.

For example, there are hundreds of estimable data points required to begin to understand trade-offs inherent in power sector decarbonisation, for which the policy system has no agreed data. From SEAI's work, we know there are in fact approximately 360 such data points, and behind each primary data point there are many more secondary and tertiary data points. As part of SEAI's study, experts will make pairwise comparisons on each qualitative criterion across thirty technologies, generating a further 2,175 secondary data points. It is difficult if not impossible (as Ireland's experience has shown) to confront the trade-offs and make meaningful policy and progress without such information.

In addition, the IEA undertook extensive analysis in preparing its recommendation that Ireland establish a cross-sectoral energy security strategy for the 2030s, which would consolidate sectoral ambitions, assess trade-offs, and set clear priorities and milestones for developing power system infrastructure, markets and operations.

The analytical work in these examples is steered by key actors, involves contracting external expertise, and in some cases involves extensive stakeholder consultation exercises. While it is ultimately the Government collectively who will take the decisions, the hard work of confronting trade-offs and building evidence, feasibility, and legitimacy must take place close to the policy area being explored. It must be undertaken by key actors and stakeholders. As per Ireland's handbook on good policy, those who will implement the policy should resolve the trade-offs and engage with everybody involved in the delivery process to help translate and tailor policies into concrete outcomes which have legitimacy (Government of Ireland, 2025h).

The research examples above recognise that appealing to the centre of government as the institutional arrangement to confront and resolve specific, competing objectives is not (always) the optimal approach. The centre's convening authority, cross-Departmental structures, and stakeholder engagement forums are not equivalent to what is necessary to successfully interrogate and resolve trade-offs.

Previous NESC Secretariat research has highlighted the challenge of building a shared understanding on infrastructure projects. Complexity, uncertainty, incoherence, and ambiguity make it less feasible to formulate expert advice in isolation from stakeholders, practitioners, and political actors (Thomas and O'Donnell, 2017). The complexity of trade-offs limits the separation and independence of analysis from societal contestation and political decision-making. Translating trade-off *analysis* into trade-off *resolution* requires political will and authority.

Overall, successfully resolving trade-offs requires the capacity, structures, and time for comprehensive analysis, and for effective engagement on specific policies and projects between policy-makers, experts, interest groups, local communities, and politicians.

Address Analytical Gaps

One key barrier to addressing the trade-offs inherent in the energy transition identified by NESC is the absence of key information. As described earlier, while we know the technologies that can work, the policy system does not yet know the optimal technology combination for decarbonisation, or the expected environmental, economic, viability, operational reliability, and socio-political impacts of any particular combination. This impacts negatively on the pace of delivery.

The *Decarbonised Electricity System Study* (DESS) being undertaken by SEAI should address this gap for the power system, for the post 2030 period. However, a gap remains regarding information to inform power sector decarbonisation for the five years from now to 2030. Further, there is no similar study underway for the decarbonisation of the heat or transport sectors, covering any time period.

Regarding power sector decarbonisation in the years up to 2030, the policy system should seek to exploit the analytical methods and resources being created and applied under the DESS. This could include:

- Executing further simulations of the DESS Energy System Model to provide refined insights on the priority decarbonisation pathways, including environmental, social, and economic considerations where possible.
- Embedding multi-criteria analysis and expert elicitation within all policy pathway exercises to provide data that techno-economic modelling cannot.
- Fostering the development of a research community that utilises and contributes to the development of modelling.
- Undertaking analysis in the near-term to evaluate the GHG and environmental impacts of proposed transitional technologies, to support trade-off decision-making.
- Examining carefully the temporal trade-off involved in making near-term large-scale capital investments which might close off medium-term options for decarbonisation.

Finally, consideration should be given to completing both a decarbonised heat system study and a decarbonised transport system study which would provide the policy system with a credible pathway to remove greenhouse gas emissions from both sectors in Ireland.

For example, working towards an agreed, comprehensive decarbonisation pathway for the heat sector would see the sector receive policy research and action commensurate to its impact. In the year 2000, annual greenhouse gas emissions from the heat sector and the power sector were at a similar level (each at approx. 16 MT CO_2 eq). While emissions from the power sector have fallen to 8 MT CO_2 eq. in the interim, those from the heat sector now stand at 12 MT CO_2 eq.

Given that it is the backbone of Ireland's energy decarbonisation strategy, the power sector has rightly been the subject of intense analysis and policy attention, and renewable power generation has a series of formal targets assigned to it. However the same is not true of the heat sector. The Government recently allocated €500m in capital funding for decarbonising the heat sector, 14 per cent of the total allocated to developing the power grid.

There are a number of explanations for this disparity (e.g. absence of associated utility actors; limited experience of heat sector technology adoption in Ireland relative to European counterparts), and despite the publication of the National Heat Study (SEAI, 2022) and the pilot District Heating Scheme in Dublin, the pathway for decarbonisation of the heat sector is even more uncertain than that for power sector.

An agreed, comprehensive decarbonisation pathway which encompassed the heat sector would also allow exploration of the relative state of readiness of various technologies (e.g. heat pumps, district heating, biomethane, and hydrogen). Though the National Heat Study set out the range of technologies and trajectory towards emissions targets, it did not – as the DESS study does – assess these technologies against multiple criteria such as affordability, security and reliability of supply, and socio-political acceptance.

Overall, having separate plans for power, heat, and transport and working hard in the ways described above should provide Government with an evidence-based pathway for decarbonising from 2027 which has confronted key issues. More importantly, it should spur a new emphasis on reconciling the key trade-offs inherent in delivering on Ireland's energy transition targets.

3.2.2 Place a new emphasis on feasibility

Given the not insignificant progress to date, there could be a view that the policy system has sufficiently reconciled the key trade-offs and knows what to do to complete the energy transition (e.g. deliver far more clean energy generation capacity and supporting infrastructure, eliminate all fossil fuel subsidies, quickly transpose relevant EU Directives, introduce bundled consumer incentives for the combined adoption of solar PV, heat pumps, and electric vehicles, make it easier for farming households to avail of grants, and review State supports for decarbonisation etc.).

In other words, 'the critical missing factor is not conceptual, financial, or technological: it is the need for political leadership and the public mobilisation to commit to decisive climate action - while we still have the time and capacity to do so' (McMullin, 2017).

In parallel, as discussed in chapter 2, there can also be an assumption that in passing the Climate Act, making legally binding commitments, modelling a path to an emissions profile consistent with the 1.5 degrees Paris Agreement, and adopting carbon budgets and sectoral ceilings, that it is just a matter of getting on with it.

A regular charge is that the primary problem is that Irish policy-makers are failing to give enough weight to climate science, are underestimating the risks posed by climate change, and are content with *status quo* policies, fearing electoral backlash, and lacking political will.

However, such a position risks missing one important point, namely that the policy system has not yet fully understood, confronted, and resolved the environmental, social, and economic trade-offs inherent in the transition, and that this is a barrier to good policy and progress.

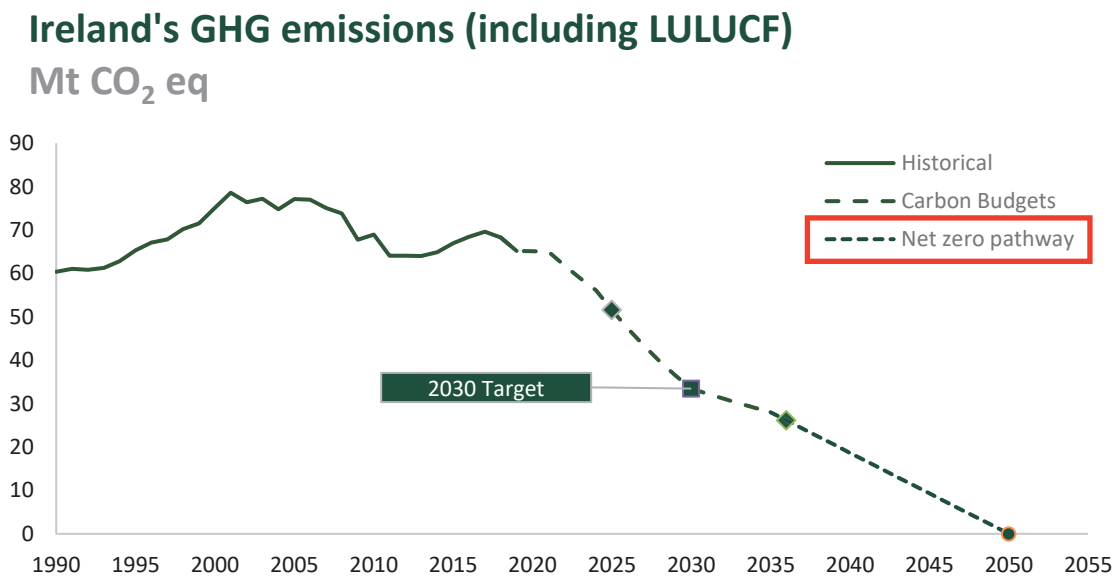
These unresolved trade-offs lead to charges of contradictory policies and of policy-makers 'speaking out of both sides of their mouths' and of, for example, supporting energy transition and targets while supporting the delivery of more data centres. Yet this is a manifestation of unresolved trade-offs and unaligned national objectives.

This situation is slightly different from the so-called Junker Curse (Buti *et al.*, 2008). In that instance – speaking about post financial crash austerity – Jean-Claude Juncker, Prime Minister of Luxembourg and President of the Eurogroup famously said 'we all know what to do, but we don't know how to get re-elected once we have done it'.[14] While there is likely an element of electoral pressure, here, it is more a case of 'we all know what to do, but we don't know how to simultaneously achieve multiple national goals as we do it'. Assuming that is even possible. As detailed in section 1.2, this can have serious, detrimental consequences.

14 "The Quest for Prosperity", The Economist, March 17th 2007.

Policy leaders cannot limit their actions simply to what is popular – that is not leadership – it must include what is feasible, and make that happen. Feasibility is one of the three key pillars of policy development (Government of Ireland, 2025h). However, a law, a target, or a sectoral ceiling does not ensure feasibility. A dashed line that joins two points on a chart is not a true, credible transition pathway; a pathway must be traversable (Figure 3.1).

Figure 3.1: Ireland's Required GHG Emissions Trajectory



Source: Ireland's Long-term Strategy on Greenhouse Gas Emissions Reduction, Government of Ireland, 2024a: 17.

At present we have excellent modelling and scenarios performed to be consistent with Ireland's fair share of emissions reduction required to meet the global 1.5 degrees temperature goal. However, in the modelling, feasibility is more a function of technical readiness, than whether 'it can be done' (Government of Ireland, 2025h). It does not necessarily confront the tetralemma of ensuring sustainability, security, affordability, and socio-political acceptability. It is desirable and possible to encapsulate a wider set of considerations and data which Ireland has deemed important (see section 3.2.3).

A feasible pathway requires recognising the fundamental importance of social, technology, economic, environmental, and political factors (STEEP) in the success of the energy transition:

> Arriving at a successful outcome will involve an assessment and understanding of all interconnections, feedback loops and time delays associated with the energy system… This will involve analysis of new technologies, government policies, regulatory frameworks, consumer preferences, the interaction between different energy vectors, an understanding of varying regional and sectoral perspectives, risks and uncertainties, a willingness to develop new business models, and an appreciation of the potential geo-political consequences of the energy transition (Nwankwo, Olaniyi, and Morgan, 2022: 499).

Where possible, feasibility assessment should be multi-layered; policy action may deliver benefits A, B and C, but also costs D. Secondary policy is then needed to mitigate those costs. Feasibility of the energy transition must be more than the technical readiness of technologies and the availability of measures, must address multi-year impact on distribution effects, the macroeconomy, investment, energy bills, energy security, national well-being, and it must be do-able under realistic assumptions.

Otherwise, claims of 'implementation deficit disorder' or 'lack of political will/urgency' etc. in relation to decarbonisation of the energy system miss the point and may deflect from what is really needed to make progress i.e. a credible pathway which has reconciled key trade-offs and aligns national objectives.

Given the centrality and importance of the Climate Act, confronting and reconciling the inherent trade-offs would help solicit a supportive and meaningful social licence for Ireland's carbon budgets, the sectoral emissions ceilings, the energy efficiency and demand goals, and the renewables targets.

Notwithstanding the excellent work of the Citizen's Assembly and what followed, the trade-offs inherent in the Act, carbon budgets, and ceilings - which entail a declining cap on available national emissions - have not yet been confronted and resolved or sufficiently subjected to a process of social agreement.

Furthermore, recent court proceedings and legislative developments highlight how problems have been stored up. The extent to which, and how exactly, State bodies are obliged to carry out their functions under the climate Act had to be adjudicated upon by the Supreme Court,[15] and two emergency pieces of legislation have recently been tabled to address urgent energy security and transport challenges, and which either deem themselves to be in compliance with the Act,[16] or exempt from it.[17]

15 Coolglass Wind Farm Limited v An Bord Pleanála, February 2026.
16 Head 20 of the General Scheme of the Strategic Gas Emergency Reserve Bill 2025.
17 Head 12 of the General Scheme of the Dublin Airport (Passenger Capacity) Bill 2026.

Placing a new emphasis on feasibility would also go some way in addressing an important issue raised by energy transition modelling experts at a recent Joint Oireachtas Committee. That Committee on Climate, Environment, and Energy heard that Ireland's Climate Act is 'world leading' in attempting to show what best practice is in terms of bottom-up commitment of a developed country to the Paris Agreement would look like. However, while the Act 'put all the pieces in place, the working-out of the Act and the filling-in of the details are missing' (Houses of the Oireachtas, 2025c). In other words, there is a feasibility gap.

Without a feasible pathway, Ireland risks delay, delivery deficits, inefficient investment, rising tensions between these goals, missed targets, and limits exceeded. Furthermore, without a feasible response, there is a danger that important data such as the past eleven years being the eleven warmest years on record, or that the 1.5 degrees point will be reached by 2030, will result in fatalism.

Placing a new emphasis on feasibility would address issues raised by one of Ireland's experts in this field:

> We have legally-binding carbon budgets and Sectoral Emissions Ceilings, but we actually don't have a scenario or plan that adds up to meeting them. Maybe it's too politically sensitive to map out what it will actually take to meet our climate commitments? But this leaves a critical vacuum. It's like signing up to run a marathon without knowing what training plan is necessary!
>
> We need scenarios that add up our commitments, not only to provide the evidence base, but to move the Overton window of what is possible, and necessary, to meet our commitments, and to hold the mirror to policymakers to show them the consequences of their decisions. What would be in those scenarios? Most likely, a focus not just on building clean energy technologies, but on actively phasing out fossil fuels, including managing demand. The challenge will be to balance which futures areimagined and presented – those that bring the widest possible benefits, that are transformative and disruptive, or those which are the most politically palatable and are least challenging to incumbents and the status quo? – *Prof. Hannah Daly, Address to the board of the Sustainable Energy Authority of Ireland, September 2025.*

There are limits to how much detail is either possible or desirable in a pathway for reducing emissions, in line with carbon budget constraints. Detailed actions are much better left to be determined by distributed, bottom-up, responses from societal actors, but the policy-system must have confronted and resolved critical trade-offs such as the declining availability and thus potentially rising cost of fossil fuels, to enable societal actors to plan those distributed responses. Such a new focus on feasibility would help counter the reverse 'Jurassic Park' critique mentioned earlier, where much time and thought was given to concluding what *should* be done, compared to fully understanding what *could* be done.

This call here for an agreed, credible and feasible energy decarbonisation pathway is consistent with NESC's systems analysis of Ireland's energy transition:

> To realise synergies and avoid siloed thinking, create a Cross-Government Energy Framework that addresses heat, transport, and electricity together in a coherent manner, integrating existing strategies and plans for different policy objectives such as climate, energy poverty, affordability, and energy security, and for different energy vectors such as electricity, gas and biofuels.
>
> The framework should aim to reduce uncertainty for energy users and investors. It should be consistent with the National Climate Objective and the Climate Action Plan but also integrate the broader social, economic, and environmental objectives associated with energy, as captured in the energy doughnut. – NESC, 2026.

This call for a new emphasis on feasibility is also closely linked to how the energy transition is modelled.

3.2.3 Enhance energy transition modelling

Trade-offs must be understood before they can be resolved, and energy transition policy, in particular, has the benefit of extensive modelling and analysis which can help inform decisions. The major physical, technology, environmental, atmospheric, and other considerations surrounding climate change have led to modelling being extensively used to inform policy making. This has been most notably through the Intergovernmental Panel on Climate Change (IPCC) review process but also in national, European, and international policy making (Mercure *et al.*, 2019).

Modelling and scenario-building are now an 'essential part of climate change research and assessment', and have increased our understanding of the long-term consequences of near-term decisions (Riahi *et al.*, 2017). It has also helped inform the significant debate which remains about the optimal policy mix to achieve a successful energy transition.

A nation's energy targets can be met via many different combinations of technological and socio-economic policy options, where trade-offs must be resolved. Climate change/impact and energy transition models allow consideration of different options in the face of fundamental uncertainty, and 'have been crucial' by providing a basis for the exploration of options, policies, and impacts (*ibid.*) The modelling work reviewed by the IPCC, specifically the value of shared socioeconomic pathways, is highlighted in the literature (O'Neill *et al.*, 2017).

The overarching context for energy transition modelling in Ireland is the *Climate Action and Low Carbon Development Act* which sets out the national climate objective, discussed above. This is Ireland's commitment to pursue and achieve, no later than 2050, a transition to a climate-resilient, biodiversity-rich, environmentally sustainable, and climate-neutral economy.

Transition models are employed to describe scenarios out to at least 2050, and inform Ireland's crucial carbon budgets (Houses of the Oireachtas Joint Committee on Climate, Environment and Energy, 2025):

- The energy system is modelled using the TIMES-Ireland Model (TIM) from University College Cork;
- Agriculture is modelled using Teagasc's FAPRI-Ireland model; and
- Both agriculture and land use are modelled using the GOBLIN model and FERS Carbon Budgets Model by the University of Galway.

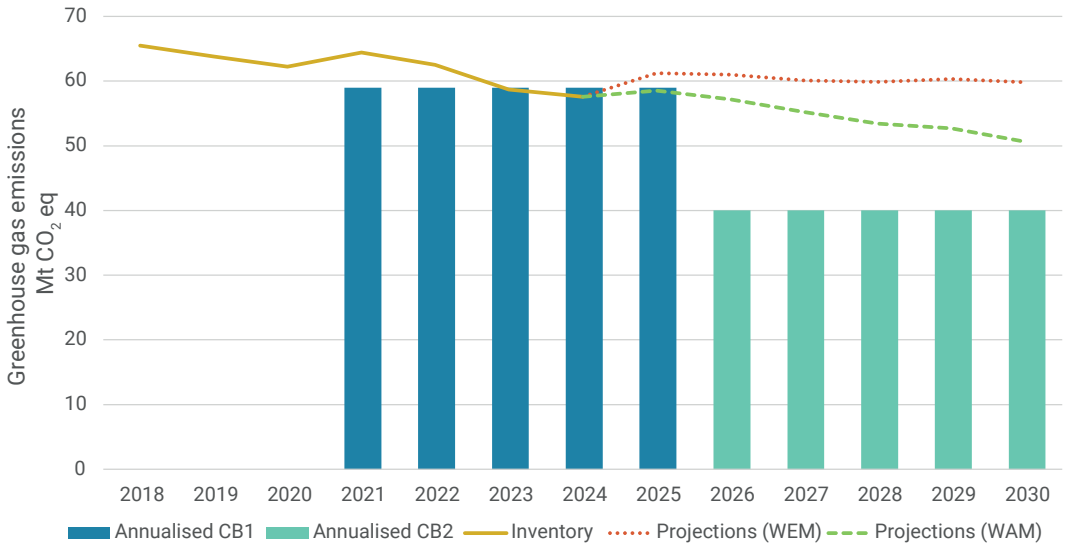
The TIM is an energy systems optimisation model which aims to quantify 'cost-optimal pathways for the energy system (encompassing the primary energy supply, power, transport, buildings and industry sectors) to meet future energy demands' (University College Cork/Energy Policy and Modelling Group, 2025).

The energy system modelling is performed to be consistent with the Climate Act's requirement to meet specific 'ultimate objectives', including those outlined in the Paris Agreement (United Nations, 2015). Core to this, and hence to Ireland's energy system modelling, is the objective of keeping the global temperature increase to 1.5 degrees, and Ireland's so-called fair share of emissions reduction required to meet that objective:

> … carbon budgets are of great importance. Carbon budgets are the mechanism through which Ireland translates its international climate obligations into binding limits at home. They are our contribution to the Paris Agreement goal of holding global temperature rise to 1.5 degrees… Carbon budgets also matter for the sectors that need to transform. They should give clarity and direction to farmers, energy companies, industry and households about the scale, direction and pace of change required. If they are to succeed, they must be transparent, robust and subject to close public scrutiny…. *Prof. Hannah Daly* (Houses of the Oireachtas, 2025c).

The Act then mandates the Climate Change Advisory Council (CCAC) to propose carbon budgets which, if achieved, would result in Ireland achieving the National Climate Objective. Finally, the Act states that sectoral ceilings must be prepared. These ceilings set out the maximum level of harmful emissions that are permitted in each sector of the economy during a carbon budget period. The CCAC's Carbon Budgets Working Group and energy system modelling scenarios underpin the process.

Figure 3.2: Ireland's Carbon Budgets and Projected Emissions 2018–2030



Source: Climate Change Advisory Council, 2025. CB1, Carbon Budget 1 (2021–2025); CB2, Carbon Budget 2 (2026–2030); WAM, with additional measures; WEM, with existing measures.

Overall, Ireland's energy transition strategy has some of the most sophisticated and impactful modelling exercises underpinning it and, in that context, has mechanisms to understand and address trade-offs. This in turn contributes to the foundations of sound policy.

Ireland is acknowledged internationally within the modelling community as world class in its analytical work, and while the policy system will always seek better models and more certainty, uncertainty will always exist, and modelling exercises have their limitations.

To begin, the ***modelling used by the policy system does not attempt to encapsulate the full range of trade-offs*** which the policy system must grapple with. The models choose the optimal level of technology deployment in a given year to meet carbon budgets and energy demands in each scenario. They also include certain subjective constraints to try produce feasible and credible decarbonisation pathways.

However, energy system modelling may not explicitly model several important factors, including the just transition,[18] biodiversity impacts, and consequences for investment, the macroeconomy, energy bills, and energy security (Daly *et al.*, 2024).[19]

18 The Just Transition Taskforce has agreed that the following definition of 'just transition' appropriately reflects the situation in Ireland. 'A Just Transition to a climate neutral Ireland will build a better future for all and ensure no-one is left behind. This will be achieved through social dialogue, promoting decent living standards, and proactive planning to anticipate change. It will support and develop sustainable and quality jobs and employment opportunities, reskilling and training. Through investment in services, infrastructure and social protection, people and communities that may be affected by this transition will be supported in a manner that is inclusive, equitable, and fair (Government of Ireland, 2024b).

19 The Tradable Energy-Emission Quotas (TEQs) approach proposed at the Citizen's Assembly on Climate Action also leaves many details to be refined such as determination of a national emissions pathway, underpinning infrastructure and supports, and dealing with potential effects on international competitiveness (McMullin, 2017).

While these are considerations which may be set aside by energy models, these are urgent and important considerations for the policy system. There are social and economic variables which could be included in energy transition modelling which would see it more closely reflect social, economic, and environmental trade-offs (see below).

In addition, ***energy transition models can alter the trade-off*** by elevating one objective, for example that of achieving our legally committed-to emissions reduction targets to produce Ireland's carbon budgets and sectoral ceilings. There is high value in, and a good rationale for, this approach. For one, climate change and science do not care about other considerations. From that perspective, there are none. Having models available which show what is required from Ireland to fairly contribute to holding emissions to the 1.5 degrees Paris objective is essential but it is not sufficient for trade-off resolution.

This again highlights the question of whether Ireland's climate action and energy transition framework specifies agreed 'non-negotiables', and also the limitations of the trilemma trade-off framing. Committing to an energy-needs hierarchy frame (see section 2.3) would challenge the policy system in this regard.

Further, ***energy system modelling has a specific comprehension of 'feasibility'.*** Feasibility is inter alia a function of the technical readiness of technologies – 'Broadly speaking, the majority of the mitigation measures and technologies depicted in these scenarios are already available, and are currently undergoing exponential growth globally' (*ibid.*: 24). Technological feasibility is not a limiting factor in achieving rapid deep decarbonisation (Glynn *et al.*, 2018).

This concept of feasibility (as opposed to 'plausibility') requires recognising the fundamental importance of social, technology, economic, environmental, and political factors (STEEP) in the success of the energy transition.

This is more than an issue of language - plausible vs. feasible; theoretical consistency and capacity vs. operational and practical capacity; 'it makes sense' vs. 'it can be done' - and further work to assess and understand the implications for policy and progress would be beneficial.

Overall, these limitations might not only impact the ability of the policy system to fully tackle and resolve trade-offs, they may also hinder the building of the three pillars of good policy: evidence, feasibility, and legitimacy.

It is absolutely true that the majority of the policy actions and technologies depicted in energy modelling scenarios are already available, and are currently undergoing exponential growth globally; yet (as described in chapter 2) the policy system does not, for example, have an agreed evidence-base, in an Irish context, of the technical readiness or impact of the power generation, energy storage, and sector coupling technology required to achieve decarbonisation. Nor have the environmental, social, and economic trade-offs been researched and resolved to the extent necessary to firmly conclude that societal readiness and political commitment are sufficiently fixed in place. Given that, for example, the expected emissions, the land-use requirement, the biodiversity impact, the cost, and the security of supply of required technology is not yet known, the necessary societal readiness and political commitment may in fact not be yet attained. Nor

is it clear how increased clarity on these factors would impact socio-political readiness and buy-in; positively or negatively.

Modelling used by Ireland's policy system could be enhanced by including the valid, competing national objectives discussed in chapter 1. Having concluded its considerations, the Oireachtas Committee recommended that the Climate Change Advisory Council's carbon budget proposal and reports be subjected to 'an open and independent socio-economic analysis' (Houses of the Oireachtas Joint Committee on Climate, Environment and Energy, 2025: 28).

Current energy transition modelling and scenarios do provide a quantitative basis for developing analyses of other important aspects of climate action and energy transition (Daly *et al.*, 2024). This presents an opportunity to enhance energy transition modelling to encapsulate a wider set of considerations and data which have been deemed important to Ireland.

For example, as well as a National Climate Objective, Ireland has adopted a National Well-Being Framework to provide a high-level holistic overview of how the country is doing, economically, environmentally, and socially (Government of Ireland, 2025j). Performance is reviewed by comparing Ireland's relative position using the latest available data (generally across the EU) on 35 indicators. These indicators cover factors such as overall life satisfaction, lifelong learning, household net wealth, employment rate, real household disposable income, average distance to everyday services, Greenhouse Gas Emissions, pollution and other environmental problems, water body quality, and more.

In part, the adoption of the National Well-Being Framework and its wide set of indicators is a reflection of the importance of looking beyond traditional (typically economic) measures of national performance and progress (Cahill and FitzGerald, 2023). The Well-Being Framework sets out factors that the policy system is to be mindful of, and could inform the selection of indicators or data to be included in enhanced energy transition modelling that better reflects pressing trade-offs. Employing them in modelling activity would be an example of the meaningful use of the National Well-Being Framework, and its greater use in strategies could also help harmonise policies across the system.

As NESC understands it, there is no technical barrier to including social, environmental, and economic indicators or data in current energy transition modelling or to linking engineering energy systems models with, say, macroeconomic models to capture feedback effects (Glynn, 2015).

For example, the models can be amended for optimisation with multiple objective functions, such as emissions minimisation, and cost minimisation, and household bill minimisation etc. There are functions and practices in models that can include macro-economic feedback, energy security, and climate and biodiversity damages. This would go some way in devising a credible, feasible decarbonisation pathway that recognises, confronts, and reconciles critical trade-offs.

All of this is an argument to confront rather than avoid trade-offs in analysis to inform policy. While strategic foresight exercises play an important role, they must not be an alternative to confronting pressing trade-offs, or simply gloss-over or look beyond them.

Enhancing energy modelling in this way would also address the findings of assessments of research and policy during the Covid-19 pandemic, regarding the need to build and strengthen knowledge translation. This involves improving the interaction among the producers and users of research, removing the barriers to research use, and tailoring information to different target audiences so that effective interventions are used more widely (Ó'Gallachóir *et al.*, 2024). In this context, the research question being addressed by energy modelling could better reflect the need for the policy system to better understand, confront, and resolve trade-offs.

Overall, there is a broad range of energy models being used across the system (Government of Ireland, 2025f). It will be the combination of insights from a range of different modelling frameworks that will enhance their impact on policy-making. Each modelling approach has its strengths and weaknesses, and one challenge will be coordinating a system that can provide policy-makers with insights from the necessary range of perspectives. This will likely mean greater investment in modelling resources.

In parallel, energy transition modelling should be enhanced by encapsulating a wider set of considerations such as just transition, biodiversity impacts, and consequences for investment, the macroeconomy, energy bills, and energy security, as well as data on considerations which Ireland has deemed important e.g. with reference to the National Well-Being Framework.

Finally, it important that there is strong pipeline of modelling skills and enterprises from the higher education sector, coupled with strong absorptive capacity within the policy system to help steer, understand, interrogate, and integrate modelling activities across policy areas.

3.2.4 Tell a story of transition that isn't only looking to the horizon

Energy transitions must resolve trade-offs, weigh costs and benefits, and bring the public on board: 'While the net-zero transition offers significant opportunities, there are also potential costs which can lead to concerns among citizens. Failure to address these not only risks inequitable outcomes, but could also lead to public opposition, slowing or halting the transition' (OECD, 2025: 25). The policy system must build support and build clean energy infrastructure in tandem.

The latest World Energy Outlook has found that countries around the world are contending with pressing energy security threats and growing longer-term risks across an unprecedented range of fuels and technologies, thrusting energy into the heart of geopolitical tensions and elevating it as a core issue of economic and national security (IEA, 2025b). At the same time, fears of climate change are decreasing across the world – in the United States, China, and many Western countries – relative to other concerns, even after the hottest year on record (Forest Stewardship Council, 2025).

There are some notable global trends:

- Research for the World Bank reveals a global shift in support for the transition with, for example, willingness to pay more tax for the transition falling by six percentage points on average across 30 countries – between 2016 and 2023 (Cojocaru, Lokshin, and Torre, 2024).
- In the United States (U.S.), the words 'con', 'scam', and 'hoax' are used at the highest political levels to describe climate action and decarbonisation efforts, and the new H.R.1 – One Big Beautiful Bill Act (US Congress, 2025) drastically reduces funding earmarked for clean energy investment, which in turn will likely shrink U.S. renewable energy investments and hamper decades-long efforts to reduce U.S. greenhouse gas emissions (UN, 2025a; Beams and Subrahmanian, 2024).
- In 2019, political consensus in the United Kingdom saw it take the lead globally in committing to reducing its carbon emissions to net zero by 2050 (House of Commons, 2019). That political consensus has since broken down. In 2025, one main opposition party declared the 2050 net zero target to be 'impossible', pledged to repeal the Climate Change Act, and promised to end the ban on new oil and gas licences to maximise extraction from the North Sea (Conservative Party, 2025). Another opposition party has declared it will 'scrap net zero' and its associated 'unaffordable, unachievable' targets, and fast-track licences of North Sea gas and oil, and grant shale gas licences (Reform UK and Oakden, 2025).
- In the European Union, traditional political party delineations have shifted to dilute climate action. For example, conservative and far right groupings recently aligned their voting to approve the easing of requirements on businesses to disclose their impact on the environment or exposure to the risks of climate change (Gros and Griera, 2025).

Co-operation is essential to energy transitions and policy-makers and communicators must get the public on board. The recent deterioration in, and challenges to, the transition narrative are a cause of concern. A stronger emphasis on the cost of living, competitiveness, affordability, and reliability of energy supply is evident across Europe since the invasion of Ukraine.

Ireland will not be insulated from the tensions which have given rise to and sustain this pushback internationally against the energy transition. Nor should the risk of the energy transition being cynically leveraged in 'culture war' divisions be ignored or underestimated. We do not need that here. In this context, the energy transition narrative is now perhaps more important than ever.

Ireland is currently well-positioned, with most people supporting climate action and renewable energy infrastructure, believing it will improve quality of life and economic growth (EPA, 2025). This must not be taken for granted:

- While 86 per cent of people in Ireland think 'climate change is happening', just 40 per cent say they are 'worried' about climate change (AIB, 2025).
- Climate change ranks ninth, behind housing, cost of living, immigration, healthcare etc. in priority issues for the public (Sunday Independent/Ireland Thinks 2025).
- Polling also suggests that over 60 per cent of people in Ireland are opposed to higher taxes for actions to help achieve national climate targets (O'Brien, 2025).

- More recent research suggests that public concern about climate change has fallen slightly, the share who are not very concerned is up slightly (as is uncertainty), while fewer than one in five people think Ireland should phase out all fossil fuel generation as soon as possible and rely fully on renewable energy sources (KPMG, 2026).

There may also be cognitive dissonance at play, where many who worry about climate change do not adjust their individual actions. All of which suggests that support in the abstract should not be assumed to equate to legitimacy for all policy actions is the purest sense.

Public support and legitimacy in Ireland should be protected by ensuring that energy transition policy has, as discussed throughout this discussion paper, addressed trade-offs and is aligned with social, economic, and environmental objectives. And has been seen to do so. This is central to a supportive transition narrative and legitimacy.

The question of whether climate action and the energy transition has a communication problem has featured recently in the media in Ireland.[20] The answer may be 'yes' or 'not yet'. For example, an energy transition narrative of cheaper and more reliable power has been delivered to households and firms in Ireland for many years. The failure to confront trade-offs can lead to claims that may not be easily or quickly realised or be accurate.

For example, the promise of 'greener renewable electricity… which will ultimately provide cheaper, green electricity to the consumer' (DECC, 2024) has run into a realisation that, at least in the medium-term, electricity will be more expensive for households and firms.

The average estimated household electricity bill, which was €1,255 in December 2021, was expected to reach €1,877 in 2025, which is greater than that experienced by households at the height of the energy crisis (Government of Ireland and Department of Climate, Energy and the Environment, 2025). Almost 320,000 people were unable to pay their electricity bills in December 2025, an increase of just over 20 per cent or 50,000 more customers in energy arrears over the year (CRU, 2026). And NESC analysis has concluded that reliability of supply is uncertain across the energy transition timeline (NESC, 2025b).

Looking ahead, the high level of necessary investment in the electricity system – which is ultimately borne by households and firms – and the move to more fixed price renewables contracts, will increase and put upward pressure on the fixed element of electricity bills. Guaranteed fixed prices are provided to renewable energy providers for up to twenty years under the auction system. Rather than emphasising the Levelised Cost of Energy or 'savings' in gas and carbon costs from renewables etc., what is important from a competitiveness and narrative perspective is the Total Systems Cost associated with the transition, which is not yet known (NESC, 2025b). In the same way that the agriculture sector talks about traceability 'from farm to fork', energy assessments and communications must consider costs and benefits 'from turbine to toaster' and 'from solar PV to smart TV' .

20 For example: "COP30 campaigners need new ways to engage as climate gloom and jargon leave public in the dark", Irish Independent, November 2nd, 2025; and "Does the climate crisis have a messaging problem?", Newstalk Radio, January 15th 2026.

It is notable that the highest priority recommendation of the UK's Climate Change Committee is 'make electricity cheaper by removing policy costs from electricity bills' (UK Climate Change Committee, 2025).[21]

In October 2025, a UK parliamentary committee was told that modelling suggests that even if the wholesale energy price was zero, electricity bills would still be the same in 2030 as they are today, because of the increase in non-commodity costs.[22]

That Committee also heard that 'in all likelihood' electricity prices for a typical UK customer are going to be 20 per cent higher in four or five years' time, even if wholesale prices halve.

If this were the case in Ireland, it may have a negative impact on public support given that households and firms have been told that the wholesale gas price is a 'major factor' in determining final retail electricity prices in Ireland (for example see CRU, 2024). It may in fact be responsible for (just) one-third of the householder's bill.

It has been estimated that, broadly, the cost of making the electricity makes up 35 per cent of the domestic bill, managing the electricity system is 25 per cent, moving the electricity is 20 per cent, retailing the power is 10 per cent, and the policy-related cost (PSO, VAT etc.) is 10 per cent (Deane, 2026). Consideration is likely needed in Ireland of where the distribution of the burden of costs of energy infrastructure should fall across, for example, consumer bills, taxation/ Exchequer funding, and fossil fuel bills.

As it stands, it may be that the majority of consumers do not give detailed consideration to the breakdown of their bills, between the wholesale price and fixed costs, but this could change as cost of living and affordability pressures persist. (Consider how quickly Irish people became familiar with the esoteric topic of bond yields following the 2008 economic crash).

It may also be the case that more people will come to understand and accept how the practices of electricity retailers might lead to prices rising rapidly, but falling slowly (the 'rockets and feathers' phenomenon – Bacon, 1990),[23] but might reasonably begin to query why falling wholesale prices do not lead to any or only a little reduction in retail prices over a longer timeframe.

Energy experts have noted that the outlook for wholesale prices and electricity bills is mixed and uncertain for 2026, and expected research on the configuration of electricity bills in Ireland is needed and welcome (Deane, 2026). This should inform a refreshed communications strategy.

21 Policy costs here refer to charges on UK bills such as the Renewables Obligation, Energy Company Obligation, Feed-in Tariffs, and legacy Contract for Difference payments etc.

22 UK House of Commons Energy Security and Net Zero Committee, Oral evidence: The Cost of Energy, October 15th 2025.

23 The 'rockets and feathers' phenomenon describes an asymmetric pricing behaviour where (electricity) retailers increase consumer prices quickly when wholesale costs rise, but are slower to lower them when those costs drop. So electricity bills seem to rise 'like rockets', but fall 'like feathers'.

Much of the above is a challenge to the existing narrative and runs contrary to previous public expectations of cheap, clean, reliable electricity. In this context, confronting trade-offs is crucial, and policy and communications must be aware of and avoid potential behavioural and other communication pitfalls. For example:

- Any attempted shift in the policy/narrative emphasis from 'cheaper' to 'more stable' electricity prices must avoid gaslighting individuals, households, and firms. Gaslighting pollutes the narrative. Research has confirmed the role of fairness in encouraging public co-operation in climate action.[24] Any shift will have to be explained and not framed simply as 'renewables were never going to be cheaper', given the messaging over recent years and the reasonable and understandable expectations of the public. The same is true of any shift in messaging regarding power reliability, that it is 'energy' rather than 'electricity' that will be cheaper, and high electricity bills now not being driven mainly by wholesale prices.
- Avoid cognitive dissonance[25] whereby energy transition targets and goals are made or restated when it is known - or sound evidence suggests - that they are unlikely to be attained. Doing so can undermine credibility and public support.[26]
- Remain resolute and hopeful, but not fall foul of optimism bias. Underestimating or downplaying costs, risks, obstacles, and timelines in the energy transition can damage policy, narrative, credibility, and buy-in.[27]
- When presented with evidence-based, good-faith critique and/or advice, avoid motivated reasoning[28] (i.e. 'I don't like it, so I don't believe it') and engage with and reflect on the data and evidence on its own merits.
- Similarly, when provided with fact-based, good-faith criticism and/or suggested corrections, avoid engaging in whataboutery (or whataboutism)[29] regarding poor performance elsewhere (e.g. 'what about the agriculture sector?' or 'what about country X?').

The purpose of communications is and must be to prompt positive action and direct actors to supports etc. These considerations above are not a lesson in how to spin but rather, given the current lack of necessary progress, a lesson in how to keep society bought-in and engaged in the need to act.

24 '… perceptions of fairness are a strong determinant of cooperation and so, where hypocrisy from leaders is perceived, cooperation is likely to breakdown'. See Martin, Timmins, and Lunn, 2024, p. 49.

25 Cognitive dissonance is where a decision-maker holds two conflicting beliefs. This could hinder strategic planning and delivery by delaying necessary course-correction, as a first step towards policy revision is often acceptance that objectives and targets will not be met. Such acceptance can be difficult in a competitive political environment. See Festinger, 1957.

26 There are examples of the policy system acting to mitigate cognitive dissonance. The Oireachtas Committee on Infrastructure and National Development Plan Delivery recently called for engagement with an energy utility actor to query a new delivery target for 2026 to 2030, which was a 99 per cent increase on what had been delivered between 2021 and 2025.

27 The IMF state that optimism bias is not uncommon in infrastructure planning and policy e.g. to justify a project or make it politically viable (Monteiro, Rial, and Tandberg, 2020). See FitzGerald, 2019, section 2.5) for a discussion of the impact of biases in policy-making.

28 Motivated reasoning is where a decision-maker arrives at desired conclusion by relying on beliefs that support that conclusion. See Kunda, 1990.

29 Whataboutism is a particular kind of critical response and fallacy aimed at deflecting criticism of one standpoint by raising parallel concerns about another. See Casey and Aikin, 2024.

Recent negative international developments bring the trade-offs in the transition between national social, economic, and environmental objectives into focus. Pessimism and cynicism are often evident across infrastructure delivery and policy more broadly. The advice from climate communications experts is that when the narrative turns negative, it is important to talk about solutions and a sustainable policy response which has been debated and negotiated (Robbins, 2025). Making sure that the key trade-offs have been debated and negotiated is an important task for protecting the energy transition narrative and maintaining and growing necessary public buy-in and legitimacy.

Based on the deterioration of energy transition debate internationally (especially online, where opposition can be amplified, and support somewhat drowned out) Ireland's energy policy proponents will have to stand tall and not buckle in the face of potentially fierce pushback.

To aid them, it is crucial that a proactive, evidence-based communications response is prepared, rolled-out, and continually updated to protect and foster public support for the energy transition in Ireland.

This response should learn from the negative developments internationally noted above, and treat misinformation as the systemic risk that it is, not just the work of some 'bad actors' (Jalli, 2025).

Progressing this work in the near-term could fall under action 29 of the Government's *Accelerating Infrastructure Action Plan* which is to enhance Government communication to promote the importance of infrastructure delivery, taking an evidence-based approach. In the medium-term, these issues could be considered as part of the EPA/UCD UWISCA project ('Using Worldviews to Inspire and Scale Climate Action'). The purpose of that project is to support the transition to a low-carbon economy in Ireland by identifying the communication and engagement strategies that are most resonant with certain segments of the Irish population.[30]

Further, Ireland's communications strategy should mind the capability-expectations gap,[31] and keep the gap between what is promised (and hence might be expected) and what is feasible (and hence might be delivered) as narrow as possible, to maintain vital public support and legitimacy. Emphasising the co-benefits of the transition continues to be vital, though care must be taken to ensure that only the co-benefits certain to materialise are employed i.e. avoiding messages of cheaper, more reliable electricity, or of Ireland becoming a major net exporter, in the near-term. What is the plan if retail prices do not fall as renewables penetration increases and wholesale prices fall? A refreshed communications strategy might also learn from policy framings adopted in other policy areas and in other countries (FitzGerald, 2019).

Furthermore, the narrative must be focused on *how* to decarbonise, not *whether* to decarbonise, as some who argue for pragmatism may in reality be angling for delay. Ireland must be ever-vigilant for 'the obstructionist wolf in pragmatist sheep's clothing'.

30 See www.climateworldviews.com for more detail.

31 The 'capability-expectations gap' analytical framework comes from international relations literature but may be useful in other policy areas and in Ireland, including in energy transition policy and communications. See Hill, 1993.

Finally, in many ways, the positive energy transition narrative – of our own sustainable, renewable energy sources with co-benefits of clean air, 'green jobs'; 'more reliable power'; 'cheap electricity'; 'net exporter of energy', 'Ireland as the Saudi Arabia of Wind') – is a distant one. The transition has to make sense at ground level, as well as in long-run forecasts, in legislation, in models, and in sectoral budgets. NESC has already offered some advice on connecting people to the energy transition (NESC, 2025a). Speaking about macroeconomic performance versus the lived experience of homes and people, the economist Andrew Haldane commented that economies need a story of growth that isn't aridly told from 30,000 feet above.[32] In Ireland's energy transition, there can be a tendency to look to the horizon – to 2040, to 2050: Ireland needs a story of energy transition that isn't told looking 30,000 feet away, to the horizon. It must speak to the lived experience of individuals, households, firms, and communities today. Ultimately, while communications are important, legitimacy is about a lot more than messaging strategies.

3.2.5 Supplement the Accelerating Infrastructure Action Plan

Ireland's energy transition is, at its heart, a national infrastructure and investment delivery project. The Climate Action Plan's targets are to be achieved by delivering large-scale clean energy infrastructure and vast sums of private and public investment. The energy transition necessitates significant private sector investment, indirect supports, and large-scale public investment. It has been estimated that the required 5 GW of offshore wind by 2030 alone would cost €10bn in public investment and would require €5bn in energy grid upgrades (Government of Ireland and Department of Finance, 2025).

One major policy development which it could be argued will address many of challenges described in this discussion paper is the recent publication of the *Accelerating Infrastructure - Report and Action Plan* (Government of Ireland, 2025a). That extensive plan is the product of the work Accelerating Infrastructure Taskforce established by the Government to support a programme of reform, advising on accelerating infrastructure delivery by identifying the key barriers impeding progress, and how these can be overcome to unlock infrastructure delivery.

There are many welcome and urgently needed actions set out in the plan. The plan's full and timely implementation can address the legal, planning, regulatory, social, and operational barriers that collectively hinder the delivery of infrastructure. However, it should be supplemented with further action.

In the context of this discussion paper, it is notable that the issue of policy trade-offs does not feature prominently in the plan. This can be explained by the fact that policy trade-offs specifically are not among the most impactful barriers impeding infrastructure development identified in the extensive consultation process which informed the plan (Government of Ireland, 2025b).

32 'Labour Must Rethink Growth Strategy To Curb Rise Of Far Right, Says Top Economist', *The Guardian*, September 17th 2025, (Partington, 2025).

The reasons for this are not certain. It may be related to the core activity of the majority respondents to that consultation process (i.e. not policy actors in the main, but rather infrastructure practitioners, companies involved in infrastructure delivery, the construction sector, the legal, accounting, and consulting professions, the electricity and transport sectors, commercial semi-State bodies etc.).[33] If that is the case, it is logical that the outcome of the consultation process is an emphasis on *external friction points that impact strategic infrastructure delivery*, as opposed to *a systemic issue more pertinent to policy-makers, such as policy trade-offs*. It is understandable that the Accelerating Infrastructure Taskforce focusses on the former.

This has some consequences. At the most basic level, the phrase 'trade-off' does not appear in the action plan. The foreword does refer to 'competing pillars' of the protection afforded by regulation, and the timely provision of infrastructure (Government of Ireland, 2025a: 5).

References to 'competing issues' which can 'lead to inconsistency and hence drive uncertainty' come under the specific topic of planning decisions and timelines (*ibid.*: 27). The trade-offs presented in the planning process are far narrower, and perhaps less profound, than those facing energy transition policy (see chapter 2) or the policy system more broadly. These crucial macro trade-offs are unlikely to be of material concern in a planning process *per se*.

But the more substantial consequence for the topic at hand is that the plan on its own is not intended to, and cannot be expected to, result in more successful resolution of key (energy transition) policy trade-offs. Implementation of the plan therefore also cannot be expected to prevent the harmful consequences arising from unresolved trade-offs and/or foster the helpful impacts of successfully confronting them as described in chapter 1.

As outlined in detail above, what is required to understand, take on, and successfully reconcile trade-offs is deep project-specific analytical work and comprehensive engagement, including with the public, private sector providers,[34] experts, representative organisations, and politicians. If the process is to be meaningful and impactful, it needs to be extensive, and will take time.

All of this is not to say that the plan does not contain actions that will help. There are five actions closely related to the challenge of reconciling trade-offs. However, these actions do not seem to have the necessary qualities named above, at least as they are described in the plan. For example:

- The action to deliver *National Planning Statements* (Action 8) does not appear to cover the necessary wide range of actors to fully understand and resolve trade-offs, including private sector providers. Further, it would seem unlikely that the necessary project-specific analytical work and engagement could be concluded for all critical infrastructure project areas within the plan's deadline for consultation (Q3 2026).
- The action to introduce *Risk Appetite Statements* (Action 20) also has a narrow scope of actors, limited analysis and engagement, and a relatively short timeline.

33 170 submissions were received during the public consultation process.

34 Much of Ireland's critical infrastructure and services are funded and delivered by or with the private sector. This is true in the case of housing, communications/digital, electricity generation, and motorway infrastructure, for example. And it is true in the case of related public services such as health, waste, child/eldercare, public transport, financial services, and some education and training.

- The action to provide *greater leadership support* (Action 28) does not include project-specific analytical work, has limited if any consultation process, is top-down and narrow in scope (mainly public sector actors), and is to be concluded in a short timeframe (Q1 2026).
- The action to *enhance Government communication* (Action 29) has similar issues, though the 'ongoing' timeline is more realistic.
- The action to establish a *Benefits Realisation Framework* (Action 30), as described, does not include the actual weighing of trade-offs (including disbenefits) via the values attached to the criteria (competitiveness, emissions, regional development etc.), and it is unclear how project-specific criteria are agreed or by whom. Again, it is not obvious how private sector infrastructure funders and providers are included.

In addition, as discussed earlier, one important lesson from climate and energy policy is that legislation to accelerate critical infrastructure and provide for emergency powers will not resolve trade-offs.

Importantly, the plan notes that while it sets out a programme of reform for improved infrastructure delivery, the actions 'will be monitored and reviewed for their… desired outcomes…' and '… further actions may be considered if delivery is not sufficiently accelerated or externalities arise' (Government of Ireland, 2025a: 22). Further actions to address unresolved trade-offs under the Accelerating Infrastructure Action Plan initiative could be considered.

The negative impacts for the energy transition from unresolved trade-offs are also at play in the delivery of housing, water/wastewater, and transport etc., yet the plan has no actions set out to address them. The current suite of actions will hopefully be fully implemented, but the negative impact of unaddressed trade-offs may continue to hinder the delivery of the energy transition and wider strategic infrastructure. Examples of such trade-offs include those between sectors (e.g. finite resources for housing, enterprise, transport, water, energy, education, and childcare) or within sectors (e.g. hitting social, affordable, market housing targets with finite resources). Others include delivering infrastructure plans, targets, and projects, while limiting inflationary impact; addressing urgent issues while meeting national commitments (e.g. traffic congestion/airport capacity, and decarbonisation); attracting international, skilled personnel for project delivery, while ensuring adequate housing and services for them; and more. Furthermore, new policy and targets which have not sufficiently resolved trade-offs can be expected to emerge, for the reasons set out in section 1.2 e.g. the formal adoption of new emissions reduction targets for 2040 at EU level.

There is an opportunity now to use the new Accelerating Infrastructure policy architecture. The Department of Public Expenditure, Infrastructure, Public Service Reform, and Digitalisation and/or the Accelerating Infrastructure Taskforce could consider how their continuing work can look to address the issue of unresolved trade-offs in the energy transition, in wider infrastructure delivery, and in new policy-making and target-setting.

Chapter 4: Conclusion

The decarbonisation of Ireland's energy system must be progressed at a faster pace. A successful transition requires an energy system that is not only environmentally sustainable but also secure, reliable, affordable, competitive, and socio-politically acceptable. This discussion paper has argued that while Ireland has well-developed policy and institutions, and has adopted ambitious, legally binding targets, progress is hindered by a failure to agree any 'non-negotiables', to fully understand, confront, resolve fundamental policy trade-offs, and to align national social, economic, and environmental objectives.

It is not clear that there is explicit, sufficient socio-political support for, and acceptance of, the primacy of sustainability obligations over social and economic objectives. We cannot pretend or act as if there is. That being the case, alignment of national social, economic, and environmental objectives must be given the same priority as ambition. Important national objectives for environmental sustainability, security and reliability of power supply, affordability and competitiveness, and social cohesion must be aligned, achievable and be achieved during the energy transition.

Harmful emissions must be reduced while the economy prospers; renewable sources must make up the vast majority of supply while reliability is maintained and demand is met; clean infrastructure for generation, transmission, distribution, and storage must be strengthened and added to while prices are kept affordable and competitive; and social license for the transition must be bolstered and maintained while costly and sometimes intrusive improvements are made. Addressing these trade-offs via the three pillars of 'good policy' identified by Government (evidence, legitimacy, and feasibility) is crucial. Without a robust plan for a clean, secure, affordable, and competitive energy system, complaints of a lack of political will or of so-called 'implementation deficit disorder' achieve little.

Recent progress, including falls in emissions and significant growth in solar and wind capacity, is something to be proud of but it is not an example of successfully managed trade-offs. Implementation lags significantly behind commitments, Ireland is currently off-track to meet its 80 per cent renewable electricity target, and its 51 per cent emissions reduction goal for 2030. The failure to reconcile trade-offs has led to knowledge gaps in key areas such as power sector decarbonisation, offshore wind energy, energy security, and digitalisation. It has also led to public expectations of the transition around affordability, reliability, and exportability which may not arise in the near to medium term, presenting a challenge to necessary buy-in and legitimacy.

Ireland must be ever-vigilant for 'the obstructionist wolf in pragmatist sheep's clothing'. Equally, it is essential that those who support decarbonisation can highlight policy shortfalls and suggest improvements without fear of, or actual, misrepresentation. Otherwise, suboptimal policy and outcomes can be expected to persist, for fear of providing grist to the mill of obstructionists.

Ireland has to avoid delay, obstruction, and fatalism, and the energy transition entering a culture war. Better understanding and reconciling of trade-offs can inject impetus, enhance the transition narrative, help defeat obstruction, and move Ireland closer and faster towards where it wants and needs to be.

To accelerate progress when no non-negotiables have been agreed, the policy system must place a new emphasis on how to achieve its targets, through a 360-degree lens that considers feasibility and legitimacy alongside evidence, and reconciles trade-offs to better align national objectives. This is a daunting task for the policy-system, and this discussion paper proposes five initial steps for consideration:

1. Work hard to explicitly define and better understand transition trade-offs: Complete the important research underway, and address the knowledge gaps out to 2030 and in the heat and transport sectors.
2. Place a new emphasis on feasibility: Move beyond technical readiness and the availability of measures, to reflect a tetralemma of ensuring sustainability, security, affordability, and socio-political acceptability; and set out an agreed, credible pathway.
3. Enhance energy transition modelling: Encapsulate a wider set of considerations and data which have been deemed important to Ireland e.g. with reference of the National Well-Being Framework.
4. Tell a story of transition that isn't only looking to the horizon: Refresh the energy transition narrative in light of developments at home and abroad. Ireland needs a story of energy transition that isn't told looking 30,000 feet away, to the horizon. It must speak to the lived experience of individuals, households, firms, and communities today.
5. Supplement the Accelerating Infrastructure Action Plan: Use this new policy architecture to address unresolved trade-offs in strategic infrastructure delivery more broadly, not only in the energy transition, and to improve future policy-making and target-setting.

Progressing these five steps to resolve trade-offs (and be seen to do so) is not an exercise in delay, but one of propulsion. By confronting these tensions now, the policy system can build greater certainty, and provide a credible, feasible pathway to a decarbonised energy system. It can help build the three pillars of good policy, for example by:

- Bridging the *evidence* gap between what current modelling and research provides and the need for an agreed decarbonisation pathway;
- Bridging the *legitimacy* gap between the Citizen's Assembly/Oireachtas Committee report/ legislation/carbon budgets and the lived experience of people, households, firms, and communities; and
- Bridging the *feasibility* gap between the technical readiness of renewable technologies and social, economic, and political constraints in the absence of agreed non-negotiables.

Specific, initial recommendations include:

- Complete the Decarbonised Electricity System Study and respond to its findings.
- In the absence of an agreed power sector decarbonisation pathway out to 2030, seek to exploit the analytical methods and resources being created and applied under the Decarbonised Electricity System Study (DESS). This could include:
    - Executing further simulations of the DESS Energy System Model to provide refined insights on the priority decarbonisation pathways;
    - Embedding multi-criteria analysis and expert elicitation within all policy pathway exercises to provide data that techno-economic modelling cannot;
    - Fostering the development of a research community that utilises and contributes to the development of modelling;
    - Undertaking analysis in the near-term to evaluate the GHG and environmental impacts of proposed transitional technologies, to support trade-off decision-making; and
    - Examining carefully the temporal trade-off involved in making near-term large-scale capital investments which might close off medium-term options for decarbonisation.
- Undertake a comprehensive study to provide the policy system with the data to resolve the environmental, social, and economic trade-offs inherent in digitalisation and Large Energy User (LEU)/data centre policy. For example, the study should provide agreed evidence on likely LEU development scenarios and the associated employment, economic contribution, and emissions associated with each, and some agreed multiplier for sectoral dependence, and other data needed to understand and reconcile the trade-offs.
- Consider completing both a decarbonised heat system study and a decarbonised transport system study to provide the policy system with an agreed, credible, evidence-based pathway to remove greenhouse gas emissions from both sectors in Ireland from 2027.
- Undertake new analysis of, and agree, the understanding and application of the concept of feasibility in energy transition policy, modelling, and target-setting, recognising the fundamental importance of social, technology, economic, environmental, and political factors, and competing national objectives.
- Enhance energy transition modelling, for example, by encapsulating a wider set of social, economic, and environmental considerations such as just transition, biodiversity impacts, and consequences for investment, the macroeconomy, energy bills, and energy security, as well as data on considerations which Ireland has deemed important e.g. with reference to the National Well-Being Framework.
- Include socio-economic modelling as part of the key work of the Climate Change Advisory Council.
- Ensure assessment, modelling, and communication exercises maintain a focus on Total Systems Cost/consumer bills.
- Implement NESC's call for a Cross Government Energy Framework which provides an agreed, evidence-based energy decarbonisation pathway which has resolved key trade-offs and is aligned with national social, economic, and environmental objectives.
- Examine where the distribution of the burden of costs of energy infrastructure should fall across, for example, consumer bills, taxation/Exchequer funding, and fossil fuel bills.

- Create the Energy System Plan promised in the Large Energy Users Action Plan with centralised spatial demand and generation projections; and ensure the plan resolves trade-offs inherent in the shared assumptions and objectives, for example demand forecasts by sector, spatial development assumptions, generation mix requirements, and consistency of gas and electricity infrastructure objectives.
- Implement the IEA's recommendation that Ireland establish a cross-sectoral energy security strategy for the 2030s, which would consolidate sectoral ambitions, assess trade-offs, and set clear priorities and milestones for developing power system infrastructure, markets and operations.
- Engage the new Accelerating Infrastructure policy architecture to address the issue of unresolved trade-offs in the energy transition, in wider infrastructure delivery, and in new policy-making and target-setting, by supplementing their action plan.
- Urgently prepare an evidence-based communications response to bolster public support for the energy transition in Ireland, learning from recent negative developments internationally, and linked to a new, credible transition pathway which aligns social, economic, and environmental goals.

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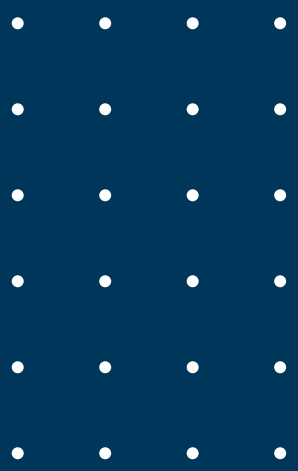

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