Department of Enterprise, Tourism and Employment

Green Growth Strategy – Consultation Response

06/02/26

About Trifecta Ireland

Trifecta Ireland is an independent, non-profit initiative working to accelerate Ireland's transition to a clean, secure, and affordable energy future.

We provide bold, evidence-informed leadership to address systemic failures in the energy sector. Grounded in global systems change theory, Trifecta identifies what enables successful large-scale transformations and applies these principles to Ireland's unique energy context.

Our niche is connecting global insight with local action. We bring together stakeholders across government, industry, science, and civil society to co-design and drive integrated, system-wide solutions. By fostering collaboration and aligning incentives, we aim to unlock opportunities and remove barriers to Ireland's energy transformation.

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1. Which specific actions in Powering Prosperity – Ireland's Offshore Wind Industrial Strategy were most impactful or effective? Could similar actions be applied to support other green technologies? Please identify the action(s) and, where possible, provide evidence or examples to support your view.

The coordinated approach carried out in Powering Prosperity, which linked supply chain development, research and innovation, regional growth, and enterprise support, was extremely effective and should now be applied to storage, smart grids, and electrification. This framework recognised that achieving offshore wind targets requires more than project delivery and understood that cross-agency alignment:

- reduces uncertainty
- strengthens investment signals
- increases the likelihood that Ireland captures durable economic value rather than importing it

The emphasis on measurable enterprise outcomes, including supply chain participation, clear performance targets and innovation activity, was also significant, as it signals that domestic capability building is an explicit objective.

2. Noting the broad set of technology areas mentioned previously, are there particular green technologies related to the energy system that Ireland should focus on to meet climate targets and maximise economic opportunities from the green transition?

Ireland's primary barriers are not the availability of renewable generation but system integration, flexibility, and delivery speed. Priority should therefore be given to green technologies associated with grid enhancement, energy storage, floating offshore wind, demand flexibility and digitalisation that both enable rapid decarbonisation and strengthen long-term system competitiveness.

Grid-enhancing and smart grid technologies fulfil the dual goal of:

1. Complementing conventional grid expansion at a time of significant execution constraints.
2. Building exportable capability in advanced grid and digital systems.

Commercially mature technologies such as dynamic line rating, advanced monitoring and flow control technologies can unlock capacity from the existing network within months, reducing curtailment and accelerating renewable integration. Dynamic line rating alone has resulted in capacity uplifts of 10–30% without major new infrastructure.

System flexibility is foundational in a high-renewables system with storage (including longer-duration storage):

- improving price stability
- reducing dispatch down
- strengthening the security of supply.

The time has passed for a series of long pilots without any follow-on implementation. Mature technologies are already proven in other markets, making clear regulatory treatment and route-to-market visibility crucial for efficiently scaling flexibility.

Offshore renewable energy, particularly floating offshore wind, represents a considerable economic opportunity for Ireland. Therefore, focusing on these technologies is crucial to leverage Ireland's enviable comparative advantage in its domestic renewable resources.

Demand flexibility and electrification technologies, such as heat pumps, EVs, and demand response, must be treated as core system enablers. Flexible power demand must evolve alongside renewable supply, supported by coherent tariff and retail pricing frameworks that send clear behavioural signals.

Digitalisation and delivery acceleration technologies, including AI-enabled planning and grid operations, can also materially shorten permitting timelines and reduce delivery risk. This outcome is especially important in an Irish context, with Ireland identified in Draghi's 2024 report, The future of European competitiveness, as one of the EU countries with the longest permitting timelines for solar and wind. Additionally, AI operating tools can assist:

1. System operators - supporting automated grid balancing and real-time scenario evaluation as system complexity grows, enabling more efficient operational decision-making.
2. Consumers - automatically carrying out consumer preferences, optimising cost, and dynamically adjusting consumption based on price signals.

3. Which of these technologies do you consider need additional support in terms of supply chain development? What part of the supply chain requires support? Please note the relevant technology/technologies and provide evidence to support this.

Supply chain development determines how efficiently renewables are integrated and how much long-term economic value Ireland retains. Therefore, Ireland must focus on system-enabling technologies: grid optimisation, storage integration, offshore wind support, advanced power electronics, and electrification platforms.

Supply chain support for commercially mature grid-enhancing technologies should prioritise:

- domestic capability in system integration
- digital optimisation
- advanced operational modelling
- specialist engineering within EirGrid and ESB Networks

Scaling storage requires predictable pipelines and clear regulatory treatment. Ireland must avoid a scenario in which assets are deployed, but system knowledge remains externalised. Therefore, it needs to prioritise support in:

- grid-scale system design and integration
- power electronics and inverter technologies
- control systems and optimisation software
- longer-duration solutions
- specialist O&M capability.

Offshore wind requires the development of associated ports. This development requires significant support made even more pressing by concerns that Ireland's current development model is not conducive to offshore wind development.

Low-inertia system management, grid-forming technologies, smart charging, and demand aggregation represent high-value segments aligned with Ireland's strengths in the digital and engineering sectors. Support must emphasise R&D-commercialisation pathways, pilot environments, and workforce training.

4. Which of these technologies do you consider need additional support in terms of broad/system research, development and innovation and in-company RD&I? Are there specific barriers to innovation or R&D in these sectors that Government could help address? Please note the relevant technology/technologies and provide evidence to support this.

RD&I support should focus on accelerating the deployment of commercially mature system-enabling technologies, not solely on early-stage invention. This support should focus on grid technologies, storage, flexibility and advanced power electronics and digitalisation. Notably, across sectors, regulatory conservatism, slow approvals, and misaligned price signals remain persistent barriers. Addressing these structural constraints is as important as increasing funding.

A significant contributing factor to the innovation gap for grid technologies is institutional capability. Their system integration is limited due to regulatory lag, conservative deployment thresholds, and limited operational test environments. Support must prioritise:

- applied system integration research
- TSO/DSO-linked pilots
- regulatory incentives tied to measurable network outcomes
- AI-enabled grid optimisation
- grid enhancement technologies

For storage and flexibility, uncertainty around market structures creates barriers, leading firms to be reluctant to invest in in-house RD&I or scale innovation domestically. These barriers must be reduced through clearer long-term signals and structured innovation funds targeted at flexibility solutions.

In advanced power electronics and digitalisation, stronger industry–academic collaboration and commercialisation pathways are needed to bridge research and operational deployment.

5. Which of these technologies do you consider need additional support in terms of industrial deployment? Please note the relevant technology/technologies and provide evidence to support this.

Industrial deployment must prioritise grid-enhancing technologies, storage and flexibility technologies and electrification and flexible demand. Crucially, Ireland's binding constraint is predominantly integration and execution speed rather than technology availability. Standardisation/modular approaches, calling for explicit assessment and incentivisation of standardised designs, are essential to reduce cost and time risk and should be prioritised alongside digital tools (including digital twins and AI-enabled permitting/compliance) that are central to faster, cheaper delivery by identifying issues earlier and reducing delay risk.

Industrial deployment support for grid-enhancing and smart grid technologies must focus on:

1. Accelerating the adoption of proven tools and grid technologies that increase capacity and/or reduce dispatch down.
2. Introducing outcome-focused incentives that reward timely energisation and efficient system performance.

Storage and flexibility technologies require clearer regulatory treatment and route-to-market certainty. Deployment support should reduce delivery risk for longer-duration assets.

Electrification and flexible demand must scale alongside generation. Support should enable infrastructure and market participation pathways that allow electrified demand to provide system value.

6. What are the main barriers to scaling renewable energy and green technologies in Ireland (e.g. regulatory, skills, infrastructure, finance)?

The principal barriers are increasingly institutional and structural rather than technological. While renewable generation technologies are mature and globally available, deployment is constrained by lengthy and fragmented planning processes, grid connection delays, and slow regulatory approval pathways for system-enabling technologies. Significant barriers to scaling renewable energy and green technologies include:

1. The absence of effective performance-based incentives that suitably reward measurable system outcomes, such as reduced curtailment, faster energisation, or improved network efficiency.
2. Market design uncertainty, particularly around storage, flexibility and hybrid models, that dampens investor confidence.
3. Skills gaps in specialist engineering, digital grid systems, advanced power electronics, and project delivery further constrain scaling capacity.
4. Long lead times between project award and commissioning increase time risk and discourage in-company innovation investment.
5. The pace of adoption of system-enabling technologies, such as AI-assisted grid optimisation, required to coordinate an increasingly large portfolio of renewable energy and green assets.

7. Are there particular interventions from the Government or State agencies that should be considered to support the development of green technologies in Ireland?

Interventions should aim to remove friction in the system rather than simply introduce additional funding streams. In many areas, the relevant technologies already exist and have been deployed in other countries. The Government's role, therefore, should be to accelerate their adoption within the Irish system and ensure that regulatory frameworks support rather than hinder their integration. Interventions should include:

1. Performance-based regulatory frameworks that reward system outcomes rather than capital expenditure alone
2. Structured pilot environments directly linked to TSO/DSO deployment.
3. Multi-year visibility on deployment pipelines that reduce investment risk and strengthen domestic supply chain participation.
4. Innovation supports that focus on system integration and flexibility solutions, with clear pathways from research to operational deployment.
5. Accelerated and digitalised permitting pathways, including structured adoption of digital tools to shorten approval timelines.
6. Stronger cross-agency coordination between enterprise, energy and innovation bodies, which ensures that industrial development aligns with infrastructure deployment.

8. Are there existing supports that should be expanded or improved?

Improving coordination, clarity and incentives within existing frameworks will deliver greater impact than introducing entirely new schemes. Trifecta Ireland promotes that:

1. Enterprise and innovation funding mechanisms should be more explicitly linked to system deployment priorities, particularly in grid optimisation, storage integration, and digital energy platforms.
2. Route-to-market clarity for storage and flexibility requires further refinement, particularly regarding tariff exposure and revenue stacking frameworks.
3. Greater emphasis on digitalisation and operational optimisation within network regulation would improve outcomes without requiring large-scale new infrastructure.
4. More structured collaboration between TSOs/DSOs, universities, and SMEs would help translate research excellence into deployment capability.

9. Are there aligned sectors of the economy that this new industrial strategy should be seeking to support and develop to support our renewable energy and green transition ambitions?

Supporting aligned sectors that contribute to system integration, delivery capability and export competitiveness strengthens both domestic deployment capabilities and export potential. In particular, three aligned sectors must be considered central to Ireland's green growth strategy:

1. Advanced engineering, power electronics and system engineering should be developed as renewable penetration increases, and the grid becomes more digitally managed and inverter based.
2. Software, data, and digital services, an area in which Ireland is already strong, should be mobilised to support energy-focused digitalisation, which can play a role in accelerating project delivery, improving regulatory approvals, and reducing megaproject risk.
3. The financial services ecosystem should be supported through strengthening green finance expertise to reduce financing friction and improve competitiveness.

10. How can companies in these complementary sectors be identified and encouraged to broaden their work to include renewable energy and or green technologies?

Companies in complementary sectors are most effectively engaged when policy provides clarity, visibility and structured pathways into the energy transition.

Identifying firms with adjacent capabilities should be supported through coordinated mapping exercises led jointly by enterprise and energy agencies. Clear multi-year infrastructure pipelines and transparent technology roadmaps will reduce uncertainty and allow firms to assess market opportunities with confidence.

Encouragement should focus on integration mechanisms such as structured pilot and test environments linked to live projects, innovation sandboxes involving system operators, targeted procurement frameworks that enable SME participation, and cluster models connected to universities and research centres. Skills programmes aligned with anticipated deployment phases will further lower entry barriers.

11. Based on your experience, are there industrial development policy interventions from other countries that you consider particularly effective?

Structured innovation funding, modular infrastructure delivery, and anticipatory grid investment have been shown to speed up deployment and strengthen domestic capacity in different countries:

1. The UK's Strategic Innovation Fund (SIF), administered by Ofgem in partnership with UK Research and Innovation, was an effective intervention. This funding is tied to performance and measurable outcomes rather than an isolated grant mechanism, creating accountability, reducing regulatory lag, and shortening the pilot-to-deployment path.
2. Denmark's modular and standardised infrastructure delivery is a clear example of how Ireland can benefit by moving away from bespoke infrastructure construction. This strategy can be applied to substations, grid reinforcement and other repeatable energy infrastructure assets, shortening delivery timelines and reducing costs.
3. Several European jurisdictions have adopted more proactive approaches to grid and enabling infrastructure investment, deploying innovative technologies and capacity ahead of immediate constraint where long-term need is clear. This anticipatory approach reduces curtailment, strengthens investor confidence, and avoids delay-driven inefficiencies.

12. If so, how might similar approaches be adapted to the Irish context?

1. Ireland should create a dedicated innovation and flexibility mechanism, like SIF, tied to measurable system outcomes and performance that directly incentivises system operators to adopt commercially mature smart grid, digitalisation and flexible technologies at pace.
2. Ireland should adopt a similar modular infrastructure model to Denmark, which explicitly prioritises standardisation. This principle has clear relevance for substations, grid reinforcement, and other repeatable energy infrastructure assets.
3. Ireland must incorporate anticipatory investment principles within regulation and planning frameworks, with a shift towards performance and innovation-driven oversight, benchmarking system operators against TSOs in similar countries.

13. How can Ireland ensure that SMEs are well placed to participate in the development and deployment of green technologies related to the energy system in Ireland? Please note this is distinct from companies decarbonising or becoming more sustainable in their current practices and processes.

SMEs will participate where opportunities are visible, risk is manageable, and commercial routes are viable. To facilitate this environment and increase SME involvement, Ireland must:

1. Introduce standardised product categories and repeatable opportunities to reduce uncertainty, accelerate deployment, and support SME scaling.
2. Focus on creating credible pathways to commercialisation through access to operational testing environments, structured routes from funding to deployment, and clear regulatory frameworks for innovation incentives.
3. Ensure coherent signals across networks, retail, and wholesale so SMEs can build sustainable business models around flexibility services, digital grid tools, and electrification solutions.
4. Develop targeted training pathways aligned with the needs of high-renewable systems so SMEs can avoid labour constraints.

14. How should Ireland monitor the development of these green technologies and identify emerging technologies and sectors in the future?

Ireland should adopt a structured, performance-based and forward-looking approach that isn't based solely on installed capacities. Instead of measuring only installed MWs, indicators reflecting system performance and resilience should be tracked, as this is essential to driving efficiency and accountability. Monitoring should include systematic benchmarking against comparable countries, as this can highlight whether Ireland is deploying technologies at pace, whether regulatory lags exist, and whether infrastructure costs and timelines are competitive. Formal advisory mechanisms connecting academia, industry and system operators could also provide early insight into emerging technologies. Monitoring should be proactive, not reactive, and should be assisted by digital twin and data analytics tools that can provide early identification of challenges and opportunities.

15. Is there anything else you would advise DETE to consider in developing this new industrial strategy?

Trifecta Ireland encourages DETE to place greater emphasis on delivery governance and time risk within the industrial strategy. Large-scale energy transition is effectively a megaprogramme of megaprojects, and success depends as much on institutional capability as on technology choice. The strategy should therefore incorporate explicit mechanisms to reduce time risk, including clearer ownership of delivery outcomes, structured reference-class benchmarking against comparable jurisdictions, and regular performance reviews tied to measurable system outcomes. The technologies required to facilitate large-scale energy transition are also already being deployed internationally at scale. Ireland's success will therefore depend less on technological discovery and more on recognising and operationalising solutions that are already proven.

Ireland has a unique and enviable comparative advantage in its domestic renewable resources, and our energy transformation state of maturity means our grid is relatively advanced. This bounty, coupled with our human resources and digital capabilities, means the potential for our nation to lead at the nexus of clean energy/grid and intelligent electrification is enormous. However, without intervention, Ireland will import a disproportionate share of value rather than capturing it domestically and building new capabilities to export to the world. Finally, Ireland would benefit from a more formalised national master planning approach that aligns grid, generation, demand, and industrial development within a single, outcome-led framework. Embedding delivery capability at the core of the strategy will determine whether Ireland captures both climate and economic opportunity.