



Sustainable Energy Authority of Ireland

National Energy Research Development and Demonstration (RD&D) Funding Programme 2021

Call for Submission of Applications

Key Dates	
Call Open Date	Tuesday the 16 th of February 2021
Deadline for Application Submission	Monday the 29 th of March 2021 at 3pm GMT

It is the responsibility of each applicant to SEAI's National Energy Research Development and Demonstration (RD&D) Funding Programme Call to ensure that they have read and fully understand all Documentation associated with this Call before making a submission, including: this Call Document (pdf); Application Form Template (word doc); SEAI RD&D Budget Policy (pdf); and the SEAI RD&D Budget Template (xls).

SEAI is pleased to announce that the 2021 SEAI National Energy RD&D Call involves co-funding partnerships with the following organisations: the Department of Transport and Geological Survey Ireland.



An Roinn Iompair
Department of Transport



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The Sustainable Energy Authority of Ireland (SEAI) works with the public, businesses, government and communities to achieve a cleaner energy future. SEAI is funded by the Government of Ireland through the Department of the Environment, Climate and Communications.



Rialtas na hÉireann
Government of Ireland

1. Programme Description and Objectives

SEAI will be central to bringing about a low carbon economy through measures and activities focused on the transition to a smarter and more sustainable energy future. To achieve this mission, SEAI will continue to build an environment for positive change through our analysis, modelling and support for policy-making. SEAI will catalyse direct action through our design and delivery of grant and incentive programmes and through our capacity-building processes with citizens, communities and private and public sector organisations.

The overarching objectives of the SEAI National Energy Research Development and Demonstration (RD&D) Funding Programme are as follows:

- Accelerate the development and deployment in the Irish marketplace of competitive energy-related products, processes and systems;
- Support solutions that enable technical and other barriers to energy market uptake to be overcome;
- Grow Ireland's national capacity to access, develop and apply international class energy RD&D;
- Provide guidance and support to policy makers and public bodies through results, outcomes and learning from supported projects.

SEAI's National Energy RD&D Funding Programme supports innovative and targeted actions which assist in delivery of the [Climate Action Plan](#), the [Programme for Government](#), the [2030 Climate and Energy Framework](#), the 2015 Department of the Environment, Climate and Communications [Energy White Paper](#), Ireland's [National Energy & Climate Plan](#) (NECP), and the Climate Action and Low Carbon Development (Amendment) Act 2020 such as it pertains to SEAI's remit.

2. Who Can Avail of the Programme

The SEAI National Energy RD&D Funding Programme is open to public and private sector organisations based in the Republic of Ireland (including Irish subsidiaries of overseas companies) who wish to carry out projects in Ireland. Applications will be accepted from Private Enterprises, Universities, Institutes of Technology and State Funded Research Organisations, Public Sector Bodies and Semi-State Bodies who are based in the Republic of Ireland. The aforementioned organisations may apply to the Programme individually or as part of a consortium. Proposals from individuals applying in their own right will not be accepted.

In some circumstances, the programme may support Irish entities/researchers to carry out work undertaken in other jurisdictions, where this is necessary for the completion of the project. Researchers based in other jurisdictions will not be funded by the programme, and should partake in proposals in the role of (non-funded) collaborators.

In exceptional cases, funding of work in other jurisdictions (e.g. where it is not possible for a component of work to be carried out in Ireland) may be supported where there is a demonstrable contribution to resolving issues directly relevant to Irish requirements.

3. Definition of Project Roles

Lead Applicant: The Lead Applicant will hold responsibility and accountability for management of the proposed project. They will be responsible for the technical direction, progress monitoring, budgeting, reporting, dissemination and other management duties associated with the proposed project in-line with SEAI policies. The Lead Applicant is responsible for ensuring that all project partners and stakeholders are kept fully informed on all matters relating to the project. The Lead

Applicant will act as the primary contact point for SEAI. Each application may list only one Lead Applicant. The Lead Applicant must hold a contract covering at least the duration of the proposed project or agreement from their employer that their employment will be extended to cover at least the period of the proposed project.

Please note, for academic institutions, the named Lead Applicant must be a core funded member of academic staff or a member of academic staff with a fixed-term contract and is therefore ineligible to receive salary funding through the SEAI National Energy RD&D Funding Programme. Postdoctoral Researchers or Research Fellows may not be listed as the Lead Applicant (except for Fellowship applications).

Partner Applicant(s): Partner Applicants may form part of the proposed funded project team, along with the Lead Applicant and are responsible for supporting the Lead Applicant in order to achieve the goals of the proposed project. The role of the Partner Applicant(s) should be well-defined within the application.

Collaborators: Collaborators are organisations who are committed to providing a valuable intellectual, technical or financial contribution to the proposed project. Collaborators are not funded by SEAI in a proposed project.

4. Levels of Funding Available – Project Scale/Type

The SEAI National Energy RD&D Funding Programme provides funding under the following four categories. Details of the typical duration and typical maximum SEAI funding associated with each scale/type are provided in the table below:

Scale/Type	Typical Duration	Typical Maximum SEAI Funding*
Small scale projects	Up to 12 months	Up to €200,000
Medium scale projects	12 to 36 months	Up to €650,000
Large scale projects	36 to 48 months	Up to €1,000,000
Fellowships	12 to 36 months	Up to €300,000

**Inclusive of Overheads, please see SEAI RD&D Budget Policy for further details.*

Classification of a small, medium or large-scale project is based on the duration of the proposed project. Please refer to Annex 1 for details of the Project Scale/Type defined for each thematic Topic.

Fellowship applications must be submitted by the individual intending to take up the proposed Fellowship. Fellowship applications will be accepted from Universities or Institutes of Technology only.

5. Funding Rate

EU state aid rules stipulate what types of research activities are eligible for support, which costs relating to these activities may be covered in part or in full (ranging from 25% up to 100%), and the maximum aid intensity that may be granted for the various activities. Applicants should refer to the SEAI RD&D Budget Policy for additional information in relation to which category their project falls under.

The Categories below represent the maximum level of support that could be available within the 2021 SEAI National Energy RD&D Call. Additional information is provided in the SEAI RD&D Budget Policy.

RD&D activities subject to EU State Aid Regulations					
Research Category	Base Level	Type of Company		Effective Collaboration	Maximum Support
		Small Enterprise	Medium Enterprise		
Industrial Research	50% of approved itemised eligible costs	+20%	+10%	+15%	80%
Experimental Development	25% of approved itemised eligible costs	+20%	+10%	+15%	60%
RD&D activities not subject to State Aid Regulations					
Non-economic Public Good Research					100%















6. What Projects are Eligible












The 2021 SEAI National Energy RD&D Funding Programme provides the opportunity for applicants to submit proposals to either a topic strand or an open strand.

Open Strand - The open strand of the call provides an opportunity for applicants to propose projects within SEAI's legal remit which directly address the aims and objectives of the SEAI National Energy RD&D Funding Programme Call. This strand is open to all areas of SEAI's legal remit.

Topic Strand - The topic strand of the call provides an opportunity for applicants to submit proposals that address the requirements of the topics outlined below. These topics have been developed by SEAI and relevant stakeholder organisations. In some cases, successful proposals to the topic strand of the call will be partially funded by co-funding partners. The table below provides an overview of the topics which form part of this call. Please refer to Annex 1 of this document for full topic details.

Each topic description in Annex 1 outlines suggested project objectives & expected outputs. Please note that proposals submitted to these topics are not necessarily expected to address every objective and output listed in all cases. Applicants should clearly outline which of the suggested objectives & expected outputs they intend to address/deliver as part of their proposed project, and may propose additional objectives/outputs. All proposals should build upon existing research and information available.

No.	Title	
Small Scale Projects		
1	Investigating ventilation within dormer attics following installation of insulation	
2	Examining life cycle analysis and embodied energy in buildings to compare the use of sustainable building materials	
3	Comparative study of decarbonisation options for heavy duty vehicles (HDVs) in Ireland (Co-funded by the Department of Transport)	
4	District heating in Ireland	
Small or Medium Scale Projects		
5	Green hydrogen production from Irish onshore and offshore wind resources	
6	Measures to reduce dispatch down (curtailment and constraint) of renewable electricity generation	
7	End of life wind turbines: Life extension, decommissioning or repowering	
8	Performance of traditional building fabric and inclusion in the National Calculation Methodology	
9	Airborne wind energy	
10	Retrofit of commercial buildings	
11	Establishing an energy self-sufficient coastal community in practice: Feasibility, development, pilot demonstration	
Medium Scale Projects		
12	Implementation of a field experiment testing a behaviour change intervention/campaign to reduce emissions in the transport sector, through EV uptake (Topic 12A) or modal shift (Topic 12B) (Co-funded by the Department of Transport)	
13	Indoor air quality, ventilation and occupant comfort in non-domestic buildings pre and post deep energy renovations	
14	Monitoring and comparing the performance of heat pump systems in relation to the fabric performance and air permeability in retrofitted buildings to a B rating or higher	

No.	Title	
15	Remote and autonomous inspection and maintenance of onshore and offshore wind turbines	
16	Novel uses of geothermal energy for decarbonisation of heat (Co-funded by Geological Survey Ireland)	
17	Investigation of residential electricity use and the opportunities to optimise solar PV renewable electricity for self-consumption	
18	Electric vehicle battery recycling and second life technology	
19	Smart buildings	
20	Floating offshore wind development	
Medium or Large-Scale Projects		
21	Evaluating heat pump design and installation quality: A study on evaluation of current practices and development of tools/processes for improvement	
22	Changing energy behaviours in the field: Measuring the impact of behaviour change strategies/interventions on changing energy related behaviours in Ireland	
23	Support for collection of data to inform policy development and consenting for offshore renewable technologies	
Large Scale Projects		
24	Support for the development of emerging ocean energy and offshore renewable technologies	
25	Adaptive or risk-based management of wind farm interactions with hen harriers	

Co-funding Partner Profiles

SEAI is pleased to announce that the 2021 SEAI National Energy RD&D Funding Programme Call involves co-funding partnerships with the following organisations:

<p>Department of Transport</p> <p>As a central Government Department, serving the Government and the people of Ireland, the mission of the Department of Transport is to shape the safe and sustainable development of transport, to support economic growth and social progress. A Climate Change Unit was established in 2016 to co-ordinate the Department's policy response to the challenge of climate change. The Department will play a significant role in the national objective to reduce emissions and in achieving a cost effective reduction pathway to a low carbon and resilient transport system by 2050. In this role, the Department will encourage and support transport networks and services that are environmentally, economically and socially sustainable. The Department will also be responsible for supporting the necessary adaptation of our critical transport infrastructure and services in response to Ireland's changing climate.</p>	 <p>An Roinn Iompair Department of Transport</p>
<p>Geological Survey Ireland (GSI)</p> <p>Founded in 1845, Geological Survey Ireland is Ireland's public earth science knowledge centre and is a division of the Department of the Environment, Climate and Communications.</p> <p>GSI is committed to providing free, open and accurate data and maps on Ireland's subsurface to landowners, the public, industry, and all other stakeholders.</p> <p>GSI also acts as a project partner in leading international projects providing expertise, data and developing models and viewers in a diverse array of topics including geological mapping, geothermal energy, groundwater, seabed mapping, natural hazards, and public health risks.</p>	 <p>Geological Survey Suirbhéireacht Gheolaíochta Ireland Éireann</p>

SEAI may enter co-funding arrangements with other funders, who may have an interest in certain Call topics. If deemed appropriate, SEAI may approach other potential funders, at any stage during the Call process, up to and including during the contract negotiation stage.

7. Submitting your Application

Applications to the 2021 SEAI National Energy RD&D Funding Programme should be made through SEAI's online application platform, PEP (Project Evaluation Platform).

The PEP Application Portal is available at the following link: <https://pepportal.seai.ie/>

Further detailed PEP application guidance can be found within the PEP Application Guidelines Document available to download at:

<https://www.seai.ie/grants/research-funding/research-development-and-demonstration-fund/>

8. Evaluation Process and Criteria

Only fully complete applications received prior to the application deadline will be considered for evaluation. The evaluation consists of a two-stage process:

Stage 1 – Eligibility Assessment: Applications will be assessed to ensure administrative compliance with programme requirements and objectives.

Stage 2 – Technical Evaluation: Applications passing the eligibility assessment will be technically evaluated under the evaluation criteria outlined below.

Following the above evaluation process, highly evaluated proposals will be recommended for funding, subject to budget availability. A Reserve List of highly evaluated proposals may also be formed. Reserve List projects may be funded at a later stage, should sufficient additional budget become available.

Projects selected for funding will be issued with a Grant Agreement which will detail the approved itemised eligible costs. SEAI may require applicants to clarify aspects of their proposal prior to issuing a Grant Agreement.

The evaluation criteria under which applications will be assessed, and the proportion of marks awarded to each criterion are provided below:

Excellence and Innovation (40%)

- Familiarity with relevant RD&D activities/knowledge of the area
- Track record of participation in previous RD&D activities
- Qualifications of the key personnel/organisations
- Quality of the research proposed
- Originality and degree of innovation - going beyond the current state of knowledge

Relevance and Impact (30%)

- Relevance to the needs of the Irish energy sector with particular reference to national policy including: Ireland's Climate Action Plan, the Programme for Government, the 2015 Department of the Environment, Climate and Communications Energy White Paper, Ireland's National Energy & Climate Plan (NECP), and the Climate Action and Low Carbon Development (Amendment) Act 2020 such as it pertains to SEAI's remit. (Differentiating between highly evaluated proposals with the same score, close alignment of the proposed research with national policy ambitions and targets will confer an advantage).

- Stimulates & accelerates the development & deployment of energy related products, processes & systems in the Irish marketplace and/or facilitates guidance to policy makers on practical, regulatory, technological and/or market opportunities.
- Builds and/or maintains national capacity, capability and critical mass to carry out internationally leading RD&D activities underpinning the energy sector.
- Enhances researcher/organisation's potential to participate in Horizon Europe or other non-exchequer funded projects.
- Enterprise, scientific and policy impacts of project outputs.
- Appropriateness of communication/dissemination and exploitation plans.
- Where appropriate, active involvement of industry in the project.

Quality and Efficiency of Implementation (including value for money) (30%)

- Coherence and effectiveness of the work plan
- Adequacy of management arrangements
- Appropriateness of the project size, budget and value for money
- Balance of cost allocation between project partners (if applicable)
- Leveraging of other funds (e.g. contributions from the applicant organisations, benefit in kind etc.)

ANNEX 1: TOPIC STRAND

Topic 1	Investigating ventilation within dormer attics following installation of insulation
Indicative Duration	Up to 1 year
Project Scale	Small scale
Indicative Funding	Up to €200k

Project Background:

When insulation is added to an attic space this 'materially alters' the building which means that homeowners would need to upgrade the building to the current requirements (as per building regulations or official government advice for best practice).

In non-traditional attics, such as dormer attics, the ventilation levels required can be up to four times greater than traditional attics. In previous years, a significant number of dwellings could not be upgraded under the [Warmer Homes Scheme](#) due to the complexity surrounding correct ventilation levels required specifically for dormer type attics.

Project Objectives & Expected Outputs:

The key objective of this topic is to examine, through dynamic simulations over a year, the potential reduction in ventilation requirements for houses with dormer attics when insulation is added to the space. The study should also look at the potential inclusion of these type of houses within the Warmer Homes Scheme administered by SEAI.

Proposal(s) to this Topic should aim to investigate a range of building archetypes for houses with dormer type attics (e.g., different house sizes, ages, locations, etc); the archetypes should be representative of the Irish dormer homes stock. Typical costs of insulation and ventilation system requirements for this type of house should be estimated, for example through consultation with industry.

The proposed project should result in, among others:

- Excel file with simulation results and corresponding modelling assumptions/building characteristics for the archetypes. Results should be shown before and after the insulation has been added to the space in each archetype;
- Recommendations on typical costs of insulation and ventilation systems in dormer homes where insulation is added to the space. Costs should be provided at archetype and national level.

A project steering group will be formed, by the Project Team, comprising the successful research team, SEAI and other relevant Public Bodies.

Topic 2	Examining life cycle analysis and embodied energy in buildings to compare the use of sustainable building materials
Indicative Duration	Up to 1 year
Project Scale	Small scale
Indicative Funding	Up to €200k

Project Background:

The [Programme for Government](#) sets out the aim of achieving a fully decarbonised economy by 2050. Ireland's [Climate Action Plan](#) highlights the need to examine life cycle analysis and embedded energy in buildings to compare the use of sustainable materials (e.g. Action 118). Moreover, the EU commission have recently launched the [Level\(s\) framework](#) which will include Life Cycle Assessment, Life Cycle Costing and Global Warming Potential of buildings. This project proposes to research the life cycle global warming potential on a series of building types, to inform policy makers and public bodies, and to provide best practice case studies.

Project Objectives & Expected Outputs:

The objective of this topic is to identify the impact on CO₂ emissions, energy consumption, construction and maintenance costs of a range of materials used in the construction and refurbishment of buildings. All materials considered should be in compliance with existing structural, thermal and fire safety building regulations.

Findings from this research could include:

- Identification and description (e.g. cost, availability, market acceptance, etc.) of materials and technical solutions applicable to the construction of new buildings and to the refurbishment of existing buildings in Ireland. This should include:
 - Common materials and building services currently used in Irish construction industry
 - Alternate materials and building services with low Global Warming Potential
- Quantification of the contribution to energy use and the associated emission reduction potential from a shift from conventional materials to more sustainable practices for residential (e.g. houses, apartments) and non-residential buildings;
- Identification/description of the challenges to the deployment of these materials in the construction sector (including meeting the Irish Building Regulations and Agrément Certification).

It is expected that proposed research will include:

- Review of existing best practice both nationally and internationally and if/how these could be applied to Ireland;
- Engagement with Irish and international experts in the construction industry;
- Measurement of the energy use and carbon impact using a life cycle approach to carbon in buildings as per EN 15978 and a minimum of Level 2 of Level(s) Indicator 1.2: Life Cycle Global Warming Potential;
- Commentary on impact of Brexit on supply chains;
- Development of guidance documents and case studies;
- Recommendations for the industry and policy-makers on the deployment of sustainable materials in the construction sector;

- Recommendations for certification of these sustainable materials.

The case studies should include a review of new and refurbished buildings and should address at least:

- 5 Residential types, including apartment development, detached one off house, estates
- 2 Office blocks, 2 storeys and 6 storeys
- 1 School
- 1 University building
- 1 Hotel
- 1 Retail development
- 1 Healthcare building

The case studies should comment on:

- Efficient building shape and form;
- Optimised construction for new building and retrofit - consider trade-off between operational CO₂ emissions and embodied carbon emissions associated with insulation, façade, structure and renewable energy technologies;
- Optimised material utilisation and circular value – consider the impact of reusing the structure of existing building;
- Extending building and component service lives – consider lifespan of building components
- Design for adaptability;
- Design for deconstruction.

The case studies should be suitable for publication on the SEAI website, detailing the methodologies applied and results obtained.

A project steering group will be formed, by the Project Team, comprising of the successful research team, representatives from SEAI and other relevant Public Bodies.

Topic 3	Comparative study of decarbonisation options for heavy duty vehicles (HDVs) in Ireland
Indicative Duration	Up to 1 year
Project Scale	Small scale
Indicative Funding	Up to €200k
Co-funding	Department of Transport

Project Background:

The transport sector accounts for approximately 20% of Ireland's greenhouse gas emissions ([EPA, 2020](#)), and transformational change is required if the sector is to reduce emissions in line with national and international commitments. Although heavy duty vehicles (HDVs) only account for approximately 5% of vehicles on EU roads, they are responsible for around 25% of all road transport emissions. Developing mitigation measures to tackle emissions from this sector is an increasingly important objective, particularly as the transport sector 'is by far the largest source of final energy demand in Ireland' ([SEAI, 20219](#)).

Given the varying degrees of maturity of low and zero emission HDV technologies, it is considered unlikely that a 'one size fits all' approach will lead to the decarbonisation of the sector. While electrification represents a key pathway to emissions reduction for cars, vans and the light duty vehicle sector, battery weight and range limitations remain a concern in the case of freight and HDVs. Technologies identified as having potential in this regard include the use of renewable biofuels (which currently constitute more than 98% of the share of renewable energy used in transport ([SEAI, 2020](#))), advanced biofuels and renewable hydrogen through the use of fuel cell electric vehicles (FCEVs). An additional technology that has been identified as a potential contributor to the reduction of emissions from the HDV and freight sectors is Electric Roads Systems (ERSs), where electric vehicles are charged while in motion through contact with overhead electric lines or with a ground-level conductive rail, or via inductive (wireless) electrical systems. Although the potential of ERS to reduce HDV emissions has been recognised, high capital costs, uncertainty regarding economic viability, technical issues relating to infrastructure and interoperability, and questions around the future market share of other forms of battery technology have been identified as barriers to ERS development and implementation ([FABRIC project, 2019](#)).

Given the urgent need to reduce emissions from the HDV sector, and the projected growth in freight activities in Ireland, all options and potential pathways towards the decarbonisation of the HDV sector require consideration. For that reason, this Topic invites research proposals aimed at investigating decarbonisation options for the Irish HDV sector, including:

- the potential of existing and projected HDV electrification technologies, including heavy duty plug-in battery electric vehicles;
- the development of one or a combination of ERSs in Ireland, focusing particularly on the key routes that form part of the EU's Trans-European Transport Network (TEN-T) that link the island's largest cities (Dublin, Cork and Belfast);
- the potential for renewable biofuels, advanced biofuels and renewable hydrogen through the use of fuel cell electric vehicles (FCEVs).

Many of these technologies provide additional co-benefits in terms of air pollutant and noise reduction and have been categorised as low or zero emissions technologies. This categorisation is largely dependent on the energy sources used to power the vehicles and the energy efficiency of the vehicles in question.

Project Objectives & Expected Outputs:

Taking the above context into account, the objectives of proposals submitted under this Topic could explore the following:

- Review existing literature, studies and projects implemented in the EU and internationally;
- Examine the relative merits and disadvantages of different existing and projected HDV decarbonisation options, technologies, systems and infrastructure;
- Review and calculate potential energy, CO₂ and air pollutant emissions savings associated with the options considered for a range of different transport growth scenarios, geographical locations and fleet projections;
- Assess the relative costs and benefits of the technologies considered, with a particular focus on Ireland, including projected energy and emissions savings within an established operational timeframe, factoring in:
 - 'well-to-wheel' and energy sources;
 - infrastructural costs;
 - market availability of technologies and vehicles;
 - existing and projected Irish HDV transport demand;
 - the profile of the Irish HDV transport fleet;
- Examine the Ireland-specific conditions that would apply to any potential option considered, in light of:
 - the travel distances performed by the Irish HDV sector;
 - freight movements in Ireland and the proportion of these movements that occur on the TEN-T network (e.g. in relation to access to required infrastructure such as ERS, charge points, re-fuelling stations);
- Review geographical, land-use, environmental and planning considerations identifying, where possible, the relevant regulatory frameworks and the relative costs and risks associated with the different options considered;
- Examine the technical feasibility of options considered, e.g. where applicable, considering technology readiness, safety regulations, road configurations, re-fuelling requirements, electrical network capacity, and disruption-related costs during construction phases;
- Examine best practice in terms of future-proofing investments in energy efficient zero-emissions vehicle technologies and infrastructure to meet increased demand and developments in vehicle technologies and the Irish renewable energy sector;
- Consider technology sustainability with respect to air quality within urban/sensitive areas. What options can ensure zero emissions within these areas;
- Compare technology options considered with the existing Irish HDV fleet and associated energy efficiency and emissions.

Proposals submitted to this Topic should build upon existing research and available information. Applicants are encouraged to form a consortium and collaborate with relevant academic and industry partners. Please see the SEAI RD&D Application Guidelines for further details regarding consortium applications.

Topic 4	District heating in Ireland
Indicative Duration	Up to 1 year
Project Scale	Small scale
Indicative Funding	Up to €200k

Project Background:

In a district heating system, heat is delivered to buildings via a network of insulated pipes. While new projects are being planned/developed, the share of district heating in Ireland is small and one of the lowest in Europe ([Department of the Environment, Climate and Communications, 2019](#)). Moreover, “district heating can play a key role in improving energy efficiency and reducing emissions” ([Department of the Environment, Climate and Communications, 2019](#)). Ireland’s [Climate Action Plan](#) includes ambitions and actions relating to district heating; this proposed Topic investigates challenges to wider deployment in Ireland.

Project Objectives & Expected Outputs:

Proposals submitted to this Topic should address financial structures for district heating in Ireland, including a review of existing schemes abroad and selection of relevant options for Ireland to offer low cost and low carbon heat through a district heating network.

Proposals to this Topic should address, among others, ownership (plant, heat network etc.), operation, tariff design, metering (including smart metering), sinking fund and financing mechanisms.

Moreover, the project(s) should result in the following outputs, among others: summary papers, and recommendations for policy-makers and stakeholders of the sector.

Topic 5	Green hydrogen production from Irish onshore and offshore wind resources
Indicative Duration	Up to 2 years
Project Scale	Small to medium scale
Indicative Funding	Up to €200k (small); or €200k – €650k (medium)

Project Background:

The [Programme for Government](#) highlights the potential of developing green hydrogen as a fuel for power generation, manufacturing, energy storage and transport. Ireland's [National Energy and Climate Plan](#) (NECP) sets out that the production and use of green hydrogen generated using large scale offshore wind is expected to have a role to play in Ireland's transition to a low carbon economy and society.

While green hydrogen may have a role to play as Ireland moves towards its target of net zero emissions by 2050, further research and innovation is required to develop the necessary technologies, solutions and infrastructure, to support future deployment in Ireland.

Project Objectives & Expected Outputs:

Given the above context, proposals submitted to this Topic could aim to investigate and examine technical requirements for the production of green hydrogen from wind energy in Ireland.

Proposals to this Topic could address some of the following:

- Investigation of optimal configurations for coupling of a wind turbine and electrolyser (onshore and/or offshore);
- Assessment of electrical requirements;
- Review and analysis of current electrolyser technologies, suitability for variable renewable electricity input, technology readiness;
- Consider suitability of production equipment, compression and distribution/transport;
- Regulatory, market or financial considerations;
- Assessment of hydrogen storage options in Ireland;
- The potential role for electrolysers as demand side response units;
- Hydrogen end-use considerations;
- Economics of dedicated green hydrogen production facilities (i.e. wind farms not connected to the grid).

Project outputs may include:

- Project report(s) outlining key findings and results;
- Dissemination of project findings in relevant peer-reviewed publications;
- Recommendations for further research, development or demonstration.

Applicants to this Topic should consider forming a project consortium or involving project collaborators/an advisory group, which could include, but is not limited to, some of the following: academia, wind farm owners, utilities and industry.

Topic 6	Measures to reduce dispatch down (curtailment and constraint) of renewable electricity generation
Indicative Duration	Up to 1 year (Small Scale); 1 to 3 years (Medium Scale)
Project Scale	Small or medium scale
Indicative Funding	Up to €200k (small); or €200k – €650k (medium)

Project Background:

The [Climate Action Plan](#) (2019) established a 70% renewable energy target for the electricity sector by 2030. The plan outlines that this target will indicatively be met from:

- at least 3.5GW of offshore renewable energy;
- up to 1.5GW of grid-scale solar energy;
- up to 8.2GW total of increased onshore wind capacity.

The [Programme for Government](#) (2020) sets out a number of actions to support and augment this target including a commitment to 5GW of offshore wind energy by 2030.

Variable renewable electricity generation sources present challenges for their incorporation within the electricity system. Particular challenges may arise at times when the amount of renewable electricity generation exceeds local demand and the transport capacity of export lines or when it displaces other generators providing critical system services. One measure used by system operators to alleviate such challenges is to instruct renewable generators to reduce their output or “dispatch down”.

In 2019, annual average dispatch down of wind energy in Ireland reached 7% and in 2020 rose to 11.4% ([Eirgrid, 2019](#) and [2020](#)). Regional monthly levels of dispatch down exceeded 25% in some areas. Rising levels of dispatch down compromise Ireland’s ability to reach its renewable energy targets, increase financial risk for wind farm owners and increase the cost of renewable electricity for electricity consumers. It is therefore a priority to maintain dispatch down at the minimum possible level. The system level solutions to dispatch down are well known and are being implemented by Eirgrid. There are also demand side actions that may be taken to reduce dispatch down levels. Dispatch down caused by localised system constraints may, in particular, be amenable to demand side mitigation. These measures would involve increasing electricity demand during periods of local dispatch down. Where such measures also involve the electrification of fossil fuelled heat and transport, dual decarbonisation benefits may be obtained.

Project Objectives & Expected Outputs:

Project(s) proposed under this Topic should contribute to developing solutions that will lead to a reduction in dispatch down of renewable electricity generation in Ireland, and may include:

1. Desktop studies on schemes for reducing high localised dispatch down, including focusing current incentives for electric heating and transport and electrification of industrial processes in areas of high localised dispatch down;
2. Developing online systems that provide precise information and/or forecasting on dispatch down events;
3. Market solutions for coordinating local demand side management schemes;
4. Pilot demand side management/demand response schemes; other technology pilots for alleviating instances of high localised dispatch down.

Ancillary benefits may include improvements in security of supply.

Project outputs could include:

Cost benefit analyses of DSM/DR schemes, online information systems that facilitate the implementation of DSM/DR schemes, results of simulations of market solutions, validated results from pilot local DSM/DR schemes, demonstration results of other technologies.

Topic 7	End-of-life wind turbines: Life extension, decommissioning or repowering
Indicative Duration	Up to 1 year (Small Scale); 1 up to 3 years (Medium Scale)
Project Scale	Small or medium scale
Indicative Funding	Up to €200k (small); or €200k – €650k (medium)

Project Background:

The [Climate Action Plan](#) (2019) established a 70% renewable energy target for the electricity sector by 2030. The plan outlines that this target will indicatively be met from:

- at least 3.5GW of offshore renewable energy;
- up to 1.5GW of grid-scale solar energy;
- up to 8.2GW total of increased onshore wind capacity.

The [Programme for Government](#) (2020) sets out a number of actions to support and augment this target including a commitment to 5GW of offshore wind energy by 2030.

In Ireland, like in other EU countries, the numbers of wind turbines reaching 20 years or older will become significant beyond 2025, with an estimated 500 turbines reaching this age by 2025 and more than 1,000 by 2030. The majority of Irish wind farms are awarded a 20-year permitted life in their planning consent.

Different options can be considered for wind plants at end-of-life: life extension, decommissioning and repowering. In the first case, the life of the plant is extended after a detailed assessment and, if necessary, revamping interventions. The power plant goes on producing electricity. In the second case the whole power plant is dismantled. In the third case, the word "repowering" is intended as an intervention finalised to the complete replacement of the old wind turbines. To improve the economic and environmental sustainability of these interventions, attention is increasingly focused on recycling of wind turbine components. The largest portion of wind turbine components are quite easy to recycle and reuse (i.e. metal parts), but the non-metallic components, in particular the blades, are less easy to be recycled.

The respective wind farm owners therefore are required to make informed decisions on these wind turbines nearing their end of design life, whether to extend their life, re-power them with new rotors or decommission them.

There are no published international standards on life extension of wind turbines and hence standardised processes to quantify the risk of failure of turbine components upon life extension are not in place. It is required therefore to demonstrate a recommended practice and the requirements to enable life extension of turbines, which can be deployed globally. Extending the lifetime of a wind turbine requires that it is feasible to do so safely, quantify the cost of damage to the wind turbine components upon life extension and to put in place a relevant maintenance plan. Furthermore, there must be sufficient energy production upon life extension under the prevailing electricity rates to maintain profitability. Procedures for life extension must meet the above needs and further be introduced into new IEC standards, so as to put in place common guidelines for the wind industry that determines lifetime extension approval and planning of site-specific design life. It is timely, therefore, to take a strategic review of the procedures and methods for wind turbine lifetime extension.

In general, most wind plants at the end-of-life will likely be suited to a life-extension, but in a medium to long term scenario the amount of repowering interventions is likely to grow significantly. Repowering interventions offer many benefits such as: potentially reduced environmental and visual impact while increasing energy production in the same area; and should contribute to a reduction of renewable energy prices and improved grid support.

However, there are still many issues/challenges such as:

- No specific regulation for repowering;

- Grid connection: lack of available grid capacity for repowered plants;
- Transport to site of the new bigger wind turbines (especially in complex terrain);
- (New) environmental and landscape constraints;
- Allocating new incentives for renewable energy supply (RES) and need for new mechanisms;
- Difficult to develop wind plant at grid parity;
- Dismantling and recycling of components (e.g. turbine components, cables or foundations).

At international level, the majority of installed wind turbine capacity facing end-of-life today is based onshore, however some offshore wind plant will reach end-of-life in the medium term. Some specific challenges, such as dismantling offshore foundations, will also have to be considered. Decommissioning and repowering of a great amount of wind power capacity means dealing with a high number of “waste” turbine components. The challenge of recycling these components, in particular wind turbine blades, has been discussed also with the lens of a circular economy. In particular, different recycling methods for composite materials have been presented underlining the issue and importance of traceability in each step of the process.

The IEA Wind Technology Collaboration Programme has recently initiated the formation of two new research Tasks on Wind Turbine Life Extension and Wind Turbine Blade Recycling. Further details of Ireland’s involvement in the IEA TCPs is available on the following [webpage](#).

Project Objectives & Expected Outputs:

Proposal(s) submitted to this topic could aim to focus on one or more options for end-of-life wind turbines (e.g. life extension, decommissioning or repowering), aiming to provide enhanced data and insights in the following areas:

- Reliability and Safety Assessment
 - Target reliability levels for life extension
 - Data based methods (e.g. for optimal remaining useful life assessment)
- Inspection procedures and maintenance
 - Preventive maintenance and repair
 - Methods for inspection and where to inspect
- Standardisation and regulatory frameworks
 - Inputs to standards development relevant to lifetime extension
 - Policies, investment decisions and insurance
- Developing decision support tools
 - Software to support decision making on life extension, repowering and decommissioning;
 - Guidance on life extension, repowering and decommissioning;
 - Guidance data and support tools for impact assessment of end of life options

Potential outputs could include:

- Methods and software for remaining useful life assessment and to support decision making on end of life options;
- Online resources to support the above;
- Guidance on life extension/repowering/decommissioning;
- Guidance on environmental impact assessment/appropriate assessment for life extension/repowering/decommissioning

Proposals to this Topic should build upon existing research and available information. Applicants are encouraged to collaborate with relevant academic, industry partners, Government bodies/programs.

Topic 8	Performance of traditional building fabric and inclusion in the National Calculation Methodology
Indicative Duration	Up to 1 year (Small Scale); 1 to 3 years (Medium Scale)
Project Scale	Small or medium scale
Indicative Funding	Up to €200k (small); or €200k – €650k (medium)

Project Background:

Ireland's [Climate Action Plan](#) includes a target to retrofit 500,000 homes to a Building Energy Rating of B2 and to upgrade all public buildings to a Building Energy Rating of B. Building Energy Ratings are calculated using the National Calculation Methodology (DEAP for Domestic and NEAP for Non-Domestic). This Topic proposes to identify the thermal performance of the main types of Traditional Building Fabric for pre 1940s buildings for inclusion within National Calculation Methodology.

Project Objectives & Expected Outputs:

The objective of this Topic is to identify the hygrothermal properties for a range of construction materials/assemblies in use in Ireland between 1700 and 1950; the overall aim is to establish the hygrothermal range likely to be met in practice and to support hygrothermal modelling in accordance with IS EN 15026:2007 - Hygrothermal performance of building components and building elements.

Findings from the proposed research should be suitable for use in the National Calculation Methodology (BER ratings) and for use in further developing retrofit guidance for traditional buildings. A final project report suitable for publication should detail the methodologies applied and results obtained. Data measured should be shared in an anonymised and GDPR-compliant way with SEAI for online publication, e.g. on the SEAI Website.

It is expected that the hygrothermal properties should be for a range of constructions, such as:

- 5 typical brick types (including handmade and machine-made examples)
- 5 typical mortar types
- 5 typical rubble walls of between 300 and 550mm in thickness comprising mixed stone types and mortars
- 2 typical earth walls of between 300 and 550mm in thickness
- 5 lime renders
- 5 lime internal plasters
- Internal lath-and-plaster
- Internal dry-lining
- Lime wash layer 0.5, 1 & 3mm thick
- Dressed ashlar walling with a 2mm mortar joint backed by rubble walling to an overall thickness of 450mm for 5 typical stones including Irish granites, limestone (including Irish limestones and Portland stone)
- 5 typical building stones including Irish granite, limestone (including Irish limestones and Portland stone), high density sandstone and low density sandstone
- 3 typical samples of roughcast render including 'insulated' render containing hemp
- 5 typical single glazed timber framed or steel framed window including windows fitted with internal timber shutters (insulated and uninsulated), secondary glazing, slimline/ double glazing in existing pane
- Solid timber door
- 3 typical floors including limecrete floors, stone paved floors and suspended timber floors

The hygrothermal properties and procedures that should be considered are:

Material Property	Procedure
Bulk Density	Insulation Materials EN 1602 Mortar and Plaster EN 1015-10 Bricks EN 772.4
Porosity	Determination of the true density with the helium pycnometer. Bulk density see above. Porosity is then calculated from these two.
Specific Heat Capacity	Determination of specific heat capacity according to ISO 11357-4 or literature values may be sufficient
Thermal Conductivity	Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods. Dry and moist products with medium and low thermal resistance; German version EN 12664. Products of high and medium thermal resistance; German version EN 12667. Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus according to ASTM C177.
Water Vapor Diffusion Resistance Factor	Determination of water vapour transmission properties according to EN ISO 12572, dry cup. Standard Test Methods for Water Vapor Transmission of Materials according to ASTM E96, Desiccant Method (dry cup) - Paints and varnishes Determination of water-vapour transmission properties - Cup method; German version EN ISO 7783. Thermal insulating products for building applications - Determination of water vapour transmission properties; German version EN 12086. Methods of test for mortar for masonry - Part 19: Determination of water vapour permeability of hardened rendering and plastering mortars; German version EN 1015-19. Flexible sheets for waterproofing - Bitumen, plastic and rubber sheets for roof waterproofing - Determination of water vapour transmission properties; German version EN 1931.
Moisture Storage Function	Only for hygroscopic building materials. Determination of hygroscopic sorption properties according to DIN EN ISO 12571, absorption test - Standard Test Method for Hygroscopic Sorption Isotherms of Building Materials according to ASTM C1498 - Determination of super hygroscopic sorption properties with the pressure plate or alternatively with approximation methods from IBP - Standard Test Method for Moisture Retention Curves of Porous Building Materials Using Pressure Plates according to ASTM C1699 - Natural stone test methods - Determination of water absorption at atmospheric pressure; German version EN 13755 - Thermal insulating products for building applications - Determination of long term water absorption by immersion; German version EN 12087.
Liquid Transport Coefficient, Suction	Only for capillary active building materials. Determination of the water absorption coefficient according to EN ISO 15148.
Water Vapor Diffusion Resistance Factor, moisture dependent	Only for polymers with solution diffusion Determination of water vapour transmission properties according to EN ISO 12572, dry and wet cup - Standard Test Methods for Water Vapor Transmission of Materials according to ASTM E96, Desiccant and Water Method (dry and wet cup)
Thermal Conductivity, moisture dependent	EN 12664
Thermal Conductivity, temperature dependent	EN 12664 and EN 12667
Enthalpy, temperature-Only dependent	ISO 11357-3

In-situ U value calculations should be carried out for at least:

- 5 typical rubble walls of between 300 and 550mm in thickness comprising mixed stone types and mortars
- 5 typical rubble walls of between 300 and 550mm in thickness comprising mixed stone types and mortars with external render and internal plaster finishes
- Dressed ashlar walling with a 2-5mm mortar joints backed by rubble walling to an overall thickness of 450mm, 550mm and 600mm for 5 typical stones including Irish granites, limestone (including Irish limestones and Portland stone), high density sandstone and low-density sandstone
- 5 typical 215 to 225mm solid brick wall (used in hygrothermal assessment for brick types)
- 5 typical 325 to 350mm solid brick wall (used in hygrothermal assessment for brick types)
- 5 typical cast concrete walls to include post-industrial slag aggregate, crushed limestone aggregate, large stone aggregates, covering a range of thicknesses in use from 75mm to 300mm
- 5 typical single glazed window systems
- 3 typical floors

A project steering group will be formed, by the Project Team, comprising of the successful research team, representatives from SEAI and other relevant Public Bodies.

Topic 9	Airborne wind energy
Indicative Duration	Up to 1 year (Small Scale); 1 to 3 years (Medium Scale)
Project Scale	Small or medium scale
Indicative Funding	Up to €200k (small); or €200k – €650k (medium)

Project Background:

Airborne wind energy (AWE) has the potential to give access to stronger and more stable high-altitude wind resources, including in remote areas and floating offshore, and thus play an important part in the future energy mix. It also reduces material consumption which leads – in combination with a higher capacity factor – to potentially very low LCOEs and lower carbon and environmental impacts. Furthermore, it may be modified to provide propulsion and power for the maritime shipping sector.

There are currently over 60 organisations working on AWE, thereof about half from industry developing AWE systems and half from academia and government research ([Airborne Wind Europe, 2021](#)). AWE is progressing towards commercial demonstration. However, there are various questions that need to be answered before it achieves widespread commercial adoption. Challenges concerning safety standards and technical guidelines, resource and deployment potentials, markets, engineering issues, environmental impacts and social acceptance, regulatory as well as financial and policy challenges.

Ireland has been identified as a suitable location for testing AWE technologies and a planning application was submitted in 2020 for an AWE demonstration site near Bangor Erris in NW Mayo. The demonstration site will give the opportunity for Irish researchers to collaborate on research that advances the state of the art of the technology and addresses the challenges to its deployment.

The IEA Wind Technology Collaboration Programme has recently initiated the formation of a new research Task on AWE. Further details of Ireland's involvement in the IEA TCPs are available on the following [webpage](#).

Project Objectives & Expected Outputs:

Potential proposals to this Topic could include:

Feasibility and technology assessment:

1. State of AWE technology: Current status, key challenges and barriers.
2. Compiling AWE Frequently Asked Questions: e.g. technology suitability and longevity of components under various environmental conditions.
3. Safety: Options for standardisation in relation to design, operation and maintenance.
4. Design tools: Design tools for benchmarking and reference standards, addressing engineering and other challenges.

Assessment of potential:

5. Scenarios for 2030 to 2050: Potential role of AWE in Ireland. Considering e.g. spatial constraints and availability onshore and offshore.
6. Viability and efficiency: Review and assess e.g. AWE power curves; energy yield per km²; capacity factor; overall efficiency; LCOE potential. Considering e.g. optimal distances between kites and wake effects; duration kites can remain airborne; maintenance intervals.

Policy and Regulation:

7. Policies for AWE: Requirements and lessons learned from other renewable energy technologies.
8. Airspace/Planning Regulation
9. Environmental and social impacts (e.g. impact on fauna, noise, visual impacts, social acceptance).

Topic 10	Retrofit of commercial buildings
Indicative Duration	Up to 1 year (Small Scale); 1 to 3 years (Medium Scale)
Project Scale	Small to medium scale
Indicative Funding	Up to €200k (small); or €200k – €650k (medium)

Project Background:

Under the [Climate Action Plan](#) and [Long Term Renovation Strategy](#) there is a target to retrofit a third of commercial buildings by 2030 and all by 2050 to a minimum Building Energy Rating of B. The revised Energy Performance Buildings Directive looks for the development of evidence-based assessment of energy savings, among others.

Project Objectives & Expected Outputs:

This project should aim to address barriers to improve energy efficiency in the commercial sector. The following list shows examples of market failures/challenges that could be addressed through this research topic:

- The lack of understanding of potential savings;
- The limited renovation & construction activity;
- The lack of attractive financing products to persuade people to renovate;
- The limited information on building stock;
- The limited uptake of efficient or smart technologies;
- The options to help address the split incentive problem.

The project may include nation-wide stakeholder consultation. Questions/topics to be addressed include, but are not limited to:

- Identifying and overcoming barriers to energy efficiency & decarbonisation retrofits and measures in the business and industry sectors;
- Review of the behaviour and decision-making triggers for commercial building owners/landlords and tenants;
- Review communication strategies relating to the business base and benefits of retrofit;
- Address the supply chain and technical barriers for deep retrofit and renewable heating of commercial buildings;
- Develop simple retrofit decision making models for commercial buildings;
- Address market failure which inhibits the energy efficiency upgrading of the business and industrial building stock and the utilisation of cost-effective energy savings potential including split incentive effects and financial barriers.

The project should result in the following outputs, among others:

- Recommendations for policy-makers;
- Survey results in a GDPR-compliant format for online publication.

A project steering group will be formed, by the Project Team, comprising of the successful research team, representatives from SEAI and other relevant Public Bodies.

Topic 11	Establishing an energy self-sufficient coastal community in practice: Feasibility, development, pilot demonstration
Indicative Duration	Up to 1 year (Small Scale); 1 to 3 years (Medium Scale)
Project Scale	Small or Medium Scale
Indicative Funding	Up to €200k (small) or €200k – €650k (medium)

Project Background:

Ireland has very ambitious targets relating to Offshore Renewable Energy (ORE) installed capacity, including a commitment to 5GW of offshore wind energy by 2030 as outlined within the [Programme for Government](#) (2020). The [OREDP](#) also identifies a long-term potential of 70GW of ocean energy more generally (wind, wave and tidal) within 100 km of the Irish coastline.

As the energy transition in Europe and in Ireland progresses, and ORE installed capacity grows, energy storage technologies will become increasingly important to ensure security of supply, particularly in times of high demand.

The Programme for Government further commits to ensuring that community energy can play a role in reaching Ireland's target of at least 70% renewable electricity by 2030.

Project Objectives & Expected Outputs:

This Topic calls for proposals that would aim to investigate options to promote energy self-sufficiency at community level. This could include options for self-sufficiency such as: Demand side management, use of smart grid technologies, potential for peer-to-peer electricity trading, integration of energy storage technologies (including, but not limited to green hydrogen), coupled with relatively small-scale renewable energy developments (including, but not limited to fixed offshore wind) in coastal communities.

The aim would be for these communities to become largely or entirely energy self-sufficient, relying on renewable energy to the largest extent possible and storing excess energy for use during periods of higher demand or investigating demand-side management opportunities for efficient and optimised energy usage.

The project(s) proposed under this Topic could lead to various forms of energy storage becoming more efficient and cheaper, at a time of increasing demand for these technologies. If successful, the project(s) could be replicated on a larger scale, further contributing to reaching or exceeding Ireland's 70% renewable electricity target and further reducing Ireland's reliance on fossil fuels.

Proposals submitted to this Topic should aim to support energy self-sufficiency at community level, and could include:

- Desk-based studies (including feasibility studies) to identify research or demonstration opportunities;
- Pilot trials in practice.

Applicants to this Topic should consider forming a project consortium or involving strategic project partners/collaborators/an advisory group, which could include, but is not limited to, some of the following: academia, community energy groups, energy industry and utilities.

Proposals submitted to this Topic should build upon existing research and available information.

Topics 12A and 12B	Implementation of a field experiment testing a behaviour change intervention/campaign to reduce emissions in the transport sector, through EV uptake (Topic 12A) or modal shift (Topic 12B)
Indicative Duration	1 to 3 years
Project Scale	Medium scale
Indicative Funding	Up to €650k
Co-funding	Department of Transport

Project Background:

Ireland is highly dependent on the private car, according to [2018 CSO figures](#), six in every ten journeys made in Ireland's cities and towns, and eight out of 10 journeys in more thinly populated areas were made by car. It is no surprise therefore that emissions from private cars are responsible for over half of all land transport emissions (51.5%), and that the transport sector is the largest energy-consuming sector, with a 42% share of final energy consumption and accounting for 41% of energy related emissions ([SEAI, 2020](#)).

The [Programme for Government](#) sets out the aim of achieving a fully decarbonised economy by 2050. To achieve this objective, all emissions, including car emissions, will need to reduce significantly both in the immediate and longer term. Replacing fossil-fuel cars with electric vehicles (EVs) has been identified as a key element of transport decarbonisation policy, along with the promotion of more environmentally friendly travel modes (such as, walking, cycling and public transport). Increasing car exhaust emissions also means that the transition to EVs will be crucial in response to air quality concerns in Irish cities and towns.

Gaining a better understanding of the human and psychological factors that influence the uptake of EVs and modal shift is therefore critical to support the large-scale behavioural change that is required for Ireland to meet its challenging target of 181,600 EVs by 2025, and ultimately 936,000 EVs by 2030, alongside large changes in transport modality and reducing unnecessary travel related behaviours in general.

Field experiments encouraging EV uptake and modal shift are also a critical part of identifying the best ways to normalise EV technologies, of addressing consumer concerns that might otherwise act to delay the transition to a carbon neutral transport sector, and encouraging more people to shift transport mode.

Typical project durations of two years are expected, and maximum of three years.

Project Objectives & Expected Outputs:

Given the urgent need to reduce transport emissions, it is important that transport research moves into a trialling and piloting phase to estimate the real-world potential impact of transport-related behaviour change measures in Ireland. Applicants should specify whether their proposal aims to address either sub-topic 12 A or 12 B, of the following:

Topic 12 A	Delivery of a behaviour change project which leads to an increase in EV uptake
Topic 12 B	Delivery of a behaviour change project which leads to modal shift and reduced emissions

The aims of this Topic are as follows:

- To deliver a behaviour change project which leads to a reduction in transport related energy use/emissions and change in human behaviour;

- Develop the evidence base on the effectiveness and longevity of transport related behavioural change interventions in the field;
- Identify, create, and implement innovative methods, based on the available evidence base, for changing transport behaviours;
- Build research capacity, and appetite, in Ireland for conducting large scale counterfactual impact evaluations of transport-energy related behaviour change interventions.

Taking the above context into account, the objectives and outcomes of proposal(s) submitted to this Topic could include the following:

- A technical and policy analysis report summarising the findings from the behaviour change intervention;
- A guide for implementing the behaviour change intervention at scale informed by learnings from the implementation of the pilot phase;
- Peer reviewed articles summarising the findings of the behaviour change intervention;
- A number of presentations summarising findings and process learnings from the pilot phase of the intervention to a variety of stakeholders;
- Determine the sustainability of any proposed behavioural change measure in terms of long term emission and energy savings and whether 'refresher' campaigns will be required to maintain these savings, based on evidence from field experiments/pilots;
- Assess the potential co-benefits and synergies of parallel behavioural change programmes aimed at transport decarbonisation and energy efficiency targets; and
- Suggest suitable behavioural change campaigns for Ireland, together with projections of the relative impacts on EV uptake or modal shift of the various campaigns proposed, based on insights from field experiments/pilots.

This project should build upon existing research and available information. Applicants are encouraged to collaborate with relevant academic, industry partners, government bodies/programs (e.g. Smarter Travel Program) and transport providers (e.g. Dublin Bikes, Bus Eireann, Luas, etc.).

A project advisory group will be formed, by the Project Team, comprising the successful research team, SEAI, Department of Transport and other relevant Public Bodies.

Topic 13	Indoor air quality, ventilation and occupant comfort in non-domestic buildings pre and post deep energy renovations
Indicative Duration	1 to 3 years
Project Scale	Medium scale
Indicative Funding	Up to €650k (medium)

Project Background:

Under the [Climate Action Plan](#) and [Long Term Renovation Strategy](#) there is a target to retrofit all public buildings by 2030 and commercial buildings by 2050 to a Building Energy Rating of B. The revised Energy Performance in Buildings Directive looks for the development of evidence-based assessment of energy savings and wider benefits of building renovation which includes health, safety and air quality. This project is to inform policy makers and building owners on the wider impact of Deep Energy Renovation on buildings other than dwellings.

Project Objectives & Expected Outputs:

The Public Sector Pathfinder projects are moving to a Deeper Retrofit of buildings which will adopt a whole building approach looking at fabric upgrades, addressing infiltration, use of heat recovery ventilation and the installation of renewable heating systems. The projects include:

- Offices
- Schools
- 3rd Level Institutes
- Health Sector buildings

The proposed topic focuses on the impact of energy efficient measures on indoor air quality, air temperatures and occupant thermal comfort. The aim will be to measure twelve priority pollutants for health in 10 to 20 buildings participating in SEAI's Pathfinder programmes or non domestic buildings undergoing deep retrofit and agreed with the steering group, for a sample number of occupied spaces.

Proposals submitted to this Topic should address the following:

- Development of a questionnaire survey which will be used to collect information on occupant comfort pre and post works and how occupants use the energy saving features;
- Measurement of priority pollutants as defined by the World Health Organisation pre and post retrofit works; the priority pollutants should include:
 - Particulate matter (PM2.5 and PM 10)
 - Total Volatile organic compounds (TVOCs)
 - Formaldehyde
 - Nitrogen dioxide
 - BTEX (Benzene, ethyl benzene, toluene, xylene)
 - NOx and SOx emissions
 - Carbon monoxide
 - Carbon Dioxide
 - Air Temperature
 - Humidity
 - Surface Temperatures
 - Lux Levels

Measurements should be carried out over 2 heating seasons at least.

The research project outcomes should include the following, among others:

- Anonymised and GDPR-compliant datasets of monitored data for online publication;
- Recommendations for policy-makers;
- Summary report and case studies.

A project steering group will be formed, by the Project Team, comprising of the successful research team, SEAI and other representatives from Public Bodies.

Topic 14	Monitoring and comparing the performance of heat pump systems in relation to the fabric performance and air permeability in retrofitted buildings to a B rating or higher
Indicative Duration	1 to 3 years
Project Scale	Medium scale
Indicative Funding	Up to €650k (medium)

Project Background:

Ireland's [Climate Action Plan](#) includes a target to install 400,000 heat pumps into existing buildings, along with achieving a BER B2 for 500,000 homes and a BER B for all public buildings. This proposed topic looks at monitoring the operational performance of heat pumps installed in retrofitted buildings over varying building characteristics and control strategies.

Project Objectives & Expected Outputs:

Proposals to this Topic should aim to analyse the performance and calculate the savings (carbon, energy and cost) achieved by installing heat pump systems in homes and non-domestic buildings with different levels of fabric performance and air permeability. Influencing factors such as the internal temperature profile, the heat distribution and emitter design, the sizing of the heat pump unit and user operation will also have to be taken into account.

In practice, proposals submitted to this Topic should include the following activities: accessing buildings, installing meters and data loggers, communicating with occupants, collecting energy bill information, monitoring and analysing data, reviewing logbooks and preparing reports for dissemination of findings.

Monitoring should be undertaken on an hourly basis over at least one full heating season, ideally pre and post heat pump installation (i.e. 2 heating seasons overall). Project duration is expected to be 18 months, maximum 2 years.

Should a proposed project be selected for funding following evaluation, a project steering group will be formed by the Project Team, comprising of the successful research team, representatives from SEAI and other relevant Public Bodies.

Monitoring equipment should include as a minimum:

- Heat meter(s) to measure heat output from the heat pump used in space heating;
- Heat meter(s) to measure heat output from the heat pump used for DHW;
- Heat meter(s) to measure the heat output of any additional heaters;
- Internal and external temperature sensors;
- Temperature sensor to measure space heating flow temperature (the temperature sensor incorporated into the heat meter can be used instead of a separate temperature sensor);
- Temperature sensor to measure DHW flow temperature (the temperature sensor incorporated into the heat meter can be used instead of a separate temperature sensor);
- Electricity meter to measure any input into an electric heater (including boilers);
- Separate metering of electricity used by the heat pump, pumps and auxiliary for space heating and DHW;
- (GSHPs only) Temperature sensors to measure ground loop flow and return temperatures;
- Data loggers connected to meters and sensors, and ICT equipment to record all data and transfer it for collection.

In cases where any of the above is not feasible, an alternative may be agreed by the project steering group. Final specifications of monitoring equipment should be agreed with the steering group.

The findings from the research should, among others:

- Identify operational performance including energy, carbon and operational costs of the heat pumps for a range of fabric performances and heat pump characteristics, including but not limited to:
 - Equivalent to New Building Specification
 - Equivalent to Cost Optimal Specification
 - Traditional Building
 - Existing fabric (no fabric upgrade)Buildings should have a BER rating of B or higher.
- Identify the additional charges/requirements associated with electrical connection to the building
- Identify the optimum operational controls and set points that should be applied to the building
- Identify operational costs associated with space heating/hot water prior to heat pump installation

It is expected that proposals to this Topic will:

- Review existing best practice both nationally and internationally
- Develop guidance documents and case studies
- Share anonymised and GDPR-compliant datasets of monitored data for online publication

Case studies should include, but are not limited to, buildings refurbished under:

- SEAI Public Sector Pathfinder Programme
- DHLGH Social Housing Retrofit

Proposals to this Topic should specify the proposed strategy to recruit buildings for analysis within the project, detailing how many buildings will be monitored, and whether the Applicants have already initiated contact with potential participants (if so, please provide supporting documents).

Topic 15	Remote and autonomous inspection and maintenance of onshore and offshore wind turbines
Indicative Duration	1 to 3 years
Project Scale	Medium scale
Indicative Funding	Up to €650k (medium)

Project Background:

The [Climate Action Plan](#) (2019) established a 70% renewable energy target for the electricity sector by 2030. The plan outlines that this target will indicatively be met from:

- at least 3.5GW of offshore renewable energy;
- up to 1.5GW of grid-scale solar energy;
- up to 8.2GW total of increased onshore wind capacity.

The [Programme for Government](#) (2020) sets out a number of actions to support and augment this target including a commitment to 5GW of offshore wind energy by 2030.

There are offshore wind farm sites in Irish waters currently at various stages in the consenting process ([MRIA, 2021](#)). These sites are generally in shallow waters within 10's of km from the shore and many of these are in close proximity to Dublin – the main electricity load centre. There is therefore adequate accessible resource to make a significant contribution to electricity demand in the period up to 2030. The cost of offshore wind energy has also been decreasing rapidly internationally, as reported by [IEA Wind Task 26](#), among others.

Moving beyond these initial projects will increasingly require offshore wind energy to be deployed in more aggressive sea regimes, particularly if west coast sites are to be exploited with floating offshore wind turbines. More limited weather and sea state windows for accessing floating offshore wind turbines by service personnel will result in lower wind turbine availability if they are maintained by conventional means. The resources in areas with a more robust wave climate may therefore only be exploited at a viable cost through the increased use of remotely controlled, robotic and autonomous technologies.

Such technologies may initially be used offshore for inspection activities but may be used for an increasing range of interventions as they become more established and customised. Technologies may also be used for a more limited set of activities for onshore wind farms. The sector has the potential to become a major sub-sector within the offshore and onshore wind sectors for provision of both technology and services. Ireland is well placed for entry to this sector with a well-established research capability in relevant technologies and a significant presence of potential technology providers.

Project Objectives & Expected Outputs:

Project(s) proposed under this Topic should contribute to establishing an Irish industrial sector in remotely operated, autonomous and robotic wind turbine inspection and maintenance. Projects may develop specific technologies for particular inspection and maintenance applications.

Projects may also include feasibility studies for technologies and test facilities for proof of concept of these technologies outside of the laboratory. Proposed projects must go beyond the application of off-the-shelf technology to a wind turbine application and must result in the development of new technology, systems or intellectual property.

Typical outputs may include:

- New remotely controlled, autonomous and robotic technologies for particular wind turbine inspection and maintenance applications;
- Feasibility studies on the above technologies or facilities in which to validate their performance outside of the laboratory;
- Test facilities to validate the performance of these technologies outside of the laboratory.

Topic 16	Novel uses of geothermal energy for decarbonisation of heat
Indicative Duration	1 to 3 years
Project Scale	Medium scale
Indicative Funding	Up to maximum of €350k
Co-funding	Geological Survey Ireland

Project Background:

Geothermal energy can be used as a low-carbon source of heat across a wide range of scales, from one-off domestic buildings, to industrial campuses and processes, to large district heating networks. Irish geothermal resources are under-utilised at present and hold potential for decarbonisation of the heat sector, particularly when applied in a mix of renewable energy sources. The site-specific nature of geothermal resources demands a bespoke design for most geothermal installations and may include other complementary renewable resources to optimise the overall efficiency of the energy system.

Project Objectives & Expected Outputs:

Proposals submitted to this Topic should seek to demonstrate a novel approach (in the Irish context) to geothermal heat use within a wider energy system, and assess the impacts of geothermal heat within the scheme. Modelled scenarios for future potential impacts could also be included.

This project should include site-specific technical details of one or more energy systems where geothermal heat plays a significant role in the overall mix of renewable energy sources. Expected outputs include a detailed description of the energy system and geothermal installation (including subsurface geothermal parameters), along with measured and modelled impacts of geothermal energy on the overall energy efficiency and economics of the system.

GSI can provide available data regarding geological settings and estimated geothermal resources for the project site.

The proposal(s) submitted to this Topic should not focus on single dwellings type projects but instead larger scale projects (e.g. district heating schemes and commercial/industrial scale projects). The project(s) should build upon existing research and available information.

Topic 17	Investigation of residential electricity use and the opportunities to optimise solar PV renewable electricity for self-consumption
Indicative Duration	1 to 3 years
Project Scale	Medium scale
Indicative Funding	Up to €650k (medium)

Project Background:

The [Climate Action Plan](#) identifies a role for micro-generation in contributing to the energy transition and assisting Ireland in meeting its 70% renewable electricity target by 2030. [The White Paper](#) states that the energy system will change into one where citizens and communities will increasingly be active participants, and agents of change in how we generate, transmit, store, conserve and use our energy.

The forthcoming microgeneration support scheme is expected to stimulate the uptake of microgeneration with homeowners, and further information on the benefits and the use of microgeneration renewable energy within the typical home will be beneficial. This will help to understand in detail how electricity is used in the home, how solar PV can contribute to this electricity usage and support innovation and technologies that can maximise the use of the microgeneration electricity.

Project Objectives & Expected Outputs:

The focus of this topic is to:

- Quantify, analyse and understand in detail the use of electricity within efficient homes in Ireland that are rated B2 or better; and
- Gather data and analyse the self-consumption of solar PV within the home, as well as options for new innovative technologies to maximise the self-consumption.

The work includes monitoring a sample of homes and extrapolating results to the whole Irish residential stock, among others. Monitoring should be carried out over a year; overall project duration is expected to be 18 months, maximum 2 years.

The primary objectives of this topic include the following:

- Monitoring the electricity consumption of regulated and unregulated loads (including heating, cooling, ventilation, cooking, lighting, electric vehicle charging, hot water, appliances, etc.) in a sample of homes achieving a minimum BER B2 rating. The sample would be expected to be higher than 30 and statistically large enough, covering different building archetypes and user types. Moreover, these homes should have a published BER rating;
- Monitoring and assessing the solar PV performance and its use within these homes;
- Investigating options for technologies that maximise self-consumption such as hot water diverters, smart appliances, EV charging;
- Analysing the market and gaps in the field of smart home technologies allowing to manage generation, storage, smart appliances and dynamic demands for home with PV systems.

The output from the research could include:

- Data logged in a GDPR-compliant format suitable for publication;
- A report assessing the use of electricity in Irish residential homes and a comparison to the BER methodology;
- Analysis of the solar PV data gathered and benefits for the specific homes, as well as potential for use in Irish homes considering the variation in electricity consumption in different homes;
- Recommendation for technologies which can help optimise the use of microgeneration solar PV within dwellings.

Topic 18	Electric vehicle battery recycling and second life technology
Indicative Duration	1 to 3 years
Project Scale	Medium scale
Indicative Funding	Up to €650k (medium)

Project Background:

Modern lithium batteries used in traction applications are improving all the time in terms of performance and cost. Present methods of battery manufacture, as well as the materials involved, result in the production of vehicles which have higher levels of embodied carbon in them with respect to equivalent petrol or diesel vehicles. While the overall lifecycle GHG emissions associated with EVs is lower than an internal combustion engine (ICE) vehicle, including disposal, it is important to consider ways to further reduce the overall embodied carbon involved in the manufacture of EVs.

Two options available to the industry include reusing the traction battery or recycling the battery to extract the valuable metals and materials for use in another battery or alternative application.

Second Life

Traction batteries typically come with warranties that guarantee 8 years of service in a vehicle while retaining 80% of its charge capacity. This means that batteries could still retain up to 80% of their useful capacity by the end of the vehicle's life, depending on vehicle usage. It is also possible that the owner may choose to retain the vehicle and upgrade the batteries with higher performing ones after 8-10 years. The amount of storage remaining in the removed battery is likely to be valuable and capable of providing service to a second stationary application, for example within the home, at fast charging petrol stations, for companies/facilities requiring emergency backup or for the provision of storage to sell electricity services to the electricity grid operator.

There are many technical challenges to resolve with respect to gathering batteries from diverse vehicles/controllers and investigating circuits and methods for integrating the cells, reconditioning and recertifying the battery cells for any new application. Work is needed to develop electronic control and charging strategies to safely manage these batteries and extract the most use from them in a pack full of cells possibly of varying age/performance levels and manufacturers. Methods are needed to assess each cell and to develop decision criteria to use when deciding to accept or reject a cell or battery pack for re-use in particular applications.

Recycling

If it is decided that EV batteries are beyond economic use for a second life application, then consideration must be given to battery recycling. Cobalt and nickel feature strongly in the current and near-term range of lithium ion battery technologies on the market. Much work is being done (such as at Argonne Laboratories in USA) to determine the most energy and cost-efficient ways to recycle these batteries. Consideration should be given to deciding which components could simply be extracted and reused, versus reducing the whole battery to its constituent chemical elements for later sale. There is scope to develop and test new recycling and extraction methods for the current lithium ion technologies and the anticipated solid-state lithium sulphur type technologies expected in the next 6-10 years.

Project Objectives and Expected Outputs:

Proposals to this Topic could include:

- Lab based investigations to test new technologies or processes which could enhance the prospects for battery second life applications;

- Investigations of recycling methods tuned to reducing the cost or increasing the value of recycled materials once the battery cells/packs have reached the end of their useful lives;
- Investigations to monitor performance of batteries and battery components/cells in use, to support forecasting e.g. risk of component failure etc.

Outputs from proposed research could include: the development of new technologies, or methodologies; technical reports; peer reviewed articles; presentations of the research findings to a variety of stakeholders.

Topic 19	Smart buildings
Indicative Duration	1 to 3 years
Project Scale	Medium scale
Indicative Funding	Up to €650k (medium)

Project Background:

The [EU Commission](#) notes that “incorporating smart technologies and ICT in buildings can have many benefits, including better energy performance and greater comfort and well-being”. This topic is focused on smart technologies in Irish buildings, the impact these can have on the energy system and the barriers that remain to be overcome. Ireland’s [Climate Action Plan](#) includes actions relating to smart buildings.

Project Objectives & Expected Outputs:

This project should aim to review and compare, in the field, different levels of systems/programmes for enabling smart buildings in the residential and non-residential sector in Ireland. These include, among others: demand side management actions, communication protocols, automated control, smart meters, energy dashboards, heating control, storage.

Proposals submitted to this topic should include trial/measurements on a representative sample of buildings in Ireland over min. 1 year. Projects submitted to this topic should address the smart building topic from a global perspective, including space heating, hot water, other end-uses, and renewable energy integration. Ideally, the project is expected to last up to 2 years.

Questions to be addressed include, but are not limited to:

- How does the building smartness level impact the energy consumption, energy bills and comfort in different types of buildings? What is the cost associated with each technology from the most basic to the most comprehensive.
- How do occupants respond to these systems and interact with them? What system features work best and are best accepted by users? (user friendliness/acceptance/readiness)
- What would be the impact on the overall energy system if each of these technologies would be deployed at large scale in Ireland?
- What are the current barriers to deployment of smart technologies/programmes in buildings in Ireland?
- How challenging/costly is it to integrate the smart technologies in the existing systems across the different buildings of the Irish stock?
- How can demand side management opportunities be optimised through smart building technology e.g. electrification of heat and transport?

The project should result in the following outputs among others:

- Publicly shareable datasets in a GDPR-compliant format;
- Review of challenges and potential solutions for the wider deployment of smart systems/programmes in Ireland;
- Recommendations on systems design/characteristics.

Topic 20	Floating offshore wind development
Indicative Duration	1 to 3 years
Project Scale	Medium scale
Indicative Funding	Up to max €650k

Project Background:

Floating offshore wind (FOW) is seen as a key development opportunity for Ireland given our extensive maritime area, deepwater conditions and exposed wind resource. The [EU Commission](#) has noted that by “2024 150MW of floating offshore wind turbines are expected to be commissioned. A higher level of ambition and clarity is needed to reach a market size sufficient to yield cost reductions: there is potential to reach an LCOE of less than EUR 100/MWh in 2030 if large capacity is deployed”.

In 2020, the [Programme for Government](#) set ambitious targets for floating offshore wind development in Ireland.

Project Objectives & Expected Outputs:

While the opportunity for Ireland is apparent, with a number of projects already in planning, the objective of this Topic is to consider the extent of these opportunities and potential challenges in deploying FOW at scale of 30GW post 2030 for energy export. It is intended that the proposal(s) submitted to this Topic will help to inform national policy development for ongoing support of this sector. The IEA Wind TCP has identified some priority areas and research gaps with respect to FOW array deployments, which may be relevant to consider for further research to unlock this potential for Ireland. These include:

- Definition of reference site conditions for floating wind arrays
 - Curating a set of site conditions representative of the global floating wind deployment pipeline
- Development of reference floating wind array designs
 - Developing reference array designs for typical site conditions and technology types.
- Array-level failure risks and mitigation
 - Cataloguing array-level failure risks and mitigation strategies with particular consideration of Irish conditions
- Stakeholder integration
 - Identifying critical innovation opportunities and marine spatial planning requirements that will affect floating wind array design and deployment
- Route to market opportunities
 - Identifying practical options and critical path to unlock connection challenges, route to market and export potential
- Examination of pathway to 2030 and parameters and timelines required for scaling
 - Identifying possible demonstration opportunities pre 2030, opportunities to build supply chain, appropriate support level pre 2030 and past 2030.

Applicants to this Topic should submit a proposal which will address all or a number of complementary items above, with a planned programme of data and intelligence gathering for each research challenge addressed. Please note that outputs from earlier projects, e.g. [OPFLOW](#), Eirwind, should be built upon rather than replicated and applicants will be expected to demonstrate in their proposals how they plan to do this. The IEA Wind TCP is forming a new research Task on floating offshore wind arrays. Further details of Ireland’s involvement in the IEA TCPs is available on the following [webpage](#).

Project outputs may include:

- Reports on the results of data collected/work done;
- Access to background data or systems developed during the work including: Software, computer models, datasets, GIS shapefiles etc.

Topic 21	Evaluating heat pump design and installation quality: A study on evaluation of current practices and development of tools/processes for improvement
Indicative Duration	1 to 3 years (medium) or 3 to 4 years (large)
Project Scale	Medium to large scale
Indicative Funding	€200k - €650k (medium) or up to €1M (large)

Project Background:

Heat was the second largest source of energy-related emissions in Ireland in 2018 ([SEAI 2020](#)). The biggest contributor to heat emissions in 2018 was heating demand from residential homes, which accounted for 47% of heat emissions. This can be partly explained by examining how Ireland's residential building stock differs from that of other European countries. Irish homes are relatively less energy efficient and a greater proportion of them rely on more carbon intensive fuel sources such as oil/solid fuel for heating. They require higher temperatures to maintain comfort levels due to their construction and the Irish climate. Irish buildings also tend to be larger and more geographically dispersed. As a result, there is a recognised need to both improve the energy efficiency of residential buildings in Ireland and decarbonise their heating source.

The [Climate Action Plan](#) was published in 2019 setting out a roadmap to improve the Irish residential building stock and decarbonise heating in the sector, among others. Analysis indicated that the most cost-effective way to achieve these goals is to retrofit 500,000 existing homes to a BER rating of B2 and to install 600,000 heat pumps (400,000 to be in existing buildings).

However, previous studies from other countries have shown that heat pump design and installation quality can vary significantly from project to project and installer to installer. Furthermore, previous studies have also shown that small errors in the design and installation process can have relatively large impacts on the operational efficiency of heat pumps, and consequently on the emissions savings they produce. An evaluation of the UK Government's Renewable Heat Premium Payment ([RHPP](#)) scheme found that "at the time of the trials, installers predominantly assessed 'net capacity' as manufacturers' nominal capacity and not at the site-specific design conditions." The report stated that "the poor agreement between measured and estimated energy use may be due to mild winters during the trial or may suggest that calculation procedures were too complex". If the designers and installers of heat pump systems rely on rules of thumb that are not site specific, such as generic guidelines from manufacturers, default U-values, and subjective assessments of factors like ventilation, heat pump systems are likely to be incorrectly sized. When heat pumps are over-sized they are less efficient, and when under-sized systems can reduce householder comfort.

Evidence from a small area-based scheme in the UK involving users, installers and area-based scheme facilitators suggests that the perceived complexity of the technology is a barrier to adoption among users and installers ([Owen et al., 2012](#)). An evaluation of the UK Government's Renewable Heat Premium Payment (RHPP) scheme also suggested that the calculation methodology used to design heat pump systems may have been overly complex, resulting in poor heat pump system design in some cases.

A recent study published by [SEAI](#), suggested that further research should be conducted to identify tools, software, checklists, and other methods to help reduce errors in heat pump design and installation, and maximise the efficiency of heat pump units being installed. Specifically, the report recommended that "to ensure that heat pump systems are designed correctly, automatic check and balance systems should be implemented to highlight when highly irregular values are entered for key heat pump design variables. These could be similar to those used in the dwelling energy assessment procedures when the non-default design flow temperature is used. Standardised decision aids, checklists, and customer questionnaires should also be developed to simplify heat loss calculations for heat pump sizing and to ensure that heat pumps are designed efficiently in line with the customer's needs."

Project Objectives & Expected Outputs:

The aims and objectives of research projects applying to this topic should be to:

- Conduct primary research to understand the design and installation quality of heat pumps being installed in Ireland;
- Identify the most common errors made throughout the design and installation phases. SEAI will provide access to statistics and information from inspections of previously installed heat pumps to assist with the identification of the most common errors made during the design and installation phases;
- Identify a number of potential options to reduce errors, and improve quality, in heat pump design and installation;
- Create shareable tools, software, checklists, and other methods to help reduce errors in heat pump design and installation, and maximise the efficiency of heat pump units being installed;
- Conduct field research to demonstrate that these methods are effective in reducing error rates and improving design and operational efficiency. Comparative performance monitoring of the heat pump systems should be carried out in the two sets for at least one heating season;
- Identify methods to scale the successful solution and ultimately improve the design and installation quality of heat pumps in Ireland.

Surveys and other quantitative methods should aim to recruit representative samples of heat pump installed in Ireland. The sample size of surveys and other quantitative methods should be large enough to maintain a low margin of error. Very small sample sizes ($n < 30$) will not be appropriate for this research topic. Recruiting an adequate survey sample is the responsibility of the project team and an adequate strategy should be detailed in the application form; however, where possible, SEAI may provide contact details for homeowners who have availed of grant-aid to assist with this recruitment.

Field studies should be adequately powered to detect the effect of the intervention being trialled. Researchers should aim to estimate the potential effect of their intervention and then conduct power analysis to determine the sample size required to properly assess the effectiveness of their intervention. For power analysis, typical conventions should be applied (power of 80%, and an alpha level of 5%).

In terms of publications arising from the research, the projects applying to this topic should, among others:

- Develop guidance document for installers/designers of the heat pump sector;
- Develop recommendations for policy makers;
- Share anonymised and GDPR-compliant datasets of monitored/surveyed data for publication.

All project outputs should be in line with the design standards and regulations. Projects submitted should also refer to the NSAI SR 50-4 standard under development.

A project steering group will be formed, by the Project Team, comprising of SEAI and other representatives from Public Bodies.

Topic 22	Changing energy behaviours in the field: Measuring the impact of behaviour change strategies/interventions on changing energy related behaviours in Ireland
Indicative Duration	1 to 3 years (medium) or 3 to 4 years (large)
Project Scale	Medium to large scale
Indicative Funding	€200k - €650k (medium) or up to €1M (large)

Project Background:

There is an urgent need to encourage more sustainable energy behaviours across society in order to reduce the risks associated with climate change. Sustainable energy behaviours include increased energy efficiency, increased use of sustainable energy sources, and a shift towards low carbon behaviours such as increasing the use of public transport.

Encouraging more sustainable energy behaviours among households, businesses, and communities will also realise multiple benefits across society ([International Energy Agency, 2014](#)). The retrofitting of homes will improve the health of homeowners and their families, and increase warmth and comfort levels. Similarly, the installation of energy efficiency measures and technologies will help homeowners and businesses to save on their energy bills. The adoption of sustainable clean energy sources will increase energy security ([SEAI, 2017](#)) and improve air quality, again generating health benefits for the people of Ireland. There is clear recognition at national level that realising this ambition will require significant behaviour change. To this end, energy and climate policy must be informed by the most robust evidence available on how individuals and organisations make energy-related decisions.

Project Objectives & Expected Outputs:

The aim of this research topic is to deliver energy savings, identify innovative methods for changing energy behaviours, and build research capacity in Ireland for conducting large-scale counterfactual impact evaluations of energy related behaviour change interventions.

This research topic has three main objectives:

1. Deliver a behaviour change project which leads to energy/emission savings as measured by comparing meter level data, or similarly robust data for transport studies, from an intervention group to a counterfactual;
2. Identify, create, and implement innovative methods, based on the available evidence base, for changing energy behaviours;
3. Build research capacity, and appetite, in Ireland for conducting large scale counterfactual impact evaluations of energy related behaviour change interventions.

The objectives of successful projects should be to design and implement a behaviour change intervention, which leads to measurable energy/emission savings relating to one of the following areas in Ireland¹:

Encouraging homeowners to install energy efficiency measures. For example:	Encouraging businesses to install energy efficiency measures. For example:
<ul style="list-style-type: none"> • External wall insulation; • Sustainable energy generation technologies e.g. heat pumps, solar PV, and solar thermal • Other energy efficiency measures e.g. smart heating controls 	
Reducing energy use at work. For example:	Reducing energy use at home. For example:

¹ The chosen behaviour should fall under one of the category headings listed here. However, the specific behaviour being targeted does not have to be included in the bulleted list.

<ul style="list-style-type: none"> • Encouraging employees to use less energy at work by switching off lights • Encouraging employees to use less energy at work by running inter-department energy saving competitions 	<ul style="list-style-type: none"> • Through the use of behaviour change strategies (e.g. competitions, training, social comparisons, feedback provision, etc.) • Changing specific behaviours in the home to reduce energy use (e.g. reducing the thermostat by one degree) • Encouraging the uptake of smart services and time of use tariffs & measuring impact on behaviour
Encouraging the purchase and installation of energy efficient home appliances. For example:	Encouraging the purchase and installation of energy efficient equipment in businesses. For example:
<ul style="list-style-type: none"> • Energy efficiency lighting • Energy efficient large appliances • Energy efficient small appliances 	<ul style="list-style-type: none"> • Variable speed drives with increased energy efficiency • Automatic light sensors • Making process improvements
Reducing transport-related emissions. For example:	
<ul style="list-style-type: none"> • Encouraging modal shift to more sustainable modes of transport such as public transport, cycling, personal electric mobility options, etc. • Encouraging eco-driving in the commercial transport sector • Encouraging individuals to purchase an electric vehicle/a more efficient vehicle 	

Given the above context, project outputs of this research topic could include:

- A technical and policy analysis report summarising the findings from the behaviour change intervention;
- A guide for implementing the behaviour change intervention at scale informed by learnings from the implementation of the pilot phase;
- Peer reviewed articles summarising the findings of the behaviour change intervention;
- A number of presentations summarising findings and process learnings from the pilot phase of the intervention to a variety of stakeholders.

Further Considerations

The successful applicant(s) will be expected to collaborate with SEAI's Behavioural Economics Unit to refine the project scope, implementation, and evaluation.

Each applicant should also choose behaviours which are well balanced in terms of the likely impact of changing the behaviour, the current penetration of the behaviour, and the probability of changing the behaviour.

Applicants to this call should consider forming a project consortium, which could include some of the following: academia, local authorities, communities, utilities, businesses and industry.

Topic 23	Support for collection of data to inform policy development and consenting for offshore renewable technologies
Indicative Duration	1 to 3 years (medium); or 3 to 4 years (large)
Project Scale	Medium or large scale
Indicative Funding	€200k - €650k (medium) or up to €1M (large)

Project Background:

Ireland has one of the best offshore renewable energy resources in the world with a maritime area of approximately 490,000 square kilometres which is approximately seven times the size of our landmass. Because of Ireland's location at the Atlantic edge of the EU, we have more offshore energy potential than most other countries in Europe, with an estimated long-term potential of 70GW of ocean energy opportunity (wind, wave and tidal) within 100km of the coastline ([Department of Housing, Local Government and Heritage](#)).

In 2019, Ireland launched the [Climate Action Plan](#) which significantly stepped up Ireland's commitments to tackle climate disruption. The plan outlines over 150 actions to address climate change and charts a course towards ambitious decarbonisation targets including achieving 70% renewable electricity by 2030. There are three actions that are specifically relevant to the development of offshore renewables and require Ireland to develop policy supports and build out significant infrastructures to integrate offshore wind and new technologies such as wave and tidal energy onto our system.

In 2020, the [Programme for Government](#) set ambitious targets to progress offshore energy in Ireland including a target to achieve 5GW capacity in offshore wind by 2030 off Ireland's Eastern and Southern coasts. Significant work has progressed over 2020 to develop the marine planning and consent policies, review grid requirements and explore supports via RESS which will underpin offshore development. However, there are still significant gaps in our knowledge on the baseline of the Irish resource, its receiving environment, and its ecological sensitivities. The premise of this call is to commence work to bridge these gaps.

Project Objectives & Expected Outputs:

Project proposals under this Topic will focus upon development and validation of tools for determining resources and environmental conditions and their impact on the reliability, survivability, and performance of offshore devices, as well as the impact of offshore energy devices on the receiving environment. **This Topic focuses on data collection and innovative utilisation and manipulation of existing datasets which is at national/transboundary level rather than at a project level.**

The collection of appropriate levels of data at relevant scales and to resolve strategic information gaps to inform ecological and site assessments are necessary to ensure that Ireland's development ambitions of offshore energy projects are sustainable and sited in the right areas; collection of data at project level and through standard surveys alone is unlikely to address important data gaps that exist at the strategic level, but that are critical to inform strategic planning. Such gaps could be closed by way of targeted surveys, monitoring and research, by way of the deployment of remote sensing technologies e.g. radar, passive acoustic monitoring or similar technologies and species-tracking studies. Projects could also incorporate high quality environmental modelling and ground-truthing with real data, which can help to explain and predict the occurrence and preferences shown by sensitive species or cohorts of animals.

Proposal(s) to this Topic should show evidence of combined or strategic attempts to gather robust national datasets on, for instance sensitive species such as non-commercial fish/elasmobranchs, turtles, birds, bats, marine mammals, their movements or migratory pathways, and other dependencies

(e.g. breeding/resting/foraging 'hotspots', keystone prey species, food web relationships, weather-related behavioural patterns, diurnal patterns. In addition, proposals which aim to inform current policy development and to establish/update best practice in offshore planning and environmentally sustainable development in Ireland's maritime area will be supported.

The following assessments and data collection are anticipated under this call:

1. Collection of environmental or ecological data;
2. Resource assessments (wave, wind, tidal);
3. Geological surveys and robust seabed characterisation, including habitat types & conditions;
4. Data to inform development of guidelines or best practice for offshore consenting and/or public acceptance;
5. Data collection and assessments that will contribute to the achievement of Ireland's marine environmental targets under the MSFD.

Please note that applicants must ensure the following

- Data collected will be novel, all efforts will be made to ensure that data is not replicating data collection or outputs by other projects; however novel use of data collected for other purposes will be accepted;
- Resource data collected will be reported in accordance with relevant IEC standards;
- Environmental/ecological data will be collected using methods and standards proposed in the guidance under the OREDP: [link](#);
- Data collected will be made available (in raw and processed format) to SEAI for use on the Ocean Energy Portal: www.oceanenergyireland.com;
- Ecological data will be reported to the National Biodiversity Data Centre <https://www.biodiversityireland.ie/> in a format compatible with their system;
- Appropriate licenses to undertake operations for gathering data are secured before relevant work commences.

Project outputs may include:

- Reports on the results of data collected/ work done;
- Access to background data or systems developed during the work including: Software, computer models, datasets, GIS shapefiles etc.

Topic 24	Support for the development of emerging ocean energy and offshore renewable technologies
Indicative Duration	3 to 4 years
Project Scale	Large scale
Indicative Funding	Up to €1M

Project Background:

Ireland has one of the best offshore renewable energy resources in the world with a maritime area of approximately 490,000 square kilometres which is approximately seven times the size of our landmass. Because of Ireland's location at the Atlantic edge of the EU, we have more offshore energy potential than most other countries in Europe, with an estimated long-term potential of 70GW of ocean energy opportunity (wind, wave and tidal) within 100km of the coastline ([Department of Housing, Local Government and Heritage](#)).

In 2020 the [EU Commission](#) published 'An EU Strategy to harness the potential of offshore renewable energy for a climate neutral future'. The strategy has set a target for deployment of 100 MW of ocean energy technologies in EU waters by 2025 and 1GW by 2030. Ireland is seen as a key contributor to this target and has equally set a national target of 30MW by 2030. The main aim of this Topic is to support research projects which will help Ireland to meet these targets.

Project Objectives & Expected Outputs:

Ireland is heavily engaged with the EU in its efforts to progress research and development of ocean energy technologies via the SET Plan for Ocean Energy and in particular in its position as lead of the EU H2020 OceanSET project. The objectives of proposal(s) submitted to this Topic must align with the '[Strategic Research and Innovation Agenda for Ocean Energy](#)', which has identified research priorities for ocean energy in order to progress the targets of the SET Plan and Offshore Strategy.

These priorities have been identified broadly as:

- Design and validation of ocean energy devices;
- Foundations, connections and mooring;
- Logistics and marine operations;
- Integration in the energy system;
- Data collection & analysis and modelling tools;
- Cross-cutting challenges;

From the high-level priorities above, the following areas of focus have been identified as particular relevant gaps for Irish technology development:

- Demonstration of ocean energy devices to increase experience in real sea conditions;
- Improvement and demonstration of PTO and control systems;
- Application of innovative materials from other sectors;
- Improvement of tidal blades and rotor;
- Advanced mooring and connection systems for floating ocean energy devices;
- Improvement and demonstration of foundations and connection systems for bottom-fixed ocean energy devices;
- Optimisation of maritime logistics and operations;
- Instrumentation for condition monitoring and predictive maintenance;

- Developing and demonstrating near-commercial application of ocean energy in niche markets;
- Quantifying and demonstrating grid-scale benefits of ocean energy;

Applicants are invited to submit research projects which address one or more the detailed priority objectives outlined above. If projects address more than one priority, then all should be clearly outlined in the proposal.

Applicants must demonstrate strong technical and theoretical foundation for their technology and be able to describe satisfactorily the theoretical performance of a proposed device. The theoretical model must provide evidence for the performance and cost of the proposed device. Where devices have undergone testing to date, independently verified data on the results should be provided with the application. Larger scale projects will be required to demonstrate a viable business development plan.

Applicants will be expected to verify the TRL level of their technology and describe how they will progress it to the next stage. It is recommended that all interested applicants apply an appropriate staged technology development plan, and in particular should familiarise themselves with the International Energy Agency Ocean Energy System document on the '[Development of Recommended Practices for Testing and Evaluating Ocean Energy Systems](#)' and the [ESB-WestWave Technology Readiness Levels](#).

The call is open to the public and private sector based in Ireland (including Irish subsidiaries of overseas companies) and carrying out projects in Ireland. As such, the emphasis is on industry-led projects with support from the research community and demonstrated collaborative work between companies and/or with a research institution will be beneficial. Demonstrated dissemination of results will be required.

While the objective of this call is to accelerate and enhance support for the research, development and testing of emerging ocean technologies (in particular wave and tidal), applicants for other emerging technologies such as floating wind, floating solar and hybrid devices may also apply.

Project outputs may include:

- Reports on the results of testing. The final report of the project will clearly document the outcome of the testing, the verified status of the TRL upon completion of project (which should satisfy the ESB verification checklist) and the proposed steps required to progress to next TRL;
- Proof of dissemination of information in relevant peer-reviewed publications or industry recognised conferences;
- Access to background data or systems developed during the work including: Software, computer models, datasets etc.

Topic 25	Adaptive or risk-based management of wind farm interactions with hen harriers
Indicative Duration	3 to 4 years
Project Scale	Large scale
Indicative Funding	Up to €1M

Project Background:

The [Climate Action Plan](#) (2019) established a 70% renewable energy target for the electricity sector by 2030. The plan outlines that this target will indicatively be met from:

- at least 3.5GW of offshore renewable energy;
- up to 1.5GW of grid-scale solar energy;
- up to 8.2GW total of increased onshore wind capacity.

In the years approaching 2030, many wind farms in Ireland will reach the end of their planned life. There are many factors to consider in the decision to extend the life of, or to repower, a legacy wind farm. A key consideration is the planning status of a wind farm. Wind farm planning permissions are usually for a fixed lifetime, commonly 20 years, continued operation beyond that lifetime with the original, or similar turbines at the same locations, will require an extension to planning permission. In order for a planning authority to grant permission for such an extension, they must carry out Environmental Impact Assessment (EIA)/Appropriate Assessment (AA) screening for any likely impacts of the project on the environment and in particular, on protected habitats or species.

Many wind farms have a requirement for ongoing monitoring of their effects upon adjacent protected habitats or species. When used in conjunction with proactive habitat and species management measures, such monitoring campaigns might provide robust evidence that might be used in support of planning applications for life extension or repowering of wind farms.

Gaps in current research and knowledge might be addressed through (a) project(s) in the following areas:

- Further research into breeding success/foraging success and proximity to windfarms - looking at impact on a finer scale than previous studies;
- Further analysis on data collated already on the pressures acting on hen harrier with a view to informing conservation management;
- Further research on non-breeding/wintering hen harrier ecology, optimizing conservation management of wintering habitats;
- Habitat Management - efficacy of existing management plans and analysis of how adaptive management could be put in place based on best available evidence at present;
- Development and application of new technologies that can improve current understanding of hen harrier behaviour around turbines, spatial ecology, and habitat use (e.g. GPS tracking);
- Research aimed at quantifying the mortality risk posed by wind turbines to hen harrier through systematic, evidence-based approaches.

Project Objectives & Expected Outputs:

The project(s) proposed under this Topic should provide field demonstration, on (an) operational wind farm(s) in Ireland, of an adaptive or risk-based management approach to managing the interaction of wind farm operations with the local hen harrier population. Ideally, the project should be carried out over an entire hen harrier SPA, with multiple wind farms, rather than solely on a single wind farm.

Proposed projects should include for robust monitoring of hen harriers within and around the study wind farm(s) to gain a better understanding of their interactions with the wind farm(s). Monitoring programmes should propose state-of-the-art technologies, including, but not limited to, GPS tracking technologies, that can provide improved insights of hen harrier behaviour around turbines, spatial ecology, and habitat use. The selection of tracking technology should give consideration to both efficacy/accuracy and any potential adverse impacts upon monitored hen harriers and their breeding success. Non-contact technologies are preferred where these can be utilised effectively. National Parks and Wildlife Service (NPWS) authorisation of any proposed physical tagging must be obtained prior to sanctioning of funding. Ancillary benefits, such as obtaining data on additional bird species, may also form a consideration in technology selection.

The monitoring campaign should inform the species management plan for the wind farms(s) operations. Informed by both the monitoring campaign and prior studies on the hen harrier such as the “Windharrier” project, the project(s) should also trial best practice management measures to improve the status of the species within the hen harrier special protection area(s) affected by the wind farm site(s), while using the monitoring campaign to assess the effectiveness of the measures. The project(s) should provide data to inform the future management practices on wind farms in hen harrier areas with the high-level objective of improving the conservation status of the hen harrier where its range overlaps with existing wind farms.

Along with providing improved data and demonstrating the efficacy of adaptive management techniques for hen harrier conservation, the development of guidance for wind farm operators on best practices in hen harrier management is a desirable output for proposed projects.

Any proposed projects should include for a steering group of government and other expert stakeholders to provide high level direction to the research, ensure scientific robustness and ensure coordination of data sharing with related initiatives.

ANNEX 2: APPLICATION FORM TEMPLATE INSTRUCTIONS

This section provides guidance on how to complete the Application Form. Please note:

- Only fully complete applications received prior to the application deadline will be considered for evaluation.
- Do not exceed the maximum page limits defined for the following Application Sections:
 - Section 2 – Max 8 Pages
 - Section 3 – Max 6 Pages
- The above page limits are exclusive of references. Please include a list of references/bibliography as an appendix as required.
- Font size must be a **minimum of 10 pts**.

SECTION 1: PROJECT DETAILS

1. Project Title (max. 30 words)

The project title should clearly convey the nature of the project to be undertaken. Please include a project acronym where possible.

2. Topic Number (if applicable)

If you are applying to the Topic Strand detailed in Annex 1, please enter the topic number you are applying to here. If you are applying to the Open Strand, please type 'open strand'.

3. Lead Applicant, Partner Applicant & Collaborators

Provide the requested details relating to the Lead Applicant, Partner Applicant(s) and Collaborator(s). See Section 3 of the Call Document for definitions of project roles.

4. Project Scale/Type

Indicate the project scale/type (Small Scale, Medium Scale, Large Scale or Fellowship) of your application. See Section 4 of the Call Document for definitions of each.

5. Requested Duration, SEAI-Requested Costs and Total Project Costs

Indicate the requested project duration (months), the costs requested from SEAI and the total cost of the project. Please ensure that these figures align with those provided within the Budget Template (excel spreadsheet).

In-kind contributions are valued by SEAI and should be detailed in the 'in-kind contributions' table (only) within Section 5.3 of the Application form. In-kind contributions should not be included within the Total Project Costs table or within the Budget Template spreadsheet.

6. SEAI and RD&D Funding Programme Remit (max 250 words)

Describe how the proposed project aligns with SEAI's legal remit and the overarching objectives of SEAI's National Energy RD&D Funding Programme. The overarching programme objectives are to:

- *Accelerate the development and deployment in the Irish marketplace of competitive energy-related products, processes and systems*
- *Support solutions that enable technical and other barriers to energy market uptake to be overcome*

- *Grow Ireland's national capacity to access, develop and apply international class energy RD&D*
- *Provide guidance and support to policy makers and public bodies through results, outcomes and learning from supported projects*

This statement will be reviewed by SEAI when determining the eligibility of the application.

7. Abstract (max 250 words)

This should be a succinct and accurate summary of the proposed work

8. Keywords (min 3 words, max 10 words)

These should be descriptors that best characterise the proposed research.

9. Energy Research Category

From the drop-down list, please select the energy research category that best aligns with the proposed research.

10. Targets and Policies addressed

List the national and international energy and climate targets and/or policies addressed through your project. Where relevant, please specify the specific policy target, and e.g. the number of the action(s) from the Climate Action Plan which your project aims to contribute to.

SECTION 2: EXCELLENCE AND INNOVATION (Max 8 Pages)

1. Previous SEAI RD&D Funding (if applicable)

If applicable, describe any previous SEAI funded research projects and clearly outline how this proposed project builds upon previously funded work.

2. State-of-the-Art/Literature Review

Describe the current state-of-the-art, current knowledge or current best practice in this area. Please ensure to use references where appropriate.

3. Innovation/Novelty - Beyond State-of-the-Art

Describe the concept of the proposed project and provide details of how the proposed project will further the current state-of-the-art, current knowledge or current practice. The degree of novelty and innovation associated with the proposed project should be clearly demonstrated.

4. Project Objectives

Provide details of the objectives of the project and the associated timelines for delivery of these objectives.

5. Project Team & Collaborator Profile

Provide details of the Project Team (Lead Applicant and Partner Applicants) and Collaborators involved in the proposed project, including details of relevant qualifications and key achievements.

*For applications submitted under the **Fellowship** Category, a mentor/supervisor should be identified as part of the project team, and should be listed as a Partner Applicant.*

Provide an outline of previous relevant involvement in research, innovation and/or commercialisation activities performed by the project team. For the Lead and Partner Applicants (only), outline their track record in obtaining research/innovation funding from exchequer, industry, European or other funding sources.

Please note: this section should refer only to the Lead and Partner Applicants and Collaborators and should not provide details of individuals or organisations who will be engaged as external consultants. Whilst requests for the funding of external consultants is permitted, please note that applications will not receive additional marks for such consultants at the evaluation stage.

6. Gender Considerations

Please describe how gender balance will be fostered within the proposed team, including reporting the ratio of males to females within the proposed project team.

For Higher Education Institutions and Technological Universities, please comment on the Athena Swan² Institutional award status or award commitment for your organisation.

Please also consider any potential gender dimension of the proposed research activity.

SECTION 3: RELEVANCE AND IMPACT (Max 6 Pages)

This section should be as specific as possible and provide information that reviewers will find helpful in assessing the relevance and potential impact of the proposed research activity.

1. Relevance to the needs of the Irish Energy Sector and to SEAI

Clearly demonstrate the relevance of the proposed project to the needs of the Irish energy sector with particular reference to Ireland's Climate Action Plan, the Programme for Government, the National Mitigation Plan, Energy White Paper and/or Ireland's National Energy & Climate Plan (NECP). Refer to other relevant policy documents as appropriate.

Alignment

Describe how the proposed project aligns with the objectives of the current SEAI National Energy RD&D Funding Programme Call.

2. Impact - Expected Impact

Describe the expected impacts of the proposed project on potential end users (e.g. businesses in the energy/low-carbon technology sector, energy consumers, regulators, policy makers, etc.) and indicate the timeframe over which the anticipated impacts will be realised.

Impacts may be referred to in categories such as: economic (e.g. jobs, exports, turnover growth); societal (e.g. benefit to consumers); policy-oriented (e.g. contribution to evidence-based policy formation and/or the legislative/regulatory framework); or scientific (enhancement of Irish scientific capacity and capability).

² <https://www.advance-he.ac.uk/equality-charters/international-charters/athena-swan-ireland>

As part of your description, where relevant, please refer to how the proposed project would enhance the applicant/organisation's potential for involvement in FP9/Horizon Europe projects and/or other non-exchequer funded RD&D activities in the future. Where relevant, also outline how the proposed project would enhance business opportunities.

3. Impact – Communication and Dissemination Plans

Communication and Dissemination Plans: Describe what activities will be undertaken to promote the proposed project and engage the relevant audiences/end-users. SEAI expects that outputs/findings from SEAI supported projects will be widely disseminated and made publicly available.

Please note that project outcomes (i.e. generated knowledge/scientific output/research results/lessons learned) must be made available in the form of a short, publishable project report/case study (allowing for IP or commercial sensitivity restrictions on any sensitive data). These outcomes may be disseminated via the SEAI website and further publication as required.

4. Impact – Data Management and Open Access Strategy

Open Access Strategy: Project teams are encouraged to work with open access tools and to make project outputs/models/assumptions available to interested stakeholders to facilitate follow-on studies and reduce duplication of research. Projects should aim to follow the FAIR principles, making research data findable, accessible, interoperable and re-usable. Please describe your open access strategy (500 words max).

Please complete the Data Management Plan Form (Annex 1) and submit along with your application. This should outline details of all data to be collected, processed and/or generated by the proposed project.

5. Impact - Intellectual Property Management & Exploitation

Exploitation Plan: describe how results and outcomes from the proposed project will be exploited during and after the project, such that the project will result in tangible impacts.

Describe how background and foreground Intellectual Property (IP) will be managed.

Describe how any discoveries, inventions or processes resulting from the proposed project will be exploited. Where relevant/available, provide details of potential end users/markets.

Where there is a reasonable potential for commercial exploitation of research outputs, applicants should apply the principles of the National IP Protocol³ 2019 – Ireland's framework for research commercialisation.

Where relevant, applicants should discuss expected project outputs and intellectual property with their Technology Transfer Office and/or consult with Knowledge Transfer Ireland for information on how to fulfil Intellectual Property obligations, and for support in relation to developing consortium agreements where required.

Successful applicants are required to take necessary steps to preserve and protect such intellectual property rights including, where appropriate, applying for patent registration; and

³ <https://www.knowledgetransferireland.com/ManagingIP/National-IP-Protocol/>

actively exploiting any discoveries, inventions or processes resulting from the research, by means of commercial licensing arrangements or otherwise.

Where appropriate and whenever possible, IP should be managed for the benefit of enterprise development in Ireland.

For collaborative projects, please confirm (by ticking the relevant box in the application form) that should the proposed application be successful, the project consortium (Lead Applicant, Partner Applicant(s) and Collaborator(s)) will put a formal agreement in place to agree on Intellectual Property Rights and other relevant issues associated with the responsibilities within the project and exploitation of results.

SECTION 4: WORKPLAN

1. Work Plan

Complete the 'summary of work packages' table in the application form template which provides details of the number and title of each work package.

WP No.	Title
1	xxx
Etc.	xxx

For each work package, replicate and complete the table below in the application form template.

WP No. & Title	<i>Provide the number and title of the work package.</i>		
Start Month No.	<i>e.g. 1</i>	Finish Month No.	<i>e.g. 6</i>
WP Lead	<i>Indicate the role and organisation of the project team member who will lead the work package</i>		
WP Contributors	<i>Indicate the role and organisation of other contributors to the work package and briefly describe their role.</i>		
Objective(s)	<i>Describe the primary objectives of the work package.</i>		
Description (max 200 words)	<i>Provide an outline of the work to be undertaken as part of the work package, including the methodology to be followed, specialised equipment to be used and analysis to be performed.</i>		
Milestones (Specify the month each milestone will be reached)	<i>Define and number each milestone (add as many lines as milestones)</i>	<i>Specify the month number each will be achieved</i>	
	<i>e.g. WP1-M1: Literature review</i>	<i>e.g. Month 3</i>	
Deliverables (Specify the month the deliverable will be provided)	<i>Define and number each deliverable (add as many lines as deliverables)</i>	<i>Specify the month number each will be achieved.</i>	
	<i>e.g. WP1-D1: Literature review paper submitted to a peer-reviewed journal</i>	<i>e.g. Month 3</i>	

2. Project Management & Risk (max 3 pages)

Clearly describe the proposed project management structure for the project and provide details of reporting lines and responsibilities. Please also provide a high-level Gantt chart (or similar) indicating timelines for the work packages and tasks.

Please include details highlighting the capacity of the Lead Applicant to lead this project, e.g. consideration to number of current awards and other activities underway, and associated full time equivalency (FTE), along with FTE expectations on this project. Similarly, please include details highlighting the capacity of the wider project leadership team, across both Lead/Partner Applicants, to deliver the project.

Please ensure to include your high-level Gantt chart within the Application Form (Word Document template). Please do not submit a Gantt chart as a separate file.

Using the table provided in the application form template, describe the primary risks associated with the proposed project, their likelihood (low, medium or high) and outline the measures which will be undertaken to avoid or mitigate these risks.

SECTION 5: BUDGET

Please complete the following:

- 1. Budget Justification (see below)*
- 2. Budget Template (MS Excel spreadsheet)*
- 3. Provide the requested 'financial documentation/declarations' (as PDF documents)*

Applicants should refer to the SEAI RD&D Budget Policy Document when completing the budget sections of their application.

1. Research Category Justification (max 250 words)

Please select a Research Category from the list and provide a justifying narrative for your selection. Before selecting, please review and refer to the SEAI RD&D Budget Policy document for detailed definitions of each research category listed.

The onus is on the Applicant organisations to select a research category which appropriately reflects the proposed project activities. Please select the appropriate Research Category.

2. Effective Collaboration - Grant Intensifier Justification (max 250 words)

If applying for the Effective Collaboration grant intensifier, please tick the relevant box and provide a justification in the table provided. Please refer to the SEAI RD&D Budget Policy document for eligibility details and requirements of this grant intensifier.

3. Budget Summary

*Provide an overview of costs by completing the budget summary table. Add additional columns for each additional project partner if applicable. **Please ensure that these figures align with those provided in the budget template** (Excel spreadsheet).*

Please also complete the Summary Table – In-kind Contributions.

In-kind contributions are valued by SEAI and should be detailed within the 'In-kind Contributions' table (only) within Section 5.3 of the Application form. In-kind contributions should not be included within the Total Project Costs table or within the Budget Template spreadsheet

4. Budget Justification

Provide a justification to support proposed total project costs included in the application under the headings of: staff, equipment, materials, travel/dissemination and external consultants.

Staff: Justify the role and need for each staff member who will be funded by the proposed project by completing the table below for each person. Repeat the table as required for each proposed staff member to be funded.

Position Title	Please detail the requested position title (e.g. Research Engineer or Postdoctoral Researcher to be Recruited)
Organisation name	Indicate the name of the organisation which this staff post will be associated with.
Total cost of staff member	Indicate the total cost (€) associated with this role.
WP/task alignment	Provide details of the work packages/tasks which this person will work on.
Justification for the level of this position	Describe how the costs associated with this position have been calculated.
Justification need for this position	Describe why this position is required on the project.

Equipment: Justify the need for each piece of equipment which will be funded by the proposed project by completing the table below for each piece of equipment. Repeat the table as required for each piece of equipment.

Equipment & quantity	Indicate the equipment required and the quantity.
Organisation name	Indicate the name of the organisation who will own the equipment and where it will be based.
WP/task alignment	Provide details of the work packages/tasks which the equipment is required for.
Total cost (€)	Indicate the total cost (€) associated with the equipment
Justification for cost	Provide a justification/rationale for the quoted cost.

Materials: Justify the need for each material which will be funded by the proposed project by completing the table below. Repeat the table as required.

Materials & quantities	Indicate the materials required and the quantity.
Organisation name	Indicate the name of the organisation who will own the materials.
WP/task alignment	Provide details of the work packages/tasks which the materials are required for.
Total cost (€)	Indicate the total cost associated with the materials.
Justification for cost	Provide a justification/rationale for the quoted cost.

Travel/Dissemination (max ½ page): Justify the need for travel costs requested as part of the proposal. Where possible, online meetings/events are encouraged.

External Consultants: (max ½ page): Justify the need for and value of external consultants costs requested as part of the proposal.

SECTION 6: LETTERS OF SUPPORT

Letters of Support (max 1 page each)

The following letters of support should be submitted as part of an application to the Call. Letters of support may be uploaded individually or may be merged into a single PDF file.

Please also complete the summary Letters of Support checklist Table within the Application Form.

- ✓ **The lead applicant**, confirming that the information provided in the application is correct to the best of their knowledge, and that the proposed project has not been/is not the subject of grant aid from any other source. By submitting a proposal, the Lead Applicant confirms that they hold a contract covering at least the duration of the proposed project or agreement from their employer that their employment will be extended to cover at least the period of the proposed project.
- ✓ **An authorised staff member in the lead institution/organisation** (e.g. company CEO/CFO/Director, University/Research Institution Vice President for Research/Director of Research or equivalent) confirming their endorsement of the proposal and confirming their commitment to hosting and facilitating the proposed project should it be successful.
- ✓ **Each Partner Applicant (if any)** confirming their role in the proposed project and indicating the level of any financial support (cash or in-kind) being provided by their organisation to the proposed project.
- ✓ **Each Collaborator (if any)** included in the application and providing details of their role in the project.
- ✓ **Other Stakeholders who are providing a financial contribution (cash or in-kind) to the proposed project (if any)** confirming their interest in the project and clarifying the value of the financial contribution being made.

Please note that unsolicited letters of support are not permitted.

ANNEX 3: BUDGET TEMPLATE INSTRUCTIONS

Please find details in Appendix 1 of the SEAI RD&D Budget Policy document, available to download from the Programme Documents section of the SEAI RD&D Webpage:

<https://www.seai.ie/grants/research-funding/research-development-and-demonstration-fund/>

ANNEX 4: GENERAL TERMS & CONDITIONS

1. Failure to fully adhere to the provisions of the Call may result in application refusal, grant offer revocation or grant claim refusal, depending on the particular status and stage of the application.
2. Please note that SEAI may, if required by law or otherwise and without incurring any liability, vary, revise or supplement Programme Documentation and/or Terms and Conditions of the Programme before or after the applicant's submission of an application and such revised terms will apply to the application unless the applicant chooses to withdraw its application or withdraw from the Grant Agreement.
3. The applicant's agreement with SEAI in the event of a Grant Offer being accepted will comprise the Grant Agreement, Terms and Conditions of the Programme, the Call Document (including its annexes), and other programme documentation provided by SEAI. The applicant having accepted the Grant Offer and communicated his/her acceptance of it to SEAI shall comply with and agree to be bound by the provisions of these documents.
4. The project, in respect of which the grant application is made, must be located in the Republic of Ireland.
5. The Grant Offer only becomes valid upon receipt by SEAI from the applicant of the signed Grant Agreement.
6. The applicant must ensure Grant approval is received before proceeding with any orders, purchases or commencing works. No payments will be made retrospectively for costs incurred prior to approval being granted. Orders placed or invoices dated prior to grant approval will not be eligible for grant support.
7. The total grant amount will not be permitted to escalate about the amount indicated in the grant agreement under any circumstances.
8. The applicant must obtain all necessary insurances, consents and statutory approvals and have authority to implement the project.

9. The SEAI National Energy RD&D Funding Programme is subject to any state aid clearances required from the Commission of the European Union and any consents, clearances or licenses that might be required from any other competent body. The applicant must ensure that compliance is achieved with the relevant principles of Irish and EC law regarding the spending of this funding and, where applicable, the laws and guidelines concerning State Aid and public procurement.
10. The applicant must be prepared to participate in follow-up site visit(s) to verify impacts and achievements and to participate in follow-up research (telephone or questionnaire) as may be commissioned by SEAI to establish the Programme's impacts and achievements. This may also include the acquisition of information and data for the development of case studies for wider dissemination (protecting as appropriate all confidential or commercially sensitive information/ data). The applicant acknowledges that SEAI may have to provide certain contact details to third party contractors in relation to these matters and the applicant hereby consents to SEAI making these disclosures.
11. The timing of payment to approved applicants is subject to the funding allocated by government to the Programme in a particular calendar year, in accordance with public financial procedures. Where all other conditions are met, payment will be made on a "first come, first served" basis. Where funding is exhausted in a particular calendar year, payment to remaining applicants will be deferred until such time as further funds may become available. Deferred payments will receive priority, if and when those funds become available.
12. The applicant shall follow the SEAI complaints procedure in relation to any disputes between the applicant and SEAI concerning any matter in connection with the Programme.
13. Any false, fictitious or fraudulent statements or claims knowingly made on grant applications, or supporting documentation, submitted in respect of previous grant applications / requests for payment or otherwise made to SEAI, its authorised officers, or an SEAI Inspector, or any breach of these Terms and Conditions of the Programme may result in current and future applications being deemed ineligible by SEAI. In respect of applications where the applicant has already received payment pursuant to the Programme.
14. The Applicant acknowledges that SEAI is subject to the requirements of the Freedom of Information Act 2014, as amended ("FOIA"). SEAI undertakes to use its best endeavours to hold confidential any information provided by the applicant subject to its obligations under law, including the FOIA. Should the applicant wish that any of the information supplied by him/her should not be disclosed because of its sensitivity, he/she should, when providing the information, identify the same and specify the reasons for its sensitivity. SEAI will consult with

the applicant about such information before making a decision on any Freedom of Information request received.

15. Any personal information which an Applicant volunteers to SEAI will be treated with the highest standards of security and confidentiality, strictly in accordance with the Data Protection Acts, 1988 and 2003, as re-enacted, amended or replaced from time to time, and pursuant to the General Data Protection Regulation (meaning Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC) and any related legislation. SEAI, as data controller, and its agents, will store such information on its database and fully respect the confidentiality of the data provided. The information provided by applicants will be used for evaluation purposes and to facilitate the administration of the grant process. This may require that data be supplied to and discussed, in confidence, with any person or organisation appointed by SEAI to assist in assessing or monitoring this application. These persons will be subject to the same requirements for protection of confidentiality.
16. An applicant must notify SEAI immediately if it decides not to undertake and/or complete its project. If a successful applicant decides not to undertake and/or complete its project, SEAI will not pay it the grant and instead may (but is not obliged to) allocate some or all of the funds provisionally allocated to that applicant to a different applicant.
17. The parties are of the view that there is no supply of goods or services between them and therefore there is no VAT chargeable to SEAI by the grantee in relation to the payment of the grant. In the event that the Revenue Commissioners determine that, in their view, VAT is chargeable then the grant payment shall be regarded as inclusive of any VAT charge.