ESIPP response to the DCCAE consultation on the Clean Energy for All Europeans Package

08 May 2017

Background

Climate Change is one of the most significant global challenges of our generation. It presents significant challenges for Ireland and for the international community which need to be addressed urgently if we are to achieve the transformation that will be required to enable us to transition effectively to a low carbon and climate resilient future. This will require contributions from all parts of society including researchers, industry, policy makers and consumers.

The Clean Energy package highlights a number of areas which need to be addressed including energy efficiency, energy performance of buildings, internal electricity market, the use of energy from renewable sources and risk preparedness in the electricity sector, along with governance and regulatory aspects. These aspects are all essential to transition Europe to a clean energy future. Ireland's Government policy has outlined a clear objective for Ireland to significantly decarbonise by 2050, i.e. greenhouse gas (GHG) emissions from the energy sector to be reduced by between 80% and 95% compared to 1990 levels[1]. It is important that this ambition is reflected in Ireland's commitments to the Clean Energy Package and to the wider European transition to ensure we are on the right trajectory to achieve this. However the scale of this challenge will require significant effort, including new technologies, modes of operation, policies and regulation.

While there has been significant development in the use of renewable energy resources in recent years, in particular in the electricity sector, there is a growing need to understand the interactions between different energy systems, including electricity and gas, and the underlying factors which influence how they operate. The interaction of energy systems with water, data and other relevant infrastructure also needs to be better understood. Energy Systems Integration (ESI) is a multidisciplinary research area which includes science, engineering and technology, policy, economics, regulation and human behaviour with a view to understanding the interaction of these different areas. This understanding will help in the planning, design and operation of the Irish, European and global energy systems through evidence based research and informed decision making.

[1] Ireland's Transition to a Low Carbon Energy Future, DCCAE, December 2015

Energy Systems Integration Partnership Programme (ESIPP)

ESI is an emerging area of research and, as such, there is a need to build research capacity in this area to address the substantial knowledge gaps and to bring expertise to industry in this fast-growing area. The Energy Systems Integration Partnership Programme (ESIPP) is a research collaboration comprising researchers from University College Dublin (UCD), Economic and Social Research Institute (ESRI), Dublin City University (DCU), National University of Ireland, Galway (NUIG), and Trinity College Dublin (TCD)[2]. It brings together industry and a multidisciplinary research team in all the main engineering disciplines (electrical, mechanical, civil and chemical) with economics, business, mathematics, environmental, psychology, and earth science disciplines to address these challenges. The research challenges include:

- managing increasing variability and uncertainty in the integrated energy system;
- managing the financial, regulatory, market risks in energy infrastructure investments;
- controlling a more distributed energy system with a more active consumer;
- quantifying the impact of climate on future energy consumption in an integrated energy system;
- optimising the integration of waste water treatment plant into the electricity system;
- developing solutions to optimally use the thermal energy stored in the energy system; and
- providing evidence to support robust policy decisions.

These research challenges will require a deeper understanding of the interactions within an integrated energy system, its dynamics and long term evolution including the potential impact of increasing electrification and the roles of natural gas and water. Understanding and addressing these challenges will play a significant role in ensuring a clean energy future for Ireland and Europe.

As we move towards a low carbon energy system there will be a need to create and nurture expertise in this area. The main goal of this partnership is to build ESI research capacity within Ireland. The research programme is designed to bring together the most relevant academics in Ireland, with industry partners and collaborators, to tackle some key research challenges in ESI. The specific capacity outcomes will be:

- An internationally competitive team of researchers and industry who can provide cohesive systems thinking to solve ESI challenges.
- Individual researchers with their own disciplinary background but with a deep understanding and appreciation of ESI.
- An international network of collaborators that will work with us in particular in H2020 proposals.

ESIPP has been developed in close consultation with industry with a view that the ESI challenges faced by the energy sector are potentially game changing but can't be addressed individually.

Research on ESI is multi-disciplinary by nature. The research programme is organised into three research strands: Modelling and Data (MD), End Use Integration (EUI) and Markets and Strategic

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Planning (MSP). These strands combine, amongst others, expertise in engineering, computer science and mathematics, earth sciences as well as economics and consumer behaviour. The core objective of ESIPP is to go beyond excellent research within each of these traditional disciplines, to integrate and synthesise the findings of the individual work packages and to evaluate and quantify potential benefits of energy system integration from individual end users to the system as a whole.

ESIPP research strands will address the principal technical and policy requirements facing the energy sector in an increasingly integrated system. In addition to filling the skills gap in ESI, industry partners will benefit from positive impacts that will include the availability of a range of new models that will assist them in planning the impact of ESI on the energy system and their product offering, technical solutions to specific ESI challenges and a better understanding of how the risks and uncertainties can be mitigated.

Comments on the Clean Energy for All Europeans package

There are a number of different elements to this package which ensures that the different areas can be assessed, i.e. energy efficiency, energy from renewable resources, electricity market design and governance. It should be noted that there is also significant overlap between these different areas, and ESI research aims to get to the heart of these interactions. In order to achieve the efficiencies that can be gained, and to ensure there is a robust regulatory and policy framework in place, continued research into the integration and optimisation of energy systems is required.

As we move to decarbonise the energy system further there will be a need for a more detailed understanding of the impact of increasing levels of renewable generation and the interaction of energy systems. ESIPP aims to address many of these challenges through the detailed research activities within the programme, however there will continue to be a need for ongoing research in this area as decarbonisation continues and further research requirements are identified. We welcome the support from the European Commission in relation to research grants and funding calls and note the importance and value in these initiatives, both in terms of advancing research and in developing expertise.

It is essential that research, development and innovation is carried out in a coordinated manner. ESIPP brings together industry and a multidisciplinary research team in all the main engineering disciplines (electrical, mechanical, civil and chemical) with economics, business, mathematics, environmental, psychology, and earth science disciplines to address these challenges. This coordinated approach should set the standard for future research in this area which takes a holistic view of energy use and wider interactions, from energy providers, to system operators and end use consumers. The interaction with industry also ensures good alignment between the needs of industry responding to climate change challenges and the research initiatives which are under way.

Energy Efficiency

There is significant scope for energy efficiency gains in many areas of energy end use. The research being carried out under ESIPP looks at a number of ways of improving energy efficiency, in particular under the End Use Strand of the programme. The End Use Integration strand will facilitate the transition to more sustainable energy and water systems, by developing nationally and internationally relevant approaches to the related problems of managing increased network volatility with

decarbonised energy production and reduction of latent demand for energy and water. The overarching aim of the End Use Integration strand is to develop analysis tools to allow consumers and providers of energy and water, both industries and individuals, to identify the benefits of system integration that can actually be realised. The research in this strand will facilitate process innovation in industry, and reduced energy/water demand in commercial and residential settings, thus enhancing competitiveness.

Electricity Market Redesign

As well as the technical requirements of energy systems, there are also economic aspects which must properly considered. Research currently underway under ESIPP aims to develop a more consistent and complete evidence base for integrated energy systems and markets at the micro- and macro-economic levels, whilst building research capacity to enable much improved strategic planning in the sector into the future. It will address limitations in current approaches to constructing Integrated Energy Systems Models, including improving the understanding of behaviour and the role of infrastructure. Energy systems exist to meet consumer needs, and supply and demand for energy are matched using market mechanisms together with regulatory interventions. Just as improved energy technologies can achieve greater efficiency by integrating the design, construction and operation of previously separate network infrastructures, markets too can achieve better outcomes through integration. Strategically planned integrated energy systems can improve the fit between consumer needs and the services that are ultimately supplied, reduce capital expenditure requirements by permitting a broader range of trade-offs and increase the operating efficiency of markets.

Renewable Energy

It is clear that renewable energy will be required to make further contributions towards progressing the transitions to a low carbon society and economy. Electricity will play a role in helping to decarbonise the heating and transport sectors through electrification of these systems, however there are also other aspects that can be considered when looking at optimising energy systems. Much of the research within the ESIPP project is focussed on developing models for the electricity system, understanding the impact of increasing levels if distributed energy resources, market signals and consumer actions. However the research does not focus solely on decarbonising electricity generation, but also takes into account the interactions of different energy systems including electric power and distributed energy resources; water and gas systems; communication and control infrastructure of end use instances; as well as weather systems.

Conclusion

In summary, we welcome the consultation on the draft Clean Energy for All Europeans Package and the need to consider how Ireland, along with the rest of Europe, can transition to a lower carbon future. While considerable progress has been made in the integration of renewable energy into our electricity system, there is a lot more to do to meet the trajectory of 80-95% reduction in GHG emissions by 2050. This will require considerable effort including new technologies, modes of operation, policies and regulation, requiring contributions from all parts of society including researchers, industry, policy makers and consumers.

In particular, there is an essential role for research in this area to understand the implications of climate change and the impacts on our energy systems and infrastructure. As we move to increasing levels of renewable energy there is a need to understand the impact on our energy systems and to develop technologies, tools and modes of operation to manage these changes. There is also a need to develop technologies which enable reduction of energy use which will be easily accepted by end users and which enable secure operation of energy systems. In order to ensure these new technologies and tools can be used to greatest effect there will also be a need for markets, policies and regulations which facilitate the required changes. Research programmes like ESIPP will be fundamental to ensuring that a holistic view is taken of energy systems, and to provide evidence based data to policy makers, while at the same time developing much needed expertise in this area. The Clean Energy for All Europeans package needs to ensure continued support for research and development, and to ensure that research is at the heart of evidence based decision making.