

Engineers Ireland

Submission to 'Draft National Mitigation Plan'

For the attention of Climate Policy Division, Department of Communications, Climate Action and Environment

26th April 2017

1. Introduction: Investment in sustainable technologies and infrastructure

Engineers Ireland welcomes the opportunity to comment on the 'Draft National Mitigation Plan' (henceforth referred to as the 'NMP'). We also welcome the NMP's initial focus on electricity generation, energy efficiency in the built environment, sustainable transport, and agriculture, forest and land use – areas in which Engineers Ireland has particular expertise. In the past two years, we have placed particular emphasis on energy and transport and so our submission focuses on these sectors.

We agree wholeheartedly that climate change is one of the greatest global challenges for this and future generations. The latest EPA greenhouse gas (GHG) emissions figures, which show a 3.7% increase from 2014 to 2015, make for alarming reading. As a member of the European Union and the global community, we have important commitments to reduce GHG emissions and mitigate the effects of climate change. Yet EPA projections suggest that Ireland's emissions in 2020 will only be approximately 6% below 2005 levels, far behind the 20% reduction target – despite a dramatic economic crisis in the intervening period. The NMP succinctly outlines the major challenges we face in achieving 2020, 2030 and 2050 targets.

Engineers Ireland notes that the purpose of the NMP is:

“to specify the policy measures required in order to manage greenhouse gas emissions and removals at a level appropriate for furthering the achievement of the national transition objective and to take into account existing EU and international obligations on the State in relation to reducing greenhouse gas emissions.”

We believe that a core element of these 'policy measures' should include recommendations for the direction of significant investment towards new technologies and infrastructure required to support the transition from a high-carbon, fuel import economy to one that is carbon free and practically self-sufficient. We note that the Capital Plan 2016-2021 'Building on Recovery' is currently under review; this should be closely linked to the objectives of the NMP and the National Planning Framework (see Section 2).

The European Commission's Country Report Ireland 2016 states: "Infrastructure needs have returned to the forefront as attention shifts to ensuring durable and balanced growth in the future. Seven years

of sharply reduced government investment have taken a toll on the quality and adequacy of infrastructure and on support for intangible investments. This includes weaknesses in housing, water, public transport and climate change mitigation capacity.”

The development of technologies and infrastructure for climate change mitigation will be essential for Ireland’s future growth and prosperity. High-quality infrastructure is a critically important element of a modern society and economy. It is of paramount importance that the country has the necessary capital infrastructure to meet economic demand in the coming years, as well as a skilled labour force ready to create and fill the jobs of the future.

The TASC report ‘The Need to be Ambitious: Greater Investment Ensures Prosperity’ clearly sets out that investing sensibly in infrastructure gives a positive return on expenditure. However, with existing levels of investment at 2 per cent of GDP, it is clear that current and planned infrastructural spending is far too low and the TASC report estimates, based on international comparisons, that investment must be in the order of 4 per cent of GDP to meet our infrastructural needs and adequately support future growth and prosperity.

Throughout this submission, we will offer a variety of recommendations for infrastructure and services for mitigating the effects of climate change. However, it would be a mistake to separate climate change mitigation from direct benefits for health and wellbeing; perhaps this could be better expressed throughout the NMP. For example, sustainable transport measures have been shown to improve air quality and social capital, while domestic energy efficiency measures can improve health and comfort.

2. Long-term planning and the need for a single infrastructure unit

Engineers Ireland welcomes the consideration of spatial planning in the NMP:

“Spatial planning can make a significant contribution to addressing climate and energy obligations by helping to shape new and existing developments in ways that reduce greenhouse gas emissions, increase resilience to the impacts of climate change and enable renewable energy obligations to be met. In this regard, it will be critically important that a coordinated and coherent approach to integrating the on-going development of both the NDCA and ‘Ireland 2040 – Our Plan’ (National Planning Framework – NPF) is adopted.”

Spatial planning is an important determinant of environmental impact, economic prosperity as well as health and wellbeing. The National Planning Framework will make a vital contribution to the direction of Irish society towards 2040 and it is important that it is afforded requisite attention in the NMP.

Furthermore, the transition to a carbon-free society will require integrated planning and courageous decisions. Yet planning and delivery of our infrastructure is currently spread across Government departments, each competing for finite funding with little central oversight. Engineers Ireland believes that an independent assessment of our long-term infrastructure needs is required, together with the establishment of a single infrastructure unit, charged with sustainably planning and integrating investment in key critical areas like transport, education, health, energy and the digital economy.

There are many examples internationally of how such an entity could be structured to best support the determination and implementation of policy on infrastructure – decoupled from the electoral cycle. This entity would also be responsible for co-ordinating a long-term, cross-sectoral approach to building political and public consensus and understanding on national infrastructure performance, under a range of possible futures.

In this area, we can learn from other jurisdictions, such as the UK, which has established the National Infrastructure Commission (NIC). The NIC was set up on an interim basis in 2015 and looks at the UK's future needs for nationally significant infrastructure, taking a long term approach to the major investment decisions facing the country. It was established permanently as an executive agency of HM Treasury in January 2017. The aim of the NIC is to enable long term strategic decision making to build effective and efficient infrastructure for the United Kingdom.

A new report, 'Strategic Infrastructure Planning: International Best Practice', produced by the OECD for NIC and published in March 2017, sets out and elaborates on the following key points:

1. Systemic risks can be reduced where projects form part of a broad and long-term strategic plan;
2. Strategic infrastructure planning nevertheless carries its own risks;
3. When it works well, strategic planning can set out a stable set of priorities for future investment with durable cross-party support;
4. A successful infrastructure planning process balances a stable framework with maintaining flexibility;
5. The planning process requires clear objectives, a degree of independence and an open, collaborative approach;
6. The planning methodology needs to address risks and uncertainties, take into account binding policy constraints and include considerations of pricing the use of infrastructure;
7. A top-down approach to infrastructure planning to complement traditional project by-project assessment is essential to a strategic assessment of long-term economic infrastructure needs across sectors;
8. Infrastructure planning across sectors can help identify the most important systemic risks early;
9. Using analytical methods such as a scenario-based approach to analysis can be helpful in future-proofing infrastructure plans;
10. It is important to consider how demand for scarce infrastructure can be managed;
11. A top-down approach could foster the development of an analytical framework for investment decisions reflecting both demand and supply side considerations.

Engineers Ireland supports a top-down approach to infrastructure planning to complement and enhance the sectoral and project-level approaches currently undertaken in Ireland. This would greatly assist both in the development of integrated plans aligned with existing and forthcoming Government plans, including the NMP and the National Planning Framework.

3. Electricity Generation

Each year, Engineers Ireland prepares 'The State of Ireland', an independent review of the performance, capability and condition of Ireland's key infrastructure networks. Last year's report, 'The State of Ireland 2016' made recommendations on energy infrastructure and was informed by extensive deliberations by experts from the energy sector. The following responses are derived from this report.

3.1 What further contribution should renewable electricity make towards progressing the transition to a low carbon society and economy? How should this be facilitated?

While the electricity sector has made considerable advances, Ireland needs to continue to progress to low or zero carbon electricity generation. This transition should include the use of renewables, biomass and, potentially, carbon capture and storage. In the short to medium-term transition period, Ireland will have to adopt a pragmatic approach to the electricity generation fuel mix and continue to rely to a certain extent on fossil fuels while actively promoting fuel switching from coal and peat to gas. As Ireland moves through that transition period, low to zero carbon generation technologies, which provide electricity that can be dispatched or stored at the same time it is generated, may also be required, along with energy storage for renewables, increased interconnection and demand side participation.

3.2 In conjunction with the need to improve the energy efficiency of the built environment through deeper levels of renovation, how do we realise the opportunities that decarbonisation of large scale electric power generation provides to decarbonise the heating and transport sectors through electrification?

The decarbonisation of Ireland's electricity is happening gradually and inexorably, but the move away from the predominant use of fossil fuels in transport and heating energy will have a major impact on electricity generation and distribution in Ireland. Capital expenditure will be required to build the infrastructure necessary to supply the energy to power a larger EV fleet, for example, whereas a 'smart grid' network is essential to manage Ireland's future energy fuel mix and consumer demand. Continued investment in additional network and smart network strategies is essential to meet customer needs so that they can decide how they consume their electricity. The network also needs configuration to allow microgenerators to sell power to energy companies, and the impact of the greater electrification of heat and transport may lead to capacity issues in urban areas, but less so in rural areas, where increased capacity can be accommodated without investment. Landowner and customer acceptance of the additional infrastructure which will be required to move to a low-carbon society is also vital and is likely to need considerable engagement.

3.3 How can we enhance community engagement with decarbonisation of the electricity system, including achieving greater social and community acceptance of necessary associated electricity infrastructure?

While there are serious changes and disruption to come, individuals need to learn about how these new technologies can enhance their lives and provide them with opportunities for cost savings. An education programme designed to engage the active citizen or create more energy citizens needs to

be implemented over many years as the transition will take generations to take effect in changing attitudes and behaviours. A dedicated long-term resource needs to be allocated to educating citizens about their energy responsibilities, including specific programmes aimed at the adult generation and a new programme developed for the primary and secondary school curriculums.

3.4 How can spatial planning for renewable electricity infrastructure be made more efficient and effective?

As indigenous renewables such as wind, solar and wave are variable and changeable, while tidal is variable but predictable, they will require new demand-side management and technology solutions, such as energy storage for both electrical and thermal power, as renewable generation increases. Additional interconnection with other countries may also be required to facilitate renewables, to augment and diversify competition and security of supply. The potential for increased renewable generation in Ireland should be explored further, including the use of different technologies as they become increasingly available and cost competitive. With our island status, Ireland's energy future is inextricably linked with Northern Ireland, and the North–South Interconnector is imperative to further bolster security of supply and reduce the cost to the consumer. Brexit and the National Planning Framework will be important influences on spatial planning for renewable electricity infrastructure.

3.5 What other renewable technologies should be considered in order to diversify the power generation mix and progress the transition to a low carbon society in a cost-efficient and cost-effective way?

The vast majority of heating systems in Ireland are domestic and powered by fossil fuels (gas, oil and solid fuels) compared to other economies that have developed renewable heating system technologies such as wood-burning boilers, air-source and geothermal ground-heat pumps or solar water heaters. Electrification of heat, particularly using heat pumps, is an often stated goal across Europe. Heat pumps and thermal storage, coupled with smart grid and distributed generation, could have a very positive impact on reducing energy demand. However, peak heat demand in winter can be five to six times greater than peak electricity demand. Rapid transition to even high-performing heat pumps without management and control of energy infrastructure and household demand could stress parts of the existing network. Further capital investment in the network and transmission systems will be required, and therefore impacts on the long-term affordability of these solutions. Conversely, if this transition is managed appropriately, it could result in more efficient and cost-effective usage of our renewable generation resources and electricity network assets.

4. Energy Efficiency in the Built Environment

4.1 What further practical measures could be introduced to encourage and enable householders in undertaking deep energy efficiency renovations to their homes?

District heating is a goal of the new energy white Paper and is a proven method of increasing energy efficiency. While it has been successfully implemented in many other European countries, it has not been deployed to any significant extent in Ireland. One of the key advantages of district heating networks are the efficient use of surplus heat from 'low grade' combined heat and power (CHP) plants, waste incineration plants, waste heat from industrial processes, natural geothermal heat

sources, and fuels that are more easily used centrally, including renewables like wood waste and residues. The development of district heating networks could help to meet Ireland's renewable heat target, help to reduce Ireland's GHG emissions and external energy dependency.

Specific technical measures include building insulation retrofits of wall, roof and floor insulation, energy-efficient glazing and draught proofing alongside heating/cooling system replacements with heating controls, heat pumps or solar water heating, energy-efficient lighting, and more efficient household appliances and electronics.

4.2 How should the Government support those who do not have the financial means to engage in renovations, for example those in energy poverty?

Technical improvements towards more energy-efficient and low-carbon renewable fuels need to be coupled with behavioural measures that include reducing the target temperature by one degree Celsius, such as turning off heating in unused rooms, turning off lights when not in use, installing a low-flow shower head and air-drying rather than tumble-drying clothes. Small, targeted behavioural changes can all contribute to increased energy efficiency and improved comfort levels for householders as a deep retrofit will naturally lead to reduced energy consumption. We have seen recent TV ads encouraging householders to switch off and save.

However, uptake of energy efficiency in the residential sector is likely to be low without additional intervention. The SEAI has identified a number of potential and existing interventions including regulation, pay as you save (PAYS), information campaigns and direct financial support. PAYS is a type of residential retrofit financing scheme currently under consideration in Ireland. A number of research papers were produced examining the PAYS concept, which formed a starting point for the Better energy financing (BEF) project. BEF is intended to overcome the financial barrier in the residential sector by providing accessible finance to householders in Ireland. There is currently an €800,000 capital budget set aside for a suite of project trials in 2016. Essentially, the task of BEF is to identify the level of cost at which energy efficiency becomes acceptable to a critical mass of the population, and then identify the nature, and extent, of the subsidy required to make that level of cost available.

4.3 How can we motivate the construction industry to promote deeper energy renovations to their clients?

4.4 For those householders and businesses that have carried out energy efficiency improvements, how should we encourage the adoption of low carbon heating solutions, including those that would facilitate the decarbonisation of electricity generation?

Radical changes are needed to the vast majority of Ireland's thermal technology, which must include switching households to a fuel source that requires a total retrofit of their heating system. The role of BEF is critical to the success of this switch to ensure that the final solution is affordable for the householder when it is combined with energy efficiency measures. A blend of gas and electricity is needed to meet the short to medium-term renewable heating targets. One recommendation is to electrify the 900,000 homes that are not connected to the gas network, and which use solid fuel or oil for heat. Priority should be given to electrifying the heating systems in these homes through a funded Government programme. Not only would this immediately contribute to the heating target, but it

would also benefit the 20% carbon emissions obligation if renewables are used in the electricity generation. However, this has to be done in conjunction with changes to how electric domestic emissions are treated in the Building regulations to facilitate adoption of all available electric heating solutions. While noting that there have been very positive developments regarding the treatment of heat pumps in recent months, the building regulations continue to be a barrier to the adoption of electric storage heating for apartment dwellings. Of the remaining 700,000 homes that are connected to the gas network, 100% of these homes could be switched from natural gas to biogas with no need to change the gas distribution infrastructure.

4.5 How could the regulatory regime be developed to best complement Government incentives and supports for the residential and commercial sectors post-2020?

Biogas is produced from anaerobic digestion and currently there are only six plants in Ireland, compared to 26 in Northern Ireland. Some of the reasons for the low level of plants in Ireland include a complex planning and licensing system, with eight different permissions required, grid connection costs, unattractive electricity tariffs, financing issues and uncertainty in waste policy. This is an area that has the potential to grow, with the help of policy development and financial incentives to support the industry. It is estimated that just replacing 20% of natural gas with biogas could allow 100% of domestic customers and up to 15% of industrial and commercial customers to operate on biogas, contributing to the renewable heating target. As well as supporting Ireland's achievement of its renewable targets, development of anaerobic digestion plants assists with the implementation of Ireland's waste policy.

The Renewable Heat Incentive (RHI) has been shown to drive rapid deployment of new technologies, for example, solar and biomass heat in the UK and fits-developed solar photovoltaic (PV) electricity in Germany and Spain. However, lessons need to be learned about how incentives can skew the market and provide unsustainable market growth. It is important to set levels at moderate rates of return, with the guaranteed tariff reducing each year.

The Government should provide leadership on this and prioritise sweeping changes in the public sector to support a consumer education programme, leading by example. Ireland's hospitals, which are among the most intensive energy users, account for around 500,000 tonnes of carbon emissions annually, and in 2014 were responsible for 21% of total energy consumption in the public sector. The 2020 target for hospitals is just less than half this at 11.8%, which means significant inroads will have to be made to achieve this in the next three years.

Mandatory energy audits have been an essential driver in making energy efficiency visible within the industrial sector. Once energy becomes a visible cost to production, companies are prompted to develop methodologies to reduce unnecessary or wasted energy by optimising their processes. The requirements to undertake energy audits should be widened to incorporate small to medium-sized businesses as well as retail centres, similar to those introduced in the public sector and for large commercial enterprises under the EU energy efficiency regulations 2014.

5. Sustainable Transport

'The State of Ireland 2017' will focus on transport and communications infrastructure, which we believe to be of pressing importance. The report will be published in the coming weeks.

5.1 The demand for transport can be expected to increase over the coming years. Improving the integration of land use and transport planning is one approach that should help address this challenge. How else could the Government manage this projected change in order to ensure a functioning, low carbon transport network that supports growing communities and businesses?

Emphasis should be placed on reducing car dependence, and on greater policy integration and joined up investment decisions across the planning, health and transport policy sectors to generate more attractive alternatives to the private car. Engineers Ireland strongly supports the need for, and emphasis on greater policy integration in this respect, and in relation to many of the other infrastructure provisions that will be required to produce the desired positive impacts on health and wellbeing for the citizens of Ireland. Within the cities, and particularly in the largest population centres of Dublin and Cork where the health and social impacts will be greatest and alternative transport solutions are feasible, a clear focus on reducing car dependence is welcome. Engineers Ireland is strongly supportive of the National Transport Authority document, 'Transport Strategy for the Greater Dublin Area 2016-2035' which deals with a timeframe similar to that of the National Planning Framework and clearly lays out the key transport infrastructure developments needed in the GDA to support continued economic growth over the next 20 years.

Within our cities, an emphasis should be placed on promotion of car clubs, for example GoCar in Ireland, to reduce the level of car ownership. This is a long-established method on the continent for reducing the number of cars parked in dense urban areas while greatly reducing the cost of ownership for motorists. This has the effect of unblocking streets and reducing congestion. In recognition of this, councils are typically willing to provide parking spaces to car clubs. New city planning rules should be designed to encourage more cars clubs with a focus on new developments where parking spaces may be shared.

Bus priority routes, core bus corridors and bus rapid transit routes all have a role to play in encouraging commuters to leave their cars in the five-major urban centres. Diverse vehicle types that contribute positively to Ireland's carbon emission targets, such as electric or hybrid buses, which are proven technologies that are affordable, sustainable and efficient in economic and financial terms should be phased in to the fleet, subject to cost benefit and risk analysis. Maintaining current bus fleet standards and replacing old stock with a modern vehicle fleet that combines fuel types must be a priority under the carbon emission targets. The bus system in Dublin needs redesigning to complement the Luas Cross City extension.

The low-density nature of Dublin means that a high-quality bus system is the correct public transport solution for many route corridors. To resolve the congestion issues, Dublin needs to invest in its bus system over the next few years to transform it into a highly efficient and reliable system. That investment needs to be in parallel with the development of the rail based projects, which take significantly longer to deliver.

5.2 Behavioural changes amongst motorists will be critical in reducing Ireland's GHG emissions. What practical measures would encourage individual motorists to be 'greener'? How can we promote a transition to cleaner vehicle types; or a change from conventionally fuelled vehicles to alternatively fuelled vehicles; or an adoption of eco-driving styles?

Based on the current number of electric vehicles in Ireland, there is a sufficient urban electric vehicle charge infrastructure though some further charge points will be required in some cities and in large shopping centres. The provision of public charging is there to facilitate journeys or daily driving that exceeds the range of current electric vehicles. The electric vehicle charge network features many chargepoint types that are a very early technology and are not fit for long term use. Investment will be required to replace early technology to improve performance and reliability. Further investment will be required to expand the Fast Charging network and to ensure that there are sufficient publicly accessible charge points available to people when they reach their destination.

At the heavier scale of road transport, the development of CNG and LNG as a fuel source will see the introduction of more natural gas powered trucks and buses. These will be particularly important for operation in the urban environment where the concentration of toxic pollutants is a growing concern from an air quality and health perspective. There is currently only one such refuelling station in Ireland but this number is expected to grow to 70 by the year 2027.

5.3 What factors discourage people from transitioning to 'greener' transport modes (i.e. walking, cycling, public transport, green cars)? How can the Government stimulate an increased uptake of 'greener' transport modes?

Successful car-restrictive strategies in other European cities have shown that by making car travel less attractive even to affluent commuters, a shift in behaviour to other modes of transport can be achieved. However, alternatives such as offering public transport at low cost, should be used in parallel. Further incentives are needed to attract commuters from their cars where alternative public transport modes are available. The construction of additional infrastructure that facilitates cycling and walking is clearly needed to achieve the 2020 Smarter Travel goals.

Much of the cycle network is incomplete and where facilities are provided they are generally narrow and discontinuous. The issue is most acute in cities, where demand is greatest, however, extra-urban facilities are practically non-existent except where recent investments have been made in greenways to exploit their tourism and leisure functionality. The existing road network accommodates reasonable volumes of cyclists particularly accessing Dublin city centre. The peak capacity of recently improved routes is generally adequate though it is reasonable to expect further growth in demand, particularly in the urban areas.

All urban areas have evidence of significant pedestrian capacity shortfall at peak times with pedestrians evident walking along roads and around parked cars in all cities, particularly near public transport stop and stations. In addition, long delays occur at signalised pedestrian crossings which continue to be biased towards vehicle capacity. There are walking constraints at peak times, particularly in cities, due to narrow footpaths and long wait times at junctions. The walking network outside of city centres is generally reasonably functional.

5.4 As a small economy, Ireland has limited influence on the international pace of progress and market development for alternative fuels and technologies. Should the Government consider early investment in the adoption of these alternative fuels and technologies or delay investment until they advance further and become more cost-efficient and cost effective?

Despite the average diesel car emitting at least 10 times more health-damaging pollutants than a petrol car, the State now has the highest percentage of new diesel sales in the EU, with diesel-powered vehicles accounted for 71 per cent of all new vehicle sales in the Republic in 2016. Against this backdrop, there is now an expectation that urban areas in Ireland could announce bans or restrictions on the use of diesel-powered vehicles including congestion charging and low-emission zones, in addition to further changes in taxation policy to encourage more sustainable transport methods. There will have to be a concerted move towards electric vehicles which will be driven by the need to improve air quality in towns and cities as well as meet Ireland's obligation under the EU renewable energy targets.

5.5 At present, Irish businesses are predominately reliant on the heavily-emitting road freight sector for transporting goods throughout the country. What measures could the Government, or businesses, employ to accelerate the decarbonisation of the Irish freight sector?

The current EU philosophy of reusing, repurposing and recycling existing assets rather than building new infrastructure must inform plans. This could for instance see a trend towards greater use of night time road freight deliveries if coupled with full or part electric propulsion system to reduce urban noise emissions. Increased utilisation of freight transport assets during both the day and night time may also occur with the perhaps inevitable drive towards autonomous vehicles. In such circumstances infrastructure to assist automated deliveries by land, and perhaps by air, may need consideration by engineers and companies.

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Background to Engineers Ireland

With over 23,000 members from every discipline of engineering, Engineers Ireland is the voice of the engineering profession in Ireland. Engineers Ireland was established in 1835 making us one of the oldest and largest professional bodies in the country. Members come from every discipline of engineering, and range from engineering students to fellows of the profession.

Our responsibility is to

- Promote knowledge of engineering
- Establish and maintain standards of professional engineering and engineering education
- Provide opportunities for Continuing Professional Development (CPD)
- Maintain standards of professional ethics and conduct
- Ensure that professional titles are granted to qualified candidates
- Act as the authoritative voice of the engineering profession in Ireland

Our Vision Statement

Engineers Ireland: a community of creative professionals delivering solutions for society.

Our Mission Statement

Engineers Ireland is an organisation that enables the engineering community to progress their professional development, make an impact on society and encourage and educate the future generations of engineers.