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Investing in a Just Transition.

Realising the potential of a low-carbon economy.

A *Just Transition* to an ecologically sustainable economy incorporates social justice for workers and for the communities most affected (as we discuss in our recent working paper). The Midlands, a region traditionally reliant on peat extraction and burning for electricity production and still reeling from the worst effects of the financial crisis, is a test case for policymakers. The loss of employment underway at Bord na Móna and the ESB as the region moves away from peat presents a significant challenge.

Recently at an Oireachtas Climate Action Committee the old adage 'you can't make an omelette without breaking eggs' was evoked in the context of the current situation facing Bord na Móna workers in the Midlands. Of course, in addition to simply breaking eggs, any half-decent omelette involves several ingredients. Sadly, the ingredients for any convincing plan for a post-peat Midlands or for the wider effort to decarbonise the Irish economy seem to be missing from the current recipe. Instead, the eggs have been broken and it looks like they will be left on the pan to burn.

The dismantling of traditionally publicly provided energy that has supported decent, unionised employment is a serious threat to the communities that have relied on them for generations. With no viable employment plan, the Midlands could go the way of former coal regions in the south of Wales and the Appalachian region of the US - high unemployment, precarious work, low wages and communities in decline.

Recently, 163 economists penned a letter to the Financial Times to argue for a 'serious injection of public investment' to bolster demand in the UK economy

and leverage the private finance which has been lacking over the past decade. Mario Draghi used his final weeks at the head of the ECB to advocate revisiting the fiscal rules and for an increase in state investment to counter stagnation in the Eurozone.

In the context of negative interest rates, low levels of private sector investment and impending environmental collapse, there is a compelling case for targeted state-led investment to drive a growth and employment enhancing transition to a low carbon economy. As private sector investment is lacking, demand-side measures from government will be central to kick starting green industry and green employment, and protecting communities reliant on environmentally unsustainable industries.

The latest data from Eurostat indicate that Ireland is the third highest emitter per capita in the EU28. At over 13 tonnes of emissions per person, Irish emissions were over 51 per cent above the EU28 average in 2017 and over double that of the best European performers. A recent report found Ireland to be 48th of 60 states in terms of climate action, and the worst European performer.

The Environmental Protection Agency (EPA) produces annual estimates of carbon emissions given enacted and proposed policies. The EPA project Ireland will miss its EU targets for 2020 and 2030, given the proposals in the National Development Plan (NDP). This will result in Ireland incurring significant fines of up to €600 million a year from the European Commission up to 2030. Maintaining the current strategy is fiscally irresponsible.

There are also long-term economic and opportunity costs to the country of falling further behind in digital, clean energy and transport technologies. An immediate shift to an entrepreneurial state approach, in which the state, as the single largest player in the Irish economy, drives investment in key areas, should provide certainty for other economic actors. Policymakers should see the gravity and urgency of the transition to a low-carbon economy as an opportunity to promote decent work and establish the conditions for broad-based, long term, sustainable development. Indeed, international bodies such as the International Labour Organisation (ILO) and the Organisation for Economic Co-operation and Development (OECD) have argued that a move to environmentally friendly production and consumption offers the potential of net gains in employment.

The more recent Climate Action Plan by the Department of Communications, Climate Action and the Environment is disappointing in its ambition. It has little chance of steering Ireland to meeting its agreed carbon reduction targets for 2020 or 2030, of realising potential employment gains, or of laying the basis for long-term sustainable development.

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The Stop Climate Chaos Coalition of 33 civil society organisations recently released a report critical of the government's 183-point plan. It argued the plan was short on detail regarding resource allocation and timelines and would likely be ineffective. The plan does not mention the role of social dialogue or trade unions, which are central to the ILO guidelines for implementing a Just Transition as part of the Paris Agreement, and to which Ireland is a signatory.

In its approach to energy reduction and renewable energy generation, the plan is a continuation of policies that tend to benefit middle to high-income households over poorer ones, that rely heavily on market mechanisms and that to date have been unsuccessful. The 'unlocking' of private investment to drive the transition has not been sufficient and with various grey clouds on the economic horizon (Brexit, slowdown in the Eurozone, trade wars etc.) it is unlikely to improve in the short to medium term.

A focus on 'nudging' households and firms to invest in energy efficiency through small grants and subsidies (e.g. for retrofitting houses or electric vehicles) has resulted in low take up rates, falling far short of already unambitious targets. The upfront costs of these investments mean that subsidies will only be available for middle to high-income households. Government funds made available through the Sustainable Energy Authority

of Ireland (SEAI) appear insufficient in the face of the emissions reductions required and current take up rates.

A pilot grant scheme for deep retrofitting was oversubscribed this year before the government suspended it due to the inadequate allocation of funding. Similarly, the modest budget of the grant scheme for electric vehicles will be exhausted by 2021. Any international economic shock would further constrain the ability of households and firms to find funds for long-term investments in energy reduction or renewables.

With electricity demand on the rise, reliance on private sector investment will likely see Ireland fail to meet renewable electricity targets going forward. This is especially worrying considering forecasts of additional capacity requirements. As much as 31 per cent of Ireland's electricity could be powering data centres by 2027, according to a recent report by Eirgrid and the government aims to have 950,000 electric vehicles on the road by 2030.

Emissions from electricity generation in Ireland fell steadily between 2005 and 2011, but have plateaued since then due to power demand rising faster in the economy than the capacity to produce renewable energy. Significantly, recent evidence found that the price per each unit of energy from utility-scale renewable electricity is now cheaper than natural gas and coal and continues to fall. It is likely that new-build renewables will outcompete even existing fossil fuel generation in most countries before 2030.

The National Mitigation Plan 2017 acknowledges that reaching carbon reduction targets requires increased investment in energy efficiency and renewable electricity technologies. The NDP also recognises that a long-term vision to a low-carbon economy will require fundamental societal transformation, and more immediately, the allocation of resources and sustained policy.

Results from a series of public opinion surveys over recent years show a near consensus in Ireland on the need for policies to fight climate change and the willingness to support those policies and others to facilitate a sustainable development path in a Just Transition to a low-carbon economy. The European Social Survey (2016), estimates that 66.2 per cent of Irish adults are in favour of 'subsidies for renewable energy to fight climate change', with only 17.5 per cent against.

A Special Eurobarometer report (2017; 459) on the attitudes of Europeans to climate policy also shows almost unanimous support among the Irish population of the need for strong government intervention to reduce carbon emissions. Eighty-eight per cent agreed that 'more public financial support should be given to the transition to clean energies, even if it means subsidies to fossil fuels are reduced' and 95 per cent that it's important that 'government provides support for improving energy efficiency' (retrofitting and electric cars).

Polling also indicates overwhelming majority support for the proposition that measures to fight climate change and reduce fossil fuel dependence (88 per cent), and that a reduction of fossil fuel imports into the EU would be economically beneficial (79 per cent). Eighty-seven per cent agreed 'that promoting EU expertise in new clean technologies to countries outside the EU can benefit the EU economically'.

More recently (May 2019), another special round of Eurobarometer polling (492) on attitudes towards EU energy policy showed near universal support for the principles of a Just Transition with 96 per cent of Irish respondents agreeing that it should be the EU's responsibility 'to address energy poverty and ensure a fair transition'.

Where opposition exists, it relates to the economic and social impacts they perceive to be associated with such a transition.

The citizens of Ireland don't appear to be inherently opposed to a transition away from carbon emitting activities. Where workers in those industries have their concerns about their futures addressed in a credible way, the evidence suggests that they support environmentally friendly policy. Where opposition exists, it relates to the economic and social impacts they perceive to be associated with such a transition.

The Irish government possesses an advantage over other states like the UK. The Irish public retain ownership of a number of semi-states in key areas that can be mobilised to achieve climate goals consistent with a Just transition.

The Electricity Service Board (ESB), Bord na Móna (BnM) and Córas Iompair Éireann (CIE) should be the vehicles through which government drives the transition to a low-carbon economy to minimise disruption to workers and communities. The state founded BnM and gave it a regional development and sustainable employment mandate for the Midlands. The state also owns CIE and the ESB. High union density in these organisations will help ease the transition for workers and support decent and secure employment in industries central to decarbonisation efforts.

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The economic arguments for the efficient use of energy and energy independence are clear. The unnecessary use of energy is a cost to Irish households, firms, government and the environment. Energy is an input cost in every product we produce and everything we consume, with the price varying significantly due to forces beyond our control.

The Republic of Ireland imported 66 per cent of its energy needs in 2017 in the form of fossil fuels, at a cost of €4.0 billion (a year of relatively low oil prices). The importation of energy means money flowing out of Ireland, money better spent in the local economy. Steady supply and self-reliance are conducive to economic growth and employment generation.

The most efficient way to lower reliance and emissions is not to consume the energy in the first place. The recent Future Jobs Ireland strategy paper has a specific focus on the creation of employment resilient to shocks. There are several areas in which government can promote carbon reduction, resilient employment and a resilient economy all at once.

Improving energy efficiency of the built environment is a stated central objective of Ireland's approach to meeting emissions targets and the most cost-effective way of meeting those targets. It is cheaper to save energy than it is to buy it. However, we often face a problem.

While long-term costs may be lower, in the short-term, the upfront costs of

these upgrades may be significant for households and firms. This mismatch between short and long-term costs implies that a body with sufficient resources and the required long-term perspective step in to address it. This is a role for government.

From an environmental, energy cost and health perspective, retrofitting programmes offer value for money and the net benefits to society as a whole, reducing costs to households and supporting a significant number of jobs. Every euro invested in retrofitting yields an estimated five euro in returns through reduced energy costs.

There is a potential of up to 32,000 jobs in residential retrofits given the right policies and appropriate funding. An appropriately supported retrofit programme represents a significant opportunity to improve cost of living, health and well-being, particularly for the 28 per cent of households suffering from energy poverty (2015).

Evidence suggests that improving the energy efficiency of the built environment would yield further returns for the state in the long-run through easing the burden on the health system by tackling factors that contribute to Chronic Obstructive Pulmonary Disease (10 per cent of all hospital admissions) and asthma; damp homes and air quality. This is particularly salient in an Irish context as Ireland has some of the highest rates of respiratory illness in the world.

The Better Homes Scheme, administered through the SEAI, has provided aid to over 200,000 households with the average grant at just over €1,000 between 2009 and 2018. Various grants exist for different energy saving measures such as wall cavity insulation (€400) or external wall insulation for a detached house (€6,000) to more extensive, deep retrofits.

Households participating in the Better Homes Scheme can expect to save an average of €450 annually and reduce their emissions by approximately 1.5 tonnes of CO_2 equivalent. A three-bed semi-detached house could save as much as €1,530 a year moving from a D2 to an A3 building energy rating (BER), reducing emissions by over 75 per cent.

As much as 98 per cent of the national stock may have an energy rating below A level and over half the housing stock has a rating of D1 or lower. Over one million older homes could require deep retrofits, and the SEAI estimates that

this could add €35 billion to the Irish economy up to 2050.

The government set a target of 45,000 retrofits per annum (to a minimum BER of 'B') in the NDP. In 2018, just 21,350 households received grants from SEAI. Unfortunately, just 120 homes were deep-retrofitted in 2017 and 139 in 2018 (a budget allocation of 4.7 million). In 2019, just over 300 households have applied and the government's allocation of €10 million is not sufficient to meet this demand.

In 2017, 41.5 per cent of Irish households could not afford to meet an unexpected expense of €1,000 (SILC 2017) making the upfront costs of deep retrofitting prohibitive for a significant portion of Irish households. For instance, the cost of an air to water heat-pump installation starts at €9,000 up to €13,000.

The Small and Medium Enterprise Programme also offers significant net benefits according to the SEAI along with average business savings of 10 per cent in the first year. However, €2 million announced for grants in 2019 for the Smart Lighting Scheme is a 33 per cent reduction on the funding allocated in 2018. To date only 256 SMEs have availed of the scheme.

Current commitments within the NDP include €4 billion in exchequer funds between 2018 and 2030. Realising the potential in the retrofit market as estimated by SEAI will require a significantly larger budget.

The approach of Germany in promoting activity in this area could provide a template for Ireland. Between 1995 and 2006, the number of jobs in the German construction industry fell by two-thirds. To tackle demand in the sector, the German government pursued an ambitious funding programme for deep retrofitting of the built environment. Employment in *Construction* increased by almost 15 per cent and the number of companies by almost 10 per cent.

The programme created and supported 200,000 jobs in 2014. While capital intensive the programme has clear returns. In 2011, KfW committed loans and grants of €2.9 billion for the retrofit of residential housing, inducing further investments of €3.9 billion, and employment for 52,000 people. For every euro spent, the German Federal Government received at least 3 Euros in tax income and savings.

In the short-term, this process should begin in Ireland with support for BnM and the ESB in implementing a state-led deep retrofit programme of the social and public building stock, inclusive of the roll out of heat pumps and roof solar paneling. This investment would have dual goals of decent employment and reducing the energy consumed by state owned buildings. Both bodies are in a position to enter this market directly or to support growth in this market indirectly.

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A public programme of deep retrofitting to social housing would be progressive, supporting the most vulnerable households through reducing the cost of living whilst improving health outcomes. However, funding available for local authorities for upgrades to the social housing stock was just 35 million in 2018. For the public building stock, investment in the short-term would reduce the burden on the state in the long run from electricity bills and could even create revenue streams for the likes of schools if appropriate compensation were offered for excess electricity.

Alongside a feed-in-tariff where providers pay households and firms for the excess electricity they produce, government could explore ownership models where the semi-states maintain ownership of the solar panels but households and firms rent them the roof space. This would address the upfront investment costs of solar panels for those that find them prohibitive. Private companies provided a similar scheme in the UK up until the scrapping of feed-in-tariffs in early 2019.

These retrofits should not be the sole preserve of wealthier individuals who can bear the upfront costs. Greater funding for higher subsidies will accelerate take up and incentivise deeper retrofits over relatively "shallow" ones, particularly for resource constrained individuals. This would entail an

increase in funding with larger grants available to lower income households alongside low or interest-free loans for other households. Scotland, for example has been successful in facilitating households in making energy improvements, first through grants and later through interest-free loans, including for solar panel installation. This would entail an increase in the existing €750 million budget in the Capital Development Plan.

Many BnM and ESB workers facing redundancies are in skilled trades. Of the approximately 500 job losses announced recently in BnM, approximately 200 are in management and administrative functions. The ESB already offer residential and business services in solar panel and heat pump installation.

At minimum short-term cost, BnM could reassign office workers to identify the skills gaps of BnM employees facing redundancies from the phase out of peat to retrain for retrofitting. BnM or the ESB (or both) could divert organisational capacity and human capital to establish an apprenticeship centre or facilitate upskilling elsewhere, and even hire additional skilled workers to meet demand. Support staff could also canvass and identify opportunities/requirements in the social and public housing stock. Manual and skilled trades workers could be redeployed and reskilled as necessary in interior, exterior and cavity insulation. Rather than forcing redundancies, BnM could offer peat workers a career progression path starting with retraining/apprenticeships and ending with a role in the state-led push to improve energy efficiency in the building stock where the ESB would install heat pumps and solar panels.

In the absence of direct entry to the market, BnM and the ESB are in a strong position to design and/or provide a retrofitting apprenticeship programme. In Belgium, for instance, the three main trade unions and employers work together in the development of training courses for construction workers for green buildings and retrofitting which government then provides. No such programme currently exists in Ireland. Both organisations are also in a position to conduct a canvassing programme to identify retrofitting needs, especially of public buildings, and provide information on costs, grants and subsidies to encourage take-up.

Approximately, 22.6 per cent of carbon-related emissions in Ireland come from transport. This is the single biggest sectoral contributor to energy related CO_2 emissions (37 per cent). Total greenhouse gas emissions from the sector grew by 139 per cent in Ireland between 1990 and 2016. The EPA project

emissions in the sector to continue to rise in the short run. Ireland is also among the EU members with the lowest share of renewables powering transport.

The strategy to tackle transport related emissions as set out in the Climate Action report is to promote the take up of personal electric vehicles. The government aim to have 950,000 EVs on Irish roads by 2030. The government hope to incentivise take-up with various grants and tax reliefs, with €200 million earmarked in the National Development plan. These grants mainly benefit middle to high-income households who can afford the initial investment in the new technology. Irish car owners registered just 1,233 electric vehicles in 2018. Nonetheless, at current rates of take up this budget will run out by 2021.

Given current rates of car ownership and projected population growth, the ESRI estimate that there will be 3 million private vehicles on our roads by 2050, one million more than today. While current plans envisage that electric vehicles will replace the current fleet, emissions reductions associated with the transition will depend on the rise in demand for electricity to power EV's as well as the carbon intensity of the electricity generated.

From an ecological perspective, there are more sustainable development paths for Ireland's transport system. For instance, 46 per cent of the lifetime emissions related to an EV is in its initial production. Public transport consumes half the energy per passenger-kilometre than private cars, and the efficiency gap is even higher during rush hour.

The additional vehicles will also place pressure on existing infrastructure and will likely increase commute times for citizens, with negative implications for society and living standards.

For society as a whole, switching the focus to developing public transport will reduce the cost of living. Although private vehicles create more costs than benefits and public transport more benefits than costs, explicit subsidies for public transport are a matter of political contestation, while the implicit subsidies for cars (the prices of personal vehicles and fuel do not reflect their social and environmental costs) are not.

Public transport also reduces social inequality, democratising access to mobility and by extension, to goods and services. This is central to promoting

equality of opportunity. A recent study also showed a strong relationship between upward mobility and the commuting times of different neighbourhoods in the US.

Government policy is driving growth in personalised transport with less than half (€8.6 billion) of the €19.7 billion budget of 'linking our cities and regions' scheme in Project 2040 for public transport, with the rest going towards roads infrastructure.

The Department of Transport spent €3.6 billion in 2008 compared to a budget of just €2 billion in 2018. Governments' contribution to public transport via the Public Service Obligation (PSO) was €308.9 million in 2008 compared to just €288 in 2018 and funding for the development of public transport infrastructure and the improvement of railway safety was less than 40 per cent the 2008 allocation in 2017 (€890 million compared to €355 million).

As a percentage of both revenue and GDP, this is a significant decrease and a clear statement about policy priorities. Government policy is driving growth in personalised transport with less than half (€8.6 billion) of the €19.7 billion budget of 'linking our cities and regions' scheme in Project 2040 for public transport, with the rest going towards roads infrastructure.

We should challenge the dominant paradigm of the need for balanced budgets in our public transport services. Policymakers should recognise the positive externalities of public transport for long-term economic growth, the environment and living standards. A recent study by a Montreal based think-tank found that making public transport in the city free would outweigh the costs and would be cheaper than subsidies already given to car drivers. Research in the US estimates that a billion dollars of annual spending on public transportation supports an average of 22,000 jobs (both direct and indirect).

Investment in Bus Éireann, Iarnrod Éireann and Dublin Bus to expand public transport would lower Ireland's carbon footprint, reduce long-term fossil fuel

consumption and dependence, and reduce the cost of living and commuting times at the same time as supporting decent employment through semi-states with high union density. The Irish government should expand public transport in and between Dublin, secondary cities and regional towns. Building up services outside of the capital would support regional spatial objectives and by extension, the wider economy, creating local employment, improving the quality of life for residents and reinvigorating communities.

Most households outside of Dublin have no viable option but to own a car. Developing the national public transport system, with particular attention given to secondary cities and regional centres would provide the option for many to reduce currently prohibitive transport costs and cut commuting times. Bus Éireann are also in the process of introducing the first generation of hybrid/electric buses. This is a positive step, which along with increased services will further reduce the carbon footprint of the state. The government should facilitate acceleration in the transition through increasing allocated funds.

In 2017, the total revenue take for CIE in tickets was €600 million. Government should immediately begin to extend free public transport at the point of use. Given total present cost, the cost of free provision appears comparatively modest even if free access leads to expanded use.

This is particularly true if we consider the fact that the current cost of private transport use does not reflect the true cost of the broader impacts to the environment. In the event that this leads to additional expenditure on public transport by the state, policymakers should consider the level of expenditure in the context of the wider societal benefit.

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Free provision could reduce commuting times in Irish cities overnight, reduce the fossil fuel import bill for the state, reduce the cost of living for some of the most vulnerable groups in society and reduce pollution from cars that negatively affect our health. Luxembourg has already declared that public transport will be free from next year and Kansas City in the United States has announced that the city will eliminate existing fares.

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Hitting reduction targets will involve a shift in Ireland's energy use profile. Where individuals, households and business use fossil fuels currently to heat buildings or to travel, electricity will have to replace these energy sources. As we have already outlined, this process will be much easier and more efficient if we retrofit homes for efficiency and expand electrified public transport provision. However, the reduction of emissions through electrification will only be effective with sufficient electricity from renewable sources.

Renewable generation, in which Irish semi-states have played an important role, has grown significantly in recent years, primarily driven by the advance of wind power within our network. However, despite some progress, the carbon intensity of Ireland's electricity production remains one of the highest in the EU, due mainly to the reliance on coal and peat. Greening our grid and expanding capacity to meet electrification needs is an essential aspect of any viable transition at the scale the climate challenge demands.

The state should support an acceleration of the expansion of renewable energy

production in areas where the ESB and BnM have already developed technological capacity-solar and wind energy. If current plans for electric vehicles and data centres are to go ahead, Ireland's electricity consumption is going to grow considerably and along with it, Ireland's energy demand and import bill. The 40 per cent target for renewable electricity generation by 2030 should be more ambitious.

Ireland has some of the best wind energy resources in the world and further scope exists to expand generation capacity substantially, given the right supports. The development of onshore wind has to-date contributed most to the process of decarbonising our electricity supply. That expansion, however, has generated local opposition in a number of cases. Semi-states could pursue other development models that tie the economic benefits of energy production to local communities. Growth in these enterprises require a supportive legislative environment and access to finance.

Examples are few in an Irish context, though the experience of the Templederry Community Windfarm could provide a template for further expansion. The success of the project was bolstered by an independent sustainable energy agency (Tipperary Energy Agency) founded by local authorities and Limerick I.T. The agency has driven several other green initiatives.

In Denmark, many areas operate community owned renewable generation projects, which support employment and raise revenue for members. These projects have proven sustainable and have helped Denmark achieve some of the highest rates of renewable energy production and energy security in the world.

Offshore wind represents an enormous resource for Ireland. According to the SEAI, offshore wind can achieve deployment of 30GW of power by 2050 compared to 11-16 GW from onshore sources. This additional capacity has the potential to generate enough electricity to exceed currently projected demand by 2030. A recent KPMG report states that Ireland will only meet additional renewable energy requirements to meet targets through the development of offshore wind. Despite this, Arklow Bank wind farm remains the sole operational offshore windfarm in the state.

Solar capacity also represents a major untapped source for additional renewable power in Ireland. The production of energy from utility-scale solar

plants has seen costs fall by 86 per cent since 2009 with one megawatt-hour of electricity now produced at around €45 for solar power. The equivalent cost for electricity production using coal is around €90.

Conditions in Ireland are, somewhat surprisingly, conducive to solar generation, especially towards the south and southeast of the island. ESB are in the initial stages of developing solar farms at scale and are currently developing a number of solar farms together with BnM. BnM and ESB with the direction and support of the State could accelerate the deployment of Solar PV at scale quickly relative to other technologies (as well as for micro generation).

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Despite these resources and the need to increase renewable generation, a number of impediments remain. The Irish government, like many states, uses feed-in tariffs to encourage renewable electricity generation. These schemes offer long-term contracts to producers with higher prices offered for their output to reflect the higher costs many firms face in the short term. These contracts are a strategy governments use to encourage investment that might otherwise be lacking due to uncertainties around future electricity prices.

However, gaps exist in the programme. Government has yet to publish details on a strategy to boost renewable electricity generation though the main pillar, the new Renewable Electricity Support Scheme (RESS), will replace the previous feed-in-tariff scheme (REFIT) with a competitive auction system

designed to attract international investment. This is a particular problem for proposed solar farms, with many sources citing delays in the new scheme and the lack of clarity of the future environment as an impediment to investment. A recent report from KPMG found that direct financial support (currently missing from the REFIT scheme) could return up to €3 to the Irish economy for every €1 spent with a potential of 10,900 jobs.

With solar feed-in-tariffs, special subsidies or reform of CAP at EU level, farmers would also have incentive to switch the use of some of their land to Solar PV production, especially in the South of the country. Co-location is also an option with some forms of agriculture; solar panel farms do not impede sheep grazing for instance. In the absence of a feed-in-tariff, government could investigate ownership models where the semi-states retain ownership of the technology and firms, households and public institutions rent out the location (e.g. their roofs) for solar panel installation.

> Renewable technologies are becoming more competitive but investment levels have not been sufficient in Ireland for the rapid expansion required to meet targets and put the state on a sustainable footing.

Capacity for micro-generation for households is constrained for similar reasons, and for reasons related to the upfront capital cost of projects. As we pointed out for retrofit programmes, most households cannot meet upfront costs of several thousand euro. Up-front grants could incentivise widespread take up as part of a retrofit scheme. This could reduce energy bills and pressure on the system as a whole.

Bord na Mona, in addition to its own land banks, could utilise particular advantages in the Midlands in this respect, including favourable levels of solar energy and the availability of additional cheap land relative to urban areas. This could present a considerable opportunity for Bord na Móna Powergen to invest in high value activities with considerable employment potential for existing workers and new employees.

To drive domestic green energy production, government should direct existing semi-states in the sector to redeploy the organisational capacity, human capital and business acumen at its disposal to this end.

Renewable technologies are becoming more competitive but investment levels have not been sufficient in Ireland for the rapid expansion required to meet targets and put the state on a sustainable footing. The price per unit of energy from utility-scale renewable electricity is now cheaper than natural gas and coal and continues to fall.

In addition, McKinsey forecast that new-build renewables will outcompete even existing fossil fuel generation in most countries before 2030. With state support, BnM and the ESB can accelerate the expansion of energy production through renewable technologies, supporting wages and communities whilst creating a long-term and steady return to the exchequer.

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Public intervention into the broader innovation system could allow Ireland to become a leader in a number of technologies and develop a competitive advantage. An *entrepreneurial state* could shape and create new markets in the green economy. Irish industrial policy should take a 'high road' approach to promote green growth and employment in high technology, productive industries that support high wages, competitiveness and communities.

With opportunities from natural resources of wind, sun and tidal energy and improving technologies, it should be the goal of every Irish government to lay the groundwork for Ireland to become a net energy exporter in the not-too-distant-future. With the right planning, government could direct investment to historically economically depressed regions and realize spatial development goals (e.g. promoting development outside of Dublin) as set out by successive governments, most recently in the National Development plan.

Western regions happen to have favourable natural conditions for many renewable technologies (offshore and onshore wind, tidal etc.), while solar technology could support decent employment in Southern and Eastern regions. The roll out of reliable and fast digital infrastructure could effectively link these areas to a vast pool of global knowledge and link domestic firms to

markets, bolstering development. Digital infrastructure could also reduce transport needs; as high speed internet reduces the necessity of commuting.

In terms of green energy production, Ireland should ramp up spending on research and development in offshore wind and tidal generation with a view to becoming a world leader in these technologies. In Ireland, cutbacks in third level education over recent years will depress future growth. Funds for R&D are also low relative to top performers in the EU. Germany for example, spent almost twice as much per inhabitant as Ireland in 2017 (€1,200 compared to €646). This was an increase of around 50 per cent on the figure in 2008, compared to just 10per cent over the same period in Ireland.

New or enhanced research centres in Ireland could be key nodes in a national innovation system with a key strategic goal to advance green technologies. Targeted investment in new courses/departments in Universities and Institutes of Technology around the country could lay the groundwork for Ireland to become a world leader in new technologies where the island has natural advantages.

> Funding commitments today in key areas are effectively investments in the future dynamism and competitiveness of the Irish economy, with clear and strong returns.

Tidal energy technology for example, although in its infancy could be an area where Ireland develops high-tech indigenous expertise, where one day the technology and knowhow become valuable Irish exports. Unfortunately, the third stage of an EU grant of €23 million for an ESB tidal project off the West coast in 2014 has been stalled and the organisation is currently looking to multinationals for investment. Appropriate levels of state funding for tidal research and development could echo the enormously successful strategy pursued in Denmark in wind power generation, where the country invested heavily in wind in the seventies. Irish wave and tidal resources are among the best in the world. Today the Danes specialise in wind turbine technology, are net energy exporters and manufacture and export wind turbines. Ireland

could emulate that example.

Funding commitments today in key areas are effectively investments in the future dynamism and competitiveness of the Irish economy, with clear and strong returns. A green industrial policy package tackling both the demand and supply-side, if coordinated correctly, would pay for itself many times over through decent, sustainable employment and through minimising costs related to over-reliance on foreign energy imports.

Though climate breakdown is arguably the most pressing environmental challenge facing us, it is not the only one. We face a global crisis of human influenced destabilisation of a number of key environmental systems. Addressing these challenges will involve changes in land-use and restoration of the natural environment. Much of this could, as in the case of tree planting, achieve multiple environmental goals, including absorbing carbon emissions.

The transition to an ecologically sustainable economy that respects the planet's boundaries will be a significant task for our society. Ensuring this transition is a just one will require coordination across a number of sectors. This shift need not diminish living standards for communities.

As ever, the only entity capable of acting to organise action at the required scale is the state. It is time that it leads the transition and commit the resources necessary to make it happen. It is time for a Green New Deal.