Power Transfer 2030:

Considering the **pace, democracy** and **diversity** of Ireland's electricity system decarbonisation

Joseph Curtin

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Executive Summary

Background

The deployment of wind energy has been the biggest success story of Ireland's decarbonisation thus far, with approximately 26% of electricity generated coming from this source in 2017. This is only the end of the beginning—a good foundation for the ultimate objective of complete power system decarbonisation. In this policy brief, we assess recent developments with a view to contributing to the debate on the power shift that will occur in the period to 2030.

Under current Government proposals, our key findings are:

The **pace** of power system decarbonisation is likely to be **slow** over the coming decade because of an over-emphasis on controlling the Public Service Obligation (PSO) Levy. The increase in PSO required for renewables has not resulted in escalating electricity bills up to now, as is often assumed, and a greater pace of renewables deployment could in fact result in lower electricity prices by 2030.

There is a **robust proposal** to promote **energy democracy**. Opportunities for local communities to collectively develop wind and solar PV projects, and for households to invest in rooftop solar PV, are likely to feature prominently. For citizen energy to work in practice, however, there is a need to promote awareness and up-skilling of communities, and for persistent policy attention over the next decade.

Technological diversity is likely to remain low, and the **dependence on on-shore wind** for power system decarbonisation is likely to persist in the immediate future.

Consensus and divergence

A consensus has emerged on many aspects of power system decarbonisation. It is widely accepted that electricity demand will grow to meet the needs of an expanding economy and that renewables will form the backbone of the future power system. Policymakers and experts also foresee the continued growth of on-shore wind, while off-shore wind, solar PV, interconnection and energy storage technologies all play a prominent role in most future scenarios, but to varying degrees.

Phasing out coal and peat is an immediate necessity, but gas generation is anticipated to remain a key feature of the power system over the coming decades. Meanwhile, the roll-out of smart meters will open avenues for citizens to engage more proactively and flexibly with their energy use. This report, however, focuses on three areas where views diverge:

Pace

How fast should renewables be deployed?

Democracy

To what extent should citizens and communities be involved in generating their own electricity?

Diversity

Which renewable technologies should be part of the future power mix?

Pace

There is a concern that the pace of power system decarbonisation will slacken in the period to 2030. Government propose that the new renewable support scheme would deliver a 40% penetration of renewables by 2030, albeit against a backdrop of growing demand. This is the same as Ireland's target for 2020, and significantly below the 45-75% penetration envisaged in EirGrid's scenarios, published in January 2017.

The low level of ambition reflects an exclusive focus on controlling increases to the PSO, the highly visible change that appears on electricity bills and features prominently in policy and public debate. However, it is important to recognise that the PSO is only one aspect of cost-effectiveness. Renewables have zero marginal cost and therefore drive down the wholesale price of electricity delivering savings for billpayers, which have largely cancelled out PSO increases to date.

On this basis, we conclude that the proposed pace of renewable deployment does not reflect a cost-effective policy mix. Modelling work undertaken suggests that a greater pace would not negatively impact bills. However, further research is required to determine the net impact on consumers' bills of more ambitious scenarios for renewables deployment, such as those outlined by EirGrid. It is vital for politicians, policymakers and citizens to differentiate between increases to the PSO and increases to consumers' bills.

Democracy

Up to now, communities and citizens have played a marginal role in the development of renewables projects in Ireland, while micro-generation of electricity is underdeveloped compared to most of our European partners. Government's proposals to promote energy democracy represents an important turning point.

Community projects

It is proposed that up to 20% of all new projects will be majority community-owned, and community developers will have access to grants, soft loans, and independent expertise. It should be noted, however, that communities do not yet have the knowhow to avail of these new opportunities. International experience illustrates that awareness and skills grow slowly, and that **policy persistence will be required over the coming decade if communities are to be successfully mobilised.** Communities may be slower to respond to the capacity that has been ring-fenced, and auctions may initially be undersubscribed, and **it will be important to roll this capacity over to future community auctions** in this scenario. Tax breaks and low interest loans would encourage higher levels of local investment.

The majority of renewable projects will continue to be developer-led, and it is welcome that developers will be required to make share offers to locals living within a 5km radius of new developments. The proposed radius, however, appears somewhat restrictive and options to ensure benefits are shared county-wide might be considered.

Micro-generation

The principle of market access for citizens is very important—power generated by households and businesses must be allowed access to the grid and receive a fair price.

It appears likely that Government will introduce a support scheme for rooftop solar PV in 2018. It is important that the proposed scheme is designed in a manner which minimises subsidies and distributional implications, creates an incentive for self-consumption of electricity, and ultimately sets the market on a sustainable pathway.

One option that meets these objectives is a feed-in tariff that combines a generation tariff for all electricity generated (at about 10 cent/kWh), combined with an export tariff (at about 6-7 cent/kWh) applying only to power exported to the grid. This would deliver a pay back of about 10 years for householders, and could be capped to control the PSO impact. The generation tariff could be phased out over time, paving the way to a fully market-driven approach to rooftop solar PV. Grants, by contrast, are a short-term fix, directly dependent on annual exchequer funding allocations.

Diversity

Renewable deployment to date has focused exclusively on on-shore wind, but there is a growing recognition of the need to promote greater technological diversity. However, is seems likely that solar energy, biomass and off-shore wind will have to compete against the cheapest technology—on-shore wind—for subsidies. This "technology-neutral" approach is aimed at minimising short-run costs and delivering cost-effectiveness for billpayers. The proposal is unlikely to deliver much diversity and is in line with EirGrid's "Slow Change" scenario, where "renewable generation is only in established technologies". In the long-term, technologies such as solar PV and off-shore wind are likely to play an important role in power system decarbonisation, and it is worth considering how these technologies can gain a foothold in the market.

1. The End of the Beginning

The decarbonisation of Ireland's energy system, and in particular its electricity sector, is at an important turning point. Up to now the transition to a more sustainable system has been mostly reliant on the deployment of one technology—wind turbines, in one place—on-shore, and at one scale—relatively large. The sector has been driven almost exclusively by a cadre of skilled professional developers, utilities and semi-state organisations. Only one wind farm of 3.9 MW is held in community ownership from a total installed wind capacity of approximately 3000 MW (although the recent announcement of a community wind farm in Wicklow is a notable development).[1]

The pace of deployment has been impressive: wind energy has become a key generation technology and supplied an estimated 26% of total electricity generated in Ireland in 2017.[2] This has been achieved at a relatively modest cost to bill-payers. The network and market, overseen by the Department of Communications, Climate Action and Environment(DCCAE), EirGrid, ESB Networks and the Commission for Regulation of Utilities (CRU) has evolved effectively to facilitate this rapid transition to non-synchronous renewables. As of 2017, the system can handle wind penetrations of up to 60%, an unparalleled technical achievement for an autarkic electricity system such as Ireland's, with low levels of interconnection with other grids.

While there are barriers and challenges to overcome, it is also clear that real progress has been made. A consensus has formed over this initial period of decarbonisation among the energy policymaking community, shared by a majority of citizens, that low-carbon transition in the power sector is a necessity, and that distributed renewables will be at the heart of this transition. One need only turn the clock back a decade to understand that this represents significant progress.

This is not an endpoint. In fact, we are only at the end of the beginning. Ireland has a national objective to achieve an 80% reduction in CO2 emissions by 2050, which is outlined in the National Policy Position on Climate Change. This requires a reduction in emissions from power generation of more than 80% by 2050. Assuming this decarbonisation objective is met, the power system of the future will look very different, and the key features of this future system will be determined by decisions taken in the near term, both nationally and at EU level.

Within this context, we explore the implications of recent policy developments for:

Pace: the speed of renewables deployment we are likely to see in the coming decade;

Democracy: the role for citizen and community involvement in the power generation; and

Diversity: the extent to which we are likely to see a portfolio of different technologies deployed.

Our objective is to identify challenges and barriers to power system decarbonisation, and to propose options for how they might be overcome.

1 http://wicklownews.net/2017/10/local-economy-community-and-environment-to-benefit-from-new-wind-farm-investment-of-e38-million/

2 Eearly estimate by Martin Howley, SEAI: https://www.linkedin.com/pulse/2017-wind-year-ireland-martin-howley/

2. Policy, economic and societal context

Ireland's electricity sector decarbonisation is part of the broader decarbonisation challenge. The key relevant EU and national targets for the transition to a low-carbon economy for 2020, 2030, 2050, 2100 are given in Table 1. As can be seen, the ultimate objective is complete power system decarbonisation. However, Ireland is not on target to meet 2020 and 2030 objectives, be they for renewables penetration or emissions reduction.

Table 1. Ireland's compliance objectives for 2020, 2030, 2050 and 2100

Objective	Time Period	Legal Nature	Estimated Shortfall
EU targets of 20% reduction in emissions from buildings, transport and agriculture[3]	2020	Legally binding	12-14 million tonnes CO2
EU targets of 16% share of renewables in energy consumption[4]	2020	Legally binding	3%
National target of 40% of power from renewables	2020	Component of legally binding target	Unclear
EU target of 39% reduction in emissions from buildings, transport and agriculture	2030	Will be legally binding	113 million tonnes[5]
National target of 80% reduction in energy emissions and "carbon neutrality" in agriculture[6]	2050	Not binding	N/A
National target of "zero or below" emissions by 2100 from energy system[7]	2100	Not binding	N/A

EPA data[8] demonstrates that Ireland's emissions are increasing in line with a recovering economy, and that the distance to meeting Ireland's target is again growing. IIEA research estimates non-compliance costs (for failing to achieve climate and renewable energy targets) for Government in the hundreds of millions by 2020, assuming no further actions were taken to reduce emissions.[9] While the compliance regime for the period to 2030 is currently under negotiation, if no further measures were taken, it has been estimated that compliance costs could potentially grow to billions by 2030.

3 EU Effort Sharing Decisions (No 406/2009/EC): http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2009.140.01.0136.01.ENG#page=12

4 EU Renewable Energy Directive (2009/28/EC): http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32009L0028

5 http://www.dccae.gov.ie/documents/National%20Mitigation%20Plan%202017.pdf

6 National Policy Position on Climate Change

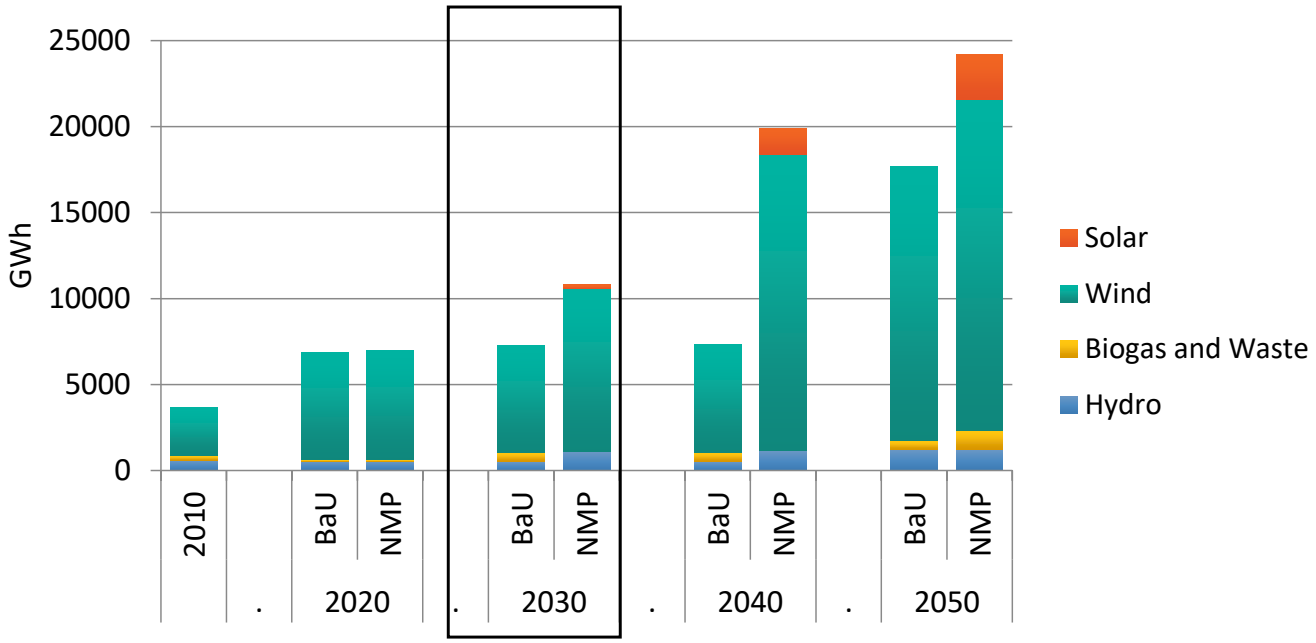
7 https://www.dccae.gov.ie/documents/Energy%20White%20Paper%20-%20Dec%202015.pdf

8 http://www.epa.ie/pubs/reports/air/airemissions/ghgprojections/EPA_2017_GHG_Emission_Projections_Summary_Report.pdf

9 http://www.iiea.com/blogosphere/how-much-of-irelands-fiscal-space-will-climate-inaction-consume

The cost-effectiveness of renewables is improving. An analysis undertaken by MaREI, UCC, suggests that in a Business as Usual scenario without targets, deployment of wind power grows in the period to 2050, and therefore that on-shore wind is approaching a point where it is competitive without subsidy. In another scenario where 2030 and 2050 objectives are met at least cost (NMP, Fig. 1), on-shore wind is deployed more rapidly and at greater magnitude, and several other renewables sources for electricity generation also grow in the period to 2030 and beyond to 2050, in particular solar PV (Fig. 1).

Figure 1. Renewable sources for power generation



Source: UCC-MaREI (2017)

The scenarios above consider the economic and technical constraints faced in deploying renewables in the power sector. While these are centrally important considerations, there are several other political, administrative and social reasons why Ireland is not on track to meet its objectives.[10] A key impediment to progress, which has come increasingly to the fore globally, is societal and local community buy-in. Individuals and communities may be slow to accept new technologies for various reasons, and addressing the issue of societal acceptability is therefore of crucial importance for low-carbon transition.[11]

A large majority of Irish citizens are in favour of greater levels of renewable energy. For example, according to a Eurobarometer survey, 88% of Irish citizens support greater levels of financial support for renewables technologies, and a remarkable 96% think that it is "important" or "very important" that Ireland should set targets to increase renewable energy by 2030.[12] Nevertheless, a "sea change in social support" for wind energy and related infrastructure has been identified by NESC and others (NESC, 2014). Local opposition has made deploying renewables increasingly challenging. A number of vocal and organised community groups have objected to the development and deployment of wind turbines in their locality, and they have been influential in persuading society and politics to take greater consideration of their

10 http://www.iiea.com/ftp/Publications/2017/IIEA_National%20Mitigaton%20Plan%20Assessment%20Report_2017.pdf

11 http://www.epa.ie/researchandeducation/research/researchpublications/researchreports/McInerney%20Curtin%20final%20web-1.pdf

12 https://ec.europa.eu/clima/sites/clima/files/support/docs/ie_climate_2017_en.pdf

concerns. An Bord Pleanála have rejected planning applications for a number of wind farms in the past number of years, often citing the impact on local communities.

As noted, community involvement in the deployment of renewables is low in Ireland compared to other jurisdictions. Research undertaken by Cork University Business School for the EPA (Text Box 1) illustrates that the ability to share local value is one of the key means of building social support for the low-carbon transition; and that citizens have been successfully mobilised as investors, both in countries with a long history of citizen investment (Germany and Denmark), but also in jurisdictions where this tradition is not evident (the UK and Ontario).

The Government's Energy White Paper (2015) places a considerable emphasis on "energy citizenship". It envisages transition from an energy system "that is almost exclusively Government and utility led, to one where citizens and communities will increasingly be participants", including by "examining shared ownership opportunities for renewable energy projects in local communities" (DCENR, 2015).

3. Consensus and divergence

If the power system is to be decarbonised in the long-term, these economic, technical, societal and political challenges must be addressed. However, while there are points of consensus about next steps, there are also important differences of opinion among policymakers, researchers, stakeholders and citizens. EirGrid's Tomorrow Energy Scenarios report[13], published in January 2017, is a very useful tool for thinking about possible futures and for identifying points of consensus, but also areas where views on future developments diverge. It describes four scenarios as follows:

1. **Slow Change:** Slow economic growth means that investment in new renewable generation is only in established technologies, and new technologies that could increase the use of renewable generation at household and large-scale levels are not adopted. Overall, there is little change in the way electricity is generated when compared to today.

2. **Steady Evolution:** Steady economic growth means that renewable electricity generation maintains a steady pace of growth. There is a considerable householder and business focus on energy efficiency enabled by smart metering, and electrification of heating and vehicles occurs gradually.

3. **Low-carbon Living:** High economic growth, strong public demand for climate action and resultant high carbon price galvanises rollout of rapid increase in renewables penetration, involving a portfolio of technologies.

4. **Consumer Action:** High economic growth results in high demand for rapid decarbonisation and greater consumer and business investment in low-carbon living, where consumers enthusiastically limit their energy use and self-generate electricity. There are a large number of community-led energy projects, micro-renewables and a rapid adoption of electric vehicles and heat pumps in the home.

It is clear from the EirGrid report that a key factor in determining the future is the rate of economic growth. The scenario planners assume that in higher growth futures, some of the social dividend from this growth would be used to promote low-carbon development, both by Government in terms of subsidies and incentives, but also at household and business levels, where greater levels of wealth result in higher levels of investment in low-carbon transition.

There is a consensus, reflected in all of EirGrid's scenarios, that renewable sources will form the backbone of the power system of the future. It is notable that in all of EirGrid's scenarios, coal and peat are phased out by 2030, the nuclear option is not touched upon, while carbon capture and storage (CCS) is considered unlikely to become "viable within the timeframe of our scenarios". The absence of CCS from all Eirgrid scenarios, however, does not mean that it can be discounted entirely at this point.[14] In all scenarios, gas generation remains an important feature of the electricity sector by 2040. On-shore wind continues to grow, while off-shore wind, solar PV, interconnection and energy storage technologies also appear in all scenarios, but to varying degrees. All scenarios also see a growth in electricity demand from economic growth, the proliferation of data centres and a trend toward greater electrification of heat and transport (from heat pumps and electric vehicles respectively). While none of these objectives are easily delivered, they represent a reasonably clear menu of "no regrets" technological options for policy to deliver in the coming years. There is a clear consensus that the power system of the future will be built largely around distributed renewables.

However, there also remains a considerable diversity and divergence of views along many axes, which reflect different perspectives on the future energy system among researchers, politicians, policymakers, civil servant, regulators and citizens. From exploring EirGrid's

13 http://www.eirgridgroup.com/site-files/library/EirGrid/EirGrid-Tomorrows-Energy-Scenarios-Report-2017.pdf

14 In a recent report ESB identified CCS as one possible option for emissions reduction: https://www.esb.ie/tns/press-centre/2017/2017/11/23/esb-and-iiea-gather-international-experts-to-set-out-a-vision-for-ireland-s-low-carbon-future

scenarios, we identify three key cleavages as follows:

Pace: the speed of renewables deployment we are likely to see in the coming decade;

Democracy: the role for citizen and community involvement in the power generation; and

Diversity: the extent to which we are likely to see a portfolio of different technologies deployed.

Table 2. Key cleavages in different scenarios

	1. Slow	2. Steady	1. Low-carbon	4. Consumer Action
Pace	Slow	Steady	Very Fast	Steady
Diversity	None	Some	A lot	Quite a lot
Democracy	Passive	Responsive	Very responsive	Prosumer

4. The Consultation

In late 2017, DCCAE opened a public consultation on a proposed new Renewable Electricity Support Scheme (RESS) to replace the existing feed-in tariff which has been closed to new applicants since 2015. Final decisions and preparation of the new scheme by Government are expected in 2018 with the new scheme anticipated to be in operation by the end of the year or by early 2019. At EU level, the Winter Package of 2016 will also have profound implications for the direction of Irish policy.

What can the consultation tell us about this future? The primary objective of the new RESS, according to DCCAE[15], is "to incentivise the introduction of sufficient renewable generation to deliver national and EU wide renewable energy and decarbonisation targets". Ancillary objectives identified by the Department include broadening and diversifying the renewable technology mix, enhancing security of energy supply, promoting economic development, and, importantly: "supporting community and citizen participation in the transition to a low-carbon economy". All of this must be achieved while delivering "value for money" for the consumer. Striking a balance between these objectives, which are in some cases conflicting, is the key challenge that Government faces. This proposal and the consultation were open to the public between September and November 2017.

It is clear from the proposal that feed-in tariffs, which support the current phase of wind deployment will be replaced by a competitive bidding process via auctions, under a floating feed-in premium (FIP), which is a subsidy based on the difference between the strike price and the reference market price. In other words, project developers will be exposed to market signals and to fluctuations in electricity process, which is not the case under the current system.

eme consultation can be seen as an attempt to resolve some of the cleavages outlined above, and to determine a path forward in the period to 2030 that is consistent with long-term decarbonisation. The key question we explore below is what these recent developments tell us about the energy pathway we are on: what are the implications for the likely pace, diversity and democracy of power system decarbonisation?

15 http://www.dccae.gov.ie/en-ie/energy/consultations/Documents/28/consultations/Renewable%20Electricity%20Support%20Scheme%20-%20Public%20Consultation.pdf

5. Pace

The pace of renewables deployment has been a challenge for Ireland. The key problem has been the slow deployment of renewables in the heat and transport sectors. Progress in the electricity sector has been quicker (approximately a third of electricity was generated by renewables in 2017 according to early estimates, with 26% coming from on-shore wind),[16] although it remains to be seen if the 40% renewable electricity target will be delivered by 2020.

Looking forward to 2030, the pace of renewables deployment is a key point of contention. The DCCAE consultation proposes a target of 40% renewable electricity by 2030, which "is in effect a continuation of the 2020 40% RES-E target extended out to 2030". It should be noted that according to EirGrid's Generation Capacity Statement (GCS) 2017-2026, annual electricity demand in Ireland in 2030 will be 29% higher than the 2016 figure (accounting for economic growth, increase in data centres etc.). Meeting the 40% target would therefore require an increased penetration of renewables against this backdrop of growing demand. When compared to EirGrid's Scenarios, however, the pace of deployment appears conservative. Even in the "Slow Change" scenario, where low economic growth is assumed, Ireland achieves a renewable penetration of 47% by 2030, while in the most optimistic scenario, a penetration of 75% is achieved.[17]

The PSO impact (the charge that consumers pay on their bill to subsidise renewables) of 45%, 50% and 55% renewable penetration by 2030 was examined in the Consultation. According to the analysis, compared to the 40% baseline, at least double the PSO impact would be required to achieve the 45% target; at least three times the PSO impact would be required to achieve the 50% target; and at least six times the PSO impact would be required to achieve a 55% target level.

Policy is therefore largely determined on the potential impact of different levels of ambition on the PSO. This is understandable to the extent that the PSO is a very visible change on user bills. In October 2017, for example, it increased from €5.90 to €7.69 per month. These highly visible increases are projected to continue into the future in line with greater overall levels of renewables, and are often discussed by the media. However, the PSO-impact is the incorrect yardstick to assess policy because it is not what determines consumers' bills, and it should not be confused with overall cost-effectiveness. SEAI and EriGrid research has demonstrated that renewables reduce the wholesale price of electricity. Thus far, these interactions (increased PSOs and reduced wholesale prices) have largely cancelled each other out, meaning that electricity bills have remained constant, or, put another way, renewables are cost-effective.[18] Modelling work undertaken by the Renewable Energy Consumers and Producers (RECAP) suggests that greater levels of renewables deployment would lead to lower cost of electricity for consumers, even after the increased PSO cost is taken into account.[19]

The problem is that more renewables drive PSO increases in two ways. The first is obvious: more feed-in tariff contracts necessarily increase the PSO. The second is more complex: because renewables have zero marginal cost of production, they drive down the wholesale price of electricity. The PSO is designed to make up the difference between the wholesale price and the pre-agreed strike price, so lower wholesale prices results in an increased PSO (but not an increase in bills). Unfortunately, when these factors interact with politics, the priority becomes to minimise the PSO impact, and this ultimately results in counteracting renewable ambition in a manner that is not in the interests of billpayers.

On this basis, when it comes to pace, we can see that Ireland is currently on a less ambitious decarbonisation pathway compared to

16 https://www.linkedin.com/pulse/2017-wind-year-ireland-martin-howley/

17 It should be noted that Power purchase agreements between generators and data centres could circumvent the RESS and continue to renewables growth beyond 40% by 2030, but it remains to be seen if these will play a significant role.

18 https://www.seai.ie/resources/publications/Impact-of-Wind-Generation-on-Wholesale-Electricity-Costs-in-2011.pdf

19 http://www.irishsolarenergy.org/news-docs/RECAP_De-carbonisation%20of%20electricity%20in%20Ireland%20-%20A%20new%20roadmap.pdf

the four EirGrid scenarios. This is based around a concern over the PSO impact, which is often mistakenly associated with increases in consumers' bills. This is an unfortunate association in the minds of the public, politicians and policymakers.

On this basis, we make the following observations:

It is important to differentiate between increases to the PSO and increases in consumers' bills

Previous research has indicated that PSO increases are cancelled out by reduced wholesale electricity costs, and there is a need to update the 2011 EirGrid/SEAI study

Policy development that gives greater emphasis to net cost-effectiveness may result in greater levels of renewable penetration by 2030.

6. Democracy

The consultation offers conflicting messages on the theme of democracy. On the one hand, it is clear that a turning point has been reached in terms of promoting community involvement in energy projects, for both developer-led and community-led projects. Indeed the "baseline" scenario in the consultation is described as "least-cost + community", indicating that a community approach is now accepted into the mainstream for the first time. In a decisive break from the past, community participation is identified as a "cornerstone" of the new scheme via both "community-led projects" and "developer led community projects". On the other hand, self-consumption (through the deployment by householders of solar PV) remains a more contentious topic. We explore each of these issues separately below.

Community-led projects

Community involvement in electricity generation has been minimal in Ireland. It is generally assumed that ensuring citizen inclusion increases systems costs. However, citizen involvement can also improve cost-effectiveness by opening up optimal sites for developments that could otherwise not be accessed, and by mobilising actors to devote time and effort on a voluntary basis (IEA-RETD, 2016; Nelson et al., 2016; Rijpens et al., 2013). This could be a particularly important consideration in Ireland. If on-shore wind is seen to have a positive economic impact for economically marginalised communities along the Western seaboard, this could allow for further deployment on optimal sites, reducing the requirement for deployment of more expensive technologies. Community and citizen involvement could therefore be socially and politically necessary, as well as economically optimal.

The proposal on community energy, currently under consultation, could be ground-breaking and has been developed in line with international best practice for overcoming financial and non-financial barriers to mobilising community investment (Text Box 1). Community-led projects are defined in the consultation as those where community investors have over 50% equity stake in the project (including projects that are 100% community owned). It is proposed that 10-20% of the total capacity (of new MWhs) of each auction is ring-fenced for these projects. This is an important and decisive proposal, in line with international best practice. However, we note that where capacity set asides like these have been brought forward (for example, in Ontario) community groups have been slow to respond. Developing a renewable project is technically and financially demanding, as is responding to an auction. It is important to understand that the proportion of the auction capacity set aside for community-led projects may initially therefore be undersubscribed.

It may therefore be worth providing that the proportion of the auction capacity available for community-led projects would be rolled over (i.e. the capacity would remain in the "community pot"), as this would send a clear long-term signal to the market. A higher auction price in the community pot would attract increased interest from communities and professional developers alike in future auctions. Under this proposed design, one could envisage professional developers playing a proactive role in the market place partnering in community-let projects to get them over the line. Some professional developers may see the benefit in asking community groups to lead on projects they already have in the pipeline. The key point here is that Government must persist with a community pot even if this is initially undersubscribed, and a clear statement of intent to this effect at the outset would be welcome.

Several other measures are proposed which illustrate that Government is very serious about community-led projects. It is proposed that a grant of €20,000 would be available to cover early stage project costs, where risk is highest. Above this level, soft loans may be available to cover early-stage project costs. These proposals are in line with international best practice in Denmark, the UK and Germany. There are encouraging signs in this consultation that Government will play a central role in upskilling communities. For example, Government proposes to establish a "trusted intermediary", to provide expert advice to communities and to facilitate grant applications etc.

Government also seems ready to address a long-standing bugbear of community renewable projects: grid access. It is proposed, on the one hand, that planning approval, grid connection, bid bonds/penalties and community participation criteria should be met before

projects can apply for support under the new RESS. Community-led projects would be disadvantaged by these criteria and this would form a major barrier to community projects. It is therefore also proposed that national policy would support facilitation of grid access for community-led schemes, and "the Commission for Energy Regulation (CER) [now the Commission for Regulation of Utilities] will set the regulatory policy in this regard".

The key risk associated with the proposal for community-led projects is that they will take time to get over the line. A number of proposals are considered to address this issue effectively, but if auction set asides were rolled over, this risk would be managed. We see every sign that this proposal places Ireland on a pathway to a considerably democratised energy future.

On this basis, we make the following observations:

The proposal to promote community energy is in line with international best practice
Promoting community ownership of renewables is a medium-term project and requires consistent policy support over the coming decade
If unused community-led capacity were rolled over to future community auctions, this would provide a strong long-term signal to community developers.

Text Box 1: International Best Practice in Overcoming Barriers to Community Energy (quoted from executive summary of McInerney and Curtin (2017), funded and published by the EPA)[20]

Findings from case studies and survey work undertaken by Cork University Business School suggest that smaller scale projects (circa 5 MW) could be fully community owned, but that co-development with professional project developers may be necessary for citizen involvement in larger projects. Key findings that emerge from international best practice are as follows:

Effectiveness of financial incentives: Feed-in tariffs (FiTs), feed in premiums (FiPs), quota schemes, grants and tax incentives have all been effectively deployed to mobilise greater levels of investment from local citizens. Soft loans have been less successful as a stand-alone instrument.

Instrument design over instrument choice: FiTs emerge as a crucial success factor in mobilising local citizen in many jurisdictions. However, it is not instrument choice per se which is the key consideration, but rather the specific design characteristics of the chosen instrument. Where FiTs have been successful, they have incorporated design features to make them more attractive to citizen investors, such as differentiation according to project size, adders, contract set asides and mandates. Furthermore, in some cases, FiPs and quota-based schemes have also been successfully designed with citizen investors in mind.

Early-stage grant supports: Introducing incentives to overcome risks at the early (feasibility and development) stages is of

20 http://www.epa.ie/researchandeducation/research/researchpublications/researchreports/McInerney%20Curtin%20final%20web-1.pdf

crucial importance if local citizens are to be mobilised. Grants have been successfully introduced to address early-stage barriers, including in Denmark, where construction costs were initially part grant-aided. Grant programmes require ongoing monitoring and assessment so that pitfalls with using this instrument are avoided.

Soft loans: In combination with other incentives, the availability of soft loans (KfW in Germany, and the 'ethical' Faelleskassen Bank in Denmark) was an important factor in promoting citizen investment. Additionally, non-recourse loans have been used effectively to address early stage barriers to citizen investment in the UK and Ontario.

Migrating to market-based incentives: Time bound grants can be important for pilot projects, and therefore perform an important function in immature markets. The objective should be to transition to market-based supports over time. **Tax incentives:** Favourable tax treatment of income from renewable energy projects emerges as important for the business case of many community renewable energy projects. The GmbH & Co. KG structure in Germany and guild structure in Denmark significantly increased post-tax returns to citizen investors.

Agency support for technical expertise: Incentives should be introduced as part of policy packages, with ancillary measures addressing lack of familiarity with the technology, technology immaturity, or low awareness of the incentive programme itself. Informational, advisory and technical support services will be required to support citizen investors, and are best provided through an independent and trusted intermediary, e.g. CARES in Scotland.

Planning and grid access: Streamlined planning, FiT application and grid access procedures were an essential enabler of rapid deployment of citizen renewable energy, particularly Germany. If these conditions are not present, grid access can act as a key barrier to community and citizen participation.

Mandates: mandating a certain percentage of citizen or community ownership has been effective in mobilising community investment in Ontario and Denmark, whereas voluntary targets were less effective in the UK.

Concerted policy attention: Countries that do not have a tradition of citizen financial participation (such as UK or Ontario) have particular challenges in mobilising investment form these non-traditional investors. It takes time to seed awareness and build the capacities of local actors, requiring persistent policy focus over time.

Typical business models: the design and choice of financial incentives can influence the types of business models that emerge as vehicles for community and citizen participation. In many jurisdictions, typical business models have emerged for both developer- and community-led projects, reducing transaction costs and increasing cost-effectiveness.

Developer-led projects

In a sign of how central communities are to the new proposal, developer-led projects (where community investors have less than 50% equity stake in the project) will also have a very strong community component. The Department argues that the most efficient primary policy for supporting community ownership is an obligation for developers to offer the community an opportunity to invest in their project. This would mean that some portion of all new renewable electricity projects supported by the RESS would be made available for community investment – though this might not necessarily involve an "equity approach" (revenue share and loan note options are cited as alternatives).

In order to receive supports under the new RESS, it is proposed that all projects above a certain minimum size (e.g. >500kW) must offer the local community an opportunity to invest in the project. It is proposed that 20% of the project must be offered to the local community. It is also proposed, however, that once an offer is made in keeping with (yet undetermined guidelines or criteria) that the project could proceed. It is suggested that the share offer would be restricted to within 5km of a particular development.

There is a danger, however, that uptake from communities would be low. It is likely that some form of additional measures would be required to encourage local investment. Several means of facilitating higher investment were reviewed in the Consultation, including tax incentives. Making investment in new companies/co-ops tax efficient would appear to be particularly important, and the availability of soft loans to local citizens might also be considered.

Within the context of Ireland's low population density, a case can be made for a share offer beyond the proposed 5km distance, perhaps within a particular county? In the case an unfulfilled offer, a national register and online portal could be established so that all Irish citizens, urban and rural, would have an opportunity to invest in a sustainable future.

If these issues are addressed, and particularly if tax breaks or low interest loans are made available for investors, Ireland could be on Eirgrid's "consumer action" pathway in respect of "democracy".

On this basis, we make the following observations:

Developers might be required to make share offers beyond the proposed 5km indicative circumference proposed in order to ensure value is shared county-wide
Tax breaks and low interest loans would encourage greater levels of local investment

Micro-generation

When it comes to supporting micro-generation, the consultation takes the view that that it should not be supported under the RESS, based on the following observations:

- Micro-generation is expensive compared larger scale (based on the DCCAE analysis, rooftop solar PV is €100/MWh more expensive than large and medium solar PV in 2020 on LCOE basis);
- Market and network reform is required before microgeneration tariffs are introduced; and
- Community and citizen Participation ambitions are being strongly supported via the main RESS through both investment opportunities and benefit payments

At a subsequent workshop organised by SEAI, the consensus view was that citizens and businesses should indeed have access to the grid. There was a high degree of consensus among civil servants, policymakers, energy experts and citizens that some form of incentive scheme was required to support micro-generation, notwithstanding the concerns identified in the consultation document itself. It seems likely that the incentive approach will be developed outside of the main RESS in a parallel process., but it remains to be seen what type of incentive scheme is ultimately introduced and at what scale. This somewhat confusing approach towards micro-generation perhaps reflects key cleavages across society, policy making and industry on the extent to which citizens should be allowed market access for self-

generated electricity and the potential implications for the energy system.

We view the principle of market access for citizens is an important one—just as in any market, monopoly access to the network or market cannot be justified in light of technological developments, and power generated by households and businesses must be allowed access to the grid and receive a market price. However, citizen access undoubtedly opens up a number of regulatory and technical challenges that must be addressed.

Furthermore, Ireland's low population density needs also to be considered. The share offer might be widened beyond the proposed 5km distance after an initial offer, perhaps within the county. Finally, in the case an unfulfilled offer, a national register should be established so that there is a possibility for all Irish citizens, urban and rural, to invest if the offer is not taken up within a particular county. An online portal might be developed where offers could be made. If these issues are addressed, and particularly if tax breaks or low interest loans are made available for investors, in this respect Ireland would be on a "consumer action" scenario pathway.

Within the context of the concerns expressed by DCCAE, and indeed citizens who demand access to the grid, previous IIEA research proposed a support scheme described in Text Box 2 below, underpinned by the preferred "Market Value" approach in the consultation. The design is based on the principle that householders should be able to export unused electricity to the grid at roughly the wholesale price of electricity (market value), which is important because it sets the market on a sustainable direction in the long-term. Grants have the opposite impact. To make rooftop PV economically attractive to householders, however, an additional generation subsidy would initially be required so that householders would receive an attractive (10-year) simple payback on their investment.

In order to address overall exchequer or PSO costs, we find that a cap on the level of micro-generation supported through by Government incentive in the period to 2030 would be effective. We also note that the subsidy required would not be as high as the LCOE analysis presented in the consultation suggests. While it is true that larger schemes offer economies of scale and lower transaction costs (as illustrated by the technical analysis published by DCCAE), householders save electricity which would otherwise be paid for at the rate of the peak electricity tariff for residential customers. This reduces the requirement for Government subsidy.

Text Box 2. Results from IIEA analysis on micro-generation

The IIEA estimates that a support scheme for rooftop solar combining a generation tariff (for all electricity generated) of 10 cent/kWh, along with an export tariff of approximately 6.6 cent/kWh would provide an attractive proposition for citizens. The export tariff would in effect take the form of a requirement on suppliers to offer customers the opportunity to sell back excess electricity to the market at a rate roughly equivalent to the wholesale price of electricity. If the scheme were capped at 50,000 homes with 3Kw systems by 2030, the cost to the PSO would be €13.85 million per annum, a small fraction of the current PSO. With a generation tariff of 10 cent/kWh, the scheme would offer roughly a 10-year simple payback for the householder. Finally, with this design, the export tariff is set at half the rate of the peak electricity tariff for households (13.5 -16 cent/kWh), creating a marginal incentive to consume domestically by investing in storage and other technologies as them become cost-effective.

The overall systems costs and benefits and distributional implications of supporting self-generation are contested. There may well be costs imposed upon the system, however these must be balanced against systems benefits. Solar PV is generated close to where it is consumed,

21 Supported by Friends of the Earth and NTR Foundation, and previously published by Friends of the Earth: LINK

and widespread rooftop solar PV can have a large impact on the electricity demand which is 'served' by the transmission system. According to EirGrid, distributed solar PV could reduce peak system demand by over 500 MW between 11:00 a.m. and 5:00 p.m. in the 2030 Consumer Action scenario during the summer.[22] In the future, households will have various storage solutions which can also potentially be of benefit to the optimal grid functioning. Costs of battery storage, for example, continue to fall at 20% per annum – Aurora Energy Research find that battery storage capacity could reach up to 8GW in the UK by 2030. Meanwhile blockchain could also allow for the development of platforms for peer-to-peer renewable energy trade. Consumers may soon be able to buy, sell or exchange renewable energy with each other using tokens or tradable digital assets representing a certain quantity of energy production. These are potentially highly disruptive technological developments that should not be ignored.

We note in jurisdictions where a full analysis of systems costs has been undertaken, such as in the UK, findings suggest that low-carbon generation located close to people's homes and businesses, combined with new technologies such as storage, could result in savings for consumers on their bills of up to £40bn over the coming decades.[23] While ex ante studies can assist in determining these impacts, it is only with a certain level of PV deployment that these questions can be answered.

A final objection to incentivising micro-generation is that this could cross-subsidise rich households. It is true that government subsidies, by their very nature, have distributional impacts. The PSO as currently structured requires all billpayers to subsidise professional developers, utilities and private investors to build wind power. The PSO also subsidises generation from peat, which is the most environmentally damaging fossil fuel. Because these costs are added as a fixed charge on all users' bills, they are regressive. It is important to point out that this logic applies to the structure of the PSO as currently designed, not exclusively to micro-generation.

Furthermore, there is unclear evidence from other jurisdictions that poor households subsidise rich households. Analysis of a Queensland scheme demonstrates that uptake of rooftop solar has in fact been highest in low-income areas among low-income households.[24] Similarly, in the United States, the average household income of an investor in rooftop solar PV in the US was $57,000, only slightly above the national household income average.[25] While no data is available for Irish households as there is no support scheme in place, we know that Irish grant schemes for home insulation have been popular with a wide demographic, from low- to high-income households.[26]

The full distributional implications, like the systems costs, are unknown at this stage, and require further consideration. At low levels of self-generation, systems and distributional impacts are likely to be unimportant.

On this basis, we make the following observations:

A support scheme could be designed for micro-generation combining an export and generation tariff which minimises exchequer costs

The objective should be to put the market for micro-generation on a sustainable long-term footing, rather than a short-term fix (as would be provided by grants)

Systems cost and distributional implications from micro-generation are unknown require further research

22 http://www.eirgridgroup.com/site-files/library/EirGrid/EirGrid-Tomorrows-Energy-Scenarios-Report-2017.pdf

23 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/568982/An_analysis_of_electricity_flexibility_for_Great_Britain.pdf

24 http://reneweconomy.com.au/rooftop-solar-uptake-still-highest-in-low-income-australia-63263/

25 https://www.google.com/search?q=average+household+income+usa&ie=utf-8&oe=utf-8&aq=t

26 http://www.seai.ie/News_Events/Press_Releases/Bringing_Energy_Home_Report.pdf

7.Diversity

A technical assessment informing the consultation found that a number of renewable technologies have a broadly similar range of costs. On the basis, it was concluded that several renewable technologies might be able to compete against each other. The Department is therefore proposing a technology-neutral auctions approach, supported by a Floating Feed-in Premium. Projects with similar viability gaps would therefore have to compete in auctions with success being based entirely on bid price. It seems, therefore, that Government is leaning to a technology-neutral approach, where there will be "a Principal Category, encompassing all viable technology options".

This would clearly be the most cost-effective approach in the short-term because the cheapest technology/project would win the auction, whereas a technology-specific approach (where there are separate categories for technologies such as solar PV), would likely increase renewable diversity at significant scale, but would likely be more expensive than a technology-neutral approach. When it comes to supporting the deployment of more PV and off-shore wind (compared to on-shore wind), the concern is clearly therefore that this could lead to higher PSO costs (although there is considerable uncertainty around the prices that these technologies might be able to bid in at).

This approach is likely to result in greater deployment of on-shore wind, whereas a technology-specific approach (where there are separate categories for technologies such as solar PV), could deliver greater diversity at significant scale. The consultation acknowledges that for alternatives to wind, "the exact scale at which they could participate successfully is unknown at this stage". In order to soften this decision for the developers of other renewable technologies, the Consultation suggests that a number of auction categories can be amended year on year, based on a review of previous auction results, a 'look-back' at viability gaps.

If Ireland is serious about total power system decarbonisation by 2050, it is clear that a portfolio of technologies will be required. Focusing on least-cost in the immediate term may not be the same as minimising average costs over the coming decades. Solar PV, in particular, is highly likely to be part of a least-cost power system in 2050, and has already experienced rapid cost decreases around the world. This has happened in markets that are similar to Ireland's, in particular in the UK, where Solar PV is projected to be among the first renewable technologies to achieve "grid parity",[27] and is projected to be the least-cost electricity generation technology in the coming five or so years.[28] UK energy system planners are projecting the deployment of 10GW of small-scale subsidy-free solar by 2030.[29]

The uncertainty faced by commercial-scale solar PV developers under the proposed technology neutral approach could negatively affect the development of rooftop solar PV for households and businesses. This is because, according to EirGrid, it is likely that utility-scale solar would need to develop first in order to develop a rooftop solar PV sector (which is an off-shoot), at least in the absence of a specific incentive scheme for micro-generation (discussed above). Opportunities for commercial solar would build up a skilled workforce and decrease the capital costs of rooftop solar PV. In the medium term, therefore, it is worth considering how solar PV and off-shore wind can get a foothold in the market, to meet the stated objective of some diversification away from on-shore wind.

When it comes to diversity, it seems that the current approach is in line with the slow change scenario, where "renewable generation is only in established technologies". Because the overall systems costs of increasing the penetration of solar PV are not fully understood, an alternative approach would be to support modest technology-specific auctions for Solar PV and perhaps for off-shore wind to allow for gathering of market information. While on-shore wind will remain the dominant technology, a technology-specific approach would ensure that these alternative technologies achieve some foothold in the Irish market, and would promote the development of a qualified cadre

27 Grid parity occurs when a new electricity source can generate power at a levelized cost of electricity (LCOE) that is less than or equal to the price of purchasing power from the electricity grid.

28 http://www.r-e-a.net/upload/uk-solar-beyond-subsidy-the-transition.pdf

29 https://www.gov.uk/government/publications/updated-energy-and-emissions-projections-2016

of project developers and technology experts. This would place Ireland in a position to benefit from future technology cost reductions in these technologies over the coming decades.

On this basis, we make the following observation:

Consider how the longer-term requirement for complete power system decarbonisation can be balanced with short-run cost considerations

8. Conclusion

What do recent developments tell us about Ireland's energy future we are heading for? In this analysis, we argue that there is a high degree of consensus around several propositions. There is likely to be strong growth in electricity demand from a vibrant economy, the proliferation of data centres and from a trend toward greater electrification of heat and transport. The future power system will increasingly be based around decentralised renewables, and interconnection to other power markets. Coal and peat are likely to be phased out in the near term, although gas generation remains an important feature of the electricity sector by 2040 in all scenarios. It is also clear from the RESS consultation that Ireland is on the pathway to an increasingly market driven support mechanism. These points of convergence represent a reasonably clear menu of "no regrets" technological options for policy to deliver in the coming years.

However, there are also key cleavages and uncertainties to consider. Specifically, how fast and diverse should the deployment of renewables be, and is a more democratic future power system likely? Our analysis of recent policy developments suggests that a slow growth pathway with low technological diversity is likely over the coming decade. With respect to democracy, a clear turning point has been reached on community involvement: a very robust proposal to address barriers to investment by local communities is on the table. Micro-generation is subject to greater uncertainty, however, some form of support will likely be introduced in 2018 or early 2019. It should be noted, however, that these prognoses are basis of policy currently under formulation - final decisions have not yet been taken.

Predicting the future is highly challenging. However, we believe that there is a risk, and with it an opportunity, that solar PV and storage costs will continue to decrease exponentially, leading to a radically altered energy system in the future. Blockchain could also allow for the development of platforms for peer-to-peer renewable energy trade. These are highly disruptive technologies, whose potential cannot necessarily be predicated, nor should they be ignored. Successful societies are those that manage creative destruction in the most efficient manner, seeking to take advantage of new opportunities as they arise, not those that attempt to insulate themselves from the winds of change. On this basis, energy systems planners might consider preparing for a flexible, modern, networked grid by removing barriers to micro-generation and smart storage technologies over time, by enabling smart homes and businesses, and by encouraging markets to work for flexibility.

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The Institute of International and European Affairs,

8 North Great Georges Street, Dublin 1, Ireland

T: +353-1-8746756 F: +353-1-8786880

E: reception@iiea.com W: www. iiea.com