The Speed of Light

The role of solar power in Ireland's energy transition

An AFRY report to the Irish Solar Energy Association

ISEA
Irish Solar Energy Association

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Forget Net Zero, it's cumulative emissions in the atmosphere that drive climate change

"For temperature to stabilize, CO2 emissions need to reach net zero" [1]

"…there is a near-linear relationship between cumulative anthropogenic CO2 emissions and the global warming they cause" [1]

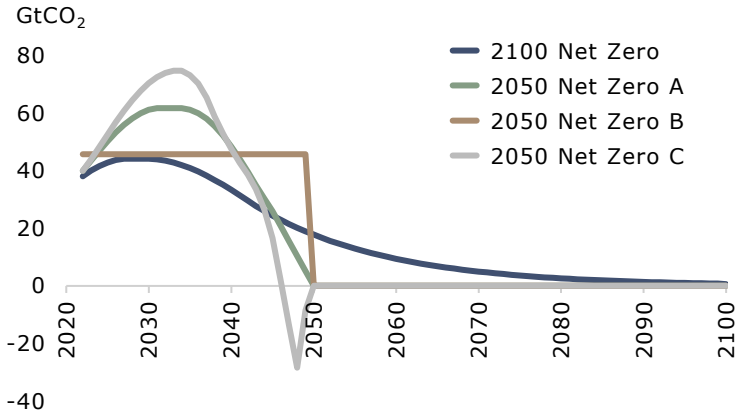
Achieving net zero should result in global temperatures stabilising. Unfortunately, it says nothing about how much temperatures will rise. The latter is determined by the cumulative level of greenhouse gas (GHG) emissions in the atmosphere.

What this means is that for a given temperature outcome, there are numerous pathways we can take and still achieve the same result (Exhibit 1 outlines a few illustrative emissions pathways that result in a 2C rise by 2100).

Alternatively, if the aim is to achieve a lower ultimate temperature rise, what is needed is a lower level of cumulative emissions, something that is typically achieved by reducing emissions to net zero more at a faster rate.

To put it bluntly, if you are serious about climate change you should do everything to maximise decarbonisation today, with mitigation options that can be deployed more quickly being favoured over those that will take longer to have an impact.

Exhibit 1 – The four global emissions pathways below all result in a 2C temperature change



Source: AFRY.

1. IPCC, Climate Change 2021: The Physical Science Basis, 2021.

With Ireland currently tracking behind its allowed carbon budgets, accelerating emissions reductions in the power sector is crucial

Following several years of declines, economy-wide emissions in Ireland increased materially in 2021, to levels that will make it very challenging to meet the 2021-25 carbon budget. EPA projections also suggest that Ireland is not on track to meet 2030 targets. Accelerating decarbonisation across all sectors is critical, with the power sector able to play a critical role.

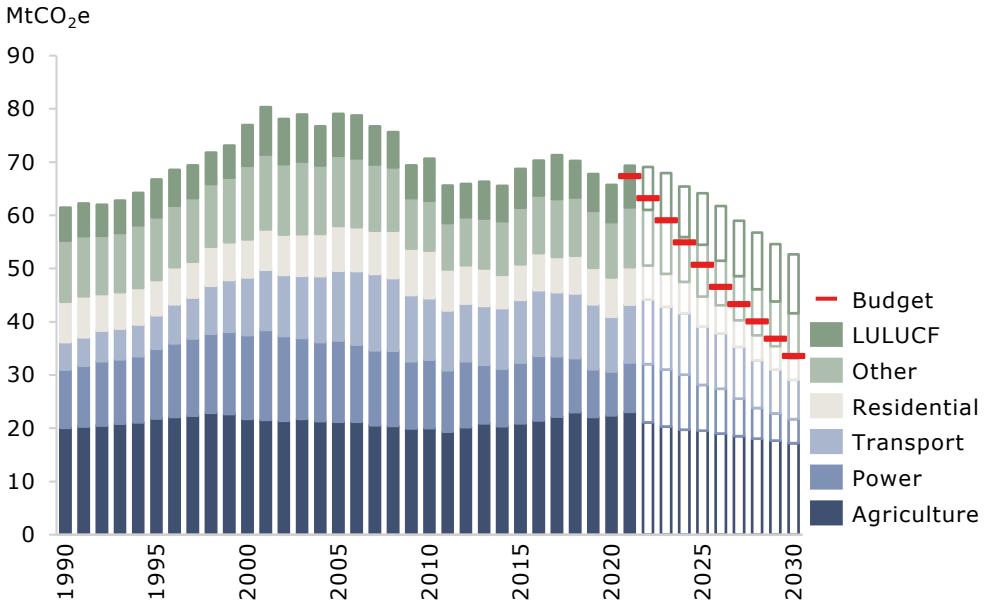
Economy-wide emissions in Ireland in 2021 were 69.3MtCO_2e across all sectors and including the impact of land use, land use change and forestry (LULUCF).

If the 2021-25 carbon budget of 295MtCO_2e is split into annual totals using a linear trajectory, 2021 outturn was higher than the 2021 'budget' (Exhibit 2).

Furthermore, according to Environmental Protection Agency (EPA) projections for sectoral emissions on a "With Additional Measures" (WAM) basis, Ireland is not on track to reach its 2030 emissions target of 33.5MtCO_2e, with a lack of reductions in LULUCF playing a major role in why the target is not met. In fact, if outturn emissions were to match the EPA's projections, Ireland would emit 620MtCO_2e in 2021-30, 125MtCO_2e (or 25%) more than the combined carbon budgets for this period.

Given the current trajectory, it is clear that Ireland needs to accelerate the decarbonisation of its economy, with the power sector able to play a critical role.

Exhibit 2 – Ireland is tracking behind its required carbon budgets



Note: Projections are from EPA and on a "With Additional Measures" basis. Quinquennial carbon budgets have been split into illustrative annual figures using linear interpolation assuming the midpoint of each five year period is equal to the annual average budget (i.e. quinquennial budget divided by 5).
Source: EPA, DECC, AFRY.

Solar faces fewer planning hurdles and can navigate the planning process relatively quickly

EU rules on Environmental Impact Assessments (EIA) do not apply to solar and so there is no legal requirement to carry out an EIA. This reduces the time it takes for solar projects to carry out permitting studies as well as reduces the number of avenues to appeal against solar project planning permission. Ultimately this results in relatively short durations spent during planning and high success rates.

Amongst other things, Directive 2011/92/EU[2] defines the types of projects that must carry out an Environmental Impact Assessment (EIA).

This Directive was transposed into Irish law via the Planning and Development Act[2] and the Planning and Development Regulations[3].

The power generation technologies most affected by the EIA requirements are thermal plant, hydro and wind. Solar is not included.

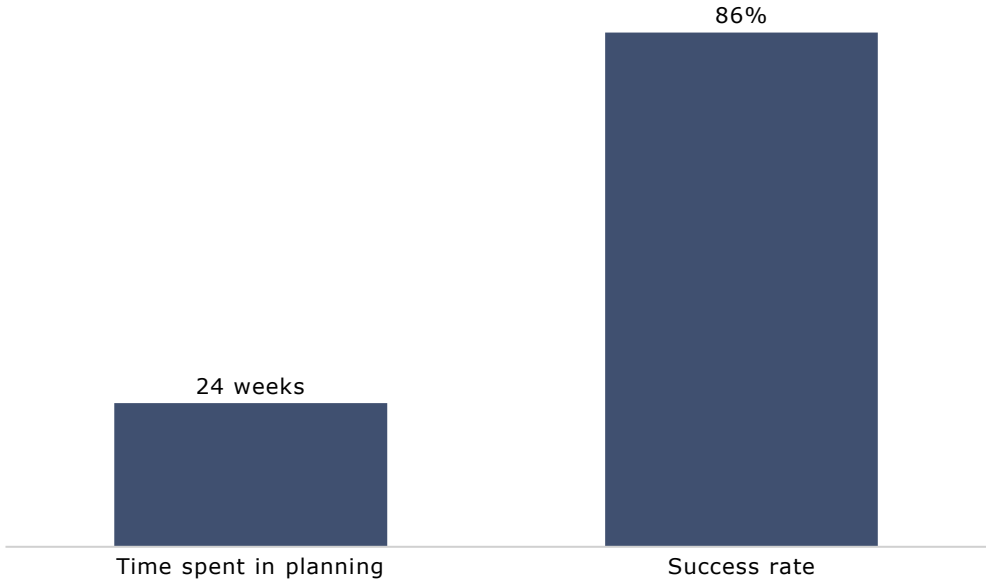
What this means is that there is typically no legal requirement for solar developments to carry out an EIA (although most do), which in turn reduces the planning barriers faced by solar projects.

In practice, this results in:

1. solar projects having a relatively high probability of successfully receiving local authority planning permission; and
2. solar projects typically spending a relatively short time in planning.

Recent experience of ISEA members on both of these dimensions is shown in Exhibit 3.

Exhibit 3 – Typical time spent in planning (weeks) and success rates (%) for solar projects in Ireland between 2016 and 2021



Note: Data shows average duration until decision of local authority planning applications. Success rate is calculated as number of successful applications divided by the total number of decided applications. Applications that are pending, withdrawn, invalid or exempt are not included in the total.
Source: ISEA.

2. EU Parliament, Directive 2011/92/EU, accessed 7 September 2022.
3. Irish Statute Book, Planning and Development Act, 2000 (Revised, updated to 23 June 2022), accessed 7 September 2022.
4. Irish Statue Book, S.I. No. 600/2001 – Planning and Development Regulations, accessed 7 September 2022.

A faster time through planning translates into more solar projects receiving grid connection offers, a key requirement for participating in RESS

85 grid connection offers are typically awarded each year. The first 25 offers are given to the largest renewables projects by generation output. The remaining 60 offers are awarded in order of their planning date. Given solar's typically faster route through planning, it is no surprise that solar projects receive the highest number of grid connection offers. This in turn results in there being more solar projects eligible to participate in RESS

The Enduring Connection Policy (ECP) provides for 85 connection offers to be awarded in each batch. In recent years, there has been one batch of offers awarded per year.

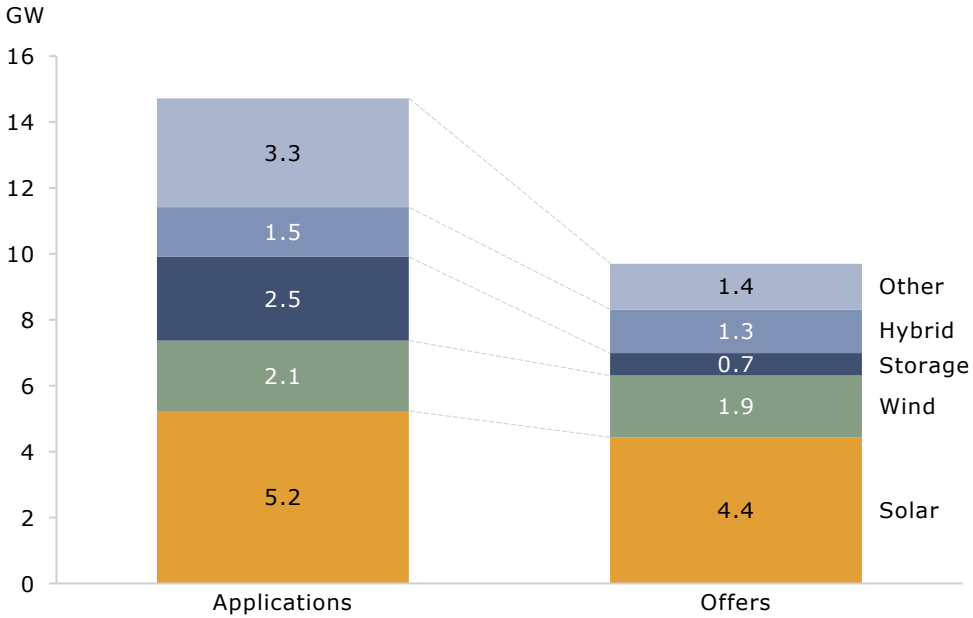
The first 25 offers are awarded to the largest eligible renewables projects by generation output. This will typically be a number of larger wind projects and the very largest solar projects.

The remaining 60 offers are awarded based on when a project was granted planning permission.

If one considers the new projects that have sought a connection offer since 2018[5], solar accounts for 40% of the capacity applying for a connection offer and 56% of offered megawatts[6] (Exhibit 4). The high number of solar projects applying and the high success rate of solar projects in ECP is a direct result of:

1. Solar projects having a high success rate in planning, which translates into more applications for a connection; and
2. Solar projects spending a shorter time in planning, which translates into earlier planning grant dates and a high probability of success in ECP.

Exhibit 4 – Solar makes up the majority of ECP applications and offers



Note: Data excludes storage DS3 applications, non-GPA fold in applications and capacity relocation applications in ECP-1.
Source: EirGrid, ESB Networks.

5. I.e. projects applying under ECP-1 (non-DS3 projects only), ECP-2.1, ECP-2.2 and ECP-2.3.
6. Including solar + storage hybrids in these totals.

Achieving 2030 solar targets could deliver sizeable savings to consumers and there is a large solar pipeline waiting to deliver these benefits

In another recent study published by AFRY and ISEA, it has been shown that adding enough solar to the system post RESS2 to meet 2030 targets would result in net benefits to society of €824 million between 2026 and 2040. More practically, there is more than enough projects to deliver this capacity in the coming years.

In the study "*The Value of Solar in RESS3*", AFRY examined the benefits to society of procuring differing levels of solar capacity in RESS3. If only solar were to be procured in RESS3 (and which we readily acknowledge is extremely unlikely), and 2030 solar capacity in Ireland reached 5.7GW, net benefits to society were found to be €824 million over the lifetime of the RESS3 contract. This amounts to almost €400 per household[7].

Moving from the realm of energy economics modelling to the real world, there are sufficient solar projects to deliver the potential welfare benefits of additional solar capacity (see Exhibit 5).

If we assume that projects in the ECP-2.2 / ECP-2.3 Batches or are consented and have grid contracts are 'ready' for RESS3, this totals 4.4GW of solar capacity.

There is a further 0.6GW of projects that have consented planning - these represent the pool of projects that could enter future ECP rounds and subsequently RESS-4.

Combined there is 5GW of solar projects that could compete for contracts in the next two RESS auctions.

Exhibit 5 – The solar pipeline is extensive with 2.4GW of projects that could be ready to bid into RESS3 (GW)

Note: RESS-3 'Ready' includes projects with grid contracts and planning plus projects in the ECP-2.2 and ECP-2.3 Batches; Consented reflects projects that have consented planning and which we assume will seek a grid connection offer in future ECP rounds.
Source: ISEA, EirGrid / ESB Networks ECP-2.3 Category A Initial Batch.

7. Assumes a total housing stock of 2.12m (CSO, 2022).

It is critical that barriers to solar deployment are removed

BARRIER	SOLUTION	IMPACT
Planning	1. Additional staff would help local authorities process planning applications more quickly. 2. Limit avenues to appeal renewables project planning consent. 3. Extend duration of planning consent for utility scale projects to 40 years.	– Shortened time to develop projects (due to less time spent in planning) will reduce cumulative emissions supporting Ireland's transition to net zero. – Extending the life of projects will improve the economics of project development, increasing societal welfare.
Grid	1. Shift network charging from being a function of installed capacity to being a function of generation output. 2. Effective incentivisation of ESB Networks to build connections more quickly and at lower cost. 3. Ensure network delivery risks are allocated to those best placed to address those risks (i.e. TAO/DAO)	– Shortened time to develop projects (as a result of faster delivery of grid connections) will reduce cumulative emissions supporting Ireland's transition to net zero. – Lower costs / better allocation of risk will improve the economics of project development, increasing societal welfare.
Hybrids	1. Change RESS ECFs for hybrids to reflect the 'improved' output profile of the hybrid project. 2. Change the rules for hybrids in RESS (specifically the requirement to be either behind the meter or effectively standalone projects) to allow for more flexibility in project design.	– Facilitating the development of hybrid projects involving renewables and storage will reduce emissions and lower costs to consumers.
Legal	1. Remove the Capital Acquisition Tax (CAT) threshold that reduces tax protections for agricultural estates where more than 50% of the land is used for renewables generation. 2. Reform current legislation prohibiting private wire connections so private generators are able to supply power directly to a consumer.	– Removal of CAT threshold will increase the attractiveness of leasing land to renewables developers. – Removal of private wire restriction will increase the potential offtakers for renewables, which in turn will assist the development of additional renewables capacity.