NexSys (Next Generation Energy Systems)

Submission to Consultation on Draft Risk Preparedness Plan for Ireland

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Introduction

NexSys (Next Generation Energy Systems) is an all-island, multidisciplinary energy research programme. Through this programme of research, 50 leading academics across 9 institutions are working in partnership with industry to tackle the challenges of energy system decarbonisation, developing evidence-based pathways for a net zero energy system.

NexSys is committed to engaging with national policy processes in order to provide evidence based research and policy insights in support of our net zero ambitions.

We appreciate the opportunity to respond to the CRU Consultation on the Draft Risk Preparedness Plan for Ireland (RPP). This submission is informed by the recent work conducted within NexSys based on the link between weather and renewable energy, as well as by the wider scientific literature around relevant topics. Our comments address some of the weather-related crisis scenarios, where we believe our contributions can help reinforce and extend the current level of analysis.

Scenario 2.1 (c) Severe Storm [W.ST]

We support the inclusion of severe storms as a crisis scenario, but believe their treatment should be broadened. Severe storms not only pose risks through high-speed wind shutdown or physical infrastructure damage, but they are also drivers of sudden ramps in renewable generation. Storm-driven ramps are relatively common and operationally challenging, while also being more frequent than shutdowns.

Our own Irish analysis further indicates that the geographical pattern of exposure is uneven: coastal wind farms are much more prone to storm-driven ramps, especially over the Atlantic coast.[1] Taken together, this suggests that severe storms should be recognised not only for their infrastructure and shutdown danger but also as a risk for their ramp generation potential.

Scenario 2.1 (f) Renewable Energy Source Shortage, including Dunkelflaute [W.DF]

We welcome the inclusion of Dunkelflaute scenarios, but would encourage the CRU to consider their dependence on Ireland's evolving generation mix. Our research shows that both the impact and the seasonality of renewable shortages change with the ratio of wind to solar capacity.[2] A system dominated by wind energy is more prone to prolonged winter shortages, while increasing solar energy reduces their frequency and shifts their seasonal profile. This means that Ireland's exposure to Dunkelflaute events is not static, but will depend on the rate at which wind and PV capacity are deployed in the coming years. Recognising this sensitivity is important to ensure that the RPP remains aligned with Ireland's actual transition pathway, especially considering the large uncertainties around the volume of installed RES capacity in the near future.[3] Ambitions for electrification of the heating sector, and hence the potential growth of heat pumps, should also be considered here when evaluating the severity of extended cold, becalmed conditions.

Scenario 2.1 (g) Unusually high demand/ RES forecast errors [W.FE]

We strongly agree that forecast error is a systemic risk, and would emphasise two additional points. First, ensemble prediction systems are now well-established tools for mitigating uncertainty in renewable forecasting, and could play a role in Ireland's preparedness framework.[4,5] Second, forecast error is not evenly distributed: extreme events such as large ramps are precisely those with the greatest forecast uncertainty.[6,7] This compounds operational risk, as the most threatening events are also those least reliably predicted.

Missing scenario: High RES output and curtailment risk

Finally, we note a gap in the current RPP: while demand-side curtailment is discussed, there is no treatment of generation curtailment arising from sustained high levels of renewable electricity output. As renewable capacity expands, Ireland will increasingly face periods of generation surplus where output exceeds both domestic demand and export capacity. This output will need to either be curtailed on the generation side or infrastructure will be required to store this energy somehow. Particular problems could arise with rooftop and small-scale solar PV installations, which are likely to be not directly observable by the power system operator and not capable of being externally controlled. We therefore recommend the addition of a complementary scenario, High RES Output and Curtailment, to ensure preparedness for surplus extremes on top of the already explored scarcity scenario. Expectations of high curtailment levels may also influence future investment decisions.

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NexSys welcomes further engagement with the CRU on this submission and related matters. Any information requests can be sent to john.doody@ucd.ie.