Protecting Consumers

Unlocking the cost-saving potential of Irish batteries this winter

November 2022

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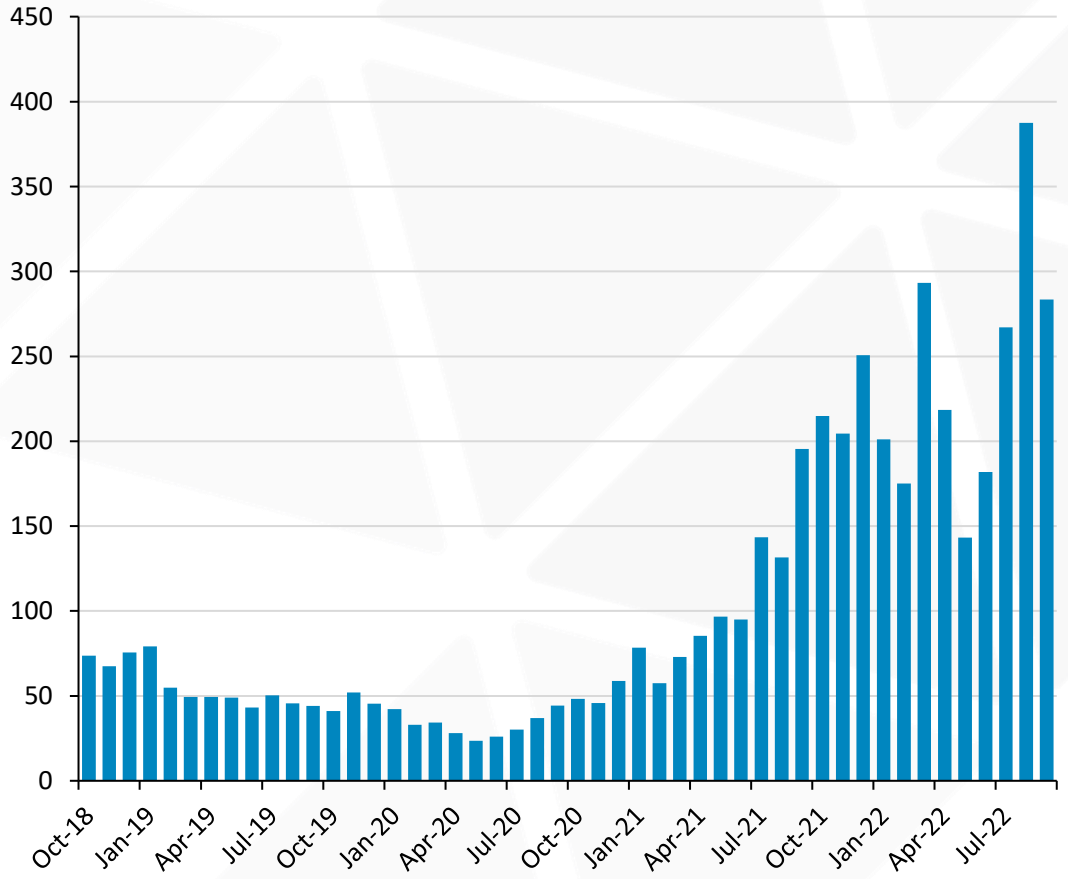
Protecting Consumers | Unlocking the cost-saving potential of batteries this winter

In a time of spiraling costs, Ireland and Northern Ireland's fleet of battery storage assets present a potential opportunity to help protect consumers from extreme electricity prices this coming winter

- Over the last two years the cost of electricity, both in the Irish all-island market and across Europe, has been driven to extremes by surging fossil fuel commodity prices.
- At the same time, over 670 MW of battery storage capacity is installed across Ireland and Northern Ireland that could help alleviate this cost burden by up to €35 million this winter.
- However, the current treatment of batteries by the Regulatory Authorities in Ireland and Northern Ireland, the CRU and UR respectively, and the Transmission System Operators (TSOs), EirGrid and SONI, restricts their effective participation in the energy market, preventing them from unlocking this potential cost saving.
- This is because current policy is to keep batteries on constant standby to respond if there are problems on the electricity grid and not allow them to compete in the energy market.
- In this study we show that enabling battery storage projects to compete in the market at times of high electricity demand would reduce Ireland’s dependence on imported fossil fuels, and perhaps most importantly help to protect Irish electricity consumers by reducing electricity prices.
- We also show that the TSOs could keep half of the current installed batteries on standby at times of peak electricity demand in case they are needed, and the consumer savings would still materialise.
- This change in policy to allow batteries to participate in the market does not require any additional investment or structural changes and can be actioned immediately by the Regulators and the TSOs.

Monthly Irish Day-Ahead Wholesale Price | Oct. 2018 to Sep. 2022

€/MWh, nominal



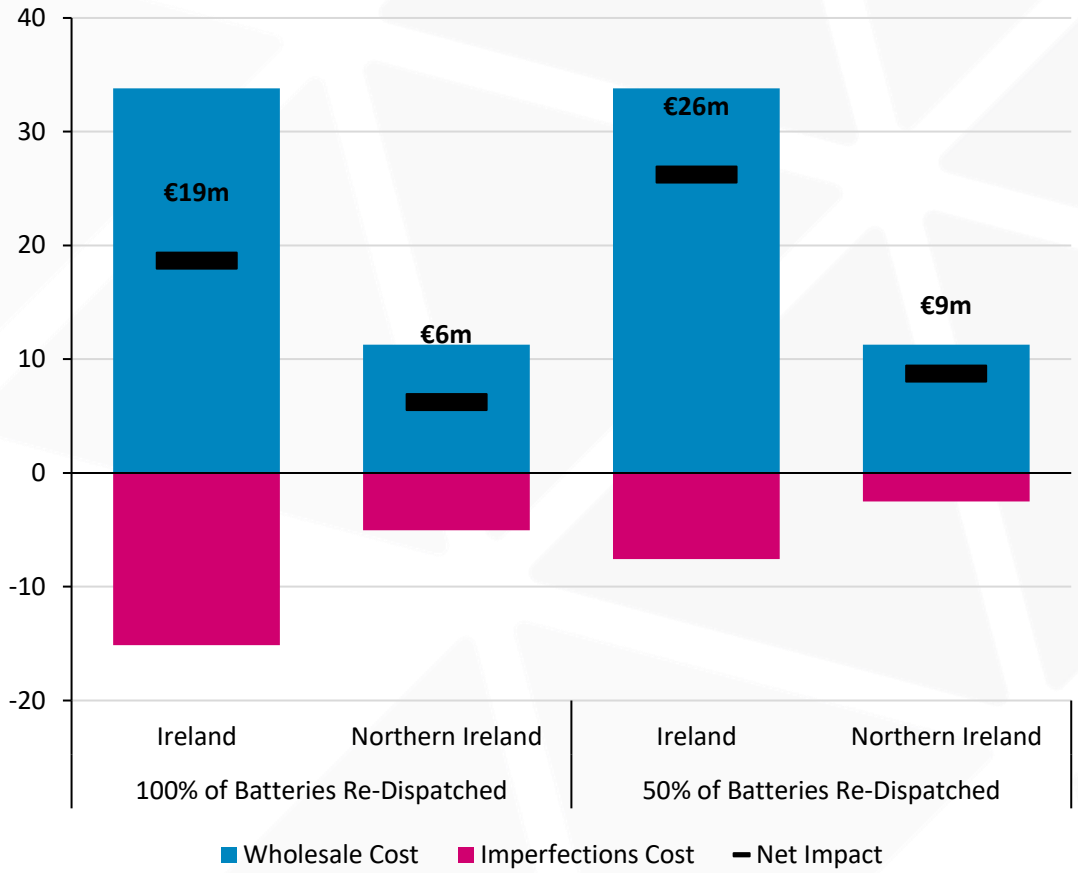
Executive Summary | End consumer cost impact of deemed-firm battery status

Offering battery storage assets in Ireland and Northern Ireland deemed-firm status as an interim dispatch measure offers an opportunity to reduce end consumer costs by up to €35m over Winter 2022/23

- A total of 471 and 200 MW of battery storage capacity is currently installed in Ireland and Northern Ireland respectively – with storage volumes totaling 334 and 125 MWh.
- However, current TSO policy concerning battery storage is to re-dispatch these assets down to zero, to hold them back to provide reserve services, or for TSO-controlled dispatch during amber alert periods.
- This approach limits the effectiveness of battery storage assets to alleviate the cost burden imposed on end consumers this winter, in which extreme commodity prices are expected to drive end consumer bills to record levels.
- An interim measure that would unlock the full potential of battery assets to reduce end consumer costs this winter would be to offer them deemed-firm dispatch status:
  - Under this policy intervention, the participation of batteries in the day-ahead market would act to reduce the overall cost of meeting demand levels in the day-ahead schedule. Our analysis suggest that this could equate to a saving of around €34m and €11m in Ireland and Northern Ireland respectively this winter.
  - However, since the TSOs may decide to re-dispatch some of the batteries to zero, this measure would increase the imperfections cost component of end consumer bills. Our modelling suggests though, that if 50% of the assets are turned down by the TSOs to be held for reserve, this impact would result in a net cost of around €8m and €3m in Ireland and Northern Ireland, respectively.
- In total, implementing deemed-firm status of batteries can offer:
  - A net saving of up to 50 €/kW of installed battery capacity across the island.
  - Or up to 80 €/kWh of installed battery storage volume.

Net Impact on End Consumer Costs | Winter 2022/23

€m, real 1st January 2022 *(benefits are positive, costs are negative)*

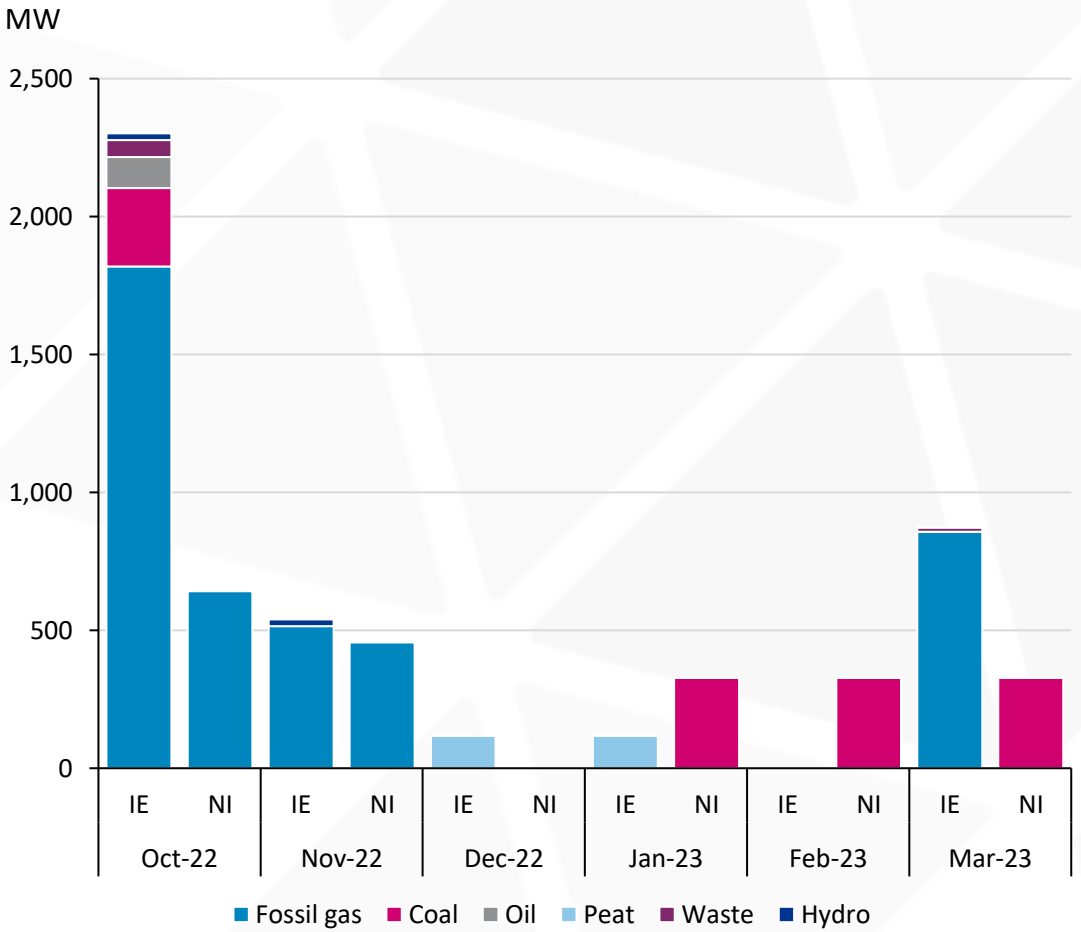


Scenario Assumptions | Commodity prices and plant outage rates

In addition to the European-wide shock to the price of fossil gas, and other commodities, the aging fossil fuel-fired fleet of the Single Electricity Market (SEM) has recently seen high outage rates

- In this study, we have modelled the Single Electricity Market (SEM), which comprises the power systems of both Ireland and Northern Ireland, during the upcoming Winter 2022/23 period (October 2022 to March 2023 inclusive), using the latest available views of commodity prices, plant outages, and the TSOs latest view of DS3 limits.
- Wholesale power prices in the day-ahead market have seen record monthly highs so far in 2022, driven by a combination of the European-wide shock to fossil gas prices catalysed by the Invasion of Ukraine and subsequent decoupling of Western Europe from Russian supply, and higher plant outages experienced by the aging fleet of fossil fuel-fired plant.
- We have sourced our assumptions of commodity and carbon prices from traded 'month + X' forward prices for delivery in the Winter 2022/23 period, averaged across the week of the 12th September 2022. Each average price below is stated in real 1st January 2022 currency.
  - Gas NBP[1] prices average around 190 €/MWh.
  - Coal CIF ARA[2] prices average around 290 $/tonne.
  - Oil Brent[3] prices average around 85 $/bbl.
  - Carbon EUA[4] and UKA[5] prices average around 67 €/tonne and 72 £/tonne respectively.
- We have explicitly modelled the latest available view of planned plant outages. These outages, which peak at almost 3 GW of capacity across the SEM in October 2022, do not include forced outages, which have been around 25% in Ireland since the start of 2021. We have captured these developments in our modelling, as well as a forced outage rate of around 5% in Northern Ireland.

Planned Outages | Winter 2022/23



[1] *National Balancing Point, a virtual trading hub for fossil gas based in the United Kingdom.*
[2] *North-West European coal price (Amsterdam-Rotterdam-Antwerp) including cost, insurance, and freight.*
[3] *North-West European crude oil hub based in the North Sea.*
[4] *European Union Allowances, carbon credits used within the EU Emissions Trading System (EU ETS).*
[5] *United Kingdom Allowances, carbon credits used within the UK Emissions Trading System (UK ETS).*

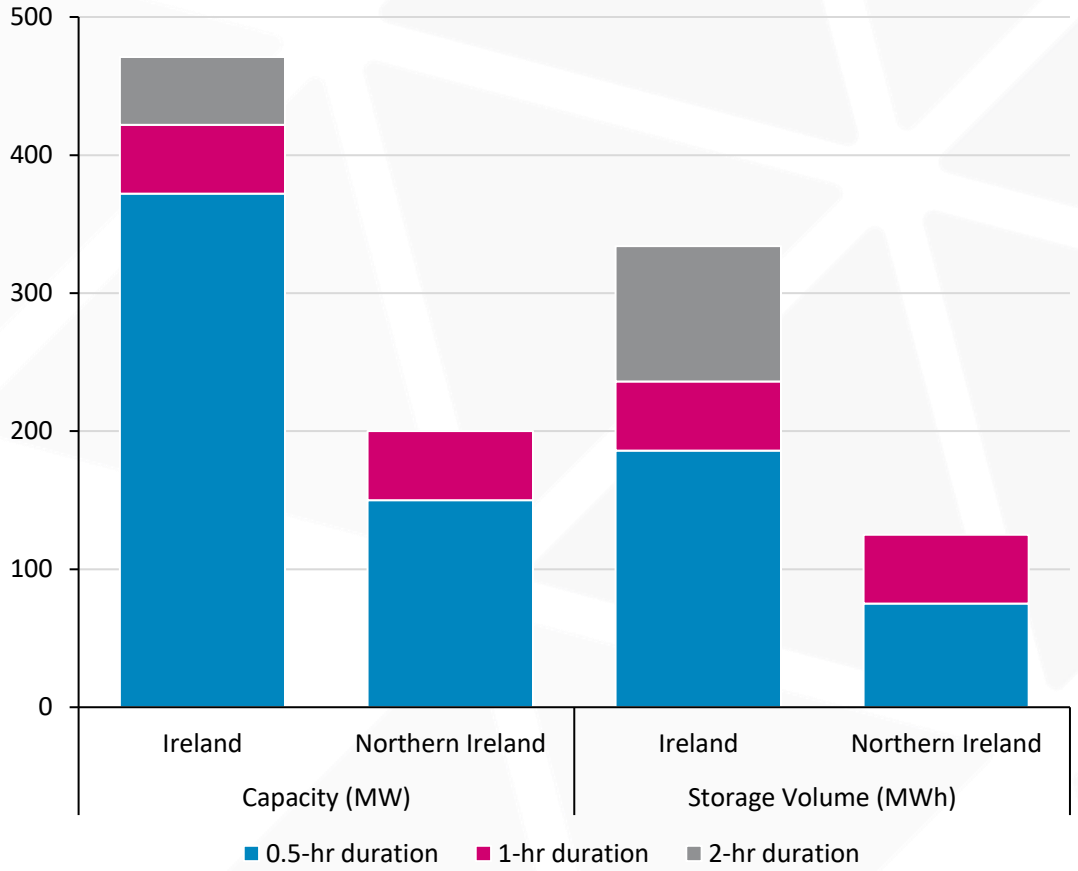
Scenario Assumptions | Battery storage in the SEM

Over 670 MW of battery storage capacity is currently installed in the SEM – if unlocked for dispatch in the ex-ante markets, these assets represent an opportunity to reduce peak wholesale prices

- A total of 471 and 200 MW of battery storage capacity is currently installed in Ireland and Northern Ireland respectively – with storage volumes totaling 334 and 125 MWh.
- However, current TSO policy on battery storage is to re-dispatch these assets down to zero, to hold them back to provide reserve services, or for TSO-controlled dispatch during amber alert periods.
- All battery assets with ex-ante positions are then re-dispatched to zero in non-energy actions in the balancing market, exposing non-firm storage assets to imbalance price risk.
- This approach limits the effectiveness of battery storage assets to alleviate the cost burden imposed on end consumers this winter by extreme commodity prices.
- Several policy options are available in the longer term to counter this limitation, but rapid adoption of an interim measure would be required for batteries to contribute effectively this winter. Two such interim options are available:
    1. **Deemed-firm status** – batteries can submit ex-ante positions into the day-ahead (or intraday) schedule, therefore impacting the day-ahead (or intraday) price. However, as the TSOs may not dispatch them physically the cost of the imbalance must be paid to the assets, increasing the imperfections cost component of end consumer bills.
    2. **Default follow physical notification (PN)** – batteries can participate in the day-ahead (or intraday) schedule, impacting the day-ahead (or intraday) price, and are then dispatched physically, avoiding an impact on imperfections costs.
- In this study, we have explored the impact of deemed-firm status on end consumer costs over the Winter 2022/23 period. This option can be enacted quickly, and without delay, and therefore offers the best opportunity to leverage battery assets to reduce costs this winter.

Battery Storage Capacity and Volume | Winter 2022/23

MW (left) & MWh (right)



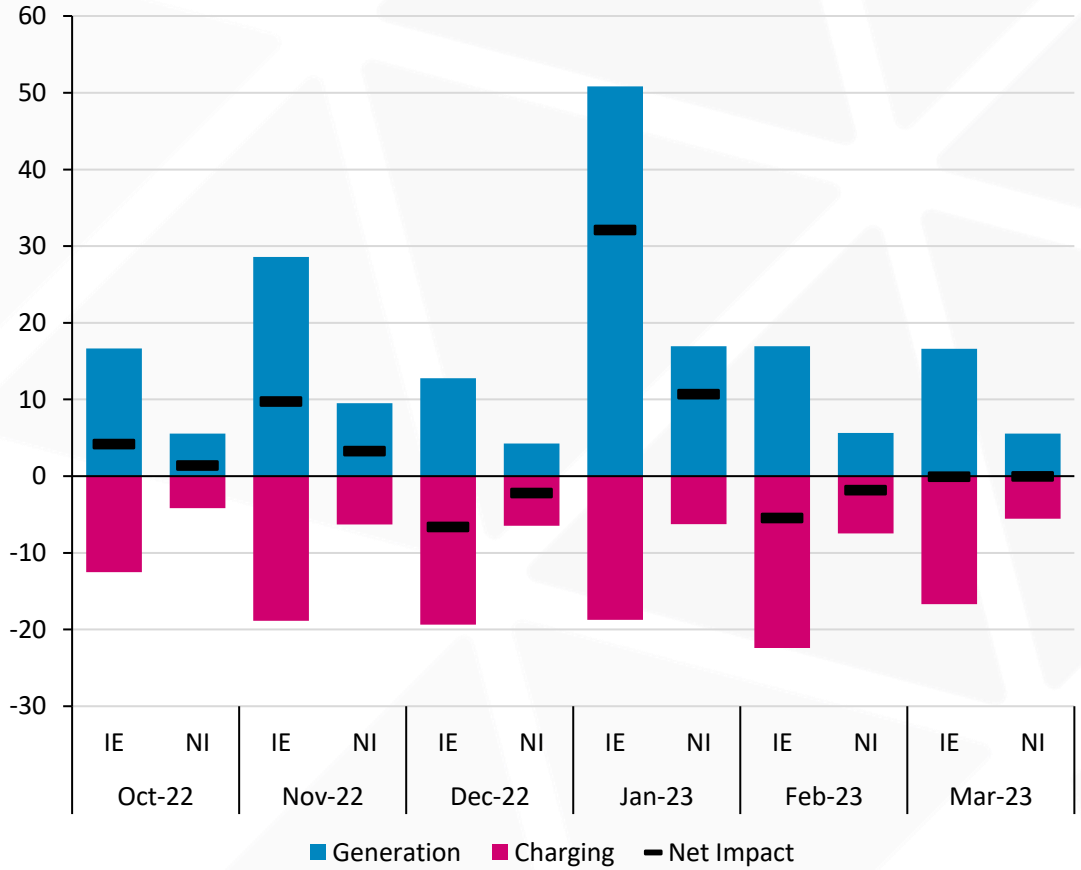
Study Results | Day-ahead market cost impact

By charging during hours of low price, and discharging during hours of high price, the virtual dispatch of batteries in the day-ahead schedule 'smooth out' the daily price shape – and can result in a net saving

- If a battery storage asset is to maximise day-ahead (or intraday) market revenue, they are incentivised to 'buy low and sell high' – i.e., take in power during hours of low price, and release it during peak price hours. This natural arbitrage potential of the daily day-ahead price curve results in storage assets acting to 'smooth out' daily price variations:
  - By charging during hours of low price, batteries increase the level of demand in these hours and may increase the day-ahead market price if the marginal plant changes.
  - By discharging during hours of high price, batteries decrease the level of demand, and may decrease the day-ahead market price if the marginal plant changes.
- We have assumed that each asset completes one cycle of charging and discharging per day and targets the hours of lowest and highest demand to charge and discharge respectively[1].
- The net balance of these two effects on the 'cost to load' of the SEM system (the total cost of meeting demand in the day-ahead market) is dependent on the shape of the system merit order curve at either end.
- The round-trip efficiency of the batteries, the ratio of energy taken in to that released, adds a layer of bias to this balance, with the volume of energy taken in exceeding that released. We have assumed a round-trip efficiency of 85% for all modelled battery assets.
- Our modelling reveals that this balance results in a net saving in most months over the Winter 2022/23 period, with a total of €34m and €11m saved in Ireland and Northern Ireland respectively.
- The largest benefit is achieved in January 2023 (the month with the tightest peak demand hours) at around €43m across the SEM, with the largest net cost incurred in December 2022, with the cost to load of the SEM increasing by around €11m.

Impact on Day-Ahead Market Cost to Load | Winter 2022/23

€m, real 1st January 2022 *(benefits are positive, costs are negative)*



[1] *We have assumed that batteries are not subject to charging limitations, charging freely within the day-ahead market.*

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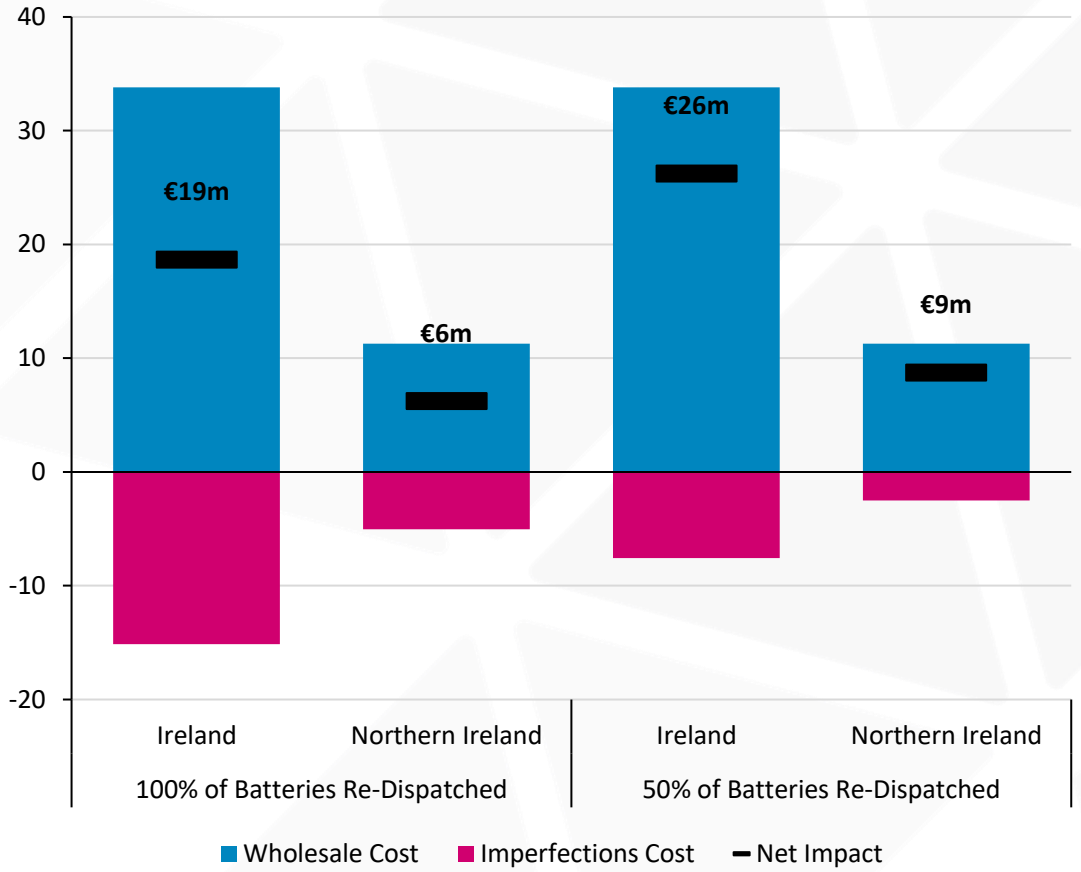
Study Results | Imperfections cost impact, and overall net benefit

Despite a net saving in the cost to load of the day-ahead market, imperfections costs are increased by the need to re-dispatch other plant in the balancing market to replace the turned-down batteries

- Under the deemed-firm status interim option, the ex-ante positions of battery assets in the day-ahead schedule, although able to influence the price, may then be re-dispatched to zero by the TSOs in the balancing market, to hold them back to provide reserve services.
- We have assumed that the assets bid at a decremental price of zero in these non-energy actions. Subsequently the impact on the imperfections cost component of end consumers bills results from two sources:
  - The incremental cost required to re-dispatch other plant, e.g., turn up gas-fired plant out of merit in the ex-ante schedule, to replace the batteries.
  - The need to remunerate the deemed-firm battery assets for their imbalance.
- The need to re-dispatch other plant away from their ex-ante positions increases the dispatch balancing cost of the system. Plant are assumed to be remunerated at their short-run marginal cost (SRMC), in line with 'complex offer' policy[1].
- We have then assumed that the cost of the battery imbalance, which must be remunerated to the assets under their deemed-firm status, is equal to the re-dispatch cost of the plant that replace them, i.e., the imbalance price is equal to the SRMC of that plant.
- If all batteries are re-dispatched to zero by the TSOs in the balancing market, a total of around €15m and €5m is added to end consumers bills in Ireland and Northern Ireland respectively via increased imperfections costs over the Winter 2022/23 period.
- However, if only half of the assets are turned down to zero in these actions, the imperfections cost impact reduces to around €8m and €3m in Ireland and Northern Ireland respectively this winter[2].

Net Impact on End Consumer Costs | Winter 2022/23

€m, real 1st January 2022 *(benefits are positive, costs are negative)*



[1] *Under complex bids and offers, plant are remunerated at the greater of their SRMC and the imbalance price. We have not modelled the downside case in which the imbalance price exceeds the SRMC of plant during hours of re-dispatch.*

[2] *We have taken the conservative assumption of a 50% reduction in net imperfections cost. In reality, as the least expensive available plant would be re-dispatched first, the net imperfections cost in this case would likely be smaller.*

Commissioned by Energy Storage Ireland

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