



An Coimisiún
um Rialáil Fóntas
**Commission for
Regulation of Utilities**

An Coimisiún um Rialáil Fóntas
Commission for Regulation of Utilities

Celtic Interconnector – consultation results

Information paper accompanying the
coordinated cross-border cost
allocation decision under Article 12 of
Regulation (EU) 347/2013

Information Paper

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Executive Summary

This information paper is further to the CRU's consultation paper on Celtic Interconnector's investment request ([CRU/18/265](#)). It addresses the key issues raised in response to our consultation, and also accompanies our cross-border cost allocation (CBCA) decision issued jointly with the French Commission de Régulation de l'Énergie (CRE) on 29 April 2019 ([CRU/19/051](#)). We note that the CBCA decision has been issued in advance of this information paper to give the project promoters sufficient time to prepare an application for the European Union's financial assistance. Notwithstanding this time lag, we ensure that all the feedback discussed in this paper was brought to our attention in the joint decision-making process with the CRE, and is duly reflected in the CBCA decision.

In September 2018, the transmission system operators (TSOs) of Ireland and France submitted an investment request for the development of the Celtic Interconnector to the relevant national regulatory authorities (NRAs), the CRU and the CRE respectively.

As part of their submission, the TSOs requested the NRAs to decide on cross-border allocation of Celtic's investment costs between Ireland and France and their inclusion in each country's tariffs under Article 12 of Regulation (EU) 347/2013.

Between 20 December 2018 and 15 February 2019, the NRAs held public consultations on the Celtic investment request in Ireland and France.

Having carefully considered stakeholders' feedback, the NRAs have reached an agreement on the way costs should be shared between Ireland and France taking into account the expected economic benefits from the project for each country and the European Union's financial assistance.

The joint cross-border cost allocation decision has been issued on 29 April 2019 ([CRU/19/051](#)) and its key elements are as follows:

- Up to the project's estimated investment costs (930 M€), 65% of investment costs will be allocated to Ireland, and 35% to France.
- Operations & maintenance (O&M) costs and revenues from congestion rents will be shared 50/50 between EirGrid and RTE.
- The feasibility of the project is contingent on substantial EU financial assistance covering at least 60% of the project's estimated investment costs. This support

should be shared between EirGrid and RTE to match the cost-allocation agreement (i.e. 65% for EirGrid, 35% for RTE).

- Should the EU financial assistance not reach 60% of the project's estimated investment costs, the NRAs will review the cost allocation decision.
- Cost overruns, if any, will be shared 50/50 between EirGrid and RTE. In addition, any amount of the CEF grant above the minimum requested (i.e. > 60%) will be ring-fenced to cover any potential cost overruns.
- The NRAs will develop appropriate incentives for the TSOs to minimise the risk of cost overruns.
- The TSOs will submit periodic cost estimate reviews to the NRAs and in addition, report to the NRAs on any material changes in cost estimate without delay.
- The TSOs shall not commit any significant expenses until procurement of the infrastructure is complete and the overall cost of the main supply contracts (including cables) is known.
- Should the cost of these contracts materially exceed the estimated costs (i.e. by 20%) or should the total costs of the project be reviewed significantly upwards (i.e. by 20%), the NRAs will consult with the project parties and review this decision in order to reconsider the opportunity to invest in the project and/or the cross-border cost allocation decision regarding cost overruns.

Public Impact Statement

Electricity interconnectors, such as the Celtic project, are physical links which allow the transfer of electricity across borders. New interconnectors should be built only to the extent that they benefit the public at large. That is, as long as the benefits of adding interconnection capacity outweigh or are equal to the costs.

Connecting to different markets, with different demand profiles and generation mixes, could be particularly beneficial for Ireland, as it would:

- bring savings in generation costs, including fuel, variable operations and maintenance as well as carbon costs. This would increase socio-economic welfare.
- facilitate the integration of more renewable energy by reducing curtailment of existing renewable generators and allow more renewable energy onto the system, helping Ireland achieve its renewable targets.
- diversify Ireland's energy supply, helping to reduce and spread security of supply risks. This is particularly the case of investing in different interconnectors, connecting to different markets.

We also note that commissioning new interconnectors in Ireland may be necessary for meeting the European Commission's 2030 interconnection targets. In particular, should the United Kingdom leave the EU internal energy market, Ireland would be at risk of becoming completely isolated from this market, with a potential knock-on effect on electricity prices.

Building a new interconnector can be costly for the Irish consumers, depending on the way it is regulated and funded. In reaching the cross-border cost allocation agreement, the CRU has given due regard to its principal objective to protect the public interest, and its general duties and functions under EU and national laws. In particular, due consideration has been given to ensuring that Irish consumers do not contribute financially to the Celtic project where the benefits do not justify such a financial contribution.

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Glossary of Terms

Term or Acronym	Definition or Meaning
CBA	cost benefit analysis
CBCA	cross-border cost allocation
CEF	Connecting Europe Facility
CRE	Commission de régulation de l'énergie (Energy Regulatory Commission, NRA in France)
CRU	Commission for Regulation of Utilities
DS3	delivering a secure, sustainable electricity system (DS3 programme)
EirGrid	transmission system operator in Ireland and Celtic's project promoter
ENTSO-E	European Network of Transmission System Operators for Electricity
EU	European Union
EWIC	East-West Interconnector
GB	Great Britain
HVDC	high voltage direct current
I-SEM	Integrated Single Electricity Market (project)
IE	Ireland
LNG	liquefied natural gas
NPV	net present value
NRA	national regulatory authority (i.e. CRU in Ireland, CRE in France)
O&M	operations and maintenance (costs)
Ofgem	Office of Gas and Electricity Markets (NRA for Great Britain)
PCI	project of common interest
RAB	regulatory asset base
RES	renewable energy sources
RTE	Réseau de Transport d'Électricité (Electricity Transmission Network) – transmission system operator in France and Celtic's project promoter
SEM	Single Electricity Market
TEN-E	trans-European networks for energy
TLAFs	transmission loss adjustment factors
TSO	transmission system operator
TYNDP	ten-year network development plan
WACC	weighted average cost of capital

1 Introduction

1.1 Commission for Regulation of Utilities

The Commission for Regulation of Utilities (CRU) is Ireland's independent energy and water regulator and has a wide range of economic, customer protection and safety responsibilities. The strategic objectives of the CRU and its mission, vision and values are focused on protecting the interests of the public in terms of energy safety, energy security and consumer rights.

Further information on the CRU's role and relevant legislation can be found on the CRU's website at www.cru.ie.

1.2 Background

The Celtic Interconnector (Celtic) is a subsea electrical cable linking electricity transmission systems of Ireland and France, with a capacity of 700MW. Celtic's project promoters are EirGrid and Réseau de Transport d'Électricité (RTE), the transmission system operators (TSOs) of Ireland and France. Celtic belongs to the projects of common interest (PCIs) which are considered key in reaching the EU internal energy market objectives. Under Regulation (EU) 347/2013 (TEN-E Regulation), PCIs can benefit from streamlined planning processes, improved regulatory conditions and funding mechanisms, such as EU financial assistance from the Connecting Europe Facility (CEF).

Article 12 of the TEN-E Regulation provides for cross-border cost allocation (CBCA) allowing countries to share the costs of PCIs based on the benefits that accrue to these countries as a result of implementing the projects. This mechanism is particularly useful where a project's benefits are not evenly distributed between the countries paying for the investment (hosting countries) or where significant benefits accrue to other (non-hosting) countries. A hosting country may not want to pay for a project where the costs outweigh its expected benefits. CBCA aims to correct this by ensuring that countries benefiting from the PCI compensate countries that are negatively impacted.

CBCA decisions are taken by the relevant national regulatory authorities (NRAs) which should ensure that the project's impact on national tariffs does not represent a disproportionate burden for energy consumers and also consider possible need for financial support. Article 14 of the TEN-E Regulation provides the eligibility criteria for EU financial assistance. To be eligible, PCIs must have demonstrated through a cost-benefit analysis (CBA) that the project would generate significant positive externalities; that the project has received a CBCA decision; and that the project would not otherwise be commercially viable according to the business plan and other assessments carried out.

1.3 Coordinated CBCA decision

In September 2018, the TSOs submitted an investment request for the development of Celtic to the relevant NRAs, the CRU and the French Commission de Régulation de l'Énergie (CRE).

As part of their submission, the TSOs requested the NRAs to decide on cross-border allocation of Celtic's investment costs between Ireland and France and their inclusion in each country's tariffs under Article 12 of the TEN-E Regulation.

Between 20 December 2018 and 15 February 2019, the NRAs held public consultations on the Celtic investment request in Ireland and France. The CRU's consultation paper ([CRU/18/265](#)) received 15 responses.

Having carefully considered stakeholders' feedback, the NRAs have reached an agreement on the way costs should be shared between Ireland and France, taking into account the expected economic benefits from the project for each country as demonstrated by the TSO and the CRU CBAs, and EU financial assistance.

The joint cross-border cost allocation decision has been issued on 29 April 2019 ([CRU/19/051](#)) and its key elements are as follows:

- 65% of the project's estimated investment costs (€930m) will be allocated to Ireland, and 35% to France.
- Operations & maintenance (O&M) costs and revenues from congestion rents will be shared 50/50 between EirGrid and RTE.

- The feasibility of the project is contingent on substantial EU financial assistance covering at least 60% of the project's estimated investment costs. This support should be shared between EirGrid and RTE to match the cost-allocation agreement (i.e. 65% for EirGrid, 35% for RTE). Should the EU financial assistance not reach 60% of the project's estimated investment costs, the NRAs will review the cost allocation decision.
- Cost overruns, if any, will be shared 50/50 between EirGrid and RTE. In addition, any amount of the CEF grant above the minimum requested (i.e. > 60%) will be ring-fenced to cover any potential cost overruns.
- The NRAs will develop appropriate incentives for the TSOs to minimise the risk of cost overruns.
- The TSOs will submit periodic cost estimate reviews to the NRAs and in addition, report to the NRAs on any material changes in cost estimate without delay.
- The TSOs shall not commit any significant expenses until procurement of the infrastructure is complete and the overall cost of the main supply contracts (including cables) is known.
- Should the cost of these contracts materially exceed the estimated costs (i.e. by 20%) or should the total costs of the project be reviewed significantly upwards (i.e. by 20%), the NRAs will consult with the project parties and review this decision in order to reconsider the opportunity to invest in the project and/or the cross-border cost allocation decision regarding cost overruns.

1.4 Purpose of this information paper

This information paper is further to the CRU consultation paper on the Celtic investment request ([CRU/18/265](#)) and accompanies the joint CBCA decision taken by the NRAs ([CRU/19/051](#)). It summarises stakeholders' feedback to the consultation and addresses the key issues raised by the respondents.

2 Consultation results

On 20 December 2018, the CRU published a consultation paper on the Celtic investment request and our assessment of the Celtic project.

We have received 15 responses from the following parties:

AQUIND Interconnector
Aughinish Alumina
Bord Gáis Energy (BGE)
EirGrid
Electricity Association of Ireland (EAI)
ERVIA
ESB Generation & Trading
Gas Networks Ireland (GNI)
Greenlink Interconnector
Ibec
Innogy Renewables
IDA Ireland
Irish Wind Energy Association (IWEA)
SSE
Union Française de l'Electricité (UFE)

Grouping the comments into major categories results in the following areas of concern, presented below along with a CRU response to the comment/concern:

General comments	Section 2.1
Assessment approach and methodology	Section 2.2
Project benefits	Section 2.3
Project costs	Section 2.4
EU financial assistance	Section 2.5
Regulatory treatment	Section 2.6
Ringfencing arrangements	Section 2.7
Interaction with the existing and potential interconnectors	Section 2.8
Other issues	Section 2.9

2.1 General comments

Respondents noted large differences in CRU and TSO results regarding the scale of benefits and their distribution between Ireland and France and/or between different stakeholder groups, as well as discrepancies in the high-level investment cost benchmarking undertaken by the CRU. Thus, respondents were of the view that Celtic's cost-benefit ratio appeared uncertain and sensitive to assumptions. In particular, as noted in the responses, Celtic's CBA appears to depend on policy decisions such as the pace of wind development and the level of interconnection with Great Britain, and thus some respondents were unclear whether progressing Celtic at this point in time, without significant EU financial assistance, might be in public interest or not.

A robust, comprehensive and transparent cost-benefit assessment showing tangible and quantifiable benefits for customers was important to many respondents.

Some respondents noted that the CRU should take a holistic approach in its assessment as interconnection policy cannot be viewed in isolation from other regulatory policies and policy goals. In that respect, as noted by one respondent, the CBCA decision should support rather than undermine the Government's revised climate policy. Furthermore, respondents suggested that the CRU should consider wider market impacts in Celtic's assessment.

Lastly, respondents were concerned about potential increases in electricity and gas tariffs due to Celtic, noting the need for a substantial CEF grant.

CRU comment

We agree with the stakeholders that differences in CRU and TSO results suggest that Celtic's benefits are somehow uncertain, and that the modelling is sensitive to assumptions. However, as noted in our consultation paper ([CRU/18/265](#)), despite some differences in the modelling inputs and results, our assessment of net benefits for Ireland is relatively consistent with the TSOs' forecast. Overall, the CBA modelling indicates that Celtic would drive benefits for both Irish and French consumers even when excluding potential security of supply benefits.

We consider that uncertainties around Celtic's costs and benefits due to potential changes in the energy landscape have been adequately captured in the CBCA decision, which is conditional on EU financial assistance covering, at minimum, 60% of the project's estimated investment costs, with 65% of this aid awarded to EirGrid. According to our assessment, this level of grant for Ireland would mitigate the risk of a negative consumer impact should the benefits from the project turn out to be lower than expected, and/or its costs turn out to be higher.

We are mindful of the impact Celtic might have on the Irish energy market. While we followed the CBA methodology developed by the European Network of Transmission System Operators for Electricity (ENTSO-E) and used the scenarios from the Ten-Year Network Development Plan (TYNDP) in our assessment, we have tailored the scenarios to capture the specifics of the Irish market, such as the size of the market and its generation mix as it evolves over time in line with Government's revised climate policy objectives. This is reflected in our key assumptions about the expected pace of wind development and decarbonisation underlying our CBA and specific impacts we have focused on, such as the impact on gas demand and gas tariffs.

2.2 Assessment approach and methodology

2.2.1 Comments on TSO assessment approach

One respondent considered that it would be more useful to stress test the TSO analysis with a 'low case' scenario, rather than relying on the 'business as usual' Vision 1 scenario from TYNDP 2016. Another respondent noted that the TSO 'base case' scenario is too optimistic, assuming high wind penetration and no new interconnection with Great Britain. The same respondent also asked the CRU to review the congestion rent figures provided in the investment request as, according to the respondent, they might be driving Celtic's benefits in the CBA.

One respondent challenged the TSO approach to extend Celtic's benefits calculated for the 2030 snapshot year for the remainder of its asset life. It was also noted that Celtic's asset life should be aligned between RTE and EirGrid, and that EirGrid's 25 years is a more reasonable lifespan assumption.

Respondents had diverging views on the TSOs' modelling of Brexit, questioning, in particular, the assumed level of expected cross-border transmission capacity between GB and other countries (including Ireland). However, respondents agreed that Celtic's CBA results would vary depending on the form of Brexit.

One respondent noted the difficulty in commenting on risk factors in the project implementation as this information has been redacted. The respondent sought clarity as to how material these risks are in terms of driving Celtic's costs up.

Finally, one respondent challenged the TSO methodology as not yet EU-approved.

CRU comment

The CRU notes that the TYNDP scenarios are developed by the ENTSO-E with the input of TSOs from the Member States. The 2nd ENTSO-E Guideline for Cost Benefit Analysis of Grid Development Projects,¹ which both the TSOs' and the CRU's assessments are based on, is compliant with the requirements of the TEN-E Regulation. The Regulation is intended to ensure a common framework for multi-criteria CBA for TYNDP projects, which are the sole base for candidate PCIs.

¹ [CBA 2.0](#).

Moreover, the Guideline is recommended to be used as the standard guideline for project specific CBA as required by Article 12(a) of the TEN-E Regulation for the CBCA process. As such, the scenarios from TYNDP 2018 and Vision 1 from TYNDP 2016 are relevant for the purposes of this CBA and CBCA. Additionally, the use of these scenarios by the TSOs has been agreed with the NRAs at the time of preparing the investment request.

We note that the Guideline was approved by the European Commission in September 2018. However, the methodology used by the TSOs to monetise security of supply benefits, departs from the Guideline and has only recently been trialled on the TYNDP 2018 projects. This methodology has been questioned by both NRAs, and therefore the CRU used a different methodology to monetise the security of supply benefits associated with Celtic, as explained in the consultation paper ([CRU/18/265](#)).

In relation to the congestion revenues presented in the TSOs' investment request, we note that they are only one component of total socio-economic welfare. Analysis across various scenarios suggests that consumer and producer surplus tend to be the largest components that drive total welfare, while congestion revenues represent a relatively small component only. The CRU's own modelling also supports this. Additionally, the congestion revenues presented in both TSO and CRU analysis represent the change in congestion revenues amongst all interconnectors in Ireland and France, respectively; not only the Celtic interconnector.

Information on key risk factors has been redacted due to confidentiality concerns. However, we consider that the mitigation measures proposed by the TSOs are sufficient at this stage to address the risks outlined. Moreover, the joint CBCA decision ([CRU/19/051](#)) imposes reporting obligations on the TSOs regarding project's costs and includes a review clause should there be material changes in cost estimates.

2.2.2 Comments on CRU assessment approach

A few respondents supported the CRU assessment of Celtic's contribution to security of supply. However, one respondent sought a more in-depth assessment from the CRU on a wider set of scenarios and in comparison with alternative solutions, in particular in the case of a low output from renewable energy sources (RES) for a system with high RES penetration. Another respondent suggested that the CRU should look at historic reliability of interconnectors.

One respondent noted that the CRU's Brexit sensitivity might appear too pessimistic if one takes positive public political positions into account and questioned whether friction in trading (as modelled by the CRU) would be a realistic outcome that would last beyond the short term.

Another respondent noted that the CRU's assessment does not capture forecasted demand increase in Ireland due to data centres.

Additionally, EirGrid in their response noted a limited scope of the CRU assessment (only 1 scenario from the 2018 TYNDP and limited sensitivities). EirGrid was also of the view that the 2040 snapshot year from TYNDP 2018 is intended for development of system needs and therefore might not be appropriate for project-specific assessments.

Finally, one respondent, while recognising that impacts on gas consumers were "correctly identified and quantified" in our assessment, raised a concern that wider gas system impacts had not been fully assessed. Specifically, the respondent noted that the forecasted increase in peak day demand as a result of Celtic may lead to higher shrinkage charges and may exacerbate the seasonality of capacity bookings, impacting on GNI revenue recovery and the stability of charges.

This respondent also challenged CRU assessment of gas tariff impact regarding its reliance on GNI supply forecasts for the year 2021/22. The respondent considered that the fact that no Inch supply is forecasted for that year may have led to an exaggerated decrease in Moffat and Corrib capacity charges as a result of the interconnector.

CRU comment

In response to the comment on our security of supply analysis, we note that the analysis was done using Vision 1 from the TYNDP 2016. Vision 1 assumes low RES penetration. As such, the analysis can be seen as a 'worst case' scenario where security of supply benefits are at their lowest level. In a world with high RES penetration, we would expect to see additional security of supply benefits associated with Celtic.

In response to the suggestion to consider the historic reliability of the existing interconnectors, we note that our sensitivity on the sustainable transition (ST) scenario, where Celtic's availability rate is reduced to 70%, roughly corresponds to historic availability rates of the East-West Interconnector (EWIC) and Moyle during certain periods of time.

We acknowledge the respondent's point with regards to the Brexit sensitivity. However, it is still unclear how, and if any, energy trading arrangements will be impacted by the expected exit of the UK from the EU. As such, the Brexit sensitivity modelled by the CRU is illustrative only and we acknowledge that the Celtic CBA results could turn out to be different than those modelled.

The comment on not capturing the forecasted demand increase in Ireland, has been addressed in our response in section 2.2.1 above.

The CRU also acknowledges EirGrid's point with regard to the scenarios and sensitivities modelled. In conducting our own analysis, we did not intend to completely replicate the TSOs' analysis but instead to model a few scenarios and sensitivities and to compare them to the TSOs' results.

With regard to concerns around the wider gas system impacts of the forecasted increase in peak day demand as a result of Celtic, we note that our analysis suggests an up to 0.9% increase in total peak day demand (see section 9.2 in the consultation paper, [CRU/18/265](#)).

We also acknowledge that if the profile of gas generation across the year changes because of the Celtic interconnector, booking behaviour may change. We reiterate our position as set out in section 9.1 of our consultation paper ([CRU/18/265](#)) that we

have not attempted to model changes in capacity bookings as this would require us to make assumptions of how generators would re-optimize their booking strategies in light of new electricity interconnectors in Ireland.

In response to the comment regarding our reliance on GNI supply forecasts for the year 2021/22 for calculating gas tariff impacts, we did not use GNI forecasts – rather, our assessment relied on the fourth price control (PC4)² forecasts of entry point supply, consistently with our use of PC4 allowed revenue forecasts. These forecasts do include a component of Inch production supply in 2021/22 (albeit small), so the respondent's concern is not applicable. Additionally, Celtic is likely to be commissioned at a time when Inch supply is forecasted to be low or non-existent by various sources. As such, we consider that modelling Celtic impacts on gas tariffs on this basis is appropriate.

² Process of setting GNI's transmission revenues for the period from Oct 2018 to Sep 2022.

2.3 Project benefits

2.3.1 Security of supply

There were mixed views on the role of Celtic (and/or further interconnection in general) in increasing Ireland's security of electricity supply. Also, respondents generally agreed with the CRU that the TSOs might overestimate Celtic's security of supply benefits, and welcomed a more prudent analysis by the CRU.

One respondent noted that interconnection might improve Ireland's generation adequacy while reducing the cost of investing in new conventional plants to replace the retiring fleet and/or DS3 plant.³ Another respondent noted that thanks to rapid ramping of power levels, a high voltage direct current (HVDC) interconnector can provide ancillary services including the reserve capacity to TSOs in times of system stress at low cost and therefore improve security of supply. Finally, according to one respondent, Celtic might reduce peak prices due to time differences and provide another option to stabilise the grid.

However, other respondents were more sceptical about Celtic's security of supply benefits. One respondent noted that predicting interconnector's behaviour in stress events and assessing the project's impact on network constraint can be particularly challenging. There were also concerns that Celtic might exacerbate security of supply issues as France might rely on imports in extreme weather conditions. One respondent also noted that Celtic, due to its location in Cork, might not improve Dublin's security of supply.

Some respondents suggested that domestic generation (procuring capacity through the capacity market), domestic measures (system services, improving system design and existing electricity and gas infrastructure) or alternative technologies (LNG, batteries) might provide security of supply at a lower cost than additional interconnection. One respondent suggested that the CRU should demonstrate that

³ Delivering a secure, sustainable electricity system. The DS3 programme aims to ensure the secure and safe operation of the electricity system with increasing amounts of variable non-synchronous generation, such as wind and solar. To achieve this aim, the TSO needs to obtain specific system services from generators and market participants (DS3 plants).

Celtic constitutes a better solution for security of supply concerns than domestic measures.

However, EirGrid noted in its response that one alternative technology explored in the investment request (battery storage), is not a like for like solution to security of supply and only comparable with interconnection on a nameplate capacity basis; and that CRU assessment should consider further solutions to provide security of supply such as peaking plants, biomass, batteries, demand response, carbon capture and storage, aggregation and power to gas (methane, hydrogen).

One respondent noted that ensuring security of supply is particularly important for large power consumers such as data centres and biopharmaceutical manufacturers.

CRU comment

The CRU notes the diverging views on Celtic's contribution to security of supply. We find that these are in line with our modelling which suggests lower security of supply benefits associated with Celtic in comparison to TSOs' estimates.

With regard to investing in alternative technologies, we would like to reaffirm our position outlined in our decision paper setting out our policy for electricity interconnectors ([CRU/18/221](#), section 3.2) where we note that in a free market economy, a vast majority of investment decisions should be driven by market forces. The Government may seek to incentivise investments in particular technologies to achieve its national and EU policy objectives. The CRU's role is to ensure a well-functioning and efficient energy market for the benefit of Irish consumers, rather than determining or promoting certain investment decisions. In that respect, in particular regarding domestic measures such as procuring DS3 system service or improving system design, we note that the recent redesign of the Single Electricity Market (SEM) is to ensure that the procurement of DS3 system services becomes one of the core elements of this market. Optimising existing infrastructure is mainly the role of EirGrid as licenced TSO to operate and maintain the system, including the interconnectors, and to further develop the system as specified in its licence. The role of the CRU is to ensure that EirGrid complies with its licence obligations.

2.3.2 Decarbonisation and renewable targets

Most respondents recognised the strategic importance of new electricity interconnection in enabling Ireland's decarbonisation by integrating renewable energy sources (both onshore and offshore) and, in particular, in the light of the EU renewable targets and the Government's climate policy. In that respect, one respondent noted that interconnection can reduce curtailment significantly and more than the equivalent capacity of electricity storage. According to another respondent, technical capabilities of HVDC systems (rapid ramping of power levels, fast switching of power flows directions) might allow Irish generators to increase export and might reduce curtailment costs. It was also noted that a potential reduction in curtailment could likely translate into lower bids under the Renewable Electricity Support Scheme (RESS).

However, some respondents were not clear regarding Celtic's overall impact on RES integration given that the project may also increase network constraints and hence, RES curtailment. In particular, one respondent noted that Celtic, together with a new IE-GB interconnector, might create a locational constraint in South/South-East. Respondents noted that existing network and locational issues need to be resolved before considering further interconnection. Also, it was pointed out that increasing operating reserve might involve running thermal generation at minimum output, displacing RES.

Finally, one respondent noted that increased RES penetration might be achieved more cost effectively through development of indigenous demand by electrification of heat and transport, instead of exports. According to the respondent, such alternative uses of excess RES in the form of heating, transport or storage would also allow RES (subsidised by Irish consumers) to be utilised domestically.

CRU comment

As set out in our consultation paper, our assessment suggests that Celtic decreases overall RES curtailment in Ireland in the two scenarios we have modelled. In the presence of a new IE-GB interconnector, the net benefit of Celtic is smaller. However, we note that our assessment also shows that Celtic may sometimes result

in additional curtailment when Ireland is importing from France. We observe lower curtailment levels when Ireland is exporting to France.

In terms of network impacts, we have investigated the capability of the Irish system to accommodate an additional 700MW interconnector, including network studies by external advisors, and can confirm EirGrid's results. We also considered a potential additional electricity interconnector to Great Britain and its interaction with Celtic. Our studies show that the grid impact of each interconnector is largely independent from each other with some network issues arising. However, these issues can be managed by dispatching generation or minor reinforcements. No significant reinforcements were identified.

Regarding operating reserve, we refer to section 2.4.2 below. Our position on investment in alternative technologies is set out in section 2.3.1.

2.3.3 Competitiveness and tariff impacts

Several respondents noted that Celtic (or additional interconnection in general) could have a potentially positive impact on the competitiveness of the Irish industry and could increase the attractiveness of Ireland for investors. According to the respondents, this positive impact might be largely due to a potential reduction in wholesale energy prices, but also potentially increased confidence in long-term security of supply from direct connectivity with Europe (both in terms of electricity and telecommunications).

At the same time, there was also a concern that any potential reduction in energy prices assumed due to Celtic might have a knock-on impact on the level of indigenous replacement reserve given that the investment case for such reserves would likely be more difficult. Furthermore, respondents noted that investing in Celtic would increase tariffs both for electricity and gas consumers, and as such undermine the competitiveness of Irish industry. As noted by the respondents, electricity prices in Ireland tend to be relatively higher than the EU average. Therefore, the respondents considered it essential that Celtic receives the maximum EU financial assistance required, in order to avoid further increase in energy costs (see section 2.5 for further comments on the CEF grant).

CRU comment

As we note in our consultation paper ([CRU/18/265](#), section 8.2.2), a potential reduction in wholesale electricity prices due to Celtic (captured in the consumer surplus indicator) may be expected to partially offset the potential tariff impact on electricity consumers.

In addition, we have assessed that the potential impact on Irish consumers in case of a 65:35 cost split, as agreed with the CRE, could range between €248⁴ million and €385⁵ million in the net present value (NPV) terms, depending on the CRU scenario and sensitivity.⁶

In order to minimise the exposure of the Irish consumers to the cost of the project, the joint CBCA decision is conditional on EU financial assistance covering, at a minimum, 60% of the project's estimated investment costs, with 65% of this aid awarded to EirGrid.

Regarding operating reserve, we refer to section 2.4.2 below.

2.3.4 Brexit and interconnection targets

Several respondents found it important to develop interconnection with mainland Europe, particularly given the uncertain outcome of Brexit. However, there were also views that interconnection with the EU internal energy market (and meeting the EU interconnection targets) should not be pursued at all cost. In particular, one respondent noted that a “hard” Brexit might also result in Ireland being exempted from the EU interconnection targets and considered an “island” under the EU legislation. Should a “soft” Brexit happen, it would greatly weaken Celtic's business case, as stated by another respondent.

⁴ CRU Sustainable Transition scenario, Celtic-only case.

⁵ CRU Sustainable Transition scenario, 70% availability sensitivity, Celtic & new IE-GB IC case.

⁶ These potential impacts are based on an indicative RAB*WACC model that estimates the allowed regulatory revenues over the project's lifetime (assuming a 65:35 cost split) and the net shortfall against congestion revenues that will have to be borne by consumers. No CEF grant is assumed in this model – a conservative assumption. We have also compared these impacts to the TSOs' modelling. The potential impact on Irish consumers as per the TSOs' modelling lies within the range provided for CRU scenarios and sensitivities. For more details on our approach, please refer to section 8.2.2 of the consultation paper ([CRU/18/265](#)), where we presented the potential consumer impacts under a 50:50 and a 70:30 split between Ireland and France respectively.

CRU comment

We note that the base assumption in our CBA is that the electricity markets of the Republic of Ireland and Northern Ireland will remain coupled, and the Brexit sensitivity assumes frictions in trading between GB and the countries it is connected to via an interconnector. Our results as well as the TSOs' results suggest that under a Brexit sensitivity, it is more beneficial for both Ireland and France to become interconnected.

In addition, we recognise that commissioning new interconnectors in Ireland may be necessary for meeting the EU interconnection targets, in particular given the risk that the expected Brexit may potentially increase the isolation of the Irish market. Our view on Celtic's contribution to reaching these targets is set out in detail in our consultation paper ([CRU/18/265](#), section 5.2.7).

2.4 Project costs

2.4.1 Cost uncertainty and risks of overruns

The respondents noted the risk of investment cost overruns signalled by the NRAs in the consultation papers and raised concerns about the resulting financial consequences for the Irish consumers. The respondents sought clarity on who is going to bear cost overruns, should they occur. There were strong views that customers should not carry any risk in that respect. EirGrid expected, as outlined in their response, that the treatment of overruns would be subject to separate engagement with the CRU and determined at a later stage.

Respondents felt that the discrepancy in CRU versus TSO investment cost estimate is large and that the CRU's assessment needs to be explained and further evidenced. It was noted that the CRU's estimate, if included in Celtic's CBA, would materially change the result of the CBA, and therefore should be included instead of the cost estimate provided by the TSOs.

The respondents had diverging views on the TSOs' cost uncertainty range provided in the investment request (-12/+15%). One respondent noted that it goes beyond ACER's recommended range (+/-10%),⁷ while another respondent suggested that it would be prudent to provide a wider range for a project of this nature, i.e. of +/- 30%.

EirGrid in their response noted that Celtic's costs cannot be determined at this stage largely due to market uncertainty (demand/supply) and volatility of raw material market prices, and that the actual budget will be confirmed prior to awarding contracts and committing to proceed with construction. In that respect, one respondent suggested to reassess the project at a later stage (or stages) once the costs are clearer.

⁷ See Agency for the Cooperation of Energy Regulators (ACER), Recommendation 05/2015.

CRU comment

Both NRAs share the concerns regarding potential cost overruns and the CBCA decision aims to mitigate this risk.

In particular, the CBCA decision is conditional on Celtic receiving a substantial EU financial support covering, at minimum, 60% of project's estimated investment costs. The NRAs also agreed that, should overruns occur, they would be shared 50/50 between EirGrid and RTE, and any amount of the EU financial support above the minimum amount required (60% of project's estimated investment costs) would be ring-fenced to cover any costs overruns.

Furthermore, the NRAs will develop appropriate incentives for the TSOs to minimise the risk of cost overruns. The TSOs will be requested to submit periodic cost estimate reviews and report to both NRAs on any material changes in cost estimate. The CBCA decision also states that the TSOs shall not commit any significant expenses until procurement of the infrastructure is complete and the overall cost of the main supply contracts (including cables) is known. Moreover, should the cost of these contracts materially exceed the estimated costs (i.e. by 20%) or should the total costs of the project be reviewed significantly upwards (i.e. by 20%), the NRAs have agreed to consult with the project parties and to review this decision in order to reconsider the opportunity to invest in the project and/or the cross-border cost allocation decision regarding cost overruns.

As part of our assessment of Celtic's CBA, we have modelled a cost sensitivity that reflects a 20% overrun in capital expenditure. This could reduce the project's net welfare benefits in Ireland by up to €28 million (in NPV terms). This reflects the conservative assumptions that no grant above the minimum 60% requirement will be made available, and that no cost sharing mechanism is included as part of the incentive package agreed with the TSOs.

The CRU's investment cost assessment is based on both publicly available and commercially sensitive and confidential data. The sensitive nature of some of these sources means that they cannot be made available. Where publicly available benchmarks were used (e.g. [the UK Electricity Transmission Costing Study](#)), we

attempted like for like comparison, for example by removing contingency and developer costs where the benchmarks offer enough granularity to do so.

2.4.2 Network reinforcement and system operational costs

Respondents suggested to include network reinforcement and increased system operational costs due to Celtic in the CBA calculation, and that not including them might not be in line with the EU approved methodology.

Some respondents questioned the TSO estimated increase in system costs due to Celtic. These are the costs of meeting the reserve requirement for operating a system with Celtic as the largest single infeed (700MW). The TSOs assumed that one to three similar size offshore windfarms would connect to the grid in the meantime and based on this, they attributed to Celtic only 25-50% of these costs. It was noted that that offshore windfarms might not be delivered as quickly as expected and/or might not be connected through single infeeds.

Two respondents noted that thermal capacity that might be displaced by the interconnector in energy generation, is likely to still be needed to provide system services. The respondents asserted that the potentially higher cost of keeping these plants in operation would need to be accounted for as well. It was suggested that the CRU should assess Celtic's capability to deliver ancillary services, such as black start and reactive power and compare this with conventional means of providing ancillary services.

One respondent sought clarity on the impact of Celtic on power flows and transmission constraints.

CRU comment

While we acknowledge that including network reinforcement and increased system costs due to Celtic in the CBA calculation may be consistent with the EU approved methodology, we note that the methodology does not explicitly require this. Additionally, in our view network reinforcement costs (as estimated both by the TSOs

and CRU)⁸ would be relatively small, compared to the scale of the interconnector project costs.

As for system costs, we acknowledge that an argument could be made for including these in the CBA. However, we note the difficulty in estimating such costs, particularly when some of the system services markets that respondents reference are yet to go live. Celtic may also be able to provide a suite of services that could assist with system operation. These have not been included in the CBA for similar reasons. The CRU considers that it would be inconsistent to consider potential system costs when the potential system benefits as a result of Celtic are difficult to quantify, and therefore not fully captured.

With regards to the specific issues raised around the estimation of system costs, we agree with the respondents questioning the TSOs' assumption that one to three similar sized offshore windfarms will connect to the Irish system. While the most optimistic scenario from EirGrid's Tomorrow Energy Scenarios assumes that 3,000MW of offshore wind generation capacity is developed by 2030, the other three scenarios assume a much more conservative development of offshore wind, ranging from 250MW to 1,000MW (see [CRU/18/265](#), section 3.2.3).

Regarding the concerns around the potential for increased costs in keeping thermal capacity operational for the provision of system services, we consider that as the energy market evolves there could be a multitude of factors that impact on the cost of system services provision. We do not consider that any additional costs can be definitively attributed to any specific project or development. It is our view that the competitive tendering of system services will ensure the lowest possible economic cost and that participants are adequately rewarded for the provision of such services.

Please see section 2.3.2 for our comments in relation to Celtic's impact on power flows and transmission constraints.

⁸ See sections 3.1.3 and 3.2.3 in the consultation paper ([CRU/18/265](#)) respectively.

2.5 EU financial assistance

The majority of respondents commented on the TSOs' intention to apply for the CEF grant.

According to the respondents, significant CEF funding is needed to alleviate both the risk and potential financial impacts of the project on both Ireland and France. One respondent queried why the TSOs do not intend to apply for the maximum amount of funding (covering 75% of project costs). Another respondent noted that requesting the maximum level of grant would be largely based on Celtic's role in strengthening EU solidarity, and this is uncertain and depends on the outcome of Brexit.

One respondent suggested that no works should commence until guaranteed funding is in place.

CRU comment

We note that without the EU financial support, including Celtic in national tariffs would have a material impact on the Irish consumers, and increase tariffs to a level that would be significantly higher than in other EU countries given the relatively high investment cost and the small size of the Irish market.

We have assessed that the potential impact on Irish consumers in case of a 65:35 cost split between Ireland and France respectively, as agreed with the CRE, could be as much as €385⁹ million in NPV terms. As a result, we have agreed with the CRE that significant EU financial assistance would be needed to ensure Irish consumers do not face significantly higher transmission charges due to this investment. A CEF grant would result in Irish consumers bearing a smaller portion of project costs, hence being less adversely impacted.

We note that Celtic may be awarded a maximum CEF grant of €697.5 million, i.e. 75% of total project costs. We are of the view that if Ireland has to pay 65% of project costs, we would require at least 65% of the required minimum grant level (60% of project costs) to be allocated to Ireland to mitigate the risk of a negative

⁹ This is based on the CRU Sustainable Transition scenario, under a 70% Celtic availability sensitivity, in the Celtic & new IE-GB IC case. See section 2.3.3 for more details on how this value was estimated.

consumer impact should the benefits from the project turn out to be significantly lower than modelled in some scenarios. This level of grant for Ireland would ensure that including Celtic in national tariffs does not represent a disproportionate burden for Irish consumers.

2.6 Regulatory treatment

Several respondents noted that they could not provide any detailed comments on the proposed regulatory treatment given the lack of detail in the investment request.

More generally, it was suggested that a clear regulatory framework for the allocation of costs and risks should be devised that sufficiently protects the interest of consumers while encouraging investment in infrastructure projects. In that respect, some respondents believed that more risk should be borne by investors, rather than consumers, as the level of potential EU financial assistance and the potential consumer benefits remain uncertain (particularly in the case of two new interconnectors, see section 2.4). Some respondents considered that the exposure of Irish consumers should be capped in a similar way to the cap suggested by the CRE under the French regulatory framework.

One respondent noted that the cost of infrastructure that facilitates the integration of renewable energy sources should be paid from general taxation, and not levied only on electricity consumers, since decarbonisation has wider societal benefits.

Two respondents were in favour of the Irish WACC/RAB¹⁰ framework. It was noted that such model might improve price stability for consumers and provide additional comfort to lenders, who in turn could offer financing at more attractive rates. However, respondents were also concerned that an asset-light entity like EirGrid might be seeking to add Celtic to its RAB, and called for a more robust justification for applying this model. (EirGrid, in their response, reiterated that the proposed WACC/RAB model would be a suitable regulatory framework and consistent with the framework proposed for RTE in France.)

One respondent believed that a cost/risk sharing mechanism, such as a cap & floor, would be more appropriate than the traditional WACC/RAB model. EirGrid noted in their response that a cap & floor model might not be appropriate for Celtic as it would provide incentives to maximise congestion revenue in a manner that may raise actual or perceived conflict of interest with EirGrid's duties as the TSO.

¹⁰ See glossary of terms.

Lastly, one respondent cautioned against ‘double counting’ interconnector revenues from energy and system services markets in assessing the potential impact of cap & floor payments on consumers, noting that the correlation between events in the two markets may not be zero.

CRU comment

We consider that the CBCA decision adequately protects the interests of Irish consumers. The CBCA agreement is conditioned on Celtic receiving a CEF grant of at least €558 million (60% of Celtic’s expected CAPEX), with 65% of this amount being awarded to EirGrid. This condition effectively provides a cap on Irish consumer exposure.

In section 2.3.3 we discussed our indicative assessment of the potential Irish consumer exposure (through tariff impacts) under a 65:35 cost split and a 0% CEF grant. With a 60% CEF grant (and 65% of this amount awarded to EirGrid), the potential Irish consumer exposure would be materially lower than without this aid. However, the ultimate cost and risk allocation on Irish consumers will depend on the nature of the regulatory framework. Subject to the CEF grant reaching the required minimum level, the CRU will develop a detailed regulatory framework for Celtic, and separately consult on that matter.

In developing this regulatory framework, the CRU will consider the respondents’ views on the relative benefits, costs and risks that may arise under different regulatory regimes as well as conduct its own assessment.

Finally, in response to the concern raised by a respondent with regard to ‘double counting’ of revenues from energy and system services markets, we note that our indicative analysis of the potential impact on consumers relied on congestion revenues only, and did not include revenues from the provision of other system services. This is a conservative assumption and can be seen as a ‘worst case’ assessment of the impact on Irish consumers. We will consider the treatment of different sources of revenues in forecasting the consumer impact of different regulatory frameworks as part of developing a proposed framework for Celtic, that will be consulted on at a later stage.

2.7 Ring-fencing arrangements

One respondent expressed concerns about the adequacy of the ring-fencing arrangements between the TSO as operator of Celtic and the TSO as administrator / operator of the capacity and balancing markets and DS3 system services procurement. According to the respondent, the TSO's central role in system operation and DS3 procurement might give Celtic a competitive advantage to secure higher revenues from ancillary services. In that respect, the respondent referred to its feedback to CRU information paper on EirGrid's licences modifications required to implement I-SEM ([CER/16/368](#)) where it suggested a number of specific licence condition changes that might mitigate similar-type concerns.

CRU comment

We recognise that there is currently no formal ring-fencing in place between the Celtic project and EirGrid's licenced activity. Under the TSO licence, EirGrid is required to explore and develop new interconnection opportunities, such as the Celtic project. However, appropriate governance arrangements will have to be put in place in advance of Celtic's commissioning to ensure EirGrid's full compliance with its licence obligations once the project is in operation. To this aim, we are currently reviewing the existing governance arrangements as submitted by EirGrid,¹¹ and will propose the required mitigation measures as part of Celtic's regulatory framework, and separately consult on that matter. This will address any potential conflicts of interest within EirGrid between discharging of functions under its TSO licence and any work carried out as Celtic's project promoter.

¹¹ EirGrid's report on Celtic Interconnector Project Governance, submitted to the CRU on 30 April 2018.

2.8 Celtic and other interconnectors

Some respondents noted that Celtic's NPV depends on the level of interconnection between Ireland and Great Britain. Pointing at the CRU's recent decision on the Greenlink project ([CRU/18/216](#)), respondents queried the need for investing in a second interconnector at this stage. In their view, it would be too costly for the Irish consumers to underwrite two new interconnectors. In terms of network impacts, one respondent noted that two interconnectors might lead to a significant generation constraint exacerbating the security of supply problem in the Dublin area and raising consumer costs.

The respondents saw the need to carry out further analysis on the interaction between the two interconnectors. It was noted that Ofgem's window approach or a competitive procurement process (tender) might be more adequate to determine which of the interconnectors constitutes the optimal solution for the Irish consumers.

One respondent noted that Celtic (and Greenlink) might undermine EWIC's business case. It was noted that regardless of this impact, EWIC would maintain a secure revenue stream as a fully underwritten interconnector. This was seen as a major drawback of imposing a second (or third) interconnector cost on consumers.

CRU comment

We note the respondents' comments on the interaction of Celtic and Greenlink, and suggestions to assess competing projects together. As outlined in [CRU/18/221](#), section 3.3, a combined assessment of multiple projects would not be feasible in Ireland for practical reasons. However, we examined the interactions with existing and/or potential new interconnectors as part of each individual application. In that respect, we can confirm the respondents' concerns that, should a new IE-GB interconnector be developed alongside Celtic, net benefits from Celtic could be significantly reduced, but still remain positive in some scenarios.

We also note that commissioning both new interconnectors may be necessary for meeting the European Commission's 2030 interconnection targets with respect to the price differential with neighbouring markets, the ability to meet a substantial proportion of peak demand through interconnection, and enabling RES deployment

(see section 5.2.7 in our consultation paper, [CRU/18/265](#)). Further, should the United Kingdom leave the EU internal energy market in its exit from the EU, Ireland would be at risk of becoming completely isolated from this market until Celtic is commissioned, with a potential knock-on effect on electricity prices.

Also, the two new interconnectors (Celtic and a new IE-GB interconnector) connect Ireland to markets with different demand profiles and generation mixes. These differences can enable greater benefits in terms of security of supply, RES integration, and the reduction of CO₂ emissions than could otherwise be realised in with a single interconnector to one market.

In terms of a cumulative cost to consumers resulting from developing two new projects in parallel, we note that this depends on the regulatory framework devised for each interconnector by the CRU. For our assessment of cumulative network impacts of the two interconnector projects, see our comment in section 2.3.2.

With regard to the business case for EWIC, we acknowledge the respondent's point that the commercial business case for existing interconnectors may be impacted by the addition of Celtic (and/or another interconnector). Our modelling did suggest that congestion revenues for existing interconnectors would be likely to fall, particularly in the case where both Celtic and a new IE-GB interconnector are commissioned. Nevertheless, the commercial business case does not capture the full benefits to socio-economic welfare from existing interconnectors. It is our view that while the addition of new interconnectors likely reduces these benefits, they can be expected to remain positive. We also reiterate the benefits of additional interconnection highlighted above. Hence, the case for consumers to be underwriting these projects still remains.

2.9 Other issues

One respondent noted potential technical issues arising for generators located near Celtic's proposed connection point due to sub-synchronous resonance (SSR). The respondent noted that SSR might result in turbine-generator shaft failure and electrical instability at oscillation frequencies lower than normal frequency, and asked the CRU to assess these risks.

Another respondent asked whether Celtic would worsen the transmission loss adjustment factors (TLAFs) of the existing wind and thermal generators located in the South/South-East area. As noted by the respondent, the current TLAFs for this area would already be low, indicating that this is not the best location for new generation.

One respondent was concerned that if Celtic bids into the capacity market, with limited exposure to wholesale markets or specific penalties that incentivise performance, this could create distortions to achieve the all-island reliability standard. In relation to this, another respondent saw potential moral hazard risks when an interconnector regulated by a cap & floor regime participates in the capacity market.

Also any perverse incentives should be considered when developing the detailed regulatory arrangements.

CRU comment

We acknowledge the respondent's concern that the HVDC link may risk causing sub-synchronous resonance to nearby generator sets, which may in turn result in shaft failures. It is not possible to predict the impact to the generation located near Celtic's proposed connection point without extensive further studies and investigations. However, we note that a wide variety of methods are employed for damping and controlling sub-synchronous resonance.

With regards to concerns around TLAFs, we note that these will depend on the interconnector losses and the expected interconnector flows. We accept that there will be an impact on the TLAFs in the region, however it is not possible to predict the significance of this issue without further study.

We also note the above comment regarding the capacity market and will consider it when developing Celtic's regulatory model. Our proposals in that respect will be subject to a separate consultation.

3 Next steps

Subject to EU financial assistance reaching the required minimum level, the CRU will seek to develop a detailed regulatory framework for Celtic, and separately consult on that matter in due course.