TRANSMISSION INFRASTRUCTURE DELIVERY MONITORING

RECOMMENDATIONS

CRU 16062-001-R0
30 JANUARY 2025
COMMERCIAL IN CONFIDENCE

An Coimisiún um Rialáil Fóntais
Commission for Regulation of Utilities

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Executive Summary

The Commission for Regulation of Utilities ("CRU") is Ireland's independent energy and water regulator. The CRU's mission is to protect the public interest in Water, Energy and Energy Safety.

Every five years the CRU publishes a Price Review that determines the amount of revenue that EirGrid and ESB Networks can collect from customers over the next five-year period. The current price review period "PR5" covers 2021-2025.

While the CRU reviews capital projects in detail at the end of the five-year review period, an active and ongoing annual Capex monitoring process has been in place over the past few years. The Capex monitoring framework increases the CRU's capacity to oversee the processes that result in transmission investment and delivery, and hence enables the CRU to better protect customers from the risks and costs of inefficient investment in its regulatory decision-making.

TNEI was tasked to support CRU with supplementing and improving existing processes and reporting, as well as recommend further actions to better understand the common causes of infrastructure delivery delays.

Reviewing documents relating to the progression of transmission infrastructure projects provided to CRU it was found that there is a significant amount of information, via annual as well as quarterly reporting and publications. However, this information was found to be disjointed, unclear and in areas, not enough granular detail is provided.

TNEI collated the details, based on documents provided by CRU, as well as information made publicly available by the TSO. The Infrastructure Delivery Workbook (IDW) includes details of all PR5 projects, and any additional projects added to TSO/TAO programme of works, as detailed in the most recent Network Delivery Portfolio (NDP) Updates[1]. Also included in the IDW are estimated delivery dates based on the three (3) significant milestones of a transmission project, Capital Approval (CA), Project Agreement (PA) and Energisation. A comparison was completed, utilising the dates originally provided as part of the PR5 submission, as a Baseline, and any subsequent updates in the form of annual Capex Outturn reports and/or NDP updates. A RAG status was then applied to each of the projects to help identify delays, and the magnitude of that delay. The IDW will allow for future updates to be automatically incorporated into the workbook and the RAG status applied. Summary plots and tables are also provided, detailing the level of delays based on different criteria and/or categories.

Reviewing the provided documentation and following discussions with CRU, the following recommendations and actions are provided, to better understand and monitor infrastructure delays going forward. These recommendations and actions will also help to identify common causes of delays and the likely point within the project life cycle where delays may occur.

Actions

- Create a Risk Register/Reference Document detailing the typical delays experienced by infrastructure projects, through the life cycle of the delivery.
- Work with TSO/TAO to agree approach for identifying priority projects and determine/agree a short list of priority projects that will become the main focus for monitoring.
- TSO/TAO to provide a quarterly update on all identified/agreed priority projects and provide details as to the cause and mitigation for delays.

[1] https://www.eirgridgroup.com/customer-and-industry/general-customer-information/network-delivery-portfoli/index.xml

- Within the existing Joint TSO/TAO PR5 Network Capital Expenditure (Capex) annual submission, include summary of project delivery based on category and a summary of common causes of delays.
- Within the existing Joint TSO/TAO PR5 Network Capital Expenditure (Capex) annual submission, provide more detail for projects delayed in the submission year (Appendix 5), and reference the Risk Register/Reference Document.

Recommendations

- Utilising the Risk Register and considering the identified priority projects, to estimate constrained project delivery timelines.

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APPENDICES

Appendix A – Table of Delayed Projects from Capex Report 2022

1 Introduction

The Commission for Regulation of Utilities ("CRU") is Ireland's independent energy and water regulator. The CRU's mission is to protect the public interest in Water, Energy and Energy Safety.

Every five years the CRU publishes a Price Review that determines the amount of revenue that EirGrid and ESB Networks can collect from customers over the next five-year period. The current price review period "PR5" covers 2021-2025.

While the CRU reviews capital projects in detail at the end of the five-year review period, an active and ongoing annual Capex monitoring process has been in place over the past few years. The Capex monitoring framework increases the CRU's capacity to understand the processes that result in transmission investment, and hence enables the CRU to better protect customers from the risks and costs of inefficient investment in its regulatory decision-making.

TNEI was tasked to support CRU with supplementing and improving existing processes and reporting, as well as recommend further actions to better understand the common causes of infrastructure delivery delays.

TNEI reviewed provided documents, as well as publicly available documents, to create an approach for more efficient monitoring of the status and progress of each PR5 (and post PR5) transmission investment. On reviewing the information provided, TNEI also made recommendations to improve the ongoing understanding of common causes of delays, as well as suggestions to improve the reporting of delays, to better equip CRU to engage with the TSO and TAO on such delays.

2 Infrastructure Delivery Workbook (IDW)

In order for CRU to actively and meaningfully monitor the status and progress of all transmission investment projects, TNEI has developed an Infrastructure Delivery Workbook (IDW). This workbook contains the details of all transmission projects identified as part of PR5, and all subsequent investment projects.

The IDW categorises each individual project by voltage, type (OHL, UGC, Station) and project categorisation (as per EirGrid's Network Delivery Portfolio publications). It contains project delivery dates as included in the original PR5 submission (Baseline), as well as updated delivery dates provided via the PR5 Transmission Programme 2022 update and subsequent NDP updates published. This allows CRU to track each project through the delivery lifecycle and easily identify delays, comparing each subsequent update as well as with the Baseline of PR5 original submission. A RAG status is applied to each update to quickly see which projects have been delayed and categorise the significance of the delay.

The RAG status is aligned with the most recent NDP update (Q2 2023)[2]. Any delays from the previous update will have the following key:

- Red: Projects delayed more than 12 months
- Amber: Projects delayed more than 3 months but less than 12 months
- Green: Projects delayed less than 3 months

The IDW will allow CRU to include future updates into the spreadsheet, with the updated dates automatically populated into the workbook and the RAG status applied. The template of the information to be provided by TSO/TAO should be the same format as the latest NDP with any new projects provided in a separate sheet with all data fields populated, and then added to the IDW master sheet.

The IDW also contains a summary sheet, that provides graphics to outline the number of projects that are experiencing delays, by voltage, type and project categorisation. This summary sheet will look to compare delays reported between updates but also delays since the Baseline of the PR5 original submission.

[2] https://www.eirgridgroup.com/site-files/library/EirGrid/Network-Delivery-Portfolio-Publication-Q2-(2023).pdf

3 Report and Data Review Findings

CRU provided TNEI a number of recent and historical documents relating to the delivery of Transmission projects.

The following reports were reviewed (as provided by CRU):

- D 22 14814 PR5 Network Capex 2021 Annual Submission_FINAL (pdf)
- PR5_Transmission_Programme_2021_FINAL (excel)
- D 22 11734 7.9 2021 TSO_TAO Joint Outturn Report (submitted to CRU 29.04.2022) (pdf)
- PR5 Transmission Programme 2022 (submitted to CRU 31st May 2023) (excel)
- PR5 Transmission Capex Report 2022 (submitted to CRU 31st May 2023) (pdf)
- EirGrid Submission - 2.7 Annex 5 IPD Supplementary Timeliness Report 2022 (pdf)
- Network Delivery Portfolio Q1 (2023) – Published on 3rd May 2023 (pdf)
- Network Delivery Portfolio Guidance Document – Published on 3rd May 2023 (pdf)
- Network Delivery Portfolio Q2 (2023) – Published on 31st July 2023 (pdf)
- Network Delivery Portfolio Guidance Document – Published on 31st July 2023 (pdf)

Although there is a significant level of information provide in the various reports it proved difficult to track and monitor projects as the information provided can be disjointed and inconsistent. The level of detail relating to the delivery of projects and forecasted delivery dates was at a high level and did not provide the level of detail CRU requires to confidently monitor the progression of infrastructure through the project life cycle and meaningfully engage with the TSO/TAO to understand and challenge causes of delays.

In the course of reviewing the reports, we identified discrepancies and noted a deficiency in the level of detail provided. The are some inconsistencies with the categorisation of projects, mentioning in one section 16 customer projects were delivered in 2022 but in Appendix 2, only 6 are listed as customer related.

The categorisation and reporting of projects is inconsistent between sections and appendices of the Capex report. This makes it very difficult to monitor the status and progression of projects through the life cycle and to delivery. It is recommended that a consistent categorisation is used when reporting on the status and delivery of transmission projects, i.e. the project categorisation used in NDP updates and the IDW.

4 Actions

4.1 Risk Register

Designing and delivering an electricity transmission project can be a complex and lengthy process. Transmission projects may experience a variety of delays through each Gateway step. To support CRU in understanding the common causes of delays, TNEI recommended producing a Risk Register, identifying common causes of delays for each of the Gateway steps, as a reference guide for PR5 Transmission Capex reporting and monitoring.

This risk register has been developed in coordination with the TSO and the TAO. The risk references contained may be used in joint reports to categorise and refer to the high-level reasons for project schedule variances and other reasons for the deviation of projects from forecast timelines. The TSO and TAO have sought to include a wide variety of risks which may be experienced on projects at varying points in the project life cycle across different categories of projects. Additional detail is provided on project challenges and mitigation activities which are carried out.

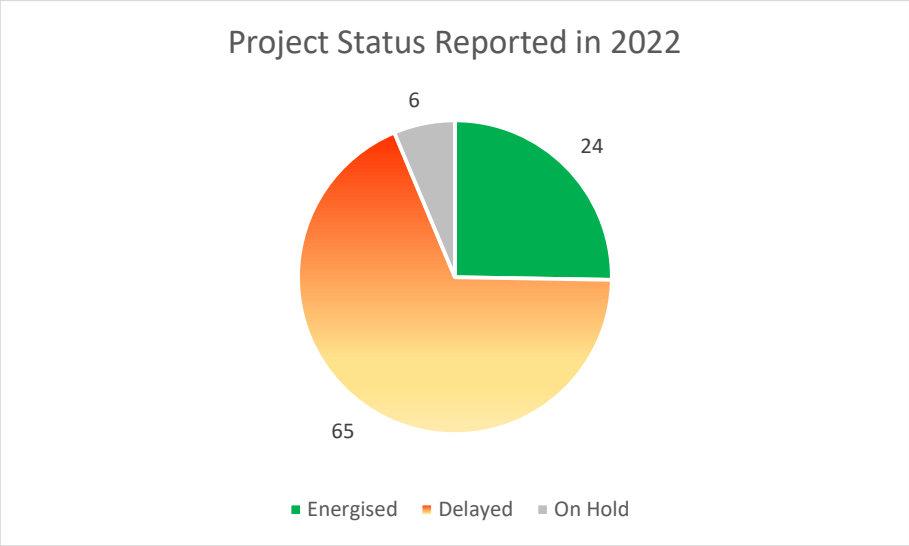
4.2 Amendments and Additions to Capital Expenditure Report

It is important to provide clear information regarding the projects that were anticipated for delivery in the preceding Capex year, including those that were successfully delivered, as well as those that encountered delays or were placed on hold or removed. To date, details of individual projects are found in the Appendixes. However, it is essential to summarise these details within the main body of the report, presenting a comprehensive overview of the total count of projects that have been completed, delayed, put on hold, or removed. Additionally, the summary of project delivery should include categorisation by voltage, type, and project category, following the criteria outlined in the NDP updates and the new Infrastructure Delivery Workbook.

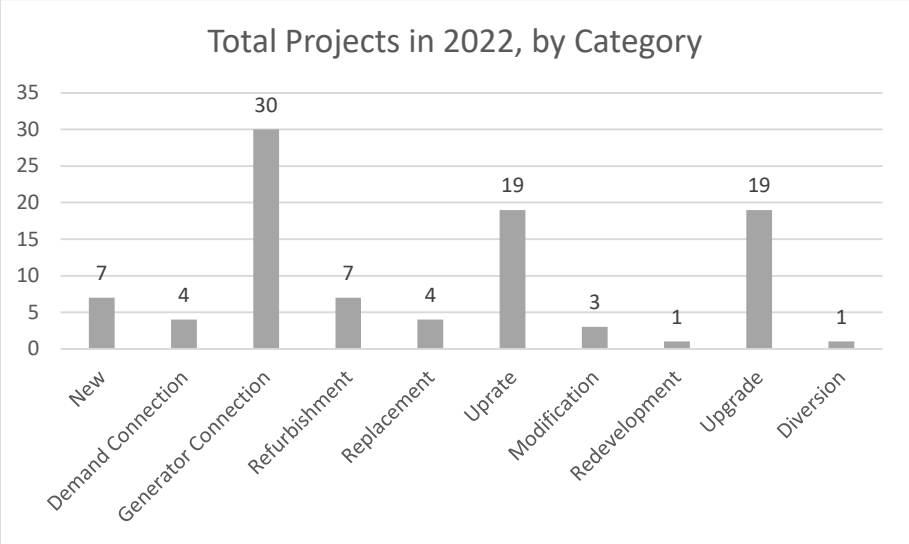
Incorporating the following enhancements into the Transmission Capex Reports would offer CRU a convenient and efficient means of obtaining a concise overview of the project status scheduled for delivery in the Capex year. To illustrate how this information could be presented, we have taken the data from the PR5 Transmission Capex Report 2022 (submitted to CRU on May 31, 2023) as an illustrative example. In certain sections, slight adjustments have been applied to the data to ensure alignment with the most up to date NDP and the new Infrastructure Delivery Workbook (IDW). These modifications primarily relate to project status and by category type. The details of all projects will remain in tables in the Appendices for closer inspection, if required.

Status	Number
Completed	**24**
Delayed	**65**
On Hold	**6**
Removed	**7**
Total	**103**

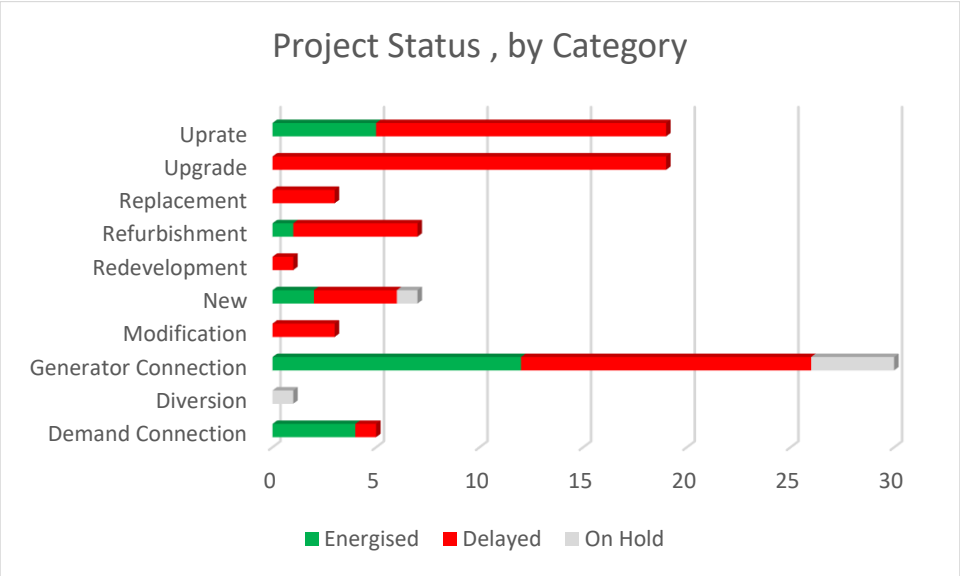
The status of projects reported in 2022



A breakdown of category of projects reported in 2022



The status of projects reported in 2022, by category.



4.2.1 Details of Delayed Projects

The Transmission Capex Reports issued to date have included a list of projects that saw delays in their energisation dates compared to the prior report. This information is presented within an appendix (specifically, Appendix 5, in the previous Capex Report in 2022). While comments concerning the reasons for delays have been included previously, the depth of information provided is insufficient to enable CRU to gain a comprehensive understanding of the causes, patterns, and parties responsible for these delays.

The recently established Risk Register, which has been reviewed and populated by both the Transmission System Operator (TSO) and Transmission Asset Owner (TAO), should be utilised and every project listed as delayed in the Capex Report should be cross-referenced with the overarching reason for the variance in its schedule. Furthermore, there is a need for a more comprehensive explanation of the delay's root causes and an indication of any identified mitigation measures aimed at rectifying the delay or preventing any future delays. In particular, it is important that any root causes have been appropriately assessed. For example, if an outage has not been granted then the likelihood of obtaining that outage in future years should be fully assessed to ensure there is a realistic revised delivery date. If this is not done correctly, there is the risk of rolling delays on projects.

An extract of the table is provided below, based on the information provided in the PR5 Transmission Capex Report 2022. This table from Appendix 5 has been updated to include the voltage, type and category of each project as well as the Risk Register reference. This table is currently under review by the TSO/TAO.

Table 1: Amended table of Energisation date changes since the previous report from Capex Report 2022

CP Number	Project Title	Voltage (kV)	Project Type	Project Category	Capex 2021 EI Year	Capex 2022 EI Year	Risk Reference	Owner	Current Comments
CP0823	Maynooth - Turlough Hill 220kV line refurbishment	220	OHL	Refurbishment	2025	2026	GW6.1/GW6.3		
CP0644	Bracklone 110kV Station and Newbridge - Portlaoise Loop in - Bracklone Stn Works DSO	110	Station	Modification	2024	2025	GW6.3		
CP0866	Great Island - Kellis 220 kV line refurbishment	220	OHL	Refurbishment	2023	2029	GW4.2		
CP0741	Trabeg 110 kV station - uprate 2 x 110 kV transformer bays and control room extension DSO	110	Station	Uprate	2024	2025	GW6.3		
CP0867	Flagford - Louth 220kV Line Refurbishment	220	OHL	Refurbishment	2024	2025	GW6.3		
CP0869	Maynooth - Woodland 220 kV line uprate	220	OHL	Uprate	2022	2024	GW5.1		
CP1022	Maynooth - Turlough Hill PLC Replacement	220	OHL	Replacement	2022	2023			

4.3 Priority Projects

Presently, there are a total of 368 transmission projects listed on the PR5 program (as per the most recent NDP Update Q2). Monitoring every project in intricate detail might not be the most efficient use of resources. It is advisable to pinpoint projects of higher priority. The process of identifying these priority projects should be a collaborative discussion with the Transmission System Operator (TSO) and Transmission Asset Owner (TAO), and the criteria for prioritising critical projects established and a final list presented to CRU. It is anticipated, and imperative, that the priority list would include critical projects which are key to enabling renewable targets and addressing security of supply and safety issues. This list of priority projects should undergo close monitoring, and periodic/quarterly updates should be provided. The updates should furnish specifics regarding project progress, the identification of any delays or risks, an evaluation of the impact of these delays, and any strategies aimed at mitigating or eliminating ongoing or future delays. This list of priority projects should undergo an annual assessment to determine if any modifications, removals or additions are warranted.

The exercise for identifying the criteria for priority projects is at the initial stages with TSO/TAO and a list of priority projects should be established following this review. After CRU has reviewed this list, it is recommended to engage in discussions with the TSO/TAO to better understand the procedure for identifying priority projects and to reach a consensus on the robustness and appropriateness of this process. To ensure the priority projects are monitored in detail, the quarterly progress updates should include the following information:

- More detailed datasets than the Infrastructure Delivery Workbook. More granular milestones to ensure timely notification of any delays between the 3 overarching milestones.
- RAG status applied, aligned with the NDP key.
- Cross-referenced with the overarching reason for the delay from the new Risk Register.
- Details of the cause of any delays identified, to the same level of delay agreed for the Delayed Projects listed in Appendix 5 of the Capex Report.
- Details of any mitigation identified and/or in progress.
- Impact of the delay (on system needs, cost to consumer, RES/carbon targets etc).
- Possible risk impact assessment, utilising the risks listed in the Risk Register

4.4 Review of Project Delays 2022

In order to ensure an appropriate level of detail regarding project delivery delays and to initiate a data gathering exercise aimed at identifying recurring themes and bottlenecks in the project lifecycle, a review is currently underway for the projects listed as delayed in the Transmission Capex Report 2022. This review encompasses the 65 projects with altered energisation dates, which are documented in Appendix 5 of the Capex Report 2022.

Additional data fields have been introduced, and a request for more comprehensive details regarding the causes of these delays has been issued to the TSO/TAO for their consideration. Ongoing discussions are crucial to ensure that the level of detail required by CRU for an effective understanding and monitoring of project progress is achieved before being consistently incorporated into future Capex Reports.

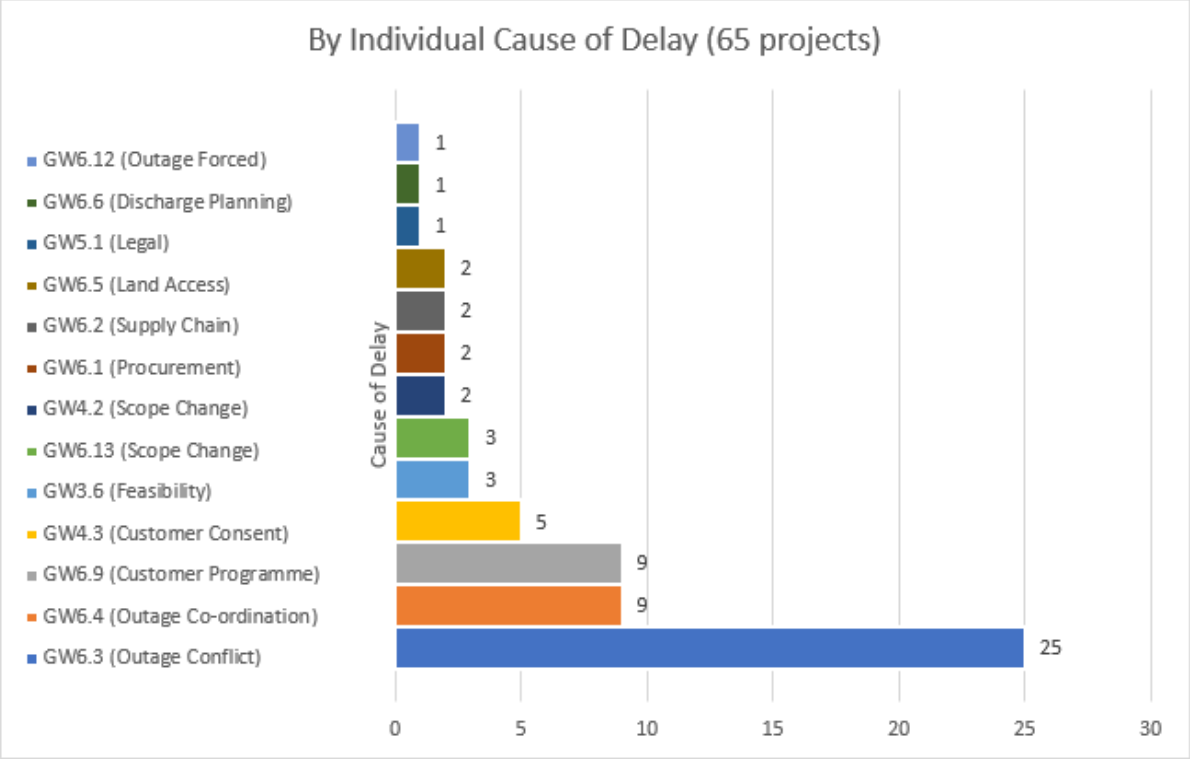
The full table, from Appendix 5 of the Transmission Capex Report 2022, has been updated to include the voltage, type and category of each project as well as the Risk Register reference, and is included in Appendix A of this report.

TNEI has conducted an examination by comparing the risk register to the explanations given for project delays, as documented in Appendix 5 of the Capex Report 2022. While it is the responsibility

of the TSO/TAO to officially verify the causes of delay, this analysis offers valuable insights into the primary reasons for these delays, with outages emerging as a predominant factor.

4.4.1 Project Delays by Risk Reference

Cause of Delay	65 Projects
GW6.3 (Outage Conflict)	24
GW6.4 (Outage Co-ordination)	10
GW6.9 (Customer Programme)	9
GW4.3 (Customer Consent)	5
GW3.6 (Feasibility)	3
GW6.13 (Scope Change)	3
GW4.2 (Scope Change)	2
GW6.1 (Procurement)	2
GW6.2 (Supply Chain)	2
GW6.5 (Land Access)	2
GW5.1 (Legal)	1
GW6.6 (Discharge Planning)	1
GW6.12 (Outage Forced)	1



The most common cause of delay to project delivery relates to outages, namely conflicting or prioritisation of outages. Outages may not be granted for a number of reasons, may not be feasible to take multiple items of plant out of service at once so projects are prioritised according to EirGrid

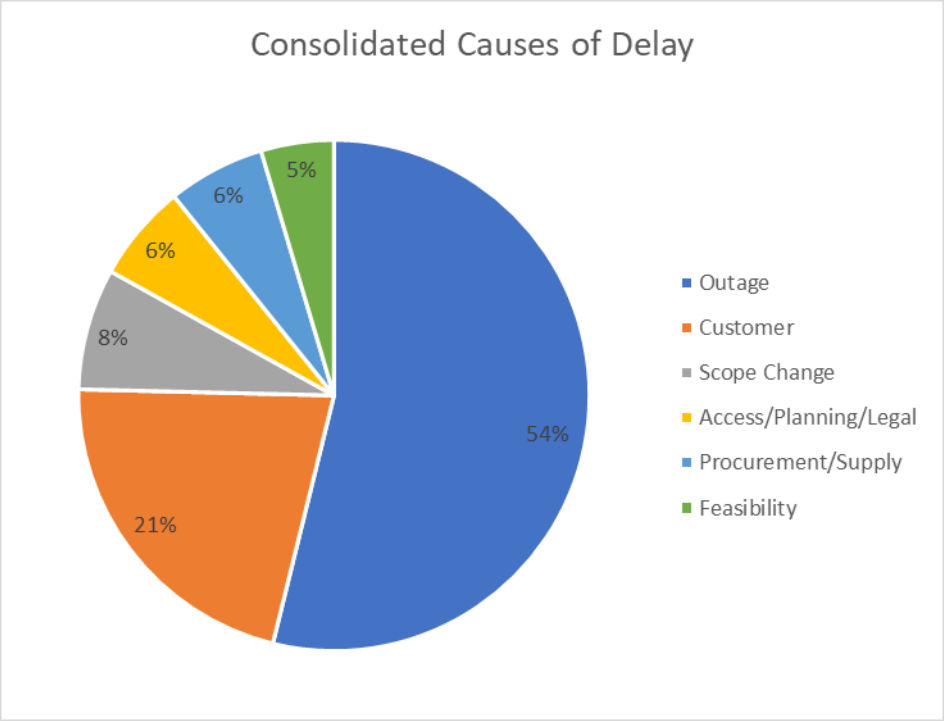
Outage Prioritisation Guidelines[3], essential to co-ordinate multiple projects to optimise outage windows and forced outages and/or generator outages may cause security of supply or system integrity and limit available outages.

Other delivery delays often result from issues on the customer's end, particularly when they encounter delays in planning, design, or scoping. EirGrid and ESBN cannot directly control or alleviate these delays, as the responsibility lies with a third party.

4.4.2 Project Delays by Theme

Consolidating the main themes of delays emphasises the substantial risk linked to outage challenges, where upwards of 54% of projects have been delayed due to outage constraints.

Consolidated Causes of Delay	65 Projects
Outage	35
Customer	14
Scope Change	5
Access/Planning/Legal	4
Procurement/Supply	4
Feasibility	3



4.4.3 Outages Complexities and Delays

Scheduling and managing outages is a multifaceted and complex process. At any one time it is possible and even likely that 20 or 30 pieces of plant / equipment are on outage. These outages must be spread across the system and carefully assessed by the TSO to ensure the system remains safe and secure

[3] https://www.eirgridgroup.com/site-files/library/EirGrid/EirGrid-Outage-Prioritisation-Guidance-Document-Final.pdf

while the outages are taking place. The TSOs must also ensure that outages are granted as efficiently as possible and risk to the wider system is minimised as much as reasonably possible.

The limited number of circuits that can be on outage in each area of the transmission system at any one time presents a challenge for granting large numbers of outages. In addition, day to day operational challenges increase the complexity further. A summary of some of the most common issues is presented below. It is important to note that this list is not exhaustive and given the complexity of system operation, any number of complications can arise.

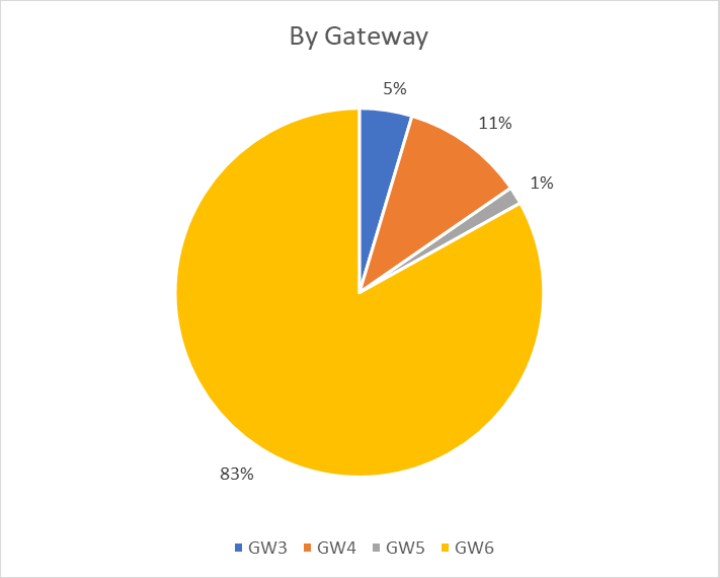
- Quantity of outages – The quantity of outages required on the Transmission System has in recent years been greater than what can be granted by the TSOs. There are hundreds of outages required every year, with routine maintenance and capital projects both requiring space in the programme.
- Forced outages – Forced outages occur regularly on the Transmission System. These are outages of plant / generators which were not planned by the TSOs. These outages are outside the control of the TSOs and can occur for many reasons. Examples include, failure of a generator, a tree falling on a circuit and any number of other causes. There are often between 5 and 10 forced outages on the system at any one time. When a forced outage occurs, it can result in the cancellation or postponement of planned outages to ensure system security is maintained. Due to the compact nature of the Transmission Outage Programme, this can result in weeks, months and even years of delays to projects as another slot needs to be found for the planned work.
- Security of supply – Security of supply considerations, such as storm preparation can result in outages being recalled. This involves stopping all work on a piece of equipment and returning it to service. Security of supply concerns can also lead to outages being postponed or cancelled before they begin.

The granting of outages on the Transmission System has always been a challenging task and in recent years this challenge has only increased. The number of outages required on the system has increased dramatically over the last 5 years as more and more capital projects are required. The number of required outages is expected to increase further over the coming years with a significant number of outages needed to accommodate the SOEF v1.1 plan. Security of supply concerns have also presented challenges in recent years. With tight generation margins, outages in areas such as Dublin have been extremely difficult to grant. The difficulty of granting an ever-increasing number of outage requests means there is a significant risk of a large backlog of both maintenance and capital works.

4.4.4 Project Delays by Gateway

Upon examining the occurrence of delays per Gateway, it becomes apparent that the majority of the delays (83%) occur in Gateway 6, the construction stage. This is to be expected as the majority of project activity at this stage is complex, carrying a much higher level of risk compared to other steps.

Gateway	Number of Projects
GW3	3
GW4	7
GW5	1
GW6	54



The primary causes of delays—outages, scope changes, and risks to the supply chain—are persistent issues. Unless transformative changes are implemented, it's probable that a similar, even worsening, trend will persist for the foreseeable future.

It should be noted that the reporting of the above delays is a snapshot, a moment in time. Although delays are appearing to occur in Gate 6, it is likely that other delays occurred in earlier gates, in particular Gate 4 and Gate due to public planning process delays. While delays might occur earlier in the project life cycle, the estimated energisation date may not change, maybe with the hope ground can be made up in subsequent Gates. A more granular view at more intermediate milestones, as proposed for the Priority Project list, would give a better insight.

5 Conclusions & Recommendations

TNEI was tasked to support CRU with supplementing and improving existing processes and reporting, as well as recommend further actions to better understand the common causes of infrastructure delivery delays.

Reviewing documents relating to the progression of transmission infrastructure projects provided to CRU it was found that there is a significant amount of information, via annual as well as quarterly reporting and publications. However, this information was found to be disjointed, unclear and in areas, not enough granular detail is provided.

TNEI has compiled project delivery information using documents supplied by CRU and publicly accessible data from the TSO. The Infrastructure Delivery Workbook (IDW) contains information about all PR5 projects, along with any supplementary projects integrated into the TSO/TAO program of work, as outlined in the latest Network Delivery Portfolio (NDP) Updates. The IDW facilitates the automatic inclusion of future updates into the workbook, while also applying RAG status indicators. The IDW will allow CRU to easily and effectively observe the status of all projects and quickly identify any changes since the previous update and/or the original PR5 submission baseline.

The outcome and recommendations of this project, with some actions currently ongoing are summarised below.

- Continue to monitor all projects via the IDW and raise queries with the TSO/TAO if concerning trends or anomalies are observed in the provided data.
- Utilise the delay details provided in the amended table in Appendix 5 of the Annual Capex Report to review any possible change or emerging trends regarding causes of delays in project delivery.
- Continue to engage with the TSO to provide the criteria for determining priority of critical projects and a resulting short list of priority projects to be monitors more closely.
- Consider requesting from the TSO/TAO a risk impact assessment, utilising the Risk Register, for short list of priority projects as well as more granular milestone delivery dates, e.g. per Gateway governance stage, certain stages within the IA.
- Request a new report on a quarterly basis, detailing any delays to priority projects, as per the draft template report provided by TSO/TAO.

Further considerations relate to the current approach to applying timelines to projects. Given the volume and complexity of transmission infrastructure delivery, the delivery timescales listed in PR5 submission, and subsequent NDP updates, seem overly ambitious and unachievable in some areas. It is accepted that the dates published are based on an unconstrained scenario. It may be beneficial for CRU to understand the time scales and programme of works if projects are considered under a constrained scenario.

However, it's important to exercise caution, considering that the objectives of the projects listed in PR5 and NDP are essential for fulfilling EirGrid's strategy to transform the power system by 2030, in alignment with the Climate Action Plan 2023. A constrained programme of works is likely to result in a substantial portion of these projects not being completed until after 2030. Such a delay could have a profound impact on meeting the system's requirements, accommodating developers seeking connections, serving consumers, and reaching both mandated EU and national climate action targets.

EirGrid is currently engaged in an effort to establish a constrained programme of works, with a primary emphasis on assessing the risks and repercussions associated solely with outage management and delays. Recognising that outage constraints are likely to be the most significant risk affecting delays in

the foreseeable future, this approach promises to provide a more informative perspective on the genuinely achievable timelines for project delivery. However, delays that occur earlier in the project, or in advance of outage considerations, may not be reported sufficiently as there may be a view that delays earlier in the project can be managed and recovered before energisation.

TNEI recommend that a comprehensive risk assessment on the agreed final list of priority projects between CRU and TSO/TAO is conducted. Subsequently, a thorough constrained program should be devised, and more granular milestone dates included. Since these projects are of paramount importance, a realistic delivery schedule would enable more effective monitoring and a proactive approach to address potential delays. It is of crucial importance that root cause and mitigation is considered if and when delays arise on these priority projects. For example, if an outage cannot be granted as planned, it is crucial that detailed consideration is given to why the outage could not be granted and when the outage could be granted in the future to ensure effective mitigation is in place and the potential for rolling delays is minimised. This will ensure a robust and effective oversight of the constrained programme can be achieved.

Appendix A – Table of Delayed Projects from Capex Report 2022

CP Number	Project Title	Voltage (kV)	Project Type	Project Category	Capex 2021 EI Year	Capex 2022 EI Year	Risk Reference	Current Comments
CP0823	Maynooth - Turlough Hill 220kV line refurbishment	220	OHL	Refurbishment	2025	2026	GW6.1/GW6.3	
CP0644	Bracklone 110kV Station and Newbridge - Portlaoise Loop in - Bracklone Stn Works DSO	110	Station	Modification	2024	2025	GW6.3	
CP0866	Great Island - Kellis 220 kV line refurbishment	220	OHL	Refurbishment	2023	2029	GW4.2	
CP0693	Baroda 110 kV station - 2 x110 kV Trafo Bays DSO	110	Station	Upgrade	2023	2025		
CP0724	Thornsberry 110 kV Station	110	Station	Uprate	2021	2023		
CP0741	Trabeg 110 kV station - uprate 2 x 110 kV transformer bays and control room extension DSO	110	Station	Uprate	2024	2025	GW6.3	
CP0867	Flagford - Louth 220kV Line Refurbishment	220	OHL	Refurbishment	2024	2025	GW6.3	
CP0869	Maynooth - Woodland 220 kV line uprate	220	OHL	Uprate	2022	2024	GW5.1	
CP1022	Maynooth - Turlough Hill PLC Replacement	220	OHL	Replacement	2022	2023		
CP0824	Moneypoint - Oldstreet 400kV line refurbishment	400	OHL	Refurbishment	2023	2024	GW6.3	
CP0825	Oldstreet - Woodland 400kV line refurbishment	400	OHL	Refurbishment	2022	2023	GW6.3	
CP0835	Coolnabacky - Portlaoise 110kV line uprate	110	OHL	Uprate	2024	2025	GW6.4	
CP0837	Bellacorrick 110 kV Station T141 Uprate	110	Station	Uprate	2022	2023	GW6.2	
CP0839	Moy 110kV Station reconfiguration and busbar uprate	110	Station	Uprate	2022	2023	GW6.3	
CP0841	Arva - Carrick-on-Shannon 110 kV line uprate	110	OHL	Uprate	2023	2023	GW6.3	

CP0622	Tarbert 220 kV Station Upgrade	220	Station	Upgrade	2022	2023	GW6.3	
CP0692	Inchicore - 220kV GIS Station Upgrade	220	Station	Upgrade	2025	2026	GW6.3	
CP0796	Knockraha station & installation of additional couplers	220	Station	New	2023	2025	GW6.3	
CP0871	Galway 110 kV Station Redevelopment Project	110	Station	Uprate	2023	2024		
CP0902	Tarbert - Trien 110 kV No 1 Line Refurbishment	110	OHL	Refurbishment	2023	2024		
CP0919	Lanesboro 110 kV Station Redevelopment Project	110	Station	Uprate	2024	2029		
CP0799	Louth 220kV Station Refurbishment/Upgrade	220	Station	Upgrade	2028	2029	GW4.2	
CP0983	Point on Wave Controller for Glanagow 220 kV Station	220	Station	Modification	2022	2023	GW6.4	
CP1029	Kellystown 220 kV Station	220	Station	New	2022	2023		
CP1031	Flagford 220 kV Station Sprecher & Schuh CB Replacement	220	Station	Replacement	2024	2026	GW6.3	
CP1032	Cashla 220 kV Station Sprecher & Schuh CB Replacement	220	Station	Replacement	2024	2026	GW6.3	

CP1139	Sligo & Srananagh 220 & 110 kV Protection upgrade	220	Station	Upgrade	2022	2025	GW6.3	
CP1041	Timahoe North Solar Farm	110	Generator Connection	Generator Connection	2023	2024	GW6.9	
CP1055	Harristown Solar Farm	110	Generator Connection	Generator Connection	2023	2025	GW6.9	
CP1060	Loughteague 110 kV solar farm	110	Generator Connection	Generator Connection	2024	2025	GW6.9	
CP1062	Drombeg Solar - 110 kV Station	110	Generator Connection	Generator Connection	2023	2024	GW6.9	
CP1069	Ballinknockane Solar Farm	110	Generator Connection	Generator Connection	2023	2024	GW6.9	
CP1073	Oweninny 3	110	Generator Connection	Generator Connection	2024	2026	GW6.9	
CP1086	Dunstown T4201 and Woodland T4201 Transformer Works	400	Station	Modification	2026	2027	GW6.3	
CP1094	Buffy 110 kV Station	110	Generator Connection	Generator Connection	2022	2023	GW6.9	
CP1102	Grangecastle South	110	Generator Connection	Generator Connection	2022	2023	GW6.9	
CP1108	Dunstown Station 400-220 kV Protection Upgrade	400	Station	Upgrade	2022	2023	GW6.3	
CP1110	Woodland Station 400-220 kV Protection Upgrade	400	Station	Upgrade	2022	2023	GW6.3	
CP1111	Ballydine, Cahir and Connected Stations 110 kV Protection Upgrade	110	Station	Upgrade	2023	2024	GW6.3	
CP1112	Limerick and Connected Stations 110 kV Protection Upgrade	110	Station	Upgrade	2024	2025	GW6.3	
CP1115	Drybridge and Connected Stations 110 kV Protection Upgrade	110	Station	Upgrade	2022	2023	GW6.3	
CP1116	Tipperary, Cahir and Connected Stations 110 kV Protection Upgrade	110	Station	Upgrade	2022	2024	GW6.3	

CP1126	Mully Graffy Windfarm	110	Generator Connection	Generator Connection	2023	2024	GW6.9	
CP1127	Lenalea Windfarm	110	Generator Connection	Generator Connection	2022	2024		
CP1128	Ballynabrannagh 110 kV Station (Monatoreen Solar)	110	Generator Connection	Generator Connection	2023	2025	GW6.9	
CP1132	Cow Cross New 110 kV Transformer	110	Station	New	2022	2023	GW6.2	
CP1136	Deenes 110 kV Station - Gaskinstown Solar Farm	110	Generator Connection	Generator Connection	2023	2024	GW6.9	
CP1141	Kellis Station 220 kV & 110 kV Protection Upgrade	220	Station	Upgrade	2023	2024	GW6.3	
CP1140	Athy, Carlow and Connected Stations 110 kV Protection Upgrade	110	Station	Upgrade	2022	2023	GW6.3	
CP1162	Irishtown, Shellybanks and connected stations 220 kV protection upgrade	220	Station	Upgrade	2023	2026	GW6.3	
CP1142	Firlough 110 kV Station (Firlough WF)	110	Generator Connection	Generator Connection	2024	2026	GW6.9	
CP1144	Kinnegad 110 kV station, Derryiron 110 kV bay conductor uprate	110	OHL	Uprate	2023	2025	GW6.3	
CP1149	Newbridge - Cushaling 110 kV line, Stations bay conductors and lead-in conductor uprate	110	OHL	Uprate	2022	2023	GW6.3	
CP1152	Arva and Connected Stations 110 kV Protection Upgrade	110	Station	Upgrade	2023	2025	GW6.3	
CP1153	Oldstreet, Tynagh & Cashla 400 kV and 220 kV Protection Upgrade	400	Station	Upgrade	2023	2024	GW6.3	
CP1156	Sligo 110 kV Station - Shrananagh 1 & 2 Bay uprates	110	Station	Uprate	2023	2025	GW6.3	
CP0984	Belcamp Shellybanks 220 kV Cable	220	UGC	New	2023	2024		
CP1163	Butlerstown, Killoteran & Waterford 110 kV protection upgrade	110	Station	Upgrade	2023	2024	GW6.3	
CP1164	West Cork 110 kV protection upgrade	110	Station	Upgrade	2023	2024	GW6.3	

CP1168	Cashla-Salthill 110 kV Thermal Uprate	110	OHL	Uprate	2024	2025		
CP1170	Newbridge - Portlaoise 110 kV Partial Thermal Uprate	110	OHL	Uprate	2024	2025		
CP1172	Crane - Wexford 110 kV Circuit Thermal Capacity	110	OHL	Uprate	2024	2025		
CP1173	Glencloosagh Phase 1 - Rotating Stabiliser	110	Generator Connection	Generator Connection	2023	2025	GW6.9	
CP1183	Mooretown 220 kV Station	110	Demand Connection	Demand Connection	2024	2025	GW6.9	
CP1194	Woodland 400 kV Station Redevelopment	400	Station	Redevelopment	2027	2028	GW4.2	
CP1207	Lisheen - Thurles 110 kV Protection Upgrade	110	Station	Upgrade	2022	2023	GW6.3	

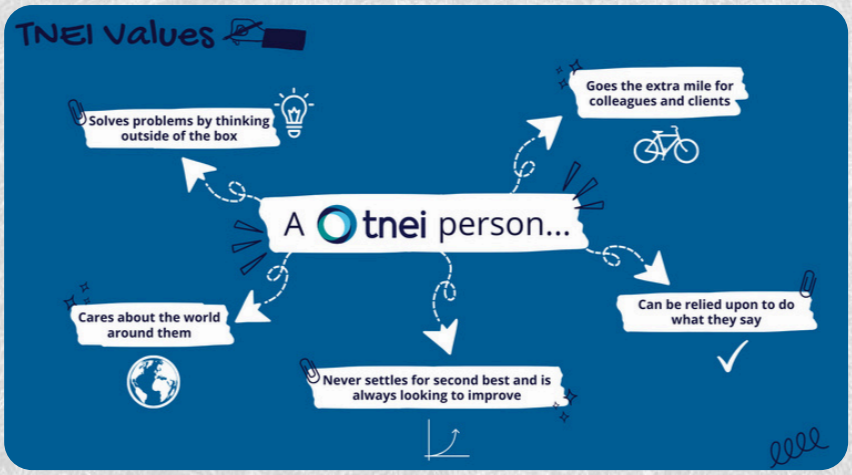
WHY TNEI IRELAND?

TNEI is an independent specialist energy consultancy providing technical, strategic, environmental and consenting advice to organisations operating within the conventional and renewable energy sectors.

Our consultants have industry leading expertise in network modelling, grid code compliance studies, noise assessment and analysis of innovative, smart grid technologies.

Our clients range from large utilities and network operators to regulators and community groups We are a specialist, independent company, and that's why we can offer a flexible, personal service and help our clients quickly and efficiently. And most importantly of all, we love to solve problems.

- TNEI has been in Ireland for nearly 20 years
- Our modelling expertise incorporates the transmission and distribution networks throughout the island of Ireland
- Our staff have experience in planning the transmission network
- We have recent operational experience at EirGrid's National Control Centre (NCC)



- Our Dublin office completes 100+ projects annually
- Approximately 35+ constraint studies
- Over 20 feasibility studies, and 15 strategic network studies
- And 15+ wind farm noise monitoring and assessments
- Bridging the Gap and Shaping Our Electricity Future
- Grid code, feasibility, detailed design

tnei

Who we are
An employee-owned business

How we do it
With industry-leading technical expertise

What we do
Provide advice and solutions to accelerate the clean energy transition

Why we do it
For the betterment of our people and the planet

- **We closely follow the evolution of the grid and continually refine and improve our grid model**
- **Python automation is at the core of our modelling approach – allowing for more consistent, robust and efficient simulations of the grid**
- **We understand the standards, policies, methodologies and tools used by EirGrid**

- **IPSA is our in-house power simulation tool – we develop and maintain this tool for our clients.**
- **We use this tool for many types of modelling – including load flow, short circuit, harmonics and dynamic stability.**
- **All our analyses is enabled by Python scripting expertise**

ipsa
Simply powerful.

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