Firm Access Methodology Review

December 2021

EIRGRID

Contents

Executive Summary

In the CRU direction CRU/20/060 Enduring Connection Policy Stage 2 (ECP-2), section 2.7, the CRU instructed EirGrid to design and develop a new methodology for firm access. This document sets out the approach taken in the development and the core concepts of the new methodology.

The concept of firm access is by its nature complex and multifaceted. It is directly influenced by how the power system is planned, how it is operated and the rules of the electricity market. A number of external variables also have a significant influence on how firm access is treated. These include the role of firm access in RESS auctions and how firm access is treated in the implementation of Articles 12 and 13 of Regulation (EU) 2019/943. Other significant considerations include the approach for conventional generation (including in the capacity market) and the impacts of significant levels of new solar and offshore wind generation as the power system transitions to a predominantly renewables system.

In the development of this new methodology EirGrid has taken time to allow some of these variables to crystallise and to understand their significance. EirGrid has also relied upon valuable inputs from various industry workshops and engagements.

The ambitions of the new methodology are as follows:

- Allocate available firm capacity to connected generators.
- Provide time bound firm access dates, initially derived based on the timeline for planned reinforcements, but not directly linked to the final completion of these specific reinforcements.
- Provide location signals for where future firm access is expected to be available.

This new methodology seeks to achieve a balance between government targets, CRU directions, European regulations, industry feedback and transmission development plans. Given the variability of this multifaceted backdrop, this methodology will remain under review. EirGrid welcomes any feedback on the methodology.

1. Introduction

The level of firm financial access available in the transmission network for a generator is that generator's Firm Access Quantity or 'FAQ'. Firm financial access means that if a generator is constrained on or off, it is eligible for compensation in the manner set out in the Trading & Settlement Code. The core concepts of firm and non-firm access were developed in the Single Electricity Market High Level Design (SEM HLD) in 2005. In essence firm access relates to three core areas of the Power System:

Market:	How prices are set and compensation is paid.
Operations:	Real time operation of constraining and re-dispatching generation.
Planning:	How the system is planned and developed to minimise constraint and provide firm access.

Since the SEM HLD, the process for connecting generators to the Irish transmission and distribution network has traditionally involved the calculation of the Firm Access Quantity (FAQ) for each generator and the allocation of Associated Transmission Reinforcements (ATR) which would enable the access. FAQ is a market related quantity which means if the output of a generator is changed by the Transmission System Operator (known as 'constraint'), then it may be eligible for financial compensation as set out in the Trading & Settlement Code.

The purpose and intent of non-firm access was to achieve a balance between granting generators access to the network in advance of transmission reinforcements and to protect the end consumer from high constraint payments. Generators connecting to parts of the network with spare capacity could receive firm access. Generators in parts of the network with limited capacity could connect on a non-firm basis, in advance of the completion of reinforcements, but would not receive compensation if they are dispatched down.

Different methodologies have been in place to assess how the amount of firm access available is determined and allocated. In particular, as part of Gate 3 (2009-2011) the

'ITC model[1]' was used to allocate capacity. This approach has remained in place throughout the last decade and has served its purpose in supporting the growth in renewable generation.

In the intervening years many key factors relating to firm access have changed or evolved. Some of these include:

- The transition from a power system predominantly supplied by traditional dispatchable conventional plant to a power system with up to 80% of annual electricity coming from variable renewable sources.
- The advent of large scale solar generation in Ireland.
- The proposed development of major offshore wind generation.
- Capacity auctions looking to attract and/or retain more conventional generation onto the Irish power system due to security of supply concerns.
- Implementation of Articles 12 and 13 of the Clean Energy Package EC/2019/943.
- Transitioning from the Renewable Energy Feed-in Tariff (REFiT) support system to a competitive renewable energy auction: Renewable Energy Support Scheme (RESS).
- Development of the "Shaping Our Electricity Future Roadmap" to transform the power system to meet new renewable ambitions.

Considering all these changes, it is timely to re-examine the firm access allocation process again. EirGrid welcomed the CRU direction to develop a new methodology for assigning firm access under the ECP process. This direction instructed that:

"*The TSO will design and develop a new methodology to schedule the FAQs possible for contracted projects based on the Transmission network development plans. This methodology will incorporate transmission capacity assumptions based on the high-level principles of ensuring network safety, security of supply and economic transmission development, whilst delivering the Government's 70% renewable target in the forthcoming years. As per pre-ECP projects that had scheduled FAQs, transmission reinforcements specific to each generator that determine the scheduling, must be*

[1] http://www.eirgridgroup.com/site-files/library/EirGrid/ITC%20Programme.pdf

completed in order for firm access to be allocated to the relevant generator. It should be noted that location will be a significant contributory factor to the timelines for firm access availability. The design and development of this new methodology is a significant undertaking, involving stakeholder engagement, which the CRU expects will not be complete before mid-2021. Therefore, offers will continue to be issued on a non-firm basis until the new mechanism for scheduling FAQs is in place"

Following this direction EirGrid has undertaken a comprehensive review of firm access. The review considered all the new factors influencing firm access, the pros and cons of previous approaches and considering if there was relevant treatment of firm access in other similar jurisdictions. Following this review a number of possible approaches were considered and tested. Throughout this process EirGrid has relied on insightful and timely inputs from key stakeholders.

This document summaries the interaction between firm access and operating the power system, the research and development phase, the core concepts of firm access allocation, the details of the new methodology and the next steps.

2. Research and Development

This section of the report recaps on the research and development phase of the project. The first three headings consider three fundamental areas of the power system. The **Operation** of the power system, the money flows through the **Market** and long term **Planning** of the power system. Understanding the relationship between firm access and these three fundamental areas is a crucial step in the process. The implications of any new firm access methodology on these three areas (and also any potential impacts on the interrelationships between the areas themselves) have to be carefully considered.
How firm access was treated in Gate 3 and internationally was also considered. All of this research, in addition to stakeholder inputs, was used to compile and test new methodology concepts for firm access.

2.1 Operations

To ensure safe and secure electricity is available throughout the system, the grid is operated in real-time from EirGrid's National Control Centres (NCC) in Dublin. We carry out the intricate task of matching electricity production to customer demand. Our main objective is to operate the transmission system in the most economical manner, consistent with safety, security, continuity, quality and environmental standards. We must also plan for unforeseen events, such as demand or (renewable) generation exceeding expectations. Sophisticated software is used to make sure that the grid is operated in a cost efficient manner. Sometimes, instructions are issued by NCC as Active Power[2] Control setpoints for generation units to reduce/increase its output to the Active Power Control setpoint and the units Active Power output or export should not exceed this level. Such instructions to reduce Active Power output could be categorised into three broad categories as follows.

Over-Supply: Dispatch down of renewable generation for over-supply reasons is necessary when the total available generation exceeds system demand plus interconnector export flows. Over-supply dispatch down is applied prior to curtailment and constraint. Under the EU's Clean Energy Package, it has been mandated that

[2] Active power is the power which is actually consumed or utilized in an AC circuit. It is also called true power or real power. It is measured in kilowatt (kW) or megawatt (MW).

priority dispatch of renewable generation will continue to apply only to generators which connected prior to July 4th 2019 (Article 12)[3]. This will create a new type of generator for consideration in the dispatch process – the non-priority dispatch renewable generator, connected post-July 4th 2019. A final decision in respect of the treatment of non-priority dispatch renewable generators is currently under consideration by the SEM Regulatory Authorities (RAs).

Curtailment: Curtailment can arise at times when solar and wind generation levels are at a high percentage of system demand. It may be necessary to reduce the output from solar and wind powered generators in order to retain the necessary amount of conventional generation online to provide all the required system services. Most system services, such as frequency control and reserve, can be located anywhere on the transmission system, whereas services such as voltage control are location specific. A main component of Curtailment is the limit on System Non Synchronous Penetration (SNSP) which is the ratio of the real time MW contribution from non-synchronous generation and net HVDC imports to demand plus net HVDC exports[4]. For the purposes of this report, the changes in generator output which are required by EirGrid for overall system reasons are defined as 'curtailment'.

Constraint: The output of generators may also need to be changed from the market schedule due to transmission network limitations, specifically the overloading of transmission lines, cables and transformers. This can happen for an intact network but typically occurs for network contingencies (N-1, N-G-1, N-1-1, etc.). In other words, a line may become overloaded if another line were to trip. In order to avoid this, generation is dispatched so that if the tripping were to occur there would not be any contingency overloads. Changes in generator output for this reason are referred to in this report as 'constraint'. The constraining of generation is location-specific and can be reduced by transmission network reinforcements. Some transmission constraints might only exist temporarily due to transmission lines being taken out of service for maintenance or uprating. For the purposes of allocating firm access, the focus is on single contingency events (N-1) as opposed to issues that occur during system maintenance.

[3] https://www.semcommittee.com/sites/semc/files/media-files/SEM-21-027%20Proposed%20Decision%20on%20treatment%20of%20new%20renewable%20units%20in%20the%20SEM.pdf
[4] https://www.eirgridgroup.com/site-files/library/EirGrid/SNSP-Formula-External-Publication.pdf

We utilise the Wind Dispatch Tool (WDT) to constrain and to curtail wind generation for system security reasons. We apply constraints/curtailments based on regulatory approved SEMC decision papers. Some of the critical papers that outline the rules that must be followed are:

- Principles of Dispatch and the Design of the Market Schedule in the Trading and Settlement Code in SEM Decision Paper SEM-11-062[5].
- Treatment of Price Taking Generation in Tie Breaks in Dispatch in the SEM and Associated Issues in SEM Decision Paper SEM-11-105[6].
- Treatment of Curtailment in Tie-break situations in SEM Decision Paper SEM-13-010[7].
- TSOs Definition of Curtailment and Constraint in SEM-13-011[8].

Wind/solar farms are grouped together depending on their effectiveness to alleviate system issues or overloading of transmission system equipment (busbars, cables, lines, transformers, etc.). The effectiveness is a measure of the change in wind/solar farm output relative to the change in the level of the potential overloading of the equipment. The effectiveness of each wind/solar farm to alleviate system issues is a function of the location of the connection relative to the topology of the transmission network in the area (see [9] for more details on the approach of control centres). Currently we do not use firm access status as a determining factor in the constraint process. This is being kept under review and may change in the future.

Pro-Rata Constraint: At the point in time when a constraint becomes binding, all wind farms in the designated group are dispatched down on a pro-rata basis to a level which will alleviate the constraint.

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[5] https://www.semcommittee.com/sites/semcommittee.com/files/media-files/SEM-11-062 Principles of Dispatch and the Design of the Market Schedule in the Trading and Settlement Code SEM Committee Decision Paper .pdf

[6] https://www.semcommittee.com/sites/semcommittee.com/files/media-files/SEM-11-105 Tie Break decision paper_0.pdf

[7] https://www.semcommittee.com/sites/semcommittee.com/files/media-files/SEM-13-010 Final Decision - Treatment of Curtailment in Tie-break Situations.pdf

[8] https://www.cru.ie/wp-content/uploads/2016/07/SEM13011-TSOs-Definition-of-Curtailment-and-Constraint.pdf

[9] https://www.sem-o.com/documents/general-publications/Wind_Dispatch_Tool_Constraint_Groups.pdf

The following example is used to illustrate the process of applying a constraint (of 100 MW) to alleviate system issues in a group with four Wind/Solar farms.

Total Availability of Wind/Solar Farm Group	400 MW	Total Output of Wind/Solar Farm Group	400 MW	Wind/Solar Farm Group Constraint down required	100 MW

	Wind/Solar Farm A	**Wind/Solar Farm B**	**Wind/Solar Farm C**	**Wind/Solar Farm B**
Permissible Capacity	100 MW	150 MW	250 MW	200 MW
Available Active Power	50 MW	100 MW	150 MW	100 MW
Active Power Output	50 MW	100 MW	150 MW	100 MW
Dispatch Instruction	50 – (100*50/400) = 37.5 MW	100 – (100*100/400) = 75 MW	150 – (100*150/400) = 112.5 MW	100 – (100*100/400) = 75 MW
Constraint	12.5 MW (25%)	25 MW (25%)	37.5 MW (25%)	25 MW (25%)

Any new firm access methodology needs to understand and take account of the day-to-day operation of the power system and in particular how this will impact on generation constraints.

2.2 Markets

The concept of firm access is fundamentally a market construct. Firm access is primarily related to compensation payments when generation is dispatched down from the original market position. When a generation unit is dispatched down by the System Operator it may be entitled to compensation from the Market Operator for lost output . The payment of compensation depends on a number of factors such as the controllability of the unit and its Firm Access Quantity (FAQ). If the unit is eligible for payment but has no firm access then no compensation will be paid for the reduction in output. Clearly the decision to grant firm access to a generator can affect the overall compensation to be paid by the market for reductions in output. The following paragraphs provide a brief summary of some of the most relevant market rules that have been considered in the development of the new methodology:

The cost associated with changes from the market position, including firm access compensation are recovered through the Imperfections Charge. The purpose of the Imperfections Charge is for the Transmission System Operator (TSO) to recover the total expected costs associated with managing the transmission system. The Imperfections Charge, which is levied on suppliers by Market Operator, is made up of a number of components. Such components include Dispatch Balancing Costs (DBC) - less Other System Charges, Fixed Cost Payments, any net imbalance between Energy Payments and Energy Charges and Capacity Payments and Capacity Charges over the tariff year, with adjustments for previous years as appropriate.

In the market, a unit with non-firm access does not have the right to be compensated for not being able to have its non-firm capacity accommodated on the system:

- In the market, a unit's FAQ is considered as a value which represents the amount of a Participant's output which can be accommodated on the system based on network capacity. If the unit is constrained down below that level, it is entitled to compensation.

This is implemented in market through the balancing and imbalance arrangements:

- The Balancing Market (BM)[10] determines the imbalance price for settlement of energy balancing actions and any uninstructed deviations from a participant's notified ex-ante position. The BM is different from the other markets in that it reflects actions taken by the TSO to keep the system balanced and secure, for example, any differences between the market schedule and actual system demand, variations in wind forecasting, or following a plant failure.
- Participants can gain a market position for their non-firm capacity, i.e. they can trade their entire output range above their firm access Quantity in the ex-ante markets;
- Normally Bid Offer Acceptances are settled at the better of the Imbalance Settlement Price or Bid Offer Price. For Decremental actions to turn a unit down / off from their market position, this means that the units can be compensated for

[10] https://www.semcommittee.com/sites/semc/files/media-files/Appendix%201%20-%20Imperfections%20Revenue%20Requirement.pdf

being turned down – they may only need to pay back what they've stated in the Bid Offer Price, which may only reflect their costs of running, or less through the Imbalance Price, meaning they retain any inframarginal rent they achieved from their ex-ante market revenue.

- However this treatment is removed for non-firm Decremental actions: if a unit traded its Non-Firm capacity but it could not be physically accommodated on the system, it will be treated as an imbalance and they have to pay back for the difference at the Imbalance Settlement Price only.

This is implemented through calculating the Non-Firm Accepted Bid Quantity and subtracting it in the Discount Component to ensure that it does not receive a discount, and therefore it is settled only through the Imbalance Component (see[11] for more details on the firm access Imbalance Settlements).

2.3 Planning

As described in Sections 2.1 and 2.2, the operation of the power system requires EirGrid to take the perfect market schedule dispatch and modify it to match the second-to-second realities of the actual power system in real time. Part of the role of power system planning is to seek to develop the transmission network in such a way as to minimise the need to deviate from market schedules while also supporting government policies such as renewable targets. In meeting these requirements, solutions must strike a balance between network reliability, costs and environmental impacts.

EirGrid has both statutory and licence obligations to produce a Transmission Development Plan (TDP) annually. The TDP presents EirGrid's view of future transmission needs and the plan to develop the network through specific projects, to meet these needs over the next ten years. The development of the transmission network involves forecasting future needs. The process is flexible to enable the long-term development of the network.

To ensure adequate security of electricity supply and improve market participation for RES-E (Electricity from Renewable Energy Sources), it is necessary to provide ongoing

[11] https://www.sem-o.com/documents/training/IMB-Settlements.pdf

and timely reinforcement of the Irish electricity transmission system. These reinforcement needs can be divided into the following categories:

- Reinforcements to support changes in, or connection of new, demand;
- Reinforcements required to support changes in, or connection of new, generation;
- Reinforcements related to interconnection;
- Reinforcements to facilitate inter-regional power flows; and
- Reinforcements to address the condition of existing assets.

The TDP 2020-2029 included 111 committed reinforcement projects. These projects are categorised as either "New Build", "Uprate/Modify" or "Refurbish/Replace" projects. These are listed in here[12]. In November 2021, following nationwide consultation[13], EirGrid and the Minister for the Environment, Climate and Communications launched the Shaping Our Electricity Future Roadmap[14].

The roadmap outlines a number of key strategic enablers which will be required in order to reach the 2030 clean electricity target. These include developing Ireland's grid through a mix of building new additional network infrastructure and optimising the use of the current infrastructure. These development plans are crucial to the delivery of firm access and will be a key focus of the new methodology.

2.4 Previous Methodology

During the course of the research and development phase for the new firm access methodology EirGrid undertook a review of the previous approach to firm access. The CRU Gate 3 direction (CER/08/260) established the core principles for how firm access was allocated at the time. These principles can be summarised as follows:

[12] https://www.eirgridgroup.com/site-files/library/EirGrid/Transmission-Development-Plan-2020-2029.pdf
[13] http://www.eirgridgroup.com/site-files/library/EirGrid/Full-Technical-Report-on-Shaping-Our-Electricity-Future.pdf
[14] https://www.eirgridgroup.com/site-files/library/EirGrid/Shaping_Our_Electricity_Future_Roadmap.pdf

- A grid development strategy (Grid25) identified the reinforcements that would be required on the future power system to meet the renewable targets defined at the time.
- The level of firm access in the transmission network is called Firm Access Quantity (FAQ).
- FAQs are calculated by a computer programme called Incremental Transfer Capability or ITC.
- The ITC identifies the specific planned reinforcement(s) which were responsible for providing FAQ. These became Associated Transmission Reinforcements (ATRs).
- The date of completion of all ATRs defines the FAQ date for a generator i.e. the date when it will have firm access.
- If an ATR completion date is delayed then the FAQ date is also delayed.
- The Constraint reports provided an estimate of the level of constraint a generator could experience in advance of the completion of their ATRs.

There are some aspects of the Gate 3 approach to firm access that should remain applicable to any new methodology. In particular:

- The concept of linking future firm access to the main TDPs, which in turn are linked to achieving government targets.

Other aspects of the Gate 3 ITC approach are now considered less desirable. For example:

- **Moving FAQ Dates.** Industry stakeholders have argued that not having time bound firm access dates, transfers significant risk to the generator developer. In other words, the generator is directly exposed to risk of delays to system reinforcements.
- **Binary Analysis.** In addition, the binary nature of results from the ITC programme (i.e. the presence of firm access is brought down to a “yes” or “no” response) is not in-keeping with the evolution of the power system towards a complex portfolio of renewable generation, conventional generation and dynamic/responsive system demands.
- **Complex Methodology.** The complexity and volumes of connections/scenarios assessed in the ITC methodology made it difficult for the process to be intuitive for potential developers.

- **Meaningful Volumes**: Linked to the above point, the volume of offers considered by the ITC, so far in advance of the actual connections, meant that the overall accuracy of the process was diminished. In some areas generators connected in areas with very little constraints but they remained non-firm by virtue of the access rights assumptions that were made years earlier. In these scenarios, the generators that have actually progressed and connected their projects are being impacted on by other conceptual projects which may never progress to connection.
- **Assessment Frequency**: Finally, and also linked to the previous points, the complexity of the process meant that frequent reviews of firm access were practically unfeasible.

2.5 International Approaches

The research and development phase also considered international approaches to access generally. Particular emphasis was focused on understanding any concepts which could be related to firm access. No specific international “best practice” approach to firm access was identified. While there are a wide array of approaches in play internationally, no one specific jurisdiction had an approach or set of characteristics which could be applied to an Irish context.

2.6 Stakeholder Engagements

EirGrid also undertook a number of workshops with industry stakeholders. The following aspects of firm access were discussed in these workshops.

- How will existing non-firm generation be treated in the new methodology?
- What is the impact on existing firm generation?
- Consideration of specific nuances of Onshore wind, Solar, Offshore wind, Conventional generation, Autoproducers and Batteries/Services providers.
- How will re-powering sites be treated?
- The importance of providing certainty for RESS bids or Power Purchase Agreements (CPPAs).
- The importance of certainty for general investor confidence.

- The consideration of dealing with actual constraint or the perceived risk of constraint.
- The concept of whether PSO (via the RESS bids) covers the perceived risk of constraints or whether Imperfections should cover the actual constraint costs via the final settlement.
- How system development plans and locational signals are incorporated?
- What tools and scenarios will be used in the analysis and how to ensure the process is robust, transparent and repeatable.
- What information will be available on the process in order to ensure developers can make their own informed estimates in support of their own bids and risk assessments?
- Resolution of risk sharing between developers (who have control over where they develop) and the TSO (who have control over reinforcement delivery).
- How to prevent “ATR target fixation” where specific ATRs are emphasised over other works which may deliver more optimum benefits to the system.
- Is there a minimum level of acceptable constraint below which generators should be consider as firm?
- Is there a minimum MEC (Max Export Capacity) floor below which generators should be consider as firm?
- Will the approach to firm access maximise the system capability for meeting RES-E targets?

2.7 Research and Development Conclusions - Key Objectives

The following key objectives for the firm access methodology were concluded from the Research and Development phase:

The primary requirement of the firm access methodology is to ensure renewables targets can be met while maintaining security of supply.

The five **secondary** requirements are:

- Minimise additional costs to end customer by ensuring appropriate risk sharing and a balance of costs covered through RESS bids (PSO) and actual constraints costs (Imperfections)
- Provide clear locational signals in line with the Transmission Development Plan (TDP).
- Ensure the process is robust, transparent and repeatable.
- Support investor confidence.
- Decouple enduring links between specific ATR projects and specific customer firm access.

Based on the knowledge garnered from the research described above, the final element of this phase was to test a number of prototype methodology concepts. These prototypes were used to consider and test the implications of the concepts against the key objectives identified above. The potential implications on the operation of the power system, the money flows in the market and the planning of the network were also considered. This testing phase was used to hone in on the final methodology.

3. Firm access Methodology

Based on the research and development phase and the key objectives identified for firm access, the following high level concepts were defined for the new methodology:

3.1 Core Concepts

- The new methodology to provide time bound firm access dates, initially derived based on the timeline for delivery of planned reinforcements, but not directly linked to the final completion of these specific reinforcements.
- Firm access to be allocated post connection via annual reviews.
- Annual reviews will also provide location signals for future firm access capacity based on the TDP.
- Firm access test for renewable energy sources will consider a minimum level of acceptable constraint (Firm Threshold, see Appendix). This threshold will be reviewed on an annual basis. Where the analysis demonstrates that constraints are expected to be below this Firm Threshold, that generator will be granted firm access.
- An MEC “floor” of 1 MW will be applied. Firm access is not considered relevant below this level.

3.2 New Approach

At a high level the new methodology will be composed of the following steps. The Appendices at the end of the report provide more detail on the steps.

3.2.1 Step 1: Look Back

- A core feature of the new firm access methodology is the inclusion of an annual review of connected generators.
- Connected generators in areas with capacity will be granted firm access.
- Connected generators in areas where the TDP will create future capacity will be allocated a set date for firm access.

3.2.2 Step 2: Look Forward

- The second element of the new methodology is to provide a locational signal for future new capacity.
- The locational signal will consider the TDP against the new firm access methodology to signal areas of the power system with firm access.
- Conversely, this approach also signals to projects in heavily constrained areas, which are currently not considered feasible for reinforcement, that connections in these areas will likely be non-firm for an extended period of time.

3.3 Other Considerations

Much of the historical developments around firm access have primarily been related to renewable generation and the fact that these “price taking” units will be “must run” or at least first on in the energy supply stack. While this is not the case for conventional generation, the key concepts developed in this methodology can still be applied to the consideration of firm access for conventional generation.

Batteries and other service providers are newer technologies primarily coming into the services market. For the purposes of this methodology, firm access for service providers is considered to be outside scope and therefore not applicable at this time. This

approach may be reviewed in the future as part of other work streams directly related to the development of these services.

3.4 Summary of Improvements, Inclusions and Exclusions

This section of the report summarises some of the key improvements that are included in the new methodology. It also outlines some aspects that have not been included and the reasons for same.

- **Set firm access date:** The new methodology will provide either full firm access or a time bound firm access date (not directly linked to the final delivery date of specific reinforcements) for connected generators in areas with access or where access will be created.
- **Annual Reviews:** Reviewing firm access on an annual basis ensures that generators who make the significant commitments to deliver their projects are not disadvantaged by large speculative volumes of applications that may have been present at the time of their initial application. It also ensures that connected generators receive regular assessments of firm access as opposed to being tied to a major once off assessment which cannot be re-run on an annual basis. The approach can also take account of up-to-date assumptions, for example if there was significant demand growth in a region, a non-firm generator could actually end up receiving firm access in a subsequent annual review.
- **Firm Threshold:** The introduction of a Firm Threshold moves the process away from a binary computation exercise and towards a targeted assessment which considers the main bottlenecks on the system which are directly contributing to constraints. While also acknowledging the move towards very dynamic power system dispatches incorporating an eclectic mix of generation.
- **Transparency:** As the new methodology is implemented annually, and in addition to other data publications (particularly the TDP) it is envisaged that there will be greater industry clarity on how the firm access process works. By reducing the complex nature of the analysis, it is hoped that developers will be able to complete their own due diligence studies to have an understanding of what firm access is likely to be available in a given area.
- **Firm access for Contracted Generators:** Currently there are very large volumes of generation moving through the connection processes. In addition, is it

acknowledged that the fundamental concept of the RESS auction process is designed around there being “winners” and “losers”. On this basis it is expected that some contracted generators will not progress to a final connection. Experience from previous firm access and Constraints studies demonstrates that there is very limited value in conducting analysis on large volumes of uncertain generation. Conversely, the approach of focusing on connected generators will ensure accurate and up-to-date analysis enabling EirGrid to give more certainty to eligible connected generators on dates for firm access.

- **Partial firm access:** The previous ITC firm access approach had a granularity tolerance down to 0.5 MW. In this approach, a 15 MW generator is effectively tested 30 times for firm access. It was common for a small percentage of the generator to receive firm access in one year and subsequent portions of partial firm access delivered in subsequent years. In addition to the excessive computational load, this approach of partial firm access does not align with the new methodology. The new methodology is focused on identifying the critical bottlenecks in the regional networks which are limiting access. Once these bottlenecks are address to the extent that constraint falls below the Firm Threshold then full firm access will be awarded. Introducing partial firm access into this approach would conflict with the overall concept of an acceptable level of constraint. The assessments will of course take steps to ensure smaller generation are not eroding firm capacity away from larger generators which are awaiting firm access.

3.5 Next Steps and Key Deliverables

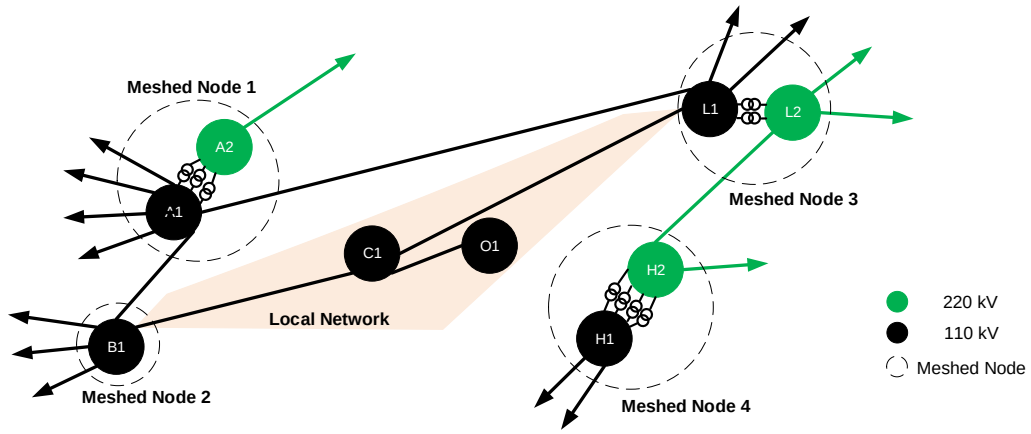
EirGrid welcomes stakeholders’ responses on the new firm access Methodology. Considering the period of time in which some generators have been connected and non-firm under the previous firm access approach, EirGrid intends to progress with the Step 1 Look Back review of connected generators. It is expected that this will be completed by Q3 2022. Following this review all associated generators will be either granted firm access or provided with a set date for firm access.

The Step 2 Look Forward will then be carried out. It is expected that this will be finalised in Q4 2022 and will provide locational signals for areas with available firm access.

Stakeholders providing feedback on the methodology should submit any sections that they do not wish to be published in an appendix that is clearly marked “confidential”.

Appendix A - Definitions

- *Meshed node* is defined as a node with three or more circuits, where all the circuits are part of the wider network and they do not constitute tail-ended circuits.
- *Local Network* is defined as the network between any two meshed nodes. Any security issue in this network is likely to be captured as Shallow works/Site Related Connection Equipment.



- *Regional Network* is defined as a group of local networks linked by two or more meshed nodes. “Bottlenecks” or system limitations in the regional networks contribute significantly to the constraints. For example, all the local networks between two or more mesh nodes with a voltage rating ≥ 220 kV could be considered as a regional network. The Regional Network could include:
    - Multiple local networks in parallel where flows in one will impact on another.
    - Multiple paths back to the bulk transmission system.
    - Possible parallel path 220 kV networks.
- *Bulk Transmission System* (relating to “inter-regional” or “system-wide”) is the general wider system network constituting of all the nodes and circuits of concern. The Bulk Transmission System constitute of multiple Regional Networks.
- *Firm Threshold* is the level of acceptable constraints (in %) for the year of analysis.

Appendix B - High Level Methodology

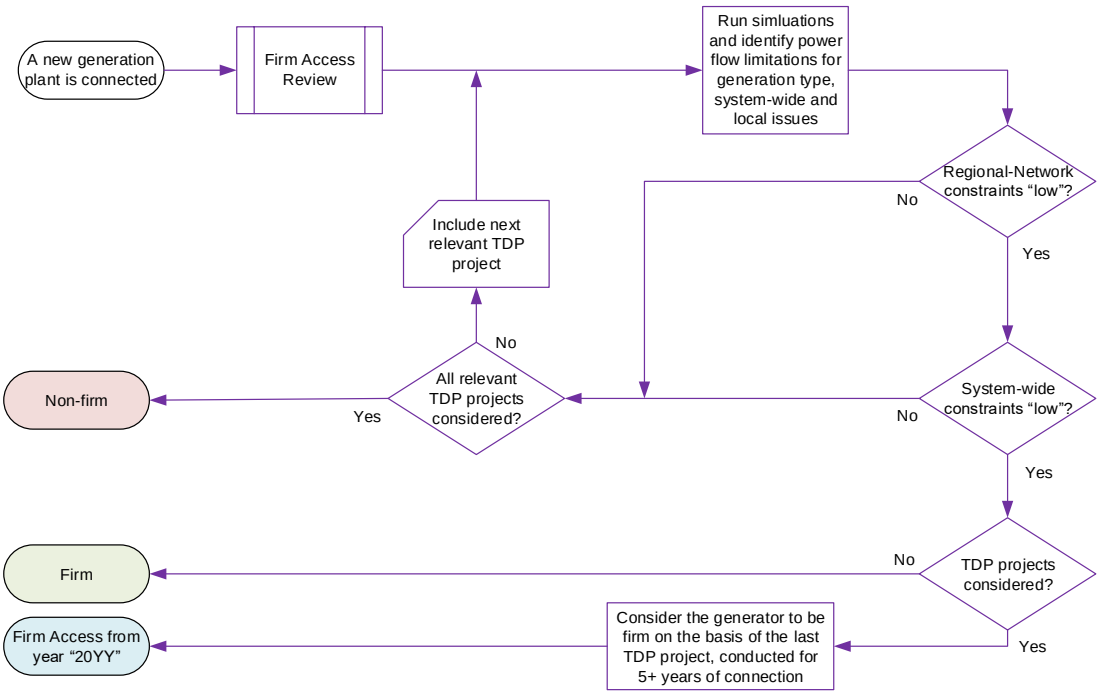


Figure 1. Methodology for Firm access Annual Review

- The firm access review will be conducted on an annual basis.
- All connected non-firm generators will be assessed and considered for allocation of firm access
- "Low" constraints signify that the constraints were below the Firm Threshold. This threshold value will be under review on an annual basis.
- Generally, the assessment will focus on Regional Networks to identify the main bottlenecks which are causing constraints. However, the assessment will also screen for issues (such as inter-regional flows) within the Bulk Transmission Network which could be a factor in the allocation of firm access.

Appendix C - Step 1 - Look Back Example

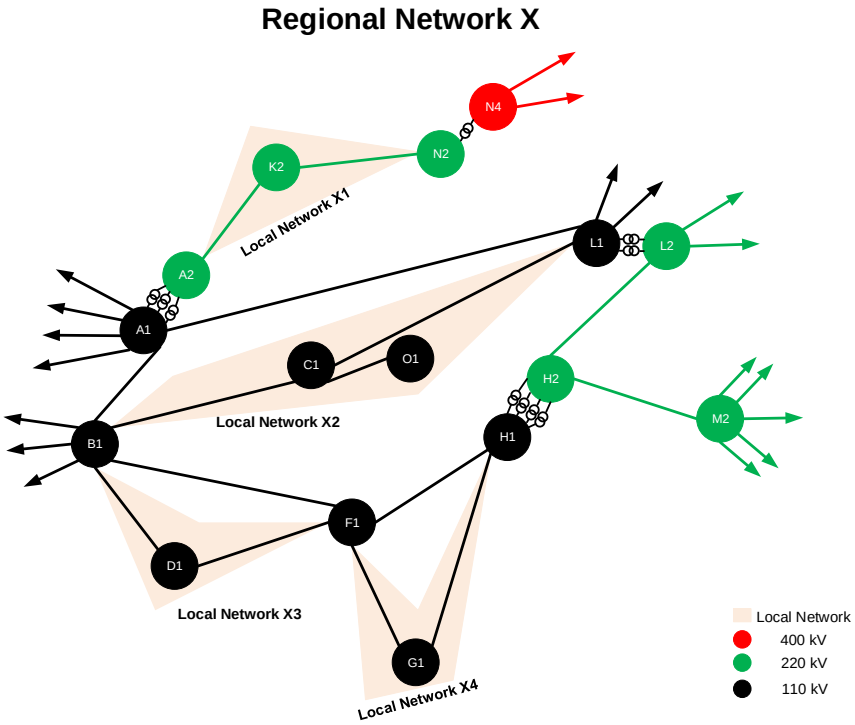


Figure 2. Step 1 - Look Back Example.

Problem Statement:

- Consider Regional Network X. The total export capability from the region is limited due the ratings of circuits in the region which could become overloaded in certain contingency scenarios.
- There are multiple connected non-firm wind farms in Regional Network X trying to export. This will result in constraints whereby they will not be able to export at full capacity.
- The other variable in Regional Network X is the level of demand. During times when there is a correlation between high wind generation and high local demand, the wind will be absorbed locally. This will place less strain on the circuits within the region to export power to the meshed nodes.
- Taking all of the above variables into account, analysis shows that the generators will face high constraints of around 20% over the course of the year.

Future scenario for Regional Network X:

- At the time of the annual firm access review for connected generators, the TDP has identified a solution for Regional Network X to uprate the limiting circuits in the region. This work is expected to be completed in the year “20YY”.
- This increases the export limits for Regional Network X and its Local Networks.
- Analysis shows that the TDP projects will result in constraints falling below the Firm Threshold.
- In addition, the assessment of the Bulk Transmission System (inter-regional power flows) has not identified any constraint concerns.
- Firm access is therefore, awarded to all the connected non-firm generators in Regional Network X from the year “20YY” when the TDP reinforcements are currently scheduled to be completed.
- This firm access date is set and will not change regardless of whether the reinforcements are delayed.

Appendix D – Step 2 - Look Forward Approach

- The Look Forward approach follows a similar concept to what was outlined for the Look Back section.
- The Look Forward will take the form of Annual reports to signal the level of acceptable capacities (based on the Firm Threshold) that could be granted firm access in Regional Networks.
- The reports will signal the potential constraints trajectory, based on expected connection dates and development projects arising from the TDP. For example:
    - Initially a Regional Network could have low constraints when there are only a few projects connected.
    - As time progresses more projects could connect to the same region and increase constraints to high levels beyond the Firm Threshold.
    - However, new/proposed transmission projects for the Regional Network could reduce constraints below Firm Threshold.
- As described above, under the Look Back approach, projects connecting in this area can expect the following:
    - The early projects to connect in these areas are made firm until constraints increase beyond the Firm Threshold. This approach (First to connect – First to be Firm) provides an incentive to developers to complete and connect their project as quickly as possible.
    - Projects in areas where future reinforcements will increase the capacity will be provided with a fixed firm access date.
    - Projects connecting into areas without capacity or reaching capacity limit are likely to be non-firm for extended periods of time.