

SONI Forward Work Plan

2022 – 23

Appendix 5 SONI Performance Measures

Published September 2022



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Key Performance Indicators

Overview of Key Performance Indicators in 2022/23 Plan

There are four SONI TSO Outcomes in relation to each role across the Forward Work Plan, being Decarbonisation, Grid Security, System Wide Costs and Stakeholder Satisfaction. We have categorised each performance measure against these four outcomes and provided a brief description below.

Decarbonisation

The decarbonisation of the electricity system is of great importance to customers and a vital component of the energy transition. The KPIs which fall within this SONI outcome are as follows:



RES-E (%): To increase the percentage of electricity from renewable sources in Northern Ireland.

SNSP (%): To increase the maximum level of System Non-Synchronous Penetration (SNSP) that SONI will allow on the system at any point in time.

Renewable Dispatch Down (%): To keep the average level of curtailment and constraint in Northern Ireland below a certain level.

Grid Security

A secure and reliable electricity network that is fit for the future of the electricity systems needs is critical to customers and market participants. The KPIs which fall within this SONI outcome are as follows:



System Frequency: to ensure that SONI manages the system frequency within Grid Code requirements.

Transmission Network Pre-Construction Project (TNPP) Submissions Approval Time - timeliness of UR approvals regarding a TNPP submission

System-Wide Costs

Ensuring customers get value for money and benefit from cost efficiency should be paramount. However the costs for customers should be viewed holistically. The KPIs which fall within this SONI outcome are as follows:



Imperfections (£): SONI intends to use the Backcast model in order to calculate savings made in relation to key projects and will be developing this performance measure over the period

SONI Service Quality

Whilst delivering on decarbonisation, grid security and cost, SONI will also need to meet the expectations of its stakeholders. Creating a transparent information sharing environment accompanied by the timely completion of our tasks will create frictionless and efficient working relationships between the parties acting in the market. The KPIs which contribute to this SONI outcome are as follows:

Stakeholder Satisfaction

Timely Delivery of Publications – all publications and materials are published according to the timelines set throughout the Forward Work Plan, with dependencies detailed as and when appropriate

Quality and Quantity of Feedback – where appropriate, feedback will be reviewed in qualitative and quantitative terms and used to inform SONI on our performance for each appropriate area as detailed throughout the Forward Work Plan

Approach to Performance Measures

The deliverables set out in our Forward Work Plan 2022 – 2023 are ambitious and in some cases world leading. This requires a culture of innovation and flexibility within SONI and for us to engage in partnerships, in order to be successful.

SONI believes that the targets should be flexible to adapt to the increasing pace of change in the energy industry. We have made a number of assumptions in the development of the targets such as demand, renewable connections, and policy changes from the Department for the Economy, etc. We therefore feel that it is prudent to periodically re-calibrate the targets to ensure that we are appropriately delivering on the right things for customers.

SONI has reviewed the feedback provided by stakeholders on the 2021 – 2022 Forward Work Plan and we considered it is important to provide this appendix document in order to allow greater detail around the key performance indicators as required by stakeholders, the Utility Regulator and the Independent Panel.

SONI has used a baseline figure where possible, which is taken from our 2019 historical data, and this is our performance comparator as detailed within the Utility Regulator's Guidance document on the Evaluative Performance Framework¹.

SONI is currently in the price control period 2020 – 2025, therefore we have provided targets set out to 2025. We understand that some stakeholders may require targets out to 2030, given the level of participation in the NI Energy Strategy exuded by some stakeholders. Therefore, we have strived to include targets out to 2030 where this has been possible.

¹ [epf-guidance.pdf \(ureg.gov.uk\)](https://www.ureg.gov.uk/epf-guidance.pdf)

Historical Background and Upcoming Targets

Decarbonisation

RES-E (%)

Purpose of the Metric

The aim of this performance measure is to maximise penetration of electricity generated by RES sources in line with policy. The NI Climate Bill aims to achieve 80% renewable electricity by 2030 and net zero carbon emissions by 2050.

This metric indirectly accounts for other aspects of the SONI business including:

- Delivery of grid infrastructure and effective outage management (to connect RES-E generation and for the TO/Users to maintain associated assets).
- Increasing the SNSP limits such that the energy that can be harnessed from RES-E is maximised.
- Minimising energy prices through displacing higher cost fossil fuel-based generation with RES-E generation with zero fuel or carbon costs.

Given the above impact on other metrics associated with this performance measure (i.e. SNSP, renewable dispatch down) and the metric itself is not wholly within SONI's control, in that it is affected by the level of demand, renewable connections, wind availability etc. SONI considers this may not be an appropriate performance measure as SONI is one of a number of contributors to the overall government targets. However, as some stakeholders consider the perspective that this metric presents, we have included it in this Forward Work Plan and we would welcome feedback on its inclusion in future plans.

Historical Figures

The actual RES-E figures for the last number of years is as follows. This shows our baseline figure of 39%² which our performance is measured against as per the Utility Regulator's Evaluative Performance Framework Guidance.

| 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|------|------|------|------|------|------|------|------|
| 18% | 23% | 23% | 31% | 36% | 39% | 44% | 37% |

Our targets detailed in the 2021-22 Plan were based on achieving RES-E at 70% by 2030. SONI is currently assessing the impact on RES-E forecasts based on the requirement to achieve 80% renewables electricity by 2030.

² There is a difference in methodology in how SONI calculates the RESE figures and those reported by DfE. This was noted in the NI Energy Strategy document (foot note 31 (page 44) in [The Path to Net Zero Energy. Safe. Affordable. Clean. \(economy-ni.gov.uk\)](#))

SNSP (%)

Purpose of the metric

System Non-Synchronous Penetration (SNSP) is an important enabler for increasing the level of renewable sources of electricity generation on the power system. System Non-Synchronous Penetration is a real-time measure of the percentage of generation that comes from non-synchronous sources, such as wind and HVDC interconnector imports, relative to the system demand. New tools and processes are required by SONI to allow increases in the SNSP metric; therefore, this is determined to be a good measure for progress to enable decarbonisation of the electricity system to achieve net zero carbon emissions by 2050.

Approach to measurement

The SNSP level is published on our website on a weekly basis in the Operational Constraints update document. At first any increase will be trialed before it is implemented on a permanent basis. At times the SNSP limit may be temporarily decreased during, for example, certain weather warnings. Any such instances should be excluded from the assessment.

Historical Figures

The actual permanent SNSP limit over the last several years is as follows:

| Year | SNSP Limit |
|------|---|
| 2011 | 50% |
| 2012 | 50% |
| 2013 | 50% |
| 2014 | 50% |
| 2015 | 55% Trial from Oct |
| 2016 | 55% Perm from Mar 60% Trial from Nov |
| 2017 | 60% Perm from Mar 65% Trial from Nov |
| 2018 | 65% Perm from Apr |
| 2019 | 65% |
| 2020 | 65% |
| 2021 | 70% Trial from Jan 70% Perm from Apr 75% Trial from Apr |
| 2022 | 75% Perm from Apr |

SNSP (System Non-Synchronous Penetration) is the sum of non-synchronous generation (such as wind, solar and HVDC imports) as a percentage of total demand and exports.

When the SNSP limit is raised, a trial period takes place before it becomes permanent. During the trial period, the system is operated at this increased SNSP limit except in times of extreme system events or during system testing.

SNSP is a system security metric that has been established from the results of the DS3 programme. These studies initially identified 50% as the maximum permissible level. Due to works undertaken by SONI under the DS3 programme, the SNSP level was reassessed and the limit was raised over the years as per the table above.

In order to achieve the levels of SNSP that are required to achieve the 2030 targets, we will need to significantly evolve how we operate the power system. In the past we operated a power system based on conventional generation that could be sent an instruction (a dispatch instruction) to generate at a particular output, with no variability and with each generating unit synchronised with each other. Our future system will be at times utilising fully variable and non synchronised renewable sources of power.

Target for year

We commenced and successfully completed a trial of 75% SNSP on the system which has now become enduring policy on the system.

New system service capabilities from low carbon sources are required to address the technical and operational challenges arising from the need to operate with SNSP levels up to 95% by 2030.

In order to achieve our 70% by 2030, we had previously been working to the targets detailed in our Forward Work Plan 2021 – 2022 (i.e. 85% SNSP by 2026). We need to revisit these targets as a result of the change in Government Policy from 70% to 80% by 2030. This will be considered as part of the Shaping our Electricity v1.1 programme of work but the target for 2022/23 will remain at 75%.

Renewable Dispatch Down (%)

Purpose of the metric

The aim of this metric is to minimise the dispatch down³ of renewable generation. Dispatch-down of renewable energy refers to the amount of renewable energy that is available but cannot be used by the system. This is because of broad power system limitations, known as curtailments, or local network limitations, known as constraints.

Renewable generation receives priority dispatch within the scheduling and dispatch algorithms in the Castlereagh House Control Centre. However, there will be times when it is not possible to accommodate all priority dispatch generation while maintaining the safe, secure operation of the power system. Security-based limits have to be imposed due to both local network and system-wide security issues. Local network issues may arise due to lack of grid infrastructure to accommodate the renewable generation or due to transmission outages required to facilitate the delivery of new infrastructure.

Approach to measurement

Renewable Dispatch Down (%) is calculated on a Monthly basis and published one month in arrears. Annual figures are available one month following the end of the year.

All controllable wind and solar farms are issued with detailed constraint and curtailment reports each month.

The reports include clear categorisation between constraint and curtailment and clear reasons for why a curtailment or constraint was applied called a 'reason code'. All wind and solar farms also have access to dispatch instructions and wind and solar farm data with each dispatch instruction time-stamped with the instruction time.

A detailed wind and solar aggregate constraint and curtailment report is also published online every month to coincide with the individual wind and solar farm reports. This report is accompanied by a separate user guide, which contains a detailed description of the methodology, worked examples and a Frequently Asked Questions (FAQs) section. Both the aggregate report and the user guide can be found at: <http://www.soni.ltd.uk/how-the-grid-works/renewables/>

Historical Figures

The actual dispatch down for the last number of years is as follows:

| 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|------|------|------|------|------|------|------|------|-------|-------|------|
| 1.3% | 0.7% | 1.9% | 2.8% | 5.3% | 3.2% | 5.0% | 9.4% | 10.7% | 14.8% | 7.8% |

In 2021, the total wind energy generated in Ireland and Northern Ireland was 11,695 GWh, while 938 GWh of wind energy was dispatched down. This represents 7.4% of the total available wind energy in 2021.

In Northern Ireland, the dispatch-down energy from wind resources was 185 GWh. This is equivalent to 7.8% of the total available wind energy. The dispatch-down energy from solar resources however was 4 GWh which represented 2.9% of the total available solar energy.

When all renewable sources of electricity are taken into account, the dispatch down level of all renewables on the island in 2021 was 6.4% (6.4% in Ireland and 6.6% in Northern Ireland).

³ For more information please see [Annual Renewable Constraint and Curtailment Report 2021](#)

Therefore, our performance in 2021 of 6.6% is **lower** than 2019 actual of 10.7% where 2019 actual figures forms the baseline performance for the Forward Work Plan, which is a better performance.

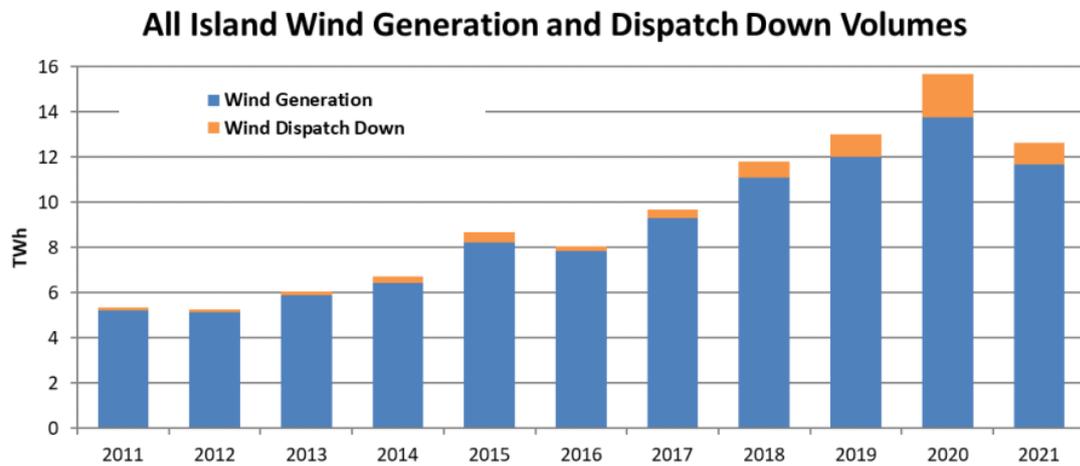


Figure 1: All Island Annual Wind Generation and Dispatch Down Volumes

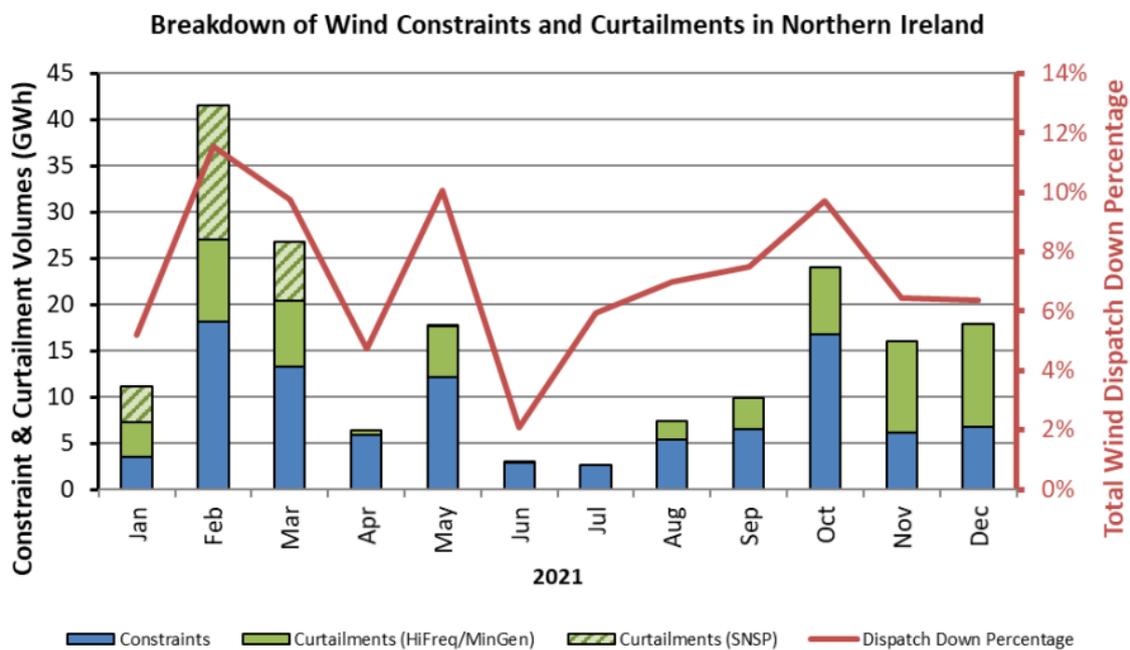


Figure 2: Monthly breakdown of wind dispatch-down categories in NI

In general, wind constraints are trending upwards in Northern Ireland due to the amount of wind on the Northern Ireland system relative to its size. At times there is no option but to constrain wind (and solar) if all the online conventional units are at minimum generation, while also managing the potential loss of the tie-line. The loss of the tie-line is flagged as a Northern Ireland constraint as opposed to curtailment, as it does not affect wind in Ireland, i.e. it's a local Northern Ireland issue. A dedicated constraint group was implemented as a change to the wind dispatch tool in Northern Ireland in December 2019 that enabled SONI to select all wind and solar farms as a single constraint group. Prior to establishing this group dispatch

down for the loss of tie-line may have been labelled as curtailment on some occasions. From a Northern Ireland perspective, there will always be occasions throughout the year when outages required to maintain the network can increase constraints. In 2021 there were no significant outages beyond what would be expected each year.

Minimising dispatch down over the coming years will become more challenging due to the rapid growth of renewable sources on the system. It is proposed that detailed modelling is carried out to forecast dispatch down each year to baseline the forecast level of dispatch down based on forecast demand, renewable connections, policy changes, etc. These targets should be aligned with this analysis.

Target for year

The fundamental issues that give rise to curtailment are being addressed through SONI's Delivering a Secure Sustainable Electricity System (DS3) programme⁴.

In 2022, SONI has carried out a trial to increase SNSP to 75% which will allow more renewables onto the all island power system. This trial completed in April 2022 and the power system is now operating at 75% SNSP.

SONI expects to see the impact of these operational changes through dispatch down reporting in 2022. SONI would also emphasize that NIE Networks are carrying out significant improvement work on the Coolkeeragh-Magherafelt double circuit throughout 2022. This will therefore result in increased constraints, however this is outside of SONI's control but important for system security.

Our target for Renewable Dispatch Down for 2022/23 is 10%.

⁴ [DS3 Programme \(soni.ltd.uk\)](https://www.soni.ltd.uk)

Grid Security

System Frequency (%)

Purpose of the metric

The Grid Code requires that the frequency is kept within the normal operating limits of 50 Hz \pm 0.2. This is to protect equipment and ensure a quality supply of electricity to end users.

Assessing the percentage of time that SONI operates within this window is considered a good measure of the performance against the Grid Code requirement. Certain events outside of the control of SONI, such as generator tripping, will result in the frequency falling outside of these normal operating limits. Management of frequency will also become more challenging due to increasing levels of non-synchronous generation on the system. It should also be noted that there needs to be a balance in relation to this metric as to not create a perverse incentive i.e. to maintain the frequency within the target range 100% of the time would require SONI to hold additional dynamic operating reserve at an additional cost to consumers.

The target percentage of time that the frequency should be in this window is outlined below. SONI believes that this strikes the best balance to ensure quality of supply but which minimise costs.

Approach to measurement

The percentage of time that the frequency is within the range of 50 Hz \pm 0.2 Hz will be assessed at the start of each year for the previous year. The information will be made available as detailed in the Annual All Island Transmission System Performance Report⁵.

Historical Figures

The actual performance over the past 5 years is detailed below:

| 2017 | 2018 | 2019 | 2020 | 2021 |
|-------|--------|--------|--------|--------|
| 99.6% | 99.65% | 99.66% | 99.67% | 98.63% |

Frequency control will become increasingly challenging with the rapid decarbonisation of the electricity system, which will result in fewer conventional sources of frequency control and stability.

The nominal frequency of the all-island transmission system is 50 Hz and is normally controlled within the range of 49.95 Hz and 50.05 Hz. A frequency event is defined as when the frequency drops below 49.8Hz. A chargeable frequency event is when the frequency drops below 49.7Hz.

Figure 3 below provides the historic frequency excursions over the period 2012 – 2021.

⁵ 2021 Report, page 15, Section 4.1 - [All-Island-Transmission-System-Performance-Report-2021.pdf](#) ([soni.ltd.uk](#))

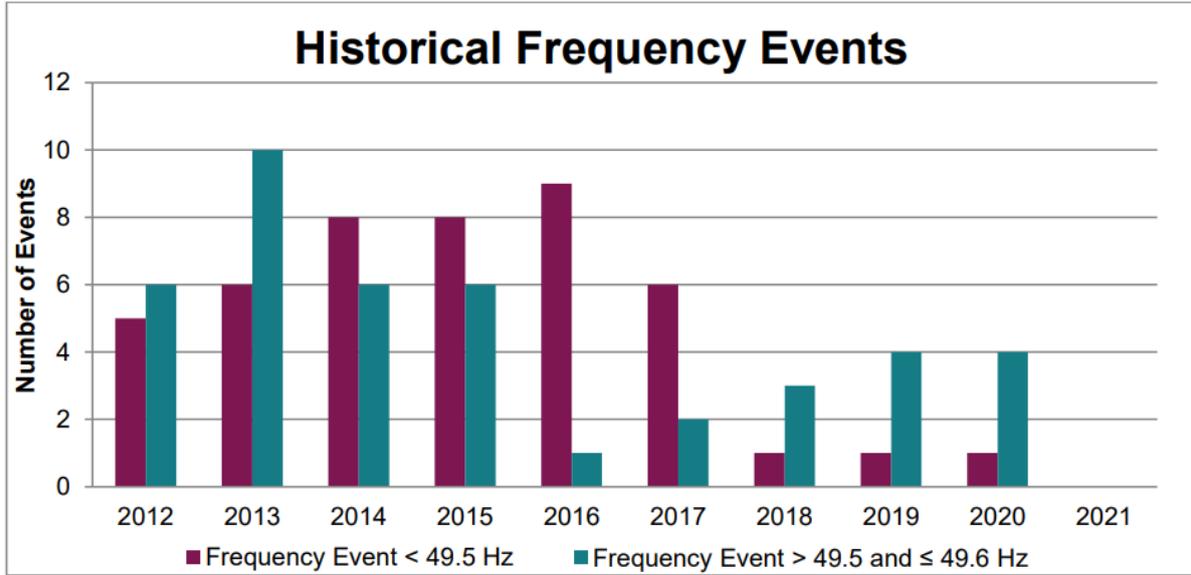


Figure 3: Historical Frequency Excursions 2012 – 2021

Target per Year

Our current target for 2022/23 will be operating within the detailed parameters indicated above for 98% of the time.

Transmission Network Pre-Construction Project (TNPP) Submissions

Purpose of the Metric

SONI has introduced a new performance measure for our activities associated with Appendix 3: SONI Deliverables Role 3. This is the TNPP Submissions.

Approach

SONI has detailed a number of projects whereby a TNPP Submission forms a key milestone as part of the programme delivery. We have calculated that in the Forward Work Plan 2022-2023 there are 6 projects with this milestone as a target.

There are a number of external dependencies that form challenges to SONI in the preparation and submission of a TNPP request for approval to the Utility Regulator. This include, but are not limited to, the following:

- Connection applications, deemed effective, that have potential to change scope or preferred option
- Availability of specialist consultants, both technical and environmental
- Timely responses from NIE Networks on asset related queries required in preparation of the Options Report
- Availability of elected representatives and council officials for stakeholder engagement
- Timely production of TNPP design costs by NIE Networks.

Given the additional dependencies associated with the TNPP Submission, SONI considers an appropriate metric for our performance in this area to be the timeliness of UR approvals regarding a TNPP submission. This will also consider the quality of the submission made to the UR, as standard UR approval times are within 4 months of approval, whereas SONI would expect a high-quality submission will not require as much time to review and challenge and therefore we would expect these to be approved in less than 4 months therefore exceeding expectations.

Targets

SONI has detailed the targets for the period in the table below, setting out our expectations for the year.

| SONI Expectation | Target |
|-------------------------|--|
| Falls below expectation | Submissions are longer than 4 months for the UR approval |
| Meets Expectation | Submissions approved at 4 months by the UR |
| Exceeds Expectation | Submissions are approved by the UR in less than 4 months |

SONI are currently reviewing the milestones around issuing a Transmission Project Instruction (TPI) and entering into a Transmission Project Agreement (TPA). We are considering potential performance measures linked to these areas and will review ways to develop these over the period.

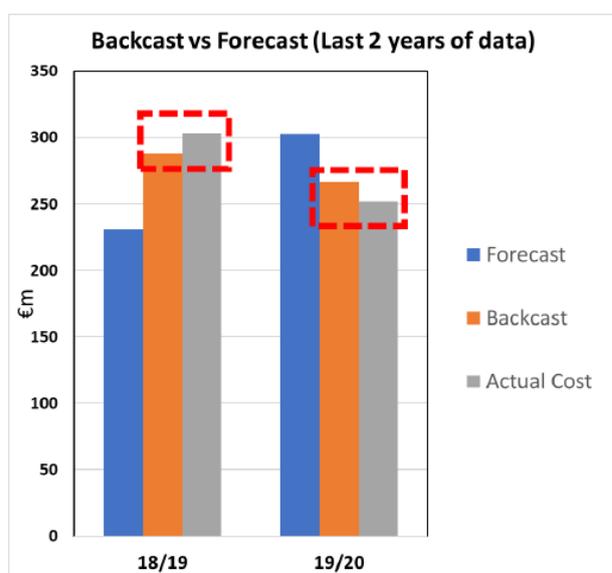
System-Wide Costs

Imperfections Cost

Imperfections modelling is performed on an all island basis. This performance measure is to minimise constraints costs (which arise due to the difference between the ex-ante market schedule and the real-time dispatch); these costs are passed onto the end electricity consumer.

SONI intends to use the backcast model, considering it to be the best model to use, when estimating the annual imperfections costs associated with constraints, as the backcast contains actual data, rather than using the forecast model which contains assumptions forecasted more than six months before the beginning of the tariff year.

Some of these assumptions, such as fuel, are very volatile and have a significant impact on the imperfections costs associated with constraints. No method of estimating the annual imperfections costs associated with constraints is perfect but it is SONI's opinion that using the backcast model to determine these costs would be less open to challenge, as we are using actual inputs rather than assumptions.



The Imperfections Forecast model is the TSO's best estimate of the year ahead imperfections – what happens can vary from assumptions, sometimes significantly.

The Imperfections Backcast is an updated model reflecting actual events, and removes any issues that were outside the TSO's control.

The graph shows a closer relationship between Actual versus Backcast, but more importantly, we know it is a more accurate model and a better baseline to perform any single factor analysis.

By introducing this new performance measure, SONI (in coordination with EirGrid in the operation of the All-Island Transmission System) is aiming to promote our role in mitigating and reducing imperfections costs.

SONI produces 4 Quarterly Imperfections Cost Reports which are published on the SEM-O website (TSO Responsibilities⁶), which will provide clear evidence of the imperfections reductions actions, progress on the plan and the future improvements that SONI will make to remove or reduce the cost of each constraint in the next period.

TSO actions during 2019/20, regarding the list of transmission constraint groups, gave rise to imperfections cost savings of €22.44m in the 2020/21 tariff year. As such, four TCGs were removed that provide all-island benefit.

1. Negative Ramping Reserve in Ireland removed
2. SNSP increased from 65% to 70%

⁶ [TSO Responsibilities \(sem-o.com\)](https://www.sem-o.com)

3. Reduction in minimum required Dynamic POR (as a result of Increased Batteries / DSUs): Reduced to 110 MW/75 MW & further to 87 MW/75 MW (Lower values apply when there is at least one Turlough Hill unit in pump mode.)
4. Increased Non-Regulating Reserve (as a result of Increased Batteries)

The removal/easing of these four TCGs has been facilitated by the following system services: operating reserve contracts with batteries and Demand Side Units (DSUs) and Steady State Reactive Power (SSRP) contracts. As this is calculated on an all-island basis these factors are required to be detailed.

SONI has used the 2020/21 Imperfections Backcast model to evaluate the cost savings associated with removing current TCGs. It should be noted that some TCGs are interdependent/interrelated as a result of which simple aggregation of the individual savings may not be appropriate in certain instances.

It should be noted that as we will be using the backcast model, which provides actual data, as opposed to the forecast model, given the rationale provided above, it is not possible at present to provide targets for future years.

SONI Service Quality

Over the period SONI will be considering the development of a metric in order to account for the issue of Connection Offers and the number of projects energised, in a way that works with the criteria such that we can measure our performance against falling short, meeting and exceeding our expectations.

Feedback indicated that we should consider other performance measures as used by National Grid ESO in their assessment by OfGem. This is an area that we have considered and will seek to develop for future Plans.

Timely Delivery of Publications

Purpose of the Metric

Feedback received during the assessment period of the 2021 – 2022 Forward Work Plan indicated some stakeholders were not clear on whether dates could change, and this would still be considered as an indication that SONI have performed well and met expectations. This section is to provide clarity around the timeframes detailed throughout the Forward Work Plan whereby the associated performance measure is the timely delivery of material or relevant publication dates.

Approach

Where SONI has provided a date or range of dates for the publication of documents/reports or availability of materials for use, we may measure our performance, alongside other KPIs, as the “timely delivery” of the described deliverable.

In this instance, SONI would highlight that these dates are not subject to change except where explicitly advised (e.g. due to external dependancies). The expectation is that these dates will be met as they are subject to a specific Licence obligation, or they align with the dates determined during our business planning process for the period.

Should a date deviate from the original planned date, SONI will notify stakeholders through our planned December 2023 publication of our Annual Performance Report 2022 – 2023. We will also detail any rationale as to why this deviation may have taken place, any external dependencies that may have resulted in this change and the mitigating actions SONI may take over the period.

Targets

SONI considers that we meet expectations in terms of delivering the date stated throughout the plan in terms of publications. Should this deviate, as above we will consider this through all perspectives to include whether there is an external dependency that has resulted in any deviation from the planned date.

We will also consider over the period how we measure “exceeding expectations” in this area as this is something that requires further development, alongside other newly introduced metrics.

Quality and Quantity of Feedback

Purpose of the Metric

Stakeholder views and the qualitative assessment is an area which was raised by stakeholders, the UR and the independent panel during the assessment period and in the final determination of the 2021 – 2022 Forward Work Plan grade.

Approach

Over the period of the plan, SONI will be progressing a deliverable FWP23-12 Stakeholder Needs Assessment⁷. This is the first step in SONI moving forwards on a KPI to consider stakeholder views. However, in the interim we would like to refer to the Appendix 6: Stakeholder Engagement which details why and how we engage with stakeholders, our various stakeholder groups and what we do with the views and information provided by stakeholders.

As this is currently in development, we are unable to provide historic trends or future based targets until we have concluded this programme in full.

At present, our approach to stakeholder feedback is detailed further in Appendix 6: Stakeholder Engagement.

⁷ FWP23-12 Stakeholder Needs Assessment is detailed further in Appendix 2: SONI Deliverables for Role 2