Training Disclaimer: *ISO New England (ISO) provides training to enhance participant and stakeholder understanding. Not all issues and requirements are addressed by the training. Consult the effective NERC standards, Transmission, Markets and Services Tariff and the relevant Market Manuals, Operating Procedures and Planning Procedures for detailed information. In case of a discrepancy between training provided by ISO and NERC standards, and the Tariff or Procedures, the meaning of the Tariff and Procedures shall govern.*

August 28, 2025
Webex Broadcast

Transitional Cluster Study (TCS) Participation

(FERC Order No. 2023) Forum

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Disclaimer

The content of this presentation is based on the Order No. 2023/2023-A compliance proposal as accepted by FERC in its April 4, 2025, Order on Compliance, as well as the ISO's May 2025 filing to adjust dates related to the Order No. 2023 transition which FERC accepted on June 30, 2025, and the June 2025 further compliance filing in response to the April Order, which remains pending before the Commission.

- FERC's order on the further compliance proposal may result in minor changes to interconnection rules that the ISO will implement
- Interconnection customers should stay informed of the timing and content of the further compliance order and the resulting Order Nos. 2023/2023-A compliant interconnection rules that the ISO will implement
- If there is a conflict between the contents of this presentation and the Tariff, the Tariff controls

ISO Tariff: Schedules 22, 23, & 25

- **Schedule 22 – Large Generator Interconnection Procedures**
  Provides the terms and conditions for interconnecting large generating facilities (more than 20 MW) to the administered transmission system
- **Schedule 23 – Small Generator Interconnection Procedures**
  Provides the terms and conditions for interconnecting small generating facilities (20 MW or less) to the administered transmission system
- **Schedule 25 – Elective Transmission Upgrade Interconnection Procedures**
  Provides the terms and conditions for interconnecting a new pool transmission facility, merchant transmission facility or other transmission facility to the administered transmission system. An elective transmission upgrade is not a generator interconnection related upgrade, a regional transmission upgrade, or a market efficiency transmission upgrade

For more information, visit: Participate > Rules and Procedures > Transmission, Markets, and Services Tariff > Open Access Transmission Tariff (OATT)

Acronyms and Description

ASO	affected system operator	**IA**	Interconnection Agreement
BESS	battery energy storage system	**IBR**	inverter based resource
BPS	bulk power system	**IC**	interconnection customer
CCIS	Capacity Capability Interconnection Standard	**IR**	interconnection request
CETU	cluster-enabling transmission upgrade	**IRTT**	Interconnection Request Tracking Tool
CNI	capacity network import	**ITO**	interconnecting transmission owner
CNIC	capacity network import capability	**LGIP**	Large Generator Interconnection Procedure
CNIIS	capacity network import interconnection service	**NCIS**	Network Capability Interconnection Standard
CNR	capacity network resource	**NCQP**	new capacity qualification package
CNRC	capacity network resource capability	**NERC**	North American Electric Reliability
CNRIS	capacity network resource interconnection service	**NI**	network import
CRD	commercial readiness deposit	**NR**	network resource
EMT	electromagnetic transient	**OATT**	Open Access Transmission Tariff
ETU	elective transmission upgrade	**OEM**	original equipment manufacturer
FERC	Federal Energy Regulatory Commission	**POI**	point of interconnection
GSU	generator step-up transformer	**PPC**	power plant controller
HVDC	high voltage direct current	**PSCAD**	power system computer-aided design

Acronyms and Description, *continued*

PSSE	Power System Simulation for Engineers	**SOI**	show of interest
RA	reconfiguration auction	**TCNRGS**	Transitional Capacity Network Resource Group Study
RFP	request for proposal	**TCS**	Transitional Cluster Study
SIS	System Impact Study	**TCSA**	Transitional Cluster Study Agreement
SGIP	Small Generator Interconnection Procedures		

Course Objectives

At the completion of the webinar session, you will be able to:

- Identify why a Transitional Cluster Study Agreement (TCSA) was issued to you
- Identify all components of a fully executed TCSA package
- Explain how to submit data for the Transitional Cluster Study (TCS)
- Restate the importance of submitting complete and accurate data in a timely manner, including for required technical data
- Explain the general steps of the TCS study process

Course Topics

- Transition events, deadlines and timelines
- TCSA requirements, including what is needed to fully execute the TCSA and submit data in IRTT
  - Deposits – CRD vs. CETU participation deposit
  - Election of interconnection service (NR/NI vs. CNR/CNI)
  - Technical data
  - Site control
- Details on required technical data and modeling expectations:
  - Power flow
  - Short circuit
  - Stability
  - Electromagnetic transient (EMT) data
  - PSS/e vs. power system computer-aided design (PSCAD) benchmarking report
  - PP5-6 Appendix C-1, C-1A, & C-1B & Appendix C-2
- General overview of TCS process
- Post TCS steps, transitional withdrawal penalty, and TCNRGS considerations

Topics Not Covered

- ☒ State jurisdictional affected system operator (ASO) study coordination
- ☒ Impact of ongoing request for proposal (RFPs)/ solicitations
- ☒ Confidential information on projects
- ☒ Guidance/discussion on specific original equipment manufacturers (OEMs), consultants, or transmission owners

Order No. 2023 Background and Timelines, Including Upcoming Events and Deadlines

Background

- On July 28, 2023, the Federal Energy Regulatory Commission (FERC) issued Order No. 2023 (184 FERC ¶ 61,054) adopting significant reforms to the standard Large Generator Interconnection Procedures (LGIP) and Small Generator Interconnection Procedures (SGIP)
  - The reforms build on the standardized procedures that FERC established in Order Nos. 2003, 2006, and 845 to address interconnection queue backlogs, improve certainty, and prevent undue discrimination for new technologies
- On March 21, 2024, FERC issued Order No. 2023-A (186 FERC ¶ 61,199) an "Order Addressing Arguments Raised on Rehearing, Setting Aside Prior Order, In Part, and Granting Clarification" of Order No. 2023

Background, *continued*

- On May 14, 2024, in compliance with, and related to Order Nos. 2023 and 2023-A, the ISO filed Tariff revisions pursuant to Sections 205 and 206 of the Federal Power Act, which included revisions to the Interconnection Procedures under Schedules 22, 23, and 25 of the Open Access Transmission Tariff ("Interconnection Procedures") as well as other related sections of the Tariff

Background, *continued*

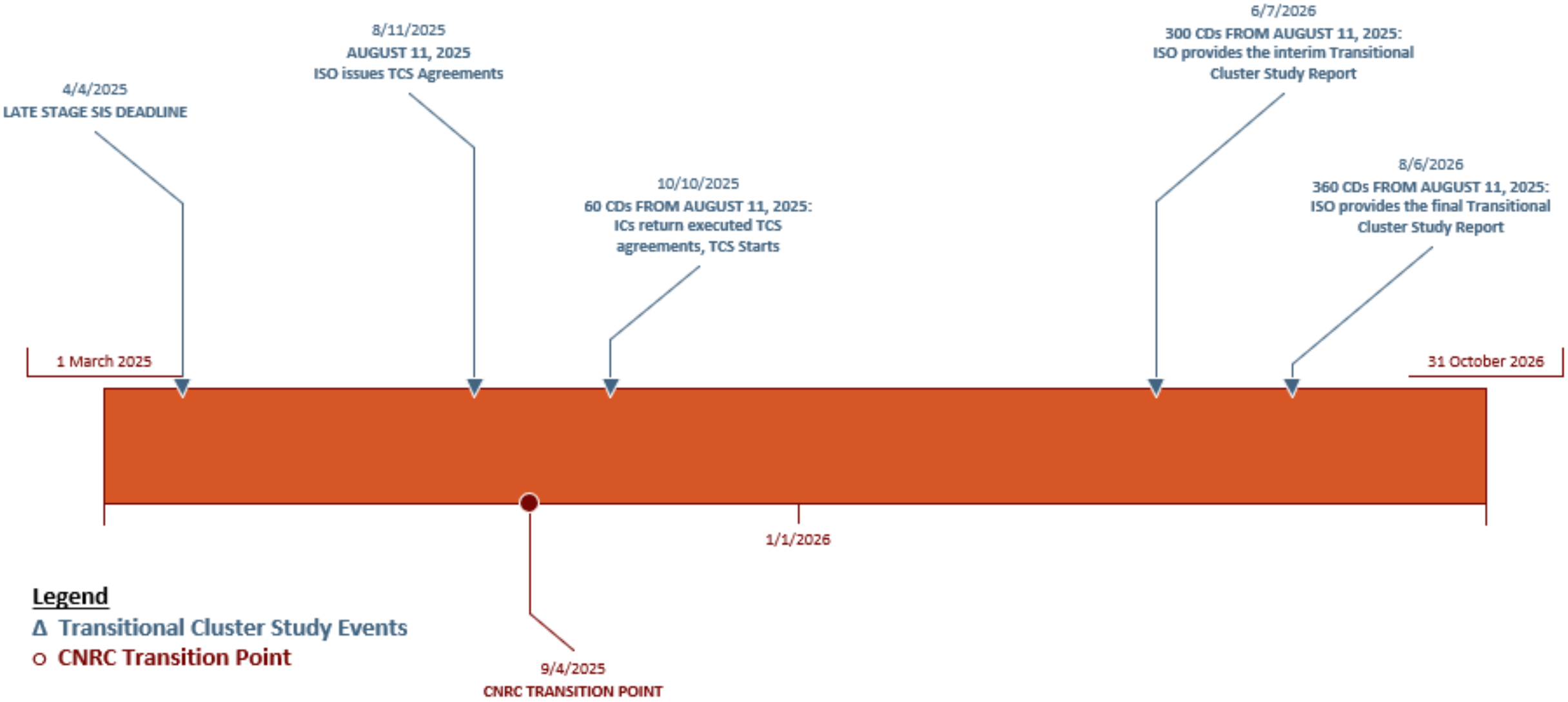
- On April 4, 2025, FERC issued an order accepting the May 14, 2024, filed compliance proposal in part, and directed the filing parties to submit a further compliance filing within 60 days of the order
  - The filings were accepted with an August 12, 2024, effective date
- ISO took two steps in response to the April 4, 2025, order:
  - Submitted on May 2, 2025, under Section 205 of the Federal Power Act, narrowly tailored date changes necessary to shift the transition activities in the compliance proposal by approximately one year
    - FERC issued an order on June 30, 2025, accepting the proposed changes in this filing, effective May 3, 2025
  - Submitted a further compliance filing on June 3, 2025
    - This filing is still pending with FERC

Background, *continued*

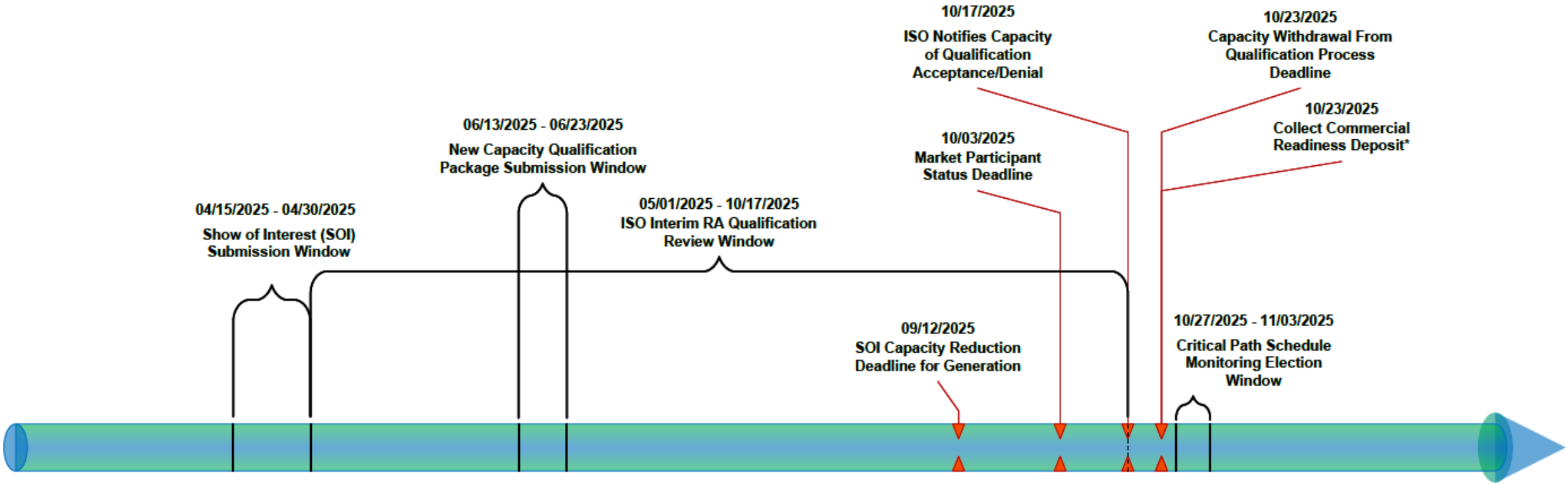
Order No. 2023 transition activities occurring in 2025 are centered around the:

1. Transitional Cluster Study (TCS)
2. Transitional Capacity Network Resource Group Study (TCNRGS) being performed as part of the 2025 interim reconfiguration auction (RA) qualification process

General TCS Timeline



2025 Interim Reconfiguration Auction Qualification Process Timeline



*The commercial readiness deposit only applies to generating capacity resources and import capacity resources associated with a project subject to the ISO Interconnection Procedures.

Important Dates in 2025

4/4: Late-stage System Impact Study (SIS) deadline (i.e., deadline for ICs to accept SIS results)	**9/12:** SOI capacity reduction deadline for generation
4/15 – 4/30: Show of interest (SOI) form submission window	**10/11:** TCS period begins
6/13 – 6/23: New capacity qualification package (NCQP) submission window	**10/17:** ISO notifies capacity of qualification acceptance/denial
8/11: ISO issues Transitional Cluster Study Agreement (TCSAs) to eligible projects	**10/23:** Capacity withdrawal from qualification process deadline
8/11 – 10/10: TCSA submission window	**10/23:** Collect CRD for TCNRGS
9/4: Deadline for establishing CNRC/CNIC through Forward Capacity Market participation	**10/27 – 11/3:** Critical path schedule (CPS) monitoring election window

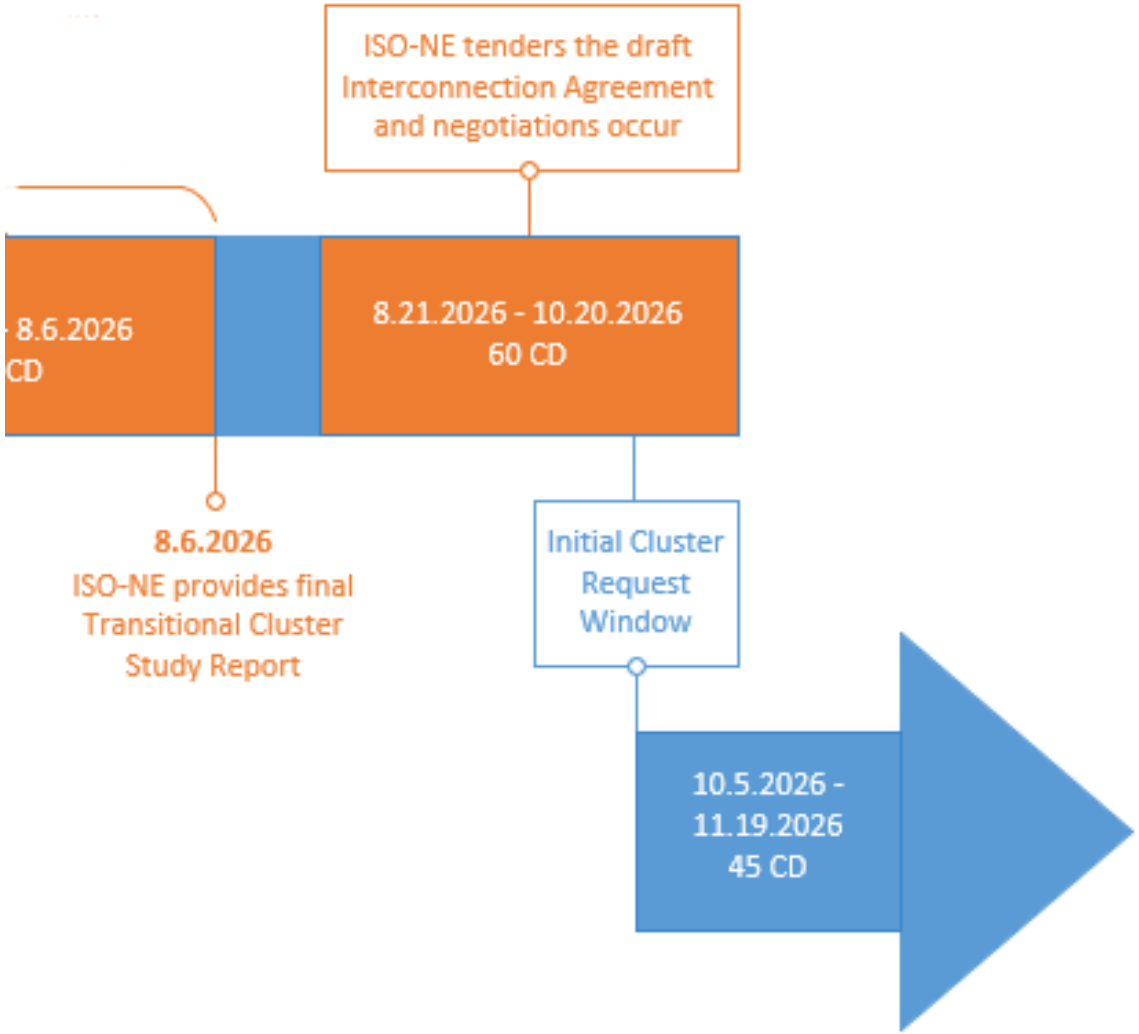
Dates related to TCS or other related Order No. 2023 transition dates

Dates related to 2025 interim RA qualification process/TCNRGS

Timing of First Regular Cluster Study

Cluster request window for the first regular cluster study will open sixty calendar days after the ISO provides the final Transitional Cluster Study report

- Currently, this date is October 5, 2026



TCSA Requirements, Preparation, and Submittal

Who Received a TCSA on August 11, 2025?

On August 11, 2025, the ISO issued TCSAs to ICs that:

- Had a valid interconnection request (IR) but did not have a completed System Impact Study (SIS) or Cluster SIS by April 4, 2025, or
- Have a valid IR for capacity network resource interconnection service (CNRIS)/capacity network import interconnection service (CNIIS) and a completed SIS by April 4, 2025, but have established capacity network resource capability (CNRC)/capacity network capability (CNIC) for an amount less than the amount of CNRIS/CNIIS requested in the IR

What is Required with a Fully Executed and Complete TCSA Package?

All the following must be included when an IC returns the executed TCSA for the TCSA package to be complete:

- Selection of interconnection service
  - Amount of capacity interconnection service requested, if capacity interconnection service is requested
- Study deposit
- Commercial readiness deposit
- Exclusive site control for 100% of the proposed generating facility*
- All technical data required under Appendix 1, Attachment A, and Attachment A-1, as well as ISO-NE Planning Procedure No. 5-6 (to the extent the interconnection customer has not already provided such data)*

*Applicable to projects that have not yet submitted the required information or are making changes to required information that was submitted prior to the TCS

What is Required for Selection of Interconnection Service?

_____ Network Resource Interconnection Service (energy capability only)

_____ Capacity Network Resource Interconnection Service (energy capability and capacity capability)

☐ Interconnection Customers seeking to complete studies for CNRIS for Interconnection Requests for which NRIS milestones have already been completed shall check this box and fill in the table below

Service Level	Requested Net MW Capability at the Point of Interconnection
CNR Capability Summer	
CNR Capability Winter	

☐ Interconnection Customer requests to be downgraded to Network Resource Interconnection Service where violations are identified in the thermal analysis associated with Capacity Network Resource Interconnection Service testing.

Need to specify if energy or capacity interconnection service is requested

- If capacity interconnection service requested, need to specify the *amount* of capacity interconnection service requested

Example – Selection of NRIS

X Network Resource Interconnection Service (energy capability only)

_____ Capacity Network Resource Interconnection Service (energy capability and capacity capability)

☐ Interconnection Customers seeking to complete studies for CNRIS for Interconnection Requests for which NRIS milestones have already been completed shall check this box and fill in the table below

Service Level	Requested Net MW Capability at the Point of Interconnection
CNR Capability Summer	
CNR Capability Winter	

☐ Interconnection Customer requests to be downgraded to Network Resource Interconnection Service where violations are identified in the thermal analysis associated with Capacity Network Resource Interconnection Service testing.

In this example, the IC selects NRIS for a project with the following ratings at the point of interconnection (POI):

- 50°F: 100 MW
- 0°F: 100 MW

Example – Selection CNRIS

_____ Network Resource Interconnection Service (energy capability only)

X Capacity Network Resource Interconnection Service (energy capability and capacity capability)

☐ Interconnection Customers seeking to complete studies for CNRIS for Interconnection Requests for which NRIS milestones have already been completed shall check this box and fill in the table below

Service Level	Requested Net MW Capability at the Point of Interconnection
CNR Capability Summer	90
CNR Capability Winter	90

☐ Interconnection Customer requests to be downgraded to Network Resource Interconnection Service where violations are identified in the thermal analysis associated with Capacity Network Resource Interconnection Service testing.

- In this case, an SIS **was not** completed before April 4, 2025, for the related IR, and so the project is seeking both NRIS and CNRIS through this TCSA
- In this example, the IC selects CNRIS for 90 MW of CNRC for a project with the following ratings at the POI:
  - 50°F: 100 MW
  - 0°F: 100 MW

Example – Selection CNRIS, *continued*

_____ Network Resource Interconnection Service (energy capability only)

X Capacity Network Resource Interconnection Service (energy capability and capacity capability)

☒ Interconnection Customers seeking to complete studies for CNRIS for Interconnection Requests for which NRIS milestones have already been completed shall check this box and fill in the table below

Service Level	Requested Net MW Capability at the Point of Interconnection
CNR Capability Summer	90
CNR Capability Winter	90

☐ Interconnection Customer requests to be downgraded to Network Resource Interconnection Service where violations are identified in the thermal analysis associated with Capacity Network Resource Interconnection Service testing.

- In this case, an SIS **was** completed before April 4, 2025, for the related IR, and so the project is seeking to augment NRIS with CNRIS through this TCSA
- In this example, the IC selects CNRIS for 90 MW of CNRC for a project with the following ratings at the POI:
  - 50°F: 100 MW
  - 0°F: 100 MW

What is Required for TCS Study Deposit?

Project and Interconnection Request Type	Deposit Requirement	Acceptable Forms of Deposit
Large Generator or ETU, NRIS/NIIS	$250,000	Cash
Large Generator or ETU, CNRIS/CNIIS	$250,000	Cash
Large Generator or ETU, CNRIS/CNIIS Only	$100,000	Cash
Small Generator, NRIS	$100,000	Cash
Small Generator, CNRIS	$100,000	Cash
Small Generator, CNRIS Only	$50,000	Cash

- Deposits need to be received by the ISO by the TCSA deadline
  - Need to consider any processing times required by financial institutions and the ISO
- Any unused amount of the TCS study deposit is refundable – further information provided on a later slide

What is Required for Commercial Readiness Deposit (CRD)?

Project and Interconnection Request Type	Deposit Requirement	Acceptable Forms of Deposit*
Large generator or ETU, NRIS/NIIS	$5,000,000	Cash, letter of credit, surety bonds, or a combination thereof
Large generator or ETU, CNRIS/CNIIS	$5,000,000	Cash, letter of credit, surety bonds, or a combination thereof
Large generator or ETU, CNRIS/CNIIS only	$1,000,000	Cash, letter of credit, surety bonds, or a combination thereof
Small generator, NRIS	$500,000	Cash, letter of credit, surety bonds, or a combination thereof
Small generator, CNRIS	$500,000	Cash, letter of credit, surety bonds, or a combination thereof
Small generator, CNRIS only	$250,000	Cash, letter of credit, surety bonds, or a combination thereof

*ISO will accept surety bonds starting September 1, 2025

- CRD needs to be received, reviewed, and accepted by the ISO by the TCSA submission deadline
  - Need to consider any processing times required by financial institutions and the ISO
- Transitional withdrawal penalty will come from the CRD – further information provided on a later slide

What is Required for Site Control?

- Exclusive site control for 100% of the proposed generating facility needs to be provided
- Additional documentation needs to be provided if the site control does not meet the following acreage requirements:

Table H.1 – Minimum Expected Acreage Requirements[73]

Photovoltaic (PV)	Electrical Energy Storage	Onshore Wind	Offshore Wind	Conventional
4 Acres/MW	1 Acres/100 MWh	15 Acres/MW	35 Acres/MW	Attestation

73 Values provided according to table H.1 must be based on physical nameplate ratings (i.e., the net MW capability at the Point of Interconnection, which may be higher than the requested levels of interconnection service). For PV, onshore wind and offshore wind, MW values are AC and reflect the maximum nameplate rating that can be delivered to the project's Point of Interconnection. For Electrical Energy Storage, MWh values are useable AC energy, which considers all losses associated with delivering power to the Point of Interconnection.

What is Required for Technical Data?

- Appendix 1 (Interconnection Request), Attachments A, and A-1
- Power System Simulation for Engineers (PSSE) power flow model
- PSSE stability model
- ASPEN one liner short circuit model
- Power system computer-aided design (PSCAD) model
- PSSE vs. PSCAD benchmarking report
- Attestations from PP5-6 Appendix C-1, C-1A & C-1B

More detailed information on the technical data requirements and software versions that ISO is currently using is provided later in this presentation

Submitting Data Into IRTT

- Company associated with the IR must be established in IRTT, and the account used to submit data must have permission granted by the company admin
  - Your company admin can create employee or consultant accounts or set up read or view permissions to an IR
- Required Attachment A and A-1 technical data are inputs directly into IRTT and all sections applicable to the project must be filled in
- Each document uploaded into IRTT must be associated with the corresponding document type
  - For example, the project one-line must be associated with the document type “Bus-Breaker Based One-Line Diagram” as shown in the screenshot

When are Fully Executed and Complete TCSA Packages Due?

- TCSA submission deadline is October 10, 2025, sixty (60) calendar days after the date the ISO issues TCSAs (i.e., August 11, 2025)
- Any IC that fails to submit an executed TCSA and all required data (i.e., a fully executed and complete TCSA package) by the TCSA submission deadline shall have its IR deemed withdrawn by the ISO without further opportunity to cure
  - In such cases, the ISO will not assess the IC any transitional withdrawal penalty

ISO's Review of Submitted TCSA Packages

- Beginning August 11, 2025, and through October 10, 2025, ISO-NE will be available to check data submitted as part of a fully executed TCSA package for completeness and notify the IC if any required components of the submitted TCSA package are incomplete
  - Submissions received close to the October 10, 2025, deadline are not guaranteed to be reviewed by the ISO for completeness before the TCSA submission deadline
  - ISO will not review data before submission of a fully executed TCSA
- ISO cannot further review data (including technical data) submitted as part of a fully executed TCSA package for deficiencies until the start of the TCS (i.e., until after October 11, 2025)
  - After the start of the TCS, the ISO will notify the IC of any data deficiencies found, at which point the IR will be subject to the withdrawal provisions of Section 3.7 of Schedule 22 and 23 of the OATT, and Section 3.6 of Schedule 25 of the OATT

Required Technical Data and Modeling Expectations

Scope of Technical Data Required for a Project

The scope of the technical data required for a project with its fully executed TCSA depends on the status of the project's submitted technical data before the TCSA is submitted, with three cases to consider:

1. **Initial Submittal** – IC never submitted any technical data for the project prior to the ISO issuing TCSAs. In other words, the technical data provided by the IC with an executed TCSA is the first time the IC provides the required technical data.
2. **Revised Submittal** – IC submitted the required technical data for the project prior to the ISO issuing TCSAs, and some or all of the previously provided technical data requires revision, or the IC submitted some, but not all, of the project's technical data prior to the ISO issuing TCSAs
3. **Unchanged Submittal** – IC submitted the required technical data for the project prior to the ISO issuing TCSAs, and none of the previously provided technical data requires revision

Scope of Technical Data Required for a Project – Case 1: Initial Submittal

Case 1: Initial Submittal – IC never submitted any technical data for the project prior to the ISO issuing TCSAs. In other words, the technical data provided by the IC with an executed TCSA is the first time the IC provides the required technical data.

Submittal Type	Required Technical Data Submittal	Action Required
Initial Submittal	Complete technical data package	• Provide all technical data as required in Appendix 1 and all information required under its attachments of Schedule 22 and 25 • Complete PP5-6 Appendix C-1 and required attestations in C-1A and C-1B for submitted electromagnetic (EMT) PSCAD models – Completed Appendix C1 and attested C-1A are required for each OEM specific PSCAD model – Only one Appendix C-1B attestation is required for the project • PSSE-PSCAD benchmarking report

Modeling Data for Schedule 22

Appendix 1		
Interconnection Request	**Attachment A – Technical Data Required for TCS**	**Attachment A-1 – Supplementary Wind and Inverter-Based Generating Facility Form** *(if applicable)*
• Point of interconnection (POI) • Type of facility • In-service date • Requested generating facility capacity • Battery energy storage system (BESS) charging data	• Generator ratings and impedance data (as applicable) • Transformer ratings and impedances • PSCAD model [electromagnetic transient analysis] (if applicable) • PSSE model (as applicable) • Induction generator data (if applicable)	• Geographic map of project • One-line diagram • Collection system detail and aggregate impedance sheets • Inverter and generator step-up transformer (GSU) information • Station transformer information • Protection settings • Unit reactive power control • Power flow model (detailed and equivalent) • Dynamic simulation model • Collection system/transformer tap-setting design

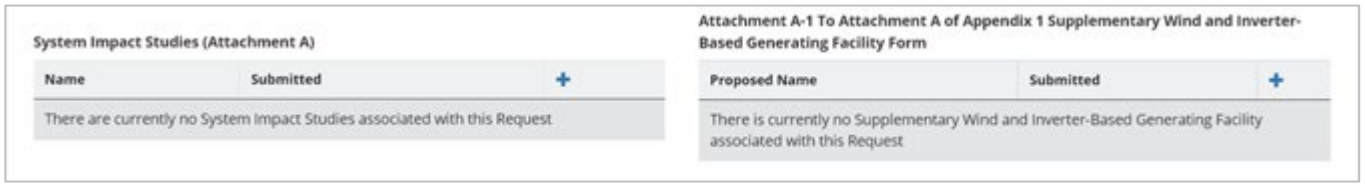
All these documents can be found at the end of their respective schedule

Submitting Data into IRTT – Large Generating Facility

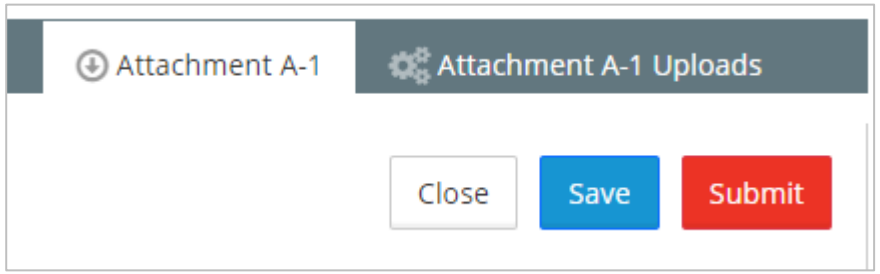
Initial Submittal

- Go to **Manage Interconnection Requests → Valid → Attachments to IR** tab

- Click on the '**+**' icon for Attachment A, complete and save:



- Click on the '**+**' icon for Attachment A-1, complete and save, then the **Attachment A-1 Uploads** tab will appear:
  - Upload all requested files
  - Submit when ready
  - Provide Attachment A signature page



Modeling Data for Schedule 25 – Elective Transmission Upgrade (ETU)

Appendix 1	
Interconnection Request	**Attachment A – Technical Data Required for TCS**
• Project name • Specific ETU technology (HVDC/AC/controllable/non-controllable) • Transfer capability • Flow (unidirectional/bidirectional) • Internal or external ETU • Site control • In-service date	• Geographic map and one line • Point of interconnection (POI) • AC transmission line data • DC transmission system data • Transformer data • Reactive device data • Proxy generation data (if applicable) • PSCAD model for wind and inverter-based proxy gen(if applicable)

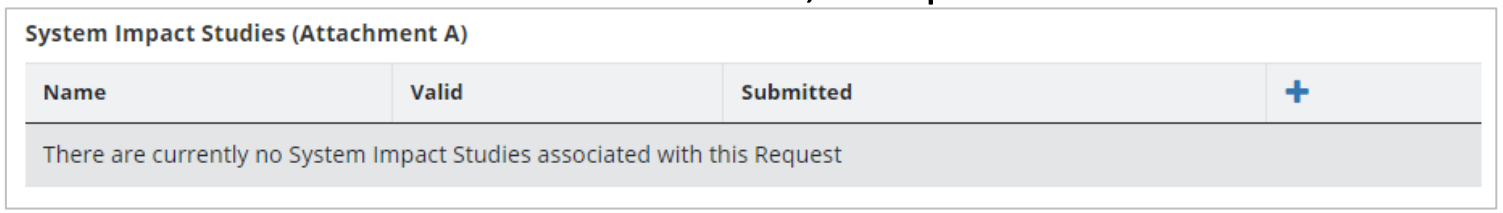
All these documents can be found at the end of their respective schedule

Submitting Data into IRTT – Elective Transmission Upgrade (ETU)

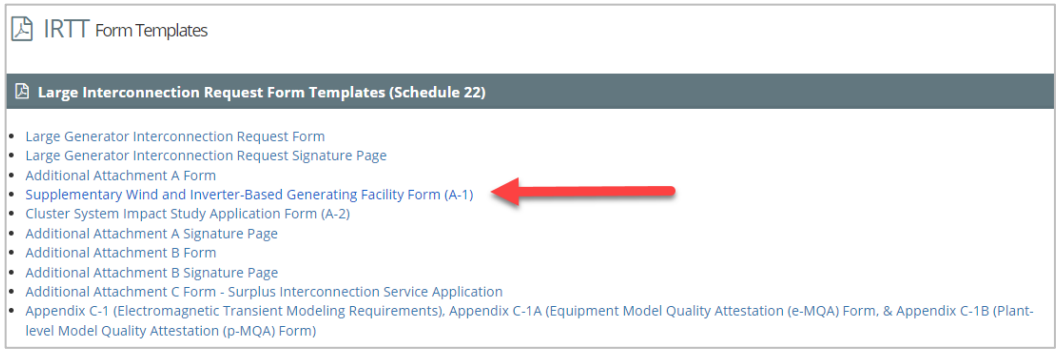
Initial Submittal

- Go to **Manage Interconnection Requests → Valid → Attachments to IR** tab → **Edit**

- Click on the '**+**' icon for Attachment A, complete and save:



- If providing inverter-based proxy generation, the information in Attachment A-1 is also needed, download the form template here:
  - Complete and upload under '**Uploads**' tab
  - If you are unsure what data is needed for an ETU, please contact your ISO PM
  - Provide *Attachment A* signature page



Scope of Technical Data Required for a Project – Case 2: Revised Submittal

Case 2: Revised Submittal – IC submitted the required technical data for the project prior to the ISO issuing TCSAs, and some or all the previously provided technical data requires revision, or the IC submitted some, but not all, of the project's technical data prior to the ISO issuing TCSAs

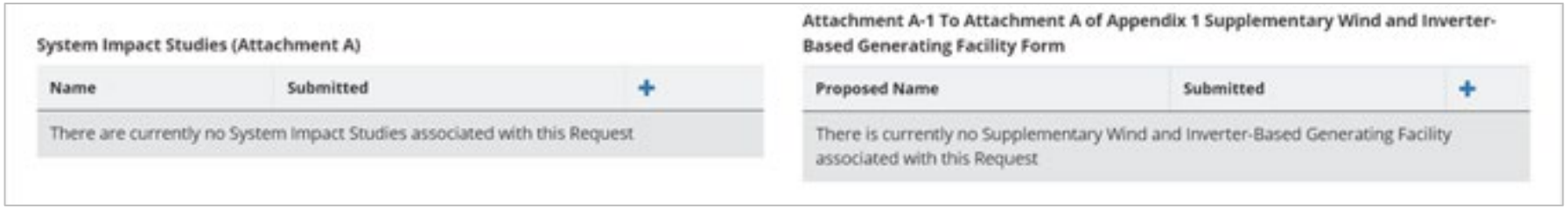
Submittal Type	Required Technical Data Submittal	Action Required
Revised Submittal	Revised or missing technical data only	• Provide all revised or missing technical data and update Appendix 1 and all information required under its attachments of Schedule 22/23/25 for revised technical data • Complete PP5-6 Appendix C-1 and required attestations in C-1A and C-1B for all revised or newly provided EMT PSCAD models – Completed Appendix C-1 and C-1A are required only for the component(s) being updated (inverter, PPC, HVDC, STATCOM, etc.) – Only one Appendix C-1B attestation is required for project – Revised PSSE-PSCAD benchmark report • Provide written confirmation to IRTT that all other previously submitted technical data remains applicable to the project

Submitting Data into IRTT – Large Generating Facility

Revised Submittal

- Request assigned ISO Project Manager unlock the IR in IRTT
- Go to **Manage Interconnection Requests → Valid** -> **Attachments to IR** tab → **Edit**

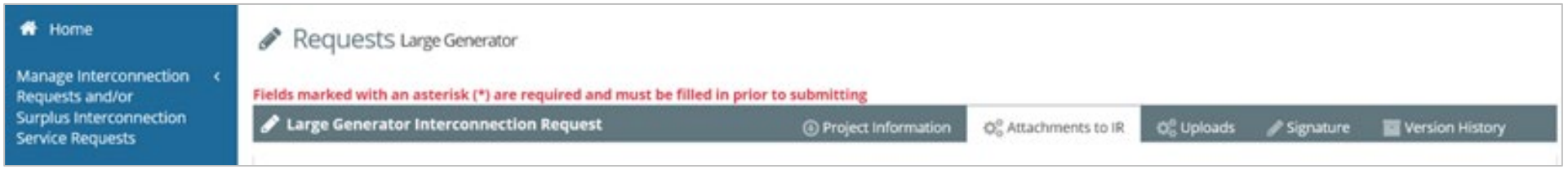
- Update any relevant information by hitting the pencil icon and update Attachment A and A-1 and upload new models and required forms:



Submitting Data into IRTT – Elective Transmission Upgrade (ETU)

Revised Submittal

- Request that the assigned ISO Project Manager unlock the IR in IRTT
- Go to **Manage Interconnection Requests → Valid → Attachments to IR** tab → **Edit**



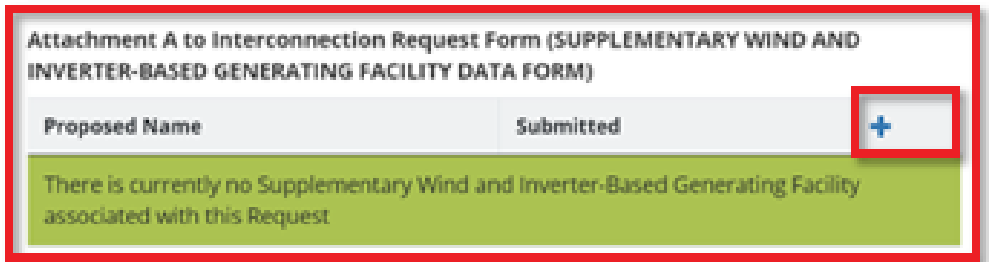
- Update any relevant information by hitting the eye icon and update Attachment A and A-1 and upload new models and required forms:

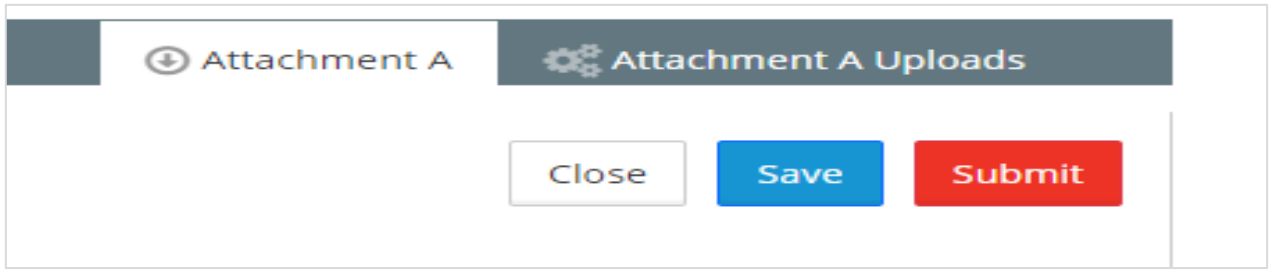
Submitting Data Into IRTT – Small Generating Facility in IRTT

Revised Submittal

- Request that the assigned ISO Project Manager unlock the IR in IRTT
- Go to **Manage Interconnection Requests → Valid → Attachments to IR** tab

- Update any relevant information by hitting the *pencil* icon in the applicable sections depending on what changes are being made, update Attachment A and A-1 and upload new models and required forms:





Modeling Data for Schedule 23

Appendix 1		
Interconnection Request	**Attachment A – Technical Data Required for TCS**	**Attachment A-1 – Supplementary Wind and Inverter-Based Generating Facility Form** *(if applicable)*
• Point of interconnection • Type of facility • In-service date • Requested generating facility capacity • BESS charging data	• Generator ratings and impedance data (as applicable) • Transformer ratings and impedances • PSCAD model (if applicable) • PSSE model (as applicable) • Induction generator data (if applicable)	• Geographic map of project • One-line diagram • Collection system detail and aggregate impedance sheets • Inverter and GSU information • Station transformer information • Protection settings • Unit reactive power control • Power flow model (detailed and equivalent) • Dynamic simulation model • Collection system/transformer tap-setting design

All these documents can be found at the end of their respective schedule

Submitting PP5-6 Appendix C-1 in IRTT

- PP5-6 Appendix C-1 (including attestations) must be uploaded in IRTT
- All projects that have not previously submitted all applicable modeling data or are making changes to previously submitted applicable data must submit a PP5-6 Appendix C-1 (including attestations) for each component, i.e., for inverter and PPC or HVDC, STATCOM, etc.

Appendix C-1 (Electromagnetic Transient Modeling Requirements), Appendix C-1A (Equipment Model Quality Attestation (e-MQA) Form & Appendix C-1B (Plant-level Model Quality Attestation (p-MQA) Form)

Name	
There is currently no Appendix C-1 associated with this Request	

Scope of Technical Data Required for a Project – Case 3: Unchanged Submittal

Case 3: Unchanged Submittal – IC submitted the required technical data for the project prior to the ISO issuing TCSAs, and none of the previously provided technical data requires revision

Submittal Type	Required Technical Data Submittal	Action Required
Unchanged Submittal	None	Provide written confirmation to IRTT that all previously submitted technical data remains applicable to the project

Submitting Written Confirmation in IRTT for Technical Data Changes

Revised and Unchanged Submittal

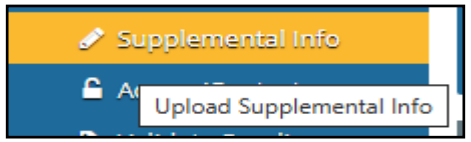
A written confirmation must be uploaded to IRTT that:

- For a ***revised*** submittal:
  - Identifies the technical data being revised, including the file name and date of upload for any revised files
  - Identifies unmodified technical data from previous submission, including the file name and date of upload for any unchanged files
- For an ***unchanged*** submittal:
  - Confirms all previously submitted technical data remains applicable to the project, including the file name and date of upload for any unchanged files

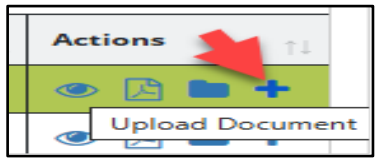
Submitting Written Confirmation in IRTT for Technical Data Changes, *continued*

Revised and Unchanged Submittal

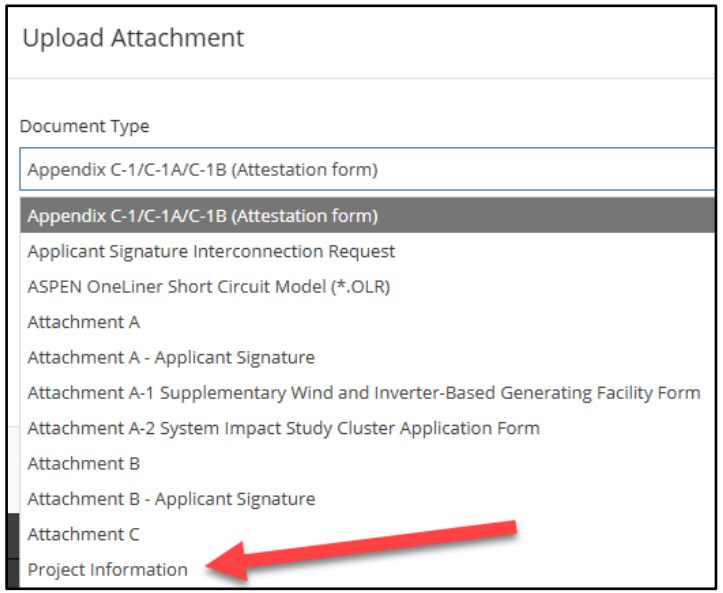
- Request that the assigned ISO Project Manager unlock the IR in IRTT
- Go to **Supplemental Info** tab →



- Click on "**+**" to upload written confirmation →



- Upload under *Document Type* "Project Information" →



A Note on PP5-6

- Any technical data submitted to meet PP5-6 requirements must meet the requirements of the currently effective version of PP5-6 (version 13)
- An Order No. 2023 ready version of PP5-6 that received stakeholder support at the joint August 2024 Transmission Committee Reliability Committee meeting and September 2024 Participants Committee exists
  - This version of PP5-6 is not yet effective, but will become effective at the start of the TCS (i.e., October 11, 2025) and once effective it will become version 14
  - While this version of PP5-6 successfully completed the stakeholder process, it becoming effective was contingent on a FERC order that sufficiently accepted the region's Order No. 2023 compliance proposal
  - This version of PP5-6 is undergoing a minor update which involves date adjustments, clarifications, and minor corrections for various typos/errors

Technical Data Review for TCS

- Beginning August 11, 2025, and through October 10, 2025, ISO-NE will check data submitted as part of a fully executed TCSA package for completeness and notify the IC if any required components of the submitted TCSA package are incomplete
  - Submissions received close to the October 10, 2025, deadline are not guaranteed to be reviewed by the ISO for completeness before the TCSA submission deadline
  - ISO will not review data before submission of a fully executed TCSA
- After October 10, 2025, the ISO will:
  - Evaluate the technical data for accuracy and consistency
  - Perform model acceptance testing for project technical data submittals; the ISO will use the revised model acceptance test requirements of the Order No. 2023 ready version of PP5-6 Appendix C-2 for this review
  - All projects entering the TCS are encouraged to provide the revised model acceptance tests (or evaluate their models according to these revised requirements) to reduce the likelihood of needing to address deficiencies identified by the ISO through its own model acceptance tests
  - Notify Interconnection Customers of any identified deficiencies

Technical Data Review for the TCS, *continued*

Technical data submittal deficiencies identified by the ISO after the October 10, 2025, deadline will trigger the withdrawal provisions of Section 3.7 of Schedules 22, 23, and Section 3.6 of Schedule 25

- These provisions include a 15-business day period to respond with information or actions that cure the deficiency
- Failure to address the deficiencies within the 15-business day period will result in the IR being deemed withdrawn and subject to the transitional withdrawal penalty

Importance of Accurate and Validated Models for Interconnection Studies, Including the TCS

- ISO must have accurate and validated project models to perform accurate interconnection studies
  - Interconnection studies must be able to assess and model all facilities' ability to respond appropriately to transmission system disturbances
  - This helps prevent potential reliability concerns if facilities do not perform as modeled during the interconnection process
- Projects with accurate and validated project models benefit when all other projects in a cluster study also have accurate and validated project models
- Accurate and validated models are necessary to minimize study delays and to ensure the ISO conducts cluster studies that identify the appropriate and necessary interconnection facilities and network upgrades to accommodate all applicable IRs (and properly allocated costs for network upgrades)
- Data issues (e.g., poorly parametrized, inaccurate, or non-fully validated models) are a common major source of study delays (e.g., study work stoppages to address modeling deficiencies, the need to re-perform study work done with inaccurate models, etc.), which creates uncertainty in the timing and cost of interconnecting to the transmission system and hinders the timely development of new generation

Importance of Accurate and Validated Models for Interconnection Studies, Including the TCS, *continued*

Concern: Accurate models for inverter-based facilities may not be available early in the interconnection study process and may need to be updated during that process

Supporting FERC response in Order No. 2023, excerpt from paragraph 1669: "*We find that the reforms we adopt herein [with respect to modeling] are consistent with the principles behind other requirements in the pro forma LGIP and pro forma SGIP, namely those that set forth requirements for an interconnection request, including requirements that requests be viable and well defined. The requirement to submit accurate models also reduces the chance that a transmission provider would need to perform additional studies, in this case if an interconnection customer submits models that are inaccurate, and those inaccuracies are not discovered until late in the interconnection process. In that instance, i.e., if model validation occurs at a point further into the interconnection process, inaccurate models that are used in interconnection studies could create errors in the studies, potentially leading to restudies and subsequent delays which would frustrate the efficiency gained by moving to a first-ready, first-served cluster study process.*"

Importance of Accurate and Validated Models for Interconnection Studies, Including the TCS, *continued*

Concern: The value obtained from models that must meet the modeling requirements is low because of the likelihood that the study will be outdated as project components are substituted with more advanced technology

Supporting response in FERC Order No. 2023, excerpt from 1668: "*We recognize that the project components for non-synchronous generating facilities may change during the interconnection process. We find, however, that this does not diminish the value of a transmission provider receiving the identified information from interconnection customers requesting to interconnect a non-synchronous generating facility and receiving models that represent the best information interconnection customers have available about their proposed generating facilities because these models will ensure that the transmission provider can accurately model the impact of the proposed generating facility throughout the interconnection process.*"

Importance of Accurate and Validated Models for Interconnection Studies, Including the TCS, *continued*

Industry continues to enhance requirements that promote accurate and validated models for use in interconnection studies:

- On June 4, 2024, the North American Electric Reliability (NERC) issued an industry recommendation on inverter-based resource model quality deficiencies:
  - Recommendation stated, "S*everal of NERC's published disturbance reports included analyses of the models for the affected facilities, which revealed systemic dynamic model inaccuracies. These analyses also revealed that the models provided for conducting generator interconnection studies or other system studies failed to accurately reflect the dynamic performance of the plants.*"

Importance of Accurate and Validated Models for Interconnection Studies, Including the TCS, *continued*

Industry continues to enhance requirements that promote accurate and validated models for use in Interconnection Studies, *cont.*:

- On June 4, 2024, NERC issued an industry recommendation on inverter-based resource model quality deficiencies, *cont.*
  - Recommendation 1 states "*All models should be detailed and accurate representations of expected or as-built facilities across all expected operational conditions. Changes to any model parameters, including plant controller parameters that change the performance of the IBR plant, should be studied to ensure BPS reliability before implementation.*
    a. *Models should be validated at the individual inverter level and plant level to ensure that the performance of the plant model matches the expected performance of the in-service inverter based resource (IBR) plant.*
    b. *Models should be updated throughout the lifecycle of the plant to capture any proposed changes that could alter a plant's performance (e.g., hardware, firmware, control settings, or any qualified changes). Proof of model accuracy should be documented and retained by the GO and supplied to all affected stakeholders any time a model update is performed. Updated models should be used to perform studies to confirm whether or not the proposed changes affect BPS reliability prior to implementation of those proposed changes at the in-service plant.*
    c. *Preferably, models should be verified by the equipment manufacturer to be accurately and appropriately parameterized to represent site- and equipment-specific capabilities, site-specific controls, settings, and protections with supporting documentation and attestations. They should also be validated against actual product performance according to NERC Reliability Standards and local TP and PC requirements."*

Modeling Data Alignment

Generating Plant Element	Parameter	Alignment Guidelines
Inverter	Power flow data	All models (PSSE, PSCAD, and ASPEN) should contain identical values
	Voltage schedule and control bus	PSSE and PSCAD models should contain identical values
Generator step-up transformer	Positive sequence impedance	All models (PSSE, PSCAD, and ASPEN) should contain identical values
	Zero sequence impedance	ASPEN model should contain values identical to Attachment A-1
	Winding configuration	All models (PSSE, PSCAD, and ASPEN) should be identical
Collector system data	Positive sequence impedance	All models (PSSE, PSCAD, and ASPEN) should contain identical values
	Zero sequence impedance	PSCAD and ASPEN model should contain identical values
Plant-level reactive compensation *(if applicable)*	Power flow	For static compensation device, PSCAD and PSSE model should contain identical values
		For dynamic reactive device, all models (PSSE, PSCAD, and ASPEN) should align
Main power/station transformer	Positive sequence impedance	All models (PSSE, PSCAD, and ASPEN) should contain identical values
	Zero sequence impedance	ASPEN model should contain values identical to Attachment A-1
	Winding configuration	All models (PSSE, PSCAD, and ASPEN) should be identical
Generator tie line	Positive sequence impedance	All models (PSSE, PSCAD, and ASPEN) should contain identical values
	Zero sequence impedance	PSCAD and ASPEN model should contain identical values

Modeling Data Alignment, *continued*

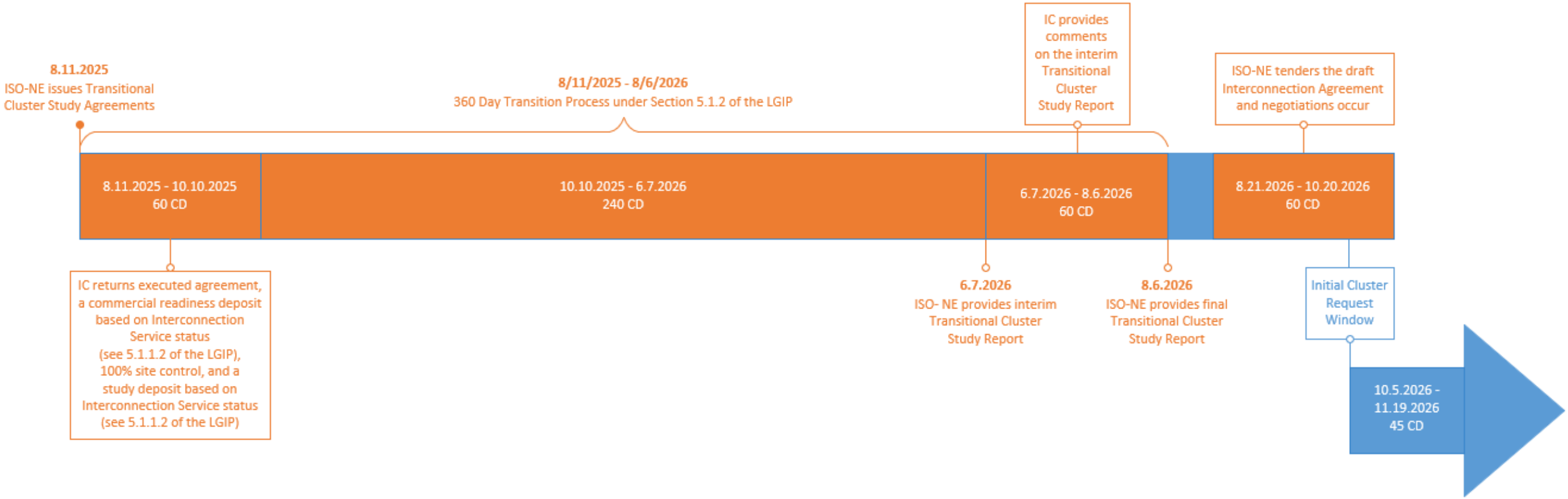
Dynamic Model Component	Alignment Guidelines
Control flags	PSSE and PSCAD should match
P/Q priority flag	PSSE and PSCAD should match
Voltage regulation bus/ point of measurement	PSSE and PSCAD should match
Frequency control deadband and droop	PSSE and PSCAD should match
Voltage droop *(if applicable)*	Effective PSSE and PSCAD values should match
Voltage and frequency protection settings	PSSE and PSCAD should match

TCS Study Process

TCS Process

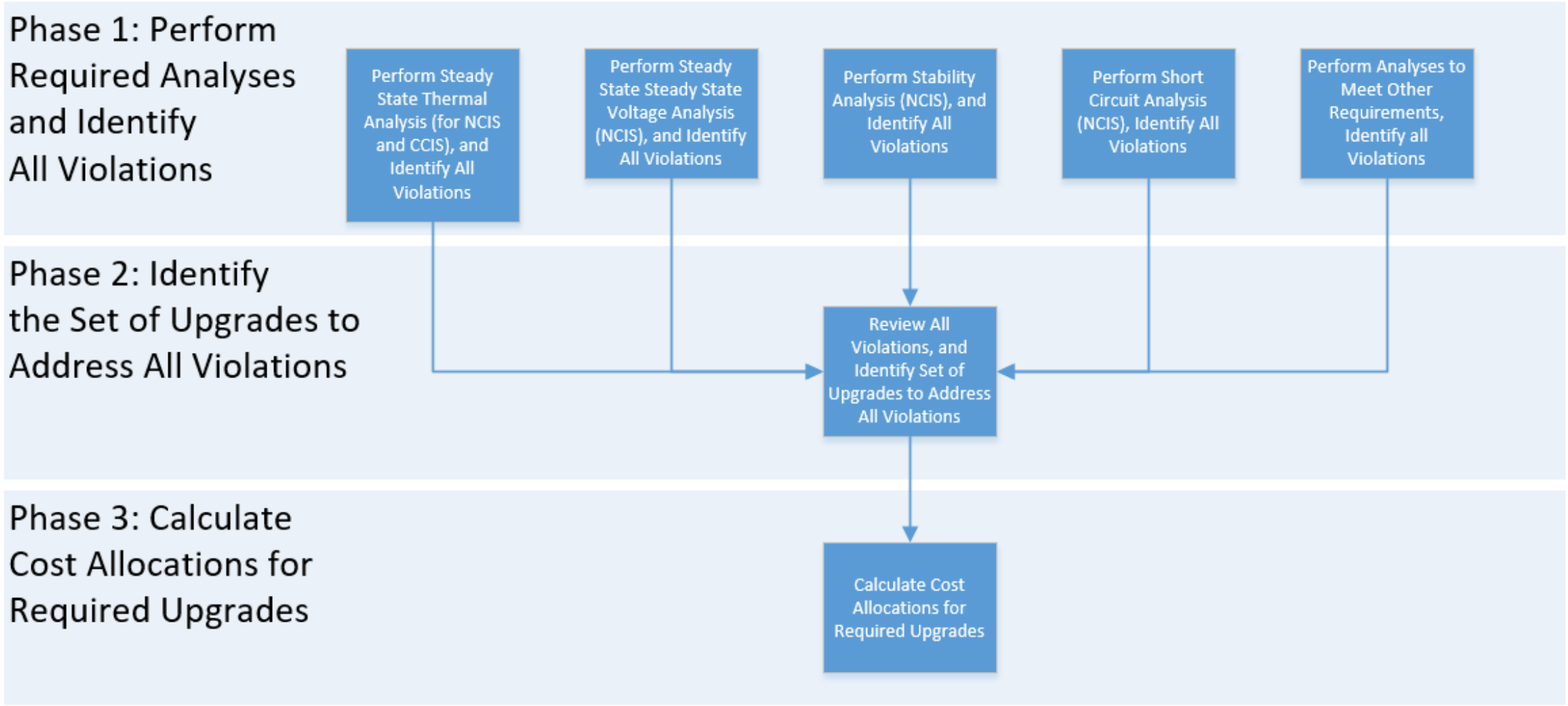
- TCS process is similar to the regular cluster study process
  - The analyses performed, and criteria used, for the TCS will be the same as the analyses performed and criteria used for a cluster study
- There is no re-study phase associated with the TCS
- There is no option to proceed with a Facilities Study after the TCS; projects will go straight to Interconnection Agreement (IA) development

TCS Timeline



Cluster Study Overview and Process Details

Cluster Studies (including the TCS) can be broken down into three main phases:



Cluster Study Overview and Process Details, *continued*

- **Phase 1:** *Perform Required Analyses and Identify All Violations*
  - ISO performs all required analyses during this phase
  - ISO may perform different analyses in parallel to take advantage of study efficiencies to meet study deadlines
  - Output of this phase is the identification of all violations for each project in a cluster
- Note for thermal steady state studies performed to meet the Network Capability Interconnection Standard (NCIS) and Capacity Capability Interconnection Standard (CCIS):
  - An interconnection customer may request CNRIS/CNIIS, but be automatically downgraded to NRIS/NIIS if violations requiring upgrades are solely seen when evaluating a project according to the CCIS
  - This “downgradable” CNRIS/CNIIS requires coordination of the thermal analyses to meet the NCIS and CCIS

Cluster Study Overview and Process Details, *continued*

_____ Network Resource Interconnection Service (energy capability only)

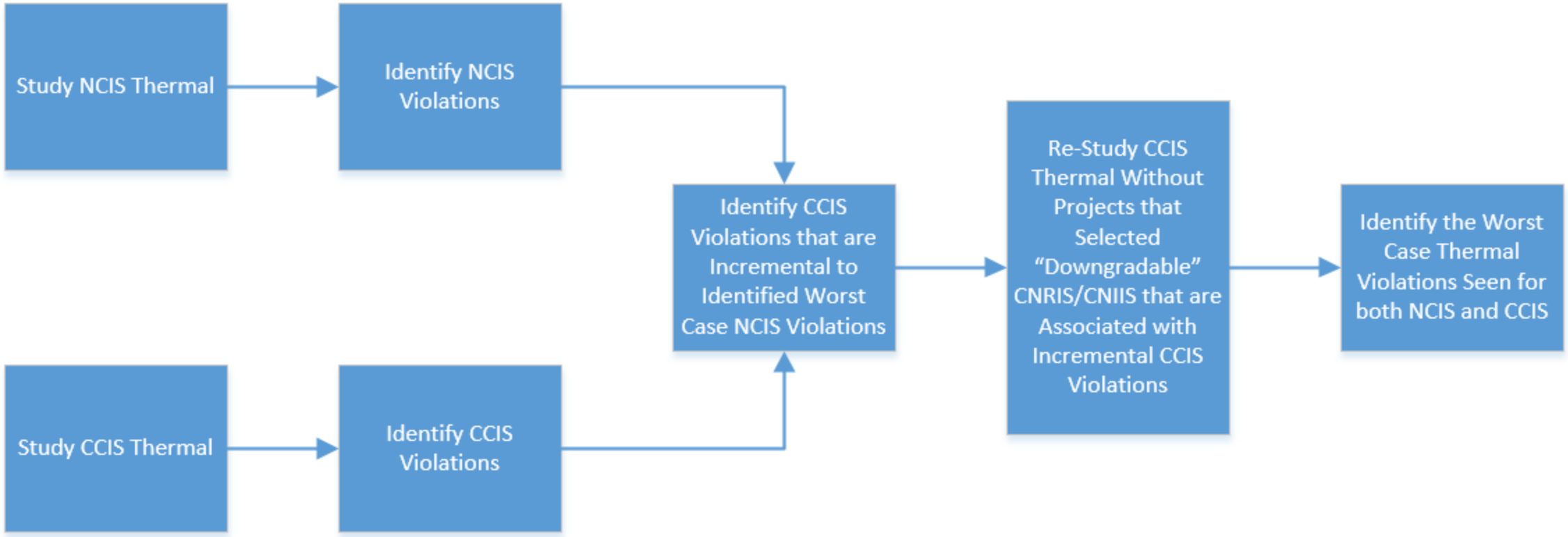
_____ Capacity Network Resource Interconnection Service (energy capability and capacity capability)

☐ Interconnection Customers seeking to complete studies for CNRIS for Interconnection Requests for which NRIS milestones have already been completed shall check this box and fill in the table below

Service Level	**Requested Net MW Capability at the Point of Interconnection**
CNR Capability Summer	
CNR Capability Winter	

☐ Interconnection Customer requests to be downgraded to Network Resource Interconnection Service where violations are identified in the thermal analysis associated with Capacity Network Resource Interconnection Service testing.

Cluster Study Overview and Process Details, *continued*



Cluster Study Overview and Process Details, *continued*

Phase 2: *Identify the Set of Upgrades to Address All Violations*

- ISO reviews all violations from all analyses performed (e.g., thermal, voltage, stability) and identifies the "worst case for each element" violations that must be addressed through system upgrades
- Output of this phase is the identification of the set of upgrades to address all identified "worst case for each element" violations
  - In some cases, the ISO may identify a set of common upgrades to address multiple "worst case for each element" violations
- ISO evaluates the use of alternative transmission technologies during this phase when identifying system upgrades

Cluster Study Overview and Process Details, *continued*

- **Phase 3:** *Calculate Cost Allocations for Required Upgrades*
  - Output of this phase is the calculated costs allocated to each project for the set of upgrades identified in Phase 2
- Cost allocation for upgrades to address identified violations will be done on a proportional impact basis, and will involve all projects that contribute to the identified violations associated with the upgrades
  - Additional details on cost allocation are described in version of PP5-6 that will be used for the TCS

Cluster Study Overview and Process Details, *continued*

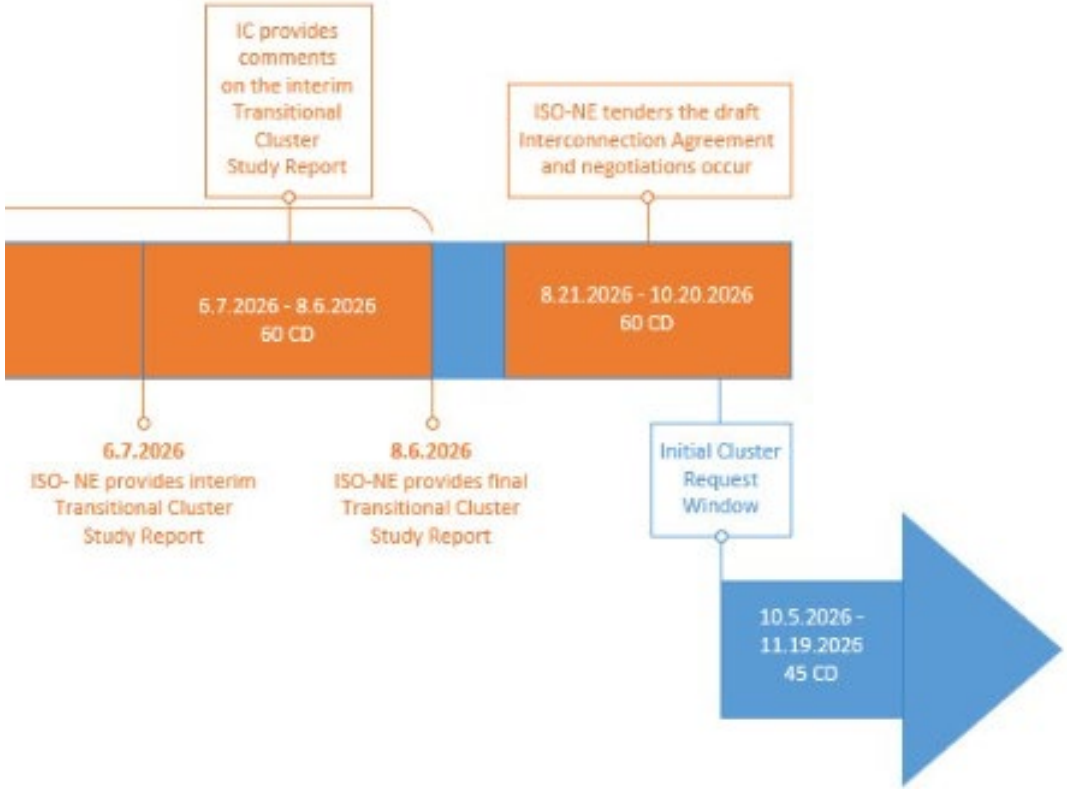
TCS Report:

- ISO will issue the interim TCS report 240 calendar days from the start of the TCS
  - Currently, this deadline is June 7, 2026
  - Interconnection customers will have 30 calendar days to comment on the interim TCS report
- ISO will issue final TCS report 300 calendar days from start of the TCS (i.e., August 6, 2026)
- Only one interim TCS report and one final TCS report will be produced for the TCS

Post TCS Steps, Transitional Withdrawal Penalty, and TCNRGS/ TCS Considerations

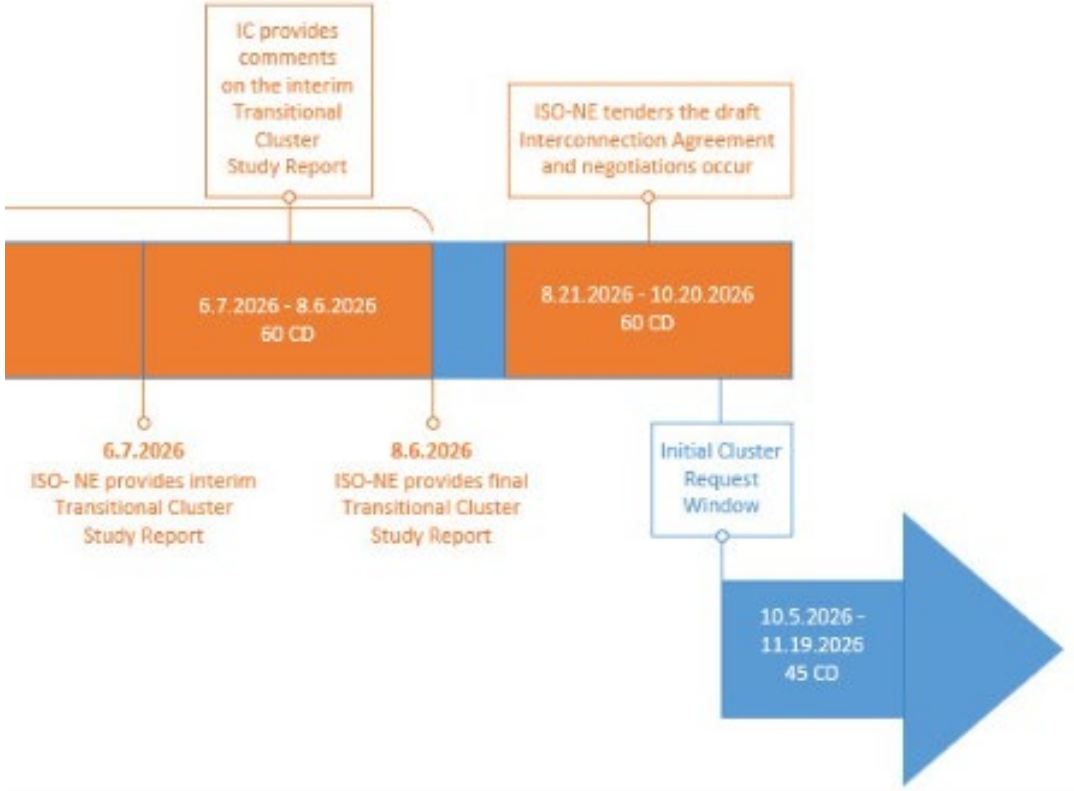
Post TCS Steps – TCS Report

- ISO will issue the interim TCS report by June 7, 2026
  - ICs will have 30 calendar days to provide comments on the interim TCS report
- ISO will issue final TCS report by August 6, 2026
- There is no option for a Facilities Study during the transition process, all projects will go straight to Interconnection Agreement (IA) development



Post TCS Steps – IA

- ISO will tender IAs to ICs 15 calendar days after issuing the final TCS report – August 21, 2026
- ISO, interconnecting transmission owners (ITOs), and interconnection customers (ICs) will have 60 calendar days to negotiate the IA, whereupon the IC can execute the IA, request submission of an unexecuted IA to FERC, or initiate dispute resolution
  - IR will be deemed withdrawn if the IC fails to take any of these actions by this deadline – October 20, 2026
- ICs will need to provide an additional deposit that brings the CRD to 10% of IC's network upgrade cost assignment identified in the TCS by 30 calendar days after the ISO issues the final TCS report – September 5, 2026



Transitional Withdrawal Penalty

- If a project withdraws or is withdrawn prior to the due date of the fully executed TCSA
  - No transitional withdrawal penalty assigned, and any unspent portions of funds on hand will be refunded to the IC
- If a project withdraws or is withdrawn after the due date of the fully executed TCSA
  - A transitional withdrawal penalty would be assigned and would come from the CRD
    - Transitional withdrawal penalties will be calculated as nine (9) times study costs based on the amount spent on all interconnection studies from submitting the IR to the time of withdrawal

TCNRGS/TCS Considerations

A project participating in the 2025 interim RA qualification process that supports the TCNRGS can execute a TCSA to participate in the TCS, assuming the project meets all submission requirements and deadlines for both processes

- Projects would only be able to successfully complete one of these processes
  - For example, a project may successfully complete the 2025 interim RA qualification process/TCNRGS (which concludes on November 3, 2025), and then withdraw from the TCS without penalty
  - As another example, a project would be able to withdraw (or be withdrawn from) the 2025 interim RA qualification process/TCNRGS and continue participation in the TCS

Contact Participant Support & Solutions

Ask ISO
ISO NEW ENGLAND PARTICIPANT SUPPORT

Submit a request via Ask ISO *(preferred)*

https://askiso.iso-ne.com

Email AskISO@iso-ne.com

Phone

(413) 540-4220 (call center)

(833) 248-4220

Pager ***(for emergency inquiries outside of business hours)***

(877) 226-4814

Business hours and additional contact details are available from the Participant Support & Solutions page

Visit the Participant Support & Solutions page