CT Flexible IX

Proposal for Implementing Flexible Interconnections in CT

Table of Contents

Overview & Definitions **3**

1.1. Information and Order 4

1.2. Introduction 4

1.3. Definitions 5

1.4. Advantages and Disadvantages of Flexible Interconnection 7

1.5. Considerations for Scheduled Interconnections/Dispatch Limiting Schedules 8

1.6. Hardware and Software 8

1.7. Integration into Integrated Distribution System Plan (IDSP) 10

1.8. Clean version of the Guidelines for Flexible Interconnections 10

1.9. Eligibility 10

1.10. Curtailment Analysis 11

1.11. Principles of Access 11

Implementation Plan **12**

2.1. A plan for implementing Flexible Interconnections across both EDC service territories 13

2.2. Eversource Proposal 13

2.3. United Illumination Proposal 15

Conclusions **21**

3.1. Conclusions 22

3.2. Stakeholder Discussions and Discussion of Non-Consensus Items 22

3.3. Proposed Framework for workgroup 2026 -2027 22

Appendices **24**

01.

Overview & Definitions

1.1. Information and Order

This proposal outlines a comprehensive plan for implementing flexible interconnections across Connecticut's Electric Distribution Companies (EDCs) in response to the Public Utilities Regulatory Authority's (PURA) directive. Developed with stakeholder input, technical evaluations, and implementation strategies, it addresses the requirements of Final Order No. 4 and aims to facilitate the integration of distributed energy resources (DERs) while optimizing grid reliability and cost efficiency. This proposal defines flexible interconnection, evaluates its advantages and disadvantages, identifies necessary investments, and outlines an implementation plan for Connecticut's EDC service territories. It incorporates stakeholder feedback from the Department of Energy and Environmental Protection (DEEP), Office of Consumer Counsel (OCC), Connecticut Solar and Storage Association (ConnSSA), and Solar Energy Industries Association (SEIA), as well as the broader Interconnection Working Group.

1.1.1. Docket No. 25-01-27 Pura Investigation into Interconnection Process Modifications Final Order No. 4 (Standing Order No. 8)

"No later than March 15, 2026, the EDCs shall submit for the Authority's review and approval, a proposal for allowing flexible interconnections, including, at a minimum, smart inverters, interconnecting load, interconnecting generation, and energy storage, to be implemented in Connecticut. The proposal must include, at a minimum: (1) A proposed definition of flexible interconnection; (2) Descriptions of any advantages or disadvantages to flexible interconnection; (3) An overview of any hardware or software investments necessary to enable flexible interconnection, and whether they are considered "in front of the meter" or "behind the meter"; (4) A breakdown of related costs for any hardware or software investments showing the portions assigned to ratepayers, developers, and other parties; (5) A plan for implementing flexible interconnections across both EDC service territories; (6) An evaluation of how flexible interconnections might replace system upgrade costs; (7) A proposal for how flexible interconnections might be reflected in the EDCs' Integrated Distribution System Plan process and document;21 (8) A framework for the EDCs to assess and incorporate flexible interconnection options into system impact studies; (9) Clean and redlined draft versions of the Interconnection Guidelines integrating the proposed flexible interconnection program; (10) A proposed implementation timeline; (11) Supporting evidence for any EDC costs and timelines; and (12) A list of areas where consensus was not reached, outlining stakeholder disagreements and the reasons for those disagreements. Additionally, the EDCs must, at a minimum, invite DEEP, OCC, ConnSSA, and SEIA to participate in the technical discussions on flexible interconnection. Before submitting a proposal to the Authority, the EDCs should seek input from stakeholders through written or oral feedback and present the proposal to the broader Interconnection Working Group for additional review. The EDCs shall make a good-faith effort to develop consensus language for the proposal to the fullest extent possible. See, Interim Decision, Section III.B.4.a., Proposal 29."

1.2. Introduction

Conventional Distributed Energy Resource (DER) study approaches used by distribution utilities across North America, referred to here as Firm Interconnections, assume utilities cannot influence DER behavior and are unmanaged. As a result, the grid must accommodate DER output or input under all feasible operating conditions. If a DER is expected to violate operational limits, it must fund any required grid upgrades. This approach can increase

interconnection costs and timelines, but it provides high certainty in DER performance and minimizes the need for ongoing utility oversight.

One alternative to a Firm Interconnection is a Scheduled Interconnection approach. This method utilizes the same planning and study processes as Firm Interconnection; however, instead of applying a single worst-case scenario across the entire year, the year is divided into smaller time windows. Grid impacts of the proposed DER are then studied separately within each time window to determine the maximum allowable DER export and/or import during that period. By more precisely accounting for grid conditions that are expected to occur within each defined time window, rather than assuming continuous worst-case conditions, this approach can increase the amount of DER capacity that can interconnect to the grid before costly infrastructure upgrades are required.

A second alternative is the Flexible Interconnection approach, which relies on the utility communicating maximum DER export and/or import limits to the DER resource in near real time based on observed or forecasted grid conditions. This approach ensures that the grid remains within safe operating limits while allowing DER output to vary dynamically. These maximum operating thresholds, referred to as Dynamic Operating Limits (DOLs), may be updated on a range of timescales, including daily, hourly, or second intervals. By continuously adjusting operating limits in response to active grid constraints, Flexible Interconnection enables more efficient utilization of available grid capacity than static interconnection methods.

The optimal interconnection approach will vary from site-to-site depending on a variety of factors, including the availability of high-quality monitoring data and the quantity of predicted curtailment. Furthermore, Flexible Interconnection require a centralized control-system to monitor the identified constraints and provide the Dynamic Operating Limits to the participating DER. Therefore, the EDCs propose an implementation plan that creates a pathway to all three interconnection approaches in their Connecticut service territories.

1.3. Definitions

The EDCs propose the following definition for Flexible Interconnection

Flexible Interconnection: utilizing utility-owned and operated real-time DER control schemes to automatically manage DER outputs to stay within grid constraints.

Scheduled Flexible Interconnections: utilizing pre-determined time varying capacity limits based on forecasted minimum hosting capacity available in each time window to manage DER outputs to stay within grid constraints. Also referred to as Dispatch Limiting Schedules (DLS) in the Guidelines.

The EDCs also define the following glossary of Flexible Interconnection related terms

Dynamic Operating Limit: The maximum level of electrical export or import applicable to the DER at any one time

Flexible Constraint: The Interconnecting EDC's facilities and/or equipment with an identified system impact that at least one Generator has chosen to address with a Flexible Interconnection

Flexible Control Scheme: A utility-owned and operated real-time DER control scheme to automatically manage DER Export and/or Import Capacity to stay within grid constraints

Firm Capacity: The amount of Export or Import capacity that can be safely and reliably interconnected to the grid without the use of a Flexible Control Scheme.

Flexible Interconnection Eligible Location (FIEL): A location on the EPS where Flexible Interconnections are available as designated by the EDCs at their own discretion

Network Curtailment: Reduction of Generator export or import due to observed grid constraints

Non-Network Curtailment: Reduction of Generator export or import due to the Flexible Control Scheme entering fail-safe mode

Principles of Access: The rules and procedures that are used to allocate required curtailment among Generators

Pro-Rata: A Principles of Access approach where curtailment is allocated to Flexible Generating Facilities proportionally to their size

Vintage: A group of Generators receiving Flexible Interconnection Service contributing to the same Flexible Constraint

1.4. Advantages and Disadvantages of Flexible Interconnection

Advantages

- **Cost Efficiency**: Defers and possibly eliminates the need for costly grid modifications by allowing DERs to be managed to operate within grid constraints.
- **Protects Grid Reliability:** Monitors constrained grid locations and takes action to protect grid equipment without requiring human intervention when near an operational limit
- **Faster Interconnection:** May enable projects to interconnect without waiting for certain infrastructure modifications, accelerating DER deployment.
- **Enhanced Grid Utilization:** Better leverages real-time grid capacity, improving the utilization of existing assets.
- **Increased Total Hosting Capacity:** By leveraging dynamic hosting capacity that is not always available, additional DERs may be able to interconnect without the need for expensive grid upgrades.
- **Supports Clean Energy Goals:** Facilitates integration of renewable energy sources, aligning with Connecticut's climate and energy targets.

Disadvantages

- **Curtailment Risk**: Increased uncertainty of the revenue a DER can generate introduced by the potential for curtailment.
- **Non-Network Curtailment:** Potential for lost revenue from fail-safe protections required as part of Flexible Control Scheme
- **Complex Agreements:** Dynamic interconnection agreements are more complicated to understand and enforce.
- **Monitoring and Control investments:** Initial, upfront costs (DERMS, real-time constraint monitoring, etc.) required to enable Flexible Interconnection may offset some of the upgrade cost savings delivered
- **Interconnection Timeline Impact:** Interconnection timelines could be extended for projects considering Flexible Interconnection due to the need to perform additional analysis to determine estimated curtailment
- **Integration Complexity:** Potential challenges integrating DER local control system with utility DER gateway.
- **Cybersecurity**: Additional systems for monitoring and control can create additional system vulnerability from a cyber security perspective.
- **Planning Uncertainty:** Flexible interconnections will complicate long-term grid planning and investment decisions.
- **Equity:** Flexible Interconnection tend to be more favorable to large DER projects due to the associated cost of participation

1.5. Considerations for Scheduled Interconnections/Dispatch Limiting Schedules

When compared to Flexible Interconnections, Scheduled Interconnections often have similar cost benefits, as both require the implementation of a utility owned DER Gateway and associated supplementary monitoring requirements, however DER Gateways for Scheduled Interconnections do not require telecommunications if the implemented schedules are intended to be static and never updated. On the contrary, Scheduled Interconnections do not provide the same level of assurance that the grid constraints used to determine the DER's import and/or export schedule are never violated. Because Scheduled Interconnections naturally reduce planning margins and, in their most simplified form, lack a real-time feedback mechanism to ensure that grid constraints are not violated, the probability of a grid constraint violation is greater when compared to a Flexible Interconnection. The probability of a Scheduled Interconnection causing a grid constraint violation can be reduced by utilizing more conservative planning assumptions and therefore reducing the additional capacity that can be utilized for the schedule. Furthermore, because Scheduled Interconnections must include some margin to account for natural variation in circuit load profiles, Scheduled Interconnection capacity limits are almost always lower than the Dynamic Operating Limit during that time interval, reducing overall grid utilization and increasing total curtailment. This does lead to one advantage Scheduled Interconnections have over Flexible Interconnections which is that because the capacity limits are static, they provide DER an elevated level of curtailment certainty. Lastly, Scheduled Interconnections do not experience Non-Network Curtailment because they do not rely on real-time grid feedback to ensure safe operation.

While it is possible to combine Flexible Interconnection and Scheduled Interconnection approaches to provide a DER with a Scheduled Interconnection as a minimum capacity limit while simultaneously allowing the DER to operate up to the Dynamic Operating Limit based on the real-time observed grid conditions, this is considered an enhancement to the base Flexible Interconnection approach.

1.6. Hardware and Software

Minimum Requirements

Flexible Interconnections require the following minimum capabilities from the interconnecting utility at the pilot or early-stage of Flexible Interconnection deployment:

a) Real-time monitoring from the identified constraint **(In Front of the Meter)**
   - Maximum data refresh rate is 15 minutes, however a 1 minute or faster data refresh rate is preferred.
   - Depending on the constraint the exact monitoring points required will vary but generally active power (W), reactive power (Var), voltage (V), and current (A) are enough to cover most constraints.

b) Monitoring and Control of the interconnected DER(s) participating in the Flexible Interconnection solution via a local utility owned DER Gateway **(In Front of the Meter)**

- Monitoring and Control solutions must include the ability to rapidly and remotely disconnect the DER from the utility's grid.
- DER Gateway must be capable of independently monitoring performance of DER to verify compliance with utility control signals.
- Maximum latency of DER controls is 1 minute; however lower latencies enable more refined control of the DER

c) A control system capable of ingesting the inputs from 1 & 2 and safely managing the Flexible Interconnection to avoid the identified constraint **(In Front of the Meter)**

In the pilot stages of Flexible Interconnection deployment (UI only), much of the design and configuration of the Flexible control schemes is expected to be manual as the centralized control system managing the Flexible DER will not have full visibility of the utility system to automate certain functions.

Enhanced Requirements

More advanced control functionality and additional features can be provided through the development of additional capabilities. These capabilities are required for the deployment of Flexible Interconnections at scale but are not required, although beneficial to have, for the pilot or early-stage deployment of Flexible Interconnection. The following capabilities provide a non-exhaustive list of these advanced capabilities:

a) Short-Term grid constraint forecasting
   - Ability to forecast constraints at least 1 hour ahead of time, Day-Ahead (24 hours) Forecasting is required to enable Flexible DERs to participate in day-ahead markets. Ability to forecast on longer time horizons up to 7 days could provide additional value by providing additional operational planning time for the DER.
   - Short-term forecasts enable the creation of dynamic fail-safe schedules instead of static setpoints.
   - Ability to notify affected generators of forecasted curtailment.

b) Awareness of the grid connectivity model
   - Ability to dynamically associate Flexible DERs with impacted grid constraints when grid connectivity shifts due to switching in contingency scenarios.
   - Enables automatic dynamic association of DERs with grid constraints without pre-configuration.

c) Awareness of the grid impedance model
   - Ability to calculate grid measurements at grid locations without direct monitoring.
   - Ability to calculate the sensitivity of a grid constraint to a specific DERs output to enable optimization of curtailment.

Full Maturity Requirements

a) Integration with a market settlement platform
   - Ability to enable other resources to enroll and provide Flexibility-as-a-Service.
   - Ability to settle Flexibility-as-a-Service arrangements

b) Monitoring and Control of all interconnected DER(s) providing Flexibility-as-a-Service via a local utility-owned DER Gateway
   - Ability to monitor and enforce Flexibility-as-a-Service commitments from market participants.

The "enhanced" requirements identified in this section are all potential features of an ADMS-integrated Grid DERMS, but the timeline of their implementation and a more detailed DERMS product feature list will depend on initial Flexible Interconnection uptake in Connecticut, lessons learned from Flexible Interconnections in Connecticut and other jurisdictions, and the feedback from Flexible Interconnection stakeholders both internal and external to the EDCs.

1.7. Integration into Integrated Distribution System Plan (IDSP)

Docket No. 21-05-15RE03, *PURA Investigation Into The Establishment of Integrated Distribution System Planning Within A Performance-Based Regulation Framework*, is currently an open docket. Per correspondence from PURA, the Authority will issue an updated schedule to the docket including final decision dates as soon as practicable. Until the content and format of the Integrated Distribution System Plan is finalized it is difficult to state how Flexible Interconnections would be integrated into the IDSP. One likely scenario is to include the investment required along with the proposed timing of the investment into the IDSP.

1.8. Clean version of the Guidelines for Flexible Interconnections

A clean and a redlined version of the "Guidelines for Generator Interconnection" incorporating the EDC's proposed approach to implementing Flexible Interconnections will be filed as an Appendix to this Proposal. The following section summarizes the key elements of the approach presented in the Guidelines.

1.9. Eligibility

To be eligible to receive a Flexible Interconnection, a Generating Facility must meet the following requirements:

(a) Be larger than 500 kW
(b) Be applying to interconnect on a FIEL

The EDCs will determine which locations to designate as FIELs at their own discretion. The only constraints considered as eligible for Flexible Interconnection will be thermal constraints on the substation transformer bank and feeder exit conductor (feeder getaway conductor). The identification of FIELs will be intended to exclude locations where there is adequate Firm Capacity to accommodate the demand for export and import capacity, where there is not sufficient monitoring and control infrastructure in place to enable a Flexible Interconnection, and where there are other limiting system constraints present that cannot be mitigated by Flexible Interconnection.

The EDCs will maintain a list of FIELs on their respective websites to provide visibility to prospective Generators.

1.10. Curtailment Analysis

If a Generator is identified as Flexible Interconnection-eligible in the Feasibility or Impact Study report, the Generator would have the option to choose not to proceed with the Flexible Interconnection option(s). The Generator shall also have the option of forgoing the Curtailment Analysis but continuing to pursue a Flexible Interconnection at this stage.

For Flexible Interconnection-eligible Generators pursuing a Curtailment Analysis, the scope of the Curtailment Analysis shall be integrated into the System Impact Study Agreement. The timeline of the System Impact Study for these Generators will be adjusted from thirty (30) days to one hundred twenty (120) Business Days and cost will also be adjusted as needed to reflect the additional scope.

1.11. Principles of Access

The Principle(s) of Access that will be applied to a specific Generator will be identified by the EDCs in the Impact Study Agreement. The Principles of Access utilized may include: Pro-Rata, Last-In-First-Out, or Vintaging/Hybrid.

02. Implementation Plan

2.1. A plan for implementing Flexible Interconnections across both EDC service territories

The Connecticut EDC's have identified both technical and policy elements of Connecticut's existing interconnection process that must be addressed for the EDC's to implement Flexible Interconnection across their service territories. These elements include:

- Principles of Access (e.g. LIFO, Pro-Rata, Vintaging, etc)
- Capacity Access Rights (minimum size requirements, queue procedures, capacity allocation)
- Finalizing constraint eligibility criteria
- Finalizing separate interconnection contract language for Flexible Interconnections
- Modifying the interconnection timelines for Flexible Interconnection-eligible DERs to accommodate the additional study time required
- Cost Recovery for site-specific and system-wide investments in enabling technologies
- Procedures and conditions under which a Generator would be allowed to transition from Flexible to Firm Interconnection
- Planning rules for Flexible Interconnection capacity in utility capital planning processes

The EDC's have proposed draft guidelines to address many of these elements in Section 10 (Guidelines for Flexible Interconnections), but the EDCs want to acknowledge the need for further opportunities for stakeholder feedback on the technical and policy elements of their proposed implementation plans. It is also important to acknowledge that other jurisdictions are also actively developing Flexible Interconnection offerings as listed in Appendix A, and it will be critical to the long-term success of Flexible Interconnections in Connecticut for the proposed Implementation Plans to enable the integration of lessons learned and best practices from these other jurisdictions as they are made public.

To enable this the EDCs propose to continue to lead Flexible Interconnection Working Group (FIWG) meetings at least once-a-quarter from April 2026 through March 2027. In March 2027, the EDCs shall reevaluate the on-going need for the FIWG and determine whether to adjust the parameters of the Working Group or terminate it altogether.

2.2. Eversource Proposal

2.2.1. Implementation Options

Option 1: System-wide Deployment

- Requires mechanism for cost recoverability of Advanced Distribution Management System (ADMS) and DERMS approved by PURA
- Proposed Revised Interconnection Guidelines will need to be finalized and approved prior to accepting applications for Flexible Interconnection

- Evaluation of the field area radio network or private LTE for potential expansion that can support additional DER Gateway real-time telemetry requirements
- ADMS implementation will be required at the Eversource Systems Operation Center (SOC)
- DERMS implementation will be required at the SOC
- Multi-year implementation from approval date

Option 2: Scheduled Flexible Interconnections

Eversource will take a two-step approach to implement Flexible interconnections. First, Eversource will implement a Scheduled Flexible Interconnections process. This will rely on the DER Gateway or RTAC to enforce the proposed schedule. To support full flexible interconnection, an Advanced Distribution Management System (ADMS) and DERMS will be required, such investment will require PURA approval.

2.2.2. Curtailment Analysis Approach

The Curtailment Analysis may be executed using one of the following methodological frameworks:

- Existing Queue Position for scheduled Flexible Interconnections

The EDC proposes to utilize queue position as the basis for the Curtailment Analysis. Leveraging the existing interconnection queue framework enables the EDC to maintain alignment with current study practices, with required modifications limited to study scope, cost, and duration. This approach provides a clear and predictable foundation for analysis while minimizing procedural disruption.

2.2.3. Implementation Timelines

Achieving full Flexible Interconnection capability will require deployment of an Advanced Distribution Management System (ADMS) integrated with a Distributed Energy Resource Management System (DERMS). The implementation timeline is dependent on several sequential activities, including PURA approval, system procurement, installation, configuration, and end-to-end testing. At this time, a formal schedule has not yet been established; however, initial estimates indicate that full implementation would require approximately two years following PURA approval.

In the interim, Scheduled Flexible Interconnection can be deployed immediately using existing systems and processes, enabling near-term access to flexible interconnection capabilities while full ADMS/DERMS functionality is developed.



2.2.4. Impact on Ratepayer Cost

Eversource will require installation of a DER Gateway (RTAC) to enable Scheduled Flexible Interconnection functionality. The current estimated cost for this equipment and associated integration is approximately $75,000. Once an ADMS/DERMS system is implemented revised costs will be updated.

2.3. United Illumination Proposal

2.3.1. Implementation Phases

Phase 1: Pilot Limited, Centralized DERMS

- Requires mechanism for cost recoverability of Utility Grid DERMS approved by PURA
- Limited to 2-3 substations selected by UI for initial pilot period
- Substations identified based on existing hosting capacity, loading, size of limiting equipment, demand for hosting capacity, and available transmission headroom
- Participating Generators chosen on a first-come-first-serve basis on eligible substations
- Pilot project will be used to identify additional program needs and requirements.
- Full Implementation with additional revisions to the Guidelines based on lessons learned to be proposed following a successful pilot project.
- Deploy Utility Grid DERMS with at minimum the capabilities as described in section 1.6.
- Participating applications fund the DER Gateway deployment costs

Phase 2: System-wide Deployment

- Requires mechanism for cost recoverability of Utility Grid DERMS approved by PURA
- Proposed Revised Interconnection Guidelines will need to be finalized and approved prior to accepting applications for Flexible Interconnection
- All distribution circuits with available hosting capacity become eligible for flexible interconnections following completion of any necessary substation upgrades
- Deploy Utility Grid DERMS with at least the minimum and the enhanced Requirements described in section 1.6
- Participating applications fund the DER Gateway deployment costs

2.3.2. How Flexible Interconnections might replace system upgrade costs

By agreeing to curtailment when certain grid constraints occur, applications receiving Flexible Interconnections can avoid funding the firm upgrade costs associated with those grid constraints. In the simplest scenario, the costs of the Flexible Control Scheme replace the costs of the firm capacity upgrade (such as a transformer bank replacement), however in some scenarios, the Flexible Interconnection scenario may also trigger additional system upgrades that cannot be mitigated by curtailment such as overvoltage or voltage flicker that are mitigated by the firm capacity upgrade.

It is important to understand that Flexible Interconnections should not be allowed to replace system upgrades in locations where demand for system capacity far outpaces the supply of capacity available and where asset condition, reliability, or resiliency requires upgrades be performed. In these cases, Flexible Interconnections can sometimes be a temporary measure to allow DER to interconnect prior to the completion of the necessary system upgrades[1]. The framework and principles outlined in this report and in UI's proposal intend to enable Flexible Interconnections in its service territory without creating new barriers to potentially beneficial system upgrades that could increase system hosting capacity for a broad range of stakeholders while improving the safety and security of CT's electric grid.

2.3.3. Framework for Flexible Interconnection System Impact Studies

System Impact Studies

Proposed Generation Facilities interested in pursuing a Flexible Interconnection shall undergo a System Impact Study as outlined under the Guidelines to:

(a) Identify and detail the EPS impacts that would result if the proposed Generating Facility were interconnected without project modification or electric system modifications, focusing on the adverse system impacts identified in the Feasibility Study, and/or
(b) Study potential impacts, including but not limited to those identified in the Scoping Meeting

This shall apply to both Distribution and Transmission System Impact Studies for any project wishing to pursue a Flexible Interconnection. If a Flexible Interconnection Eligible system impact is identified, the UI will coordinate with the developer to identify additional cost and schedule for the curtailment analysis.

Curtailment Analysis

The purpose of the Curtailment Analysis performed for proposed Generation Facilities wishing to pursue Flexible Interconnection will be to provide sufficient estimates of the probability of

[1] *In these "Bridge-to-Wires" scenarios, there must exist sufficient grid capacity on the current system to safely interconnect the project(s)*

Network Curtailment[2] throughout a median year to allow proposed Generation Facilities to make an informed decision on the prudence of pursuing a Flexible Interconnection. It is important to recognize that the values presented in a Curtailment Analysis are intended to be conservative to account for potential future variations in system conditions. Furthermore, Curtailment Analysis will not include estimates for the quantity of Non-Network Curtailment[3] the proposed Generation Facilities may experience as Non-Network Curtailment is driven by other factors such as the strength and reliability of the cell signal in a particular area.

Data Inputs:

- Historical Load and Generation Data from Constraint Locations
  - **Resolution:** 15 min preferred, 1 hours minimum
  - **Time Frame:** 2 years preferred, 1 year minimum
- Proposed Generation Facility Operating Characteristics (may vary by type and design of DER being studied)
- Forecasted generation profile
- DC Nameplate Capacity
- AC Nameplate Capacity
- Planned Revenue Stream(s)
- Service Class
- State of Charge Target
- Minimum State of Charge

Analysis Outputs:

- Expected energy curtailment for potential Flexible Interconnection under identified Flexible Interconnection scenarios
- Heat maps of the predicted expected energy curtailment (for generation) and/or average expected discharge/charge limit (for storage) by hour and month (UI only)
- Sensitivity analysis of the effects of load growth or reduction on the probability of Generator curtailment

[2] Network Curtailment is the amount of generation curtailed throughout the year due to observed grid constraints
[3] Non-Network Curtailment is the amount of generation curtailed throughout the year due to the Flexible Control Scheme entering fail-safe mode due to the loss of connectivity to some portion of the scheme

2.3.4. Principles of Access

UI proposes to utilize a Vintaging Principles of Access approach to determine curtailment priority unless otherwise agreed to. Vintaging assigns Generators to Vintages based on when their application for Flexible Interconnection is submitted. Applications submitted before the Vintage cut-off will be assigned to Vintage 1 while applications submitted after the Vintage cut-off will be assigned to Vintage 2. The Vintage cut-off will be determined as the earlier of, when Total Export or Import Capacity in queue or interconnected ahead of the Generator exceeds the Short-Term Emergency (STE) Rating of the Flexible Constraint and Two (2) years from the date the first Generator in the FIEL receives its Approval to Energize Form.

The Generators in each Vintage will be curtailed according to Pro-Rata Principles of Access, which attempts to share the curtailment burden equally among all Generators in the Vintage according to the Flexible Hosting Capacity each Generator occupies. Generators in different Vintages will be curtailed according to Last-In-First-Out Principles of Access, which requires that the Generators in the lower priority Vintage be fully curtailed[4] before the Generators in the higher priority Vintage can begin to be curtailed. Figure 1 shows a visual example of the curtailment allocation that a Vintaging approach aims to achieve. UI will determine whether additional Vintages will be created based on stakeholder feedback and more operational experience with Flexible Interconnections has been gained.

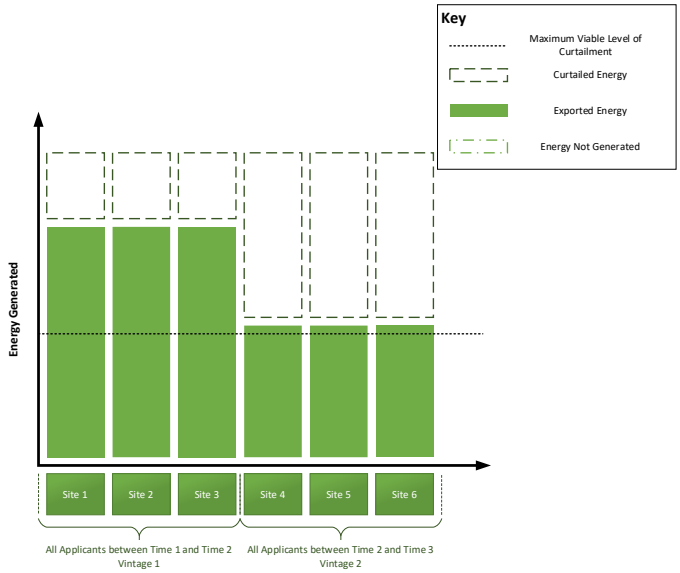

Figure 1 Example of Vintaging Principles of Access

[4] *Curtailed to 0 kW import or export*

2.3.5. Implementation Timelines

The timelines for implementing Flexible Interconnections presented below are estimates only. Month 1 is the month the formal directive is issued by PURA to implement Flexible Interconnections in Connecticut and the establishment of a PURA-approved cost recovery mechanism for all incremental UI Flexible Interconnection costs.

Task #	Task	Start Month	End Month	Predecessor Tasks
1	Identify Flexible Interconnection Eligible Substations	1	4	
2	Continue to Gather Stakeholder Feedback on Flexible Interconnection Approach	1	5	
3	Finalize Updated Guidelines for Flexible Interconnections	1	6	2
4	Draft Flexible Interconnection Agreement	2	6	2, 3
5	Release Flexible Interconnection Eligible Substation List	6	6	1, 3
6	Accept and Study Flexible Interconnection Applications	7	12+[5]	3, 4, 5
7	Design and Approve Utility Grid DERMS Platform Architecture	1	6	
8	Implement Utility Grid DERMS Platform	6	12	7
9	Finalize Flexible Interconnection DER Gateway Point List	12	15	6, 7
10	Install Flexible Interconnection DER Gateway at DER Site	UCC[6]	UCC+1	9
11	Test and Commission Flexible Interconnection DER Gateway at DER Site	AtE[7]	AtE+2	10

2.3.6. Impact on Ratepayer Cost

The following are estimated direct incremental costs to implement and maintain the minimum viable product[8] Utility Grid DERMS required to enable Flexible Interconnection in the UI's service territories.

[5] *UI will continue to accept and study Flexible Interconnection-eligible applications on a rolling basis as they are received.*
[6] *Utility Construction Completion (UCC): Month of completion of all utility facilities required to safely interconnect the DER Site*
[7] *Approval to Energize (AtE): Month of Issuance of Approval to Energize Form*
[8] *Minimum Capabilities as described in section 1.6*

2.3.7. UI External Costs for Flexible Interconnection Implementation:

Licensing Cost for Utility Grid DERMS – $100,000/substation (up to 25 UI Substations)
Support Cost for Utility Grid DERMS - $30,000/substation/per year

Integration Cost for 1st Flexible Interconnection on a Substation - $100,000
Integration Cost for Additional Flexible Interconnection sites on a Substation - $60,000

UI expects further costs will be required for implementation. The extent of these costs will be dependent on the technology vendor chosen and implementation method. We expect that changes to Powerclerk will be required in addition to costs for software tools required to complete curtailment studies. These costs are still unknown at this time and require further evaluation of vendors and available technology platforms.

03. Conclusions

3.1. Conclusions

The Electric Distribution Companies have met the immediate requirements of the Order by advancing flexible interconnection proposals that reflect their respective technical capabilities, yet national experience shows the concept remains in an early stage of development. Given the continuing absence of standardized technical requirements, consistent hosting-capacity data, widely available compliant control technologies, and established curtailment or cost-allocation frameworks—even in leading jurisdictions such as California, Massachusetts, and New York—the Companies recommend continuing the development of flexible interconnection requirements within IX Working Group. EDCs further propose aligning their efforts with emerging standards in Massachusetts and New York, where affiliated system operators provide an opportunity to promote consistency and leverage lessons learned in other jurisdictions.

The EDCs propose to continue convening and presiding over meetings of the Flexible Interconnection IX Working Group ("FIWG") on a quarterly basis from April 2026 through March 2027. At the conclusion of this period, in March 2027, the EDCs will reassess the ongoing necessity of the FIWG and determine whether its scope should be modified or whether the Working Group should be dissolved. In addition, the EDCs propose to coordinate the timing of the release of flexible interconnection requirements in New York and Massachusetts so that both jurisdictions issue their respective materials concurrently.

3.2. Stakeholder Discussions and Discussion of Non-Consensus Items

Throughout the meetings held within the CT IX Working Group and the Flexible IX Subgroup, a number of areas of concern were noted by both EDC's, participating developers, and industry groups. While there are no formal areas of non-consensus, there is agreement that the proposals which have been put forward require further refinement. Developer / Industry groups and EDCs have agreed on a framework for continued development of Flexible IX beyond the formal filing of this document.

3.3. Proposed Framework for workgroup 2026 -2027

- On March 10, 2026, Eversource received the comments included in Appendix B. While the EDCs have primarily focused their efforts on DER installations of 500 kW and greater due to the associated DER gateway costs, the EDCs support undertaking an effort to address these comments. However, because the comments were submitted on March 10, there was insufficient time to provide a resolution prior to this filing.

- The EDC will focus on aligning the MA and NY Flexible interconnection requirements still under development.
- Continue discussion of optimal Principles of Access
- Continue to monitor all states flexible interconnection rules and update Appendix A
- Continue to gather feedback on proposed definitions outlined in this document section 1.1.
- Define the level of curtailment information that utilities will provide to developers. This should include projected annual curtailment percentages, expected hourly or seasonal constraints, and sensitivity analyses. Reliable and transparent curtailment forecasts are required for developers to assess project feasibility, model expected revenues, and secure financing. Without predictable curtailment data, evaluating project economics becomes significantly more difficult.
- Finalize all hardware and software technical requirements.
- Program Eligibility (Limiting implementation to a specific kW threshold.)
- Schedule Interconnection Time Windows
- Data Sharing Methods (Dynamic Hosting Capacity, Flexible Eligibile Locations Lists)

Appendices

APPENDIX A – STATE BENCHMARKING

This appendix summarizes the latest developments in state regulatory frameworks for Flexible Interconnection (FI), Limited Export, and Dynamic Export arrangements. This update reflects major activity through early 2026.

- **California** began offering DERs the option to interconnect with a Limited Generation Profile (LGP) as of July 9th, 2025. Under the LGP option, DERs have the option of a Scheduled Interconnection/Dispatch Limiting Schedule using one of three methods of segmenting the year into schedule windows: Block, 18-23 Fixed, or 24-hourly. The California Investor-Owned Utilities (IOUs) have Integration Capacity Analysis (ICA) maps that provide one value for every hour of every month on each circuit. These ICA values are utilized to define the LGP schedules by utilizing the lowest ICA value minus a 10% buffer across the entire LGP block. Utilities utilize the 10% buffer on ICA values to account for changes in system loading and as an operational safety margin. Utilities maintain the ability to temporarily further curtail or disconnect both LGP and non-LGP customers beyond their LGP level under Rule 21 to maintain reliability. The "restoration costs" to return DER to agreed-upon LGP levels in the case of permanent loading changes are rate based. Under the definitions proposed above, California's LGP approach would be considered Scheduled Interconnections as it relies on fixed, forward-looking export schedules rather than dynamic, real-time adjustments typical of the Flexible Interconnection approach
- **Maryland** Title 20 Subtitle 50 Chapter 9.06P[9] requires Utilities to: "approve interconnection requests while considering flexible interconnection options under a limited export agreement or, for inadvertent export, net system capacity and a proposed use." Under these regulations, a small generator facility is given the ability to be studied and interconnected at a maximum export capacity below its nameplate by agreeing to comply with said maximum export capacity through one of the approved methods based on the terms of their chosen interconnection option. The use of this interconnection option is contingent on the generator implementing "the appropriate standardized controls" to ensure compliance with the maximum export limit. There is an allowance in the Chapter 9.06P(2) for facilities with energy storage to "inadvertently" export over the agreed upon limit at a magnitude and duration determined by the utility but defaulting to thirty (30) seconds. It is not clear from Chapter 9.06P if these maximum export limits are allowed to be time-varying and thus whether this approach qualifies as a Scheduled Interconnection or a Firm Interconnection at a limited export capacity.
- The **Massachusetts** Interconnection Implementation Review Group (IIRG) established a Flexible Interconnection subgroup in May 2025 co-chaired by National Grid, the Massachusetts Attorney General's Office (AGO), and Blue Wave. The IIRG and its Flexible Interconnection subgroup has been working since August 2025 to develop Draft Flexible Interconnection Guidelines and a Draft Implementation Plan with the goal of submitting the

[9] *20.50.09.06P | Library of Maryland Regulations*

plan to the Massachusetts Department of Public Utilities (DPU) in 2026. The DPU has directed via Docket No. 25-20 that the IIRG to file a "Flex IX Straw Proposal" in the first quarter of 2026. The IIRG held a Flexible Interconnection workshop on March 3rd and 4th, 2026 jointly facilitated by the Distribution Companies and Flexible Interconnection Stakeholders to discuss and gather feedback on key topics in Flexible Interconnection such as Curtailment Studies, Interconnection Process, Queue Management, Interconnection Agreements, and Technical and Operational Requirements. The DPU also ordered that Flexible Interconnections be incorporated into the Massachusetts Long-term System Planning Process (LTSPP) in 2026[10].

- In **Illinois**, Commonwealth Edison (ComEd) deployed a DERMS solution to manage DER outputs on a thermally constrained substation in its service territory in early April 2021. As of the April 2025 ComEd's DERMs demonstration had enabled 6.75 MW of additional DER to interconnect safely by monitoring the substation power flow via the DERMS and dynamically curtailing the output of participating solar PV sites when the reverse power flow exceeds the transformer thermal limits. The Illinois Commerce Commission (ICC) directed ComEd to develop a plan for implementing and scaling Flexible Interconnection approaches in December 2023[11]. ComEd has worked with Joint Non-Governmental Organizations (JNGOs) made up of the Environmental Law & Policy Center and Gaia Energy to jointly file a "Flexible Interconnection: Initial Plan & Process" in December 2024 and conduct a "DERMS and Flexible Interconnection Workshop" in April 2025. The ComEd and JNGO joint report on the outcome of the April 2025 workshop identifies that ComEd planned to use Flexible Interconnection to add an additional 2 MW of DER to the initial DERMS demonstration substation in 2025 as well as add 5 more customers to a new substation from 2025 to 2026[12].
- In **New York**, National Grid, NYSEG, and RG&E have deployed Flexible Interconnections at limited pilot sites. For NYSEG and RG&E four Flexible Interconnection sites were commissioned in 2021 on two substations under the Flexible Interconnection Capacity Solution (FICS) REV Demonstration Project. National Grid has interconnected two Flexible Interconnection sites under their Active Resource Integration (ARI) pilot in November 2024 and January 2025 total 8.25 MW of capacity. National Grid filed a "Petition Seeking Approval to Offer Flexible Interconnection Service Options to Distributed Generation and/or Energy Storage Project Interconnection Under the New York State Standardized Interconnection Requirements at Limited Locations as an Expansion of the Active Resource Integration Pilot: on January 21st, 2026[13]. To date multiple Stakeholder Engagement Workshops have been jointly held by NYSEG, RG&E, and National Grid in NY to present results of the utilities Flexible Interconnection deployments to date and discuss key Flexible Interconnection topics. All Investor-owned Utilities in New York (collectively referred to as the Joint Utilities) currently offer some form of a Scheduled Interconnection option for ESS sites. DER developers wishing to pursue a Scheduled Interconnection can provide their requested

[10] LTSPP 25-20 Scoping Order (12.16.2025) FINAL
[11] Initial ICC Order Requiring ComEd file a plan for Flex IX, page 224
[12] ComEd DERMS and Flexible Interconnection Workshop Report
[13] Petition Seeking Approval to Offer Flexible Interconnection Service Options Under the SIR at Limited Locations (26-E-0052)

charge and discharge schedule via Appendix K of the New York Standardized Interconnection Requirements (SIR) as part of the Interconnection Application process.

- **Colorado** SB24-218[14], which passed in May 2024, mandates the proposal of a "Flexible Interconnection or Energization Tariff or Phased Interconnection or Energization Agreement" by the retail utilities in the state as an alternative to system upgrade for a proposed DER interconnection. The Colorado Public Utilities Commission (PUC) approved a "flexible interconnection" pilot between Xcel Energy, one of the state's electric utilities and Pivot Energy in December 2025 to install a plant controller at one of Xcel's community solar sites. In the same December 2025 decision the Colorado PUC required that Xcel file a flexible interconnection tariff within 60 days of its filing. The decision defines Flexible Interconnection as "approaches that optimize the use of existing grid infrastructure by allowing developers to connect new load or generation projects in constrained locations that would otherwise require capacity upgrades." This definition would appear to include both Flexible Interconnections and Scheduled Interconnections as defined in this proposal, but the tariff filing required by the decision seems focused on pre-determined export or load limits as opposed to real-time control.

[14] *SB 24-218 An Act Concerning Measures to Modernize Energy Distribution Systems, and, in Connection Therewith, Making an Appropriation*

APPENDIX B – STAKEHOLDER COMMENTS

STAKEHOLDER COMMENTS

Scheduled Flexible Interconnection

CT PURA Docket No. 17-12-03RE06 / 25-01-27

Re: UI Flexible Interconnection Proposal

March 10, 2026

Submitted by Earthlight Technologies

Summary

Earthlight Technologies supports a flexible interconnection framework in Connecticut. These comments focus on Option 3 (Scheduled Interconnection) for C&I projects under 1 MW with one central argument:

Small C&I projects are the lowest-cost, fastest path to getting Scheduled IX in the field. This can be achieved by using customer owned curtailment equipment and following existing interconnection standards.

Scheduled IX enforces static, pre-programmed export limits, and the equipment needed to enforce these limits is commercially available. The proposal's requirement of utility-owned DER Gateways and utility telecommunications at every site is designed for real-time Flexible IX and is unnecessary for Scheduled IX at C&I scale. A customer-owned equipment model would let both EDCs pilot Scheduled IX at minimal cost and risk as well as enable deployment within months, not years.

A Small C&I Pilot with Customer-Owned Equipment

1. Small C&I is a low-cost, fast-to-market opportunity to prove Scheduled IX.

With customer-owned equipment, the utility incurs no on-site capital cost. Its incremental cost is limited to engineering review of relay settings, witness testing (already required), periodic compliance data review, and administrative overhead, the same costs the utility already incurs for any relay-equipped interconnection.

The proposal's 500 kW minimum blocks exactly this opportunity. The floor is justified by per-site costs of utility-owned DER Gateway hardware and DERMS integration ($60K-$100K), costs that do not exist under the customer-owned model. Meanwhile, Eversource routinely lists maximum hosting capacity of 200 kW on constrained feeders, anything above routinely hits capacity issues.

A small C&I carve-out would let both EDCs test Scheduled IX at minimal cost and risk:

- 250 kW minimum size (captures projects on constrained feeders where hosting capacity is typically 200 kW)
- Customer-owned protection and cellular telemetry per Positions 2-3
- Developer-submitted curtailment plan reviewed with minimal study period
- Standard witness testing for commissioning

Earthlight's C&I projects in CT typically range from 100 kW to 500 kW, often on feeders with 200 kW or less hosting capacity. Under the current proposal, nearly all would be ineligible, and currently abandon the opportunity if constraints arise.

Question for both EDCs: Will the EDCs consider lowering the minimum to 250 kW for Scheduled IX with customer-owned equipment, given that the per-site capital cost justifying the 500 kW floor does not exist under this model?

2. Customer-owned protection is already proven in CT.

Eversource has approved limited export interconnection agreements in CT where the generator installs and maintains all protection and control equipment. In one such agreement, a C&I solar installation:

- Submitted 8760 hourly load and production data to Eversource to establish the export limit
- Uses a customer-owned SEL-751 relay to monitor site export at the POI
- Uses a customer-owned SEL RTAC to curtail inverter output when approaching the 200 kW export limit
- Trips the PV breaker via the SEL-751 if curtailment fails
- Will be commissioned through Eversource's standard witness testing process

This is identical to Scheduled IX, except the schedule is a flat 200 kW cap rather than a time-varying profile. Extending to time-varying schedules is a firmware change to the relay and RTAC programming.

Question for both EDCs: Eversource has already approved customer-owned relay-based export limiting in CT. What technical justification exists for requiring a utility-owned DER Gateway for Scheduled IX? If the generator owns all on-site equipment, what is the realistic deployment timeline?

3. Cellular reporting is sufficient for compliance.

The proposal requires monitoring via utility-owned telecommunications (field area radio or private LTE) with a 15-minute maximum data refresh (1-minute preferred). These requirements are driven by real-time Flexible IX, where the utility must actively control DER

output. Scheduled IX does not require active control, and cellular reporting from a customer-owned gateway is already standard elsewhere:

Maryland (COMAR 20.50.09.06): Requires a "verification reporting plan" but the method is not prescriptive: "periodic reports, online monitoring, or other verification methods," mutually agreed. The plan can be waived if both parties agree.

Dominion Energy Virginia: Uses power quality meters at the POI using AMI infrastructure and cellular backhaul, not dedicated SCADA telemetry or utility-owned field area networks.

Proposed C&I Scheduled IX model for CT:

- Generator installs a telemetry gateway with 4G/LTE cellular connectivity
- Gateway reports site export, generation, and relay status at 15-minute intervals to a utility-accessible endpoint
- Generator maintains the gateway and cellular subscription as a condition of the IX agreement
- Utility reviews compliance data and can request additional data or site inspection if anomalies are detected

This separates the protection function (relay trip, milliseconds) from the verification function (cellular reporting, 15-minute intervals). Even if cellular connectivity drops, the relay continues to protect the grid in real time.

Question for both EDCs: Will the EDCs accept customer-owned cellular telemetry for C&I Scheduled IX compliance reporting, given that real-time protection is performed by the customer-owned relay?

4. Existing interconnection provisions already handle enforcement.

Standard CT interconnection agreements already give the EDC the right to disconnect any generating facility that causes adverse impacts to the distribution system, independent of who owns the on-site equipment. With customer-owned equipment, enforcement is layered:

1. Automatic curtailment: RTAC curtails inverters per the schedule (continuous)
2. Hard trip: SEL-751 trips PV breaker if export exceeds limit (millisecond response)
3. Compliance verification: Cellular gateway reports 15-minute data to utility
4. Enforcement backstop: EDC exercises existing contractual right to disconnect if non-compliance is detected

This provides more protection than a single utility-owned DER Gateway, because the hard relay trip is independent of any communication system.

Question for both EDCs: Do existing interconnection agreement provisions provide sufficient enforcement authority for C&I Scheduled IX without utility-owned on-site control equipment?

5. Developer-submitted curtailment plans should replace the 120-day study process.

The proposal extends the System Impact Study timeline from 30 to 120 business days for a utility-performed curtailment analysis, assuming the utility must generate the schedule from scratch.

The CT limited export agreement in Position 2 used a developer-driven approach: the developer submitted 8760 hourly load and production data with a proposed export limit, and Eversource reviewed and approved it. The same model should apply to Scheduled IX:

1. Developer reviews publicly available hosting capacity data to identify the constraint
2. Developer proposes a time-varying export schedule based on that data and the project's production profile
3. Developer submits the proposed schedule with supporting analysis
4. EDC reviews, applies its planning buffer, and approves, modifies, or rejects

This requires feeder-level data. Eversource MA publishes feeder-level seasonal and time-series hosting capacity data on its interactive map. If Eversource CT and UI published equivalent data (which they may already be developing under the IDSP process, Docket 21-05-15RE03), developers could self-screen sites and submit proposals before entering the formal study process.

Feeder-level constraints should also be eligible. The proposal limits eligibility to substation transformer constraints, but many C&I-scale constraints occur at the feeder level. A review target of 30-45 business days aligns with the existing SIS timeline for firm interconnections.

Question for both EDCs: Will the EDCs publish feeder-level time-series hosting capacity data in CT, consistent with what Eversource publishes in Massachusetts? Will the EDCs accept developer-submitted curtailment plans? And will feeder-level thermal constraints be eligible?

Supporting Position

6. Scheduled IX should be implemented as Phase 1 for both EDCs.

The proposal positions Scheduled as Eversource-only (Option 3). The pilot described above requires no DERMS, no utility telecommunications, and no DER Gateway procurement. Both EDCs could begin accepting applications within months of a PURA order. California has operated an equivalent program (Rule 21 Limited Generation Profiles) for years. PURA should order Scheduled as Phase 1 for both utilities while Flexible infrastructure is built out.