New York ISO
Independent System Operator

Recommended Approach to Update ELR Output Restriction Starting 2024-2025 IRM

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Resource Adequacy

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Background

- Prior to 2021, the elected ELRs were modeled using the simplified approach, with pre-determined output profiles.
  - These fixed output profiles cannot adjust the output from the ELRs according to the system needs.
- The 2021 Whitepaper recommended using the GE ELR functionalities with the TC4C configurations.
  - TC4C allows flexibility in utilizing the ELR units during simulation and contains the input parameters consistent with the existing pre-determined output profiles (i.e. same max output, daily energy limit and similar output profiles, etc.).
  - The TC4C configurations also determined the limitation for when the output from the ELR units can be available
  - The recommended ELR modeling with the new GE functionality was adopted in the 2023-2024 FBC.

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TC4C Methodology

- GE ELR Functionality with TC4C Configuration
  - Maximum output consistent with unit capacity
  - Energy limitation consistent with unit duration limitation at full output
- Outputs from the ELRs are restricted until:
  - ES unit: **after 1pm**
  - EL3 small unit: **after 1pm**
  - EL3 large unit: **gradually start between 7am and 11am**

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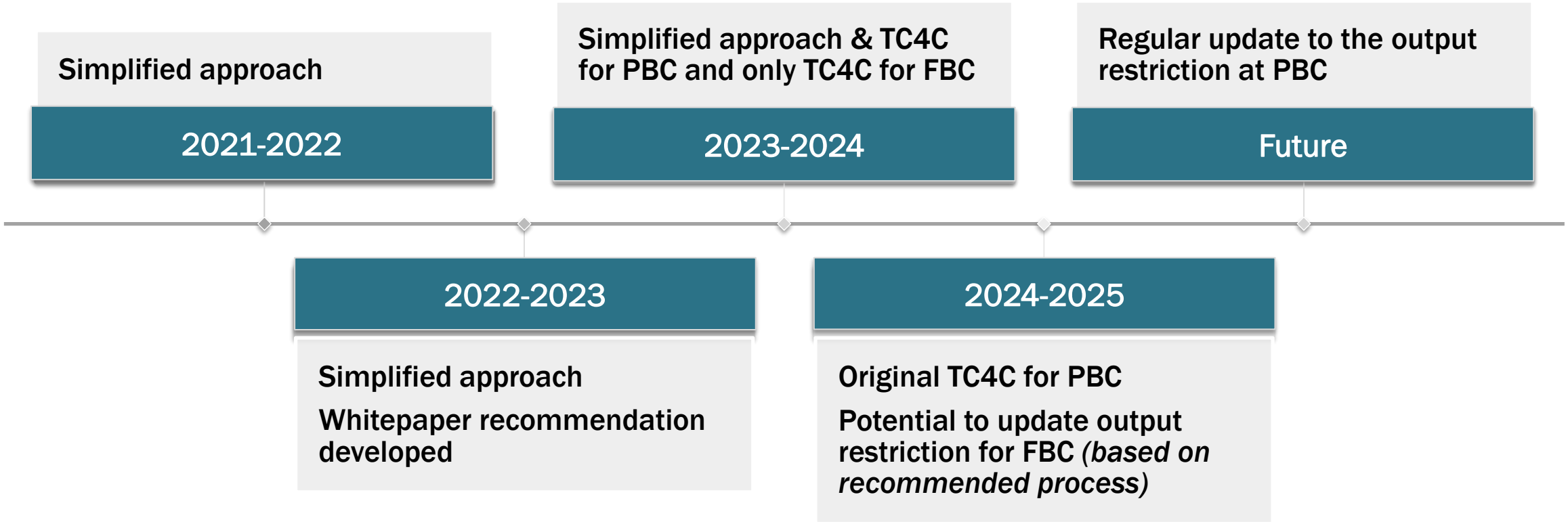
ELR Methodology Timeline



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LOLE Distribution Window Shifts

Table 1: Example of changing LOLE distribution window due to underlying modeling change (adoption of new load shapes)

HB	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Preliminary Base Case	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%	6%	10%	18%	22%	22%	11%	4%	3%	1%	0%	0%	0%
New Load Shapes	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	4%	5%	7%	14%	22%	24%	12%	7%	3%	1%	0%	0%

- When implementing modeling changes to the IRM base case, the LOLE distribution window can be impacted. An example is last year's sensitivity case for adoption of the new load shapes, as shown in Table 1 above.
  - Hourly LOLE Distribution is concentrated to approximately 6-hour windows for both the Preliminary Base Case (Old Load Shapes) and New Load Shapes
  - The high-risk hours for LOLE shifted to later in the day from approximately HB14 – HB16 to HB15 – HB17
- Therefore, an update to the ELR's output limitation should be considered to algin with the up-to-date LOLE distribution window
  - A number of modeling changes are being considered, e.g. EOP and Gas Constraints, which can cause the LOLE window to shift

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Recommended Implementation of ELRs

- **The NYISO proposes to update the output limitation for ELR units based on the LOLE distribution window from the prior year's LCR model**
  - **ES and Small EL3**: output limitations should be lifted at the beginning of the 90% of LOLE risk window.
    - From the 2023 LCR model, HB14 represents at least 90% of the LOLE window
    - The process aims to keep the ELR output in close proximity to the period with the highest risk
  - **Large EL3**: maintain the TC4C configuration (gradually start between 7am and 11am)
    - Due to significant impact from the large unit
- **IRM Impact: -0.05% from 2023-2024 IRM FCB (parametric)**

Table 2: INFORMATIONAL Hourly LOLE distribution

HB	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
2023 LCR model	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	3%	5%	7%	13%	22%	24%	13%	8%	3%	1%	0%	0%

At least 90% LOLE window

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NYISO Modeling Recommendations

The 2024-2025 IRM study should include the demonstration of IRM impacts using either the GE MARS functionality with the TC4C configuration or the proposed LOLE methodology

Short term, continue to collaborate with GE to enhance the MARS ELR functionality to capture unit outage rates, and to explore ways to apply limitations beyond the output limit approach to accommodate the future increase of ELR penetration.

In the longer term, significant penetration of ELR resources is expected. Modeling enhancements should be considered in conjunction with other improvements and impacts on the Resource Adequacy model.

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Next Steps

- Implement the recommended process and update the ELR unit output limitation in the FBC this year, with ICS approval.
  - Based on the LOLE distribution windows from the 2023-2024 LCR model
- Implement the recommended process for future years to update the ELR unit modeling at PBC
- In the longer term, explore options for modeling enhancements to the ELR functionality to prepare for increased penetration

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Questions?

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Appendix

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Current Modeling Methodology

- When GE MARS encounter shortages, it starts dispatching ELRs, to alleviate those perceived shortages without looking ahead.
- ELRs get dispatched earlier in the day (at the start of the red shaded area) and those units effectively run out of energy when the system experiences the actual hours of risk (blue shaded area).
  - The ELR energy is used during hours where reliance on external assistance would be sufficient to arrest the shortages*, leaving little to no energy left for the actual hours of risk.

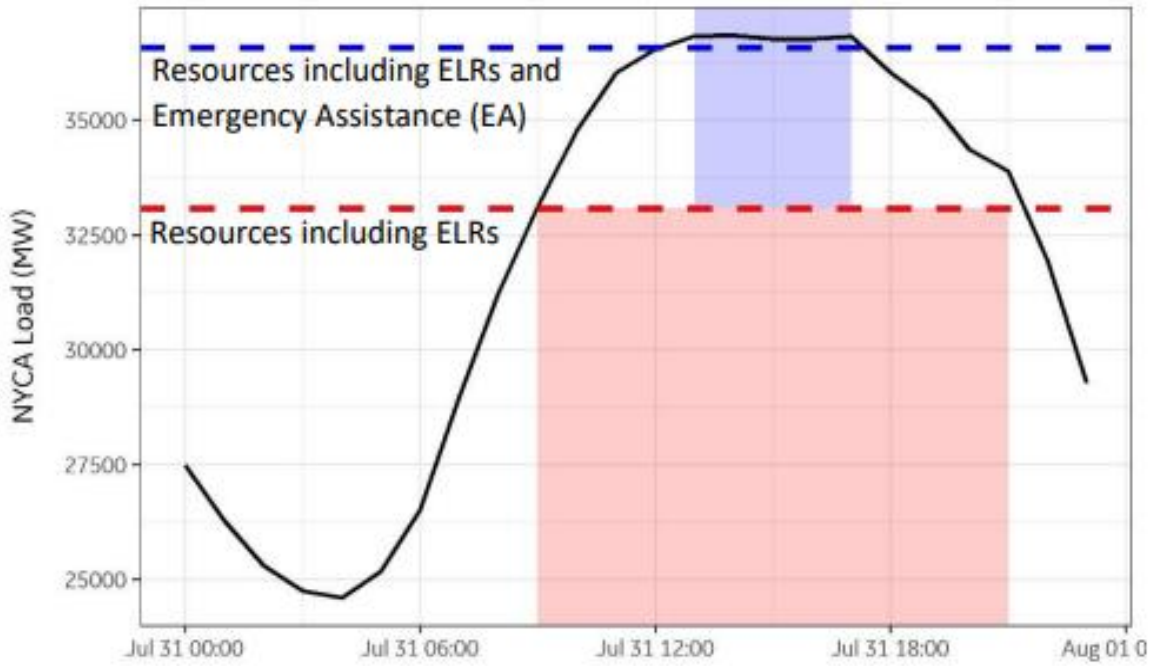

Figure 3. Timing of peak load and EL3/ES dispatch

Generation from EL3 and ES units is considered **after GE MARS has performed the balanced of load and non-ELR resources.*

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ELR definition

- **Batteries**
  - Sizable charging requirements
  - Batteries are flexible with the daily charging and discharging cycle
  - Are fast to response to changing market price signals throughout the day by switching between charging and discharging modes
- **Pumped Storage**
  - Sizable charging requirements
  - Pumped storage resources have limited flexibility with the daily charging/discharging cycle
- **Fuel Limited Resources**
  - None or limited charging requirements
  - Capable of providing various output levels throughout the day
  - Some flexibility with the timing of their maximum output levels

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Modeling Types

- **Energy Limited Type 3 (EL3)**
  - This unit type is designed to represent resources that do not require withdrawing energy from the system for charging, and have energy "budgets" that are deployed by the system on an as-needed basis
  - Energy generated by these units is stored in a real (or virtual) tank and is usually available at the beginning on each month, representing the monthly energy limit for the unit to use.

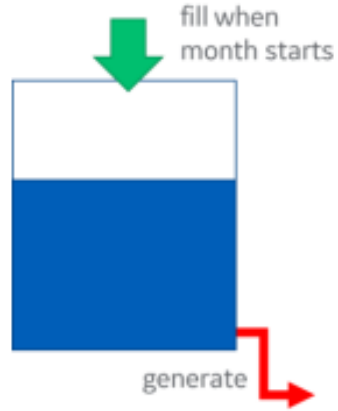

Figure 1. Conceptual representation of Energy Limited Type 3 (EL3) units

- **Energy Storage (ES)**
  - Like the EL3 model, the unit has an energy storage tank from which energy is drawn when required by the system
  - The unit also has the ability to charge its storage tank from the grid
    - the main difference between ES and EL3 units

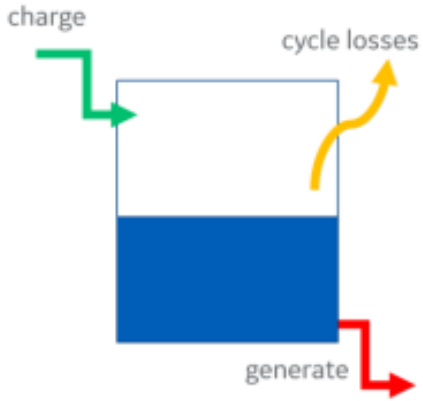

Figure 2 Conceptual representation of Energy Storage (ES) units

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