ELR testing update

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This document contains "forward-looking statements" – that is, statements related to future events that by their nature address matters that are, to different degrees, uncertain. For details on the uncertainties that may cause our actual future results to be materially different than those expressed in our forward-looking statements, see http://www.ge.com/investor-relations/disclaimer-caution-concerning-forwardlooking-statements as well as our annual reports on Form 10-K and quarterly reports on Form 10-Q. We do not undertake to update our forward-looking statements. This document also includes certain forward-looking projected financial information that is based on current estimates and forecasts. Actual results could differ materially. to total risk-weighted assets.]

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In this document, we sometimes use information derived from consolidated financial data but not presented in our financial statements prepared in accordance with U.S. generally accepted accounting principles (GAAP). Certain of these data are considered "non-GAAP financial measures" under the U.S. Securities and Exchange Commission rules. These non-GAAP financial measures supplement our GAAP disclosures and should not be considered an alternative to the GAAP measure. The reasons we use these non-GAAP financial measures and the reconciliations to their most directly comparable GAAP financial measures are posted to the investor relations section of our website at www.ge.com. [We use non-GAAP financial measures including the following:

- Operating earnings and EPS, which is earnings from continuing operations excluding non-service-related pension costs of our principal pension plans.
- GE Industrial operating & Verticals earnings and EPS, which is operating earnings of our industrial businesses and the GE Capital businesses that we expect to retain.
- GE Industrial & Verticals revenues, which is revenue of our industrial businesses and the GE Capital businesses that we expect to retain.
- Industrial segment organic revenue, which is the sum of revenue from all of our industrial segments less the effects of acquisitions/dispositions and currency exchange.
- Industrial segment organic operating profit, which is the sum of segment profit from all of our industrial segments less the effects of acquisitions/dispositions and currency exchange.
- Industrial cash flows from operating activities (Industrial CFOA), which is GE's cash flow from operating activities excluding dividends received from GE Capital.
- Capital ending net investment (ENI), excluding liquidity, which is a measure we use to measure the size of our Capital segment.
- GE Capital Tier 1 Common ratio estimate is a ratio of equity

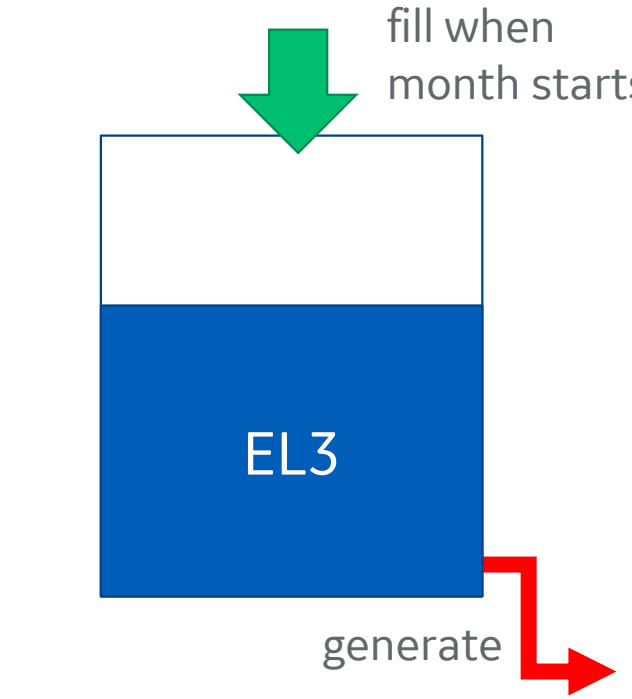
Goal of the exercise

Explore improvements to GE MARS to represent ELRs in the IRM model

Current model uses a fixed-shape (repeated daily) to capture the dispatch of ELRs during high-risk hours

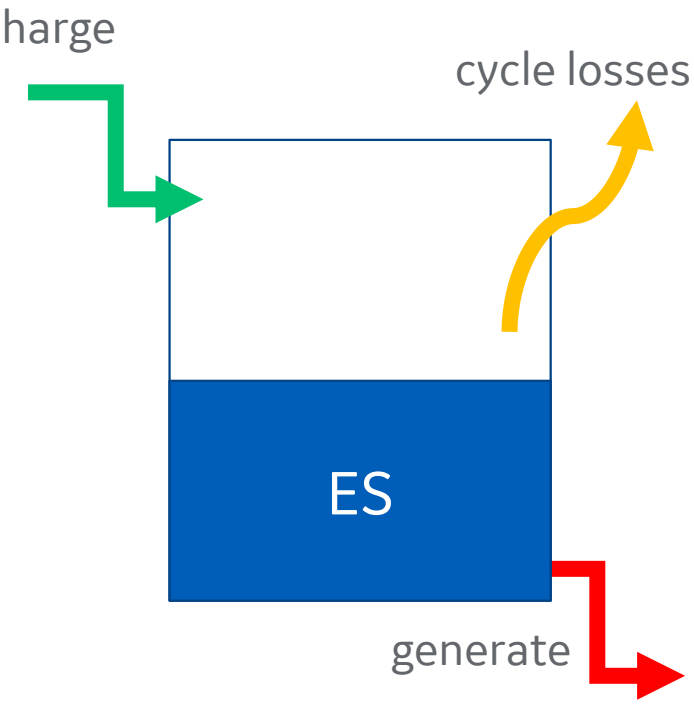
New GE MARS release (4.0) includes improvements to as-needed energy limited resources (EL3) and new energy storage model (ES)

As-needed energy limited (EL3) and Dynamic storage (ES): possible usage to model ELRs



Hydro without pumping

Demand response contracts



Pumped hydro storage

Battery

Recap: Main issue deploying EL3/ES models

Under high-load LFU steps, negative margins appear during most of the day before SCR and other EOP steps are consider

This is partly due to (among other things) non-firm external assistance are not considered until later in the EOP steps

EL3/ES models react to those negative margins early in the day. Their energy is depleted by the time when LOLE ultimately occurs, later in the day (after external assistance and EOPs reduce shortages in other hours)

Other tested configurations (1)

GE and NYISO considered different configurations to the dynamic models to improve their performance

Some of the configurations considered, but not selected:

- Base, unconstrained EL3/ES model
- EL3/ES model generating after EOPs/emergency assistance
  - Better LOLE reduction
  - Does not represent actual operations, shows very high EOP usage

Other tested configurations (2)

- Dispatch EL3/ES model before EOPS, but considering emergency assistance
  - Better timing during high-risk days (reduction in LOLE)
  - During average days emergency assistance covers margins, units are not called (leads to higher EOP usage)
- Alternative EL2 model (static shape generated against load shapes)
  - Improved LOLE, but increased EOP usage compared to fixed shapes

Current results

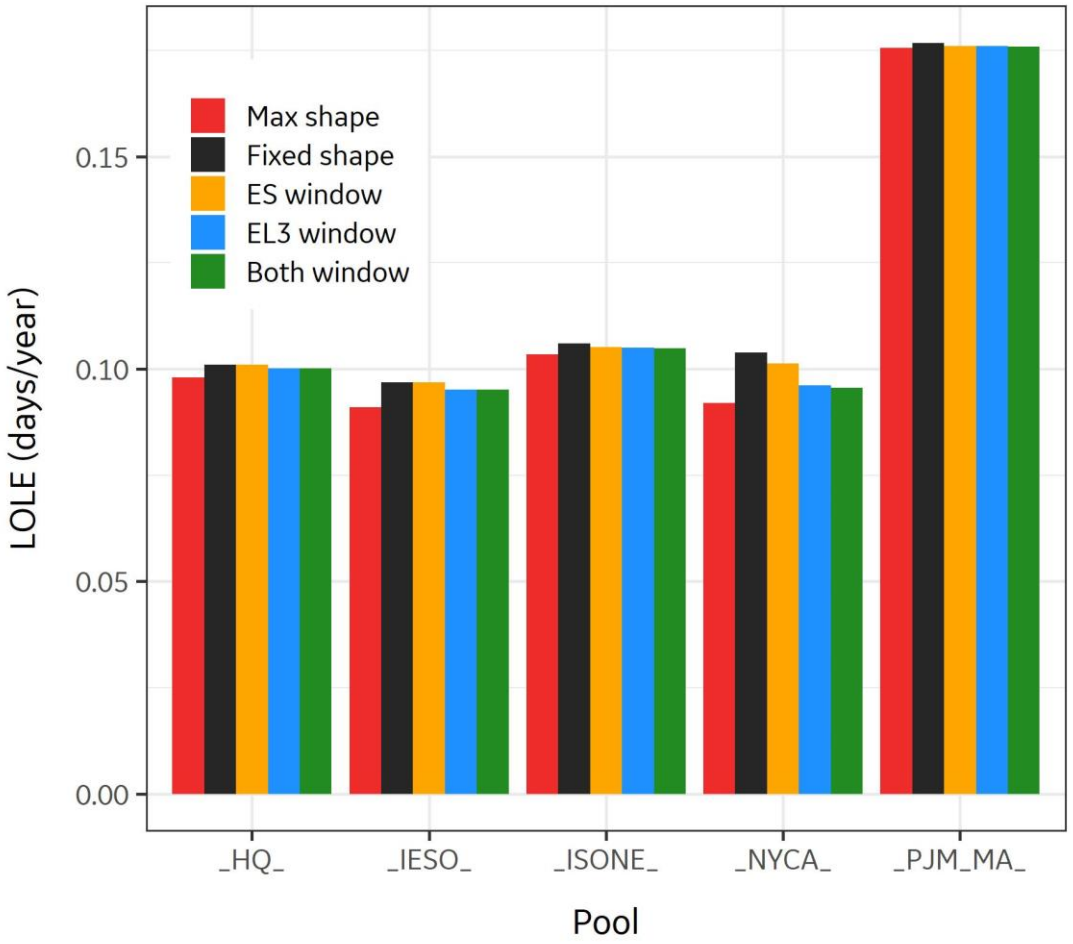
Models in our results

- “Fixed shape”: current model
- “Max shape”: maximum capacity, help at all hours (to bound performance)
- “ES Window”: ES unit that only generates after 1pm
- “EL3 window”: EL3 unit with generation window gradually enabled 6-10am

The results shows modeling comparison with two units:

- Unit A is a pumped storage unit, candidate for ES;
- Unit B is a fuel limited resource, candidate for EL3

LOLE by pool and for NYCA

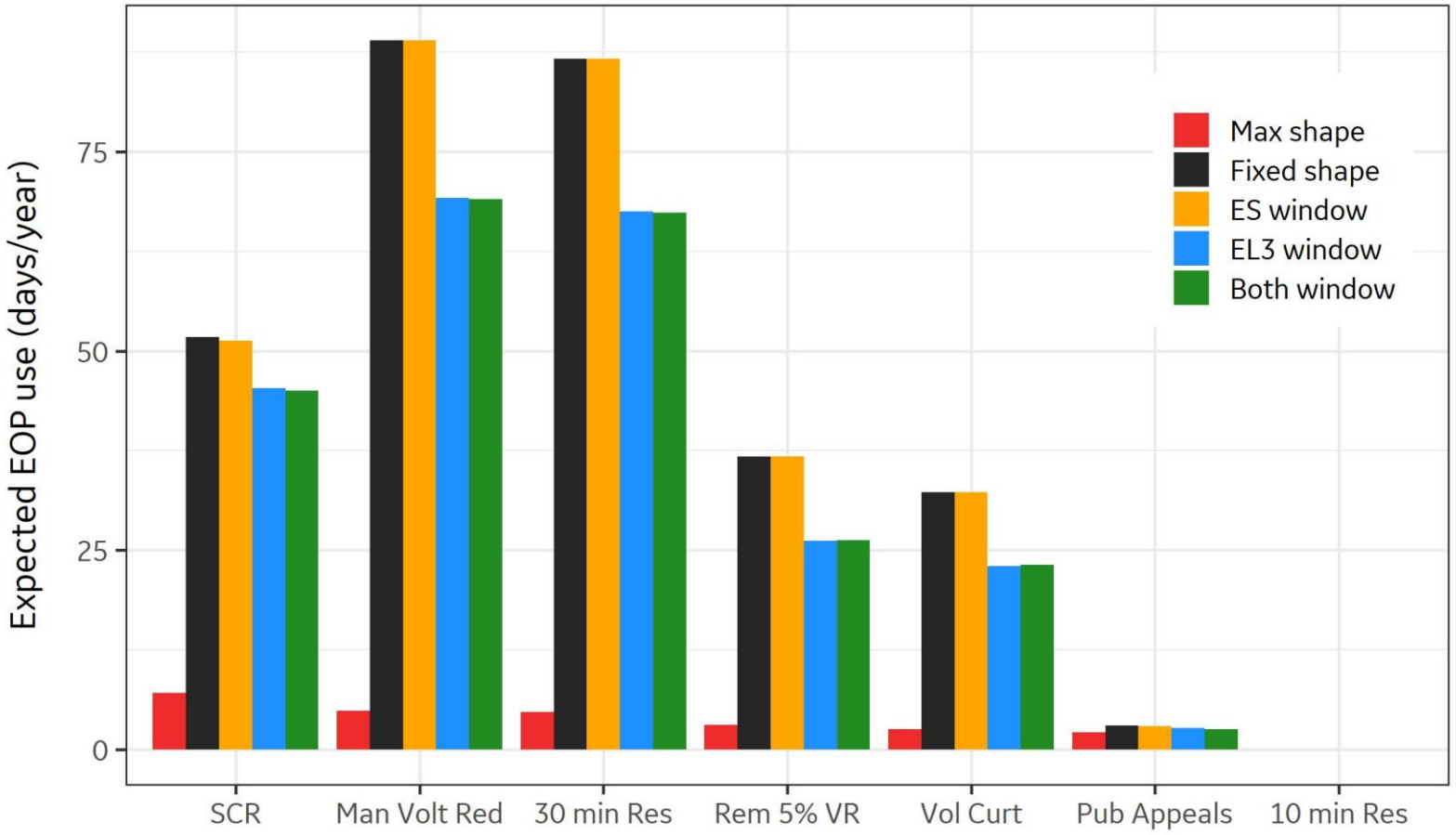


Scenario	NYCA LOLE (days/year)
A and B with Max shape	0.092
A and B with Fixed shape	0.104
A as ES window, B Fixed shape	0.101
B as EL3 window, A Fixed shape	0.096
A as ES window, B as EL3 window	0.096

LOLE improves with dynamic representation compared to the fixed shape

Close to maximum improvement

Expected EOP usage for NYCA



A and B with Max shape
A and B with Fixed shape
A as ES window, B Fixed shape
B as EL3 window, A Fixed shape
A as ES window, B as EL3 window

EOP usage declines, especially with usage of the EL3 model, as it generates during more hours of the day

Preliminary conclusions

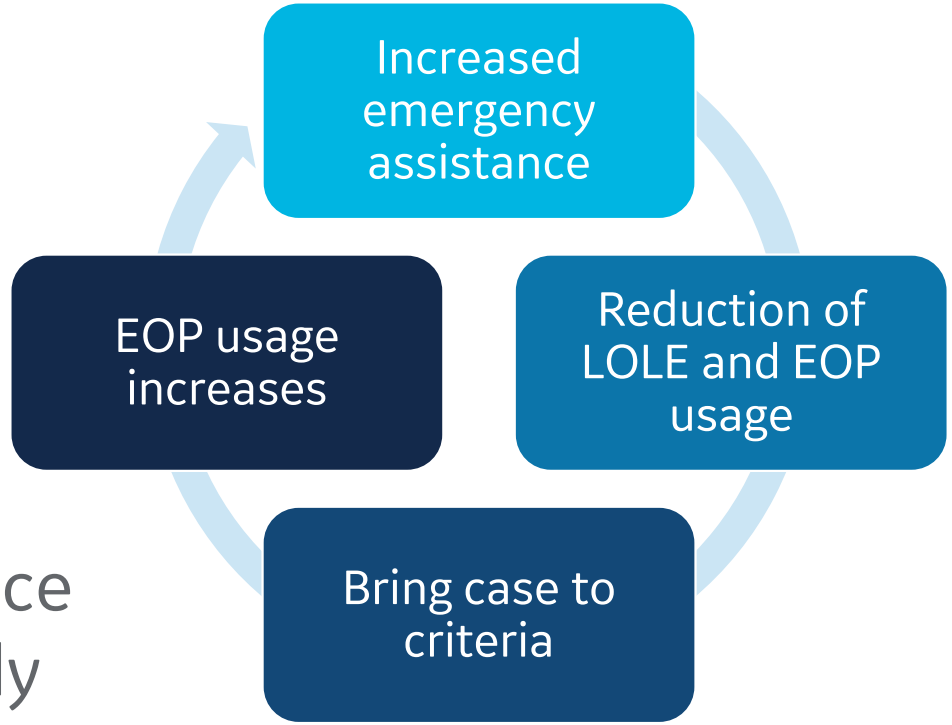
- The ES model (with generation window) improves model performance, as it avoids charging to incur EOP usage (it happens with fixed shapes)
- The EL3 model (with gradual window) performs well, compared to other options. GE and NYISO will perform a few additional simulations and check dispatch shapes.
- May consider keeping current fixed shape modeling for EL3 units
- All simulations will be summarized in the white paper. Need to balance summary of results with confidentiality of ELR elections.

Additional Consideration

ICS recommended exploring the option of allowing a fraction of emergency assistance during EL3/ES and EOP dispatch

Preliminary runs show a decrease in LOLE, very rapid decrease in EOP usage

Such option may have broader implications and determining “correct” amount of assistance will require a much more comprehensive study



Backup slides (from Feb. 3 meeting)

Overview of updated MARS unit types

Next MARS version will include improved modeling of energy-limited resources:

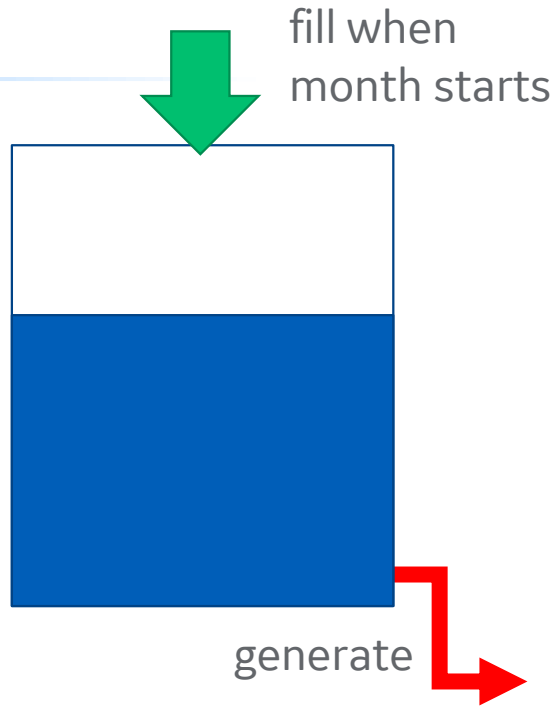
- More powerful
- New dynamic energy storage (ES) model

Both models share significant portions of the modeling, but capture different unit types

Energy-limited type 3 (EL3) model

Used to represent units that have:

- Energy budget (MWh) to be used in a month
- Maximum generation output (MW)
- Optionally, minimum generation (MW), *e.g., run of river output*
- Optionally, ability to transfer unused energy from one month to another



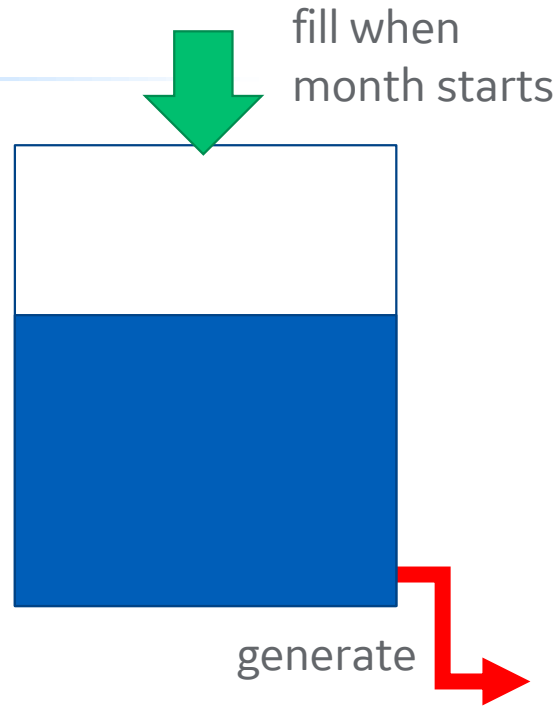
Think of a storage tank that you fill at the beginning of the month and you use when you need it

Energy-limited type 3 (EL3) model – additional constraints

Additional constraints may include

- Limit hours/days per year
- Limit hours/days per month
- Limit hours/energy per day

These are optional but can be used specific operational constraints or contract restrictions



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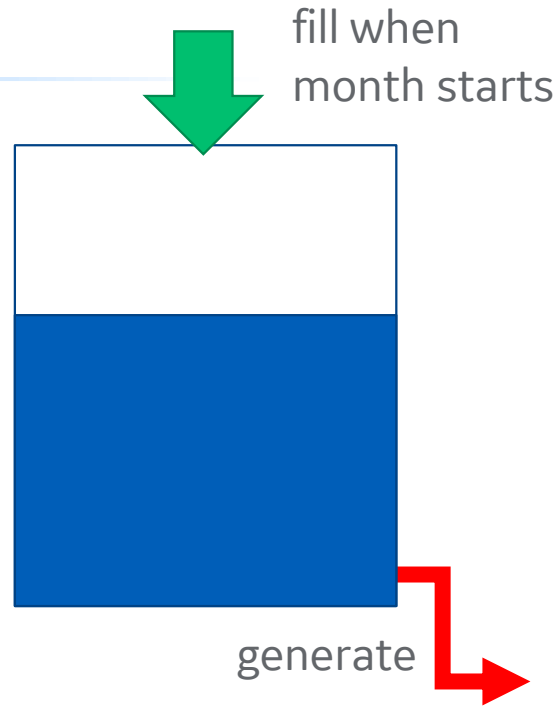
Energy-limited type 3 (EL3) model – when is it called?

- MARS first considers the balance of capacity/load
- Area and pool exchanges are considered
- If there is a shortage, the EL3 unit will attempt to dispatch:
  - Subject to limits of available capacity/energy
  - Subject to limits of use
  - Subject to transmission limits

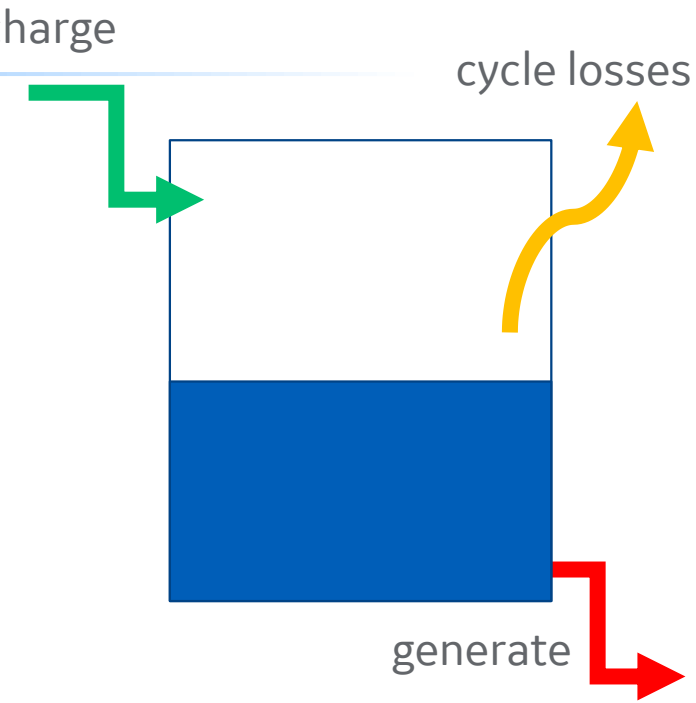


Think of a storage tank that you fill at the beginning of the month and you use when you need it

Energy storage (ES) model

Used to represent units that have:

- Capacity storage (MWh)
- Maximum generation output (MW)
- Ability to refill the storage (MW) when not generating
- Optionally, round-trip efficiency (%) to represent losses in the charge/generate cycle



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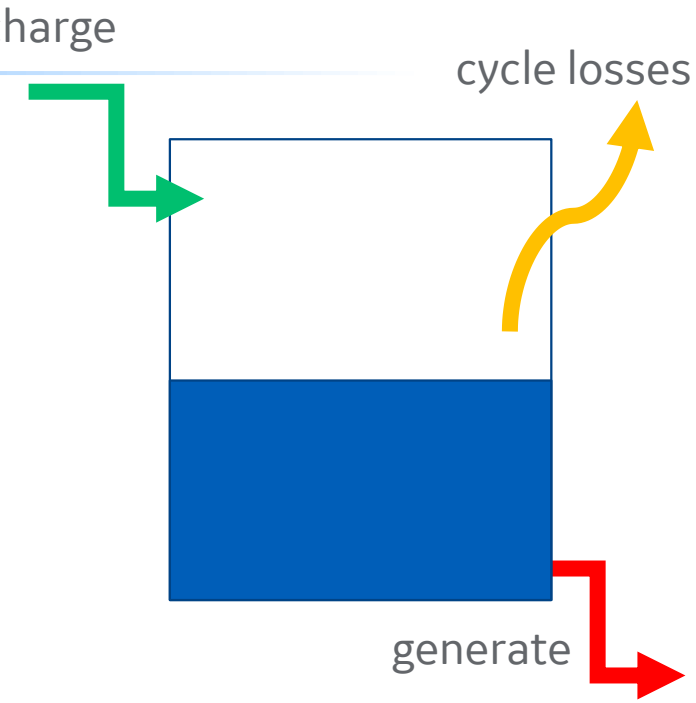
Energy storage (ES) model – when is it called?

Same time that EL3 units are considered, limited to:

- Capacity and energy balance
- Transmission constraints
- Usage limits (if defined)

If not used for an hour and there is available excess capacity, it will attempt to charge

- Limited to charging capacity, transmission
- Charge from excess capacity
- Don't use EOP or reserves



Think of a storage tank that you fill at the beginning of the month and you use when you need it

Generalized modeling

All modeling to date is general, not specific to NYISO and NYSRC's needs

Other NPCC Areas studying adoption for hydro, contract modeling

Other features added:

- Control number of calls (one or more consecutive hours)
- Control during which EOPs the unit can generate
- Enable disable charging and/or generation by hour of day (to better align with operational profiles)

Advantages over a fixed shape

Determining a fixed shape requires an initial run to know what hours of the day the generation is typically needed

Risks of fixed shapes:

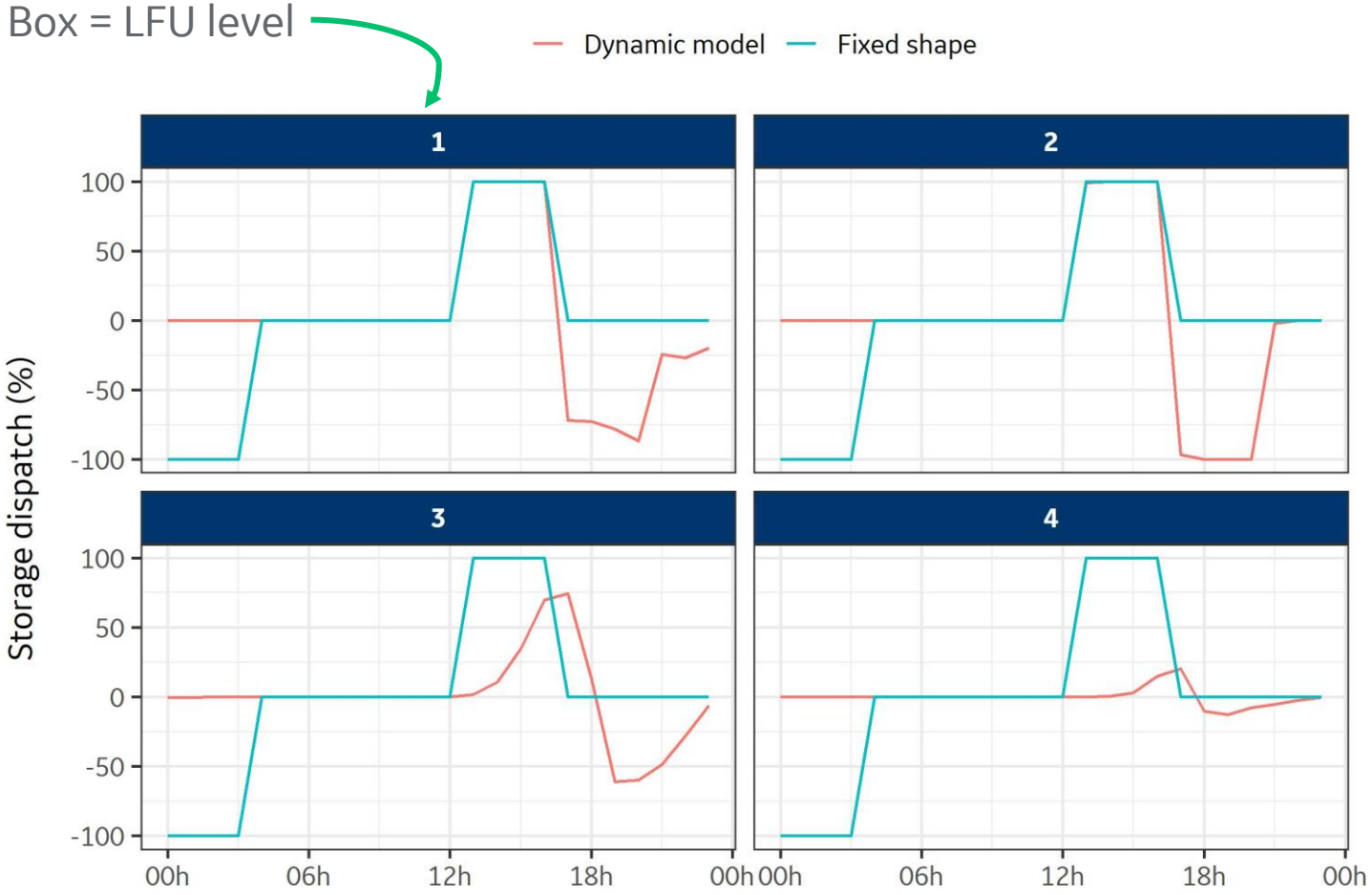
- "Overfitting" the model (too much knowledge of NYCA LOLE)
- Not robust over different scenarios (e.g., a high-solar scenario)
- Fixed shape behaves the same for all load forecast uncertainty

EL3/ES models require fewer assumptions/inputs/knowledge

- More robust over wider range of scenarios
- LOLE results may be higher/lower, not guaranteed to outperformed fixed shape

Comparison of fixed shape vs. dynamic modeling
4 hours of storage

Box = LFU level



- Levels 1 and 2 generate at the same hours, full output
- Levels 3 and 4 don't use 100% of output, but generate over a wider window, later
- Storage charges as soon as they are able