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Independent System Operator

Improve Duct-Firing Modeling: Market Design Concept Proposed

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Agenda

- Background
- Problem Statement
- Market Design Concept Proposed
- Next Steps

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Previous Presentations

Date	Working Group	Discussion Points and Links to Materials
09-30-2022	ICAPWG/MIWG	Improve Duct-Firing Modeling Update https://www.nyiso.com/documents/20142/33520089/Improve%20Duct%20Firing%20Modeling_MIWG_09302022_final%20(002).pdf/1dd9e83a-a2f2-bac4-b8ed-f3e3d97a9461
08-24-2022	ICAPWG/MIWG	Improve Duct-Firing Modeling Update https://www.nyiso.com/documents/20142/32941988/DBimprove_MIWG_08242022_final.pdf/862020d9-faa1-ab30-9f02-e9aa8604d43f
04-05-2022	ICAPWG/MIWG	Improve Duct-Firing Modeling – Update https://www.nyiso.com/documents/20142/29688278/DBimprove_MIWG_040522_final.pdf/fe5ca5ce-d999-7609-a671-6311d06c573a
02-08-2022	ICAPWG/MIWG	Improve Duct-Firing Modeling – Kick-off https://www.nyiso.com/documents/20142/28305948/DBimprove_MIWG_020822_r2.pdf/cd34412c-cce6-5f84-230e-511b0f00e4cc

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Background

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Project Background

- The Improve Duct-Firing Modeling Project is considering market enhancements to better accommodate combined-cycle gas turbine generators (“CCGTs”) equipped with duct-firing.

- We are targeting a 2022 Market Design Concept Proposed (MDCP).

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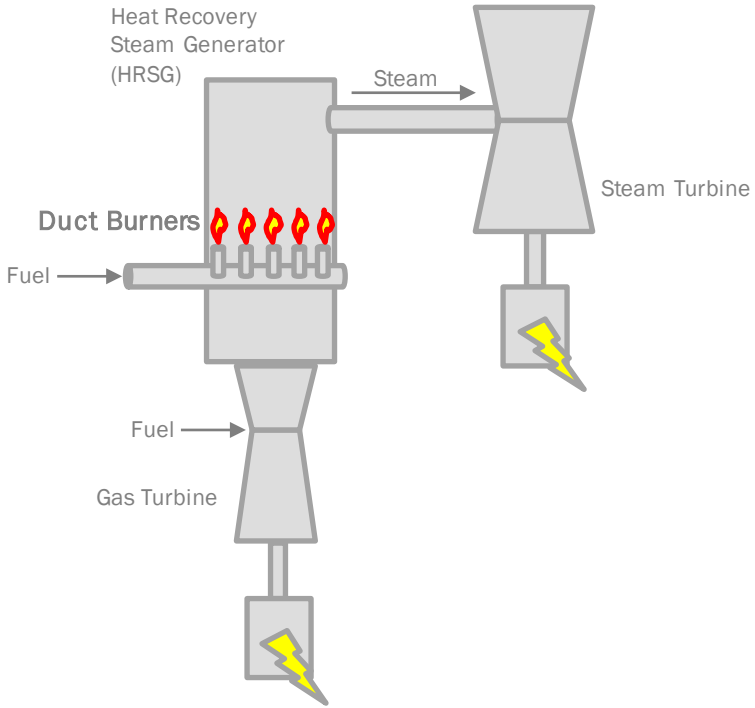
What is Duct-Firing?

- **In some combined-cycle power stations, the Heat Recovery Steam Generators (HRSGs) are equipped with duct burners, which add additional heat to the steam cycle by burning fuel directly in the exhaust duct.**
  - The additional heat from the duct burners increases steam flow to the steam turbine, and results in power increase from the steam turbine only.
  - Typically, the operation of duct burners is limited to the last 1-10% of combined cycle output and requires the gas turbine to be near (or at) maximum output prior to use.
  - There are exceptions to this typical operation in NYISO's fleet, mostly in plants designed for cogeneration.



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Problem Statement

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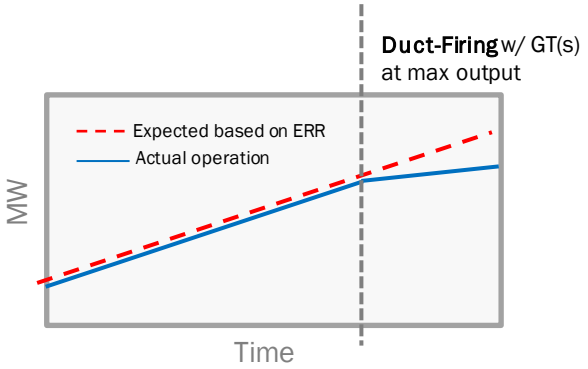
Problem Statement

- **For Energy market participation, up to three normal response rates (NRRs) may be used to characterize the MW/min ramp rate of a generator with respect to MW output.**
  - The NRR values and breakpoints can be tailored to best fit the specific generator's operating characteristics.
    - For example, reduced ramp rate capability in a certain range of operation (e.g., ramping on duct burners alone).
    - NRRs only apply to normal energy dispatch.
- **For Operating Reserves scheduling, the emergency response rate (ERR) is used.**
  - ERR is a single value required to be greater than or equal to all NRRs.
    - Thus, it does not appropriately capture the variable ramp rate over the complete operating range of some units.



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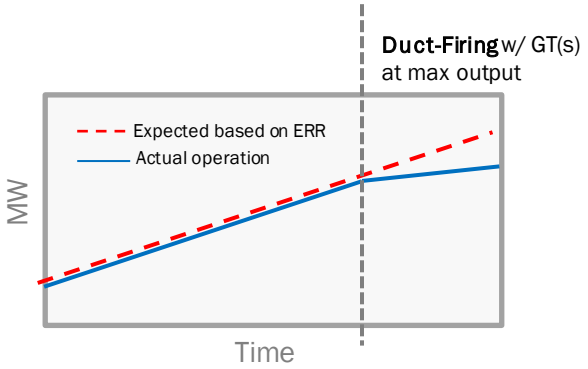
Problem Statement (cont'd)

- It has been observed that CCGTs equipped with duct-firing systems may not be able to physically achieve their registered ERR when ramping through the region where duct burners are used.
- This project explores changes to accommodate the operating capability of CCGTs when they are in the duct-firing region and called upon to provide reserves.



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Market Design Concept Proposed

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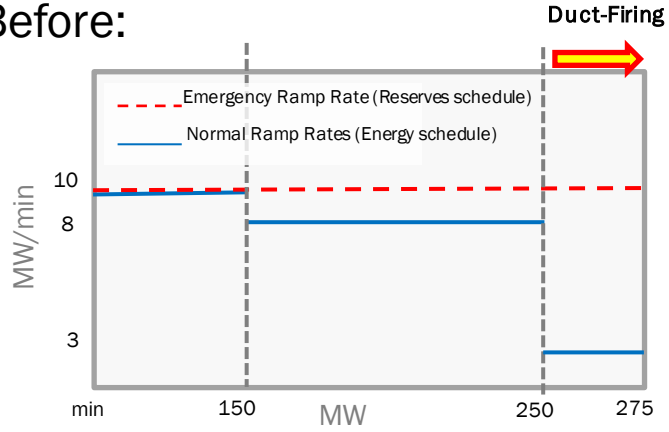
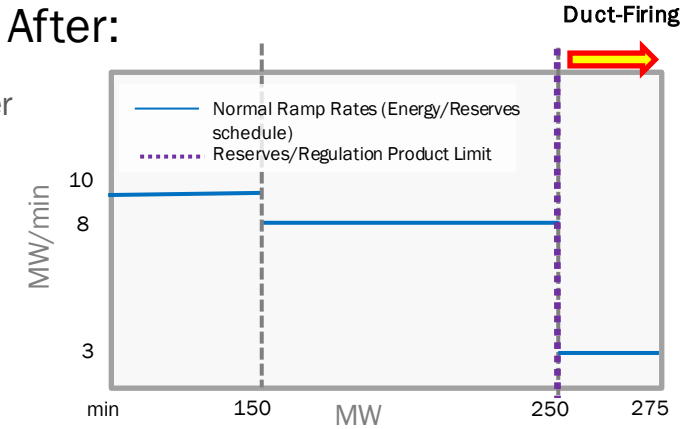
Market Design Proposal

- **Use multiple ramp rates for scheduling reserves**
  - Consistent with scheduling of energy today, leverage normal ramp rate “segments” (instead of the single emergency rate) to schedule reserves.
  - The ramp rates utilized for operating reserve shall be the same as energy ramp rates which are registration parameters.
- **Allow limited participation for reserve products**
  - If necessary due to limitations of the plant’s configuration, the MP may set a participation limit for reserves that is lower than the unit’s operating capacity.
  - The existing ramp rate breakpoint for duct-firing range shall be used for setting the threshold limit when MP opts to limit participation in a specific reserve product.
  - Opting to use the participation limit shall be a registration parameter.

Before:



After:



*example values

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Additional Market Design Considerations

- **Explore limiting participation for regulation product**
  - NYISO agrees that limiting regulation participation to the operating range over which the resource can provide regulation is desirable.
  - As part of the prototyping efforts for limiting participation for reserves, the NYISO will explore limiting participation for regulation product as well.
  - The limiting participation for reserves is envisioned to use the ramp rate breakpoint as the threshold from the multiple ramp rates for reserves.
  - The limiting participation for regulation would likely need a different approach.

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Additional Market Design Considerations

- **Explore the concept of Flexible Ramp Rates ("FRRs")**
  - NYISO appreciates the feedback on making the existing registration ramp rates flexible so that they could be changed by the Market Participants.
  - NYISO agrees that the ramp rates and breakpoints for specific units could change based on ambient conditions.
  - Flexible ramp rates would likely improve the accuracy of scheduling CCGTs in the normal operating region and the duct firing region.
  - NYISO will explore the concept of FRRs to understand the complexity of such an effort.

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Next Steps

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Next Steps

- Continue prototyping the Limiting Participation model and explore the concept of Flexible Ramp Rates until the end of the year.
- This project is currently not prioritized for 2023.
- This project will be incorporated in the 2024 project prioritization process.

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Our Mission & Vision

Mission

Ensure power system reliability and competitive markets for New York in a clean energy future

Vision

Working together with stakeholders to build the cleanest, most reliable electric system in the nation

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