New York ISO
Independent System Operator

Improved Duct Firing Modeling: Market Design and Tariff Review

Vijay Kaki
Market Design Specialist

ICAPWG/MIWG

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Agenda

- Background
- Market Design Review
- Tariff Review
- Next Steps

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Previous Presentations

Date	Working Group	Discussion Points and Links to Materials
08-22-2024	ICAPWG/MIWG	Improve Duct-Firing Modeling: Final Tariff Revisions https://www.nyiso.com/documents/20142/46549955/3%20Improve%20Duct%20Firing%20Modeling_08222024_MIWG.pdf/a01ab96c-b109-e3c0-213d-5563d5d8bb1b
06-25-2024	ICAPWG/MIWG	Improve Duct-Firing Modeling: 2024 Proposed Market Design Details https://www.nyiso.com/documents/20142/45442995/Improve%20Duct-Firing%20Modeling_MIWG_06252024.pdf/35f61fb0-92a6-ee7b-63c7-89eb428fe1c0
05-30-2024	ICAPWG/MIWG	Improve Duct-Firing Modeling: 2024 Proposed Project Scope https://www.nyiso.com/documents/20142/44935892/Improve%20Duct-Firing%20Modeling_MIWG_05302024_draft.pdf/cb406062-ab9f-c972-bc7f-a7709f184fd5
05-02-2024	ICAPWG/MIWG	Improve Duct-Firing Modeling: Implementation Plan and Proposed Tariff Revisions https://www.nyiso.com/documents/20142/44469922/Improve%20Duct%20Firing%20Modeling_05022024_MIWG.pdf/fdac1cd3-dba6-74e3-c97d-015925462795
02-29-2024	ICAPWG/MIWG	Improve Duct-Firing Modeling: Market Design Update https://www.nyiso.com/documents/20142/43275262/Improve%20Duct%20Firing%20Modeling_02292024_final.pdf/1512a290-02ec-afb8-92e3-9aa8bf9e9c07
02-07-2024	ICAPWG/MIWG	Improve Duct-Firing Modeling Kickoff https://www.nyiso.com/documents/20142/42807168/Improve%20Duct%20Firing%20Modeling%20MDC_Kickoff_02072024.pdf/ebc1c317-a42f-669e-1f3e-26ccd5e80b44

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Previous Presentations

Date	Working Group	Discussion Points and Links to Materials
08-30-2023	BPWG	Market Project Descriptions: Improve Duct-Firing Modeling (Page 13) https://www.nyiso.com/documents/20142/39653286/August%2030%20BPWG%20Market%20Project%20Descriptions.pdf/7ade6560-c017-c29a-7ab9-769cd3a4c01e
03-07-2023	ICAPWG/MIWG	Improve Duct-Firing Modeling Update https://www.nyiso.com/documents/20142/36639552/Improve%20Duct%20Firing%20Modeling%20Update_MIWG_03072023_final.pdf/2f5af6b8-11b5-f1c2-e0ce-59585dfc1f00
10-27-2022	ICAPWG/MIWG	Improve Duct-Firing Modeling: Market Design Concept Proposed https://www.nyiso.com/documents/20142/34087499/Improve%20Duct%20Firing%20Modeling%20MDCP_MIWG_10272022.pdf/8e18e862-1ba0-513b-bc18-1573fb55f1dc
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

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Background

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.

- 2024 project commitment is to complete the Functional Requirement Specifications (FRS).

- As per NYISO’s prioritization process, the project deployment is scheduled for 2026.

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Market Design Review

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Limiting Participation

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Limiting Participation

- **Opt-In Limiting Participation flag for CCGTs based on their ramp rate breakpoint pertaining to the duct-firing range.**
- **Opting in would prevent the duct-firing range from being used for:**
  - 10-min reserve and regulation products in DAM, RTD, and RTC.
  - 10-min reserve, regulation, and energy products in RTD-CAM.

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Limiting Participation– Details

- The participation limit will not apply for 30-min reserves and energy in SCUC, RTC, RTD and will not apply for 30-min reserves in RTD-CAM.
- The participation limit will be a registration parameter that has to be opted in by the unit and would have to be validated by MMA before the participation limit is activated for the unit.
- If these units are already present within the duct-firing range before the activation of any RTD-CAM mode, then these units will be held at the physical basepoint in effect prior to the activation.
- Limiting Participation option can be used by the unit to alleviate the transition time issue.

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Limiting Participation– Example

- **Consider a Combined Cycle Gas Turbine Generator, equipped with Duct burners, has the following operating ranges and characteristics:**
  - Min Gen to 150 MW with a ramp rate of 10 MW/min (Normal operating range 1)
  - 150 to 250 MW with a ramp rate of 8 MW/min (Normal operating range 2)
  - 250 to 275 MW with a ramp rate of 3 MW/min (Duct-firing range)
- **If this unit opts for the limiting participation option, then**
  - This unit will not be scheduled for 10-min reserves and regulation beyond 250 MW in SCUC, RTC, RTD, and RTD-CAM.
  - It can be scheduled for 30-min reserves and Energy till 275 MW in SCUC, RTC, and RTD.
  - It can be scheduled for 30-min reserves until 275 MW and Energy until 250 MW in RTD-CAM.
    - If this unit is at 240 MWs prior to RTD-CAM activation, then this unit can be moved up to 250 MWs and not beyond that.
    - If this unit is at 255 MWs prior to RTD-CAM activation, then this unit will be maintained at 255 MWs during the RTD-CAM mode.

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Limiting Participation– Example

- **The emergency response rate (>=10 MW/min) would be utilized for scheduling the 10-min reserves until 250 MWs and 30-min reserves until 275 MWs.**
- **The normal response rates would be utilized for energy scheduling in SCUC, RTD, and RTC until 275 MW.**
- **The regulation response rate would be utilized for scheduling regulation until 250 MWs.**
  - The regulation response rate is taken to be the slowest of the three response rates.
  - The above unit's regulation response rate would be the slowest of the first two response rates (8 MW/min) since it is limited from participating in providing the regulation service beyond 250 MW.

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RTD-CAM Enhancements

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RTD-CAM Enhancement: Prior Normal Response Rate

- This enhancement applies to all the combined cycle units with duct-burners (including the units that have opted for Limiting Participation option)
- These units will be moved using the normal response rate of the operating region that the unit was in prior to the activation of any of the RTD-CAM modes.
- This alleviates the concern of utilizing the emergency response rate to move these units into the duct-firing range and within the duct-firing range.

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RTD-CAM Enhancement: Prior Normal Response Rate

- **Consider the same unit from slide 11:**
  - Min Gen to 150 MW with a ramp rate of 10 MW/min (Normal operating range 1) (ERR is 10 MW/min)
  - 150 to 250 MW with a ramp rate of 8 MW/min (Normal operating range 2)
  - 250 to 275 MW with a ramp rate of 3 MW/min (Duct-firing range)
- **This unit has not opted for Limiting Participation option. Consider the following scenarios:**
- If this unit is at 240 MWs prior to RTD-CAM activation, then this unit can be moved up/down using the 8 MW/min.
  - If this unit is at 255 MWs prior to RTD-CAM activation, then this unit can be moved up/down using the 3 MW/min response rate as opposed to using the Emergency Response Rate.

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Tariff Review

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Definitions

- **Combined Cycle Gas Turbine ("CCGT") Generator –**
  - A Generator that produces electric power from gas turbine(s) and uses exhaust heat from gas turbine(s) to generate steam and additional electric power with a heat recovery steam generator and steam turbine (s).
- **Combined Cycle Gas Turbine ("CCGT") Generator with Duct-Firing Capability –**
  - A Combined Cycle Gas Turbine Generator equipped with duct burners, which add additional heat to the steam used to produce additional electric power from the heat recovery steam generator and steam turbine (s).
- **Limiting Participation Flag –**
  - An Operating Reserve and Regulation Service participation option that a Combined Cycle Gas Turbine Generator with Duct-Firing Capability may utilize, subject to technical validation pursuant to ISO Procedures, to limit its 10-Minute Spinning Reserves and Regulation Service Schedules to the Participation Limit.
- **Participation Limit –**
  - The maximum amount of Energy that a Combined Cycle Gas Turbine Generator with Duct-Firing Capability can produce without using its Duct-Firing Capability, which is used as the upper limit for scheduling 10-min Spinning Reserves and Regulation Service. This limit does not apply to Energy scheduling.

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Day-Ahead Markets and Schedules Concept (MST 4.2)

- For a Combined Cycle Gas Turbine Generator with Duct-Firing Capability that has opted for the Limiting Participation Flag, the Participation Limit and the emergency response rate will determine the quantity of 10-Minute Reserves that the Resource is capable of providing.

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Real-Time Markets and Schedules Concept (MST 4.4)

- In RTD-CAM, Combined Cycle Gas Turbine Generators with Duct-Firing Capability that have opted for the Limiting Participation Flag will not be dispatched beyond the Participation Limit.
- If these resources are already at or above their Participation Limit, they will be maintained at their physical basepoint.

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Real-Time Markets and Schedules Concept (MST 4.4) (continued)

- **In Max Gen Pickup mode of RTD-CAM:**
  - Combined Cycle Gas Turbine Generators with Duct-Firing Capability can be scheduled to the UOLe level using their normal response rate pertaining to the operating region that its physical base point was at prior to the activation of the RTD-CAM mode.
  - Combined Cycle Gas Turbine Generators with Duct-Firing Capability, that have opted for the Limiting Participation Flag can be scheduled
    - To their Participation Limit using their normal response rate pertaining to the operating region that its physical base point was at prior to the activation of the RTD-CAM mode if the Generator was at a level below the Participation Limit.
    - To stay at the level that the Generator was in prior to the RTD-CAM activation if the Generator was at a level equal to or above the Participation Limit.

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General Day-Ahead and Real-Time Market Rules Concept (15.4.2 and 15.4.3)

- **Combined Cycle Gas Turbine Generators with Duct-Firing Capability, that have opted for the Limiting Participation Flag can be scheduled to:**
  - The least of the resource's emergency response rate multiplied by ten or the resource's applicable Participation Limit for 10-min spinning reserves.
  - The least of the resource's emergency response rate multiplied by twenty or its applicable upper operating limit for 30-min reserves.

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Variations in RTD-CAM Concept (17.1.2.1.3)

- **Under the Max Gen Pickup mode:**
  - The ISO will have the discretion to either move the RTD basepoint signal of each CCGT with Duct-Firing Capability towards its UOLe at the normal response rate pertaining to the operating region that its physical base point was at prior to the RTD-CAM activation or set it at a level equal to its physical base point.
  - The ISO will have the discretion to either move the RTD basepoint signal of each CCGT with Duct-Firing Capability, that has opted for the Limiting Participation Flag:
    - Towards its Participation Limit at the normal response rate pertaining to the operating region that its physical base point was at prior to the RTD-CAM activation or set it at a level equal to its physical base point if the Generator is below the Participation Limit.
    - Set it at a level equal to its physical base point if the Generator is above or equal to the Participation Limit.

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Tariff Revisions - Rate Schedule 3 – Payments for Regulation Service (MST 15.3)

- **MST 15.3.1.2**
  - Each Supplier shall choose to opt in or opt out of the Limiting Participation Flag if the resource is a Combined Cycle Gas Turbine Generator with Duct-Firing Capability.
- **MST 15.3.2.1**
  - Regulation Service Offers from Combined Cycle Gas Turbine Generators with Duct-Firing Capability that have opted in for the Limiting Participation Flag: The ISO shall limit the Regulation Capacity (in MW) from a Combined Cycle Gas Turbine Generator with Duct-Firing Capability, that has opted for the Limiting Participation Flag, to the Resource's maximum Regulation Service Capability without exceeding its Participation Limit.

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Services Tariff Sections Posted with Today's Materials

- **NYISO posted proposed MST revisions:**
  - MST 4.2
  - MST 4.4
  - MST 15.4
  - MST 15.3
  - MST 17.1

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Next Steps

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Next Steps

- **October**
  - BIC/MC Vote

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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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