2016 Economic Study Results: Peak-Gas-Day/Hour Capacity & Energy Analysis

Planning Advisory Committee

Revised on 08/01/17

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Peak-Gas-Day Capacity and Energy Analysis | REVISED

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STUDY GOALS AND
HIGHLIGHTS OF STUDY RESULTS

Peak-Gas-Day Capacity and Energy Analysis | REVISED

Study Goals

- After meeting all firm natural gas customers' needs, determine whether New England's natural gas system capacity, under six gas system topology cases, can satisfy the natural gas-fired generating resources in the six resource expansion scenarios:
  - The daily natural gas requirements to fuel the installed gas-fired generating capacity assumed to have capacity supply obligations on the summer and winter peak-gas-day (MW that can be served for 24 hours).
  - The hourly natural gas requirements to fuel the maximum hourly dispatched gas-fired generating capacity on the winter peak-gas-day (maximum MW that can be dispatched over the peak-gas-hour).
  - The hourly natural gas requirements to fuel the maximum hourly dispatched generation to produce electric energy on the summer and winter peak-gas-day (maximum MWh that can be dispatched over the peak-gas-hour).

Peak-Gas-Day Capacity and Energy Analysis | REVISED

Study Matrix

- NEPOOL's Six Resource Expansion Scenarios
  - Scenario 1 = RPS + Gas
  - Scenario 2 = ISO Queue
  - Scenario 3 = Renewables Plus
  - Scenario 4 = No Retirements
  - Scenario 5 = ACPs + Gas
  - Scenario 6 = RPS + Geodiverse Renewables

- ISO-NE's Six Natural Gas System Cases
  - Case 1 - Minimum Amount of Gas System Capacity
  - Case 2 - Case 1 + LDC peak shaving growth
  - Case 3 - Case 2 + pipeline growth
  - Case 4 - Case 3 + Distrigas
  - Case 5 - Case 3 + offshore LNG
  - Case 6 - Maximum Amount of Gas System Capacity

Note: Acronyms are defined in the last section of the Appendices

Differences Between Two ISO Studies

The primary differences between this 2016 NEPOOL Scenario Analysis: Peak-Gas-Day Natural Gas Capacity and Energy Analysis and the ISO-NE's upcoming Fuel Security Analysis (fall 2017) are:

- The objective of this ***Peak-Gas-Day Natural Gas Capacity and Energy Analysis*** is to identify surpluses/deficiencies in serving the installed capacity, dispatched capacity, and energy requirements of gas-fired and dual-fuel generators in the ***2016 NEPOOL Scenario Analysis*** for the peak days of the study year.
- The objective of ISO-NE's upcoming ***Fuel Security Analysis*** is to quantify the operational risks associated with insufficient fuel(s) during the entire winter period and identify if there are energy shortfalls under various power system scenarios.

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Differences Between Two ISO Studies – cont'd

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- The ***NEPOOL Scenario Analysis*** focuses on the winter and summer peak-gas-day for 2025 and 2030, while the ***Fuel Security Analysis*** will study the entire 90-day winter period in 2025.
- Both studies are intended to analyze different issues.
  - The ***NEPOOL Scenario Analysis*** examines the system's maximum, short-term capability on the peak-gas-day.
  - The ***Fuel Security Analysis*** will assess the frequency the power system is likely to be stressed under different scenarios for the winter operating period.
- The ***NEPOOL Scenario Analysis*** assumes the natural gas and LNG supply chain is always fully available to satisfy the seasonal needs of customers.
- The two studies also differ in terms of specific modeling methodologies, metrics and scenarios.

Peak-Gas-Day Capacity and Energy Analysis | REVISED

Highlights of Study Results

- Under the maximum gas infrastructure case (Gas Case 6):
  - There is enough spare natural gas system capacity to serve the gas-fired capacity and energy requirements for all six resource expansion scenarios in the **summers** of 2025 and 2030.
  - There is not enough spare natural gas system capacity to satisfy the installed gas-fired capacity for all six resource expansion scenarios in the **winters** of 2025 and 2030.
  - Only Scenario 3 (Renewables Plus) can satisfy the dispatched gas-fired capacity and energy generation requirements in the **winters** of 2025 and 2030.

SIX EXPANSION SCENARIOS AND SIX GAS CASES

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NEPOOL's Six Resource Expansion Scenarios

Scenario 1 = RPS + Gas: Physically meet Renewable Portfolio Standards (RPS) and replace generator retirements with natural gas combined-cycle units.

Scenario 2 = ISO Queue: Physically meet RPS and replace generator retirements with new renewables/clean energy.

Scenario 3 = Renewables Plus: Physically meet RPS, add renewables/clean energy, EE, PV, PEV, storage, and retire older generating units.

Scenario 4 = No Retirements (beyond FCA #10): Meet RPS with new resources under development and use RPS' Alternative Compliance Payments (ACPs) for shortfalls. Add natural gas units.

Scenario 5 = ACPs + Gas: Meet RPS with new resources under development and use ACPs. Replace all retirements with natural gas units.

Scenario 6 = RPS + Geodiverse Renewables: Scenario 2 with a more geographically balanced mix of on/offshore wind and solar PV.

ISO-NE's Six Natural Gas System Topology Cases

- Six natural gas system cases encompass the various combinations of gas system capacity and supply options regarding pipelines, LDC peak-shaving, expansion projects, LNG supplies, and future growth:
  - **Gas Case 1** = **Minimum amount of gas system capacity** available for gas LDC and power generation. Reflects existing gas pipelines, existing LDC peak-shaving & near-term pipeline expansion projects.
  - **Gas Case 2** = Includes Gas Case 1 plus LDC peak shaving growth.
  - **Gas Case 3** = Includes Gas Case 2 plus pipeline growth.
  - **Gas Case 4** = Includes Gas Case 3 plus Distrigas LNG.
  - **Gas Case 5** = Includes Gas Case 3 plus offshore LNG.
  - **Gas Case 6** = **Maximum amount of gas system capacity** available for both gas LDC and power generation. Includes Gas Case 3 plus Distrigas LNG and offshore LNG.

Peak-Gas-Day Capacity and Energy Analysis

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Six Natural Gas System Topology Cases – cont'd

ADDITIONAL GAS

Natural Gas Infrastructure	Gas Case 1 Minimum Gas Capacity(*)	Gas Case 2 Case 1 + LDC Peak Shaving	Gas Case 3 Case 2 + Pipeline Growth	Gas Case 4 Case 3 + Distrigas LNG	Gas Case 5 Case 3 + Offshore LNG	Gas Case 6 Maximum Gas Capacity
Existing Pipelines	√	√	√	√	√	√
Existing LDC Peak Shaving	√	√	√	√	√	√
Pipeline Projects	√	√	√	√	√	√
LDC Peak Shaving Growth		√	√	√	√	√
Pipeline Growth			√	√	√	√
Distrigas				√		√
Offshore LNG (FSRU)					√	√

ADDITIONAL GAS

(*) This is the first case in which the gas-system assumptions provide adequate winter capacity to serve all regional LDC core-gas demands.

Peak-Gas-Day Capacity and Energy Analysis

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Six Scenarios and Six Gas Cases

	Gas Case 1 Minimum Gas Capacity	Gas Case 2 Case 1 + LDC Peak Shaving	Gas Case 3 Case 2 + Pipeline Growth	Gas Case 4 Case 3 + Distrigas LNG	Gas Case 5 Case 3 + Offshore LNG	Gas Case 6 Maximum Gas Capacity
Scenario 1 RPS + Gas						
Scenario 2 ISO Queue						
Scenario 3 Renewables Plus						
Scenario 4 No Retirements						
Scenario 5 ACPs + Gas						
Scenario 6 RPS + Geodiverse Renewables						

Analysis of Six Scenarios and Six Gas Cases
(with 36 outcomes)
Completed For 2025 and 2030:

Installed Capacity
Dispatched Capacity
Energy Generation

ANALYSIS AND METHODOLOGY

INSTALLED GAS-FIRED CAPACITY ANALYSIS AND METHODOLOGY

Installed Gas-Fired Capacity Analysis (MW)

- After meeting all firm natural gas customers' needs, determine whether New England's natural gas system capacity, under six gas system topology cases, can fuel the installed gas-fired capacity within the six NEPOOL resource expansion scenarios
  - Focus is on **summer** gas-fired installed capacity
  - Represents a situation where all gas-fired capacity is assumed to operate at seasonal claimed capability (SCC)
  - Represents the upper band of gas consumption by the electric sector

Installed Gas-Fired Capacity Analysis Methodology

- On the winter and summer peak-gas-day, this methodology determines whether the installed gas-fired capacity can be fueled within each scenario:
  - Identify natural gas system capacity within all six gas cases
  - Identify firm natural gas customer demands
  - Determine if there is surplus* natural gas system capacity available to the electric sector
  - If so, compare surplus natural gas system capacity to the installed gas-fired capacity
  - Results show a surplus or deficiency for fueling installed gas-fired capacity

** Note: Peak-gas-day surplus represent spare natural gas system capacity that may be utilized ratably by the electric sector over 24 hours.*

Peak-Gas-Day Capacity and Energy Analysis

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Installed Gas-Fired Capacity in NEPOOL's Six Scenarios

2025 SCENARIO		INSTALLED GAS-FIRED CAPACITY (MW) (Note 1 & 2 & 3)
S1	RPS + Gas	16,847
S2	ISO Queue	16,190
S3	Renewables Plus	16,190
S4	No Retirements	16,297
S5	ACPs + Gas	17,335
S6	RPS + Geodiverse Renewables	16,190

2030 SCENARIO		INSTALLED GAS-FIRED CAPACITY (MW) (Note 1 & 2 & 3)
S1	RPS + Gas	19,770
S2	ISO Queue	15,625
S3	Renewables Plus	15,625
S4	No Retirements	16,297
S5	ACPs + Gas	20,458
S6	RPS + Geodiverse Renewables	15,625

Note 1: Total installed gas-fired capacity includes both gas-only and dual fuel capacity burning natural gas.

Note 2: Installed gas-fired capacity totals do not include 1,500 MW of Mystic 8 & 9 burning LNG and 16 MW of gas-fired generation located behind LDC city-gates.

Note 3: Total installed gas-fired capacity reflects winter seasonal claimed capability (WSCC) ratings.

DISPATCHED GAS-FIRED CAPACITY ANALYSIS AND METHODOLOGY

Peak-Gas-Day Capacity and Energy Analysis | REVISED

Dispatched Gas-Fired Capacity Analysis (MW)

- After meeting all firm natural gas customers' needs, determine whether New England's natural gas system capacity, under six gas system topology cases, can fuel the dispatched gas-fired capacity on the **winter** peak-gas-hour for the six NEPOOL resource expansion scenarios:
  - Performed only for **winter** because summer gas-fired capacity and energy generation margins are surplus
  - A sub-set of the installed gas-fired capacity
  - Represents a situation where only a portion of the installed gas-fired capacity is required to operate to serve electric demand
  - Represents the lower band of gas consumption by the electric sector

Dispatched Gas-Fired Capacity Analysis Methodology

- On the **winter** peak-gas-hour, this methodology determines whether the dispatched gas-fired capacity can be fueled within each scenario:
  - Identify natural gas system capacity within all six gas cases
  - Identify firm natural gas customer demands
  - Determine if there is surplus natural gas system capacity available to the electric sector
  - If so, compare surplus natural gas system capacity to the electric sector's maximum hourly, dispatched gas-fired capacity
  - Results show a surplus or deficiency for fueling dispatched gas-fired capacity

Peak-Gas-Day Capacity and Energy Analysis

Maximum Hourly, Gas-Fired Winter Dispatched Capacity in NEPOOL's Six Scenarios

2025 SCENARIO		MAX HOURLY GAS-FIRED WINTER DISPATCHED CAPACITY (MW)
S1	RPS + Gas	9,610
S2	ISO Queue	9,542
S3	Renewables Plus	6,779
S4	No Retirements	8,863
S5	ACPs + Gas	9,480
S6	RPS + Geodiverse Renewables	9,464

2030 SCENARIO		MAX HOURLY GAS-FIRED WINTER DISPATCHED CAPACITY (MW)
S1	RPS + Gas	9,929
S2	ISO Queue	9,149
S3	Renewables Plus	5,256
S4	No Retirements	9,207
S5	ACPs + Gas	10,098
S6	RPS + Geodiverse Renewables	9,131

GAS-FIRED ENERGY GENERATION ANALYSIS AND METHODOLOGY

Gas-Fired Energy Generation Analysis (MWh)

- After meeting all firm natural gas customers' needs, determine whether New England's natural gas system energy, under six gas system topology cases, can fuel the maximum hourly electric energy production by gas-fired generation:
  - Represents the electric energy production from dispatched gas-fired resources within each scenario
  - The maximum hourly energy is equal to the maximum hourly dispatched gas-fired capacity on the peak-gas-day/hour

Gas-Fired Energy Generation Analysis Methodology

- On the seasonal peak-gas-day, this methodology determines whether the maximum hourly, gas-fired energy generation fuel requirements can be satisfied within each scenario:
  - Identify natural gas system generation within all six gas cases
  - Identify firm natural gas customer demands
  - Determine if there is surplus natural gas system capacity available to the electric sector
  - If so, convert surplus natural gas system capacity into a 24-hour energy equivalent
  - Compare the natural gas system's 24-hour energy equivalent to the electric sector's maximum hourly gas-fired energy generation
  - Results show a surplus or deficiency for fueling gas-fired energy generation

Peak-Gas-Day Capacity and Energy Analysis

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2025 Peak-Gas-Day, Maximum Hourly Gas-Fired Energy Production in Six NEPOOL Scenarios

	RPS + Gas	ISO Queue	Renewables +	No Retirements	ACPs + Gas	RPS + Renewables
	2025_S1	2025_S2	2025_S3	2025_S4	2025_S5	2025_S6
Winter Maximum Hourly Gas-Fired Energy (MWh)	9,610	9,542	6,779	8,863	9,480	9,464
Summer Maximum Hourly Gas-Fired Energy (MWh)	15,409	14,477	9,930	14,935	15,744	14,605

Peak-Gas-Day Capacity and Energy Analysis

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2030 Peak-Gas-Day, Maximum Hourly Gas-Fired Energy Production in Six NEPOOL Scenarios

	RPS + Gas	ISO Queue	Renewables +	No Retirements	ACPs + Gas	RPS + Renewables
	2030_S1	2030_S2	2030_S3	2030_S4	2030_S5	2030_S6
Winter Maximum Hourly Gas-Fired Energy (MWh)	9,929	9,149	5,256	9,207	10,098	9,131
Summer Maximum Hourly Gas-Fired Energy (MWh)	16,087	13,875	6,779	15,008	16,493	10,218

RESULTS AND FINDINGS

Results and Findings – Installed Gas-Fired Capacity

- Under all natural gas system topology cases, there is enough spare natural gas system capacity to fuel the gas-fired capacity and energy for all six resource expansion scenarios in the **summers** of 2025 and 2030.

- Under the maximum natural gas system topology case (Gas Case 6), there is not enough spare natural gas system capacity to fuel all six resource expansion scenarios' installed gas-fired capacity in the **winters** of 2025 or 2030; these deficiencies equate to about half the amount of the installed gas-fired capacity for all scenarios.

Results and Findings – Dispatched Gas-Fired Capacity and Energy Generation

- In **winter** of 2025 and 2030, the amount of dispatched gas-fired capacity ranges from about **one-third to one-half** of the total amount of installed gas-fired capacity across all six scenarios.
- In **summer** of 2025 and 2030, the amount of dispatched gas-fired capacity ranges from about **one-third to three-quarters** of the total amount of installed gas-fired capacity across all six scenarios.
- Under the maximum natural gas system topology case, there is enough surplus gas to satisfy the dispatched gas-fired capacity and energy generation for Scenario 3 (Renewables Plus) in the **winters** of 2025 and 2030.
- In winter of 2030, Scenario 3's dispatched gas-fired capacity and energy generation can also be satisfied without the need for offshore LNG.

Results and Findings – Renewables, Retirements and Gas

- Under the maximum gas infrastructure case, the following Scenarios still have gas-fired capacity and energy deficiencies in the **winters** of 2025 and 2030:
  - Scenario S1 (RPS + Gas)
  - Scenario S2 (ISO Queue)
  - Scenario S4 (No Retirements)
  - Scenario S5 (ACPs + Gas)
  - Scenario S6 (RPS + Geodiverse Renewables)

Results and Findings - LNG

- LNG from Canaport, Distrigas and offshore FSRU's are critical for meeting the winter peak-gas-day requirements of the electric sector. Without these gas supply sources, approximately ~1.5 Bcf/day (~214,300 MWh/d) would be taken out the market.

  Should this occur during the **summer** peak-gas-day, this would reduce the surplus gas system capacity available to the electric sector to 3.2 Bcf/d (2025) to 4.4 Bcf/d (2030) (457,100 MWh/d in 2025 to 628,600 MWh/d in 2030).

  However, there would still be enough surplus gas system capacity to fuel all the gas-fired capacity and energy production of all six resource expansion scenarios, under all gas cases, in the **summers** of 2025 and 2030.

Results and Findings - Other

- Gas Case 1 (minimum gas infrastructure) has only enough natural gas system capacity to serve firm gas customer demands in **winter** of 2030. There is no spare gas system capacity available for electric sector use, thus deficiencies exist within all six scenarios in **winter** of 2030 under Gas Case 1.

STOPLIGHT DETAILS OF THE STUDY RESULTS: INSTALLED GAS-FIRED CAPACITY ANALYSIS

STOPLIGHT LEGEND

Red Shading = Deficiencies Greater than -10,000 MW
Yellow Shading = Deficiencies Between -9,999 to 0 MW
Green Shading = Surplus Greater than 0 MW

Peak-Gas-Day Capacity and Energy Analysis

NEW

Stoplight Results for 2025 Winter Installed Gas-Fired Capacity Analysis Under Six Scenarios and Six Gas Cases (Ratable MW)

Scenario		Gas Case 1 Minimum Gas Capacity	Gas Case 2 Case 1 + LDC Peak Shaving	Gas Case 3 Case 2 + Pipeline Growth	Gas Case 4 Case 3 + Distrigas LNG	Gas Case 5 Case 3 + Offshore LNG	Gas Case 6 Maximum Gas Capacity
S1	RPS + Gas	-15,823	-15,383	-13,127	-11,341	-10,746	-8,960
S2	ISO Queue	-15,166	-14,726	-12,470	-10,684	-10,089	-8,303
S3	Renewables Plus	-15,166	-14,726	-12,470	-10,684	-10,089	-8,303
S4	No Retirements	-15,273	-14,833	-12,577	-10,791	-10,196	-8,410
S5	ACPs + Gas	-16,311	-15,871	-13,615	-11,826	-11,234	-9,448
S6	RPS + Geodiverse Renewables	-15,166	-14,726	-12,470	-10,684	-10,089	-8,303

Surplus = (Green > 0 MW)

Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Stoplight Results for 2030 Winter Installed Gas-Fired Capacity Analysis Under Six Scenarios and Six Gas Cases (Ratable MW)

Scenario		Gas Case 1 Minimum Gas Capacity	Gas Case 2 Case 1 + LDC Peak Shaving	Gas Case 3 Case 2 + Pipeline Growth	Gas Case 4 Case 3 + Distrigas LNG	Gas Case 5 Case 3 + Offshore LNG	Gas Case 6 Maximum Gas Capacity
S1	RPS + Gas	-19,734	-19,181	-16,091	-14,306	-13,710	-11,925
S2	ISO Queue	-15,625	-15,036	-11,946	-10,161	-9,565	-7,780
S3	Renewables Plus	-15,625	-15,036	-11,946	-10,161	-9,565	-7,780
S4	No Retirements	-16,297	-15,708	-12,618	-10,833	-10,237	-8,452
S5	ACPs + Gas	-20,458	-19,869	-16,779	-14,994	-14,398	-12,613
S6	RPS + Geodiverse Renewables	-15,625	-15,036	-11,946	-10,161	-9,565	-7,780

Surplus = (Green > 0 MW)

Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

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Stoplight Results for 2025 Summer Installed Gas-Fired Capacity Analysis Under Six Scenarios and Six Gas Cases (Ratable MW)

Scenario		Gas Case 1 Minimum Gas Capacity	Gas Case 2 Case 1 + LDC Peak Shaving	Gas Case 3 Case 2 + Pipeline Growth	Gas Case 4 Case 3 + Distrigas LNG	Gas Case 5 Case 3 + Offshore LNG	Gas Case 6 Maximum Gas Capacity
S1	RPS + Gas	+5,986	+5,986	+8,242	+10,028	+10,623	+12,409
S2	ISO Queue	+6,643	+6,643	+8,899	+10,685	+11,280	+13,066
S3	Renewables Plus	+6,643	+6,643	+8,899	+10,685	+11,280	+13,066
S4	No Retirements	+6,536	+6,536	+8,792	+10,578	+11,173	+12,959
S5	ACPs + Gas	+5,498	+5,498	+7,754	+9,540	+10,135	+11,921
S6	RPS + Geodiverse Renewables	+6,643	+6,643	+8,899	+10,685	+11,280	+13,066

Surplus = (Green > 0 MW)

Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Stoplight Results for 2030 Summer Installed Gas-Fired Capacity Analysis Under Six Scenarios and Six Gas Cases (Ratable MW)

Scenario		Gas Case 1 Minimum Gas Capacity	Gas Case 2 Case 1 + LDC Peak Shaving	Gas Case 3 Case 2 + Pipeline Growth	Gas Case 4 Case 3 + Distrigas LNG	Gas Case 5 Case 3 + Offshore LNG	Gas Case 6 Maximum Gas Capacity
S1	RPS + Gas	+2,748	+2,748	+5,837	+7,623	+8,218	+10,004
S2	ISO Queue	+6,893	+6,893	+9,982	+11,768	+12,363	+14,149
S3	Renewables Plus	+6,893	+6,893	+9,982	+11,768	+12,363	+14,149
S4	No Retirements	+6,221	+6,221	+9,310	+11,096	+11,691	+13,477
S5	ACPs + Gas	+2,060	+2,060	+5,149	+6,935	+7,530	+9,316
S6	RPS + Geodiverse Renewables	+6,893	+6,893	+9,982	+11,768	+12,363	+14,149

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

STOPLIGHT DETAILS OF THE STUDY RESULTS: DISPATCHED GAS-FIRED CAPACITY ANALYSIS

STOPLIGHT LEGEND

Red Shading = Deficiencies Greater than -10,000 MW
Yellow Shading = Deficiencies Between -9,999 to 0 MW
Green Shading = Surplus Greater than 0 MW

Peak-Gas-Day Capacity and Energy Analysis

NEW

Stoplight Results for 2025 Winter Peak-Gas-Hour Dispatched Gas-Fired Capacity Analysis Under Six Scenarios and Six Gas Cases (Ratable MW)

Scenario		Gas Case 1 Minimum Gas Capacity	Gas Case 2 Case 1 + LDC Peak Shaving	Gas Case 3 Case 2 + Pipeline Growth	Gas Case 4 Case 3 + Distrigas LNG	Gas Case 5 Case 3 + Offshore LNG	Gas Case 6 Maximum Gas Capacity
S1	RPS + Gas	-8,586	-8,146	-5,890	-4,104	-3,509	-1,723
S2	ISO Queue	-8,518	-8,078	-5,822	-4,036	-3,441	-1,655
S3	Renewables Plus	-5,755	-5,315	-3,059	-1,273	-678	+1,108
S4	No Retirements	-7,839	-7,399	-5,143	-3,357	-2,762	-976
S5	ACPs + Gas	-8,456	-8,016	-5,760	-3,974	-3,379	-1,593
S6	RPS + Geodiverse Renewables	-8,440	-8,000	-5,744	-3,958	-3,363	-1,577

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Stoplight Results for 2030 Winter Peak-Gas-Hour Dispatched Gas-Fired Capacity Analysis Under Six Scenarios and Six Gas Cases (Ratable MW)

Scenario		Gas Case 1 Minimum Gas Capacity	Gas Case 2 Case 1 + LDC Peak Shaving	Gas Case 3 Case 2 + Pipeline Growth	Gas Case 4 Case 3 + Distrigas LNG	Gas Case 5 Case 3 + Offshore LNG	Gas Case 6 Maximum Gas Capacity
S1	RPS + Gas	-9,929	-9,340	-6,250	-4,465	-3,869	-2,084
S2	ISO Queue	-9,149	-8,560	-5,470	-3,685	-3,089	-1,304
S3	Renewables Plus	-5,256	-4,667	-1,577	+208	+804	+2,589
S4	No Retirements	-9,207	-8,618	-5,528	-3,743	-3,147	-1,362
S5	ACPs + Gas	-10,098	-9,509	-6,419	-4,634	-4,038	-2,253
S6	RPS + Geodiverse Renewables	-9,131	-8,542	-5,452	-3,667	-3,071	-1,286

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

STOPLIGHT DETAILS OF THE STUDY RESULTS: GAS-FIRED ENERGY GENERATION ANALYSIS

STOPLIGHT LEGEND

Red Shading = Deficiencies Greater than -10,000 MWh
Yellow Shading = Deficiencies Between -9,999 to 0 MWh
Green Shading = Surplus Greater than 0 MWh

Peak-Gas-Day Capacity and Energy Analysis

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Stoplight Results for 2025 Winter Gas-Fired Energy Generation Analysis Under Six Scenarios and Six Gas Cases (Ratable MWh)

Scenario		Gas Case 1 Minimum Gas Capacity	Gas Case 2 Case 1 + LDC Peak Shaving	Gas Case 3 Case 2 + Pipeline Growth	Gas Case 4 Case 3 + Distrigas LNG	Gas Case 5 Case 3 + Offshore LNG	Gas Case 6 Maximum Gas Capacity
S1	RPS + Gas	-8,586	-8,146	-5,890	-4,104	-3,509	-1,723
S2	ISO Queue	-8,518	-8,078	-5,822	-4,036	-3,441	-1,655
S3	Renewables Plus	-5,755	-5,315	-3,059	-1,273	-678	+1,108
S4	No Retirements	-7,839	-7,399	-5,143	-3,357	-2,762	-976
S5	ACPs + Gas	-8,456	-8,016	-5,760	-3,974	-3,379	-1,593
S6	RPS + Geodiverse Renewables	-8,440	-8,000	-5,744	-3,958	-3,363	-1,577

Surplus = (Green > 0 MWh)

Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Stoplight Results for 2030 Winter Gas-Fired Energy Generation Analysis Under Six Scenarios and Six Gas Cases (Ratable MWh)

Scenario		Gas Case 1 Minimum Gas Capacity	Gas Case 2 Case 1 + LDC Peak Shaving	Gas Case 3 Case 2 + Pipeline Growth	Gas Case 4 Case 3 + Distrigas LNG	Gas Case 5 Case 3 + Offshore LNG	Gas Case 6 Maximum Gas Capacity
S1	RPS + Gas	-9,929	-9,340	-6,250	-4,465	-3,869	-2,084
S2	ISO Queue	-9,149	-8,560	-5,470	-3,685	-3,089	-1,304
S3	Renewables Plus	-5,256	-4,667	-1,577	+208	+804	+2,589
S4	No Retirements	-9,207	-8,618	-5,528	-3,743	-3,147	-1,362
S5	ACPs + Gas	-10,098	-9,509	-6,419	-4,634	-4,038	-2,253
S6	RPS + Geodiverse Renewables	-9,131	-8,542	-5,452	-3,667	-3,071	-1,286

Surplus = (Green > 0 MWh)

Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Stoplight Results for 2025 Summer Peak-Gas-Hour Gas-Fired Energy Generation Analysis Under Six Scenarios and Six Gas Cases (Ratable MWh)

Scenario		Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
S1	RPS + Gas	+7,424	+7,424	+9,680	+11,466	+12,061	+13,847
S2	ISO Queue	+8,356	+8,356	+10,612	+12,398	+12,993	+14,779
S3	Renewables Plus	+12,903	+12,903	+15,159	+16,945	+17,540	+19,326
S4	No Retirements	+7,898	+7,898	+10,154	+11,940	+12,535	+14,321
S5	ACPs + Gas	+7,089	+7,089	+9,345	+11,131	+11,726	+13,512
S6	RPS + Geodiverse Renewables	+8,228	+8,228	+10,484	+12,270	+12,865	+14,651

Surplus = (Green > 0 MWh)
Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Peak-Gas-Day Capacity and Energy Analysis

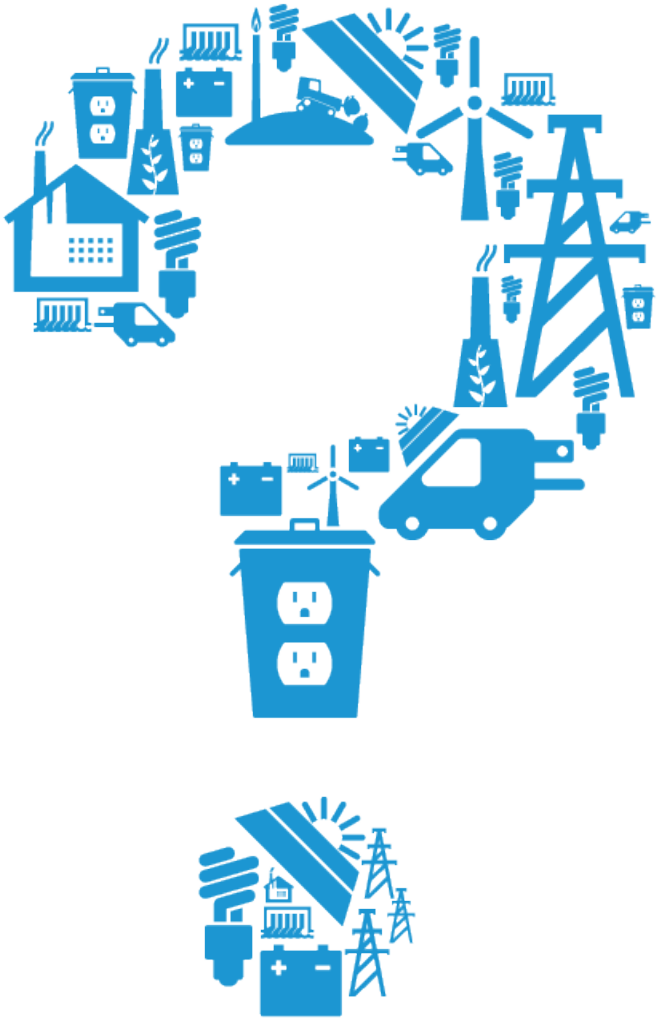
NEW

Stoplight Results for 2030 Summer Peak-Gas-Hour Gas-Fired Energy Generation Analysis Under Six Scenarios and Six Gas Cases (Ratable MWh)

Scenario		Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
S1	RPS + Gas	+6,431	+6,431	+9,520	+11,306	+11,901	+13,687
S2	ISO Queue	+8,643	+8,643	+11,732	+13,518	+14,113	+15,899
S3	Renewables Plus	+15,739	+15,739	+18,828	+20,614	+21,209	+22,995
S4	No Retirements	+7,510	+7,510	+10,599	+12,385	+12,980	+14,766
S5	ACPs + Gas	+6,025	+6,025	+9,114	+10,900	+11,495	+13,281
S6	RPS + Geodiverse Renewables	+12,300	+12,300	+15,389	+17,175	+17,770	+19,556

Surplus = (Green > 0 MWh)
Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Questions



APPENDICES

REVISIONS TO PRIOR ASSUMPTIONS & METHODOLOGY

Peak-Gas-Day Capacity and Energy Analysis

Revisions to Prior Assumptions and Methodology

- The following changes were made within the revised *"2016 Economic Study - Natural Gas Analysis - Assumptions and Methodology"* presentation which was recently posted on the PAC web site at the following location: ***https://www.iso-ne.com/static-assets/documents/2017/05/a3_2016_economic_study_natural_gas_system_capacity_and_energy_analysis_methodology_and_assumptions.pdf***

  - A sixth Scenario was added (S6 or RSP + Geodiverse Renewables)
  - Monthly peak-day LDC gas demand forecasts were used for each monthly profile versus the peak-load-exposure methodology
  - The maximum vaporization rate of Canaport LNG was increased, which resulted in elimination of the seasonal derations to the M&N pipeline
  - ICF Consulting revised (upward) the July peak-gas-day LDC demands

Peak-Gas-Day Capacity and Energy Analysis

Revisions to Prior Assumptions and Methodology – cont'd

- Winter is the 4 months of December – March (121 days)
- Summer is the 4 months of June – September (122 days)
- Off-Peak is the 4 months of October, November, April and May (122 days)
- Miscellaneous editorials, acronyms and clarifications were made
- Link to original "*2016 Economic Study - Natural Gas Analysis - Assumptions and Methodology,*" PAC presentation dated December 14, 2016 is located at: *https://www.iso-ne.com/static-assets/documents/2016/12/a6_2016_economic_study_natural_gas_system_capacity_and_energy_analysis_methodology_and_assumptions.pdf*

INSTALLED GAS-FIRED CAPACITY ANALYSIS CALCULATIONS AND RESULTS

Peak-Gas-Day Capacity and Energy Analysis | REVISED

Installed Gas-Fired Capacity Analysis Results

- Maximum **winter** peak-gas-day, installed gas-fired capacity deficiency:
  - -20,458 MW in Scenario 2030_S5 (ACPs + Gas) in Gas Case 1.
  - This value is equal to the installed capacity value in Scenario 5, because Gas Case 1 in 2030 has no spare winter capacity for electric sector use.
- Minimum **winter** peak-gas-day, installed gas-fired capacity deficiency:
  - -7,780 MW in Scenarios 2030_S2 (ISO Queue), 2030_S3 (Renewables Plus) and 2030_S6 (RPS + Geodiverse Renewables) in Gas Case 6.
- Maximum **summer** peak-gas-day, installed gas-fired capacity surplus:
  - +14,149 MW in Scenarios 2030_S2 (ISO Queue), 2030_S3 (Renewables Plus) and 2030_S6 (RSP + Geodiverse Renewables) in Gas Case 6.
- Minimum **summer** peak-gas-day, installed gas-fired capacity surplus:
  - +2,060 MW in Scenario 2030_S5 (ACPs + Gas) in Gas Cases 1 & 2.

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 1 - 2025 Winter Installed Gas-Fired Capacity Analysis: Deficiencies (Ratable MW)

Installed Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Winter Pipeline Surplus (Bcf/d)	0.172	0.246	0.625	0.925	1.025	1.325
Electrical Capacity Equivalent (MW/d)	1,024	1,464	3,720	5,506	6,101	7,887
Installed Gas-Fired Capacity (MW)	16,847	16,847	16,847	16,847	16,847	16,847
Installed Gas-Fired Capacity Deficiency (MW)	-15,823	-15,383	-13,127	-11,341	-10,746	-8,960

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 1 - 2030 Winter Installed Gas-Fired Capacity Analysis: Deficiencies (Ratable MW)

Installed Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Winter Pipeline Surplus (Bcf/d)	0.000	0.099	0.618	0.918	1.018	1.318
Electrical Capacity Equivalent (MW/d)	0	589	3,679	5,464	6,060	7,845
Installed Gas-Fired Capacity (MW)	19,770	19,770	19,770	19,770	19,770	19,770
Installed Gas-Fired Capacity Deficiency (MW)	-19,770	-19,181	-16,091	-14,306	-13,710	-11,925

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 2 - 2025 Winter Installed Gas-Fired Capacity Analysis: Deficiencies (Ratable MW)

Installed Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Winter Pipeline Surplus (Bcf/d)	0.172	0.246	0.625	0.925	1.025	1.325
Electrical Capacity Equivalent (MW/d)	1,024	1,464	3,720	5,506	6,101	7,887
Installed Gas-Fired Capacity (MW)	16,190	16,190	16,190	16,190	16,190	16,190
Installed Gas-Fired Capacity Deficiency (MW)	-15,166	-14,726	-12,470	-10,684	-10,089	-8,303

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 2 - 2030 Winter Installed Gas-Fired Capacity Analysis: Deficiencies (Ratable MW)

Installed Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Winter Pipeline Surplus (Bcf/d)	0.000	0.099	0.618	0.918	1.018	1.318
Electrical Capacity Equivalent (MW/d)	0	589	3,679	5,464	6,060	7,845
Installed Gas-Fired Capacity (MW)	15,625	15,625	15,625	15,625	15,625	15,625
Installed Gas-Fired Capacity Deficiency (MW)	-15,625	-15,036	-11,946	-10,161	-9,565	-7,780

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 3 - 2025 Winter Installed Gas-Fired Capacity Analysis: Deficiencies (Ratable MW)

Installed Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Winter Pipeline Surplus (Bcf/d)	0.172	0.246	0.625	0.925	1.025	1.325
Electrical Capacity Equivalent (MW/d)	1,024	1,464	3,720	5,506	6,101	7,887
Installed Gas-Fired Capacity (MW)	16,190	16,190	16,190	16,190	16,190	16,190
Installed Gas-Fired Capacity Deficiency (MW)	-15,166	-14,726	-12,470	-10,684	-10,089	-8,303

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 3 - 2030 Winter Installed Gas-Fired Capacity Analysis: Deficiencies (Ratable MW)

Installed Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Winter Pipeline Surplus (Bcf/d)	0.000	0.099	0.618	0.918	1.018	1.318
Electrical Capacity Equivalent (MW/d)	0	589	3,679	5,464	6,060	7,845
Installed Gas-Fired Capacity (MW)	15,625	15,625	15,625	15,625	15,625	15,625
Installed Gas-Fired Capacity Deficiency (MW)	-15,625	-15,036	-11,946	-10,161	-9,565	-7,780

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 4 - 2025 Winter Installed Gas-Fired Capacity Analysis: Deficiencies (Ratable MW)

Installed Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Winter Pipeline Surplus (Bcf/d)	0.172	0.246	0.625	0.925	1.025	1.325
Electrical Capacity Equivalent (MW/d)	1,024	1,464	3,720	5,506	6,101	7,887
Installed Gas-Fired Capacity (MW)	16,297	16,297	16,297	16,297	16,297	16,297
Installed Gas-Fired Capacity Deficiency (MW)	-15,273	-14,833	-12,577	-10,791	-10,196	-8,410

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 4 - 2030 Winter Installed Gas-Fired Capacity Analysis: Deficiencies (Ratable MW)

Installed Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Winter Pipeline Surplus (Bcf/d)	0.000	0.099	0.618	0.918	1.018	1.318
Electrical Capacity Equivalent (MW/d)	0	589	3,679	5,464	6,060	7,845
Installed Gas-Fired Capacity (MW)	16,297	16,297	16,297	16,297	16,297	16,297
Installed Gas-Fired Capacity Deficiency (MW)	-16,297	-15,708	-12,618	-10,833	-10,237	-8,452

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 5 - 2025 Winter Installed Gas-Fired Capacity Analysis: Deficiencies (Ratable MW)

Installed Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Winter Pipeline Surplus (Bcf/d)	0.172	0.246	0.625	0.925	1.025	1.325
Electrical Capacity Equivalent (MW/d)	1,024	1,464	3,720	5,506	6,101	7,887
Installed Gas-Fired Capacity (MW)	17,335	17,335	17,335	17,335	17,335	17,335
Installed Gas-Fired Capacity Deficiency (MW)	-16,311	-15,871	-13,615	-11,826	-11,234	-9,448

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 5 - 2030 Winter Installed Gas-Fired Capacity Analysis: Deficiencies (Ratable MW)

Installed Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Winter Pipeline Surplus (Bcf/d)	0.000	0.099	0.618	0.918	1.018	1.318
Electrical Capacity Equivalent (MW/d)	0	589	3,679	5,464	6,060	7,845
Installed Gas-Fired Capacity (MW)	20,458	20,458	20,458	20,458	20,458	20,458
Installed Gas-Fired Capacity Deficiency (MW)	-20,458	-19,869	-16,779	-14,994	-14,398	-12,613

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 6 - 2025 Winter Installed Gas-Fired Capacity Analysis: Deficiencies (Ratable MW)

Installed Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Winter Pipeline Surplus (Bcf/d)	0.172	0.246	0.625	0.925	1.025	1.325
Electrical Capacity Equivalent (MW/d)	1,024	1,464	3,720	5,506	6,101	7,887
Installed Gas-Fired Capacity (MW)	16,190	16,190	16,190	16,190	16,190	16,190
Installed Gas-Fired Capacity Deficiency (MW)	-15,166	-14,726	-12,470	-10,684	-10,089	-8,303

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 6 - 2030 Winter Installed Gas-Fired Capacity Analysis: Deficiencies (Ratable MW)

Installed Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Winter Pipeline Surplus (Bcf/d)	0.000	0.099	0.618	0.918	1.018	1.318
Electrical Capacity Equivalent (MW/d)	0	589	3,679	5,464	6,060	7,845
Installed Gas-Fired Capacity (MW)	15,625	15,625	15,625	15,625	15,625	15,625
Installed Gas-Fired Capacity Deficiency (MW)	-15,625	-15,036	-11,946	-10,161	-9,565	-7,780

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 1 -2025 Summer Installed Gas-Fired Capacity Analysis: Surpluses (Ratable MW)

Installed Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Summer Pipeline Surplus (Bcf/d)	3.836	3.836	4.215	4.515	4.615	4.915
Electrical Capacity Equivalent (MW/d)	22,833	22,833	25,089	26,875	27,470	29,256
Installed Gas-Fired Capacity (MW)	16,847	16,847	16,847	16,847	16,847	16,847
Installed Gas-Fired Capacity Surplus (MW)	+5,986	+5,986	+8,242	+10,028	+10,623	+12,409

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 1 -2030 Summer Installed Gas-Fired Capacity Analysis: Surpluses (Ratable MW)

Installed Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Summer Pipeline Surplus (Bcf/d)	3.783	3.783	4.302	4.602	4.702	5.002
Electrical Capacity Equivalent (MW/d)	22,518	22,518	25,607	27,393	27,988	29,774
Installed Gas-Fired Capacity (MW)	19,770	19,770	19,770	19,770	19,770	19,770
Installed Gas-Fired Capacity Surplus (MW)	+2,748	+2,748	+5,837	+7,623	+8,218	+10,004

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 2 -2025 Summer Installed Gas-Fired Capacity Analysis: Surpluses (Ratable MW)

Installed Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Summer Pipeline Surplus (Bcf/d)	3.836	3.836	4.215	4.515	4.615	4.915
Electrical Capacity Equivalent (MW/d)	22,833	22,833	25,089	26,875	27,470	29,256
Installed Gas-Fired Capacity (MW)	16,190	16,190	16,190	16,190	16,190	16,190
Installed Gas-Fired Capacity Surplus (MW)	+6,643	+6,643	+8,899	+10,685	+11,280	+13,066

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 2 -2030 Summer Installed Gas-Fired Capacity Analysis: Surpluses (Ratable MW)

Installed Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Summer Pipeline Surplus (Bcf/d)	3.783	3.783	4.302	4.602	4.702	5.002
Electrical Capacity Equivalent (MW/d)	22,518	22,518	25,607	27,393	27,988	29,774
Installed Gas-Fired Capacity (MW)	15,625	15,625	15,625	15,625	15,625	15,625
Installed Gas-Fired Capacity Surplus (MW)	+6,893	+6,893	+9,982	+11,768	+12,363	+14,149

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 3 -2025 Summer Installed Gas-Fired Capacity Analysis: Surpluses (Ratable MW)

Installed Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Summer Pipeline Surplus (Bcf/d)	3.836	3.836	4.215	4.515	4.615	4.915
Electrical Capacity Equivalent (MW/d)	22,833	22,833	25,089	26,875	27,470	29,256
Installed Gas-Fired Capacity (MW)	16,190	16,190	16,190	16,190	16,190	16,190
Installed Gas-Fired Capacity Surplus (MW)	+6,643	+6,643	+8,899	+10,685	+11,280	+13,066

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 3 -2030 Summer Installed Gas-Fired Capacity Analysis: Surpluses (Ratable MW)

Installed Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Summer Pipeline Surplus (Bcf/d)	3.783	3.783	4.302	4.602	4.702	5.002
Electrical Capacity Equivalent (MW/d)	22,518	22,518	25,607	27,393	27,988	29,774
Installed Gas-Fired Capacity (MW)	15,625	15,625	15,625	15,625	15,625	15,625
Installed Gas-Fired Capacity Surplus (MW)	+6,893	+6,893	+9,982	+11,768	+12,363	+14,149

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 4 -2025 Summer Installed Gas-Fired Capacity Analysis: Surpluses (Ratable MW)

Installed Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Summer Pipeline Surplus (Bcf/d)	3.836	3.836	4.215	4.515	4.615	4.915
Electrical Capacity Equivalent (MW/d)	22,833	22,833	25,089	26,875	27,470	29,256
Installed Gas-Fired Capacity (MW)	16,297	16,297	16,297	16,297	16,297	16,297
Installed Gas-Fired Capacity Surplus (MW)	+6,536	+6,536	+8,792	+10,578	+11,173	+12,959

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 4 -2030 Summer Installed Gas-Fired Capacity Analysis: Surpluses (Ratable MW)

Installed Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Summer Pipeline Surplus (Bcf/d)	3.783	3.783	4.302	4.602	4.702	5.002
Electrical Capacity Equivalent (MW/d)	22,518	22,518	25,607	27,393	27,988	29,774
Installed Gas-Fired Capacity (MW)	16,297	16,297	16,297	16,297	16,297	16,297
Installed Gas-Fired Capacity Surplus (MW)	+6,221	+6,221	+9,310	+11,096	+11,691	+13,477

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 5 -2025 Summer Installed Gas-Fired Capacity Analysis: Surpluses (Ratable MW)

Installed Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Summer Pipeline Surplus (Bcf/d)	3.836	3.836	4.215	4.515	4.615	4.915
Electrical Capacity Equivalent (MW/d)	22,833	22,833	25,089	26,875	27,470	29,256
Installed Gas-Fired Capacity (MW)	17,335	17,335	17,335	17,335	17,335	17,335
Installed Gas-Fired Capacity Surplus (MW)	+5,498	+5,498	+7,754	+9,540	+10,135	+11,921

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 5 -2030 Summer Installed Gas-Fired Capacity Analysis: Surpluses (Ratable MW)

Installed Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Summer Pipeline Surplus (Bcf/d)	3.783	3.783	4.302	4.602	4.702	5.002
Electrical Capacity Equivalent (MW/d)	22,518	22,518	25,607	27,393	27,988	29,774
Installed Gas-Fired Capacity (MW)	20,458	20,458	20,458	20,458	20,458	20,458
Installed Gas-Fired Capacity Surplus (MW)	+2,060	+2,060	+5,149	+6,935	+7,530	+9,316

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 6 -2025 Summer Installed Gas-Fired Capacity Analysis: Surpluses (Ratable MW)

Installed Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Summer Pipeline Surplus (Bcf/d)	3.836	3.836	4.215	4.515	4.615	4.915
Electrical Capacity Equivalent (MW/d)	22,833	22,833	25,089	26,875	27,470	29,256
Installed Gas-Fired Capacity (MW)	16,190	16,190	16,190	16,190	16,190	16,190
Installed Gas-Fired Capacity Surplus (MW)	+6,643	+6,643	+8,899	+10,685	+11,280	+13,066

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 6 -2030 Summer Installed Gas-Fired Capacity Analysis: Surpluses (Ratable MW)

Installed Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Summer Pipeline Surplus (Bcf/d)	3.783	3.783	4.302	4.602	4.702	5.002
Electrical Capacity Equivalent (MW/d)	22,518	22,518	25,607	27,393	27,988	29,774
Installed Gas-Fired Capacity (MW)	15,625	15,625	15,625	15,625	15,625	15,625
Installed Gas-Fired Capacity Surplus (MW)	+6,893	+6,893	+9,982	+11,768	+12,363	+14,149

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

WINTER DISPATCHED GAS-FIRED CAPACITY ANALYSIS CALCULATIONS AND RESULTS

Winter Peak-Gas-Hour Dispatched Gas-Fired Capacity Analysis Results

- Maximum dispatched gas-fired capacity is +10,098 MW or 49.3% in 2030_S5 (ACPs + Gas) out of 20,458 MW installed gas-fired capacity:
  - Due to no spare gas system capacity in Gas Case 1 in 2030, the maximum dispatched gas-fired capacity deficiency is (the same) -10,098 MW.
- Minimum dispatched gas-fired capacity is +5,256 MW or 33.6% in 2030_S3 (Renewable Plus) out of 15,625 MW installed gas-fired capacity.
  - Due to large amounts of spare gas system capacity in Gas Case 6 in 2030, the maximum dispatched gas-fired capacity surpluses is +2,589 MW.
- In most Scenarios, **winter** dispatched gas-fired capacity is the same within the constrained and unconstrained transmission cases.

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 1 – 2025 Winter Peak-Gas-Hour Dispatched Gas-Fired Capacity Analysis (Ratable MW)

Dispatched Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Winter Gas-System Surplus (Bcf/d)	0.172	0.246	0.625	0.925	1.025	1.325
Electrical Capacity Equivalent (MW)	1,024	1,464	3,720	5,506	6,101	7,887
Dispatched Gas-Fired Capacity (MW)	9,610	9,610	9,610	9,610	9,610	9,610
Dispatched Gas-Fired Capacity Deficiency/Surplus (MW)	-8,586	-8,146	-5,890	-4,104	-3,509	-1,723

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 1 – 2030 Winter Peak-Gas-Hour Dispatched Gas-Fired Capacity Analysis (Ratable MW)

Dispatched Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Winter Gas-System Surplus (Bcf/d)	0.000	0.099	0.618	0.918	1.018	1.318
Electrical Capacity Equivalent (MW)	0	589	3,679	5,464	6,060	7,845
Dispatched Gas-Fired Capacity (MW)	9,929	9,929	9,929	9,929	9,929	9,929
Dispatched Gas-Fired Capacity Deficiency/Surplus (MW)	-9,929	-9,340	-6,250	-4,465	-3,869	-2,084

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 2 – 2025 Winter Peak-Gas-Hour Dispatched Gas-Fired Capacity Analysis (Ratable MW)

Dispatched Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Winter Gas-System Surplus (Bcf/d)	0.172	0.246	0.625	0.925	1.025	1.325
Electrical Capacity Equivalent (MW)	1,024	1,464	3,720	5,506	6,101	7,887
Dispatched Gas-Fired Capacity (MW)	9,542	9,542	9,542	9,542	9,542	9,542
Dispatched Gas-Fired Capacity Deficiency/Surplus (MW)	-8,518	-8,078	-5,822	-4,036	-3,441	-1,655

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 2 – 2030 Winter Peak-Gas-Hour Dispatched Gas-Fired Capacity Analysis (Ratable MW)

Dispatched Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Winter Gas-System Surplus (Bcf/d)	0.000	0.099	0.618	0.918	1.018	1.318
Electrical Capacity Equivalent (MW)	0	589	3,679	5,464	6,060	7,845
Dispatched Gas-Fired Capacity (MW)	9,149	9,149	9,149	9,149	9,149	9,149
Dispatched Gas-Fired Capacity Deficiency/Surplus (MW)	-9,149	-8,560	-5,470	-3,685	-3,089	-1,304

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 3 – 2025 Winter Peak-Gas-Hour Dispatched Gas-Fired Capacity Analysis (Ratable MW)

Dispatched Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Winter Gas-System Surplus (Bcf/d)	0.172	0.246	0.625	0.925	1.025	1.325
Electrical Capacity Equivalent (MW)	1,024	1,464	3,720	5,506	6,101	7,887
Dispatched Gas-Fired Capacity (MW)	6,779	6,779	6,779	6,779	6,779	6,779
Dispatched Gas-Fired Capacity Deficiency/Surplus (MW)	-5,755	-5,315	-3,059	-1,273	-678	+1,108

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 3 – 2030 Winter Peak-Gas-Hour Dispatched Gas-Fired Capacity Analysis (Ratable MW)

Dispatched Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Winter Gas-System Surplus (Bcf/d)	0.000	0.099	0.618	0.918	1.018	1.318
Electrical Capacity Equivalent (MW)	0	589	3,679	5,464	6,060	7,845
Dispatched Gas-Fired Capacity (MW)	5,256	5,256	5,256	5,256	5,256	5,256
Dispatched Gas-Fired Capacity Deficiency/Surplus (MW)	-5,256	-4,667	-1,577	+208	+804	+2,589

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 4 – 2025 Winter Peak-Gas-Hour Dispatched Gas-Fired Capacity Analysis (Ratable MW)

Dispatched Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Winter Gas-System Surplus (Bcf/d)	0.172	0.246	0.625	0.925	1.025	1.325
Electrical Capacity Equivalent (MW)	1,024	1,464	3,720	5,506	6,101	7,887
Dispatched Gas-Fired Capacity (MW)	8,863	8,863	8,863	8,863	8,863	8,863
Dispatched Gas-Fired Capacity Deficiency/Surplus (MW)	-7,839	-7,399	-5,143	-3,357	-2,762	-976

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 4 – 2030 Winter Peak-Gas-Hour Dispatched Gas-Fired Capacity Analysis (Ratable MW)

Dispatched Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Winter Gas-System Surplus (Bcf/d)	0.000	0.099	0.618	0.918	1.018	1.318
Electrical Capacity Equivalent (MW)	0	589	3,679	5,464	6,060	7,845
Dispatched Gas-Fired Capacity (MW)	9,207	9,207	9,207	9,207	9,207	9,207
Dispatched Gas-Fired Capacity Deficiency/Surplus (MW)	-9,207	-8,618	-5,528	-3,743	-3,147	-1,362

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 5 – 2025 Winter Peak-Gas-Hour Dispatched Gas-Fired Capacity Analysis (Ratable MW)

Dispatched Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Winter Gas-System Surplus (Bcf/d)	0.172	0.246	0.625	0.925	1.025	1.325
Electrical Capacity Equivalent (MW)	1,024	1,464	3,720	5,506	6,101	7,887
Dispatched Gas-Fired Capacity (MW)	9,480	9,480	9,480	9,480	9,480	9,480
Dispatched Gas-Fired Capacity Deficiency/Surplus (MW)	-8,456	-8,016	-5,760	-3,974	-3,379	-1,593

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 5 – 2030 Winter Peak-Gas-Hour Dispatched Gas-Fired Capacity Analysis (Ratable MW)

Dispatched Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Winter Gas-System Surplus (Bcf/d)	0.000	0.099	0.618	0.918	1.018	1.318
Electrical Capacity Equivalent (MW)	0	589	3,679	5,464	6,060	7,845
Dispatched Gas-Fired Capacity (MW)	10,098	10,098	10,098	10,098	10,098	10,098
Dispatched Gas-Fired Capacity Deficiency/Surplus (MW)	-10,098	-9,509	-6,419	-4,634	-4,038	-2,253

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 6 – 2025 Winter Peak-Gas-Hour Dispatched Gas-Fired Capacity Analysis (Ratable MW)

Dispatched Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Winter Gas-System Surplus (Bcf/d)	0.172	0.246	0.625	0.925	1.025	1.325
Electrical Capacity Equivalent (MW)	1,024	1,464	3,720	5,506	6,101	7,887
Dispatched Gas-Fired Capacity (MW)	9,464	9,464	9,464	9,464	9,464	9,464
Dispatched Gas-Fired Capacity Deficiency/Surplus (MW)	-8,440	-8,000	-5,744	-3,958	-3,363	-1,577

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 6 – 2030 Winter Peak-Gas-Hour Dispatched Gas-Fired Capacity Analysis (Ratable MW)

Dispatched Gas-Fired Capacity Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
Winter Gas-System Surplus (Bcf/d)	0.000	0.099	0.618	0.918	1.018	1.318
Electrical Capacity Equivalent (MW)	0	589	3,679	5,464	6,060	7,845
Dispatched Gas-Fired Capacity (MW)	9,131	9,131	9,131	9,131	9,131	9,131
Dispatched Gas-Fired Capacity Deficiency/Surplus (MW)	-9,131	-8,542	-5,452	-3,667	-3,071	-1,286

Surplus = (Green > 0 MW)
Deficiency = (Red > -10,000 MW) and (Yellow = -9,999 MW to 0 MW)

GAS-FIRED ENERGY GENERATION ANALYSIS CALCULATIONS AND RESULTS

Gas-Fired Energy Generation Analysis Results

- Maximum **winter** peak-gas-hour, gas-fired energy deficiency:
  - -10,098 MWh in Scenario 2030_S5 (ACPs + Gas) in Gas Case 1.
- Maximum **winter** peak-gas-hour, gas-fired energy surplus:
  - +2,589 MWh in Scenarios 2030_S3 (Renewables Plus) in Gas Case 6.
- Maximum **summer** peak-gas-hour, gas-fired energy surplus:
  - +22,995 MWh in Scenarios 2030_S3 (Renewables Plus) in Gas Case 6.
- Minimum **summer** peak-gas-hour, gas-fired energy surplus:
  - +6,025 MWh in Scenario 2030_S5 (ACPs + Gas) in Gas Cases 1.

Peak-Gas-Day Capacity and Energy Analysis

REVISED

2025 Maximum Hourly Gas-Fired Energy Production in Six NEPOOL Scenarios

	RPS + Gas	ISO Queue	Renewables +	No Retirements	ACPs + Gas	RPS + Renewables
	2025_S1	2025_S2	2025_S3	2025_S4	2025_S5	2025_S6
Winter Maximum Hourly Gas-Fired Energy (MWh)	9,610	9,542	6,779	8,863	9,480	9,464
Summer Maximum Hourly Gas-Fired Energy (MWh)	15,409	14,477	9,930	14,935	15,744	14,605

Peak-Gas-Day Capacity and Energy Analysis

REVISED

2030 Maximum Hourly Gas-Fired Energy Production in Six NEPOOL Scenarios

	RPS + Gas	ISO Queue	Renewables +	No Retirements	ACPs + Gas	RPS + Renewables
	2030_S1	2030_S2	2030_S3	2030_S4	2030_S5	2030_S6
Winter Maximum Hourly Gas-Fired Energy (MWh)	9,929	9,149	5,256	9,207	10,098	9,131
Summer Maximum Hourly Gas-Fired Energy (MWh)	16,087	13,875	6,779	15,008	16,493	10,218

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 1 - 2025 Winter Gas-Fired Energy Generation Analysis: Surplus / Deficiency (Ratable MWh)

Gas-Fired Energy Generation Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
2025 Winter Gas-System Capacity Surplus (Bcf/d)	0.172	0.246	0.625	0.925	1.025	1.325
2025 Winter Gas-System Energy Equivalent (MWhr/d)	24,576	35,136	89,280	132,144	146,424	189,288
2025 Winter Gas-System Peak-Hour Energy Equivalent (MWh)	1,024	1,464	3,720	5,506	6,101	7,887
2025 Gas-Fired Winter Peak-Hour Energy Requirement (MWh)	9,610	9,610	9,610	9,610	9,610	9,610
2025 Gas-Fired, Peak-Hour, Energy Surplus/Deficiency (MWh)	-8,586	-8,146	-5,890	-4,104	-3,509	-1,723

Surplus = (Green > 0 MWh)
Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 1 - 2030 Winter Gas-Fired Energy Generation Analysis: Surplus / Deficiency (Ratable MWh)

Gas-Fired Energy Generation Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
2030 Winter Gas-System Capacity Surplus (Bcf/d)	0.000	0.099	0.618	0.918	1.018	1.318
2030 Winter Gas-System Energy Equivalent (MWhr/d)	0	14,136	88,296	131,136	145,429	188,280
2030 Winter Gas-System Peak-Hour Energy Equivalent (MWh)	0	589	3,679	5,464	6,060	7,845
2030 Gas-Fired Winter Peak-Hour Energy Requirement (MWh)	9,929	9,929	9,929	9,929	9,929	9,929
2030 Gas-Fired, Peak-Hour, Energy Surplus/Deficiency (MWh)	-9,929	-9,340	-6,250	-4,465	-3,869	-2,084

Surplus = (Green > 0 MWh)
Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 2 - 2025 Winter Gas-Fired Energy Generation Analysis: Surplus / Deficiency (Ratable MWh)

Gas-Fired Energy Generation Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
2025 Winter Gas-System Capacity Surplus (Bcf/d)	0.172	0.246	0.625	0.925	1.025	1.325
2025 Winter Gas-System Energy Equivalent (MWhr/d)	24,576	35,136	89,280	132,144	146,424	189,288
2025 Winter Gas-System Peak-Hour Energy Equivalent (MWh)	1,024	1,464	3,720	5,506	6,101	7,887
2025 Gas-Fired Winter Peak-Hour Energy (MWh)	9,542	9,542	9,542	9,542	9,542	9,542
2025 Gas-Fired, Peak-Hour, Energy Surplus/Deficiency (MWh)	-8,518	-8,078	-5,822	-4,036	-3,441	-1,655

Surplus = (Green > 0 MWh)
Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 2 - 2030 Winter Gas-Fired Energy Generation Analysis: Surplus / Deficiency (Ratable MWh)

Gas-Fired Energy Generation Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
2030 Winter Gas-System Capacity Surplus (Bcf/d)	0.000	0.099	0.618	0.918	1.018	1.318
2030 Winter Gas-System Energy Equivalent (MWhr/d)	0	14,136	88,296	131,136	145,429	188,280
2030 Winter Gas-System Peak-Hour Energy Equivalent (MWh)	0	589	3,679	5,464	6,060	7,845
2030 Gas-Fired Winter Peak-Hour Energy (MWh)	9,149	9,149	9,149	9,149	9,149	9,149
2030 Gas-Fired, Peak-Hour, Energy Surplus/Deficiency (MWh)	-9,149	-8,560	-5,470	-3,685	-3,089	-1,304

Surplus = (Green > 0 MWh)
Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 3 - 2025 Winter Gas-Fired Energy Generation Analysis: Surplus / Deficiency (Ratable MWh)

Gas-Fired Energy Generation Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
2025 Winter Gas-System Capacity Surplus (Bcf/d)	0.172	0.246	0.625	0.925	1.025	1.325
2025 Winter Gas-System Energy Equivalent (MWhr/d)	24,576	35,136	89,280	132,144	146,424	189,288
2025 Winter Gas-System Peak-Hour Energy Equivalent (MWh)	1,024	1,464	3,720	5,506	6,101	7,887
2025 Gas-Fired Winter Peak-Hour Energy (MWh)	6,779	6,779	6,779	6,779	6,779	6,779
2025 Gas-Fired, Peak-Hour, Energy Surplus/Deficiency (MWh)	-5,755	-5,315	-3,059	-1,273	-678	+1,108

Surplus = (Green > 0 MWh)
Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 3 - 2030 Winter Gas-Fired Energy Generation Analysis: Surplus / Deficiency (Ratable MWh)

Gas-Fired Energy Generation Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
2030 Winter Gas-System Capacity Surplus (Bcf/d)	0.000	0.099	0.618	0.918	1.018	1.318
2030 Winter Gas-System Energy Equivalent (MWhr/d)	0	14,136	88,296	131,136	145,429	188,280
2030 Winter Gas-System Peak-Hour Energy Equivalent (MWh)	0	589	3,679	5,464	6,060	7,845
2030 Gas-Fired Winter Peak-Hour Energy (MWh)	5,256	5,256	5,256	5,256	5,256	5,256
2030 Gas-Fired, Peak-Hour, Energy Surplus/Deficiency (MWh)	-5,256	-4,667	-1,577	+208	+804	+2,589

Surplus = (Green > 0 MWh)
Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 4 - 2025 Winter Gas-Fired Energy Generation Analysis: Surplus / Deficiency (Ratable MWh)

Gas-Fired Energy Generation Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
2025 Winter Gas-System Capacity Surplus (Bcf/d)	0.172	0.246	0.625	0.925	1.025	1.325
2025 Winter Gas-System Energy Equivalent (MWhr/d)	24,576	35,136	89,280	132,144	146,424	189,288
2025 Winter Gas-System Peak-Hour Energy Equivalent (MWh)	1,024	1,464	3,720	5,506	6,101	7,887
2025 Gas-Fired Winter Peak-Hour Energy (MWh)	8,863	8,863	8,863	8,863	8,863	8,863
2025 Gas-Fired, Peak-Hour, Energy Surplus/Deficiency (MWh)	-7,839	-7,399	-5,143	-3,357	-2,762	-976

Surplus = (Green > 0 MWh)
Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 4 - 2030 Winter Gas-Fired Energy Generation Analysis: Surplus / Deficiency (Ratable MWh)

Gas-Fired Energy Generation Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
2030 Winter Gas-System Capacity Surplus (Bcf/d)	0.000	0.099	0.618	0.918	1.018	1.318
2030 Winter Gas-System Energy Equivalent (MWhr/d)	0	14,136	88,296	131,136	145,429	188,280
2030 Winter Gas-System Peak-Hour Energy Equivalent (MWh)	0	589	3,679	5,464	6,060	7,845
2030 Gas-Fired Winter Peak-Hour Energy (MWh)	9,207	9,207	9,207	9,207	9,207	9,207
2030 Gas-Fired, Peak-Hour, Energy Surplus/Deficiency (MWh)	-9,207	-8,618	-5,528	-3,743	-3,147	-1,362

Surplus = (Green > 0 MWh)
Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 5 - 2025 Winter Gas-Fired Energy Generation Analysis: Surplus / Deficiency (Ratable MWh)

Gas-Fired Energy Generation Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
2025 Winter Gas-System Capacity Surplus (Bcf/d)	0.172	0.246	0.625	0.925	1.025	1.325
2025 Winter Gas-System Energy Equivalent (MWhr/d)	24,576	35,136	89,280	132,144	146,424	189,288
2025 Winter Gas-System Peak-Hour Energy Equivalent (MWh)	1,024	1,464	3,720	5,506	6,101	7,887
2025 Gas-Fired Winter Peak-Hour Energy (MWh)	9,480	9,480	9,480	9,480	9,480	9,480
2025 Gas-Fired, Peak-Hour, Energy Surplus/Deficiency (MWh)	-8,456	-8,016	-5,760	-3,974	-3,379	-1,593

Surplus = (Green > 0 MWh)
Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 5 - 2030 Winter Gas-Fired Energy Generation Analysis: Surplus / Deficiency (Ratable MWh)

Gas-Fired Energy Generation Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
2030 Winter Gas-System Capacity Surplus (Bcf/d)	0.000	0.099	0.618	0.918	1.018	1.318
2030 Winter Gas-System Energy Equivalent (MWhr/d)	0	14,136	88,296	131,136	145,429	188,280
2030 Winter Gas-System Peak-Hour Energy Equivalent (MWh)	0	589	3,679	5,464	6,060	7,845
2030 Gas-Fired Winter Peak-Hour Energy (MWh)	10,098	10,098	10,098	10,098	10,098	10,098
2030 Gas-Fired, Peak-Hour, Energy Surplus/Deficiency (MWh)	-10,098	-9,509	-6,419	-4,634	-4,038	-2,253

Surplus = (Green > 0 MWh)
Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 6 - 2025 Winter Gas-Fired Energy Generation Analysis: Surplus / Deficiency (Ratable MWh)

Gas-Fired Energy Generation Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
2025 Winter Gas-System Capacity Surplus (Bcf/d)	0.172	0.246	0.625	0.925	1.025	1.325
2025 Winter Gas-System Energy Equivalent (MWhr/d)	24,576	35,136	89,280	132,144	146,424	189,288
2025 Winter Gas-System Peak-Hour Energy Equivalent (MWh)	1,024	1,464	3,720	5,506	6,101	7,887
2025 Gas-Fired Winter Peak-Hour Energy (MWh)	9,464	9,464	9,464	9,464	9,464	9,464
2025 Gas-Fired, Peak-Hour, Energy Surplus/Deficiency (MWh)	-8,440	-8,000	-5,744	-3,958	-3,363	-1,577

Surplus = (Green > 0 MWh)
Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 6 - 2030 Winter Gas-Fired Energy Generation Analysis: Surplus / Deficiency (Ratable MWh)

Gas-Fired Energy Generation Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
2030 Winter Gas-System Capacity Surplus (Bcf/d)	0.000	0.099	0.618	0.918	1.018	1.318
2030 Winter Gas-System Energy Equivalent (MWhr/d)	0	14,136	88,296	131,136	145,429	188,280
2030 Winter Gas-System Peak-Hour Energy Equivalent (MWh)	0	589	3,679	5,464	6,060	7,845
2030 Gas-Fired Winter Peak-Hour Energy (MWh)	9,131	9,131	9,131	9,131	9,131	9,131
2030 Gas-Fired, Peak-Hour, Energy Surplus/Deficiency (MWh)	-9,131	-8,542	-5,452	-3,667	-3,071	-1,285

Surplus = (Green > 0 MWh)
Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 1-2025 Summer Gas-Fired Energy Generation Analysis: Surplus / Deficiency (Ratable MWh)

Gas-Fired Energy Generation Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
2025 Summer Gas-System Capacity Surplus (Bcf/d)	3.836	3.836	4.215	4.515	4.615	4.915
2025 Summer Gas-System Energy Equivalent (MWhr/d)	547,992	547,992	602,136	645,000	659,280	702,144
2025 Summer Gas-System Peak-Hour Energy Equivalent (MWh)	22,833	22,833	25,089	26,875	27,470	29,256
2025 Gas-Fired Summer Peak-Hour Energy (MWh)	15,409	15,409	15,409	15,409	15,409	15,409
2025 Gas-Fired, Peak-Hour, Energy Surplus/Deficiency (MWh)	+7,424	+7,424	+9,680	+11,466	+12,061	+13,847

Surplus = (Green > 0 MWh)
Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 1-2030 Summer Gas-Fired Energy Generation Analysis: Surplus / Deficiency (Ratable MWh)

Gas-Fired Energy Generation Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
2030 Summer Gas-System Capacity Surplus (Bcf/d)	3.783	3.783	4.302	4.602	4.702	5.002
2030 Summer Gas-System Energy Equivalent (MWhr/d)	540,432	540,432	614,568	657,432	671,712	714,576
2030 Summer Gas-System Peak-Hour Energy Equivalent (MWh)	22,518	22,518	25,607	27,393	27,988	29,774
2030 Gas-Fired Summer Peak-Hour Energy (MWh)	16,087	16,087	16,087	16,087	16,087	16,087
2030 Gas-Fired, Peak-Hour, Energy Surplus/Deficiency (MWh)	+6,431	+6,431	+9,520	+11,306	+11,901	+13,687

Surplus = (Green > 0 MWh)
Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 2-2025 Summer Gas-Fired Energy Generation Analysis: Surplus / Deficiency (Ratable MWh)

Gas-Fired Energy Generation Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
2025 Summer Gas-System Capacity Surplus (Bcf/d)	3.836	3.836	4.215	4.515	4.615	4.915
2025 Summer Gas-System Energy Equivalent (MWhr/d)	547,992	547,992	602,136	645,000	659,280	702,144
2025 Summer Gas-System Peak-Hour Energy Equivalent (MWh)	22,833	22,833	25,089	26,875	27,470	29,256
2025 Gas-Fired Summer Peak-Hour Energy (MWh)	14,477	14,477	14,477	14,477	14,477	14,477
2025 Gas-Fired, Peak-Hour, Energy Surplus/Deficiency (MWh)	+8,356	+8,356	+10,612	+12,398	+12,993	+14,779

Surplus = (Green > 0 MWh)
Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 2-2030 Summer Gas-Fired Energy Generation Analysis: Surplus / Deficiency (Ratable MWh)

Gas-Fired Energy Generation Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
2030 Summer Gas-System Capacity Surplus (Bcf/d)	3.783	3.783	4.302	4.602	4.702	5.002
2030 Summer Gas-System Energy Equivalent (MWhr/d)	540,432	540,432	614,568	657,432	671,712	714,576
2030 Summer Gas-System Peak-Hour Energy Equivalent (MWh)	22,518	22,518	25,607	27,393	27,988	29,774
2030 Gas-Fired Summer Peak-Hour Energy (MWh)	13,875	13,875	13,875	13,875	13,875	13,875
2030 Gas-Fired, Peak-Hour, Energy Surplus/Deficiency (MWh)	+8,643	+8,643	+11,732	+13,518	+14,113	+15,899

Surplus = (Green > 0 MWh)
Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 3-2025 Summer Gas-Fired Energy Generation Analysis: Surplus / Deficiency (Ratable MWh)

Gas-Fired Energy Generation Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
2025 Summer Gas-System Capacity Surplus (Bcf/d)	3.836	3.836	4.215	4.515	4.615	4.915
2025 Summer Gas-System Energy Equivalent (MWhr/d)	547,992	547,992	602,136	645,000	659,280	702,144
2025 Summer Gas-System Peak-Hour Energy Equivalent (MWh)	22,833	22,833	25,089	26,875	27,470	29,256
2025 Gas-Fired Summer Peak-Hour Energy (MWh)	9,930	9,930	9,930	9,930	9,930	9,930
2025 Gas-Fired, Peak-Hour, Energy Surplus/Deficiency (MWh)	+12,903	+12,903	+15,159	+16,945	+17,540	+19,326

Surplus = (Green > 0 MWh)
Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 3-2030 Summer Gas-Fired Energy Generation Analysis: Surplus / Deficiency (Ratable MWh)

Gas-Fired Energy Generation Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
2030 Summer Gas-System Capacity Surplus (Bcf/d)	3.783	3.783	4.302	4.602	4.702	5.002
2030 Summer Gas-System Energy Equivalent (MWhr/d)	540,432	540,432	614,568	657,432	671,712	714,576
2030 Summer Gas-System Peak-Hour Energy Equivalent (MWh)	22,518	22,518	25,607	27,393	27,988	29,774
2030 Gas-Fired Summer Peak-Hour Energy (MWh)	6,779	6,779	6,779	6,779	6,779	6,779
2030 Gas-Fired, Peak-Hour, Energy Surplus/Deficiency (MWh)	+15,739	+15,739	+18,828	+20,614	+21,209	+22,995

Surplus = (Green > 0 MWh)
Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 4-2025 Summer Gas-Fired Energy Generation Analysis: Surplus / Deficiency (Ratable MWh)

Gas-Fired Energy Generation Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
2025 Summer Gas-System Capacity Surplus (Bcf/d)	3.836	3.836	4.215	4.515	4.615	4.915
2025 Summer Gas-System Energy Equivalent (MWhr/d)	547,992	547,992	602,136	645,000	659,280	702,144
2025 Summer Gas-System Peak-Hour Energy Equivalent (MWh)	22,833	22,833	25,089	26,875	27,470	29,256
2025 Gas-Fired Summer Peak-Hour Energy (MWh)	14,935	14,935	14,935	14,935	14,935	14,935
2025 Gas-Fired, Peak-Hour, Energy Surplus/Deficiency (MWh)	+7,898	+7,898	+10,154	+11,940	+12,535	+14,321

Surplus = (Green > 0 MWh)
Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 4-2030 Summer Gas-Fired Energy Generation Analysis: Surplus / Deficiency (Ratable MWh)

Gas-Fired Energy Generation Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
2030 Summer Gas-System Capacity Surplus (Bcf/d)	3.783	3.783	4.302	4.602	4.702	5.002
2030 Summer Gas-System Energy Equivalent (MWhr/d)	540,432	540,432	614,568	657,432	671,712	714,576
2030 Summer Gas-System Peak-Hour Energy Equivalent (MWh)	22,518	22,518	25,607	27,393	27,988	29,774
2030 Gas-Fired Summer Peak-Hour Energy (MWh)	15,008	15,008	15,008	15,008	15,008	15,008
2030 Gas-Fired, Peak-Hour, Energy Surplus/Deficiency (MWh)	+7,510	+7,510	+10,599	+12,385	+12,980	+14,766

Surplus = (Green > 0 MWh)
Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 5-2025 Summer Gas-Fired Energy Generation Analysis: Surplus / Deficiency (Ratable MWh)

Gas-Fired Energy Generation Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
2025 Summer Gas-System Capacity Surplus (Bcf/d)	3.836	3.836	4.215	4.515	4.615	4.915
2025 Summer Gas-System Energy Equivalent (MWhr/d)	547,992	547,992	602,136	645,000	659,280	702,144
2025 Summer Gas-System Peak-Hour Energy Equivalent (MWh)	22,833	22,833	25,089	26,875	27,470	29,256
2025 Gas-Fired Summer Peak-Hour Energy (MWh)	15,744	15,744	15,744	15,744	15,744	15,744
2025 Gas-Fired, Peak-Hour, Energy Surplus/Deficiency (MWh)	+7,089	+7,089	+9,345	+11,131	+11,726	+13,512

Surplus = (Green > 0 MWh)
Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 5-2030 Summer Gas-Fired Energy Generation Analysis: Surplus / Deficiency (Ratable MWh)

Gas-Fired Energy Generation Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
2030 Summer Gas-System Capacity Surplus (Bcf/d)	3.783	3.783	4.302	4.602	4.702	5.002
2030 Summer Gas-System Energy Equivalent (MWhr/d)	540,432	540,432	614,568	657,432	671,712	714,576
2030 Summer Gas-System Peak-Hour Energy Equivalent (MWh)	22,518	22,518	25,607	27,393	27,988	29,774
2030 Gas-Fired Summer Peak-Hour Energy (MWh)	16,493	16,493	16,493	16,493	16,493	16,493
2030 Gas-Fired, Peak-Hour, Energy Surplus/Deficiency (MWh)	+6,025	+6,025	+9,114	+10,900	+11,495	+13,281

Surplus = (Green > 0 MWh)
Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Peak-Gas-Day Capacity and Energy Analysis

NEW

Scenario 6-2025 Summer Gas-Fired Energy Generation Analysis: Surplus / Deficiency (Ratable MWh)

Gas-Fired Energy Generation Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
2025 Summer Gas-System Capacity Surplus (Bcf/d)	3.836	3.836	4.215	4.515	4.615	4.915
2025 Summer Gas-System Energy Equivalent (MWhr/d)	547,992	547,992	602,136	645,000	659,280	702,144
2025 Summer Gas-System Peak-Hour Energy Equivalent (MWh)	22,833	22,833	25,089	26,875	27,470	29,256
2025 Gas-Fired Summer Peak-Hour Energy (MWh)	14,605	14,605	14,605	14,605	14,605	14,605
2025 Gas-Fired, Peak-Hour, Energy Surplus/Deficiency (MWh)	+8,228	+8,228	+10,484	+12,270	+12,865	+14,651

Surplus = (Green > 0 MWh)
Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Peak-Gas-Day Capacity and Energy Analysis

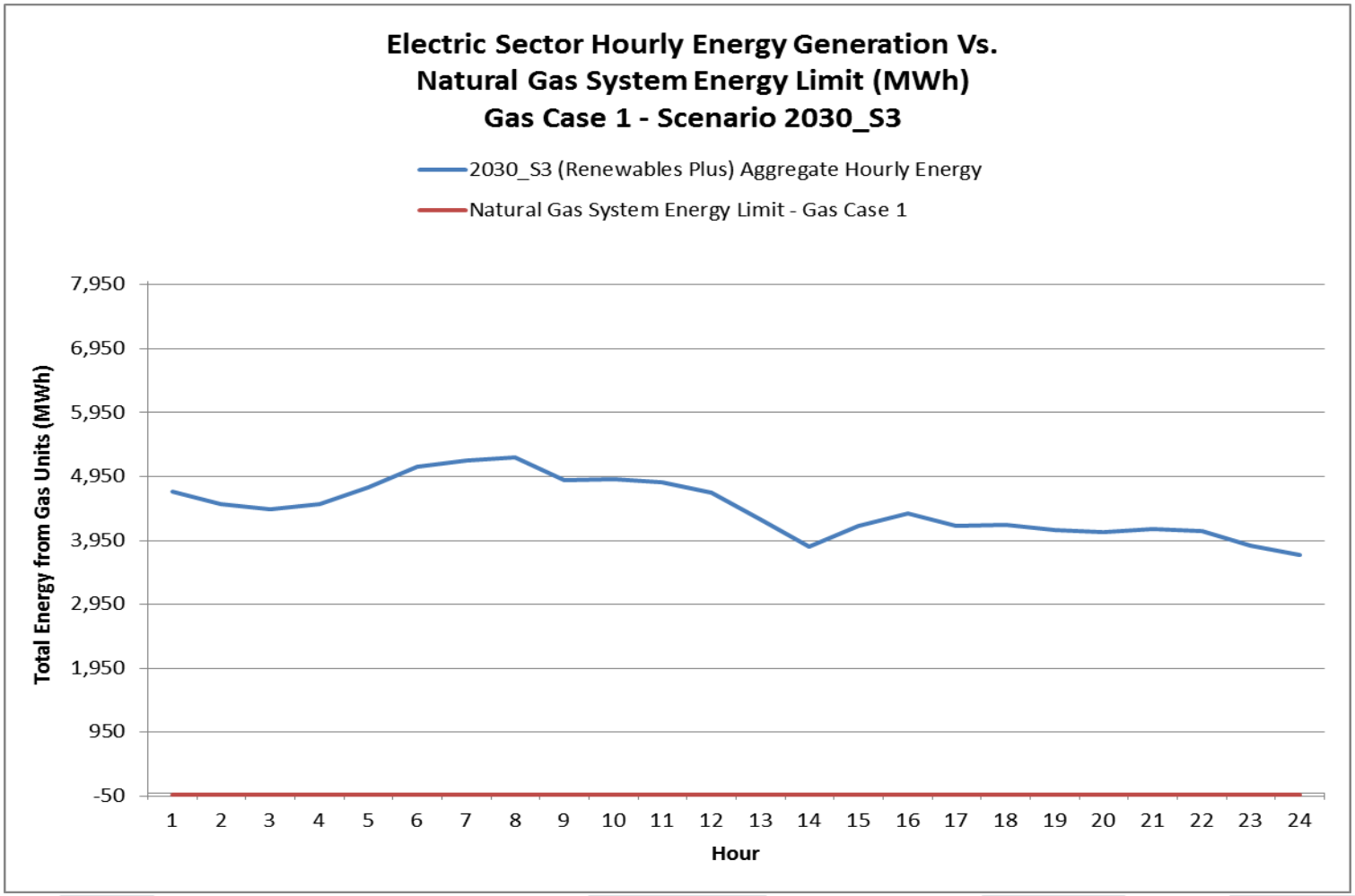
NEW

Scenario 6-2030 Summer Gas-Fired Energy Generation Analysis: Surplus / Deficiency (Ratable MWh)

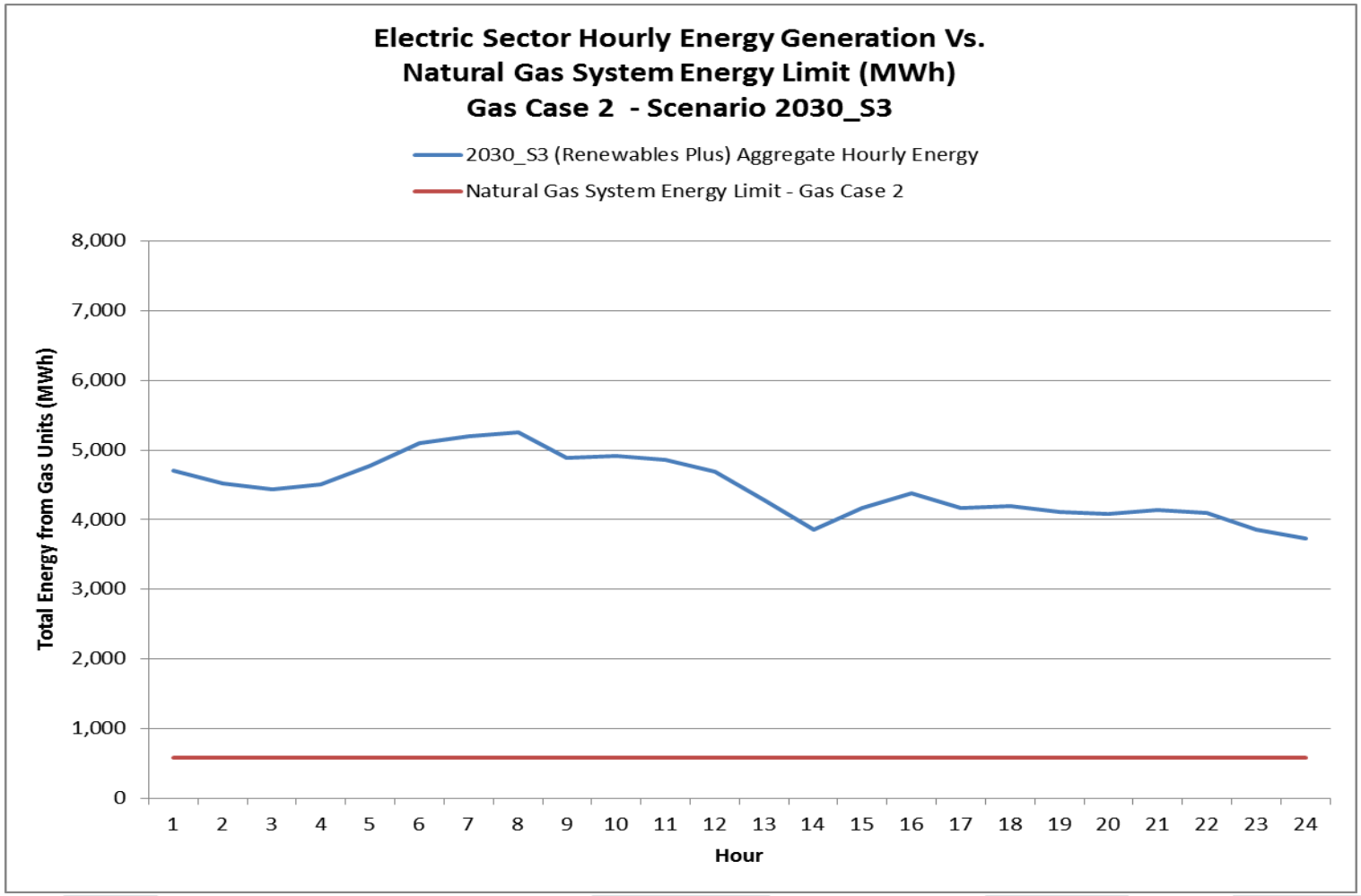
Gas-Fired Energy Generation Analysis Metric	Gas Case 1	Gas Case 2	Gas Case 3	Gas Case 4	Gas Case 5	Gas Case 6
2030 Summer Gas-System Capacity Surplus (Bcf/d)	3.783	3.783	4.302	4.602	4.702	5.002
2030 Summer Gas-System Energy Equivalent (MWhr/d)	540,432	540,432	614,568	657,432	671,712	714,576
2030 Summer Gas-System Peak-Hour Energy Equivalent (MWh)	22,518	22,518	25,607	27,393	27,988	29,774
2030 Gas-Fired Summer Peak-Hour Energy (MWh)	10,218	10,218	10,218	10,218	10,218	10,218
2030 Gas-Fired, Peak-Hour, Energy Surplus/Deficiency (MWh)	+12,300	+12,300	+15,389	+17,175	+17,770	+19,556

Surplus = (Green > 0 MWh)
Deficiency = (Red > -10,000 MWh) and (Yellow = -9,999 MWh to 0 MWh)

Graphics of 2030 Winter Gas-Fired Energy Generation Analysis: Scenario 3 - Gas Case 1 - (Ratable MWh)



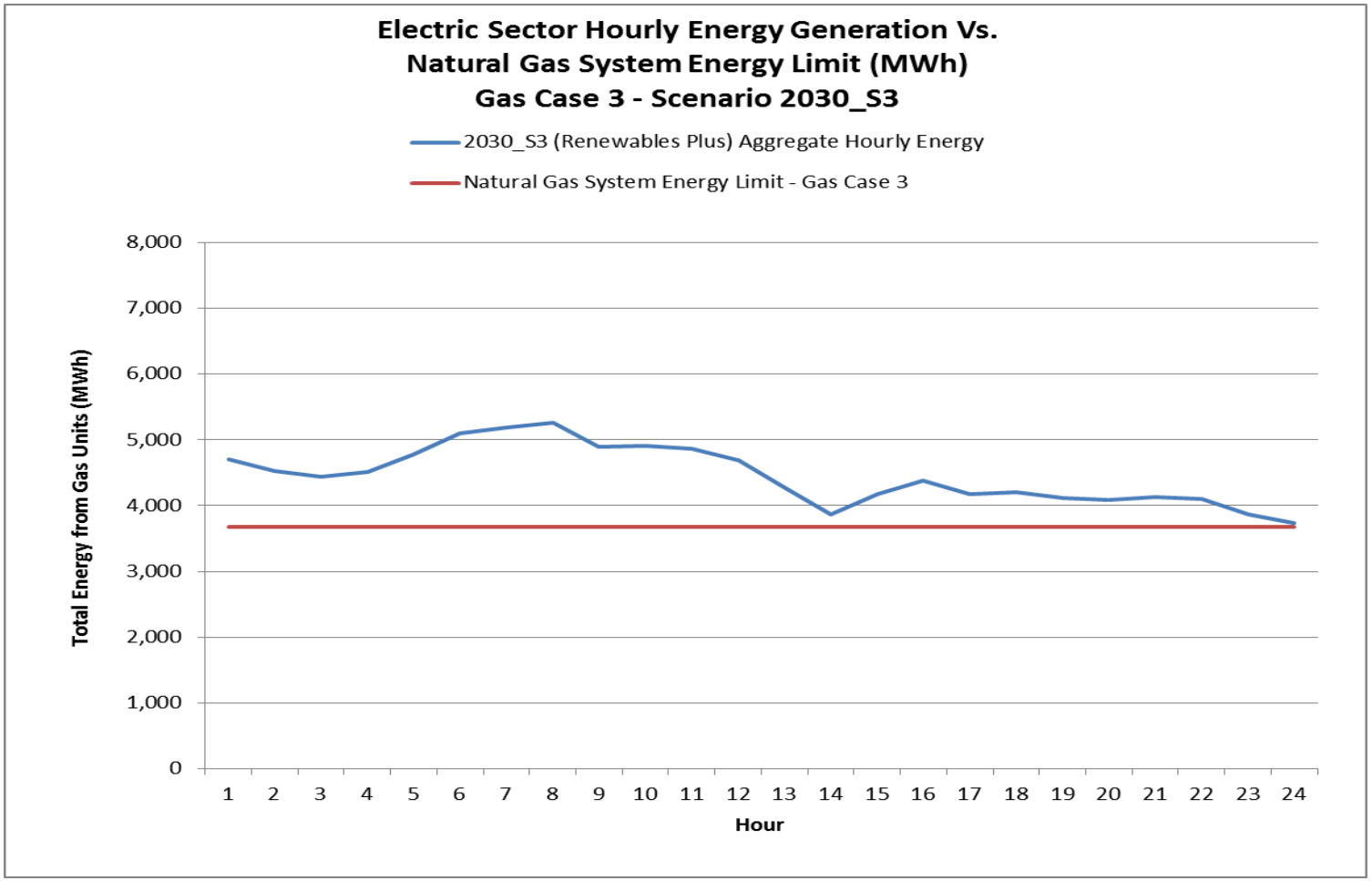
Graphics of 2030 Winter Gas-Fired Energy Generation Analysis: Scenario 3 - Gas Case 2 - (Ratable MWh)



Peak-Gas-Day Capacity and Energy Analysis

REVISED

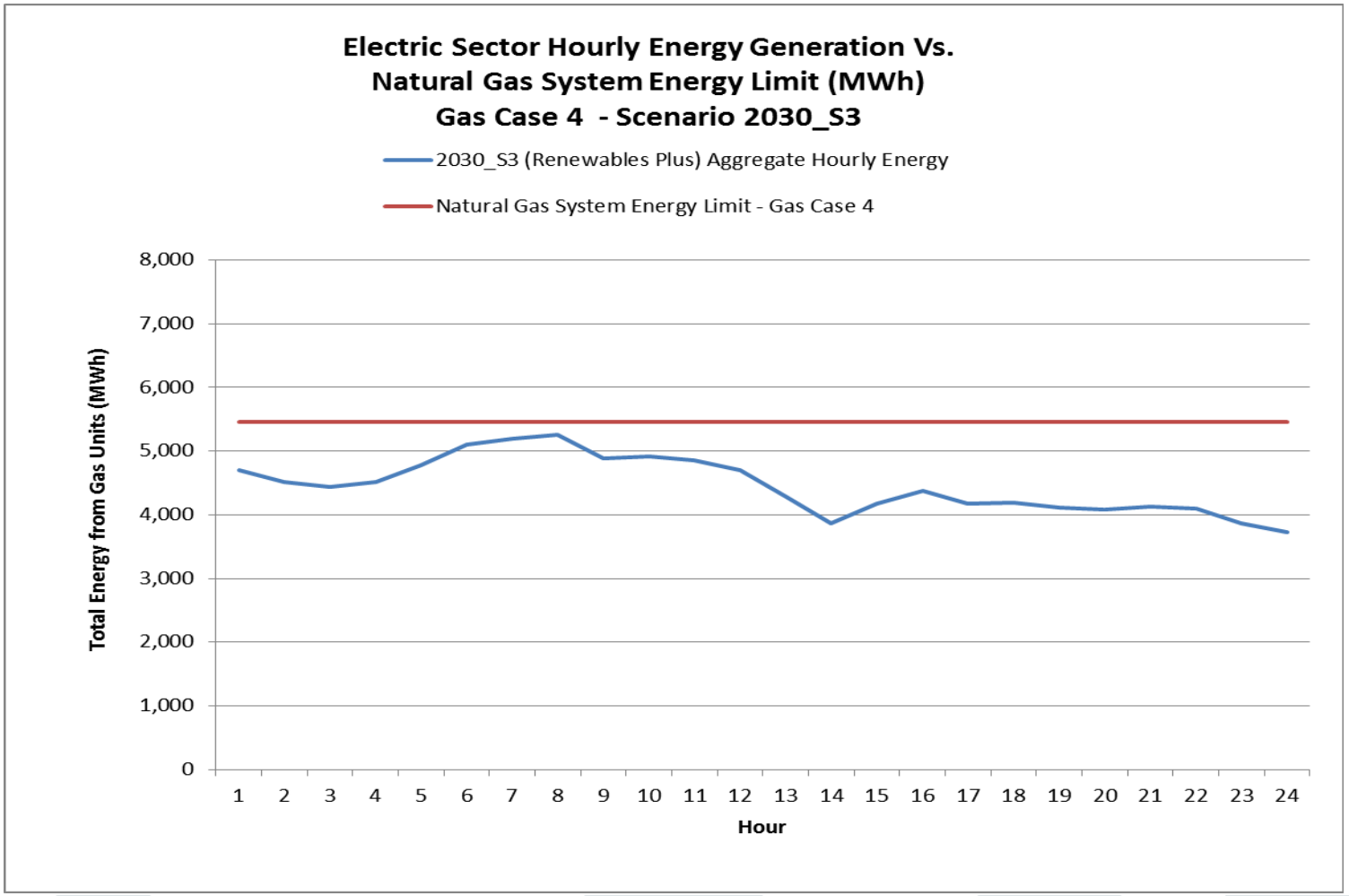
Graphics of 2030 Winter Gas-Fired Energy Generation Analysis: Scenario 3 - Gas Case 3 - (Ratable MWh)



Peak-Gas-Day Capacity and Energy Analysis

REVISED

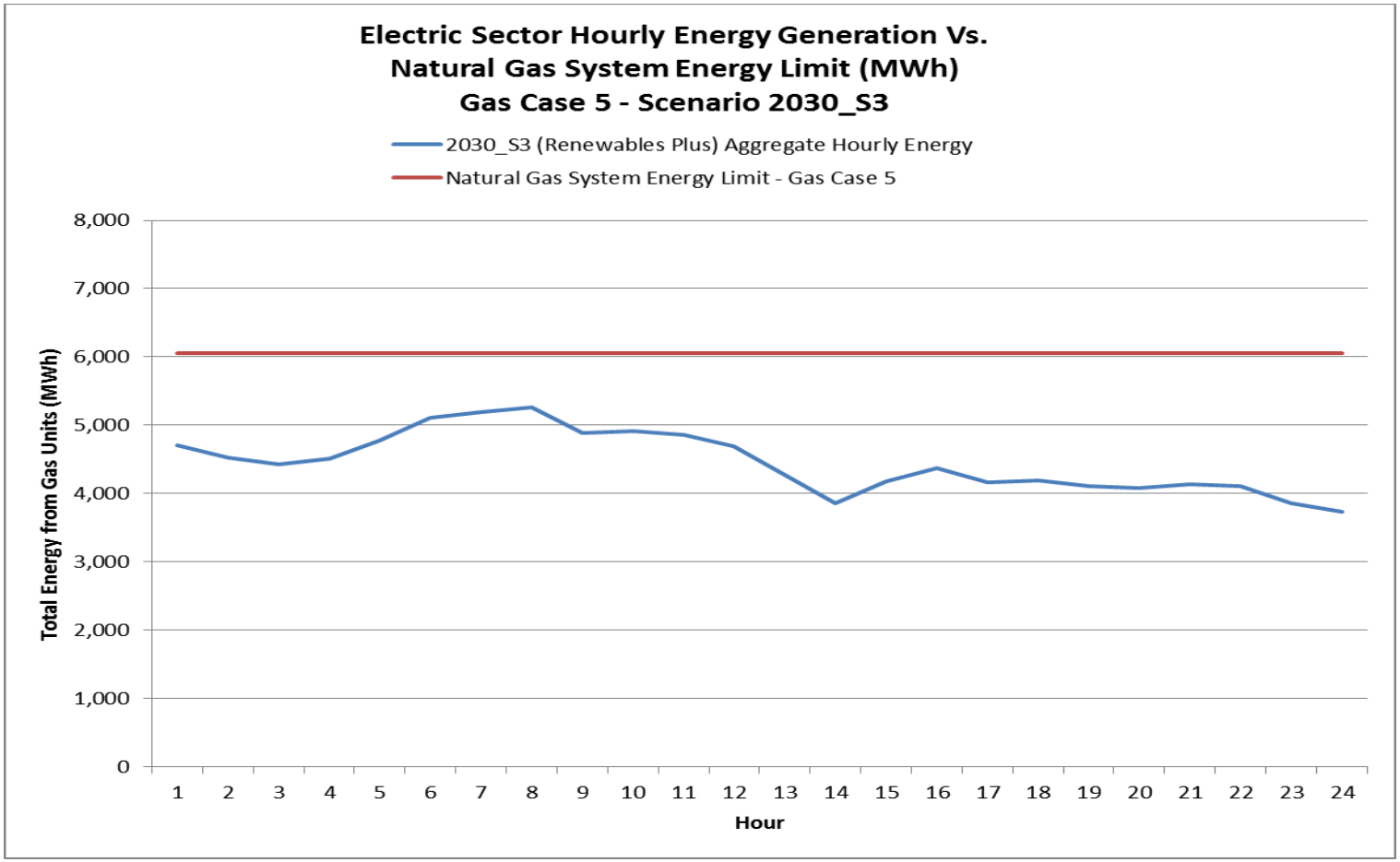
Graphics of 2030 Winter Gas-Fired Energy Generation Analysis: Scenario 3 - Gas Case 4 - (Ratable MWh)



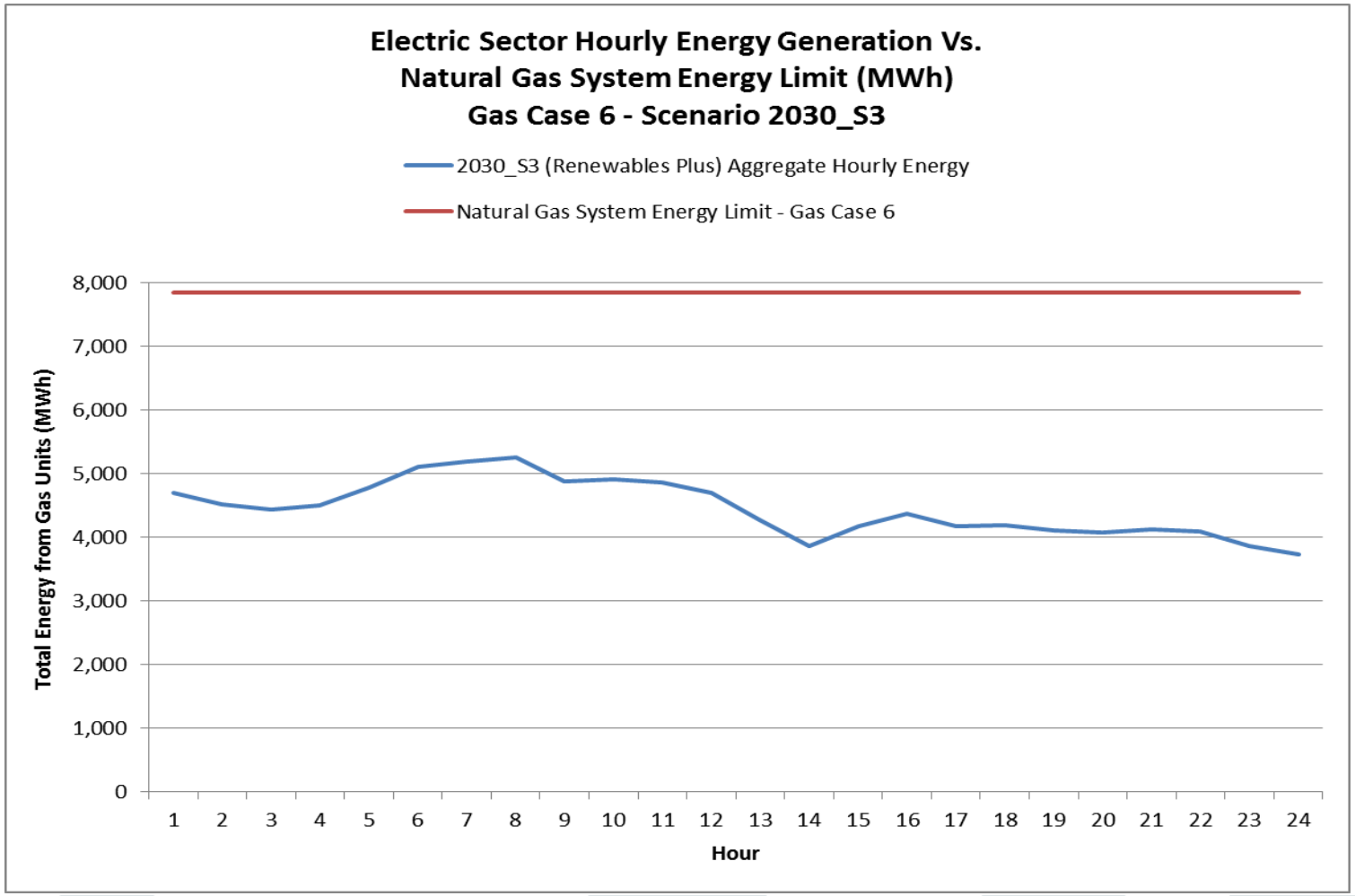
Peak-Gas-Day Capacity and Energy Analysis

REVISED

Graphics of 2030 Winter Gas-Fired Energy Generation Analysis: Scenario 3 - Gas Case 5 - (Ratable MWh)



Graphics of 2030 Winter Gas-Fired Energy Generation Analysis: Scenario 3 - Gas Case 6 - (Ratable MWh)



SIX NATURAL GAS SYSTEM TOPOLOGY CASES

Peak-Gas-Day Capacity and Energy Analysis

REVISED

Six Natural Gas System Topology Cases

ADDITIONAL GAS

Natural Gas Infrastructure	Gas Case 1 Minimum Gas Capacity(*)	Gas Case 2 Case 1 + LDC Peak Shaving	Gas Case 3 Case 2 + Pipeline Growth	Gas Case 4 Case 3 + Distrigas LNG	Gas Case 5 Case 3 + Offshore LNG	Gas Case 6 Maximum Gas Capacity
Existing Pipelines	√	√	√	√	√	√
Existing LDC Peak Shaving	√	√	√	√	√	√
Pipeline Projects	√	√	√	√	√	√
LDC Peak Shaving Growth		√	√	√	√	√
Pipeline Growth			√	√	√	√
Distrigas				√		√
Offshore LNG (FSRU)					√	√

ADDITIONAL GAS

(*) This is the first case in which the gas-system assumptions provide adequate winter capacity to serve all regional LDC core-gas demands.

Peak-Gas-Day Capacity and Energy Analysis

Natural Gas System Capacity Assumptions (Bcf/d)

Natural Gas Infrastructure	2020 Winter Capacity (Bcf/d)	2025 Winter Capacity (Bcf/d)	2030 Winter Capacity (Bcf/d)
Existing Pipelines	4.043	4.043	4.043
LDC Peak Shaving	0.853	0.853	0.853
Pipeline Projects	0.654	0.654	0.654
Peak Shaving Growth	0.000	0.074	0.105
Pipeline Growth	0.000	0.379	0.519
Distrigas (AGT & TGP)	0.300	0.300	0.300
Offshore LNG (AGT)	0.400	0.400	0.400
Winter Total	**6.250**	**6.703**	**6.874**

Peak-Gas-Day Capacity and Energy Analysis

REVISED

Natural Gas System Capacity Under Six Gas Cases (Bcf/d)

Total Gas System Capacity	Gas Case 1 Minimum Gas Capacity	Gas Case 2 Case 1 + LDC Peak Shaving	Gas Case 3 Case 2 + Pipeline Growth	Gas Case 4 Case 3 + Distrigas LNG	Gas Case 5 Case 3 + Offshore LNG	Gas Case 6 Maximum Gas Capacity
2025 Winter (January)	5.550	5.624	6.003	6.303	6.403	6.703
2025 Summer (July)	4.697	4.697	5.076	5.376	5.476	5.776
2030 Winter (January)	5.550	5.655	6.174	6.474	6.574	6.874
2030 Summer (July)	4.697	4.697	5.216	5.516	5.616	5.916

Peak-Gas-Day Capacity and Energy Analysis

REVISED

Natural Gas System Equivalent Electrical Capacity Under Six Gas Cases (Ratable MW) – Assumes a 7,000 Btu/kWh Heat Rate

Total Gas System Capacity	Gas Case 1 Minimum Gas Capacity	Gas Case 2 Case 1 + LDC Peak Shaving	Gas Case 3 Case 2 + Pipeline Growth	Gas Case 4 Case 3 + Distrigas LNG	Gas Case 5 Case 3 + Offshore LNG	Gas Case 6 Maximum Gas Capacity
2025 Winter (January)	33,036	33,476	35,732	37,518	38,113	39,899
2025 Summer (July)	27,958	27,958	30,214	32,000	32,595	34,381
2030 Winter (January)	33,036	33,661	36,750	38,536	39,131	40,917
2030 Summer (July)	27,958	27,958	31,048	32,833	33,429	35,214

Peak-Gas-Day Capacity and Energy Analysis

REVISED

Surplus Gas System Capacity for Electric Sector Use (Bcf/d)

Total Gas System Capacity	Gas Case 1 Minimum Gas Capacity	Gas Case 2 Case 1 + LDC Peak Shaving	Gas Case 3 Case 2 + Pipeline Growth	Gas Case 4 Case 3 + Distrigas LNG	Gas Case 5 Case 3 + Offshore LNG	Gas Case 6 Maximum Gas Capacity
2025 Winter (January)	0.172	0.246	0.625	0.925	1.025	1.325
2025 Summer (July)	3.836	3.836	4.215	4.515	4.615	4.915
2030 Winter (January)	0.000	0.099	0.618	0.918	1.018	1.318
2030 Summer (July)	3.783	3.783	4.302	4.602	4.702	5.002

Peak-Gas-Day Capacity and Energy Analysis

REVISED

Surplus Natural Gas System Equivalent Electrical Capacity (Ratable MW) - Assumes a 7,000 Btu/kWh Heat Rate

Total Gas System Capacity	Gas Case 1 Minimum Gas Capacity	Gas Case 2 Case 1 + LDC Peak Shaving	Gas Case 3 Case 2 + Pipeline Growth	Gas Case 4 Case 3 + Distrigas LNG	Gas Case 5 Case 3 + Offshore LNG	Gas Case 6 Maximum Gas Capacity
2025 Winter (January)	1,024	1,464	3,720	5,506	6,101	7,887
2025 Summer (July)	22,833	22,833	25,089	26,875	27,470	29,256
2030 Winter (January)	0	589	3,679	5,464	6,059	7,845
2030 Summer (July)	22,518	22,518	25,607	27,393	27,988	29,774

Peak-Gas-Day Capacity and Energy Analysis

REVISED

Surplus Natural Gas System Equivalent Electrical Energy (Ratable MWh) - Assumes a 7,000 Btu/kWh Heat Rate

Total Gas System Capacity	Gas Case 1 Minimum Gas Capacity	Gas Case 2 Case 1 + LDC Peak Shaving	Gas Case 3 Case 2 + Pipeline Growth	Gas Case 4 Case 3 + Distrigas LNG	Gas Case 5 Case 3 + Offshore LNG	Gas Case 6 Maximum Gas Capacity
2025 Winter (January)	24,576	35,136	89,280	132,144	146,424	189,288
2025 Summer (July)	547,992	547,992	602,136	645,000	659,280	702,144
2030 Winter (January)	0	14,136	88,296	131,136	145,416	188,280
2030 Summer (July)	540,432	540,432	614,568	657,432	671,712	714,576

DEFINITIONS, ACRONYMS, ASSUMPTIONS, AND DISCLAIMERS

Peak-Gas-Day Capacity and Energy Analysis

Definitions

- **Peak-Gas-Day** – The winter and summer day in which the consumption of natural gas by both the gas and electric sectors is at maximum.

- **Peak-Gas-Hour** – The peak-gas-day in winter and summer, in which the hourly consumption of natural gas by both the gas and electric sectors is at maximum (a.k.a. maximum hourly).

- **Ratable (Take)** – Consuming natural gas from a pipeline in equal amounts over a 24-hour (gas-day) period. Consuming 1/24th of the total volume of gas in each hour for 24 hours. This condition is usually mandated by Gas Control Operators to help balance customers' receipts and deliveries of natural gas. This mandate usually occurs on peak-gas-day conditions.

Definitions – cont'd

- **Installed Gas-Fired Capacity (MW)** – The amount of gas-fired generating capacity that are in each of the six NEPOOL resource expansion scenarios. Includes gas-only and dual fuel units burning natural gas. See Slides 16-18.

- **Dispatched Gas-Fired Capacity (MW)** – The amount of gas-fired generating capacity that are committed and economically dispatched within the GridView simulation model. A subset of the installed gas-fired capacity. Includes gas-only and dual fuel units burning natural gas. See Slides 20-22.

- **Gas-Fired Energy Generation (MWh)** – The amount of electric energy that was produced by all gas-fired resources within the GridView simulation model. Equals the hourly dispatched gas-fired capacity. Includes gas-only and dual fuel units burning natural gas. See Slides 24-27.

Definitions & Notes

- **Distrigas** – Distrigas is a LNG receiving, storage, and regasification terminal located in Everett, MA. The gas supply benefits of the LNG facility is modeled via gas injections into the Algonquin and Tennessee gas pipelines. Because Distrigas also directly fuels Exelon's Mystic 8 & 9 units from regasified LNG, those two gas-fired units are NOT included within this capacity and energy analyses.

- **Note on Canaport LNG** – Canaport is a receiving, storage, and regasification LNG terminal located in St. John, New Brunswick. The gas supply benefits of the LNG facility is modeled via gas injections into the Brunswick and Maritimes & Northeast (M&N) natural gas pipelines.

Definitions & Notes – cont'd

- **FSRU** – Floating Storage Regasification Unit. A FSRU is a special type of ship used for LNG transfer which is capable of storing, transporting, and regasifying LNG onboard the ship. Floating regasification also requires either an offshore terminal, which typically includes a buoy and connecting undersea pipeline to transport regasified LNG to shore, or an onshore dockside receiving terminal. The gas supply benefits of Northeast Gateway's FSRU is modeled via gas injections into the Algonquin's undersea HubLine pipeline. Noted as "Offshore LNG."

Acronyms

- **ACP** – Alternative Compliance Payment
- **BCF/D** – Billion Cubic Feet per Day
- **EE** – Energy Efficiency
- **LDC** – Local (gas) Distribution Company
- **LNG** – Liquefied Natural Gas
- **PV** – Photovoltaic
- **PEV** – Plugin Electric Vehicle
- **RPS** – Renewable Portfolio Standard
- **SCC** - Seasonal Claimed Capability

Assumptions

- **Winter** peak-gas-day operations would dictate that Gas Control operators would most likely have issued Operational Flow Orders (OFOs) to balance customers' receipts and deliveries of natural gas. As such, gas-fired generators would prefer to minimize fluctuations in their output by ratably-taking their fuel. The results within this presentation reflect spare gas system capacity being used ratably by the electric sector to comply with such OFOs.
- **Summer** peak-gas-day operations would dictate that the regional pipelines should have enough operational flexibility to accommodate the non-ratable-taking of fuel by power plants. This would allow gas-fired units to vary their output in response to ISO dispatch instructions, which enhances unit flexibility.

Assumption – cont'd

- The North American Energy Standards Board's (NAESB) 24-hour "Natural-Gas-Day" starts at 9:00 AM on Day X and ends at 8:59 AM on Day X+1 Central Clock Time (CCT). Because of the 1 hour advanced time zone difference, New England's natural-gas-day is from 10:00 AM on Day X and ends at 9:59 on Day X+1 Eastern Clock Time (ECT).
- In New England, the 24-Hour "Electric-Day" starts at 12:00 AM on Day X and ends at 11:59 PM on Day X Eastern Clock Time (ECT).
- These three analyzes did not take these differences in market timelines into account, because ISO-NE assumed that the seasonal peak-gas-day "occurs" on the seasonal peak-electric-day.

Disclaimer

- This analysis provides information about a range of hypothetical future scenarios that may or may not materialize within New England's natural gas and electric sectors. The electric sector input assumptions are the direct results from the 2016 Economic Study - Scenario Analysis Report and do not constitute a roadmap for the timing, location, or quantities of existing or future resource additions or attrition. ISO-NE welcomes comments, suggestions or clarification from the Planning Advisory Committee for any assumptions or data related to this analysis.
- For the **winter** peak-gas-day analyses, it is assumed that no natural gas infrastructure is forced out of service. Should this assumption be invalid, the electric sector's non-firm transportation entitlements would be the first to be reduced by the equivalent gas sector capacity reductions.
- For the **summer** peak-gas-day analyses, it is assumed that scheduled maintenance, construction activities or forced outages on natural gas infrastructure does not occur. Should this assumption be invalid, the electric sector's non-firm transportation entitlements would be the first to be reduced by the equivalent gas sector capacity reductions.

Presentation Notes

- The 2016 Scenario Analyses constrained and unconstrained electric transmission cases are very similar in terms of natural gas consumption. Therefore, the unconstrained electric transmission case results were omitted from this presentation to reduce the number of sensitivities and slides. The electric transmission constrained cases are slightly more stringent in terms of consumption of natural gas by gas-fired generation.
- All three sets of analyses are performed on the seasonal peak-gas-day or peak-gas-hour. These results reflect assumptions for that 24 hour peak-period only and are not indicative of conditions that may exist throughout the four-month winter or summer season. Therefore, the term “peak-gas-day or peak-gas-hour” has been eliminated from some slides for brevity purposes.