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Independent System Operator

Grid in Transition Study: Phase 1 First Results

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ICAPWG/MIWG

May 3, 2022

Agenda

- Background, 2022 study deliverable & plan
- Phase 1 Assumptions
- First results: leveraging the information in the Climate Change Phase 1 Study
  - Load shapes over time
  - Distributions of ramp rates over time
- Next Steps

Today's Goal: Review the first results for Phase 1 of the Grid in Transition Study and get stakeholder feedback.

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Background, 2022 study deliverable & plan

Grid in Transition

- **Background:**
  - A rapid transition is underway in New York State from a power grid where energy is largely produced by central-station fossil fuel generation, towards a grid with increased intermittent renewable resources and distributed generation.
  - A grid characterized by high levels of intermittent renewable resources and distributed generation will require new thinking. We approach potential market enhancement efforts with two guiding principles:
    - (1) all aspects of grid reliability must be maintained; and
    - (2) competitive markets should continue to maximize economic efficiency and minimize the cost of maintaining reliability while supporting the achievement of New York's climate policy codified in the CLCPA.
  - The study will inform the NYISO's planning, forecasting, and operations, as well as the development of wholesale market mechanisms to enhance grid resilience.

Excerpted from the August 27 2021 presentation of *2022 Market Project Candidates*
https://www.nyiso.com/documents/20142/24145498/02%20Proposed%202022%20Market%20Project%20Descriptionsl.pdf/1950d339-57d7-7e0d-dcc2-4ac1e6a738bc

Grid in Transition

- **Deliverable: Q4 Study Complete**
- **Project Description:**
  - Using the work completed to date across various NYISO studies and initiatives, including the Reliability and Market Considerations for a Grid in Transition work and Climate Change Study work, the 2022 effort will identify and, if possible, quantify through a new study, the potential level of system flexibility and/or grid attributes needed to reliably maintain system balance.

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Plan

- The study will look at the evolution of the variability that dispatchable generators will face over time to inform upcoming market design decisions : are changes to existing market products needed and/or are new products needed for the reliable operation of the grid?
- The study will
  - Look at evolution of load and net load shapes (load net of wind and solar) over time,
  - Look at the distribution of hourly ramps over time, and
  - Look at periods (multi day) with low wind and solar and what that implies for net energy and hourly ramps.
- Since load forecasts are constantly evolving and being reviewed and since different load forecasts have different implications, the study will leverage different forecasts and their underlying assumptions using data from previous studies.

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Multi phase study

- First phase – leverage the Climate Change Phase 1 "CLCPA Case" data to look at the questions
- Second phase – coordinate with 2022 planning studies
  - Leverage the upcoming Outlook study Policy Case and possibly the NYSERDA Integration Analysis: Scenario 2 load forecast case
  - Possibly leverage the RNA in a similar way
- See March 3 ICAP/MIWG presentation for additional details

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Previous Presentations

- March 3, 2022 ICAP/MIWG Grid in Transition: Kickoff for 2022 Study
- April 5, 2022 ICAP/MIWG Grid in Transition: Phase 1 Plan and Assumptions

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Phase 1 Assumptions

Climate Change Phase 1 "CLCPA Case"

- **As discussed in the prior presentation, this phase of the study will be based on the Climate Change Phase 1 CLCPA Case data. See the Climate Change Phase 1 report for a detailed discussion of assumptions and methodology.**
  - Brief overview of the assumptions*:
    1. The CLCPA Case builds on energy policy case and accelerated climate change case.
    2. Directs 70% electricity production from renewable energy sources by 2030 and 100% electricity production from carbon-free sources by 2040.
    3. Achieves 85% reduction in greenhouse gases (GHG) by 2050 in residential, commercial, industrial and transportation sectors from 1990 GHG emission levels.
    4. Replaces fossil-based technologies with electric technologies
       a) End uses include space heat, water heat, clothes dryers and cooking in residential & commercial sectors. Industrial sector sees modest improvements in energy intensity.
       b) Residential electric space heat technology is primarily air source heat pump, with resistance heating for supplemental and secondary heating needs.
    a) 85% reduction in transportation greenhouse gases via transition to electric vehicles.

*For an overview of the assumptions see the Climate Study Assumptions – Phase 1 from the October 25, 2019 Fall Economic Conference

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Adjustments

- **At the last meeting we discussed two additions to (or really subtractions from) the Climate Change Phase 1 CLCPA forecast to develop the net load forecast (net of all solar and wind):**
  - Adjustments to solar assumptions to capture the grid scale solar resources in addition to the BTM Solar PV resources already accounted for in the Climate Change Phase 1 CLCPA case.
    - For upstate solar resources we are using the 2006 Solar Planning Shape and for zone K we will be using the 2019 production data shape
  - Adjustments for intermittent wind resources
    - We are considering the feedback from the last meeting and will include this adjustment in the next presentation

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Phase 1 First Results

Focus on variability

- **Focus on load shape over time and on the distribution of ramp rates over a year**
- **Will approach the analysis in stages**
  - Climate Change Phase 1 – CLCPA Case
  - Climate Change Phase 1 – CLCPA Case + Front of the meter solar variability
  - Climate Change Phase 1 – CLCPA Case + Front of the meter solar variability + Wind Variability
    - This analysis will be part of the next presentation

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Load Shapes over Time - Climate Change Phase 1

- **Assumptions**
  - FTM Solar Profiles:
    - Upstate: 2006 Solar Planning Shape
    - Zone K: 2019 Production Data
  - FTM Solar:
    - 3218.5 MW Added
      - Facilities that have completed Class Year Facilities Study (2021 Gold Book)
      - Facilities that have completed CRIS Request (2021 Gold Book)
      - Future and Non-Class Year Facilities Reported to NYSERDA (https://data.ny.gov/Energy-Environment/Large-scale-Renewable-Projects-Reported-by-NYSERDA/dprp-55ye)
    - No FTM Solar is included beyond contracted resources
- **We are also considering using a linear trend of FTM Solar additions beyond 2024 based on policy goals and the Outlook Study solar additions**

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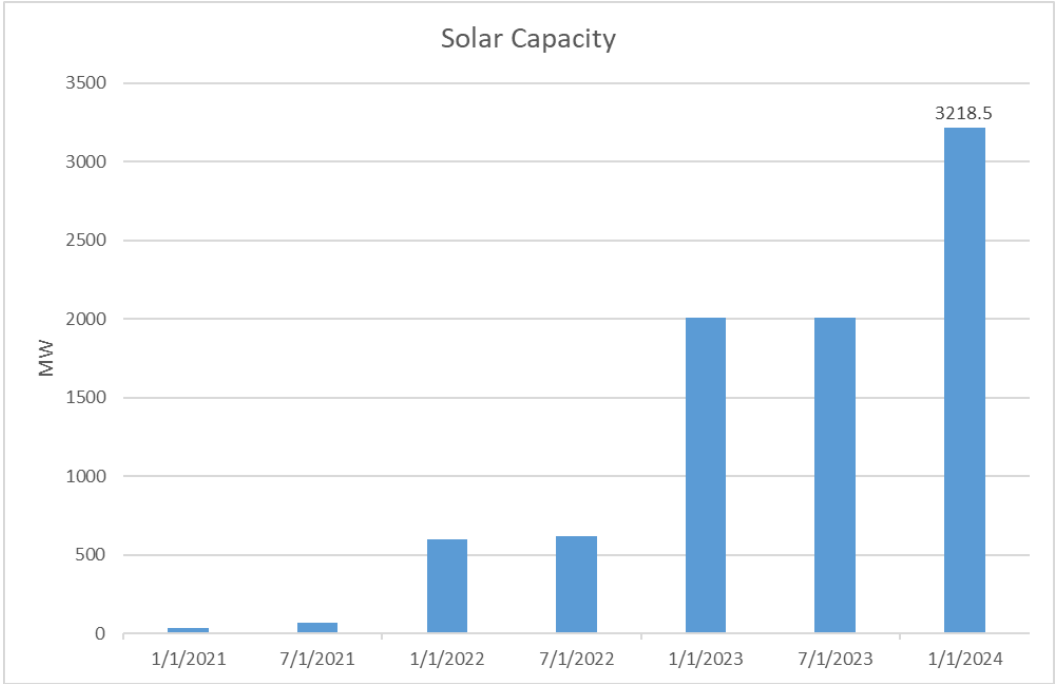
FTM Solar Capacity Additions

- FTM solar additions based on installed in-service date provided in the 2021 Gold Book



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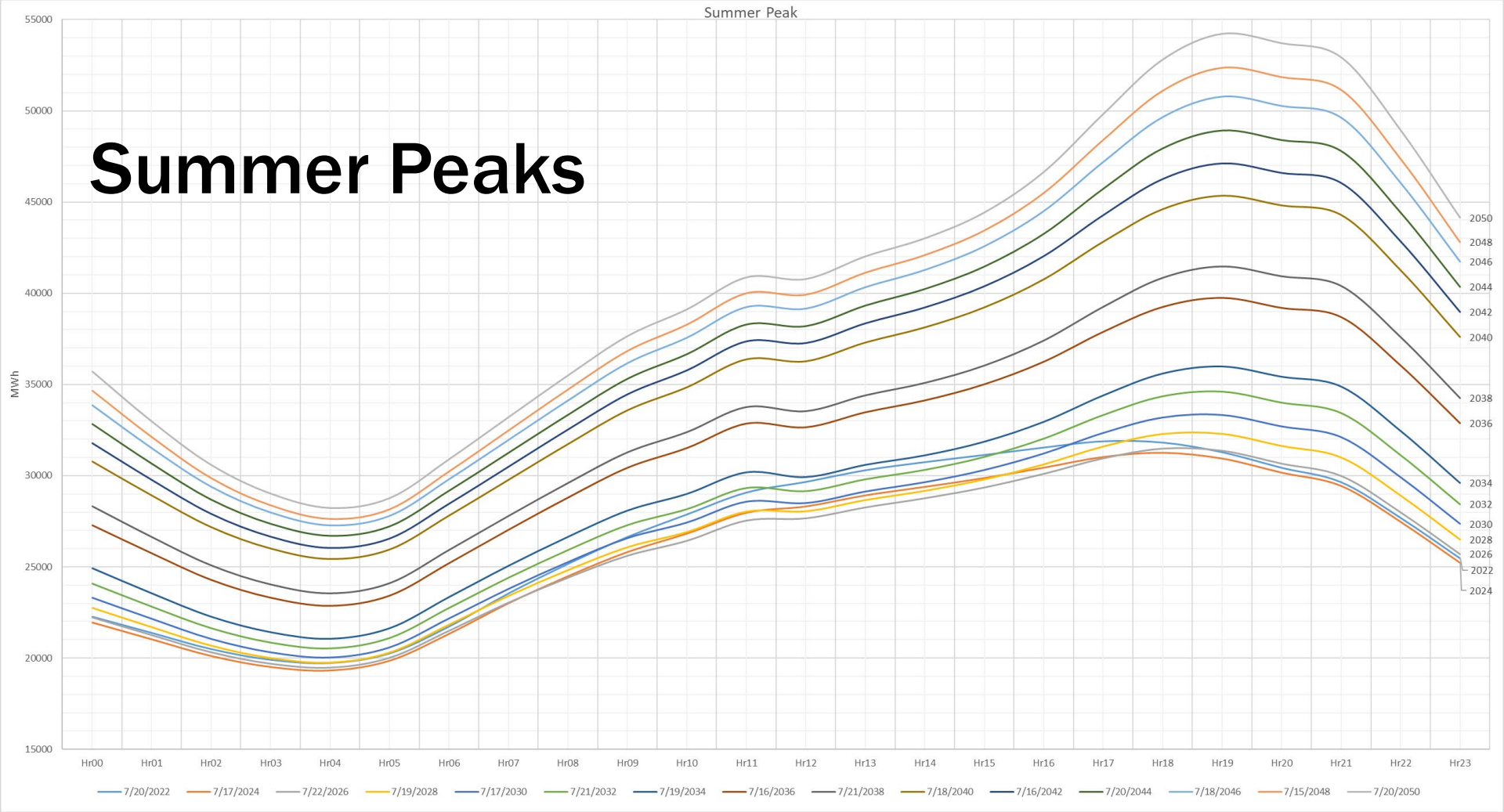
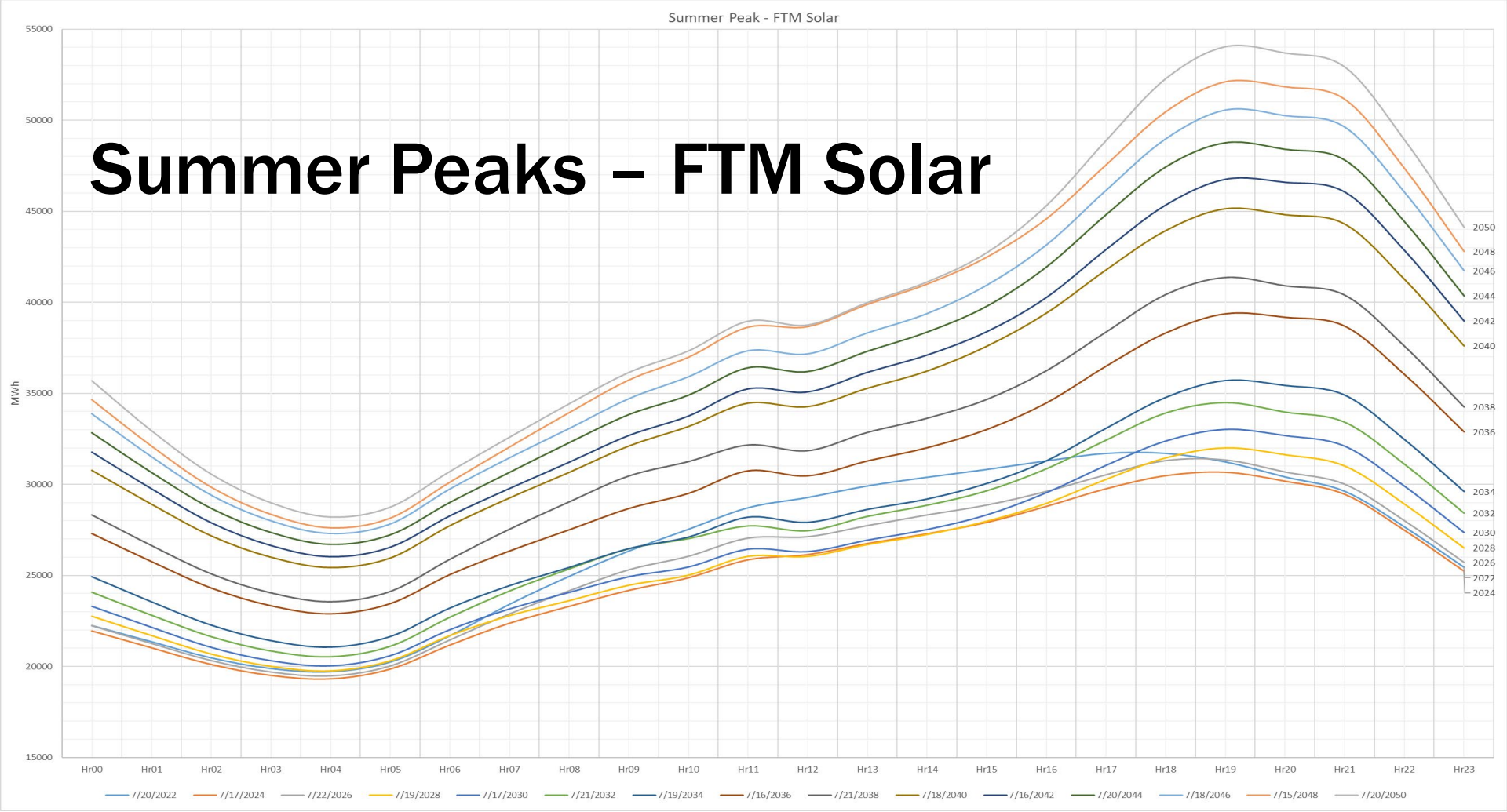
Load Shapes over Time

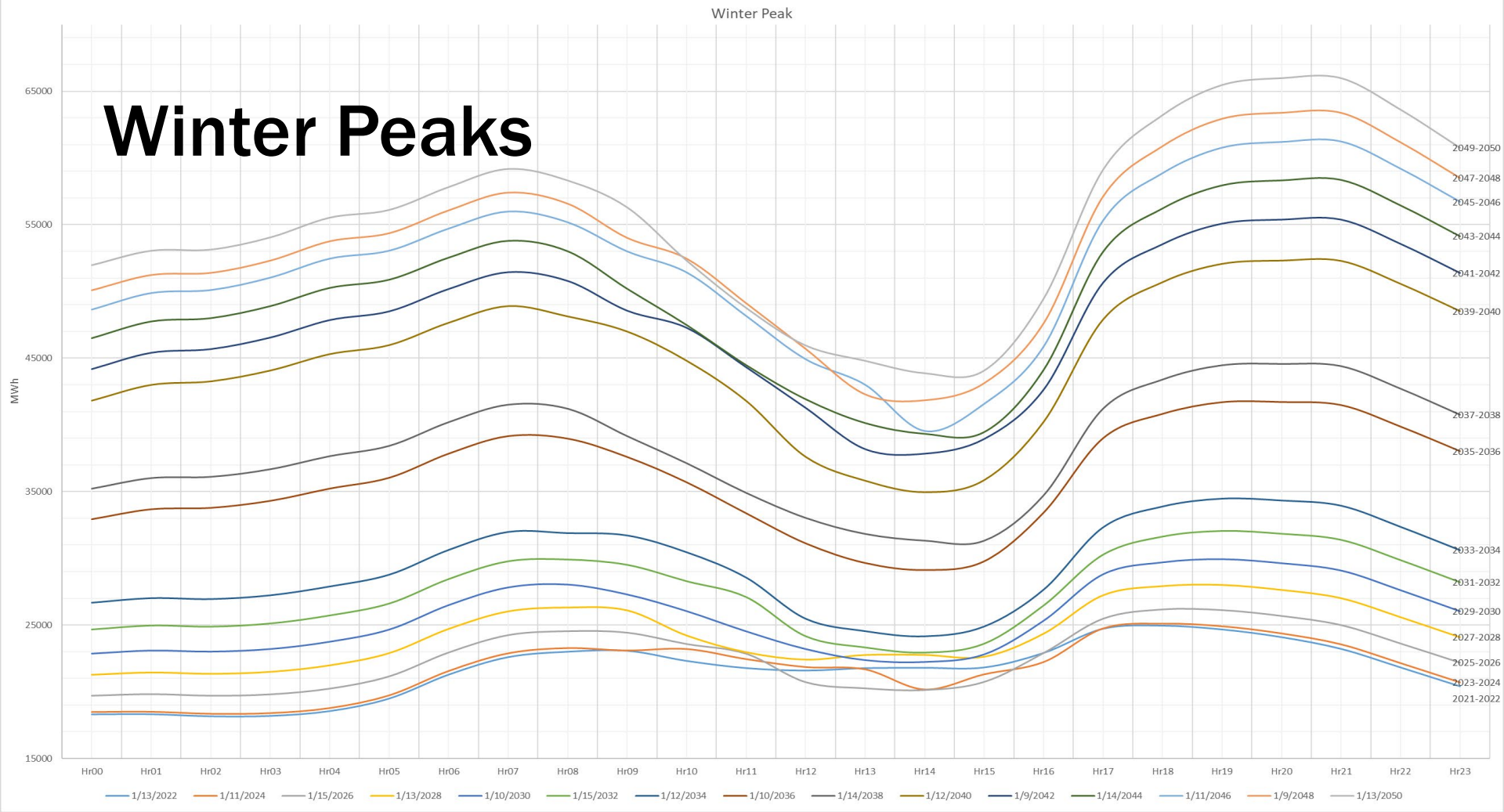
Summer Peaks



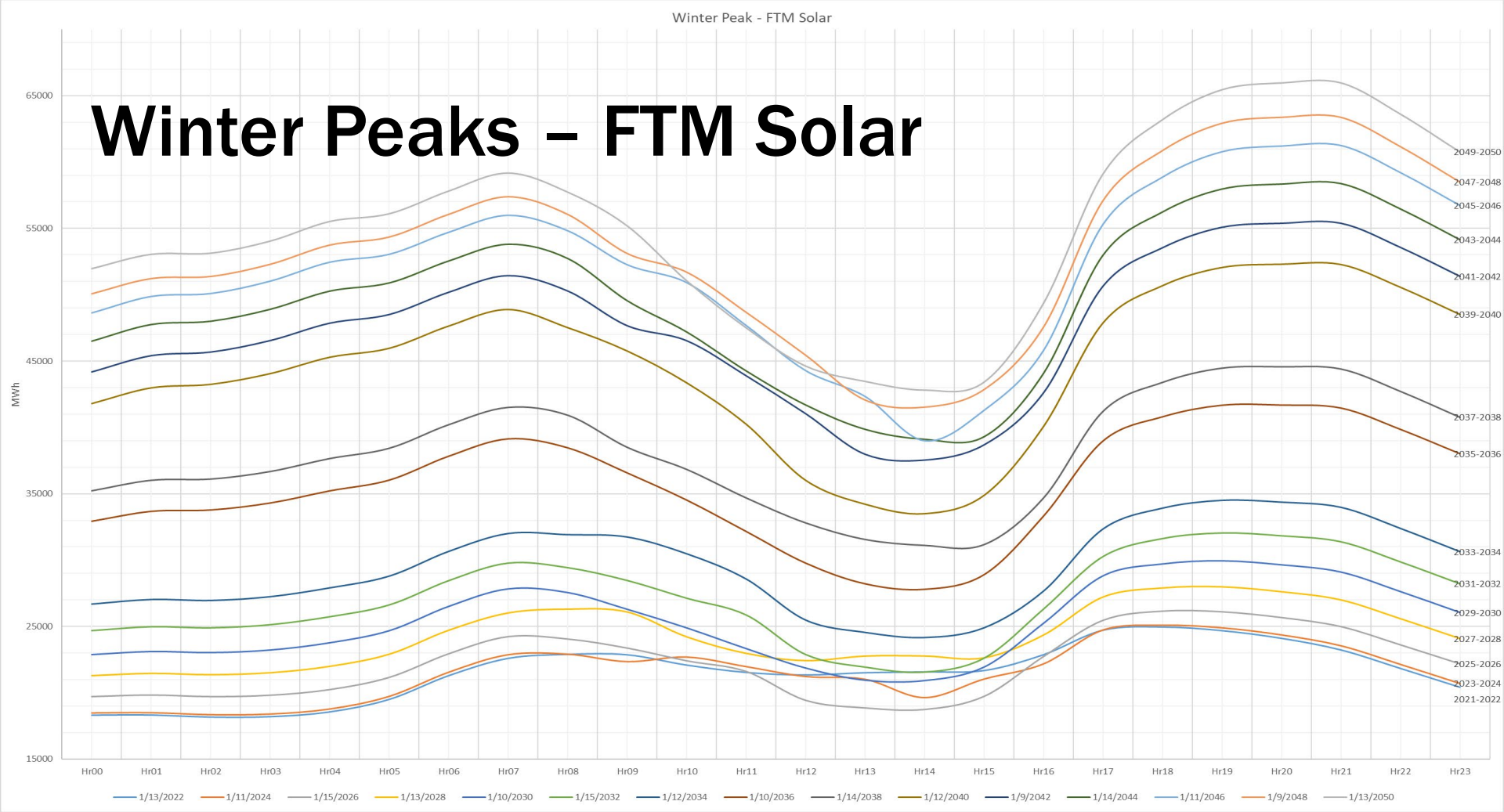
Summer Peaks – FTM Solar



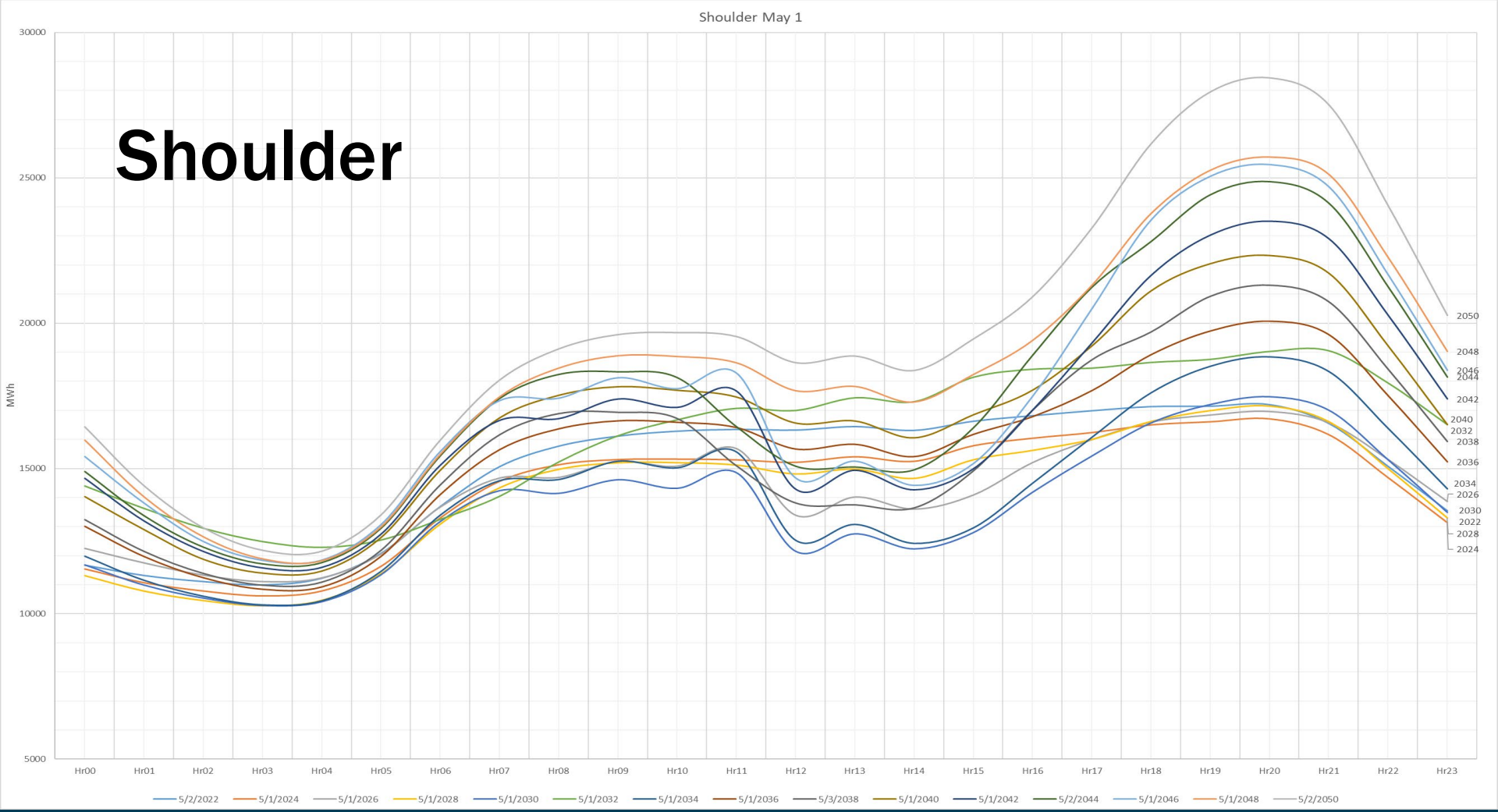
Winter Peaks



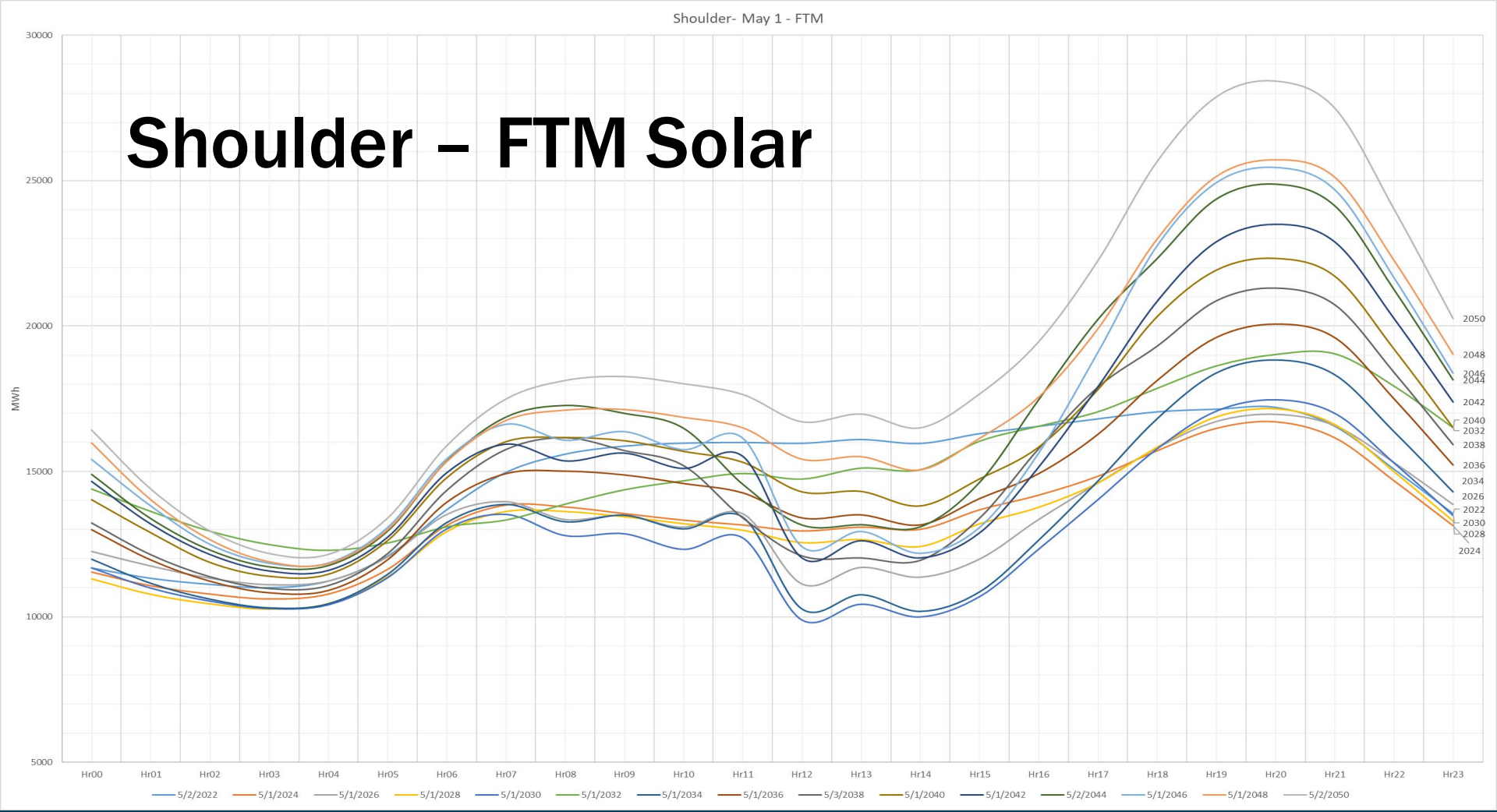
Winter Peaks – FTM Solar



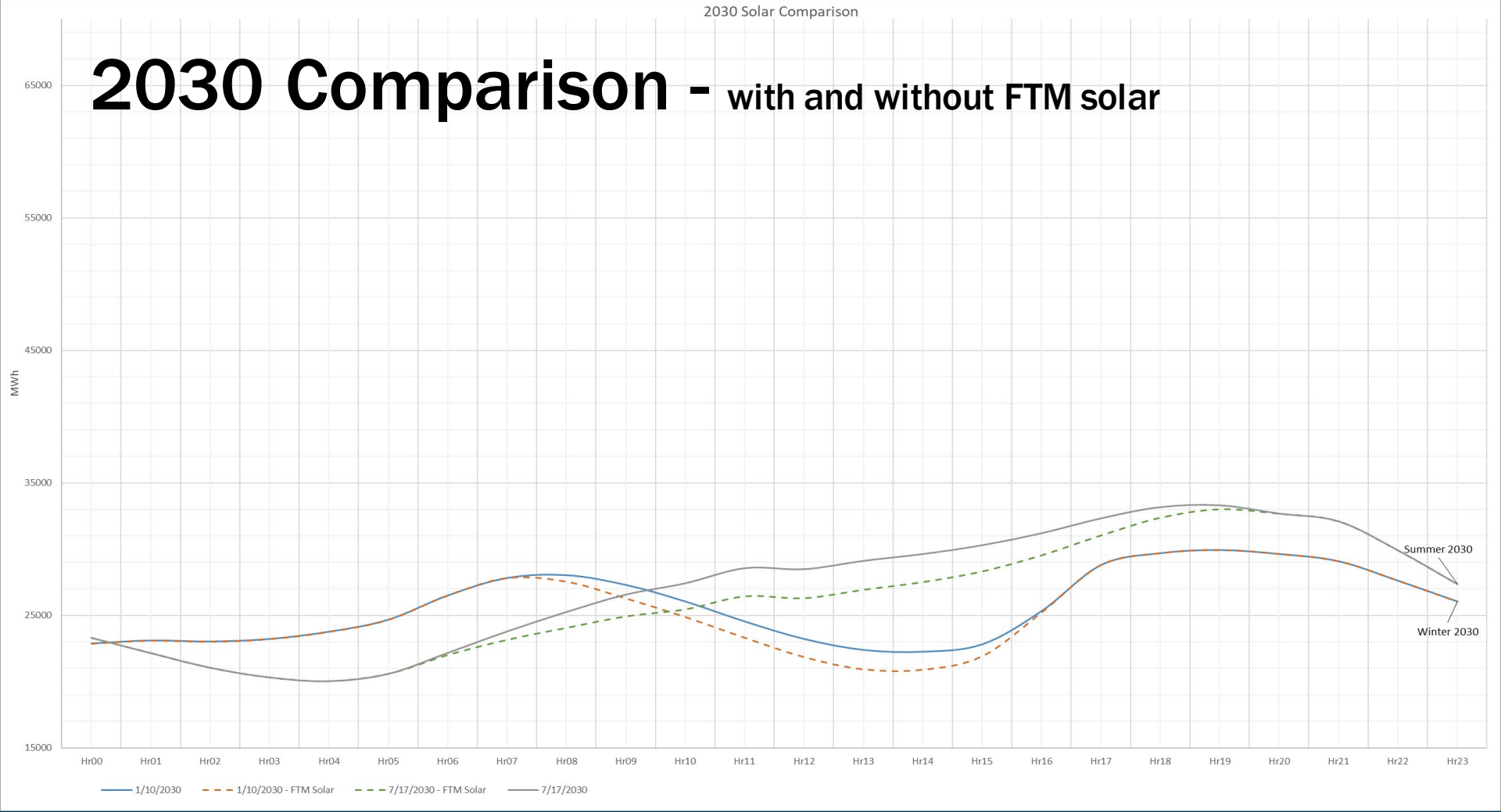
Shoulder



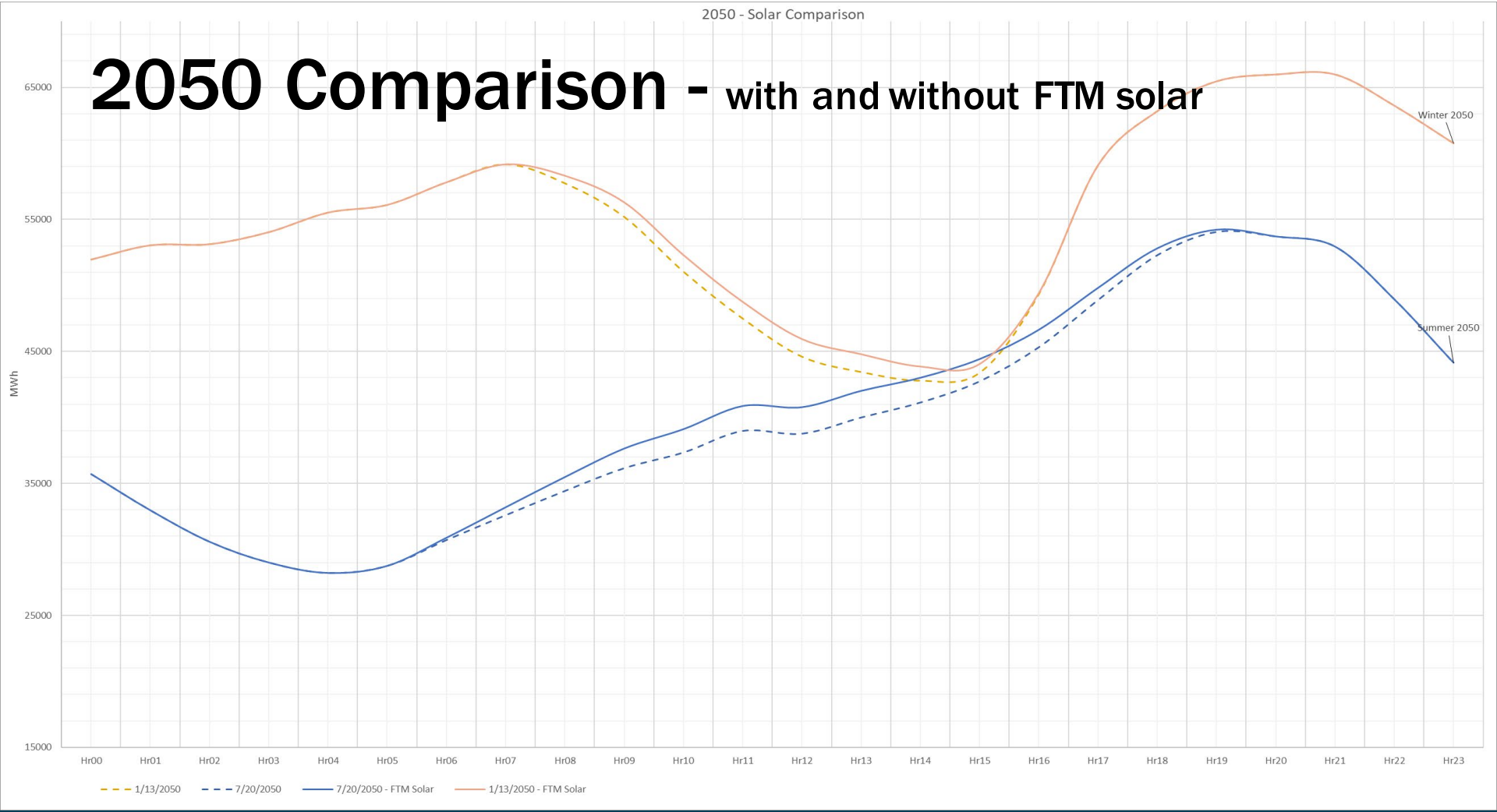
Shoulder – FTM Solar



2030 Comparison - with and without FTM solar



2050 Comparison - with and without FTM solar



Ramp Distribution Curves

Showing the hourly ramps over the entire year*

*Note: Does not include the over midnight ramps because of data discontinuities that produce phantom ramps

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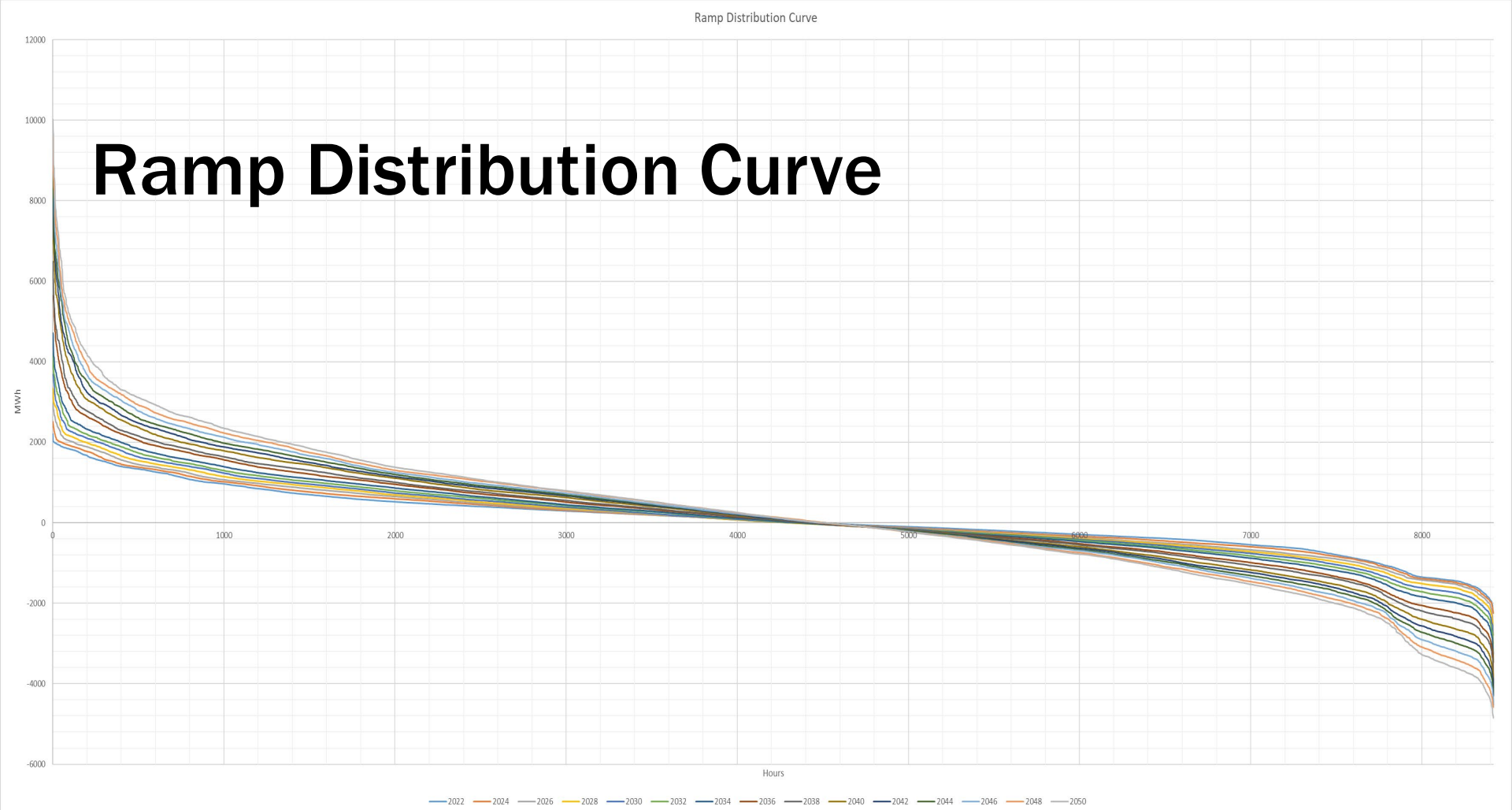
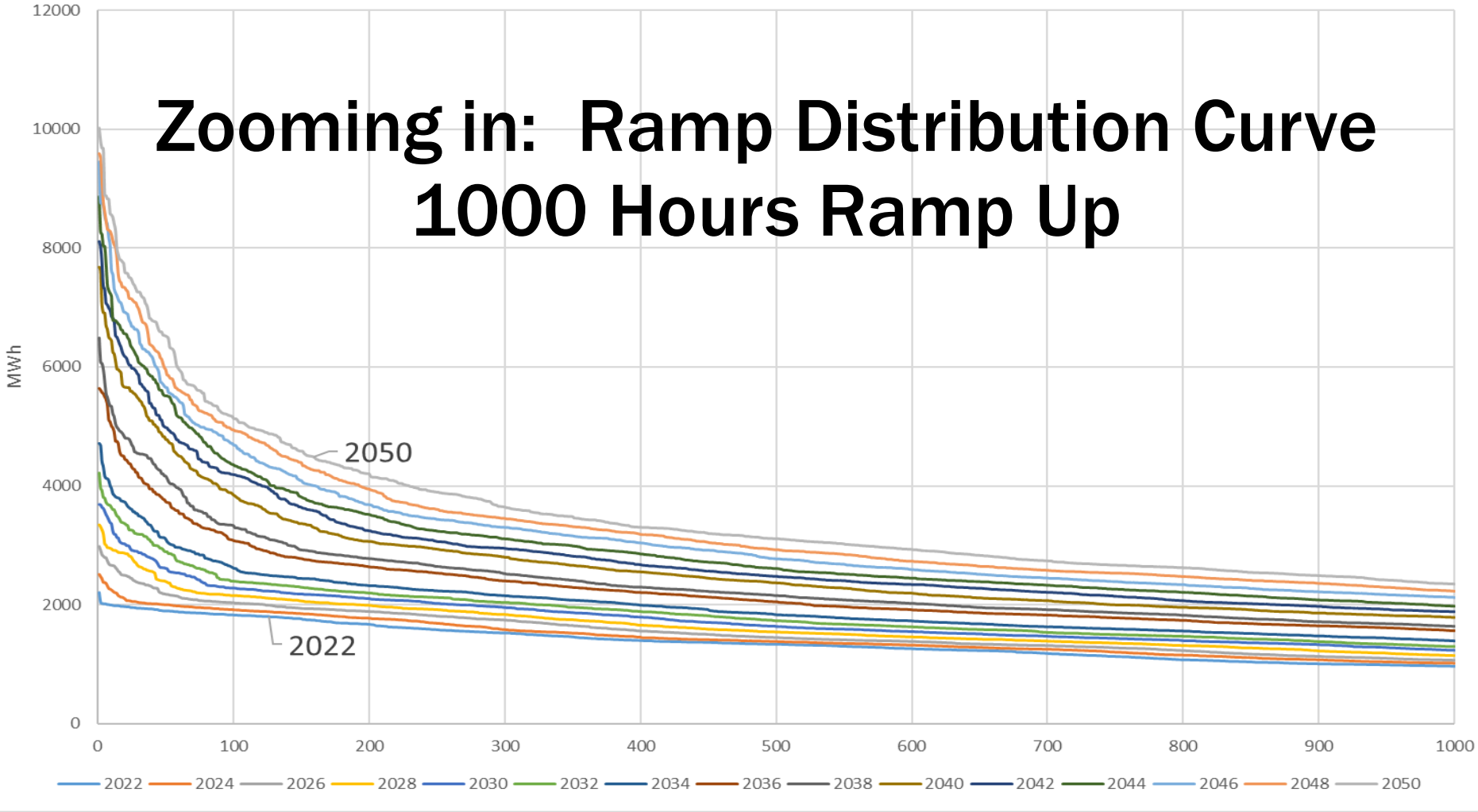
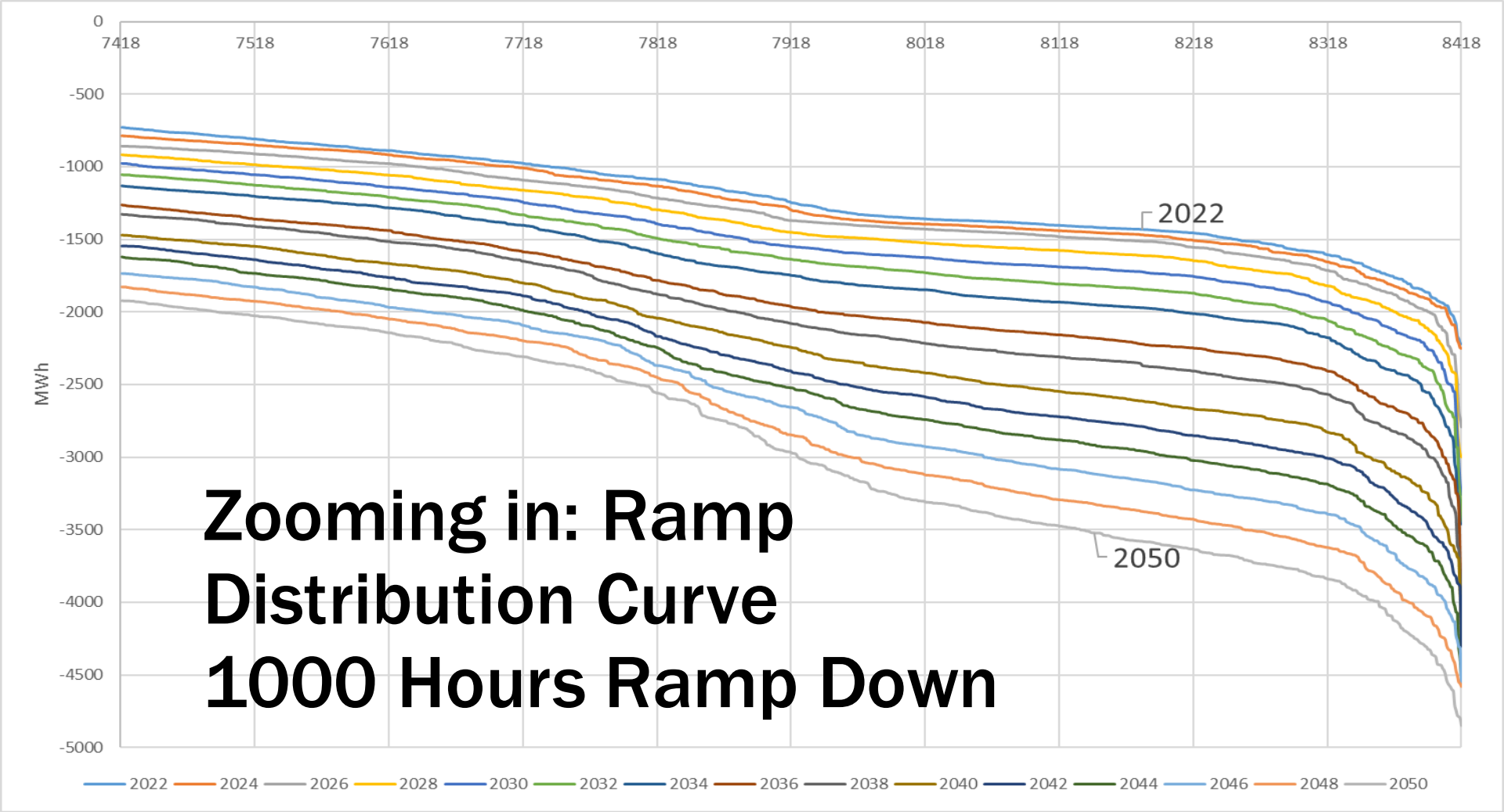
Ramp Distribution Curve



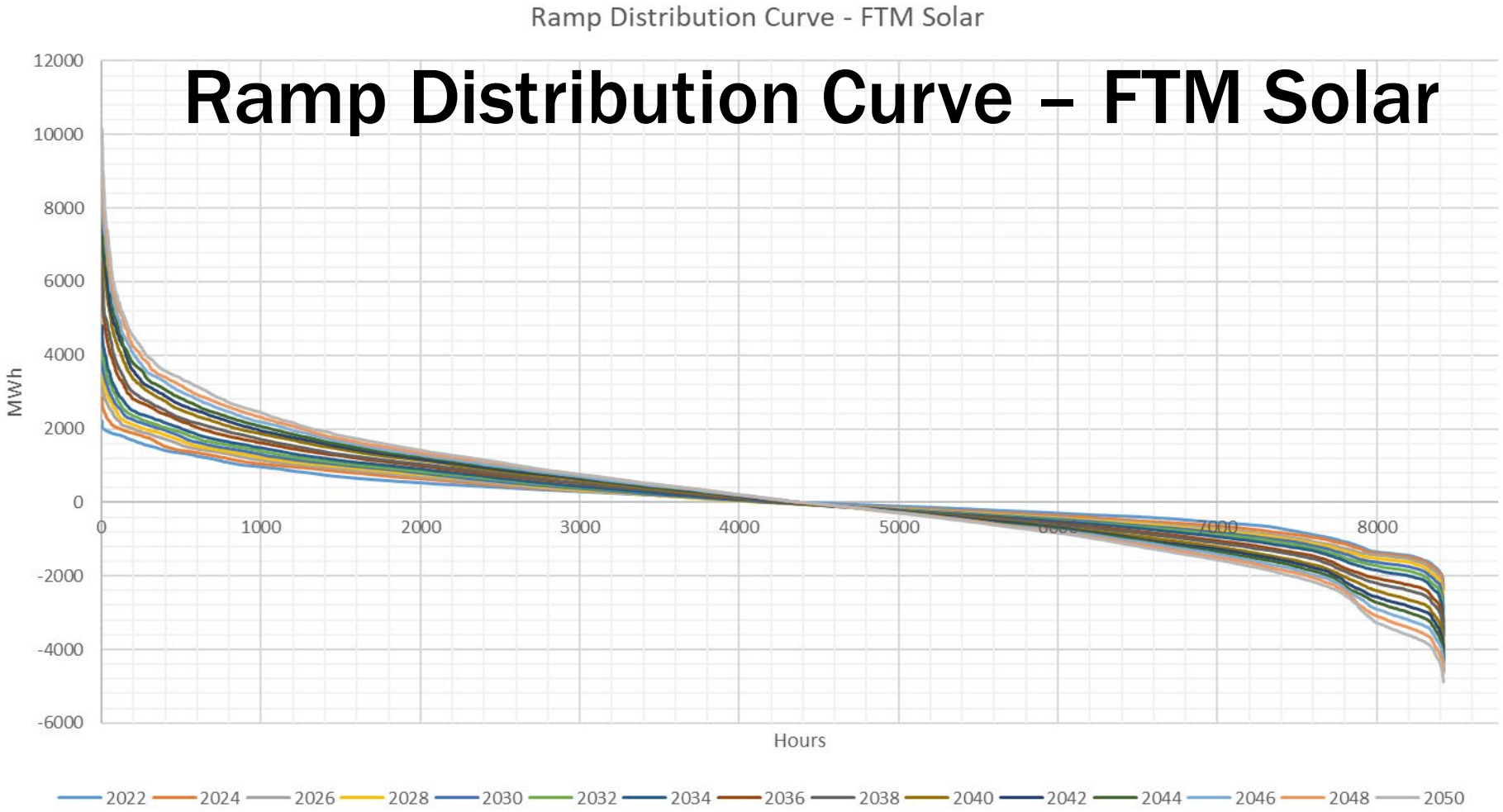
Zooming in: Ramp Distribution Curve 1000 Hours Ramp Up



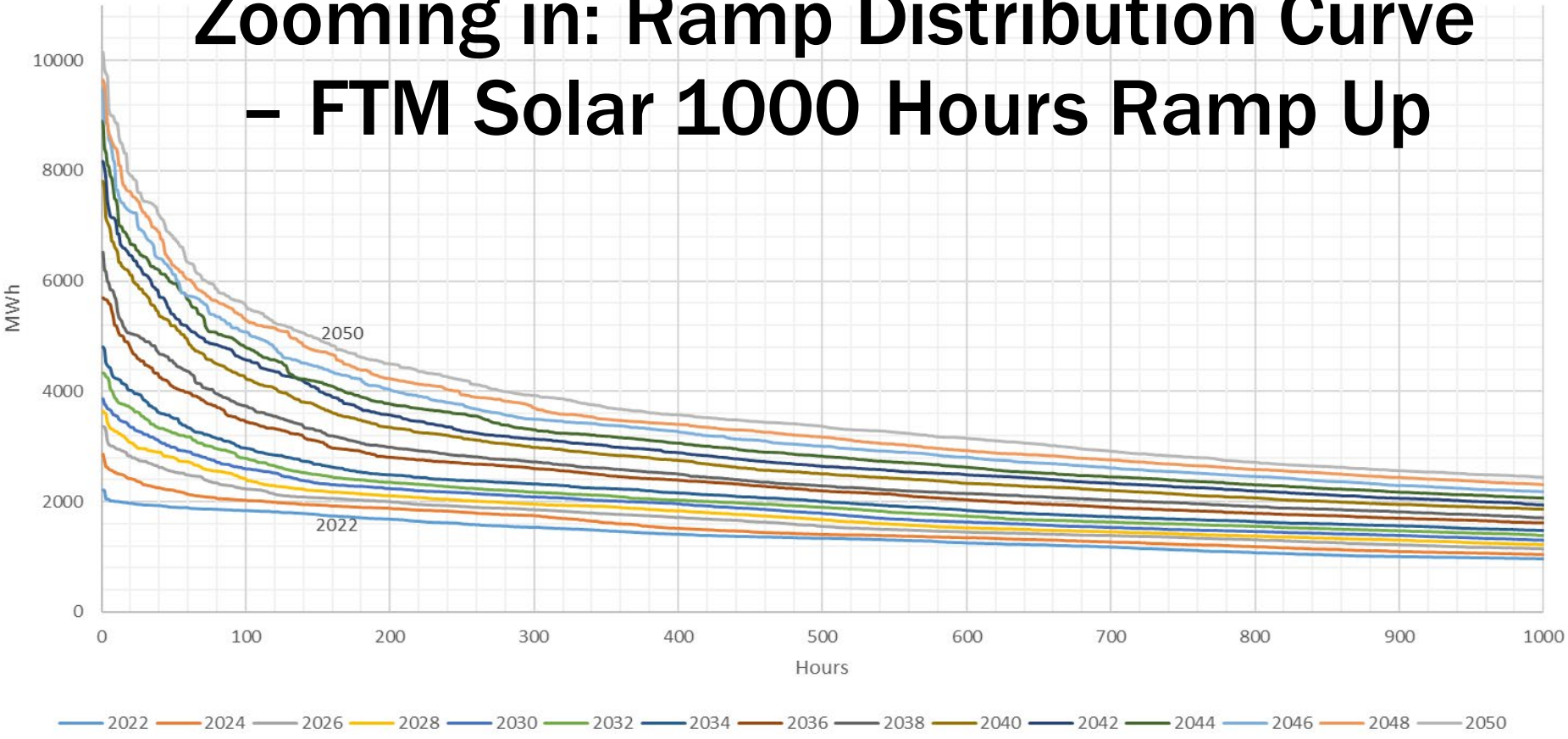


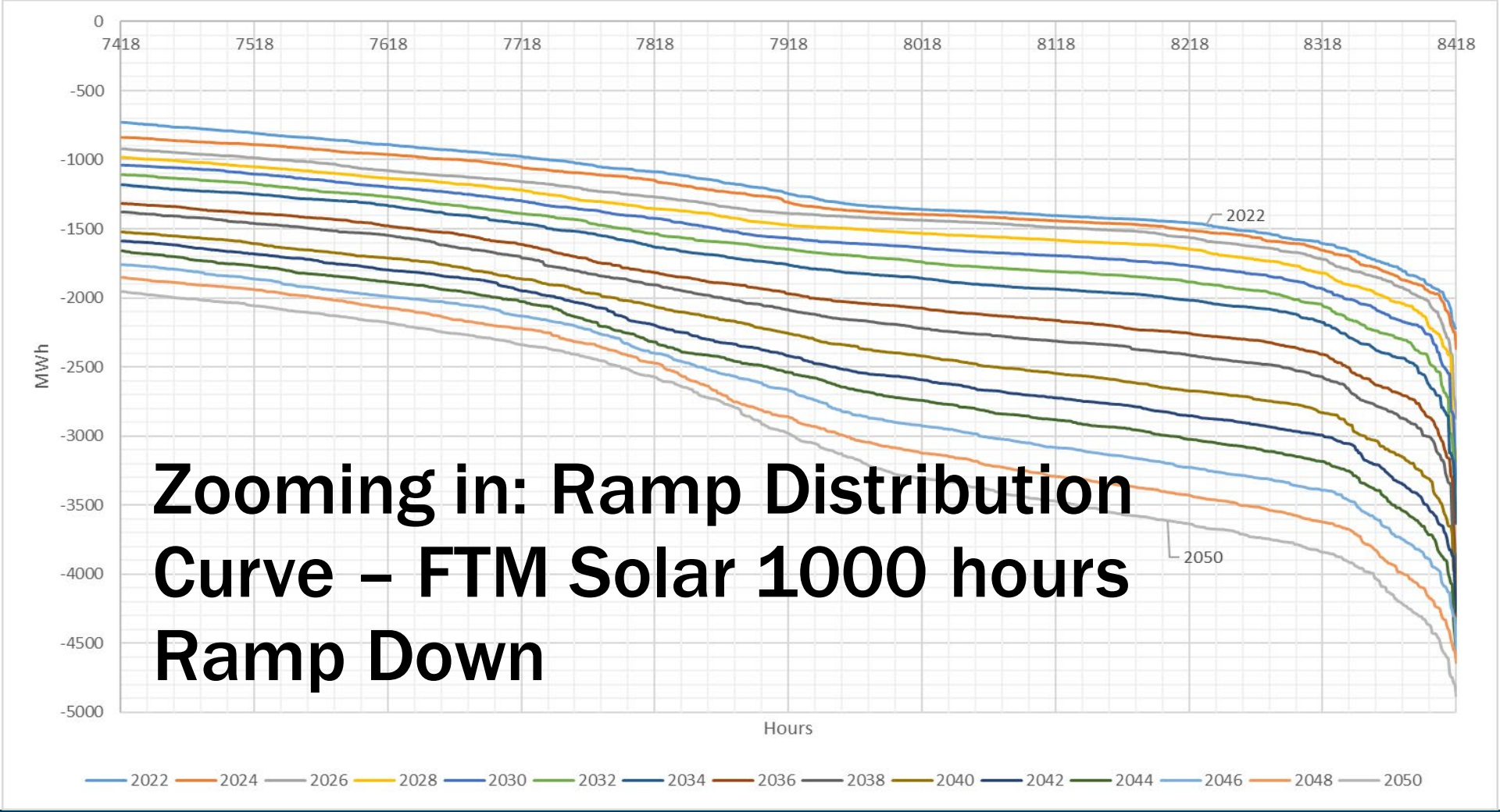
Zooming in: Ramp Distribution Curve 1000 Hours Ramp Down

Ramp Distribution Curve – FTM Solar



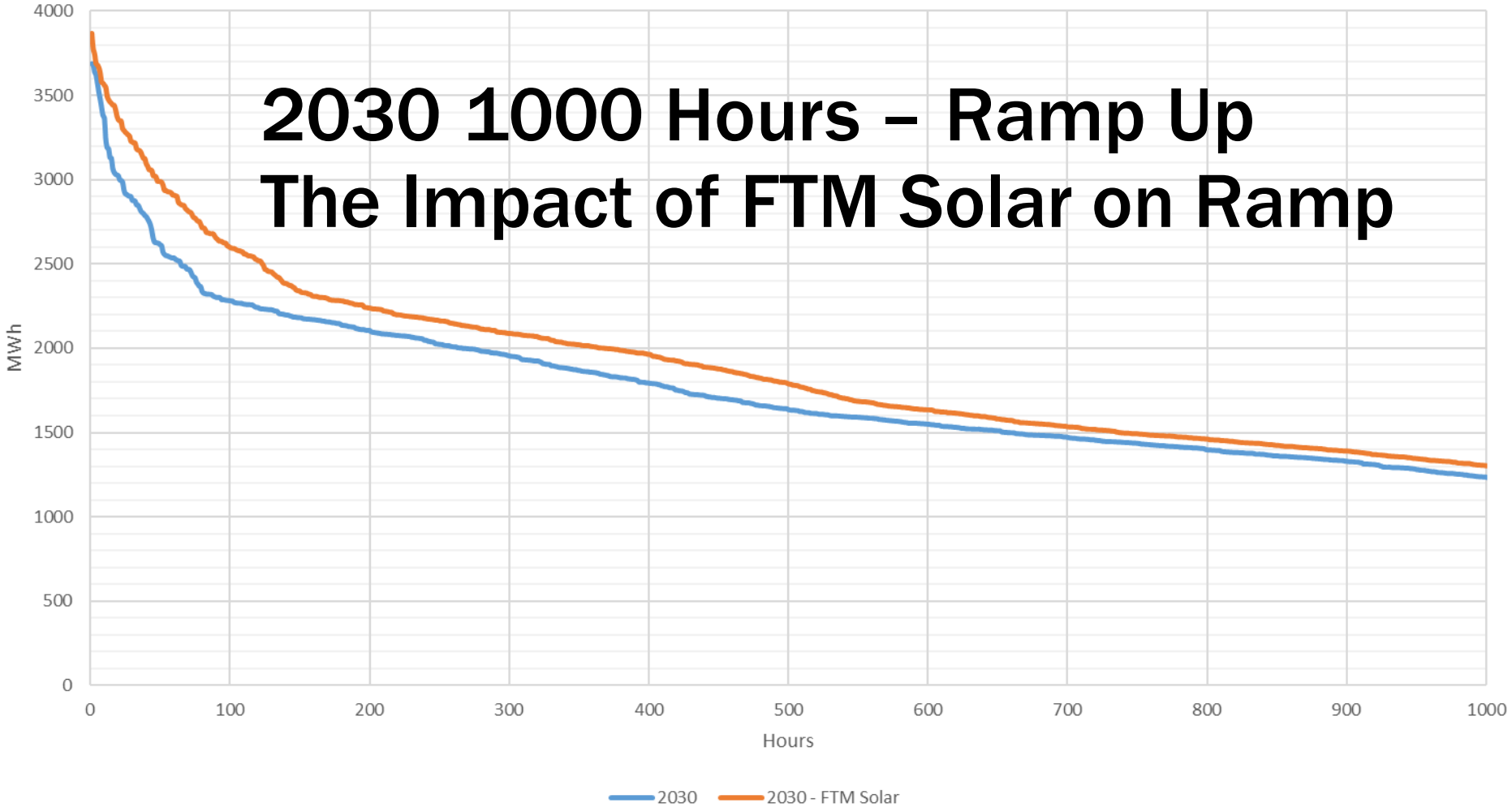
Zooming in: Ramp Distribution Curve – FTM Solar 1000 Hours Ramp Up



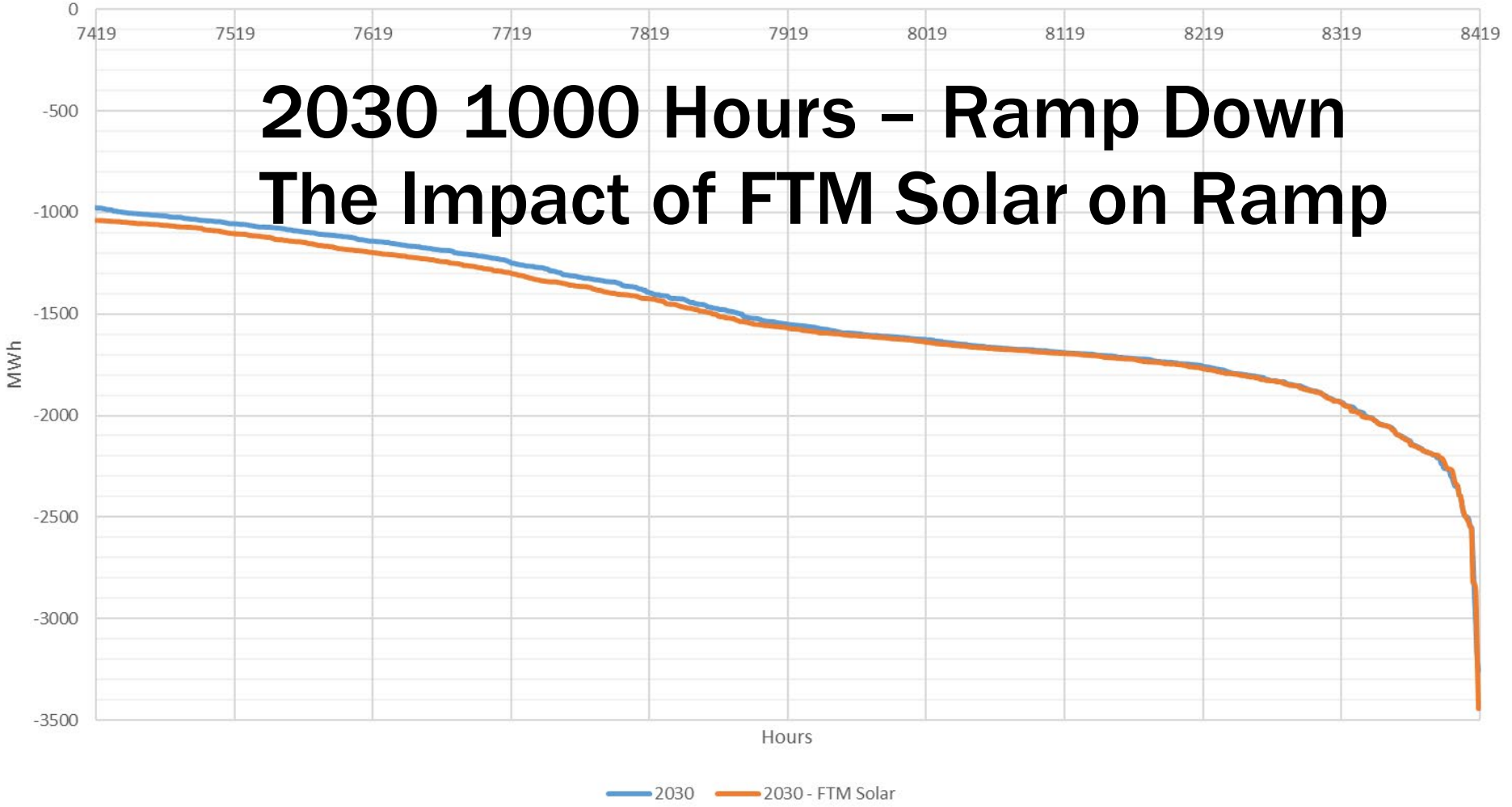


Zooming in: Ramp Distribution Curve – FTM Solar 1000 hours Ramp Down

2030 1000 Hours – Ramp Up
The Impact of FTM Solar on Ramp



2030 1000 Hours – Ramp Down
The Impact of FTM Solar on Ramp



Ramp Statistics

Year	Day	Max Ramp Up	Max Ramp Up (Minus FTM PV)	Min Ramp Down	Min Ramp Down (Minus FTM PV)	Average	Average (Minus FTM PV)	Median	Median (Minus FTM PV)
2022	7/20/2022	2209	2215	-2220	-2220	369	373	159	164
2024	7/17/2024	2513	2864	-2250	-2368	405	444	188	219
2026	7/22/2026	2982	3364	-2792	-2868	450	497	217	244
2028	7/19/2028	3346	3646	-2998	-3191	480	529	221	250
2030	7/17/2030	3688	3868	-3257	-3443	512	563	225	258
2032	7/21/2032	4220	4336	-3443	-3504	549	599	247	280
2034	7/19/2034	4715	4809	-3460	-3632	588	639	263	295
2036	1/10/2036	5642	5700	-4295	-4355	662	714	287	331
2038	1/14/2038	6491	6526	-3990	-3959	707	757	302	331
2040	1/12/2040	7681	7810	-4195	-4227	784	836	337	355
2042	1/9/2042	8112	8171	-4304	-4273	834	885	363	383
2044	1/14/2044	8865	8900	-4521	-4574	881	932	369	391
2046	1/11/2046	9451	9492	-4571	-4603	933	985	392	422
2048	1/9/2048	9589	9648	-4580	-4641	985	1034	414	430
2050	1/13/2050	10020	10149	-4848	-4880	1259	1299	721	735

*Values in MWhs

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Next Steps

Planned Next Steps

- May 24– present the rest of the Climate Change Phase 1 analysis for stakeholder feedback
- Early August - Phase 2 analysis based on the Outlook study
- September - Finalize study

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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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Questions?