



California Energy Commission

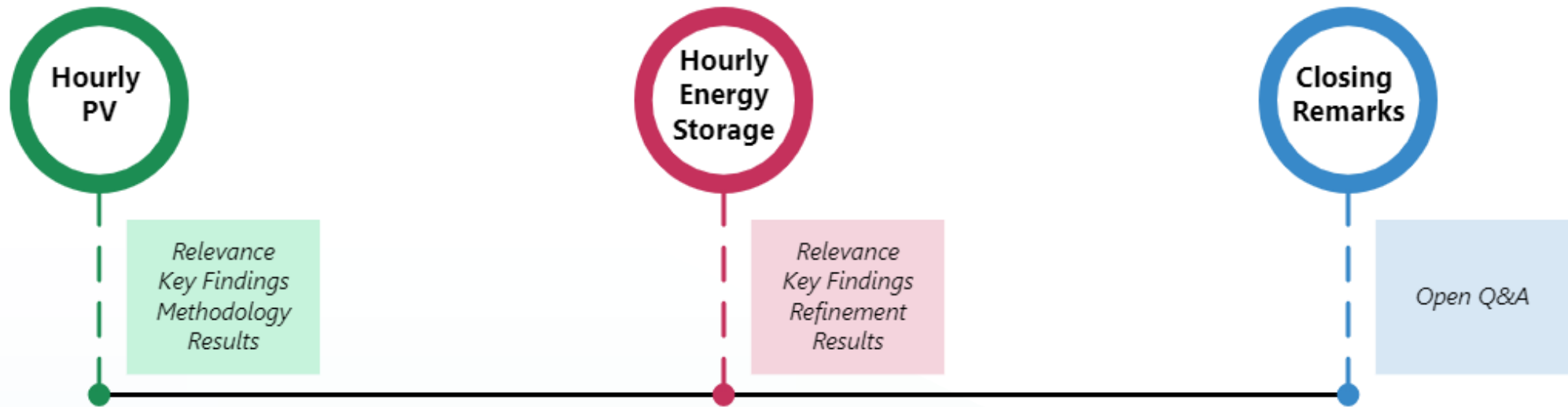
Title: Hourly Behind-The-Meter Distributed Generation Forecast Results

Presenter: Alex Lonsdale, Distributed Generation Forecast Supervisor

Date: October 21, 2024



Agenda





List of Acronyms and Initialisms

BTM – Behind-the-meter

CA – California

CAISO – California Independent System Operator

DAWG – Demand Analysis Working Group

DER – Distributed Energy Resource

DG – Distributed Generation

dGen – Distributed Generation Market Demand Model

HLM – Hourly Load Model

IEPR – Integrated Energy Policy Report

MW – Megawatt

NBT – Net Billing Tariff

NEM – Net Energy Metering

PA – Planning Area

POU – Publicly Owned Utility

PV – Photovoltaics

SAM – System Advisor Model



Forecast BTM PV Profiles



Relevance: BTM PV Generation

Forecast Model	Purpose	Description
HLM	Model Training	Historical PV generation estimates required to construct hourly consumption profiles
	Forecast Results	Forecast PV generation required to determine baseline net load
Summary Model	Forecast Results	Forecast annual PV generation needed to determine annual baseline net sales



Key Findings: BTM PV Generation Forecast

- Lower capacity factors compound effect of more conservative capacity forecasts
- CAISO early September BTM PV capacity factors during hour of:
 - Peak demand (17) is **3%** points lower than 2023 IEPR
 - Daily max generation (13) is **13%** points lower than 2023 IEPR
- Reductions in BTM PV generation during hour of:
 - Peak demand range from **240 MW in 2024** to **2,490 MW in 2040**
 - Daily max generation range from **1,010 MW in 2024** to **8,610 MW in 2040**



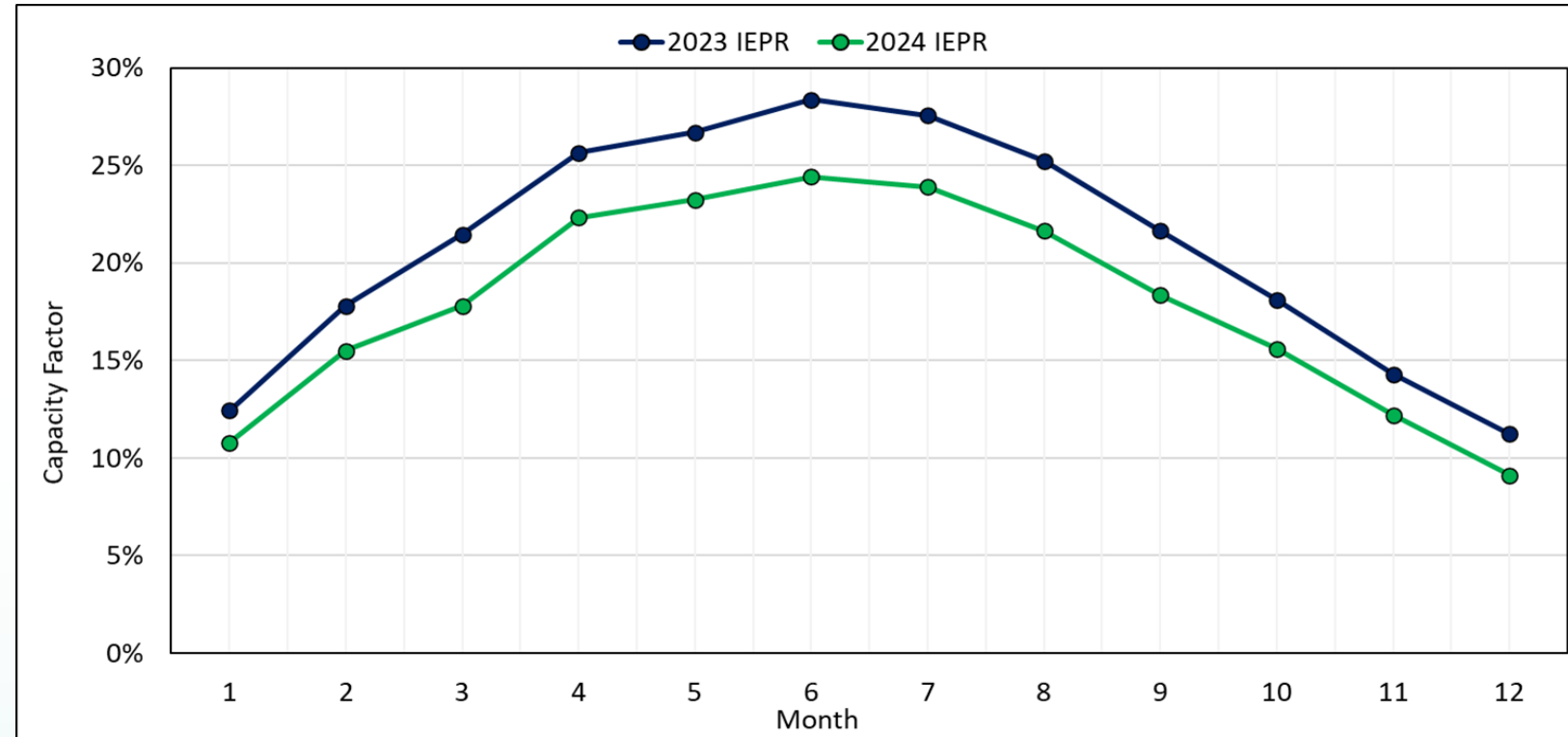
Forecast BTM PV Profiles Methodology

- **Unchanged methodology for 2024 IEPR**
- Data Incorporation
 - 6 years of historical PV data (2018-2023)
- Data groupings
 - Forecast zone
 - Sector
 - Month
 - Week of Month
 - Hour
- Capacity Factors
 - Averaged profiles across days in the same week and years
- Results
 - 4 distinct hourly profiles for each forecast zone, month, and sector
 - 1,152 unique profiles contributing to CAISO forecast



CAISO Forecast BTM PV Monthly Capacity Factors

Season	% Point Reduction
Summer	3.8% - 4.3%
Fall	2.2% - 3.4%
Winter	1.9% - 2.7%
Spring	3.6% - 3.9%



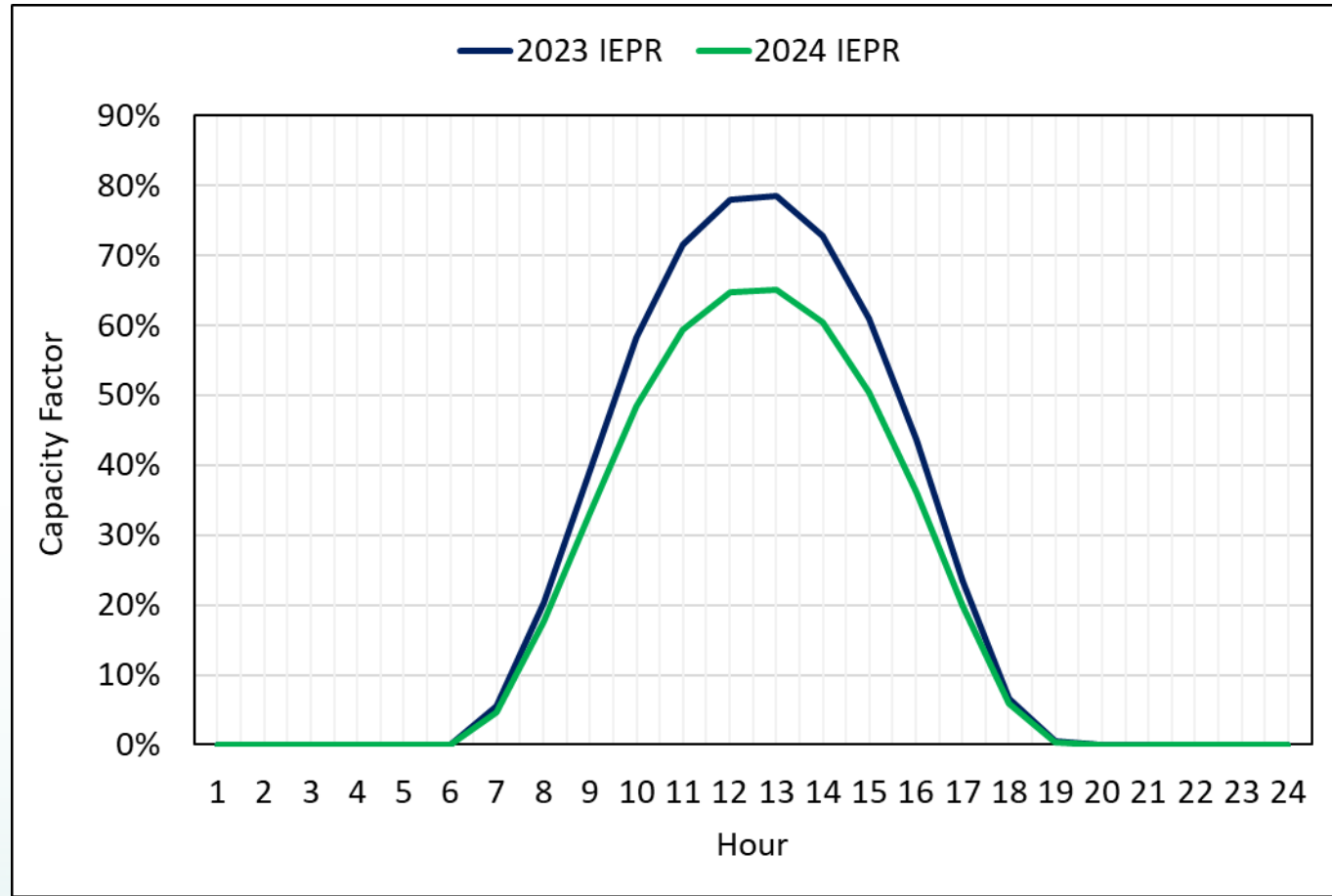
Source: CEC Staff



CAISO Forecast Average Hourly PV Capacity Factors: September

- Capacity factor reductions:
 - Hour of peak demand (17) – **3%**
 - Daily max generation (13) – **13%**

Hour	2023 IEPR	2024 IEPR
1	0%	0%
2	0%	0%
3	0%	0%
4	0%	0%
5	0%	0%
6	0%	0%
7	5%	5%
8	20%	18%
9	39%	33%
10	58%	48%
11	71%	59%
12	78%	65%
13	78%	65%
14	73%	60%
15	61%	50%
16	44%	36%
17	23%	20%
18	7%	6%
19	0%	0%
20	0%	0%
21	0%	0%
22	0%	0%
23	0%	0%
24	0%	0%



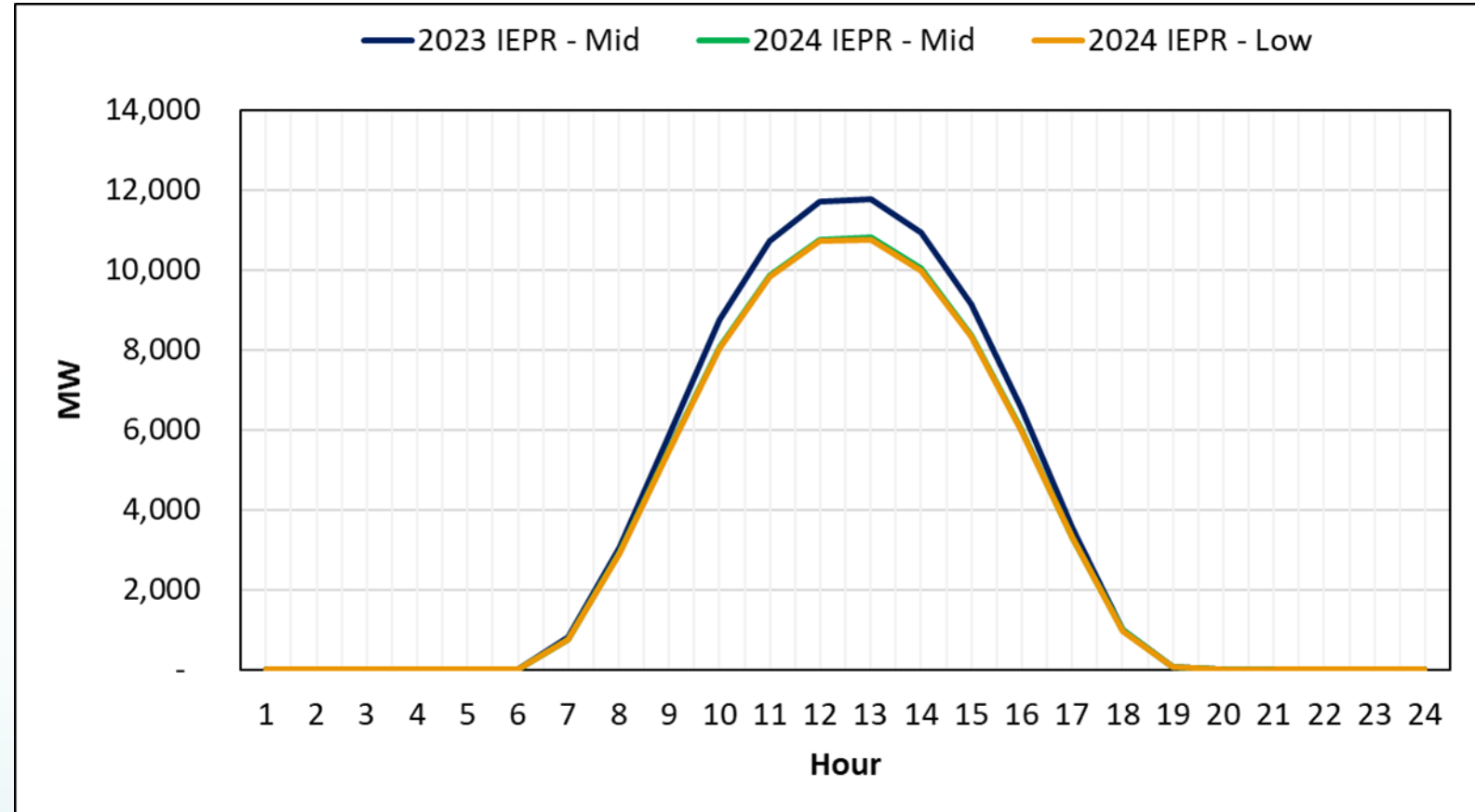
Source: CEC Staff



CAISO Forecast Average Hourly PV Generation: September 2024

- 2024 IEPR includes **additional ~1.2GW of nameplate capacity**
- PV generation forecast **reductions:**

Hour	2024 IEPR Mid (MW)	2024 IEPR Low (MW)
13	-960	-1,010
17	-220	-240



Source: CEC Staff



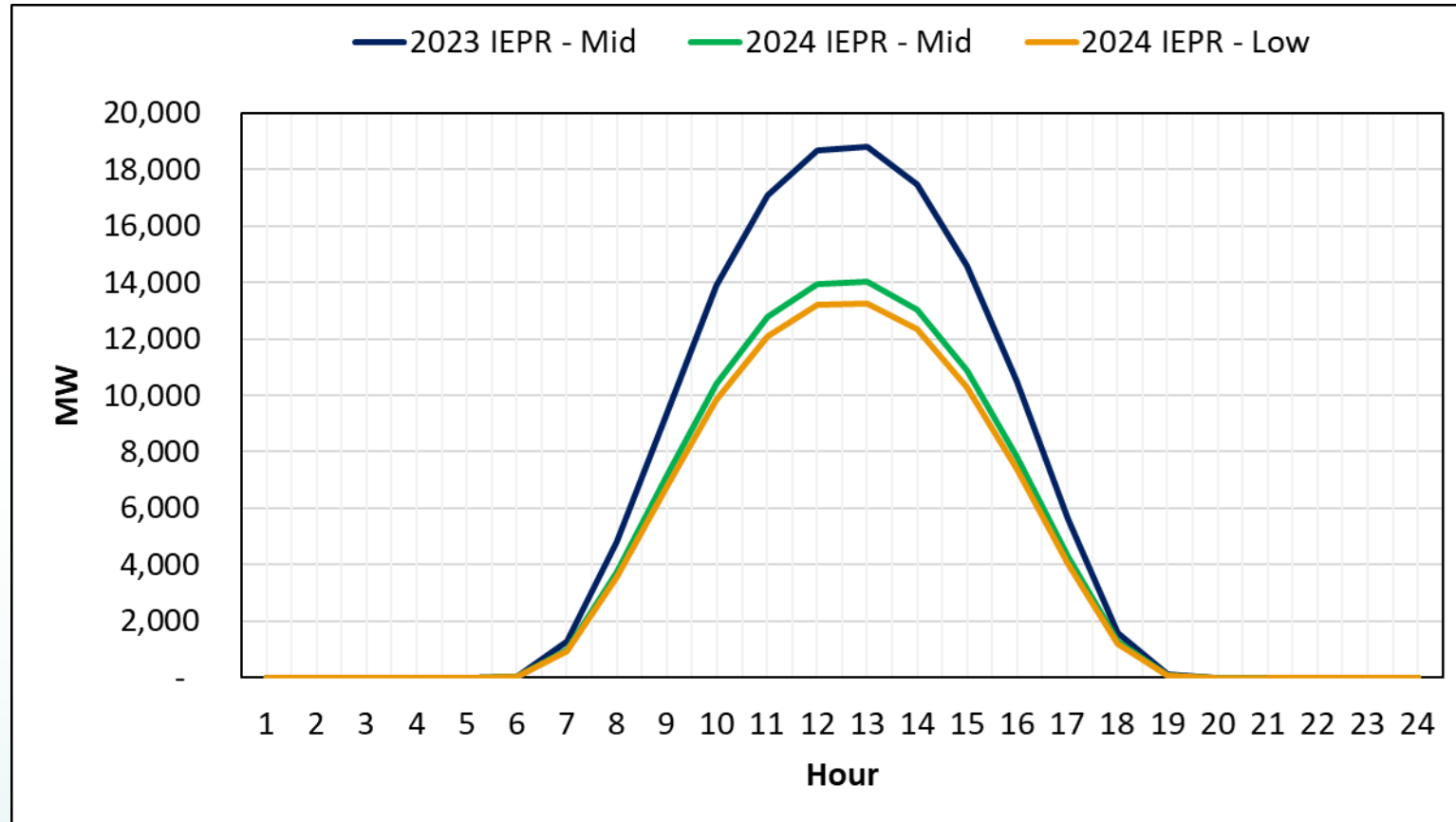
CAISO Forecast Average Hourly PV Generation: September 2030

- Nameplate capacity comparison:

2023 IEPR Mid (MW)	2024 IEPR Mid (MW)	2024 IEPR Low (MW)
24,939	22,213	21,013

- PV generation forecast **reductions**:

Hour	2024 IEPR Mid (MW)	2024 IEPR Low (MW)
13	-4,760	-5,530
17	-1,340	-1,570



Source: CEC Staff



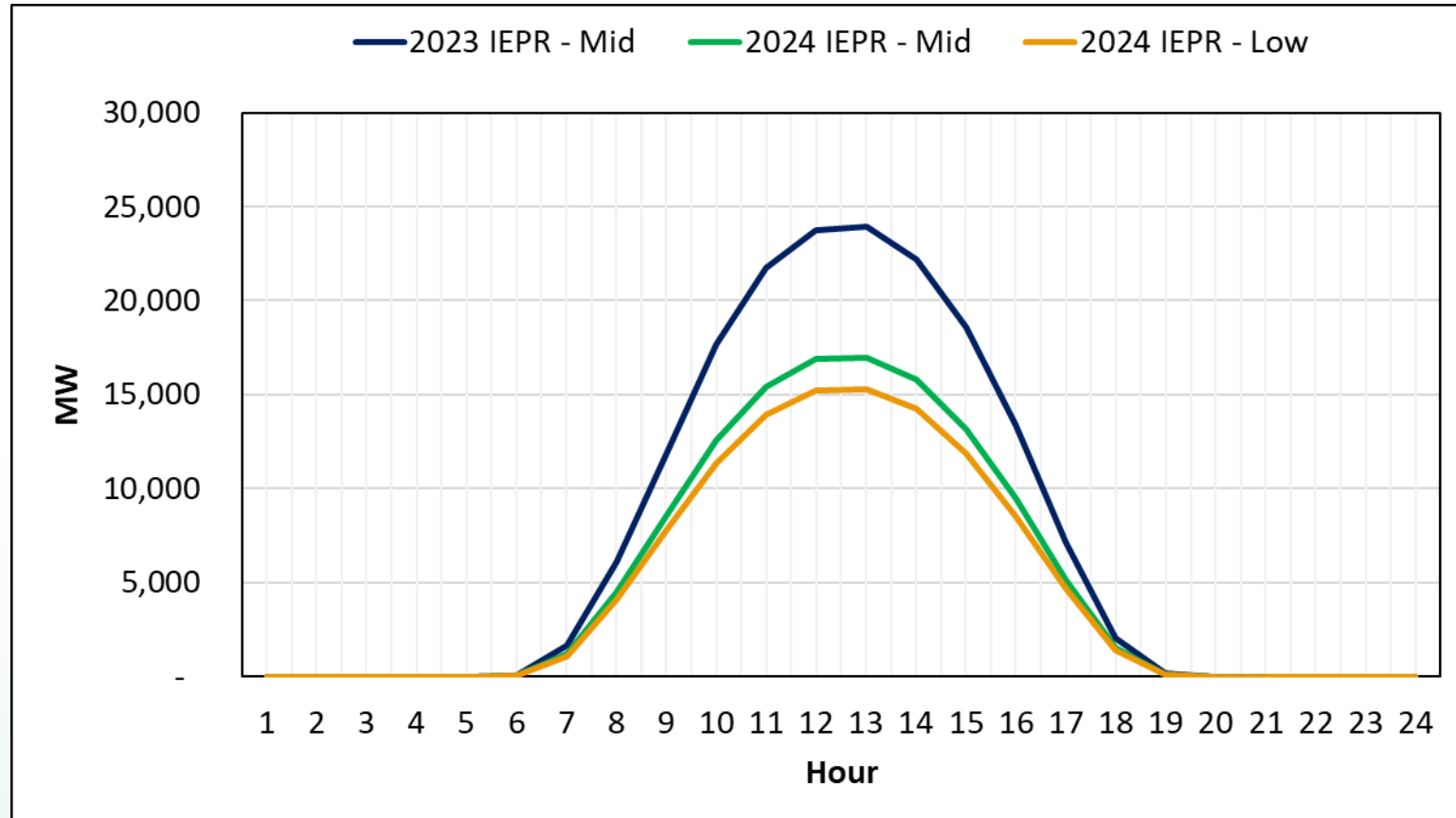
CAISO Forecast Average Hourly PV Generation: September 2040

- Nameplate capacity comparison:

2023 IEPR Mid (MW)	2024 IEPR Mid (MW)	2024 IEPR Low (MW)
32,850	27,967	25,276

- PV generation forecast reductions:

Hour	2024 IEPR Mid (MW)	2024 IEPR Low (MW)
13	-6,940	-8,610
17	-1,980	-2,490



Source: CEC Staff



Hourly BTM PV Results Summary

- Lower generation estimates will lead to greater hourly net load and annual net sales projections compared to 2023 IEPR
 - More details regarding changes to net load and annual sales will be presented at a DAWG in November



Hourly Storage Profiles



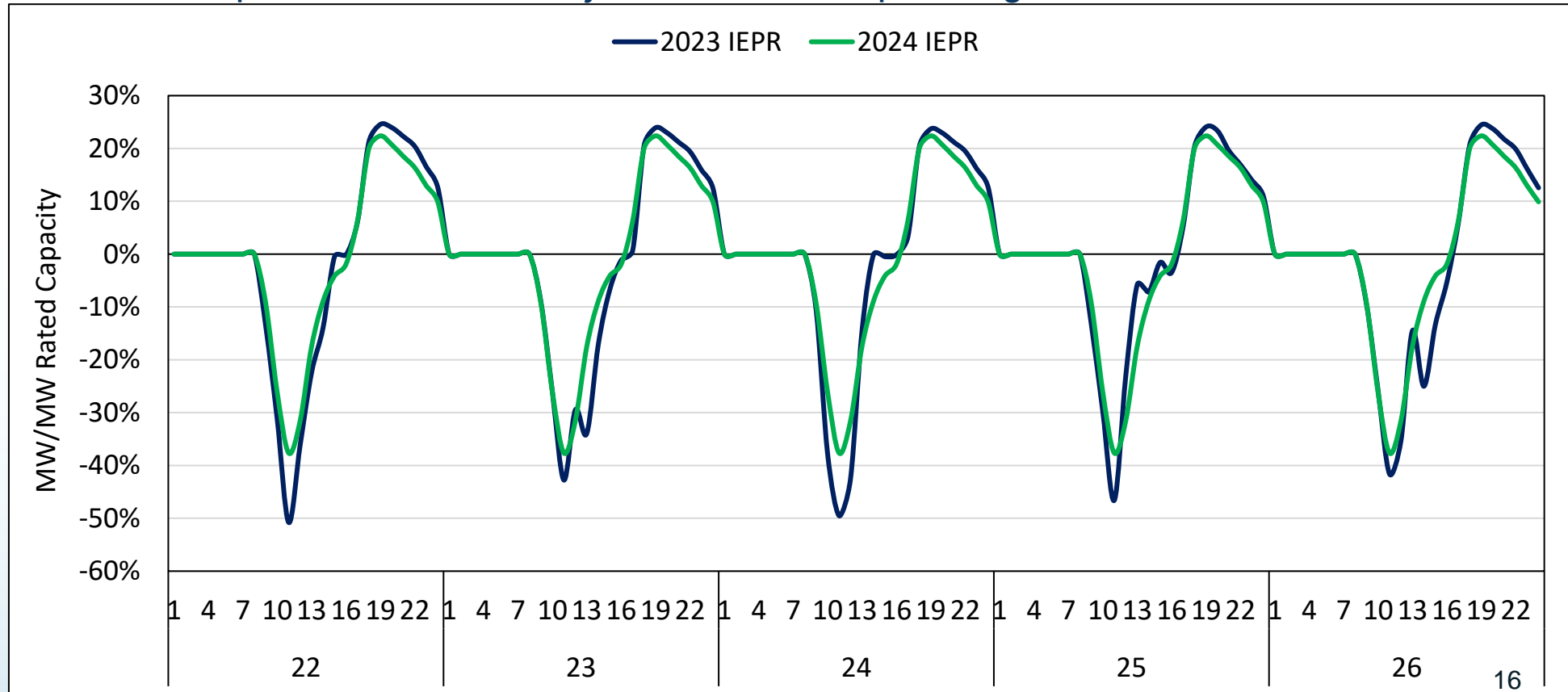
Relevance and Findings: BTM Energy Storage

- Relevance
 - Forecast charge and discharge required for baseline net load calculation in HLM
- Key Findings
 - More conservative BTM DG adoption forecasts lead to less energy storage use, especially during the on-peak TOU period
 - Compared to 2023 IEPR, reductions in daily max energy storage discharge range from:
 - 355 MW to 715 MW in 2030
 - 380 MW to 896 MW in 2040



Residential Profile Refinement

- 2023 IEPR SAM residential simulations used TMY data which introduced daily variability to energy storage charge and discharge
- Averaged SAM simulations to better align variability with non-residential profiles and PV generation assumptions
 - Example below for January 22-26 in PG&E planning area

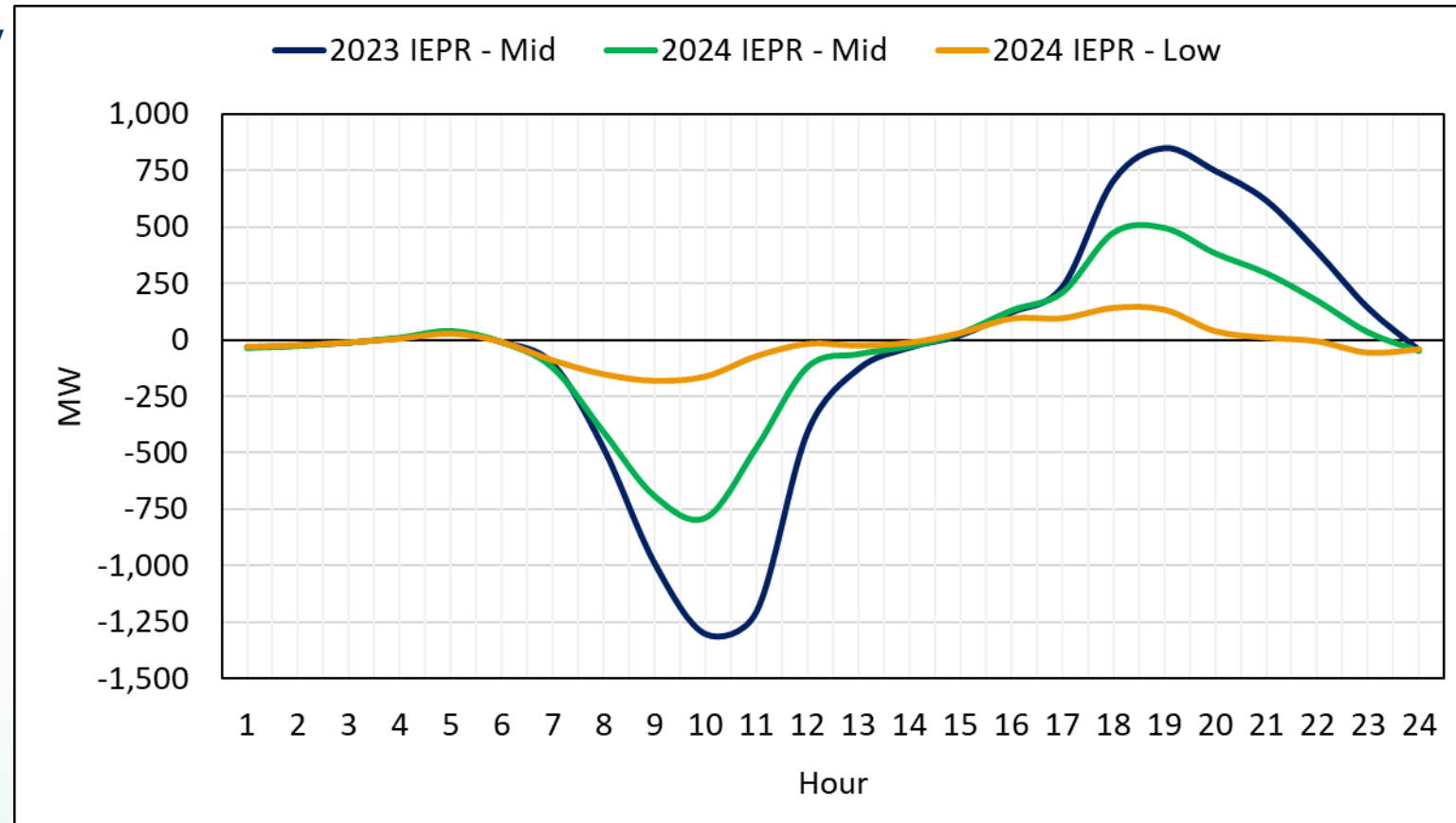




CAISO Forecast Average Hourly Storage: September 2030

- Reductions in daily max discharge driven by more conservative BTM DG adoption forecasts
- 2024 IEPR forecast daily max discharge reductions:

Hour	2024 IEPR Mid (MW)	2024 IEPR Low (MW)
19	-355	-715



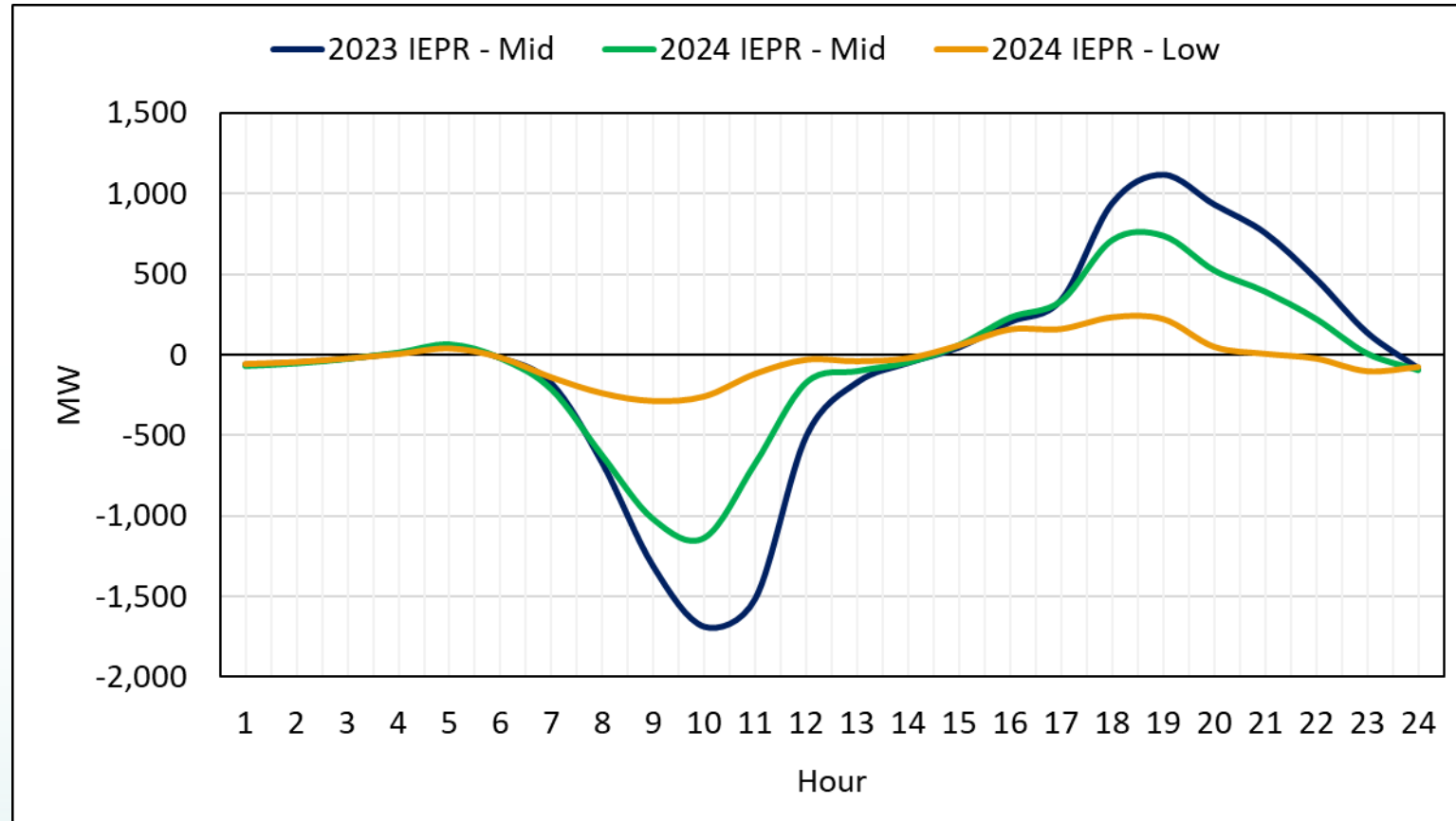
Source: CEC Staff



CAISO Forecast Average Hourly Storage: September 2040

- 2024 IEPR forecast daily max discharge reductions:

Hour	2024 IEPR Mid (MW)	2024 IEPR Low (MW)
19	-380	-896



Source: CEC Staff



Closing Remarks

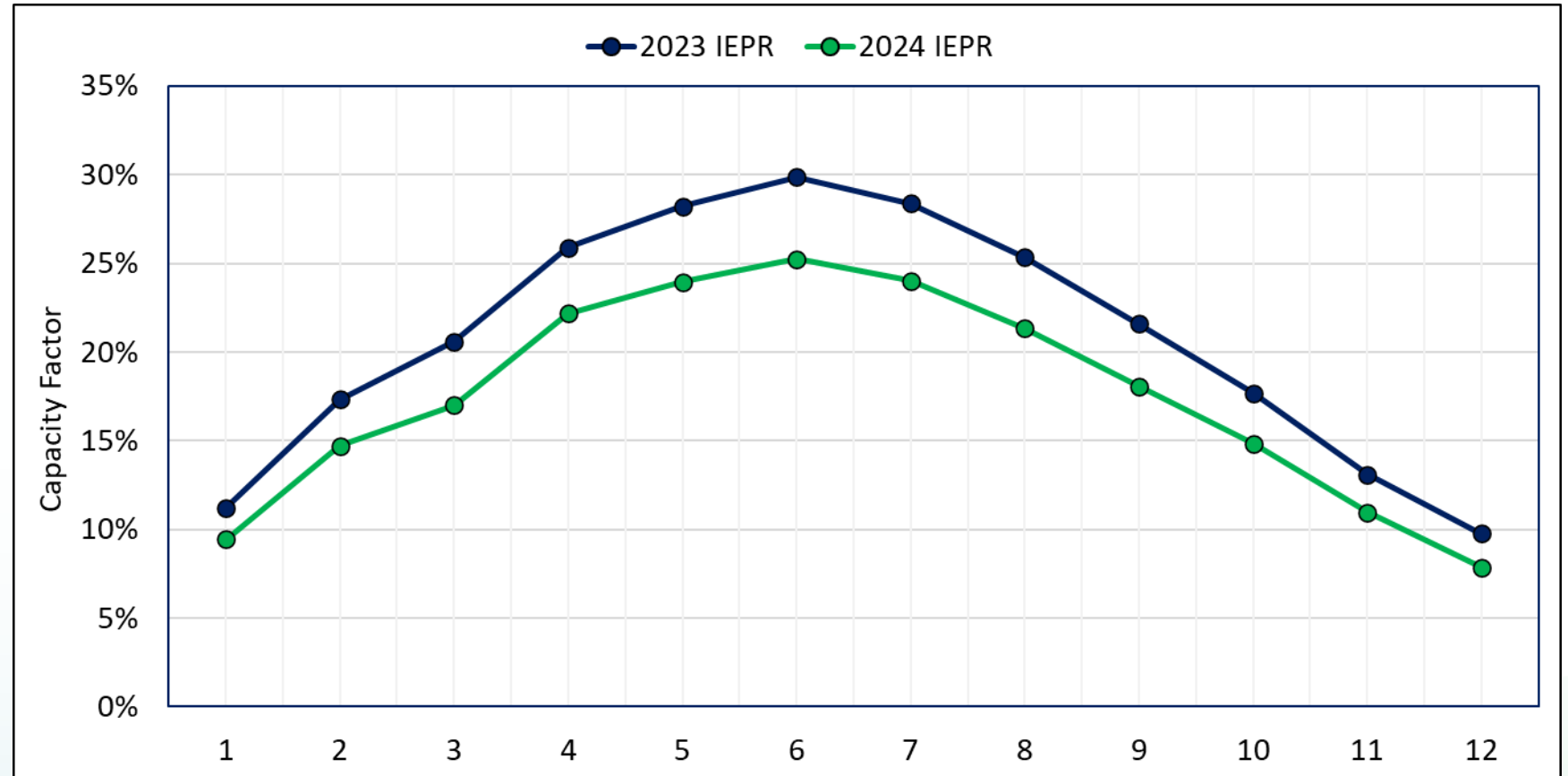
- Thank you for your participation at DAWG!
 - Additional material provided in the appendix
- A special thanks to our DG Forecast team
 - Mark Palmere
 - Sudhakar Konala
 - Bobby Wilson
- Have a question? Contact us!
 - Demand Forecast Unit Supervisor
 - Anne Fisher – Anne.Fisher@energy.ca.gov
 - DG Forecast Supervisor
 - Alex Lonsdale – Alexander.Lonsdale@energy.ca.gov



Appendix

Forecast Monthly PV Capacity Factors: PG&E

Month	2023 IEPR	2024 IEPR
1	11.2%	9.5%
2	17.3%	14.7%
3	20.6%	17.0%
4	25.9%	22.2%
5	28.2%	23.9%
6	29.9%	25.2%
7	28.4%	24.0%
8	25.3%	21.3%
9	21.6%	18.1%
10	17.7%	14.8%
11	13.1%	11.0%
12	9.8%	7.9%

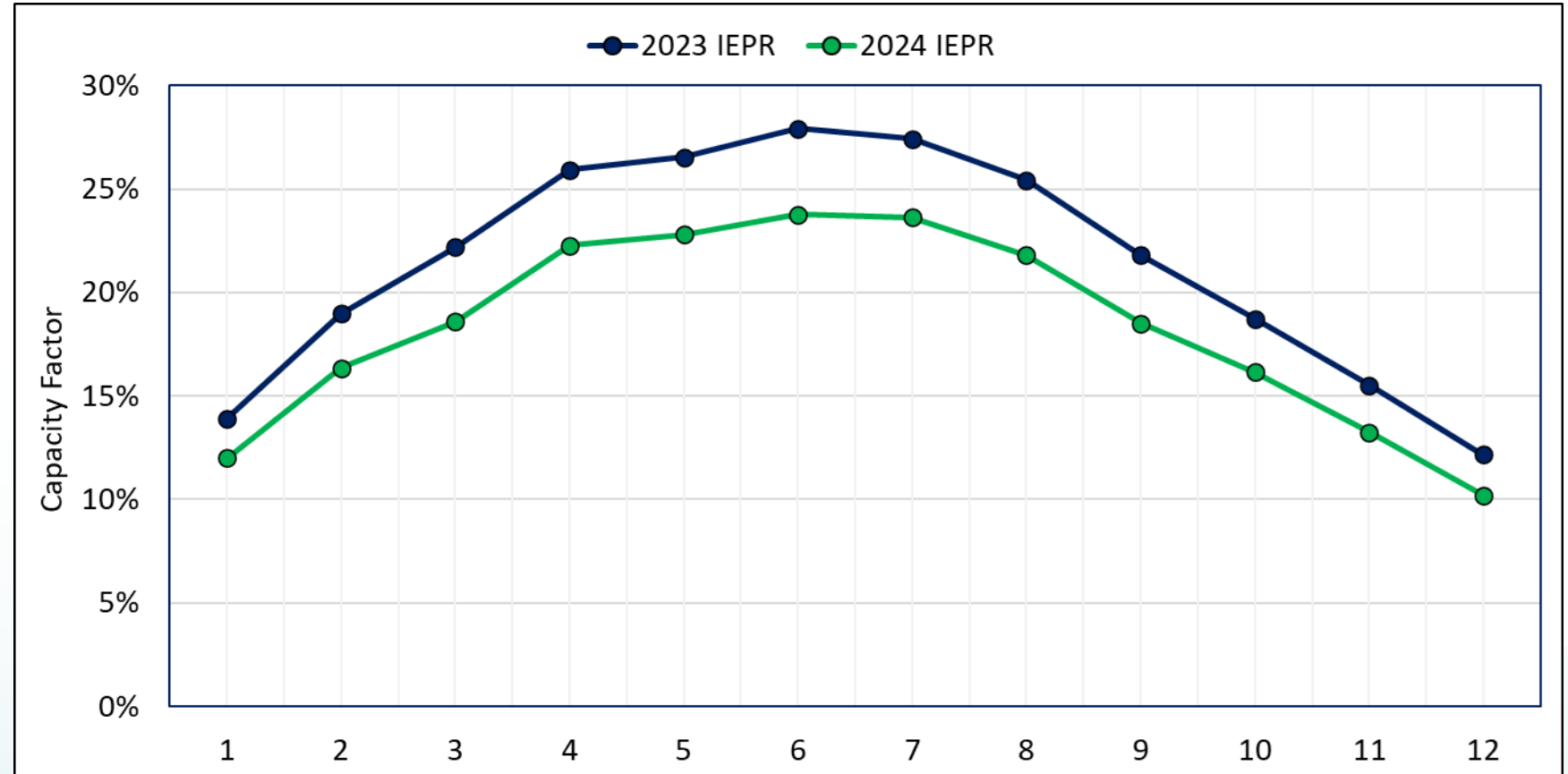


Source: CEC Staff



Forecast Monthly PV Capacity Factors: SCE

Month	2023 IEPR	2024 IEPR
1	11.2%	9.5%
2	17.3%	14.7%
3	20.6%	17.0%
4	25.9%	22.2%
5	28.2%	23.9%
6	29.9%	25.2%
7	28.4%	24.0%
8	25.3%	21.3%
9	21.6%	18.1%
10	17.7%	14.8%
11	13.1%	11.0%
12	9.8%	7.9%

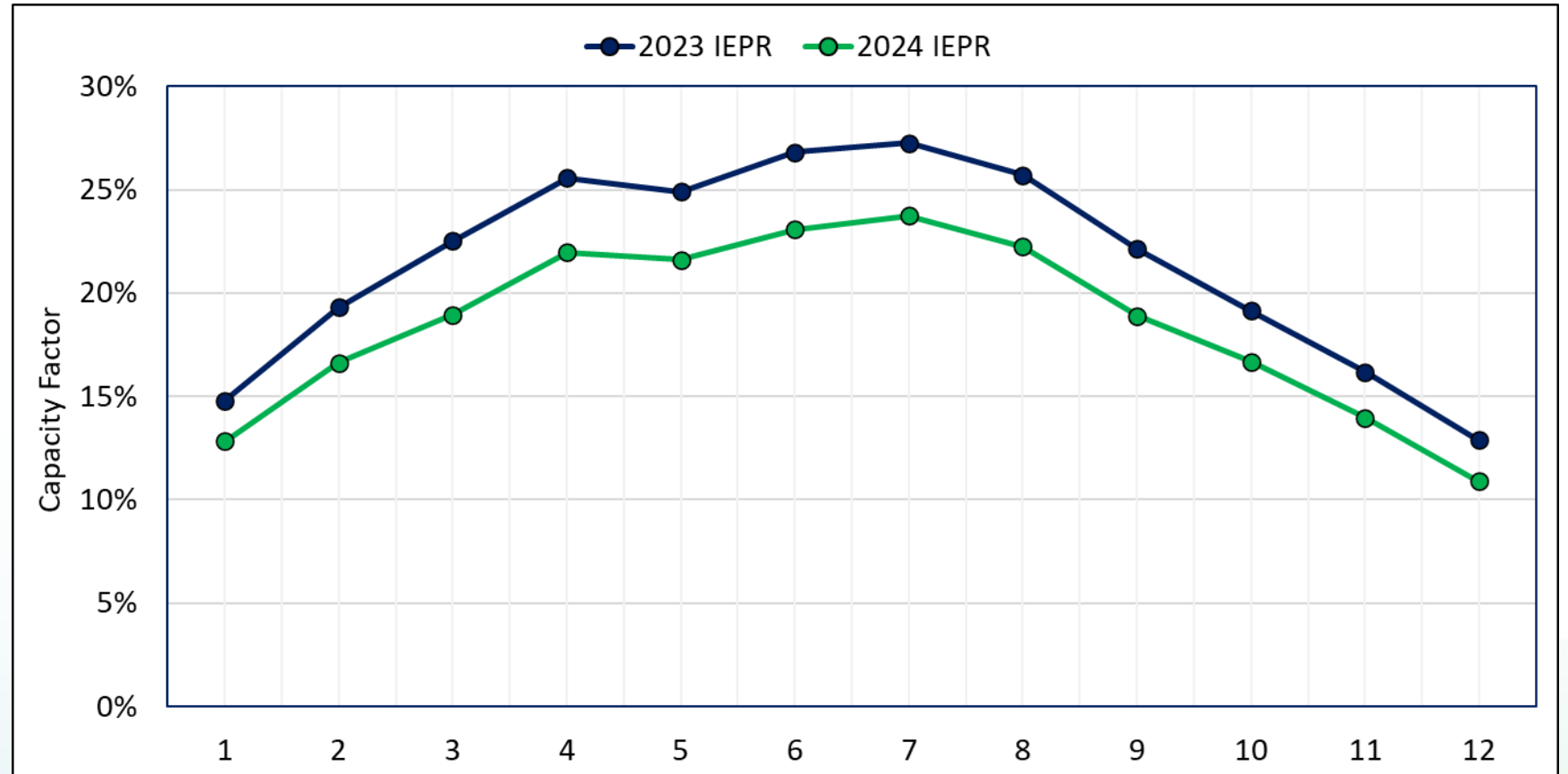


Source: CEC Staff



Forecast Monthly PV Capacity Factors: SDG&E

Month	2023 IEPR	2024 IEPR
1	11.2%	9.5%
2	17.3%	14.7%
3	20.6%	17.0%
4	25.9%	22.2%
5	28.2%	23.9%
6	29.9%	25.2%
7	28.4%	24.0%
8	25.3%	21.3%
9	21.6%	18.1%
10	17.7%	14.8%
11	13.1%	11.0%
12	9.8%	7.9%



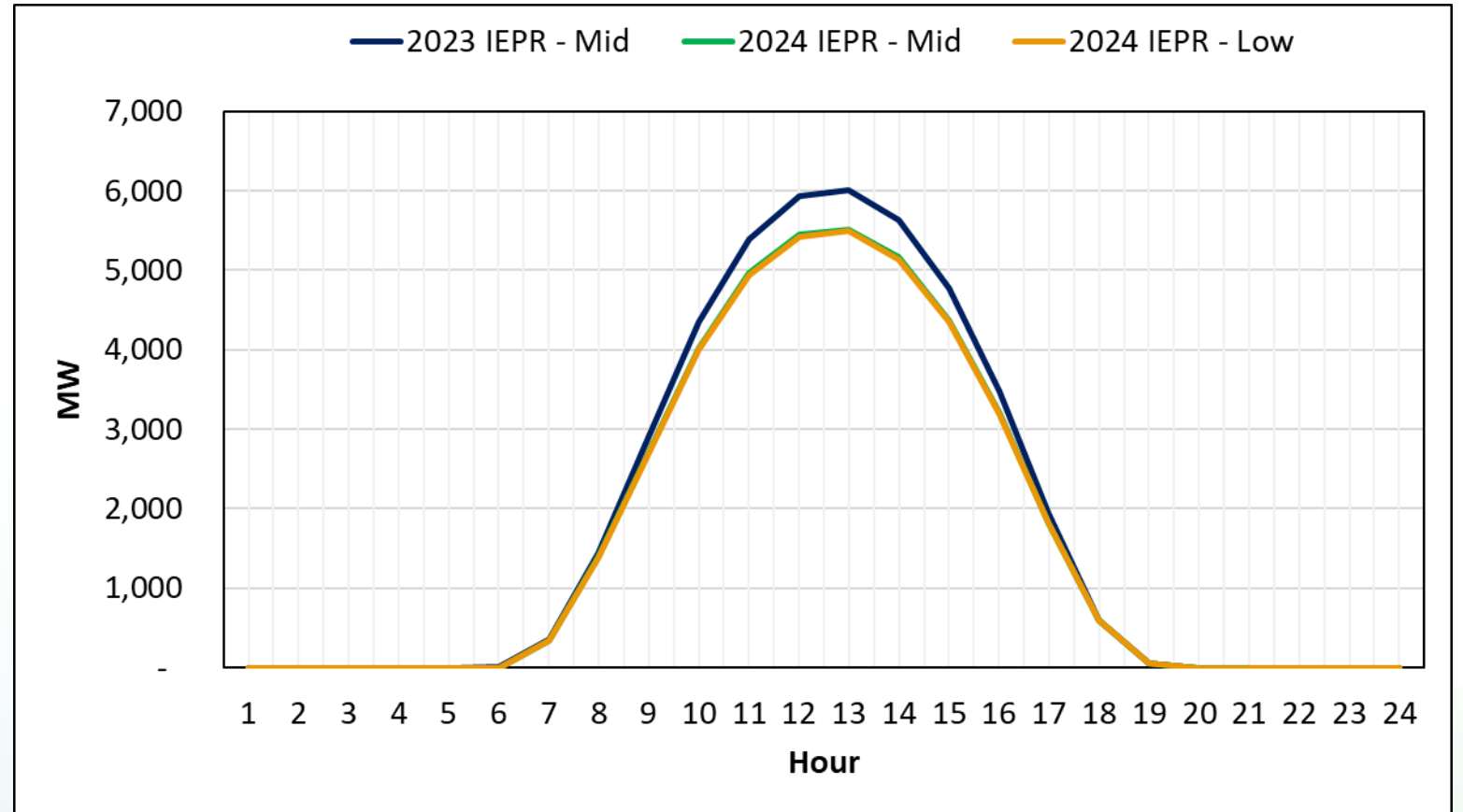
Source: CEC Staff



PG&E Forecast Average Hourly PV Generation: September 2024

- 2024 IEPR includes **additional ~1.2GW of nameplate capacity**
- PV generation forecast **reductions:**

Hour	2024 IEPR Mid (MW)	2024 IEPR Low (MW)
13	-499	-525
17	-111	-120



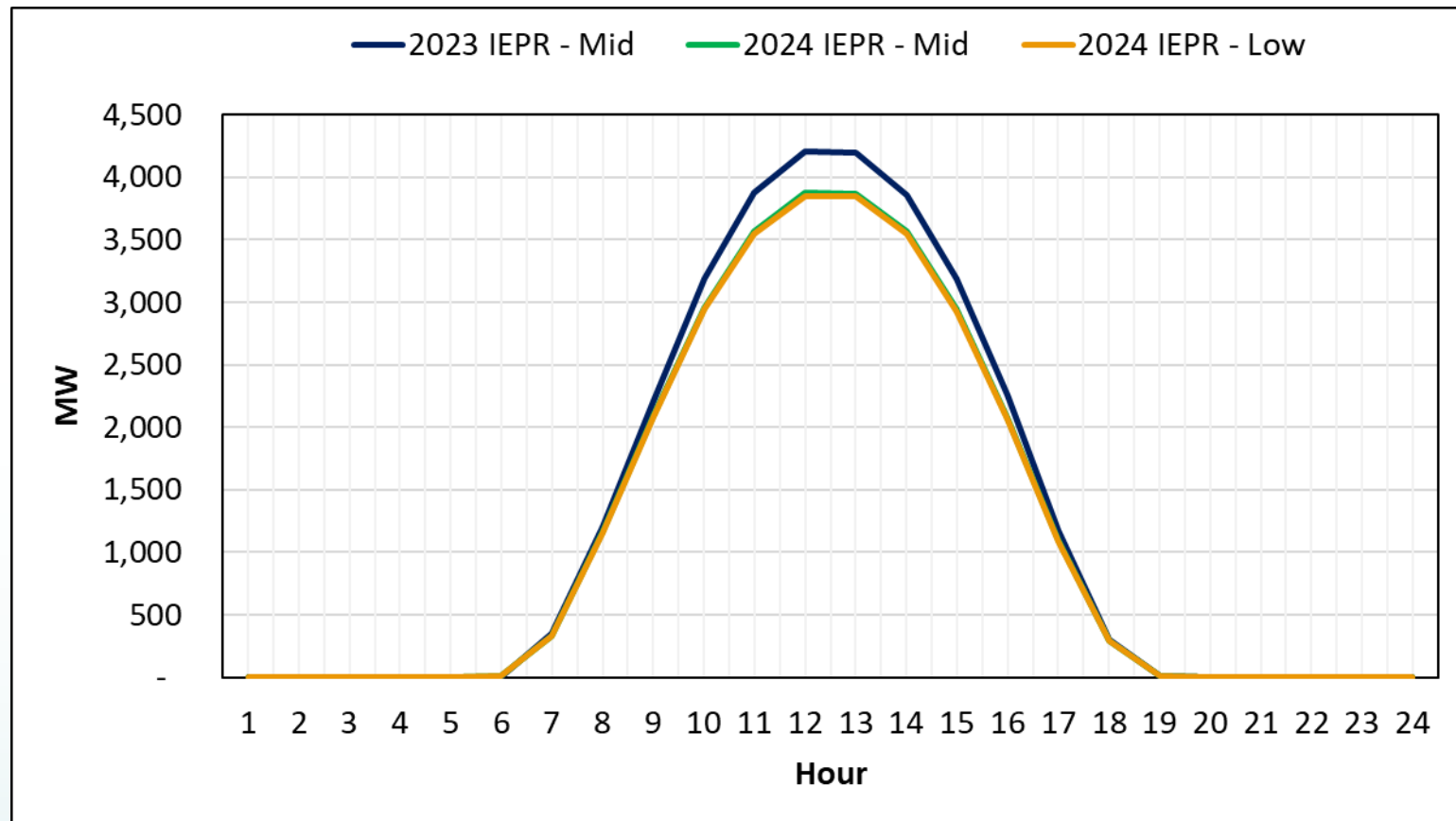
Source: CEC Staff



SCE Forecast Average Hourly PV Generation: September 2024

- 2024 IEPR includes **additional ~1.2GW of nameplate capacity**
- PV generation forecast **reductions:**

Hour	2024 IEPR Mid (MW)	2024 IEPR Low (MW)
13	-327	-348
17	-79	-85



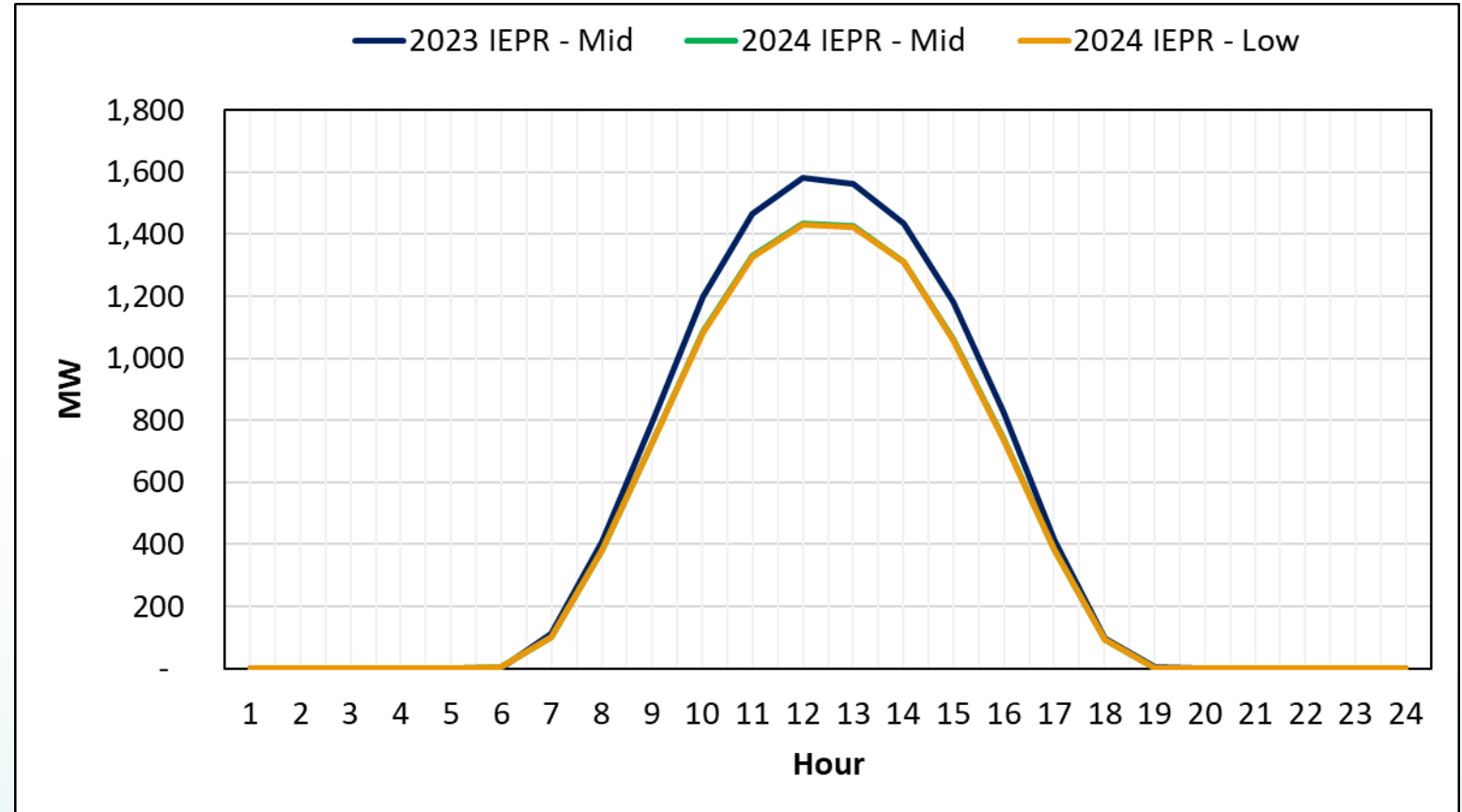
Source: CEC Staff



SDG&E Forecast Average Hourly PV Generation: September 2024

- 2024 IEPR includes **additional ~1.2GW of nameplate capacity**
- PV generation forecast **reductions:**

Hour	2024 IEPR Mid (MW)	2024 IEPR Low (MW)
13	-136	-140
17	-33	-34



Source: CEC Staff



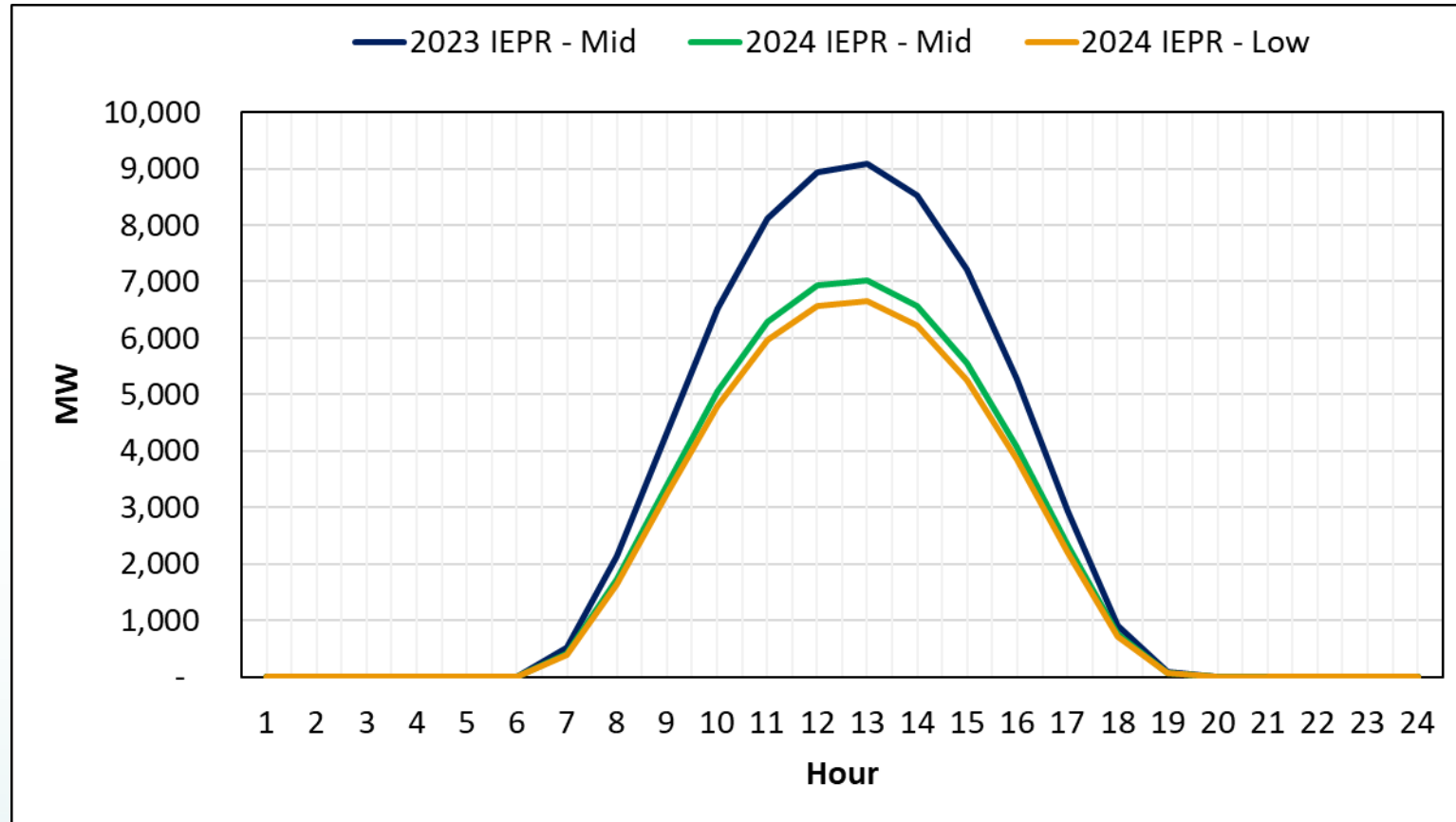
PG&E Forecast Average Hourly PV Generation: September 2030

- Nameplate capacity comparison:

2023 IEPR Mid (MW)	2024 IEPR Mid (MW)	2024 IEPR Low (MW)
11,991	11,159	10,581

- PV generation forecast **reductions**:

Hour	2024 IEPR Mid (MW)	2024 IEPR Low (MW)
13	-2,065	-2,436
17	-614	-738



Source: CEC Staff



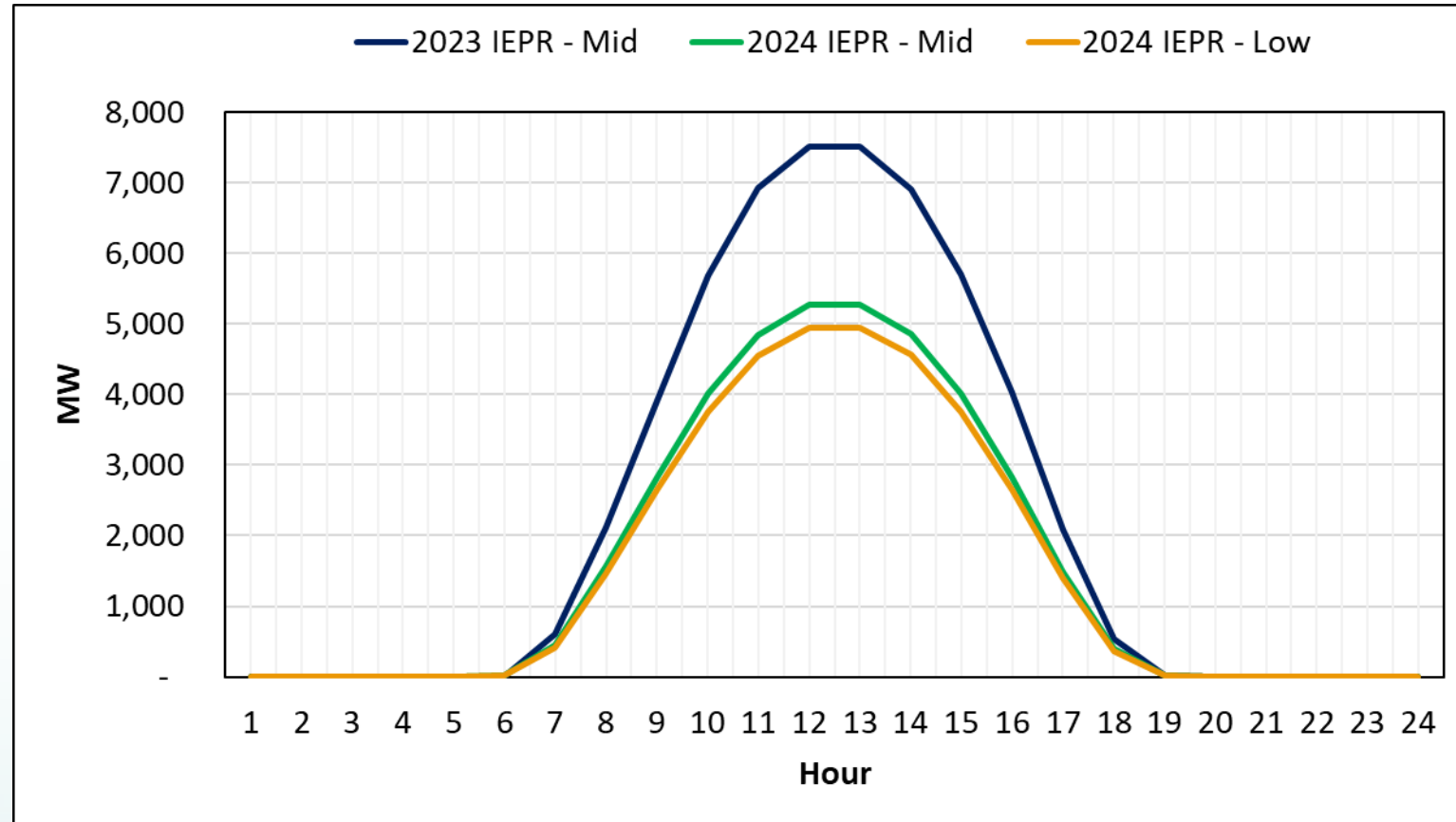
SCE Forecast Average Hourly PV Generation: September 2030

- Nameplate capacity comparison:

2023 IEPR Mid (MW)	2024 IEPR Mid (MW)	2024 IEPR Low (MW)
10,014	8,353	7,832

- PV generation forecast **reductions**:

Hour	2024 IEPR Mid (MW)	2024 IEPR Low (MW)
13	-2,239	-2,571
17	-605	-698



Source: CEC Staff



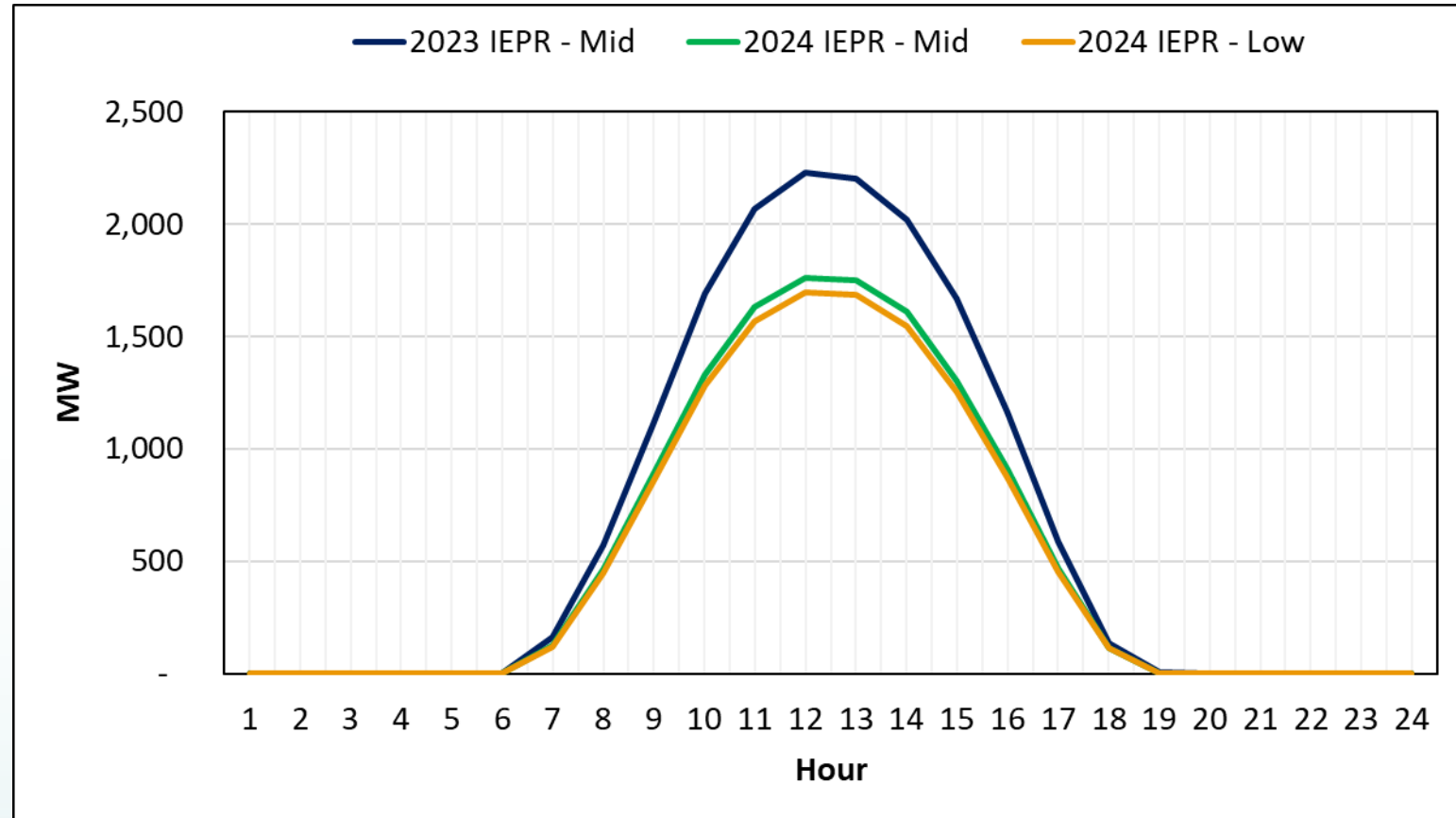
SDG&E Forecast Average Hourly PV Generation: September 2030

- Nameplate capacity comparison:

2023 IEPR Mid (MW)	2024 IEPR Mid (MW)	2024 IEPR Low (MW)
2,933	2,701	2,600

- PV generation forecast **reductions**:

Hour	2024 IEPR Mid (MW)	2024 IEPR Low (MW)
13	-454	-521
17	-117	-135



Source: CEC Staff