



Behind-the-Meter Distributed Generation Forecast Results: High Case

Presenters:

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List of Acronyms and Initialisms

AB – Assembly Bill

ACS – American Community Survey

ATB – Annual Technology Baseline

BTM – Behind-the-Meter

CEC – California Energy Commission

CHP – Combined Heat and Power

CPUC – California Public Utilities Commission

DG – Distributed Generation

dGen – Distributed Generation Market Demand Model

DGStats – California Distributed Generation Statistics

KW – Kilowatt

IEPR – Integrated Energy Policy Report

IOU – Investor-Owned Utility

ITC – Investment Tax Credit

LBNL – Lawrence Berkeley National Laboratory

MW – Megawatt

NBT – Net Billing Tariff

NEM – Net Energy Metering

PV – Photovoltaics



Input Updates



Distributed Generation Forecast Drivers

- BTM capacity forecasts are developed using:
 - Interconnection data
 - Factors that influence future adoption, such as:
 - System costs
 - Energy costs
 - Incentives
 - Statewide building standards (Title 24)



Three Distributed Generation Scenarios

Applicability to Each Model

Scenario Lever	dGen	Standalone Storage	Title 24
Total System Load	✓	x	x
CAPEX Costs	✓	✓	x
Investment Tax Credit	✓	✓	x

Source: CEC Staff

Scenario Table

Scenario	CAPEX Costs	Investment Tax Credit
Low	High	Ends in 2034
Mid	Mid	Ends in 2034
High	Low	Extended to 2040

Source: CEC Staff



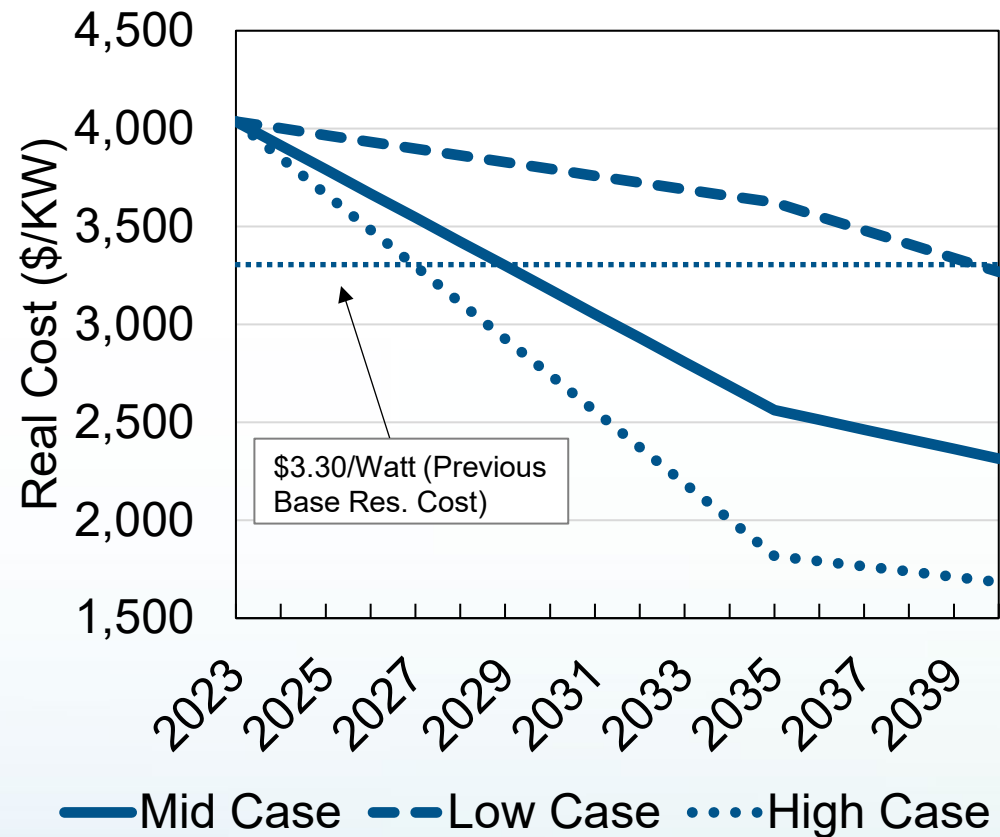
NEM Turnover

- CPUC's NEM 2.0 decision (D.16-01-044) states NEM service expires **20 years** from customer's interconnection date
 - All NEM BTM PV move to NBT by early 2040s
 - NBT decision provides greater incentive to pair solar with storage
- High case includes potential storage attachments from NEM contract turnover
 - 15,805 MW BTM standalone PV installed in CA through 2023
 - Standalone PV customers modeled adopting storage at NBT attachment rates 20 years after original PV installation



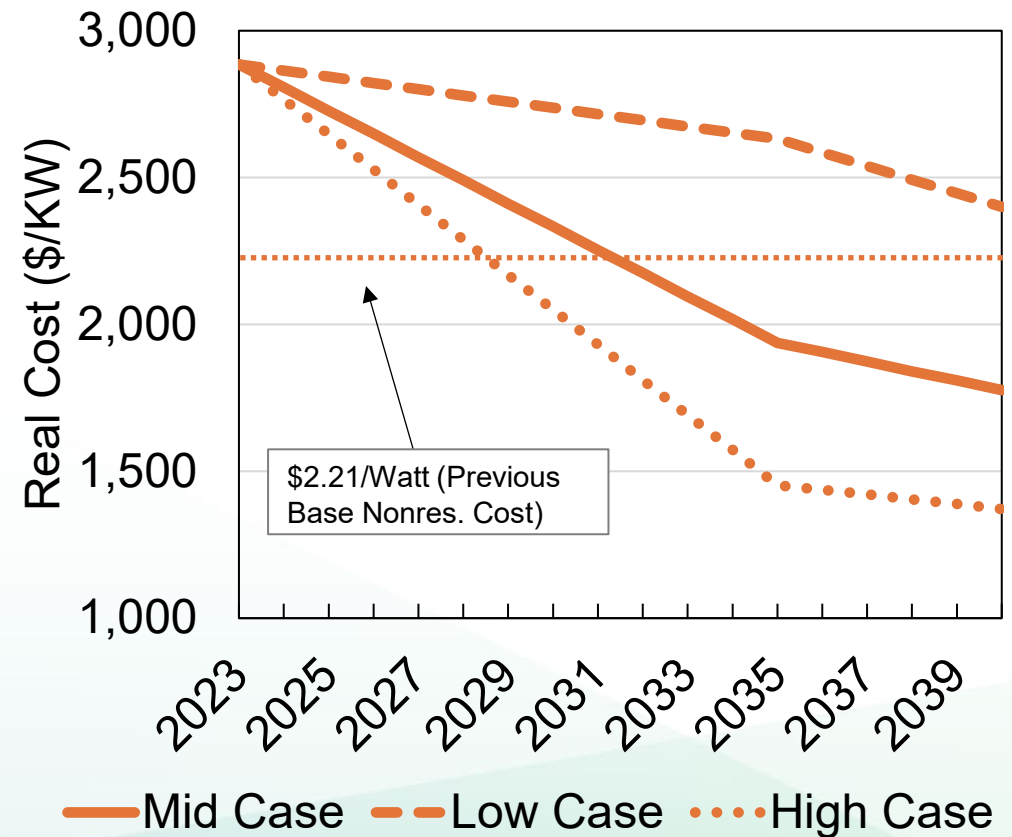
Effect of Base Year Cost Change on Forecast Costs

Projected Average Cost of Residential Solar, 2024 Forecast



Source: CEC Staff

Projected Average Cost of Nonresidential Solar, 2024 Forecast



Source: CEC Staff

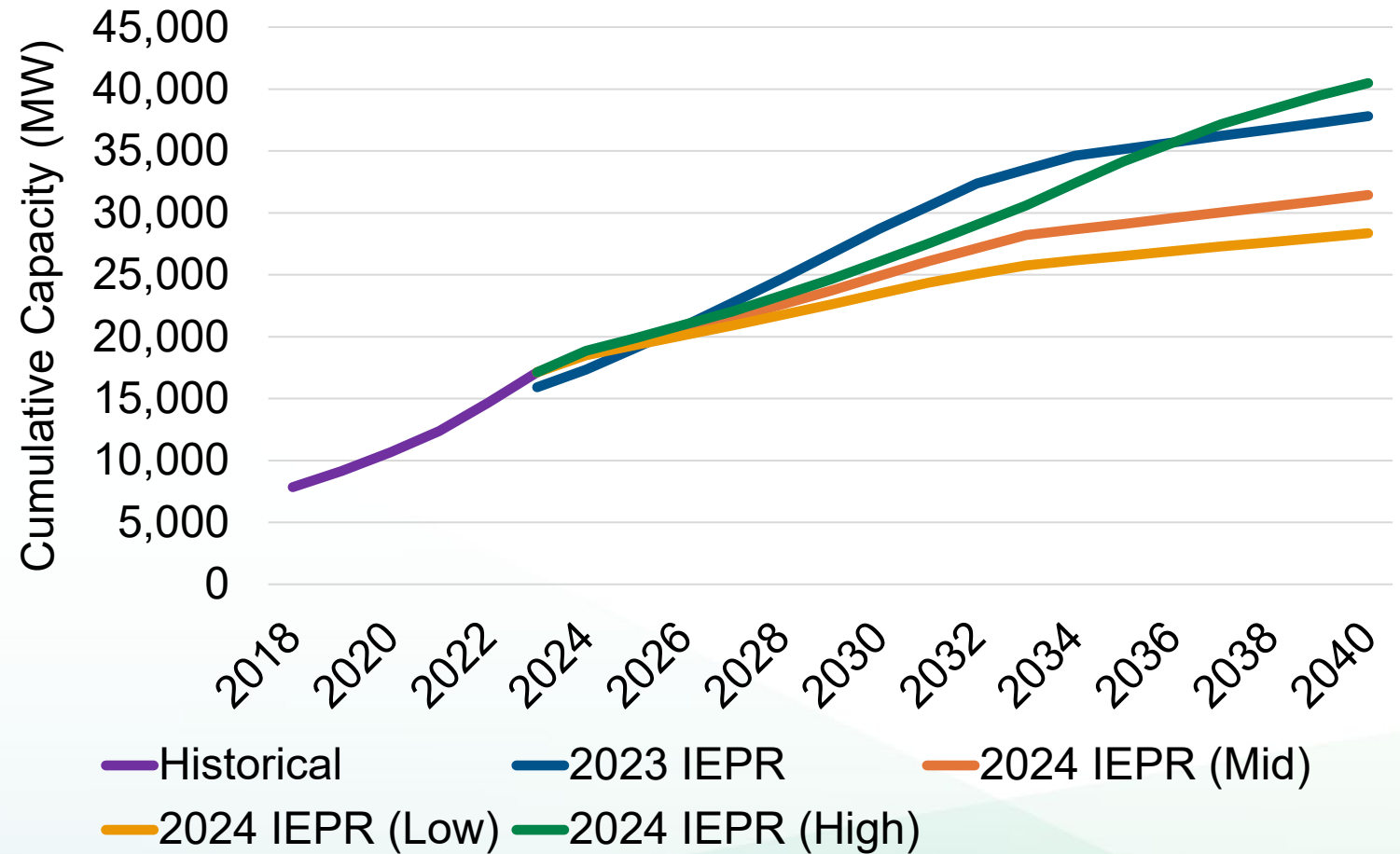


Annual Results



PV Forecast Comparison

- From 2026 to 2036:
 - 2024 high case is lower than 2023 forecast due to higher initial technology costs
- After 2036:
 - High case surpasses 2023 forecast due to ITC extension
- In 2040:
 - High case is 7%, or 2,700 MW, higher than 2023 forecast
 - High case is 29%, or 9,000 MW, higher than mid case

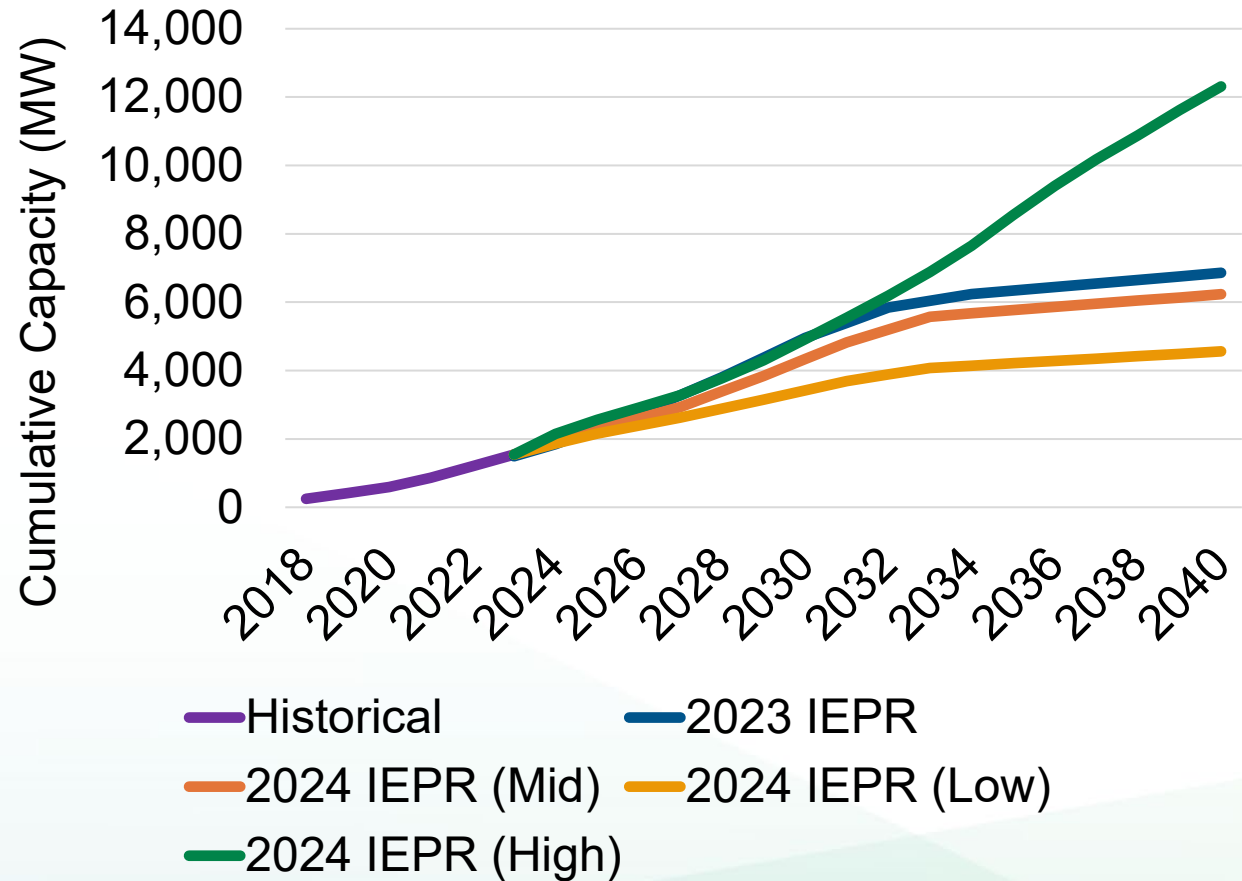


Source: CEC Staff



Storage Forecast Comparison

- From 2028 to 2030:
 - Higher base year technology costs in the 2024 high case results in lower adoption than the 2023 forecast
- After 2030:
 - High case surpasses 2023 forecast due to ITC extension and NEM retrofit adoption in that case
- In 2040:
 - High case is 79%, or 5,500 MW, higher than 2023 forecast
 - High case is 97%, or 6,100 MW, higher than mid case
 - 4,100 MW of difference attributable to NEM retrofit adoption



Source: CEC Staff



Hourly Forecast Results



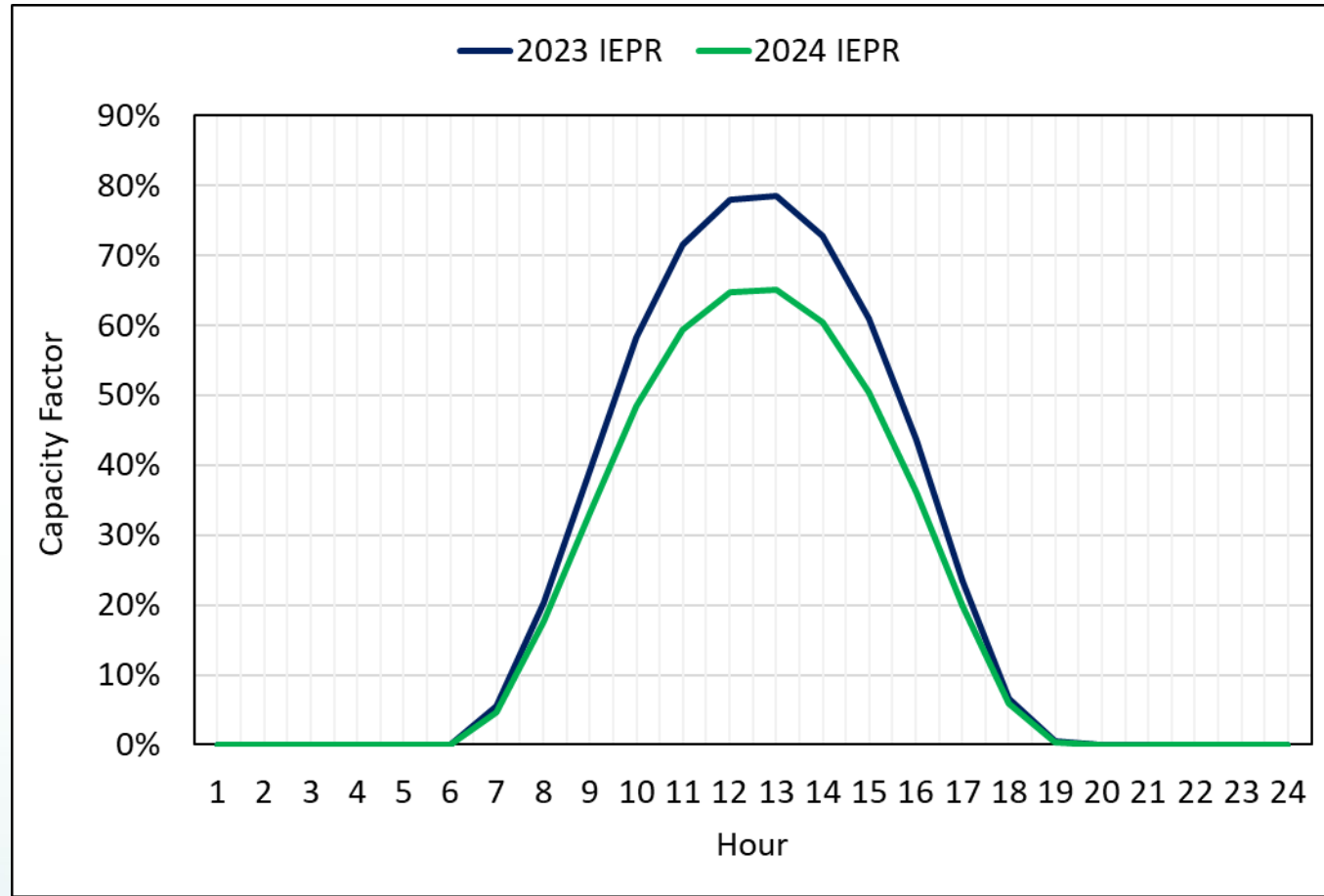


Forecast Average Hourly PV Capacity Factors: September

CAISO Region

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

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



Forecast Average Hourly PV Generation: September 2030

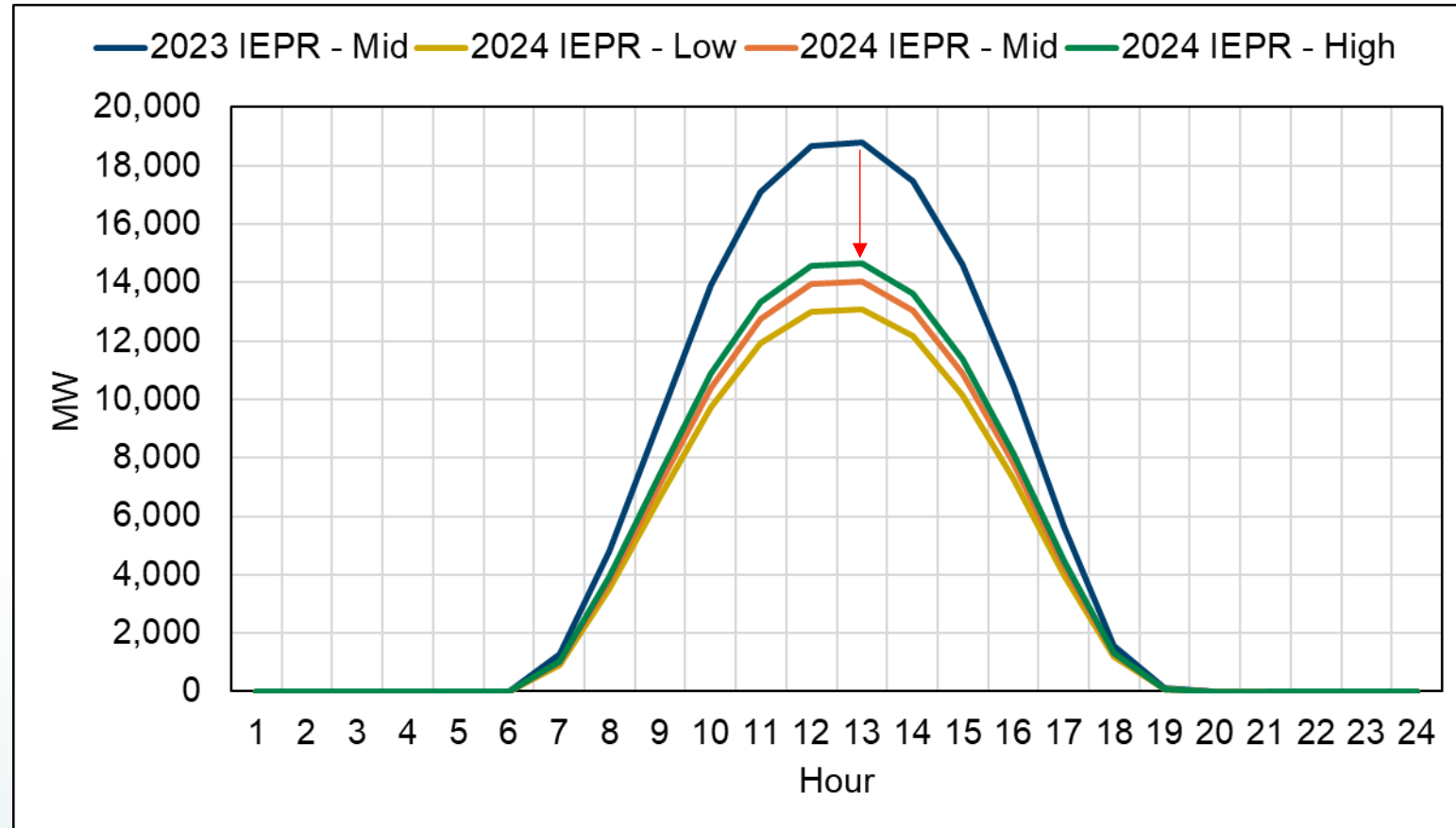
- Nameplate capacity comparison:

2023 IEPR Mid (MW)	2024 IEPR High (MW)	2024 IEPR Mid (MW)	2024 IEPR Low (MW)
24,939	23,201	22,213	20,724

- PV generation forecast reductions:

Hour	2024 IEPR High (MW)	2024 IEPR Mid (MW)	2024 IEPR Low (MW)
13	-4,130	-4,760	-5,710
17	-1,140	-1,340	-1,625

CAISO Region



Source: CEC Staff

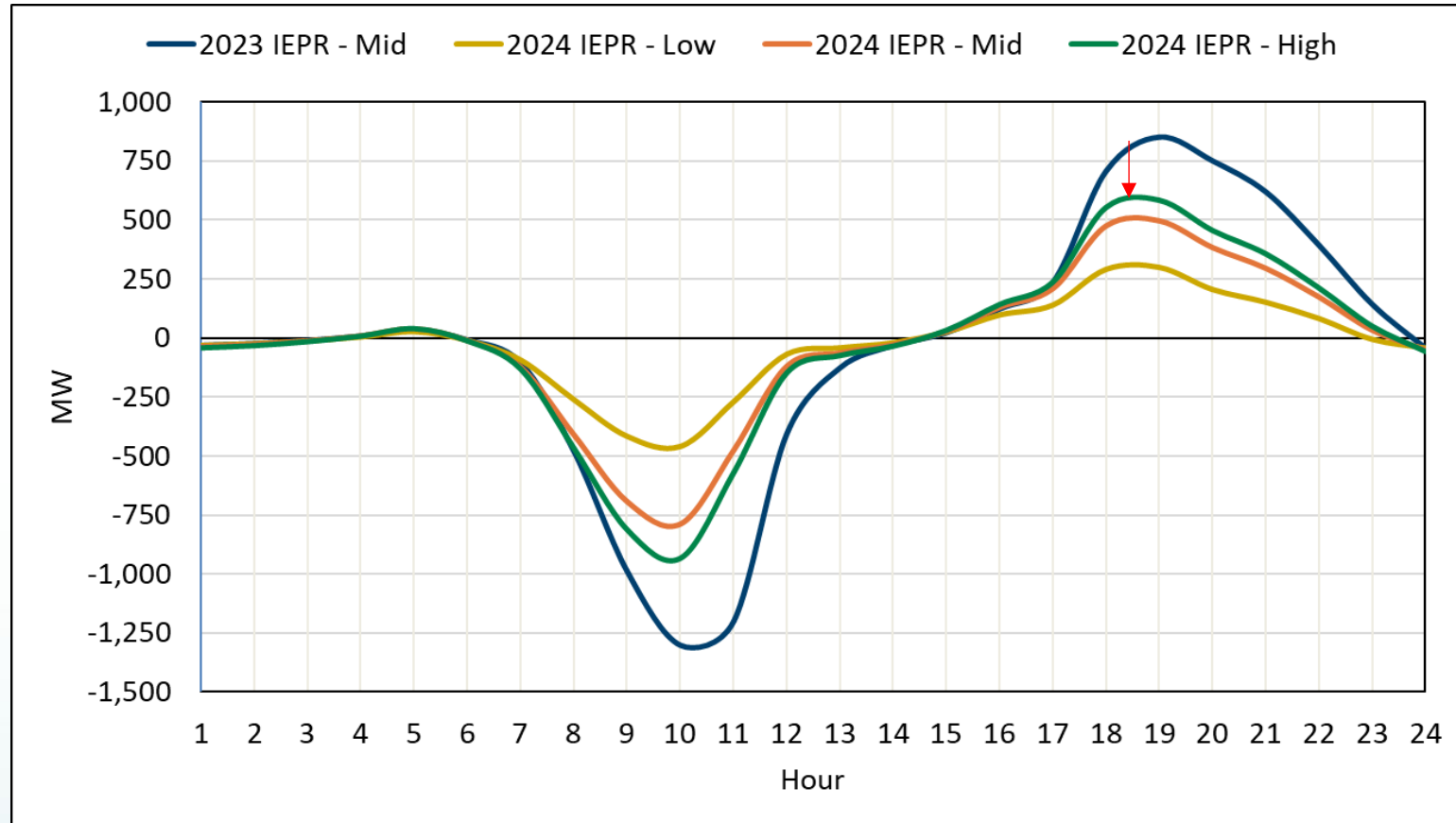


Forecast Average Hourly Storage: September 2030

CAISO Region

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

Hour	2024 IEPR High (MW)	2024 IEPR Mid (MW)	2024 IEPR Low (MW)
19	-267	-355	-549



Source: CEC Staff



Forecast Average Hourly PV Generation: September 2040

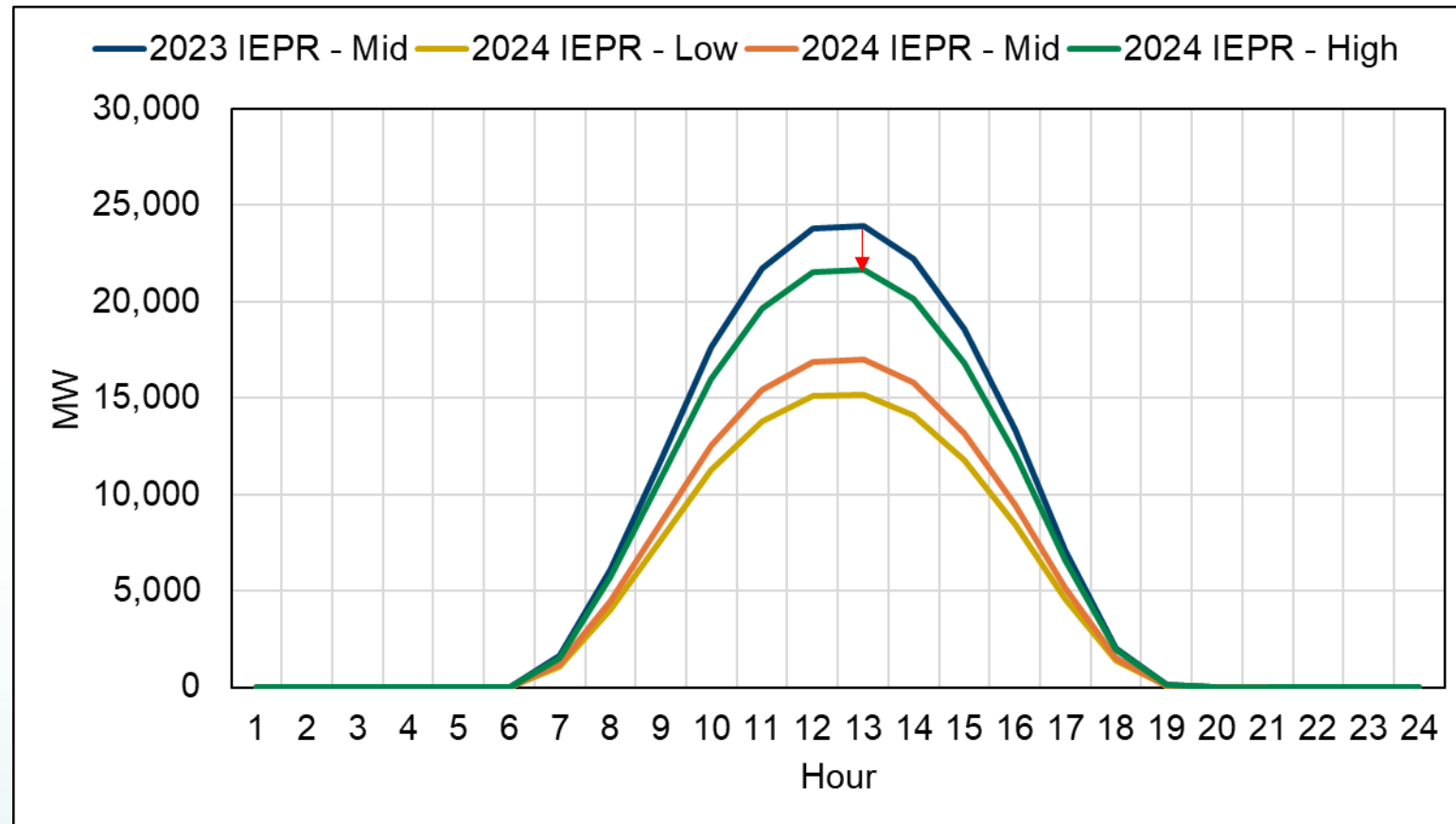
- Nameplate capacity comparison:

2023 IEPR Mid (MW)	2024 IEPR High (MW)	2024 IEPR Mid (MW)	2024 IEPR Low (MW)
32,850	35,407	27,967	25,038

- PV generation forecast reductions:

Hour	2024 IEPR High (MW)	2024 IEPR Mid (MW)	2024 IEPR Low (MW)
13	-2,250	-6,940	-8,750
17	-540	-1,980	-2,530

CAISO Region



Source: CEC Staff

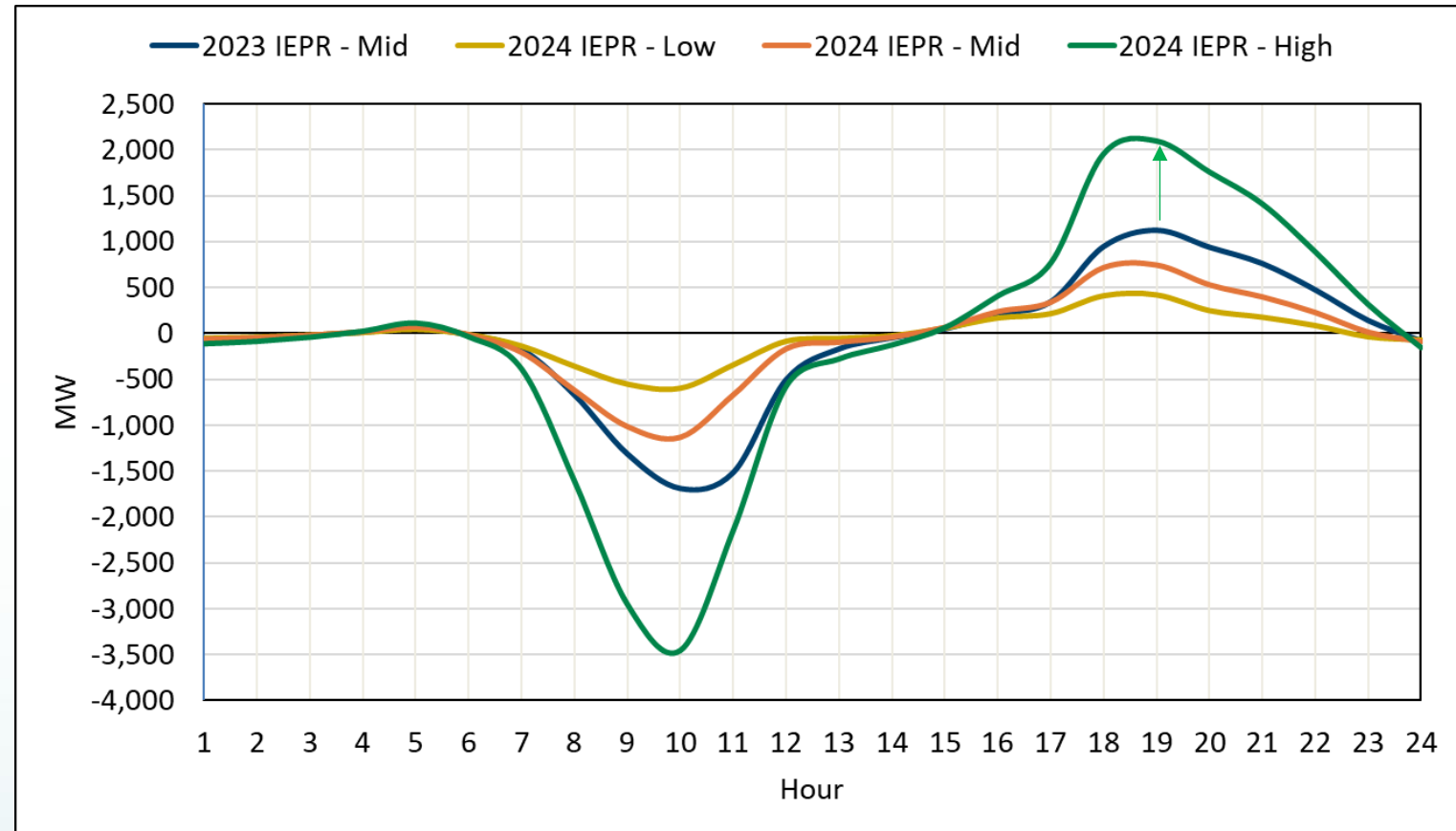


Forecast Average Hourly Storage: September 2040

- 2024 IEPR forecast daily max discharge reductions:

Hour	2024 IEPR High (MW)	2024 IEPR Mid (MW)	2024 IEPR Low (MW)
19	+979	-380	-704

CAISO Region



Source: CEC Staff



Closing

- Thank you for your participation at today's DAWG
- Written comments or questions via email
 - Mark Palmere - mark.palmere@energy.ca.gov
 - Alex Lonsdale - alexander.lonsdale@energy.ca.gov



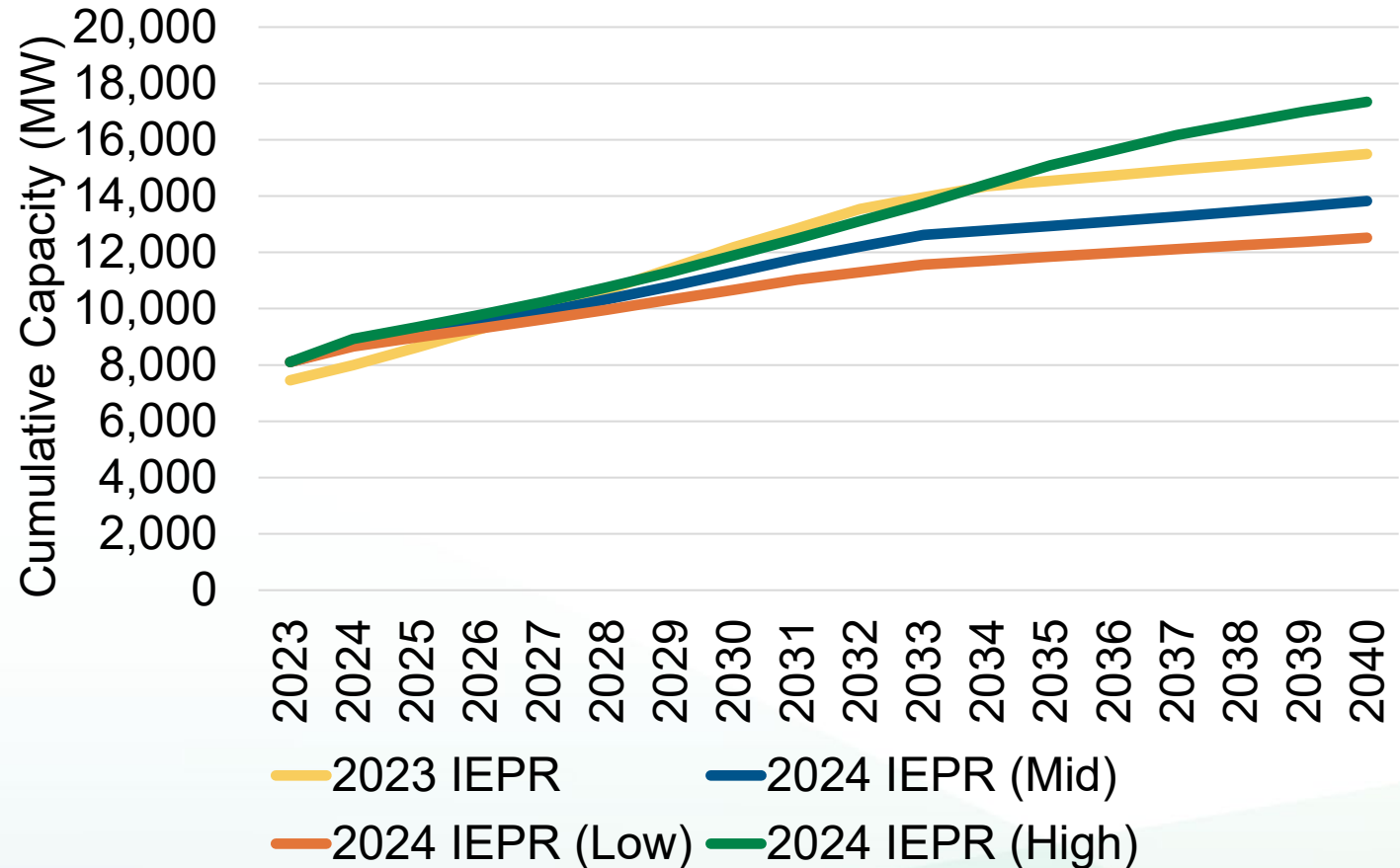
Supplemental Slides



PV Forecast Comparison: PG&E Planning Area

- In 2040:
 - High case is 12%, or 1,900 MW, higher than the 2023 forecast
 - Mid case is 11%, or 1,700 MW, lower than the 2023 forecast
 - Low case is 19%, or 3,000 MW, lower than the 2023 forecast

Year	Capacity (MW)			
	2023 IEPR	2024 IEPR (High)	2024 IEPR (Mid)	2024 IEPR (Low)
2023	7,454	8,103	8,103	8,103
2025	8,625	9,337	9,091	8,985
2030	12,182	11,891	11,283	10,670
2035	14,540	15,085	12,929	11,840
2040	15,492	17,346	13,823	12,518



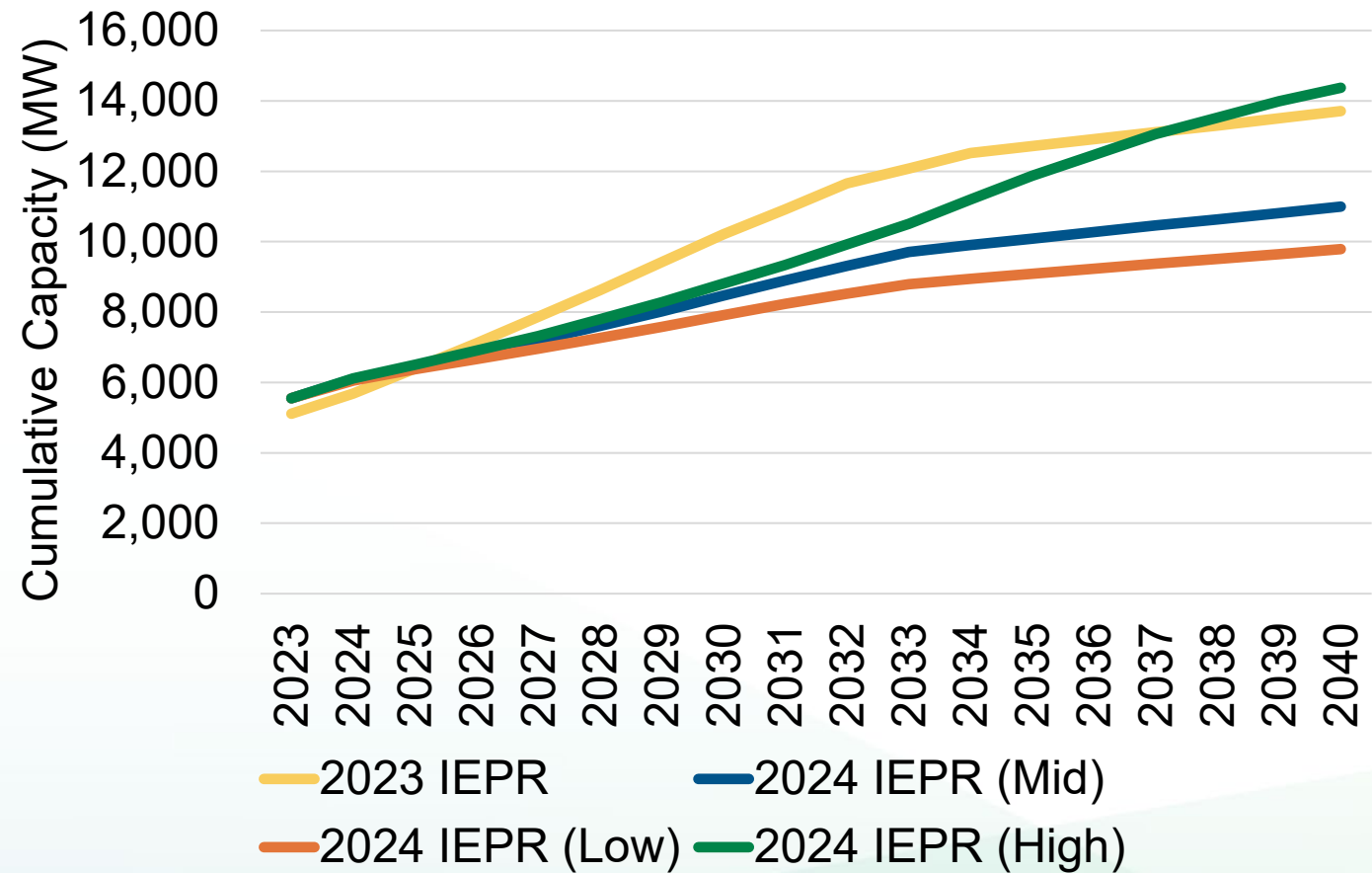
Source: CEC Staff



PV Forecast Comparison: SCE Planning Area

- In 2040:
 - High case is 5%, or 700 MW, higher than the 2023 forecast
 - Mid case is 20%, or 2,700 MW, lower than the 2023 forecast
 - Low case is 28%, or 3,900 MW, lower than the 2023 forecast

Year	Capacity (MW)			
	2023 IEPR	2024 IEPR (High)	2024 IEPR (Mid)	2024 IEPR (Low)
2023	5,112	5,552	5,552	5,552
2025	6,397	6,500	6,462	6,376
2030	10,212	8,811	8,464	7,914
2035	12,713	11,871	10,088	9,088
2040	13,710	14,373	10,996	9,789



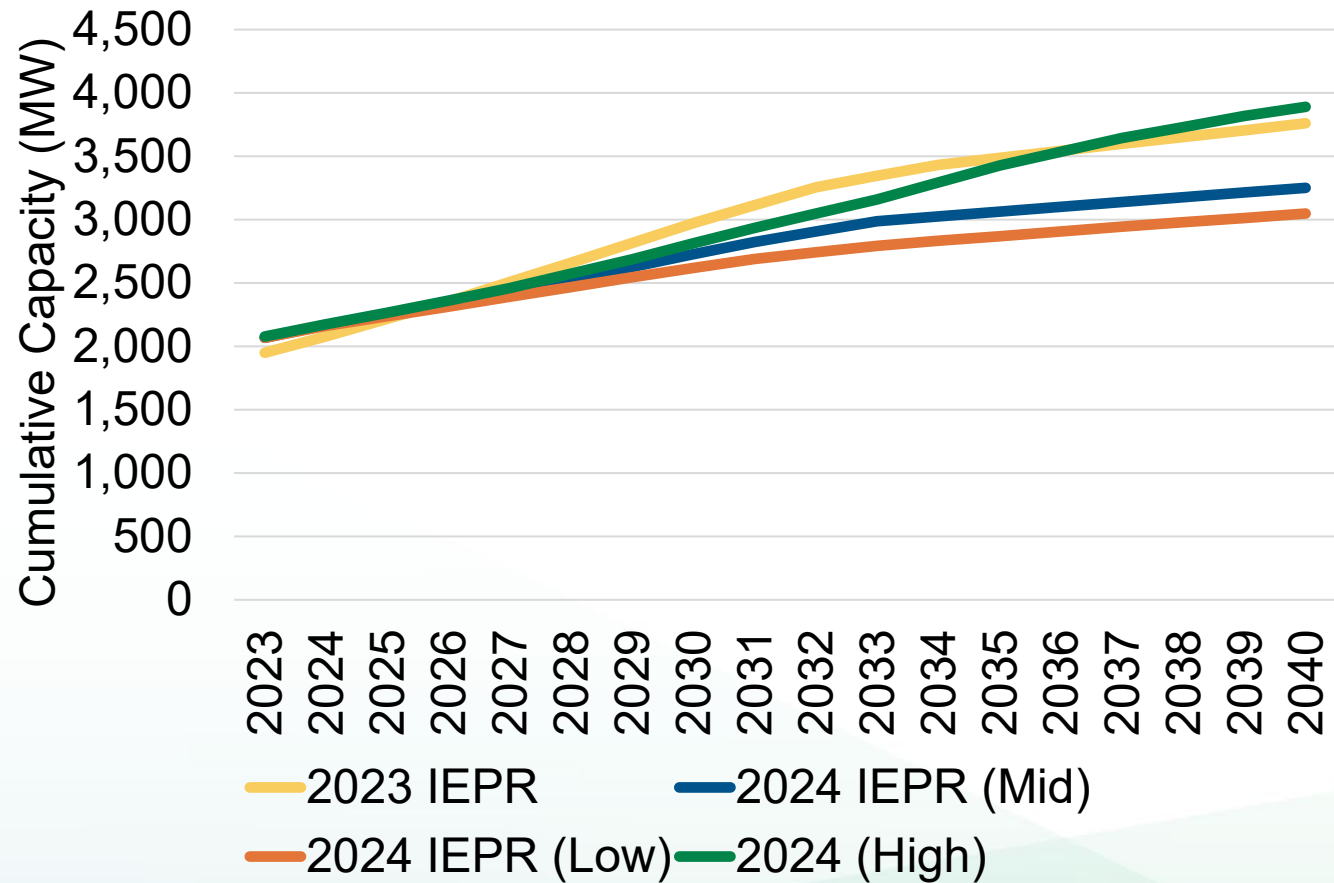
Source: CEC Staff



PV Forecast Comparison: SDG&E Planning Area

- In 2040:
 - High case is 3%, or 130 MW, higher than the 2023 forecast
 - Mid case is 14%, or 510 MW, lower than the 2023 forecast
 - Low case is 19%, or 710 MW, lower than the 2023 forecast

Year	Capacity (MW)			
	2023 IEPR	2024 IEPR (High)	2024 IEPR (Mid)	2024 IEPR (Low)
2023	1,950	2,068	2,068	2,068
2025	2,217	2,264	2,255	2,238
2030	2,972	2,812	2,726	2,619
2035	3,487	3,427	3,062	2,869
2040	3,760	3,890	3,251	3,048



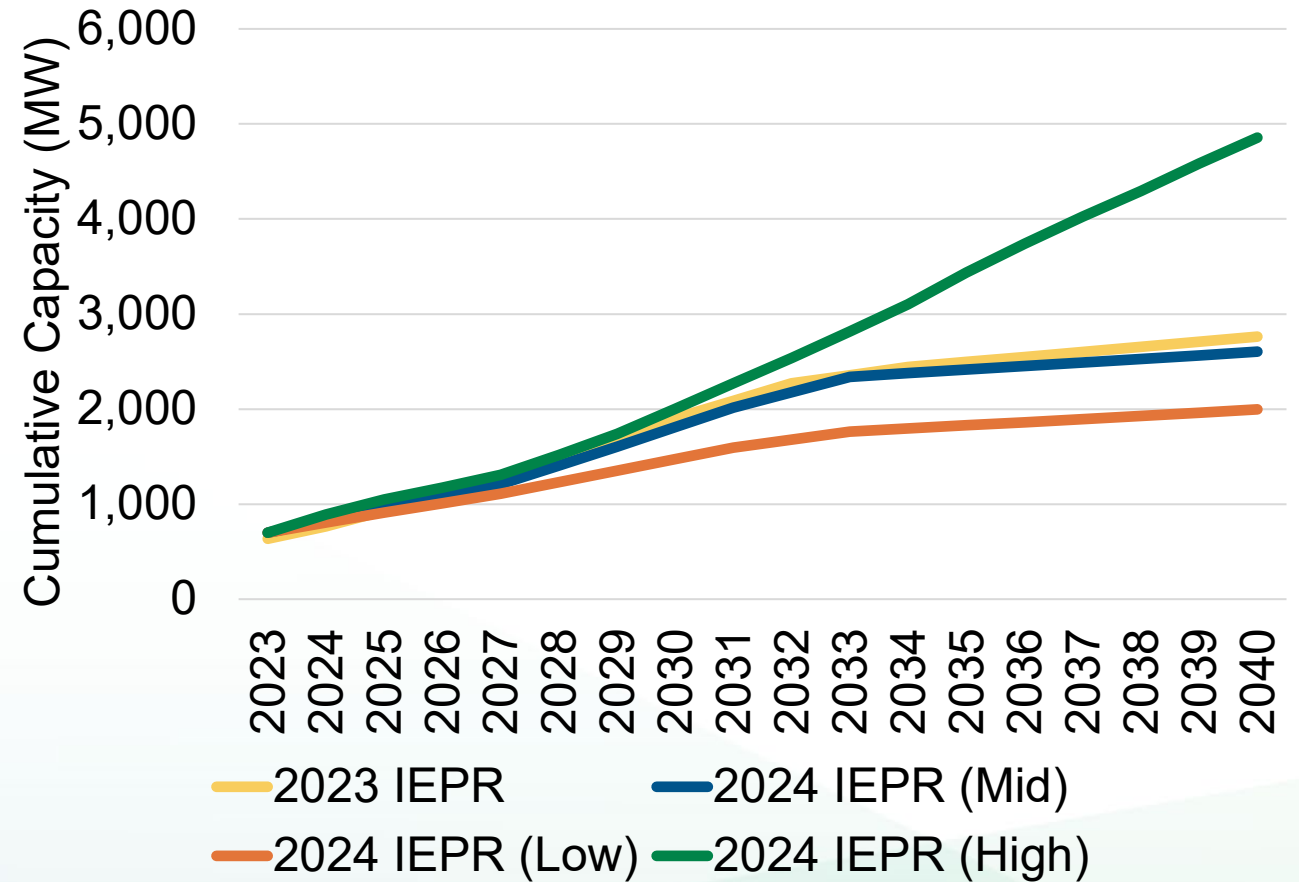
Source: CEC Staff



Storage Forecast Comparison: PG&E Planning Area

- In 2040:
 - High case is 76%, or 2,100 MW, higher than the 2023 forecast
 - Mid case is 6%, or 160 MW, lower than the 2023 forecast
 - Low case is 19%, or 520 MW, lower than the 2023 forecast

Year	Capacity (MW)			
	2023 IEPR	2024 IEPR (High)	2024 IEPR (Mid)	2024 IEPR (Low)
2023	636	699	699	699
2025	932	1,047	951	877
2030	1,903	2,002	1,809	1,411
2035	2,496	3,435	2,415	1,845
2040	2,762	4,856	2,604	2,237



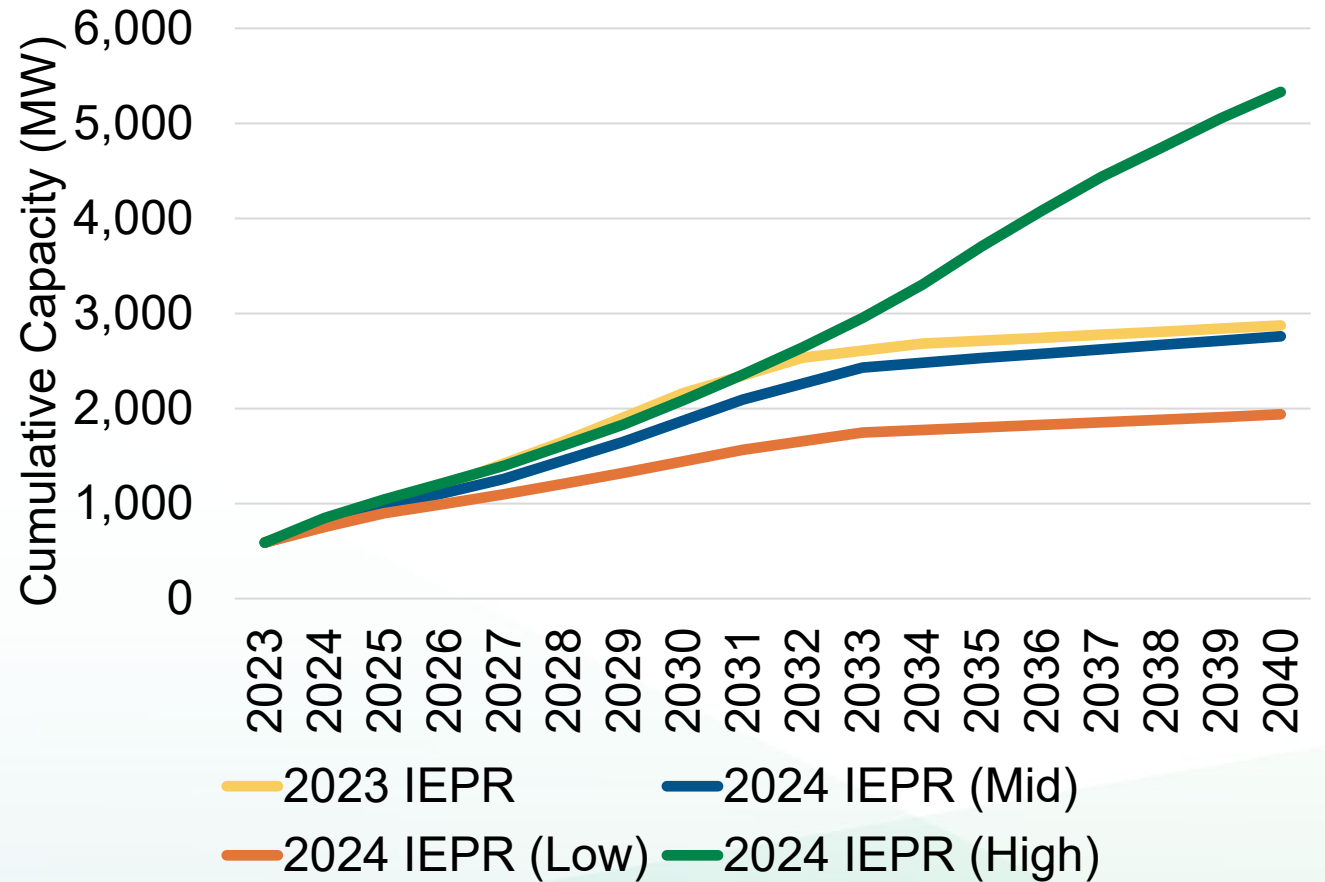
Source: CEC Staff



Storage Forecast Comparison: SCE Planning Area

- In 2040:
 - High case is 85%, or 2,500 MW, higher than the 2023 forecast
 - Mid case is 4%, or 110 MW, lower than the 2023 forecast
 - Low case is 35%, or 1,000 MW, lower than the 2023 forecast

Capacity (MW)				
Year	2023 IEPR	2024 IEPR (High)	2024 IEPR (Mid)	2024 IEPR (Low)
2023	595	589	589	589
2025	972	1,045	961	706
2030	2,161	2,087	1,873	1,153
2035	2,713	3,707	2,531	1,567
2040	2,874	5,331	2,760	1,855



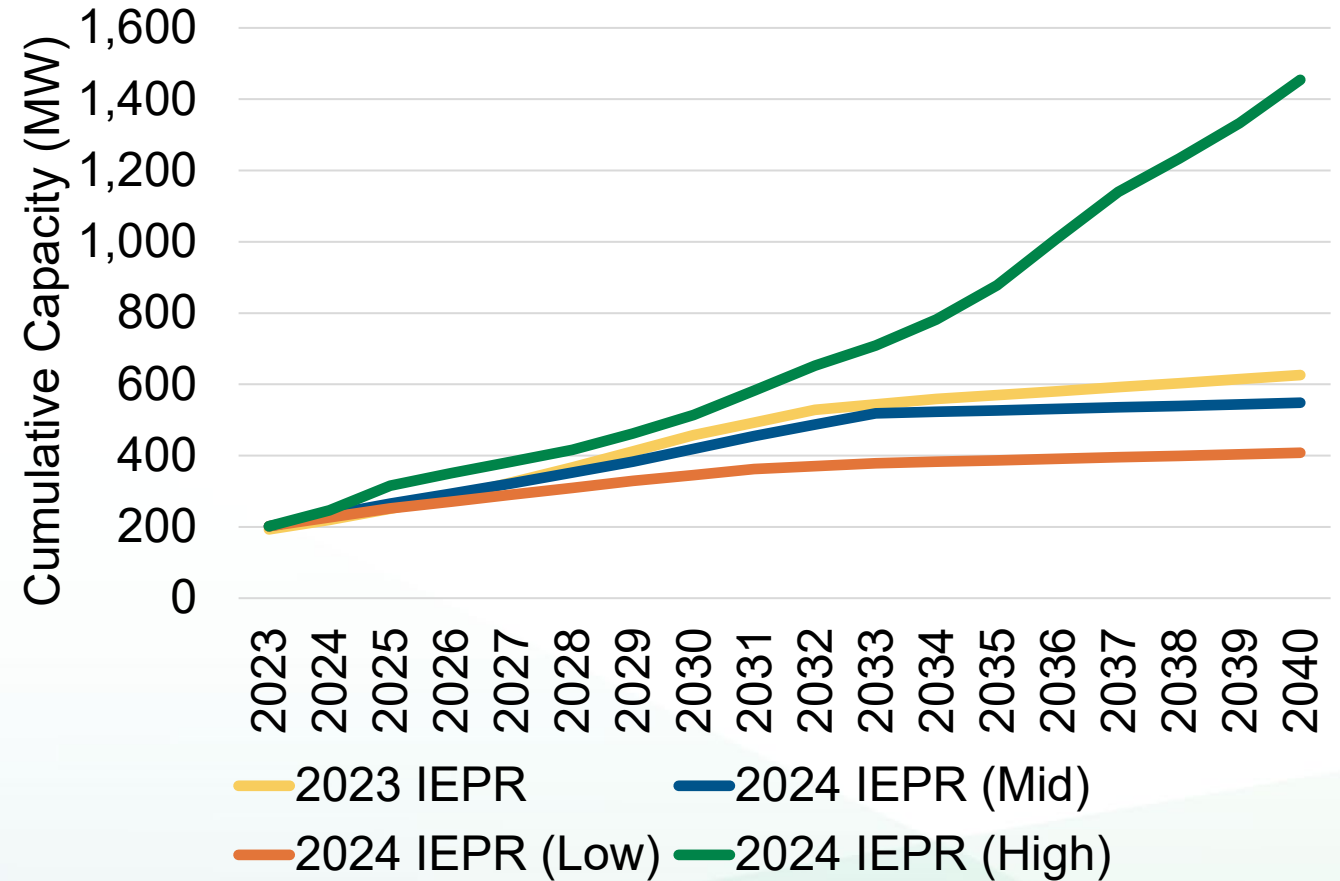
Source: CEC Staff



Storage Forecast Comparison: SDG&E Planning Area

- In 2040:
 - High case is 132%, or 830 MW, higher than the 2023 forecast
 - Mid case is 12%, or 80 MW, lower than the 2023 forecast
 - Low case is 40%, or 260 MW, lower than the 2023 forecast

Year	Capacity (MW)			
	2023 IEPR	2024 IEPR (High)	2024 IEPR (Mid)	2024 IEPR (Low)
2023	193	202	202	202
2025	251	316	265	233
2030	457	514	419	311
2035	570	878	527	349
2040	626	1454	548	370



Source: CEC Staff



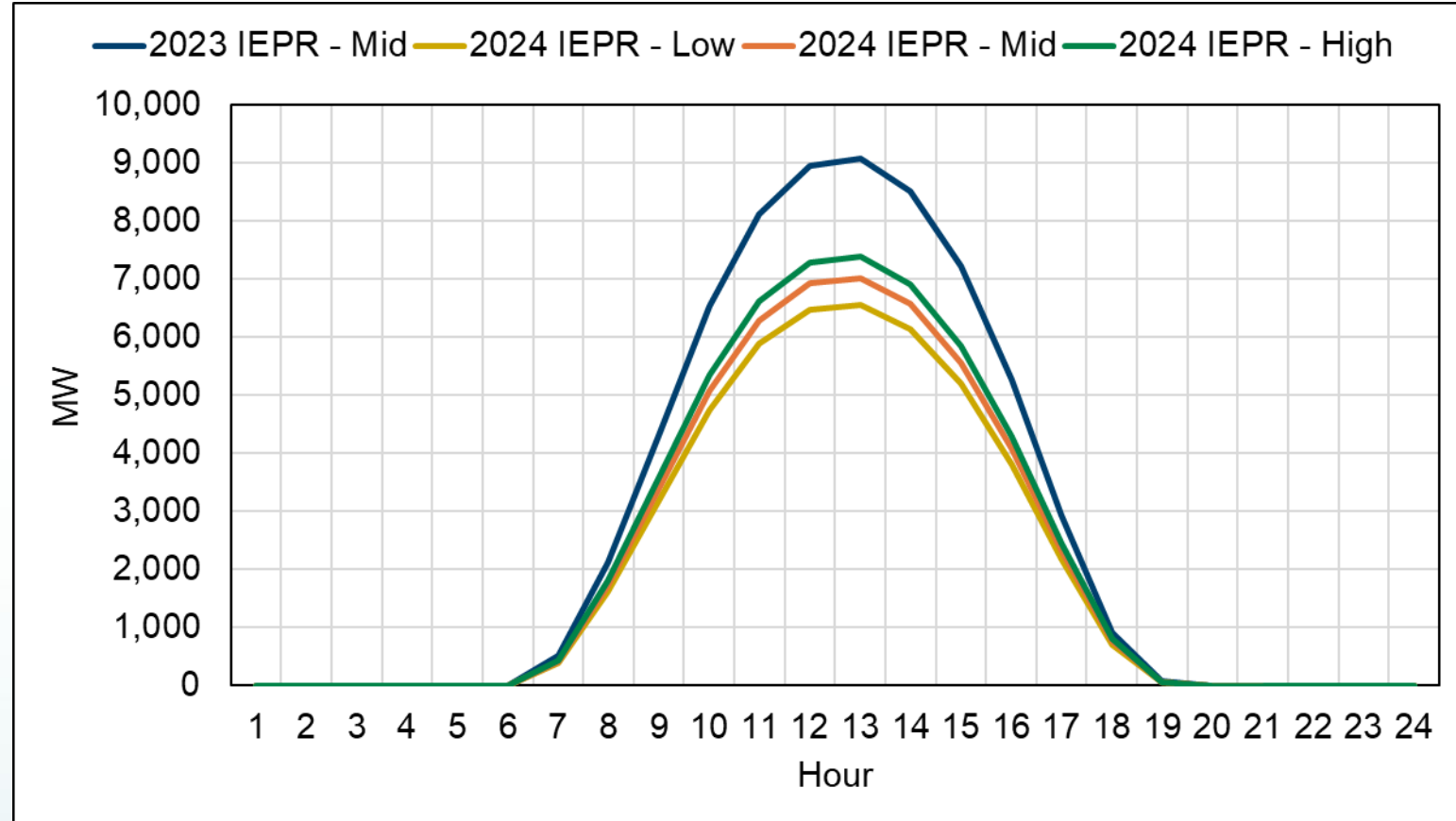
PG&E Forecast Average Hourly PV Generation: September 2030

- Nameplate capacity comparison:

2023 IEPR Mid (MW)	2024 IEPR Low (MW)	2024 IEPR Mid (MW)	2024 IEPR High (MW)
11,991	10,445	11,159	11,742

- PV generation forecast **reductions**:

Hour	2024 IEPR Low (MW)	2024 IEPR Mid (MW)	2024 IEPR Low (MW)
13	-2,519	-2,065	-1,698
17	-764	-614	-493



Source: CEC Staff



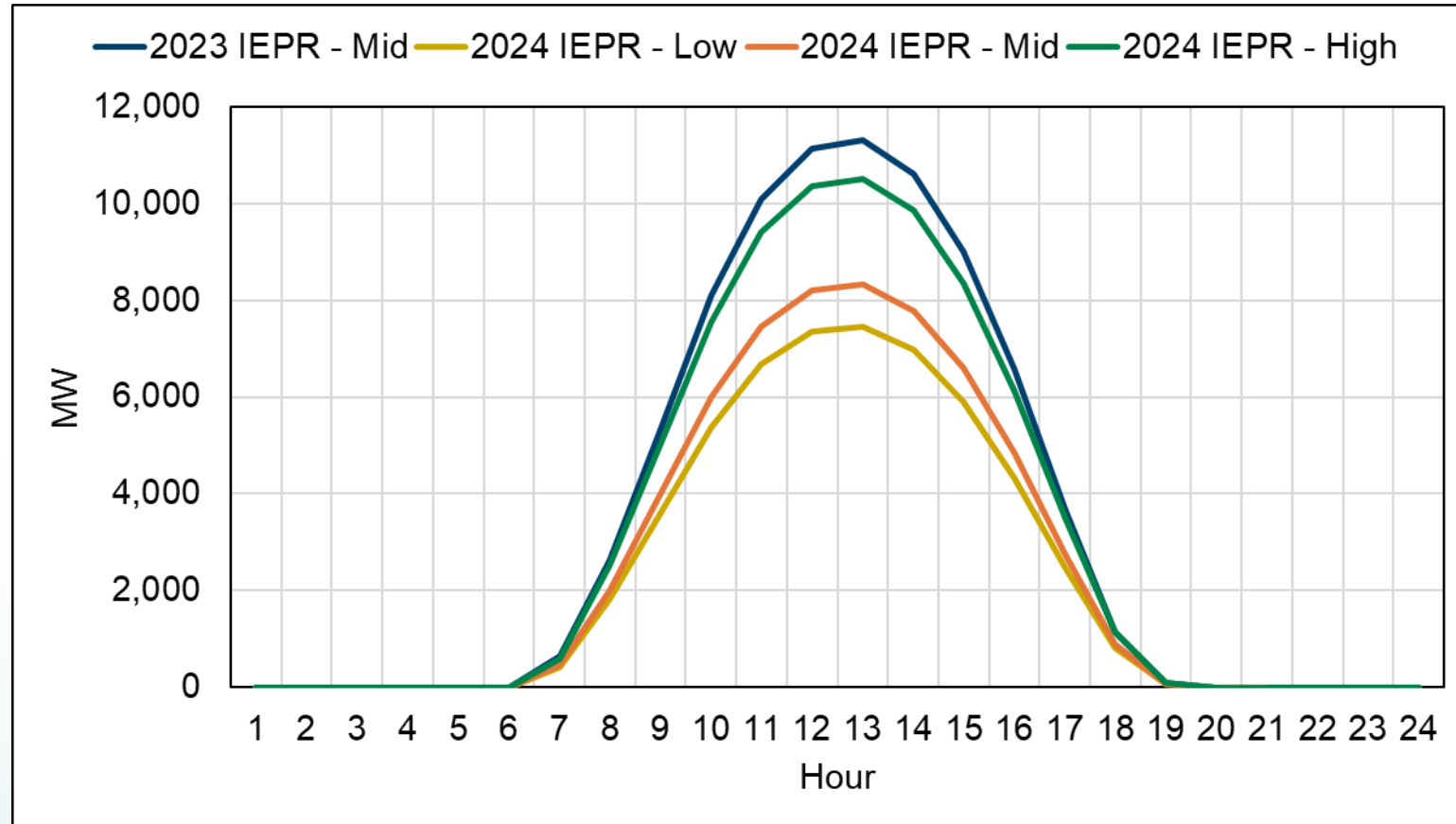
PG&E Forecast Average Hourly PV Generation: September 2040

- Nameplate capacity comparison:

2023 IEPR Mid (MW)	2024 IEPR Low (MW)	2024 IEPR Mid (MW)	2024 IEPR High (MW)
15,444	12,377	13,775	17,259

- PV generation forecast reductions:

Hour	2024 IEPR Low (MW)	2024 IEPR Mid (MW)	2024 IEPR Low (MW)
13	-3,842	-2,979	-788
17	-1,196	-908	-171



Source: CEC Staff



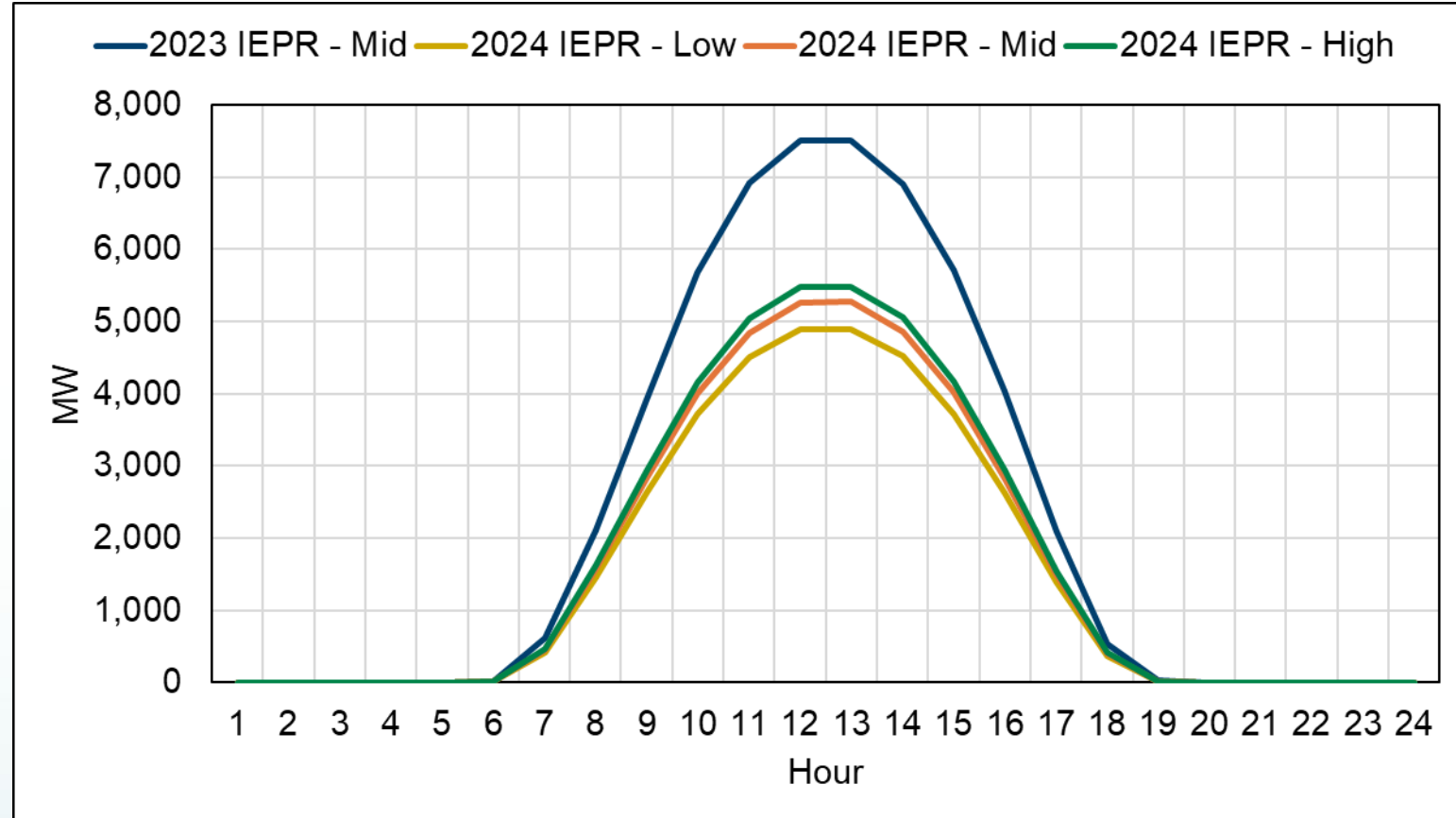
SCE Forecast Average Hourly PV Generation: September 2030

- Nameplate capacity comparison:

2023 IEPR Mid (MW)	2024 IEPR Low (MW)	2024 IEPR Mid (MW)	2024 IEPR High (MW)
10,014	7,755	8,353	8,678

- PV generation forecast **reductions**:

Hour	2024 IEPR Low (MW)	2024 IEPR Mid (MW)	2024 IEPR High (MW)
13	-2,619	-2,239	-2,032
17	-711	-605	-547



Source: CEC Staff



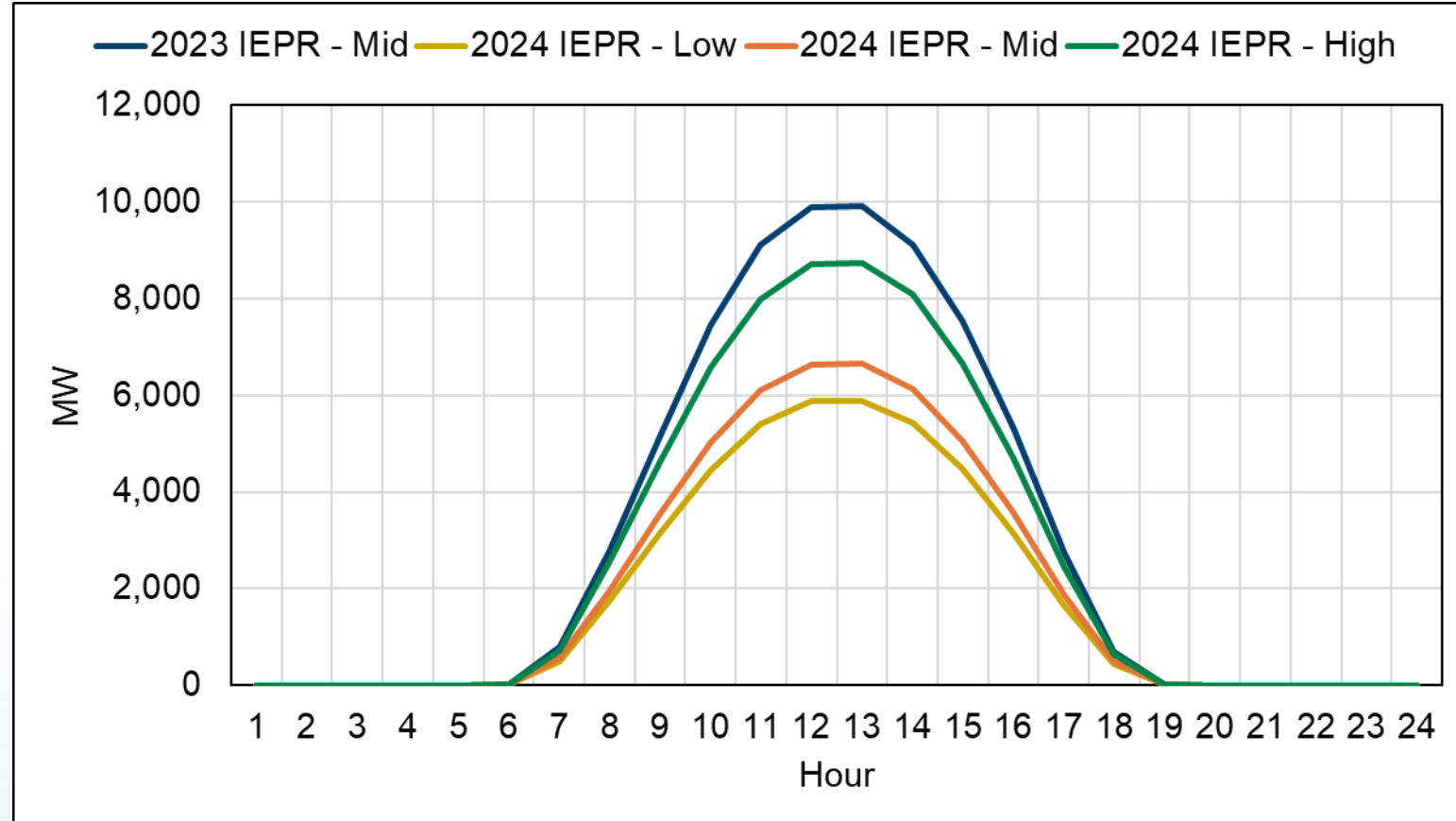
SCE Forecast Average Hourly PV Generation: September 2040

- Nameplate capacity comparison:

2023 IEPR Mid (MW)	2024 IEPR Low (MW)	2024 IEPR Mid (MW)	2024 IEPR High (MW)
13,659	9,696	10,950	14,276

- PV generation forecast **reductions**:

Hour	2024 IEPR Low (MW)	2024 IEPR Mid (MW)	2024 IEPR High (MW)
13	-4,029	-3,259	-1,169
17	-1,101	-885	-297



Source: CEC Staff



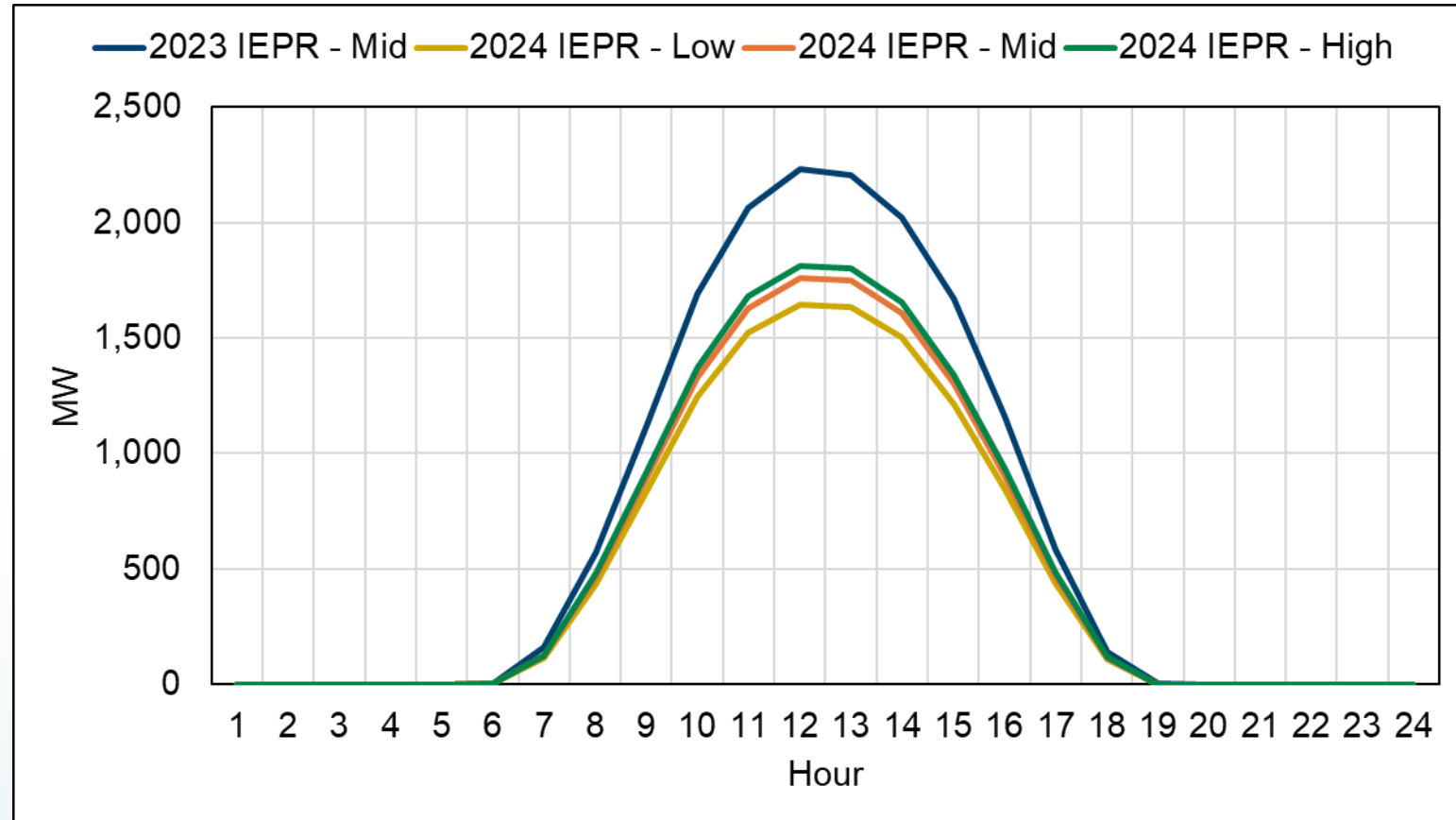
SDG&E Forecast Average Hourly PV Generation: September 2030

- Nameplate capacity comparison:

2023 IEPR Mid (MW)	2024 IEPR Low (MW)	2024 IEPR Mid (MW)	2024 IEPR High (MW)
2,933	2,525	2,701	2,781

- PV generation forecast **reductions**:

Hour	2024 IEPR Low (MW)	2024 IEPR Mid (MW)	2024 IEPR High (MW)
13	-569	-454	-402
17	-148	-117	-103



Source: CEC Staff



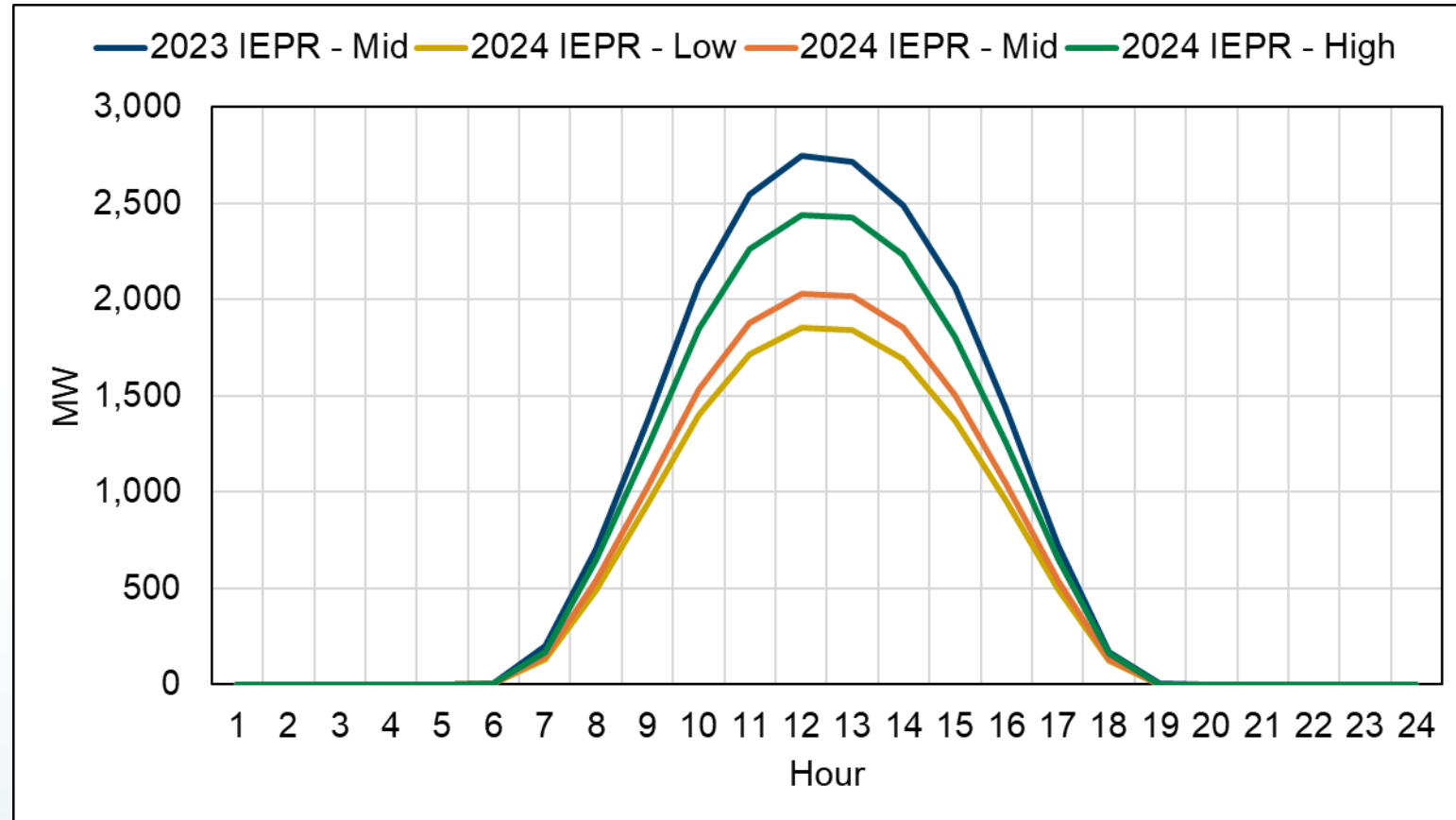
SDG&E Forecast Average Hourly PV Generation: September 2040

- Nameplate capacity comparison:

2023 IEPR Mid (MW)	2024 IEPR Low (MW)	2024 IEPR Mid (MW)	2024 IEPR High (MW)
3,747	2,965	3,242	3,872

- PV generation forecast reductions:

Hour	2024 IEPR Low (MW)	2024 IEPR Mid (MW)	2024 IEPR High (MW)
13	-877	-703	-294
17	-229	-182	-73



Source: CEC Staff