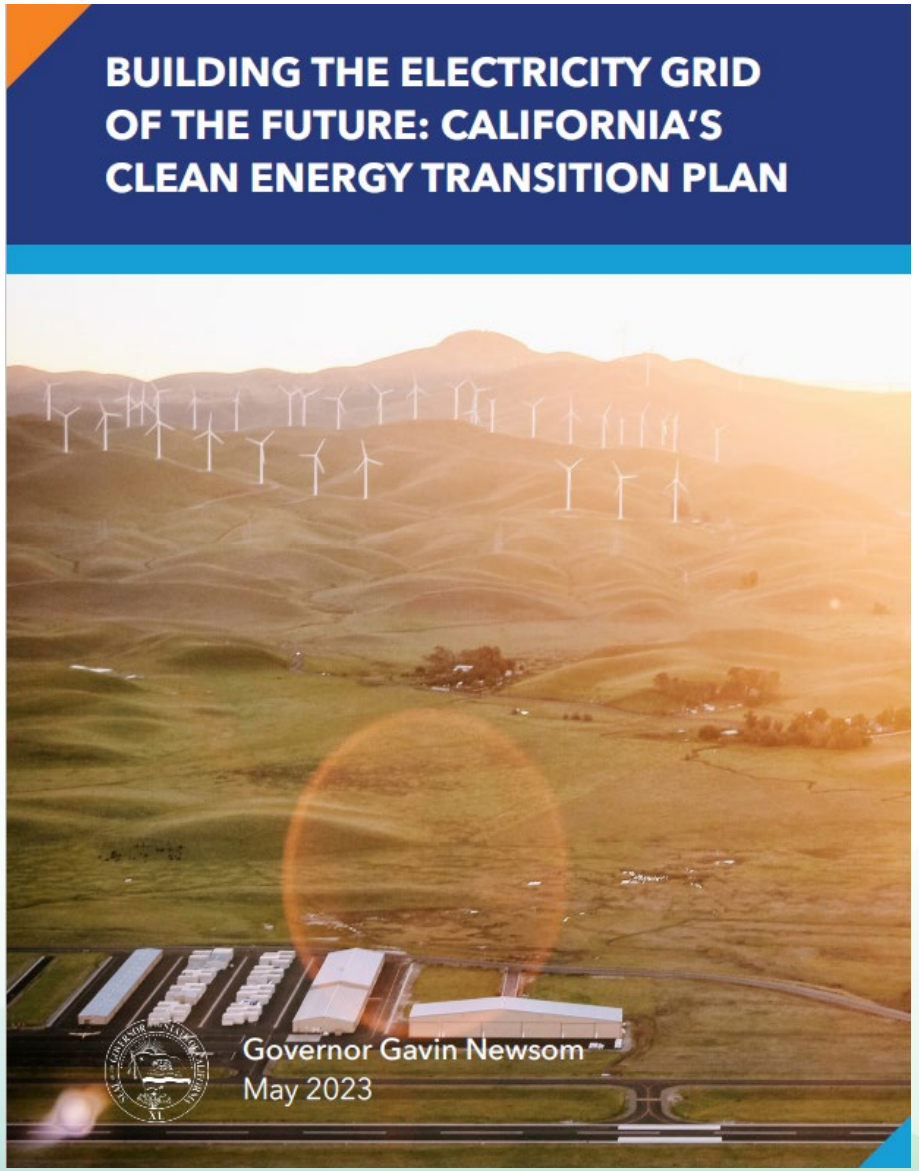
2024 Summer Grid Reliability

Assembly Utilities and Energy Committee - Oversight Hearing

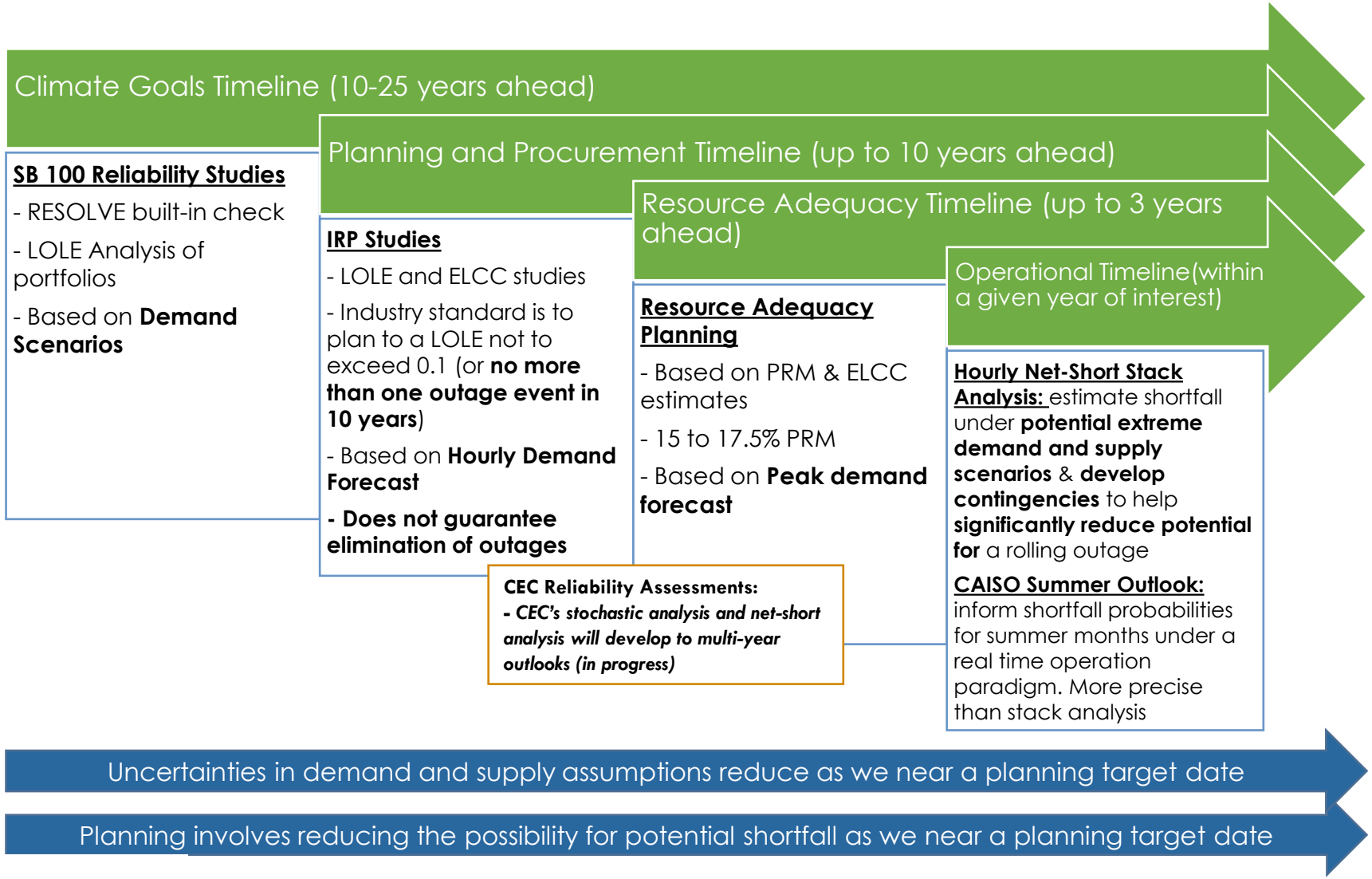
May 8, 2024

Transitioning to California's Clean Energy Future

- Electrifying our economy and decarbonizing the grid are cornerstones in California climate change leadership.
- California has long led the clean energy transition with 61% of the state's electric retail sales generated by renewable and zero-carbon resources in 2022.
- California has ambitious clean energy goals - 90% clean electricity sales by 2035, 95% by 2040 and 100% by 2045.
- Climate change is also causing unprecedented stress on our grid. Extreme heat, drought, flood and wildfire are increasing in frequency and intensity threaten reliability.
- The grid of the future is one that is clean, safe, affordable and reliable. It is not a question if, but how we transition to our clean energy future.



Electric System Planning – *Layered Planning Horizons*



Toplines for 2024

- **January 2024 analysis shows an improved outlook compared to recent years**
  - No supply shortfalls expected under standard planning conditions
  - Little to no supply shortfalls expected under extreme conditions, such as those experienced in 2022 and 2020

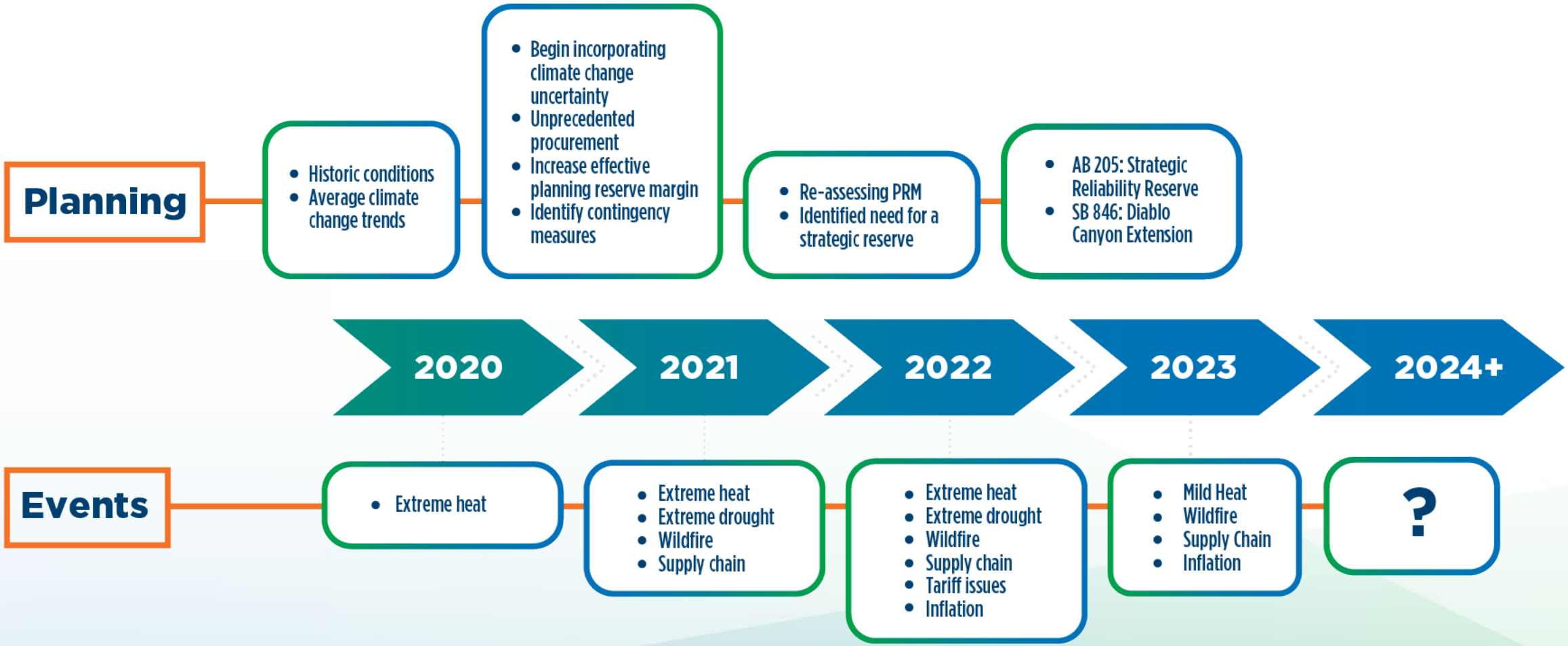
- **Long lasting west-wide extreme conditions, coincidental or sudden onset events could still create tight supply availability conditions on the grid**

- **Once-Through Cooling (OTCs) generators are now part of state's Strategic Reliability Reserve (SRR), bolstering contingency capacity by 2,859 MWs**
  - Other contingency resources in addition to the OTC resources, lead to almost 5,000 MWs of contingency resources to meet demand during extreme events

- **Clean contingency resources will likely be needed in the SRR to replace the OTC generators and support long-term grid needs under extreme conditions**

Past Four Years (2020-24)

Changing Grid Conditions



Actions - Grid Reliability & Clean Energy Transition

- **Improving Grid Planning Processes**
  - Improvements to forecasting for climate change-induced weather variability and electrification
  - Ordering sufficient and diverse energy resource procurement
  - Improvements to Resource Adequacy process and requirements

- **Scaling Supply & Demand-Side Clean Energy Resources**
  - Track procurement
  - Improve interconnection & permitting process
  - SB 846 (2022) requirements, including demand flexibility goal

- **Preparing for Extreme Events (Contingencies)**
  - Retain existing and construct new assets & procure energy imports to backstop uncertainties
  - Create emergency demand flexibility opportunities

Procurement Ordered By CPUC

In Megawatts* (MW) By Year

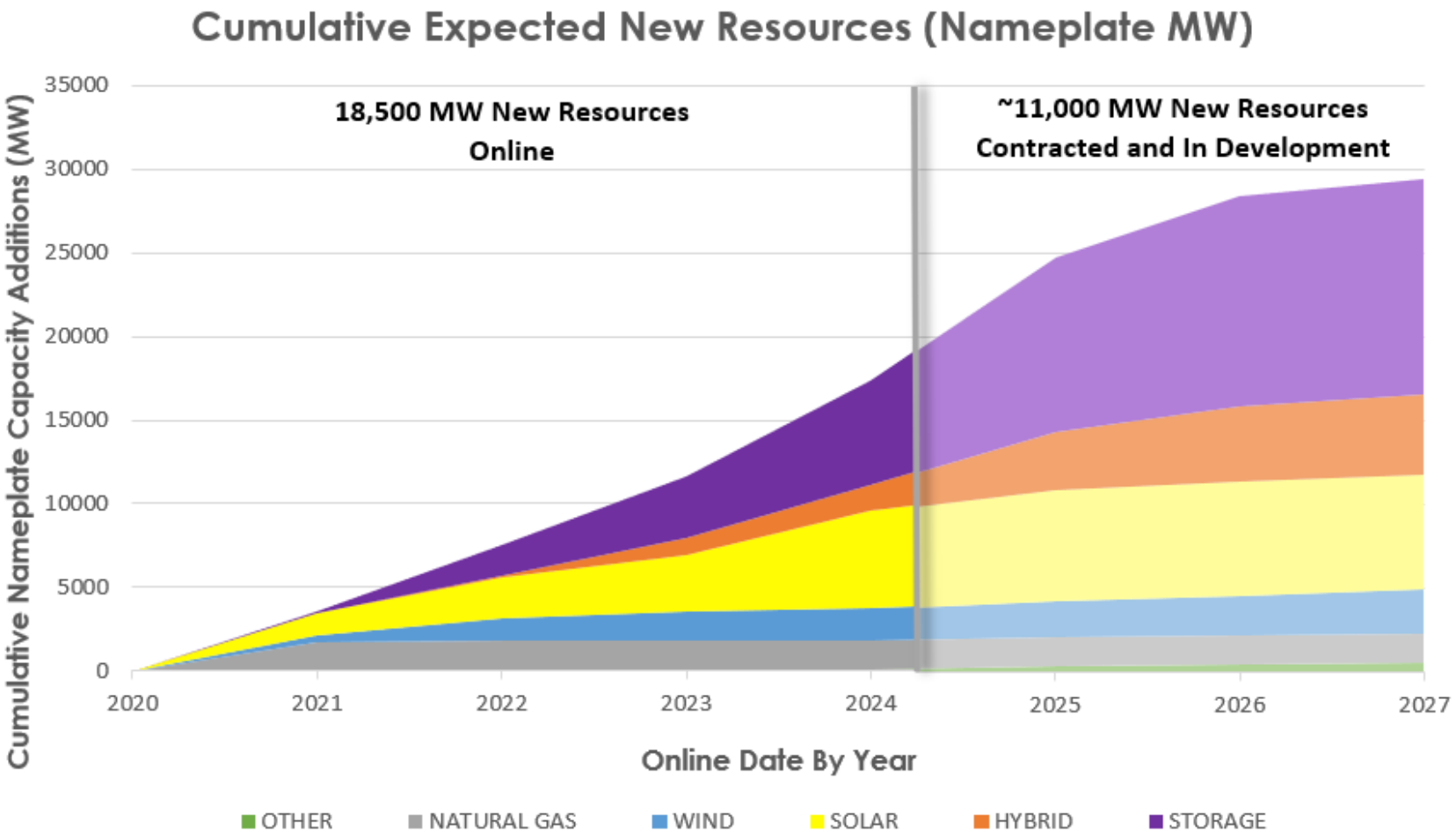
CPUC Orders	Amount	2021	2022	2023	2024	2025	2026	2027	2028
Near-Term Reliability Ordered in 2019	**3,300 MW**	1,650	825	825	-	-	-	-	-
Mid-Term Reliability (MTR) Ordered in 2021	**11,500 MW**	-	-	2,000	6,000	1,500	-	-	2,000**
Supplemental MTR Ordered in 2023	**4,000 MW**	-	-	-	-	-	2,000	2,000	-
Total Recently Ordered Procurement	**18,800 MW**								

**Megawatts (MW) reflect Net Qualifying Capacity (NQC)*

*** The order requires LSEs to procure 2,000 MW of long-lead time (LLT) resources by 2028. Per D.24-02-047, LSEs may request extensions for their required LLT procurement for CODs no later than June 1, 2031.*

New Energy Resources Contracted & Online

- Over 18,500 MW of new resources were added between 2020 and 2024 to date
- Annual new resources installed nearly **DOUBLED** in the last four years.
- Most of the new resources were solar PV and battery storage.



Note: Data shown here shows a snapshot of new energy resources added to CAISO grid Q12020 - Q12024, including specified CAISO imports. Also shown is a projection of future new resources based on contracts in place by October 2023. "Other" resources includes geothermal, biomass, biogas, and hydropower.

Transmission Planning & Resource Interconnection

- Transformative changes to transmission planning and interconnection queueing support state energy goals

- In close coordination with state agency planners, the CAISO has adopted a new approach to transmission planning, identifying zones that make the most economic and operational sense for new resource development.

- The CAISO is also developing significant reforms to its interconnection queueing processes to help bring new grid resources into service as soon as possible and stay on track with SB 100/SB 1020 goals.

2020-24 Grid Stress Events

Alerts	2020	2021	2022		2023		2024
	Total	Total	Through End of March	Total	Through End of March	Total	Through End of February
Flex Alerts	10	8	0	11	0	0	0
Restricted Maintenance Operations	20	24	0	16	0	6	0
Transmission Emergencies	2	0	0	10	2	2	2
Energy Emergency Alerts							
Energy Emergency Alert Watch	16	4	0	9	0	2	0
Energy Emergency Alert 1	0	0	0	6	0	1	0
Energy Emergency Alert 2	6	1	0	5	0	0	0
Energy Emergency Alert 3	2	0	0	1	0	0	0
Total Emergency Alerts in CAISO Area	**24**	**5**	**0**	**22**	**0**	**3**	**0**
Total Emergency Alerts across RC West	**47**	**17**	**0**	**42**	**2**	**29**	**8**

Summer 2024 Grid Outlook

2024 Forecasted Summer Conditions

- Continue to improve over previous summers

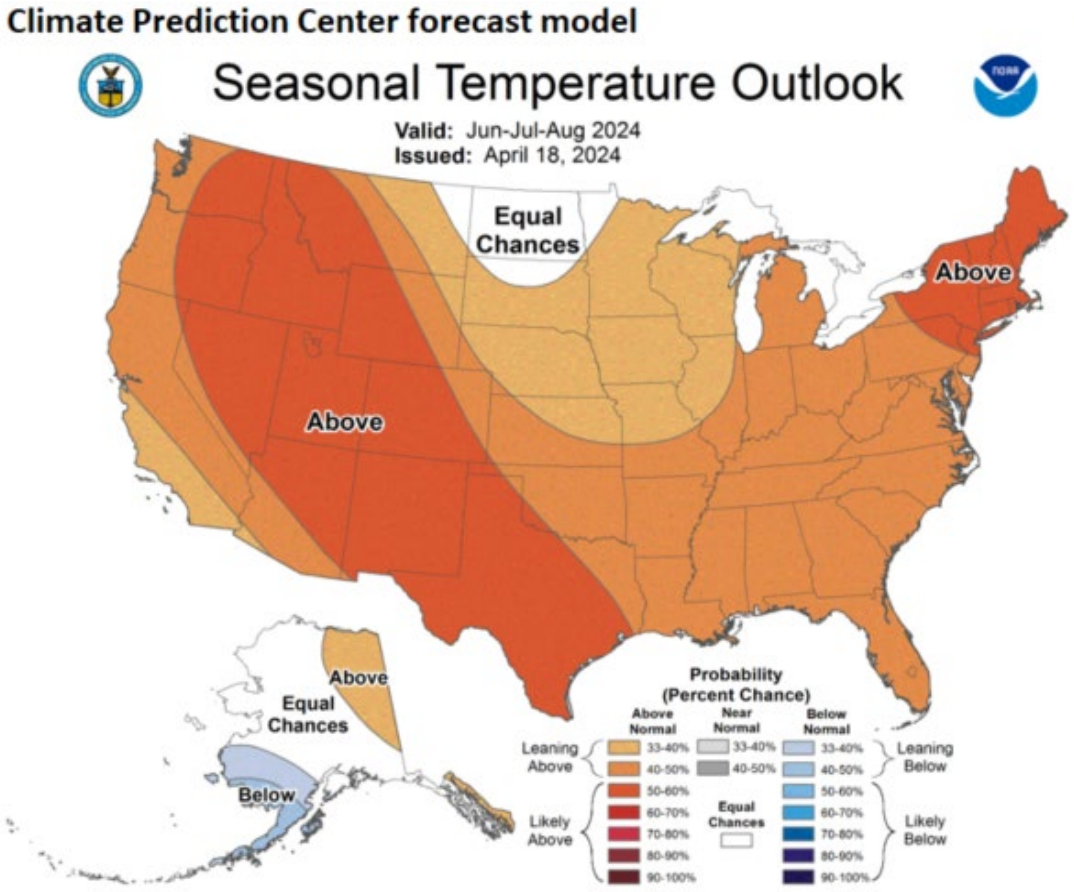
- CAISO analyses show a reasonable supply margin to meet forecasted demand and reserve margins.
  - Nearly 6,300 MW of new capacity added in 2023.
  - 1,200 MW of new capacity added through April 1, 2024.
  - The loss of load expectation target of 1-in-10 is forecast to be met with a 2,550 MW surplus.

Weather Forecast Guidance

- Shows an increased chance of above normal temperatures across interior CA, but lower chances of above normal temperatures for coastal CA

- June - August 2024:
  - Above normal temperatures are most likely to occur across the Desert Southwest.
  - Lower chance of above normal temperatures in coastal locations, especially Southern California.

- Late July – August 2024:
  - Increased chance of heat events across interior California.



2024 Expected New Energy Resources

Nameplate Capacity

- **Expected 2024 New Resource Additions:**
  - 7,535 MW (Total)
  - 5,152 MW (Expected before September)
- **Q1, 2024 update:**
  - 1,215 MW installed at the end of March (1,640 MW was expected)

2024 Monthly Progress Report - Cumulative* (MW)

Resource Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Solar	0	190	640	785	1127	1127	1427	1777	1777	1777	1919	3233
Battery	40	792	952	2156	2423	3003	3155	3327	3405	3605	3640	4080
Hydro	0	0	0	0	0	0	0	0	0	0	0	0
Wind	0	0	0	0	0	0	0	0	0	80	80	161
Geothermal	0	0	0	0	0	0	0	0	13	13	13	13
Natural Gas	48	48	48	48	48	48	48	48	48	48	48	48
Others	0	0	0	0	0	0	0	0	0	0	0	0
Total (Expected)	88	1030	1640	2989	3598	4177	4630	5152	5243	5523	5700	7535
Installed	**127**	**357**	**1215**									

Comparison to Past Analyses

September Forecast	Summer 2022	Summer 2023	Summer 2024	Changes Between Summers 23 & 24
	May 2022 Analysis	Aug 2023 Report	Jan 2024 Report	Jan 2024 & Aug 2023 Reports
Demand				
Total Demand	46,319 MW	47,327 MW	45,972 MW	-1355 MW
Resources				
Total Resources	53,080 MW	55,533 MW	56,439 MW	+906 MW
Potential Surplus/Shortfall Before Contingencies Are Need (Resources – Demand)				
Standard Planning Event	40 MW	2100 MW	4020 MW	+1920 MW
2020 Extreme Event	-3,000 MW	-400 MW	+1500 MW	+1900 MW
2022 Extreme Event	-7,000 MW	-2,000 MW	-90 MW	+1910 MW

* Does not include the risk of coincident wildfire impacting generation and/or electricity imports into California

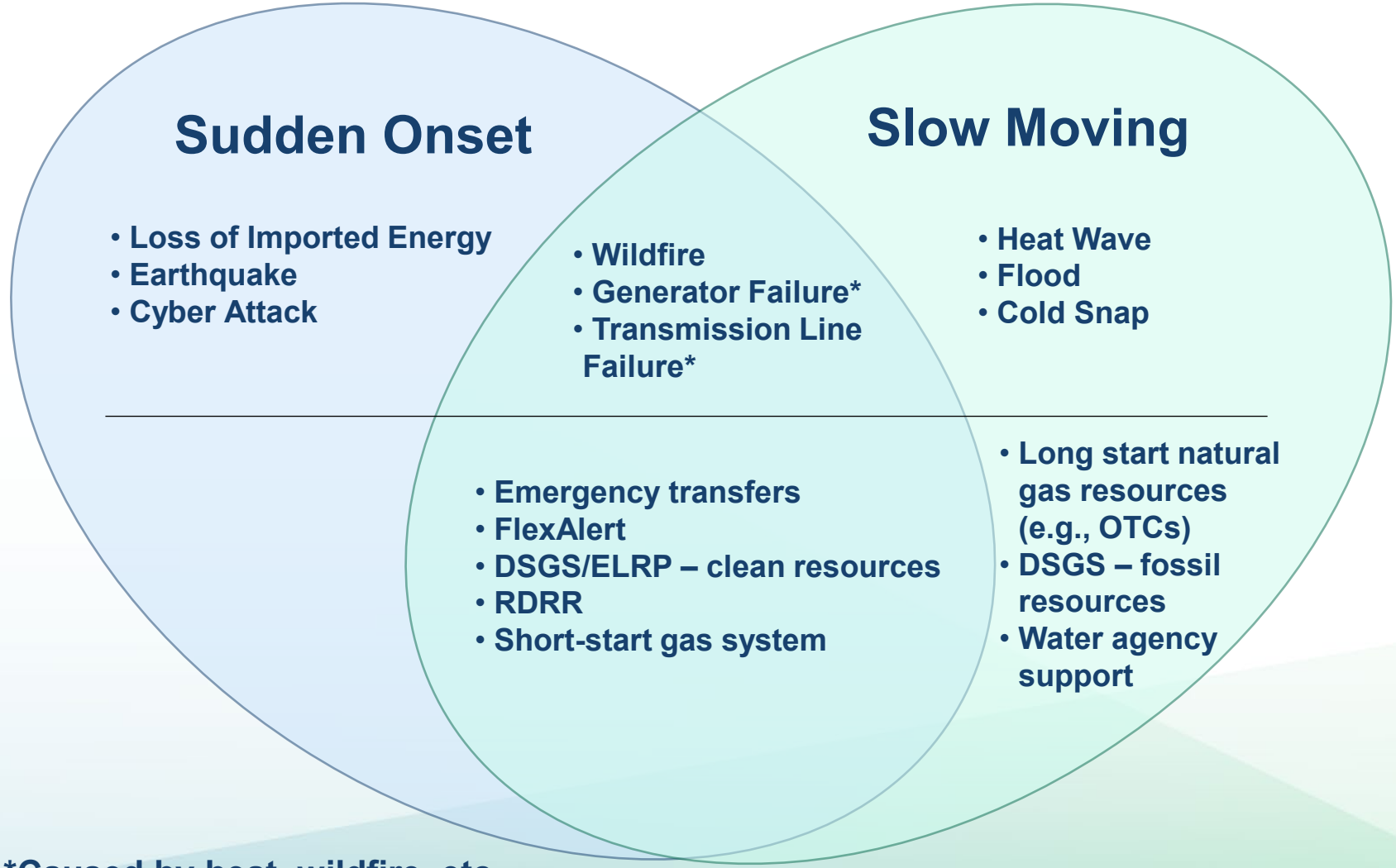
Types of Grid Emergencies & Support Resources

Extreme Events

- Can be singular or coincidental, but most are driven by climate change

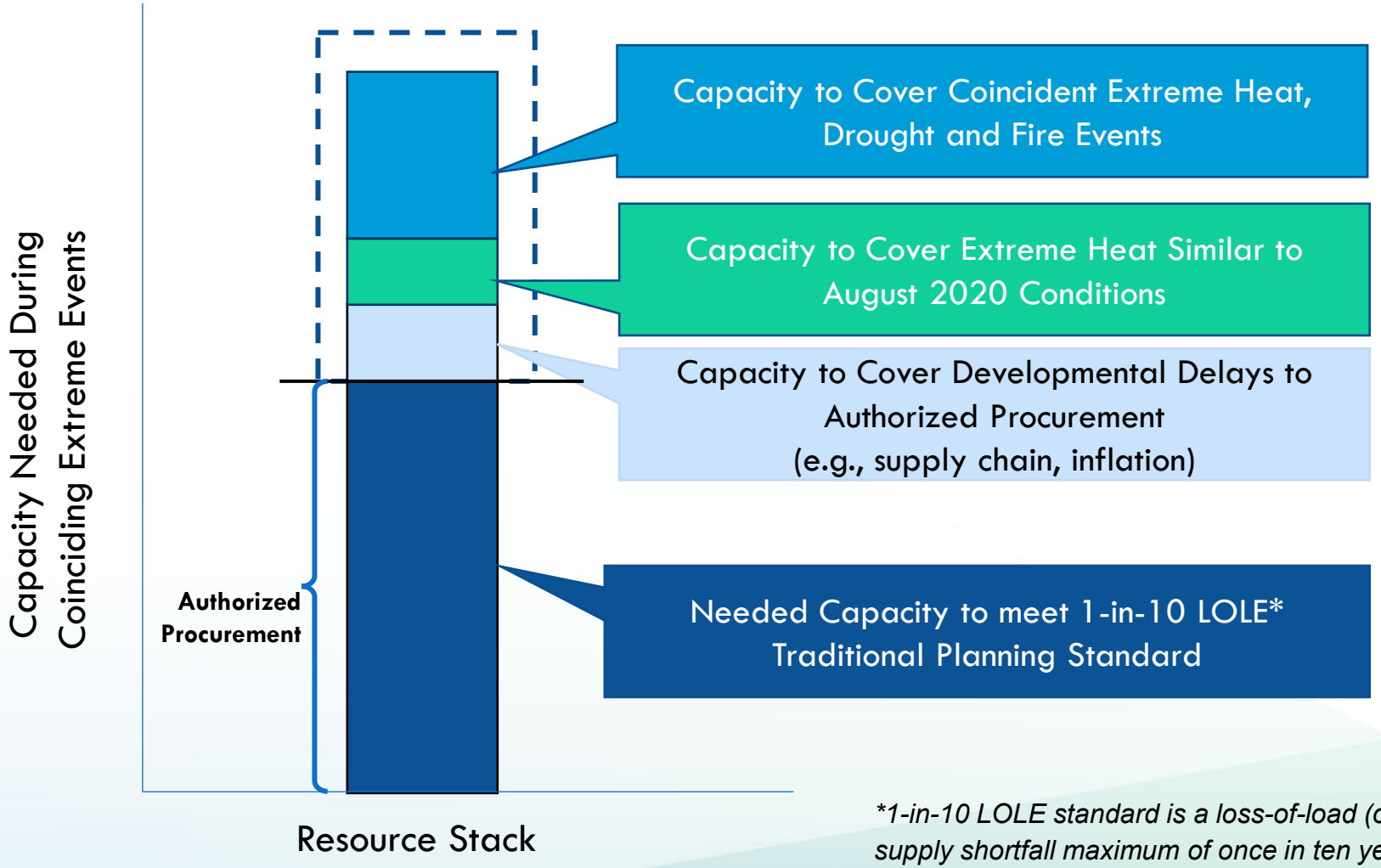
Energy Resources

- Almost 5,000 MWs of contingency resources in 2024
- Operational characteristics impact when they are useful, such as OTCs



*Caused by heat, wildfire, etc.

Why a Strategic Reliability Reserve?



**1-in-10 LOLE standard is a loss-of-load (outage) expectation due to supply shortfall maximum of once in ten years.*

2024 Contingencies (as of 4/29/2024)

Type	Contingency Resource	MW Available			Note
		July	August	September	
Strategic Reliability Reserve	DWR Electricity Supply Strategic Reliability Reserve Program	3,150	3,150	3,150	Up to …
	CEC Demand Side Grid Support (DSGS)[1]	225	261	297	See Note
	CEC Distributed Electricity Backup Assets (DEBA)[2]	0	0	0	See Note
CPUC*	Ratepayer Programs (Emergency Load Reduction Program, Smart Thermostats, etc.)[3]	305	333	357	See Note
	IOU Import Contracts	325	930	825	Unchanged
	As Available Energy from Installed Resources	119	50	39	Unchanged
DWR	DWR State Water Project	0	0	0	Pending
Non-Program	Balancing Authorities Emergency Energy Transfers	300	300	300	Down from 500
	Thermal Resources Beyond Limits: Gen Limits	40	40	40	Down from 60
	Thermal Resources Beyond Limits: Gen Limits Needing 202c	25	25	25	Unchanged
	Total	**4,489**	**5,089**	**5,033**	

[1] Adjusted to reflect availability vs enrolled participants, and additional time needed for participants to transfer from ELRP to DSGS and new clean DR aggregators to operationalize

[2] Nine projects were recommended for DEBA funding for a total of 296 MW

[3] Based on enrollment numbers

** Numbers are from June 2023 IOU Excess Reports. Numbers will be updated for summer 2024 when IOUs submit their June 2024 Month-Ahead Showings to CPUC*

Overview - Electricity Supply Strategic Reliability Reserve Portfolio (ESSRRP)

	2022	2023	2024
Emergency & temporary natural gas resources for extreme events[1]	120.0 MW	147.5 MW	Up to 291.0 MW
Once-through cooling (OTC) natural gas fueled generators for extreme events[2]	0 MW	0 MW	2,859.3 MW
Firm energy import contracts[3]	3,349 MW *(47% low- or GHG-free)*	~3,400 MW	--
Temporary diesel generators[4]	82.4 MW	0	--

[1]Resource default is "off." Includes low emitting resources in 2024 based on similar technology that has achieved California Air Resources Board's Distributed Generation certification. https://ww2.arb.ca.gov/our-work/programs/dgcert
[2]Resource default is "off."
[3]Authorization for firm energy imports up through October 31, 2023. Data for 2023 pending final settlement verification.
[4]AB 205 (2022) only authorized diesel generator procurement until July 31, 2023. DWR closed this program early in favor of lower emission resources.

Overview – Demand Side Grid Support (DSGS) & Distributed Electricity Backup Asset (DEBA)

- DSGS and DEBA serve as on-call emergency supply or load reduction for the state's electrical grid during extreme events.

- DSGS incentivizes dispatchable customer load reduction and backup generation operation
  - The dispatch of clean energy resources is prioritized, with other energy resources being called-on as a last resort.

- DEBA incentivizes the installation construction of cleaner and more efficient distributed energy assets

Implementation – DSGS & DEBA

		2022	2023	2024	2025	2026	2027	2028 - 2030
DSGS	**Milestones**	- Program launch - Responded to Sept 2022 heat wave	- 2nd edition - VPP launch - Responded to 3 EEAs	- 3rd edition - V2X option	**Continue growing participation from clean resources*			
	MWs	315	142	300	330	345	380	(beyond encumbrance deadline)
DEBA	**Milestones**	Initiated public process	- Adopted guidelines - Issued Bulk Grid GFO	- Bulk Grid NOPA for 296 MW - Issued draft DER GFO - **Release DER GFO & NOPA*	**DEBA projects come online; Release additional DER GFOs*			
	Bulk MW	---	---	---	42	171	296	296
	DER MW	---	---	---	50	175	300	300
	Total MW	**315**	**142**	**300**	**422**	**691**	**976**	**596**

**Future milestones*

Ten-year Outlook

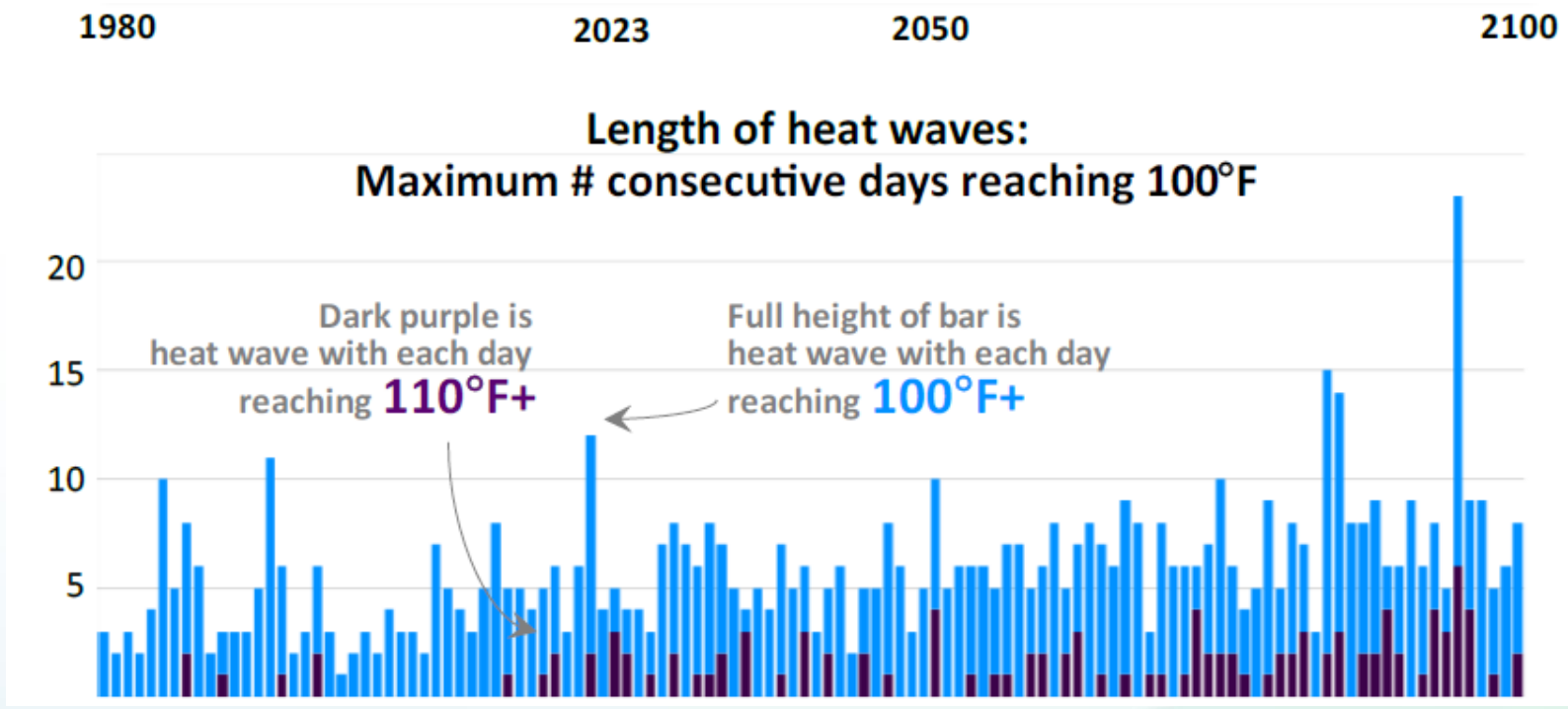
Climate Change Impacts on Grid Reliability

- **Increased Weather Pattern Variability:**
  - More frequent, intense and longer lasting extreme weather events anticipated
  - Greater challenges in maintaining grid reliability

- **<u>Specific Examples of Climate-Driven Grid Stress:</u>**
  - **2020 West wide Heat Event:** Rotating outages implemented on August 14-15 due to extreme heat
  - **2021 Oregon Wildfire:** Transmission line damage from wildfires led to:
    - Loss of 3,000 MW imports to CA ISO territory
    - Overall import capacity reduction of 4,000 MW to the state
  - **2022 California Heatwave:** Record high temperatures between August 31-September 9, 2022
    - New peak load record set at 52,061 MW on September 6, exceeding the previous record by nearly 2,000 MW
  - **Late July 2023 Western Heat Event:** Extreme heat outside California caused challenging market dynamics

Extreme Temperature Events -
Increased Frequency Projected

Extreme Temperature Projections — E.g., Sacramento Region



10-Year Outlook

- A 4,000 MW fire risk impact was added to the 10-year outlook
  - 4,000 MW of fire risk is associated with loss of transmission capacity
  - Average conditions with fire risks are manageable
  - Fire risk, extreme events and resource build out delays happening simultaneously may be challenging

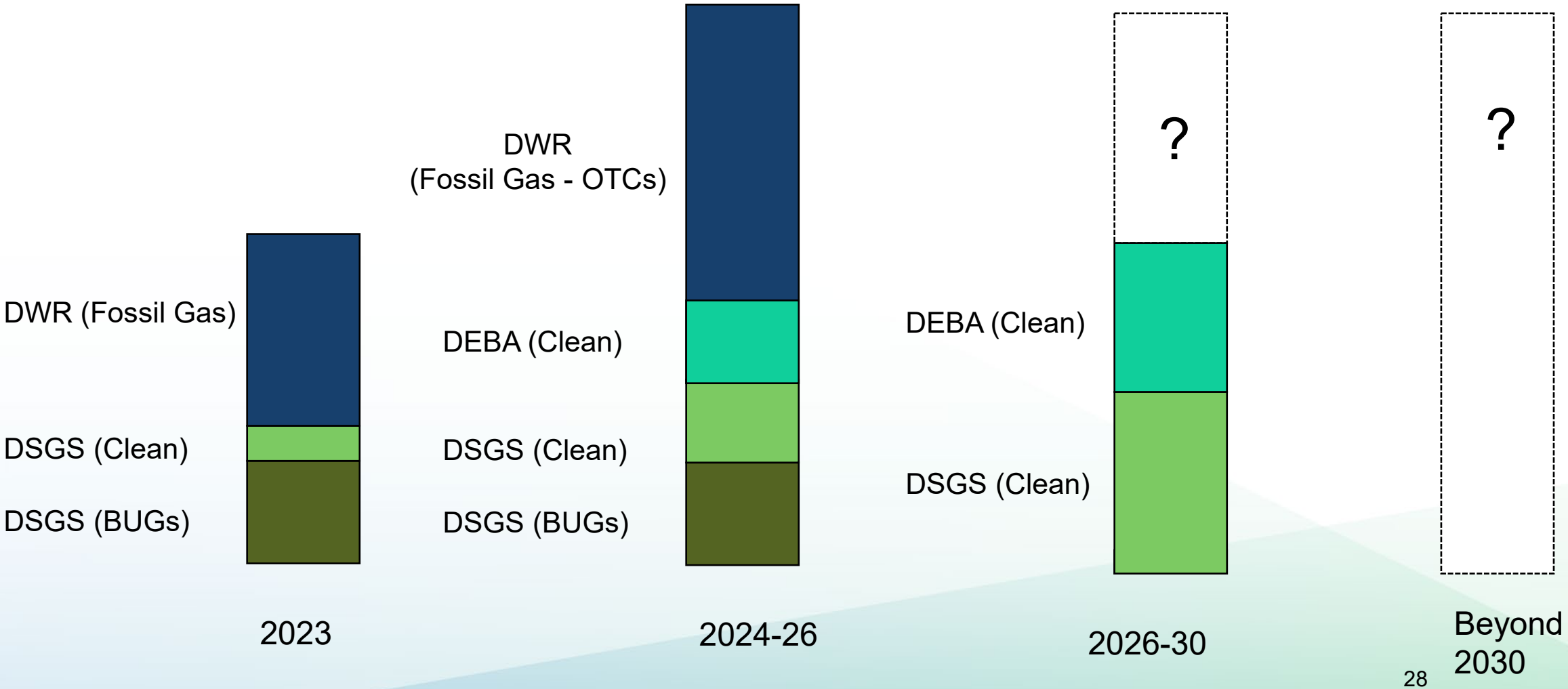
- It is prudent to continue to develop and support contingency resources to maintain grid reliability

		Year										
	Delay Percent	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
2022 Equivalent Event	40	-5593	-4,179	-3,394	-3,380	-3,610	-4,000	-4,000	-4,732	-6,216	-8,501	-10,374
	20	-4842	-3,683	-3,148	-3,228	-3,439	-4,000	-4,000	-4,732	-6,216	-8,501	-10,374
	0	-4090	-3,187	-2,903	-3,075	-3,267	-4,000	-4,000	-4,732	-6,216	-8,501	-10,374
2020 Equivalent Event	40	-3995	-2,566	-2,089	-2,049	-2,250	-2,602	-2,617	-3,370	-4,803	-7,035	-8,852
	20	-3243	-2,070	-1,842	-1,897	-2,078	-2,602	-2,617	-3,370	-4,803	-7,035	-8,852
	0	-2492	-1,857	-1,597	-1,744	-1,906	-2,602	-2,617	-3,370	-4,803	-7,035	-8,852
Planning Standard	40	-1483	-31	-37	44	-111	-406	-443	-1,231	-2,583	-4,733	-6,461
	20	-731	106	209	196	60	-406	-443	-1,231	-2,583	-4,733	-6,461
	0	20	151	454	349	232	-406	-443	-1,231	-2,583	-4,733	-6,461

Evolving the Strategic Reliability Reserve

Strategic Reliability Reserve (SRR) – *Long-Term Vision*

DSGS / DEBA help transition SRR to clean contingency resources – away from dependency on OTCs



Key Takeaways

- January 2024 analysis shows an improved outlook compared to recent years.

- California is increasingly powering its economy with clean energy resources BUT we face challenges with scaling up clean energy resources, while retiring fossil fueled resources and maintaining grid reliability during climate induced extreme events.

- However, California has new investments, tools and mechanisms in place that is enabling a comprehensive, focused and multi-pronged electric supply and demand approach to ensure grid reliability during peak-demand summer months.

- We need to SUSTAIN our existing efforts, while considering new policy and investment approaches, constructs and options that place the state in a position to proactively address our challenges now, and going forward.

Thank You!

Assembly Utilities and Energy Committee - Oversight Hearing

May 8, 2024