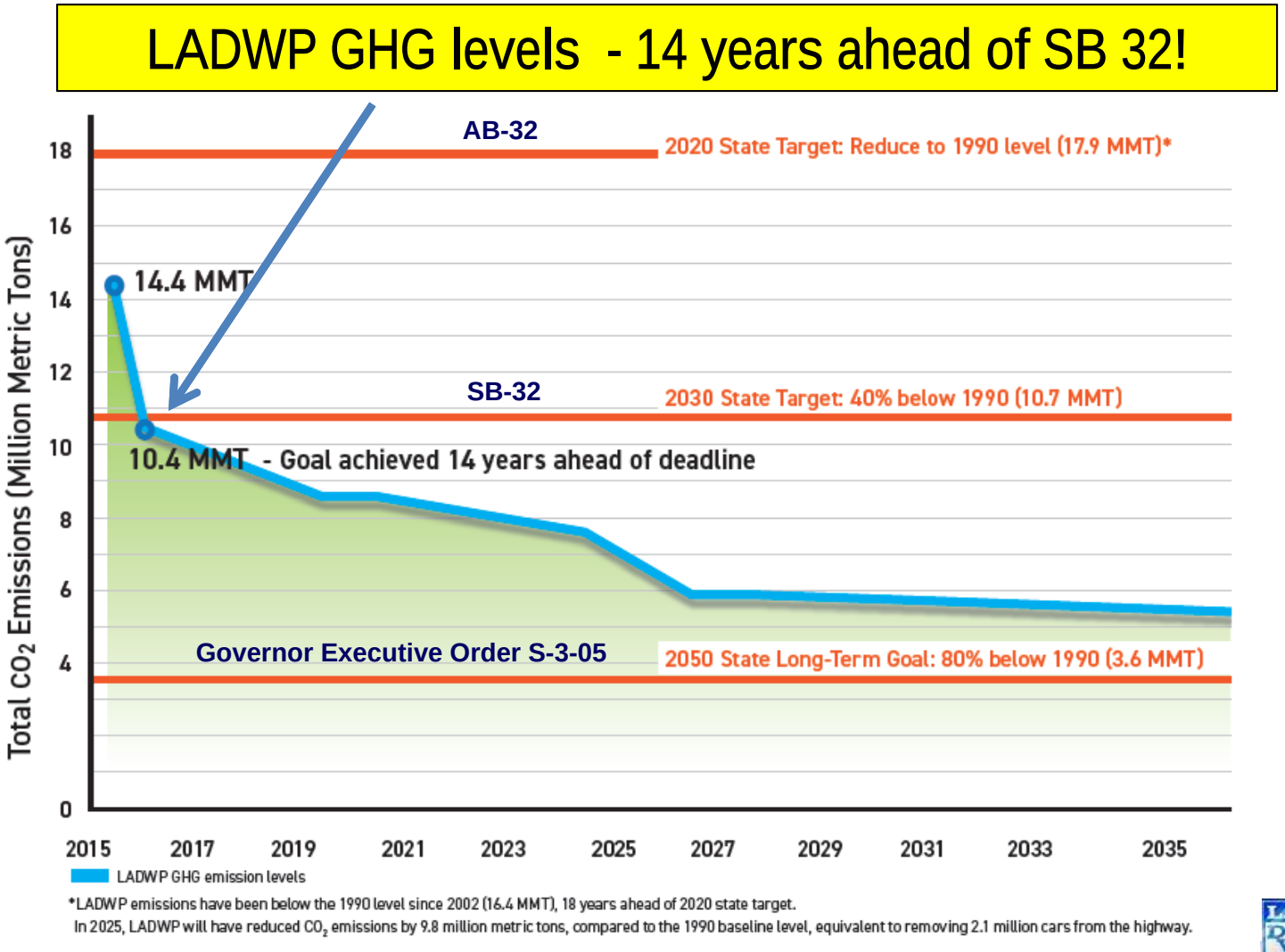
Los Angeles Department of Water & Power

LA's Clean Energy Future

CAISO Regional Issues Form (RIF)
March 9, 2018

Putting Customers First

LADWP's Clean Energy Successes

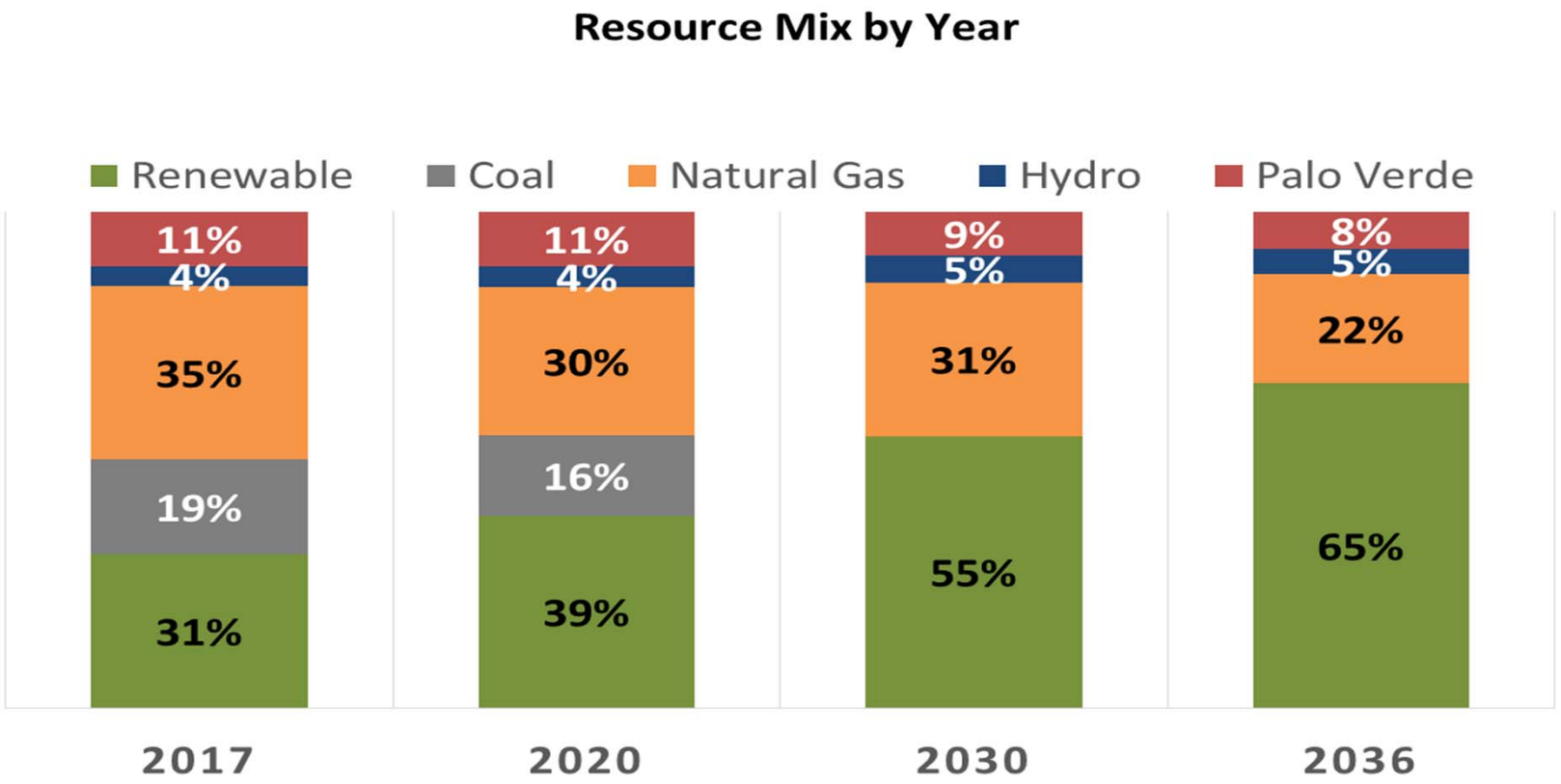


LADWP's Clean Energy Successes

- Achieved 961 MW of large-scale solar power
- Achieved 240 MW customer solar (Top 5 in U.S.)
- Achieved 1116 MW wind and geothermal power
- Divested of Navajo coal power plant; expect to achieve 0 coal by 2025
- Added 1,000 MW transmission to access renewables

Transformation of Energy Resources

Over the next 10 years, LADWP plans to nearly double its renewable power supply using a least cost/best fit methodology



Note: Includes a doubling of energy efficiency by 2030

Reiko

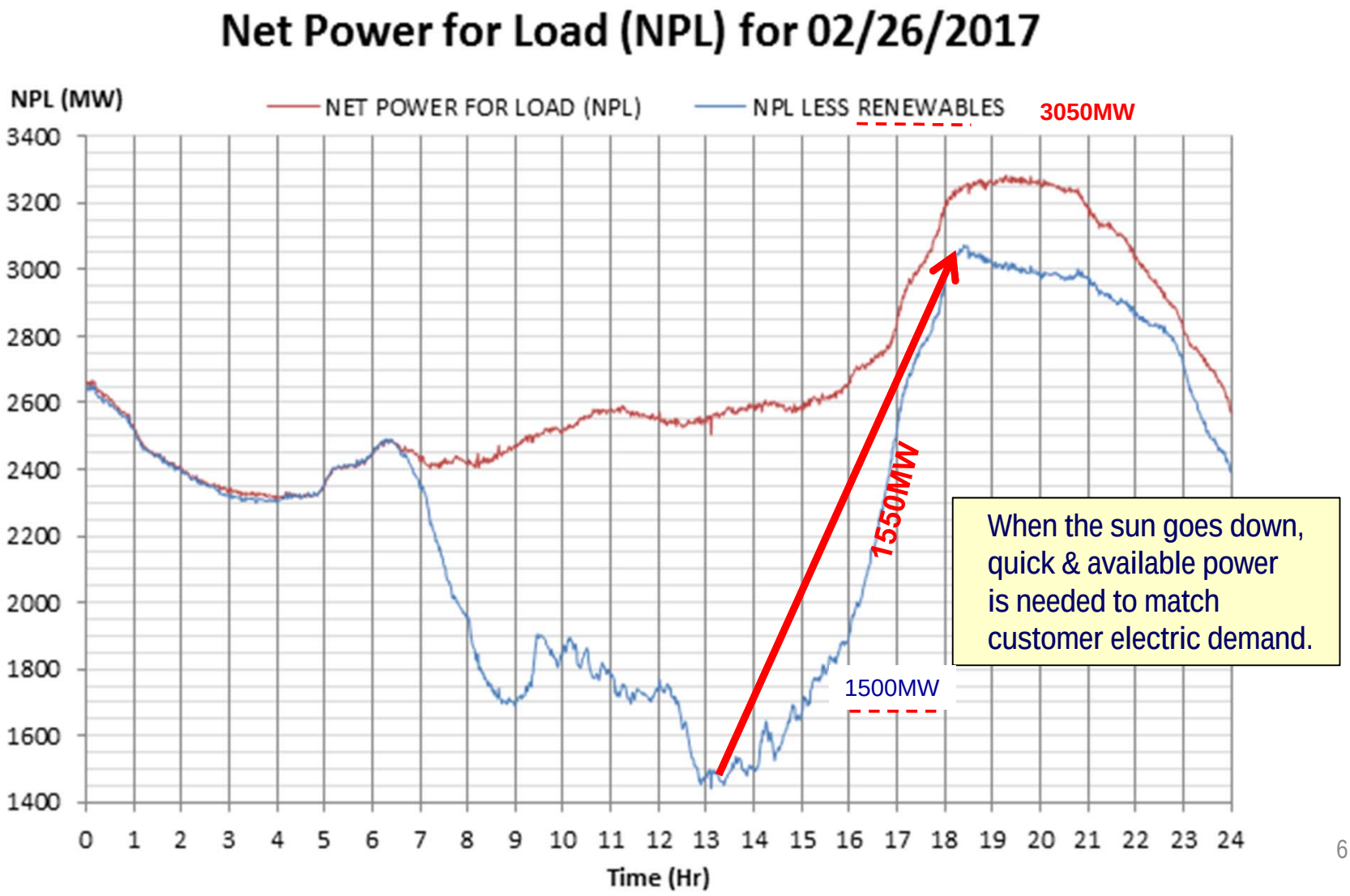
Mandatory Federal Reliability Standards

LADWP is a “Balancing Authority” and must comply with many federal reliability rules that provide for:

- Continuously balancing power generation & electrical use.
- Providing sufficient contingency power generation for sudden loss or fluctuation of energy.
- LADWP is responsible for balancing Los Angeles, Glendale, and Burbank loads
- Violations can be as much as $1M per day

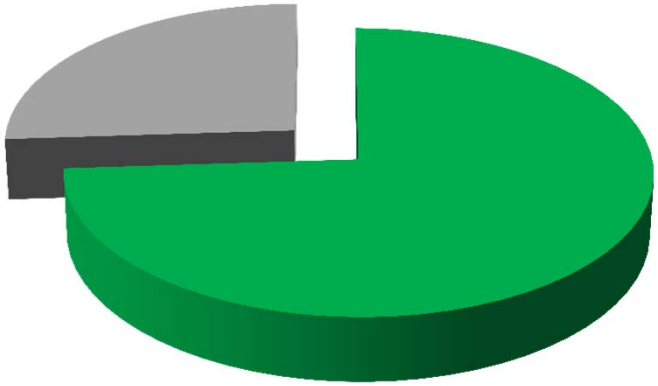
ECC dispatchers continuously balance power generation & demand

Reliability Challenge: The Duck Curve



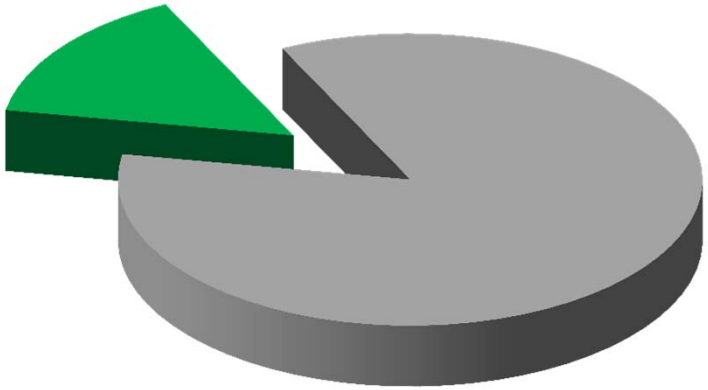
24/7–365: LADWP's Obligation to Serve

Record Low Demand
2600 MW



April 16, 2016:
74% renewables

Record High Demand
6502 MW



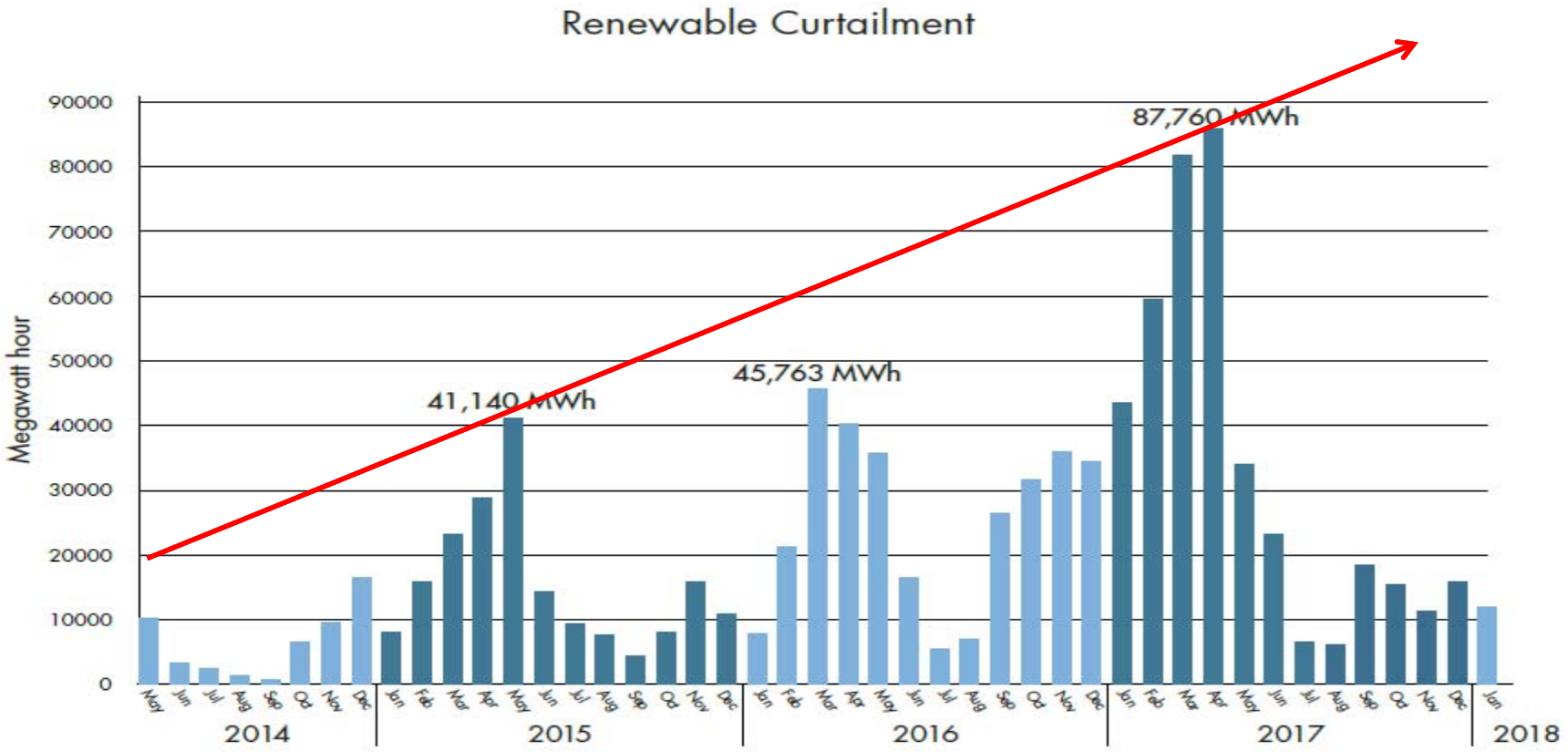
Aug. 31, 2017:
15% renewables

Renewable Energy

Non-Renewables

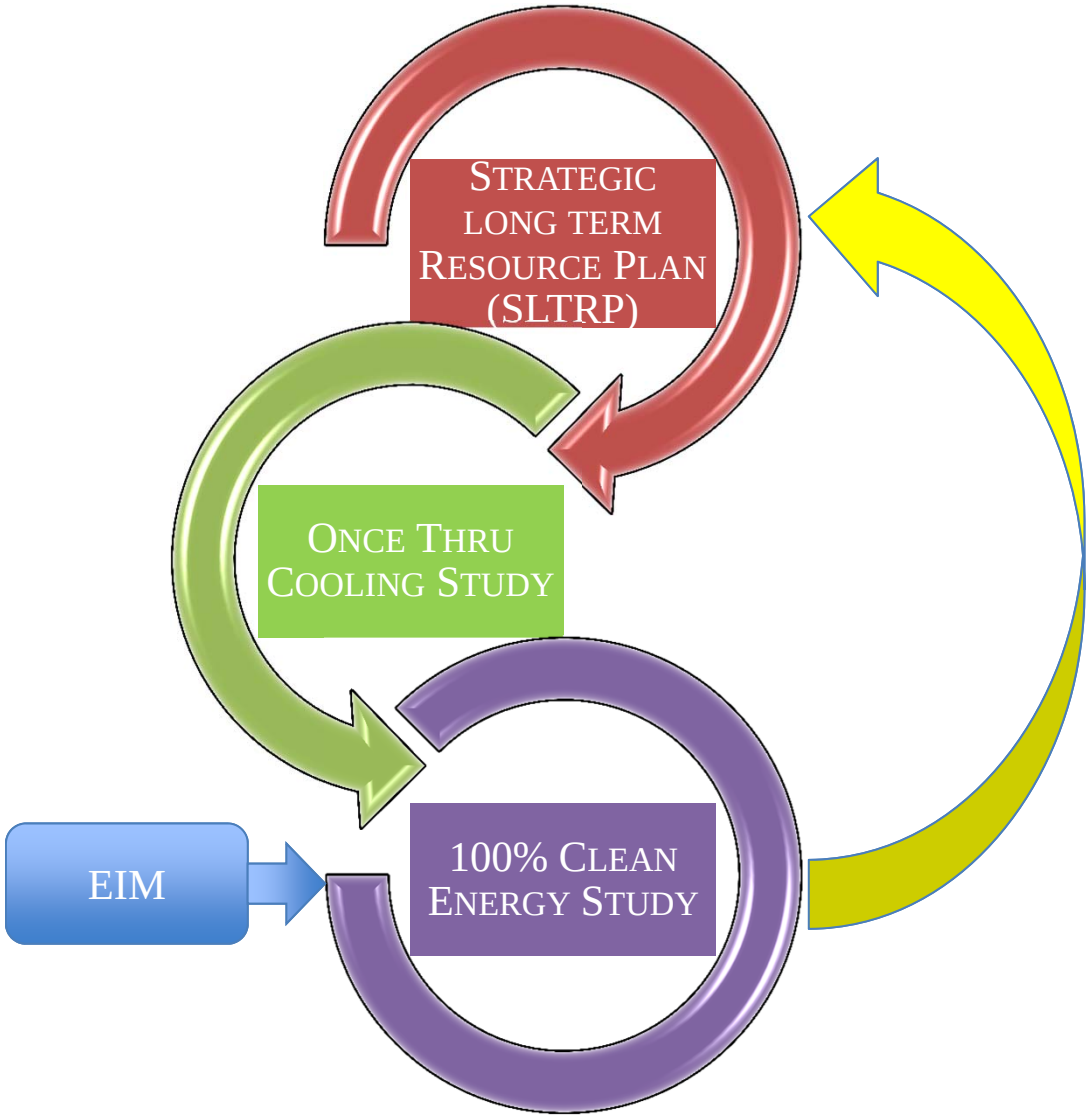
Reliability Challenge: California Case

Renewable Curtailment Steadily Growing in California



California ISO

KEY STRATEGIC INITIATIVES



2017 Power Strategic Long-Term Resource Plan (SLTRP)
LADWP's Power System Roadmap

Reduce GHG emissions below 40% by 2030

Reach 33% RPS by 2020, 55% by 2030, 65% by 2036

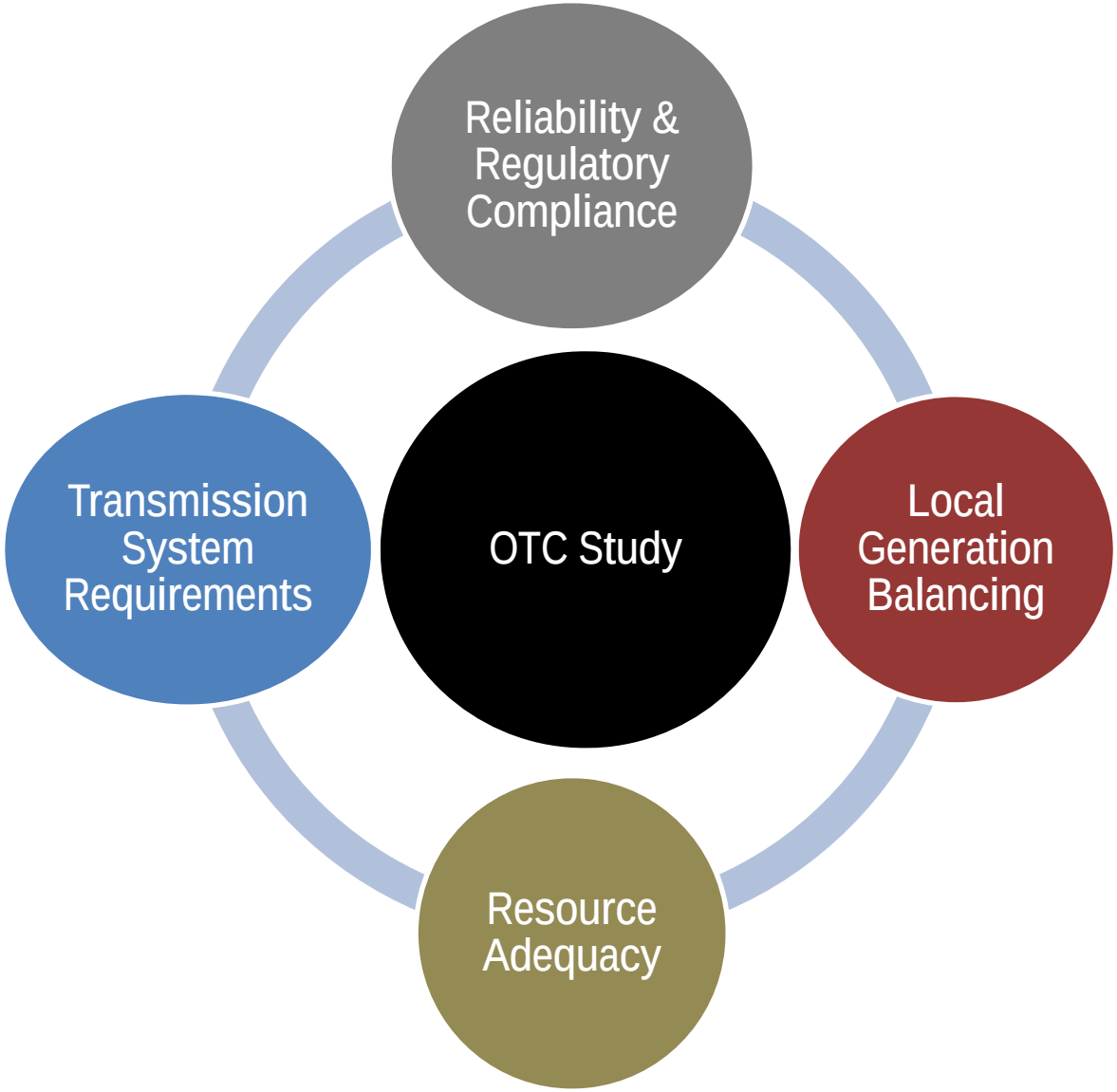
Achieve 15% Energy Efficiency by 2020

Implement Energy Projects (OTC, Storage, DER)

Accelerate Electric Vehicle Expansion

Invest in Power System Reliability Program

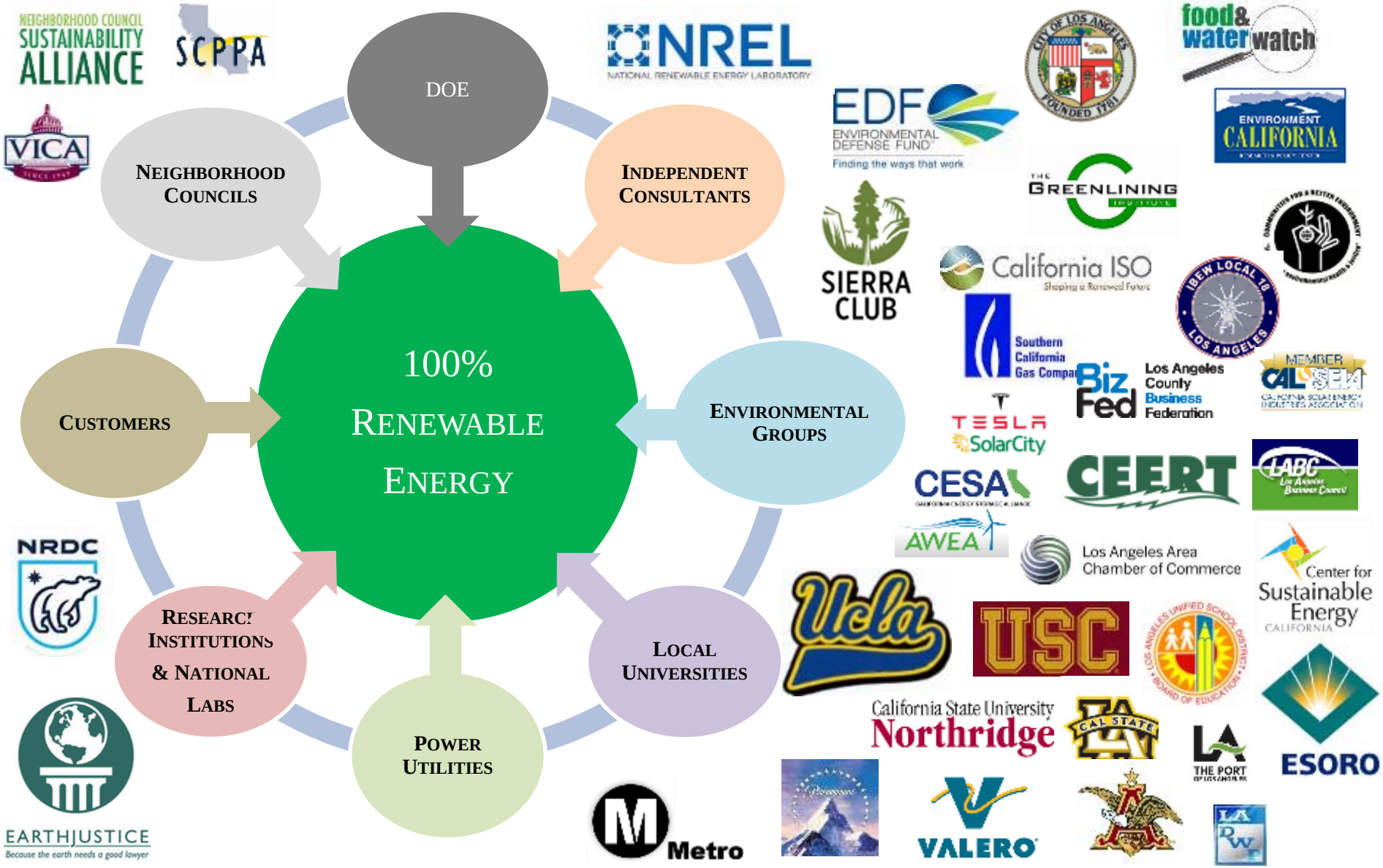
Once-Through Cooling (OTC) Study



100% Renewable Energy Mission Statement

Develop and implement a research partnership that will utilize technical, academic, and policy experts, as well as experts from the utility industry, to study what investments should be made to achieve a 100% Renewable Energy portfolio for the Los Angeles Department of Water and Power.

100% Renewables Advisory Group



100% Renewable Study - Key Considerations

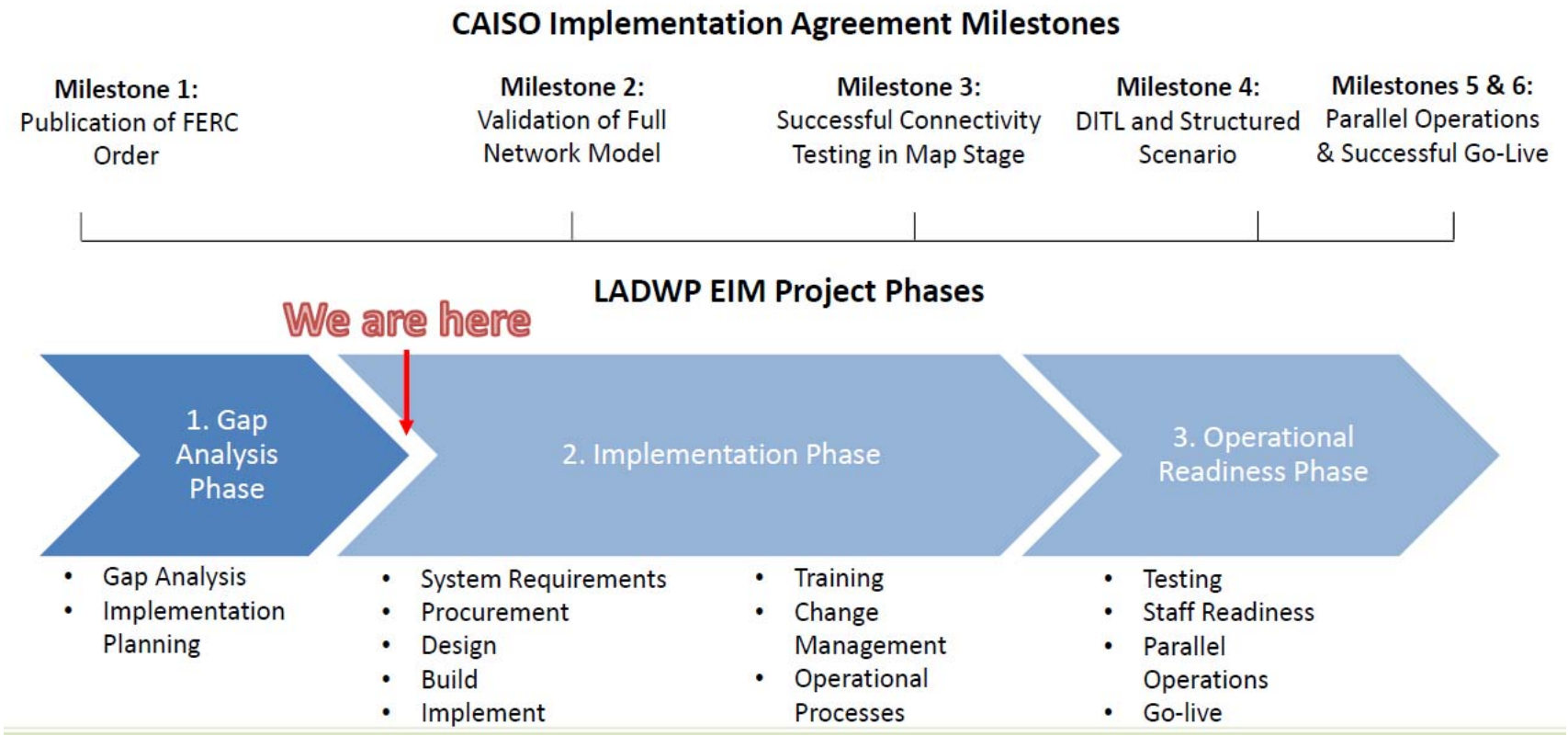
- Maintain safety and reliability of Power System
- Comply with environmental requirements
- Meet all reliability requirements (i.e. contingency reserve power)
- Capability and cost effectiveness of energy storage
- Constraints of expanding local transmission
- Determine investments and impacts on rates
- Process Transparency

100% Clean Energy Scenarios

Six Scenarios identified:

- 2018 SLTRP
- 100% RPS
- 100% Carbon Neutral
- 100% Renewable
- 100% Carbon Neutral - Accelerated
- Load Modernization

Energy Imbalance Market 101



Key Challenges

- Maintain system reliability
- Increase renewable resources
- Meet all regulatory mandates
- Upgrading transmission lines
- Increase imports of renewable resources
- Upgrading local distribution grid
- Implement advanced technologies
- Maintain competitive rates

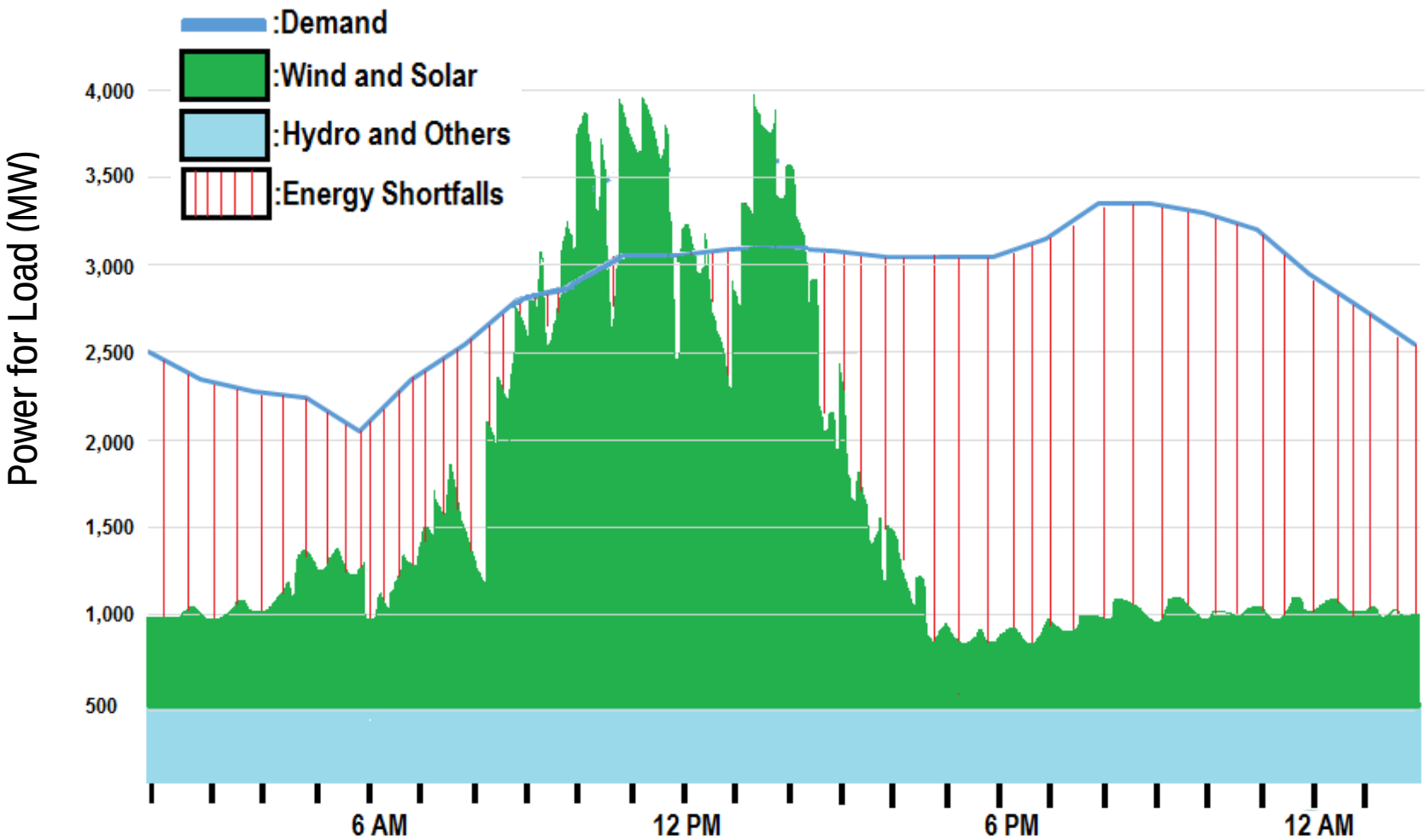
Next Steps

- Increase renewables and energy storage
- Modernize local generating units
- Explore viable technologies and programs to further reduce GHG emission
- Continue with 100% study
- Continue EIM implementation

Questions?

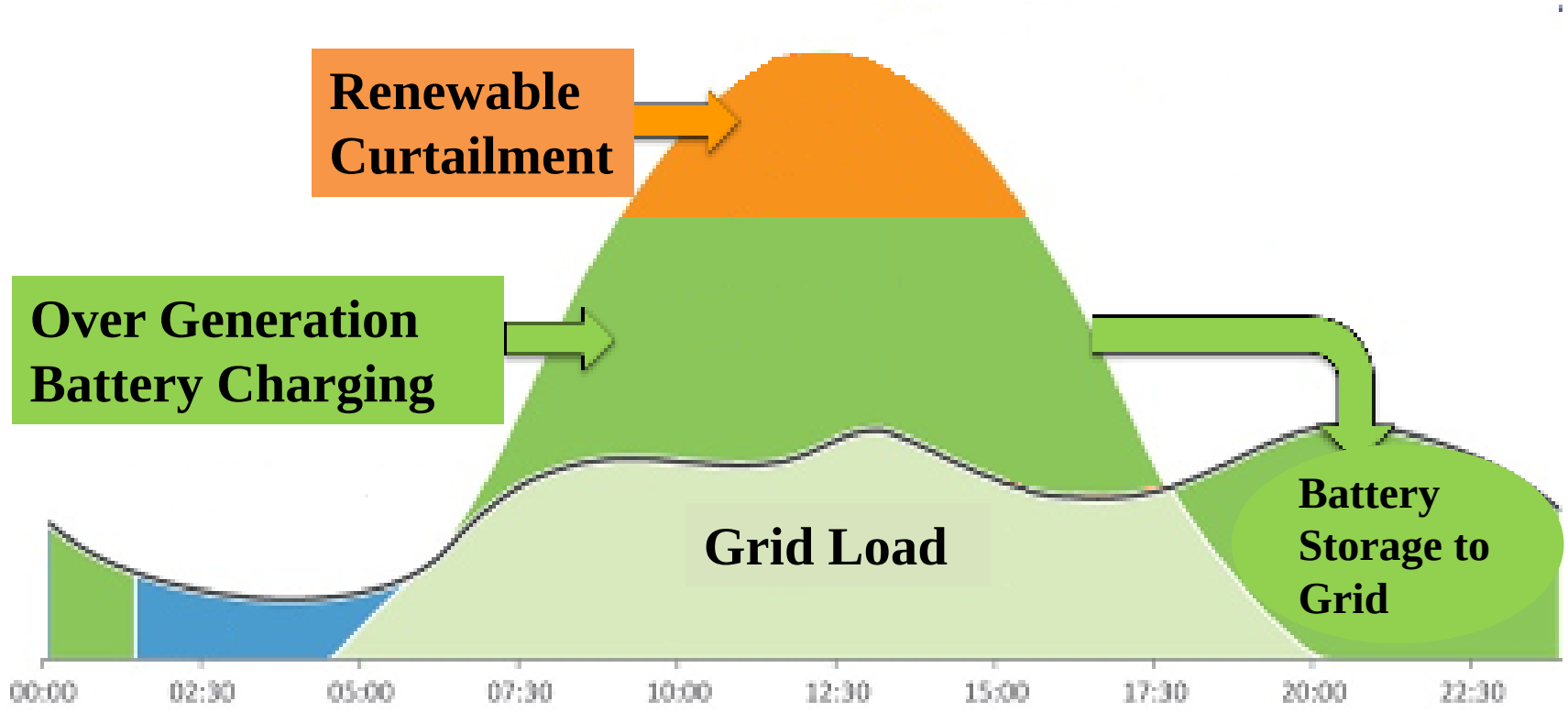
Appendix

Overcoming Energy Shortfalls



Energy Storage 101

Energy Storage is the capture and re-dispatch of already produced energy using various technologies to safely and cost effectively store it from one time frame to another

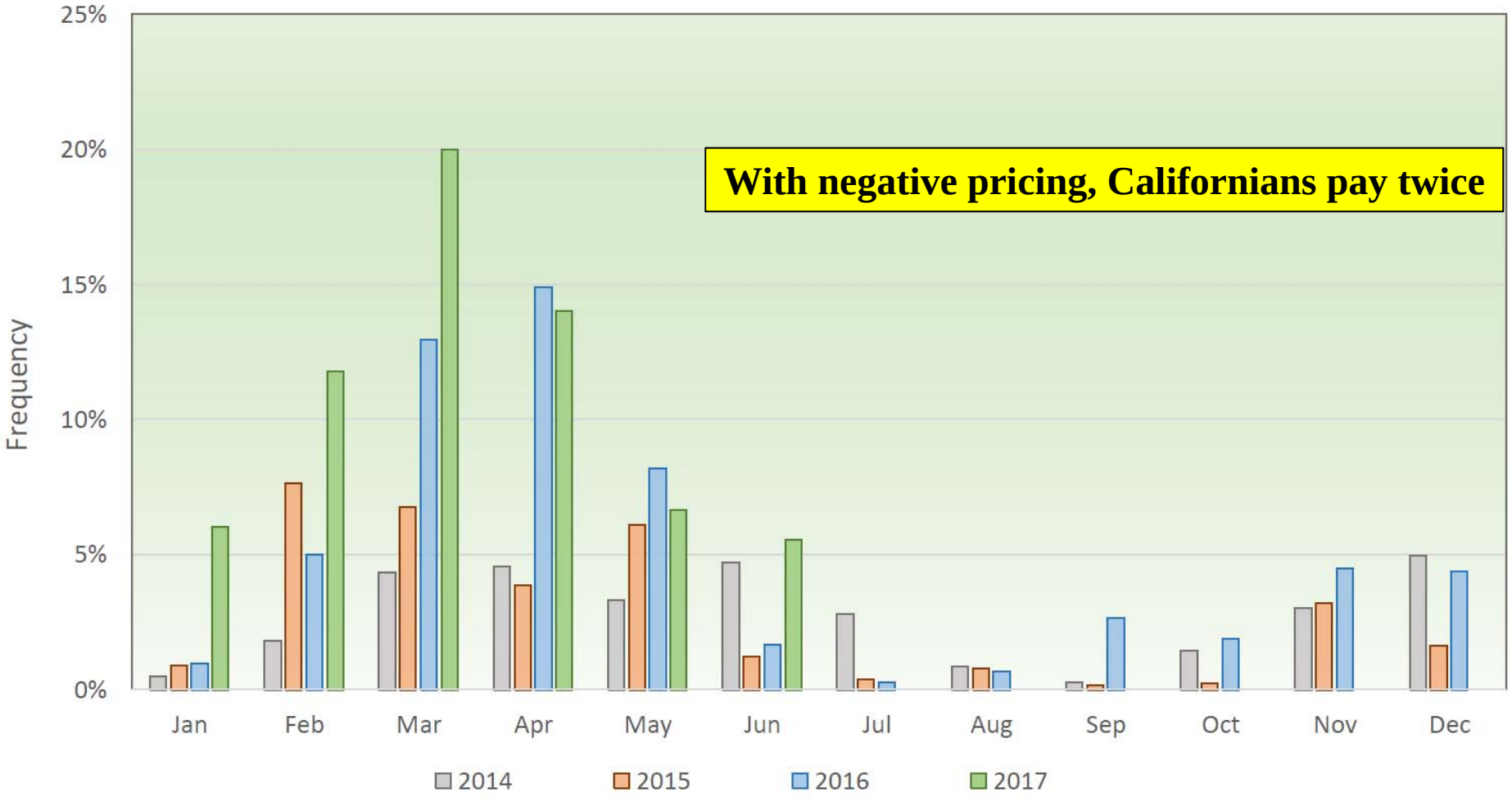


Energy Storage 2021 Targets Status

Connection Level	Pre 2010 Existing ES	2014 Board Approved		LADWP Update	
		2016 Targets	2021 Targets	Achieved	2021 Targets
Generation	1,275 MW	21 MW	60 MW	21 MW	128.4 MW
Transmission	-	-	50 MW	-	
Distribution	-	-	4 MW	-	25 MW
Customer	9.08 MW	3.08 MW	40.3 MW	1.6 MW	2 MW
Subtotal	1,284.08 MW	24.08 MW	154.3 MW	22.6 MW	155.4 MW
Total	1,284.08 MW	178 MW		178 MW	

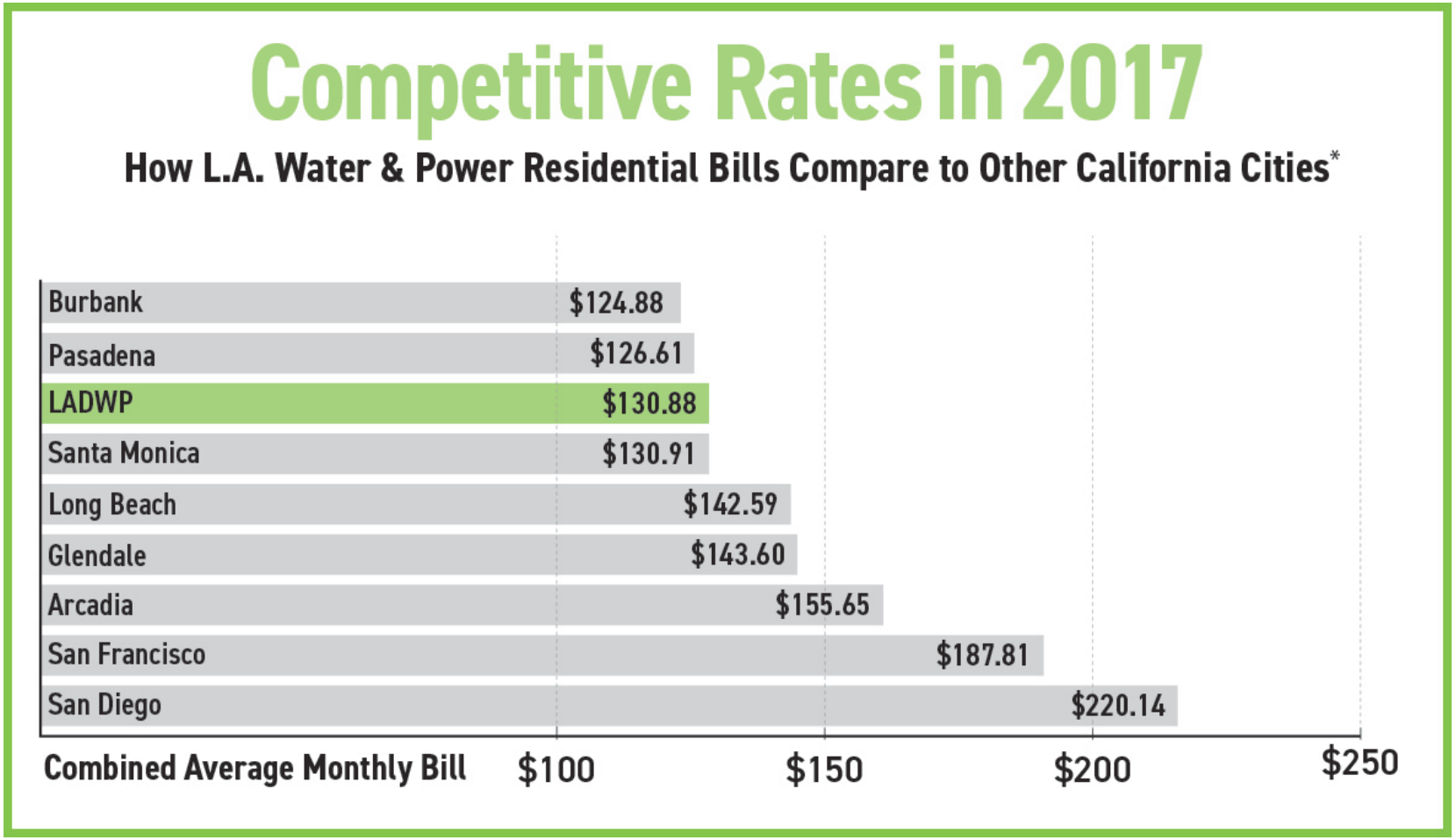
Reliability Challenge: California Case

Frequency of Negative Wholesale Energy Prices Steadily Increasing

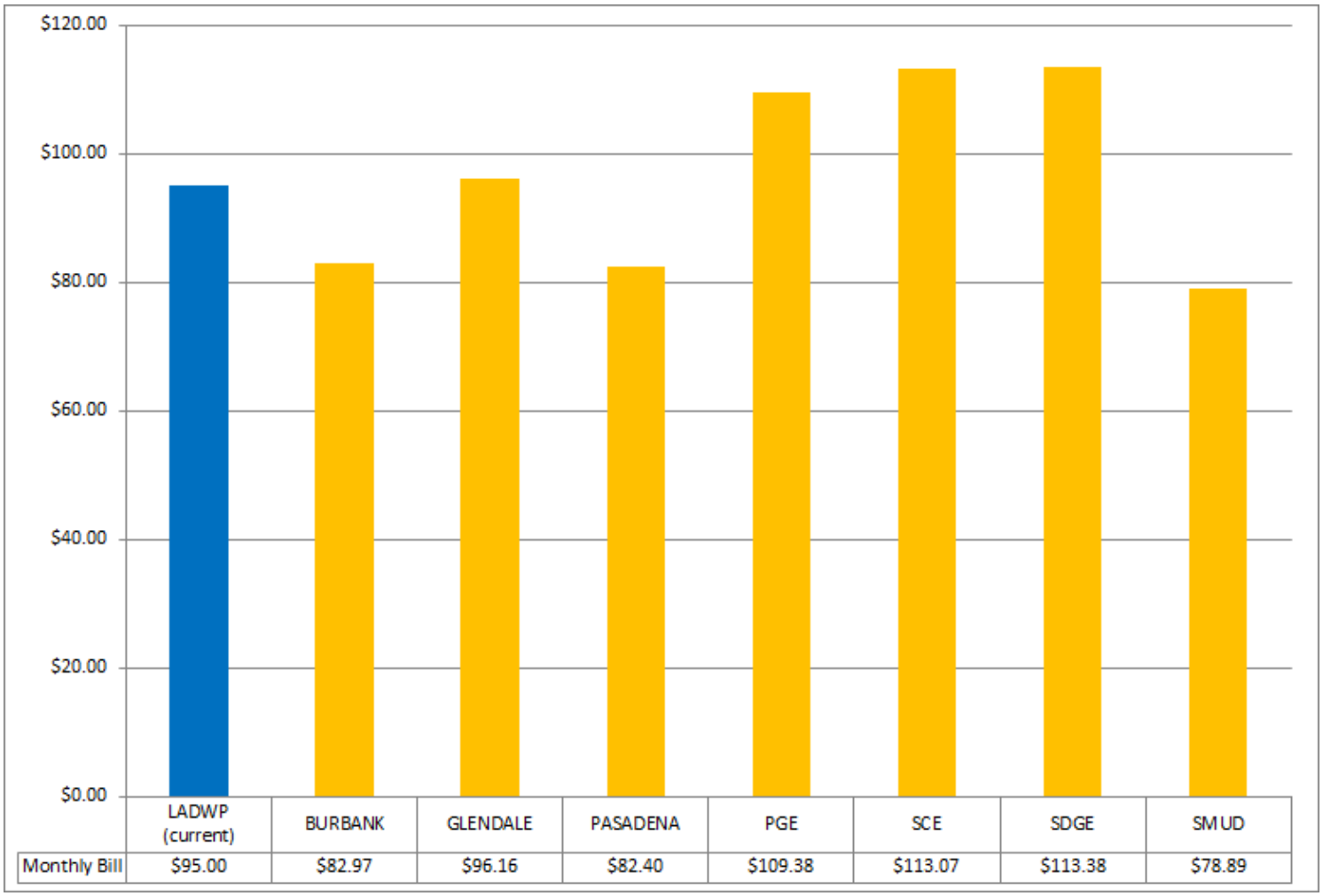


Source: California Independent System Operator (CAISO) data

Residential Water & Power Rates

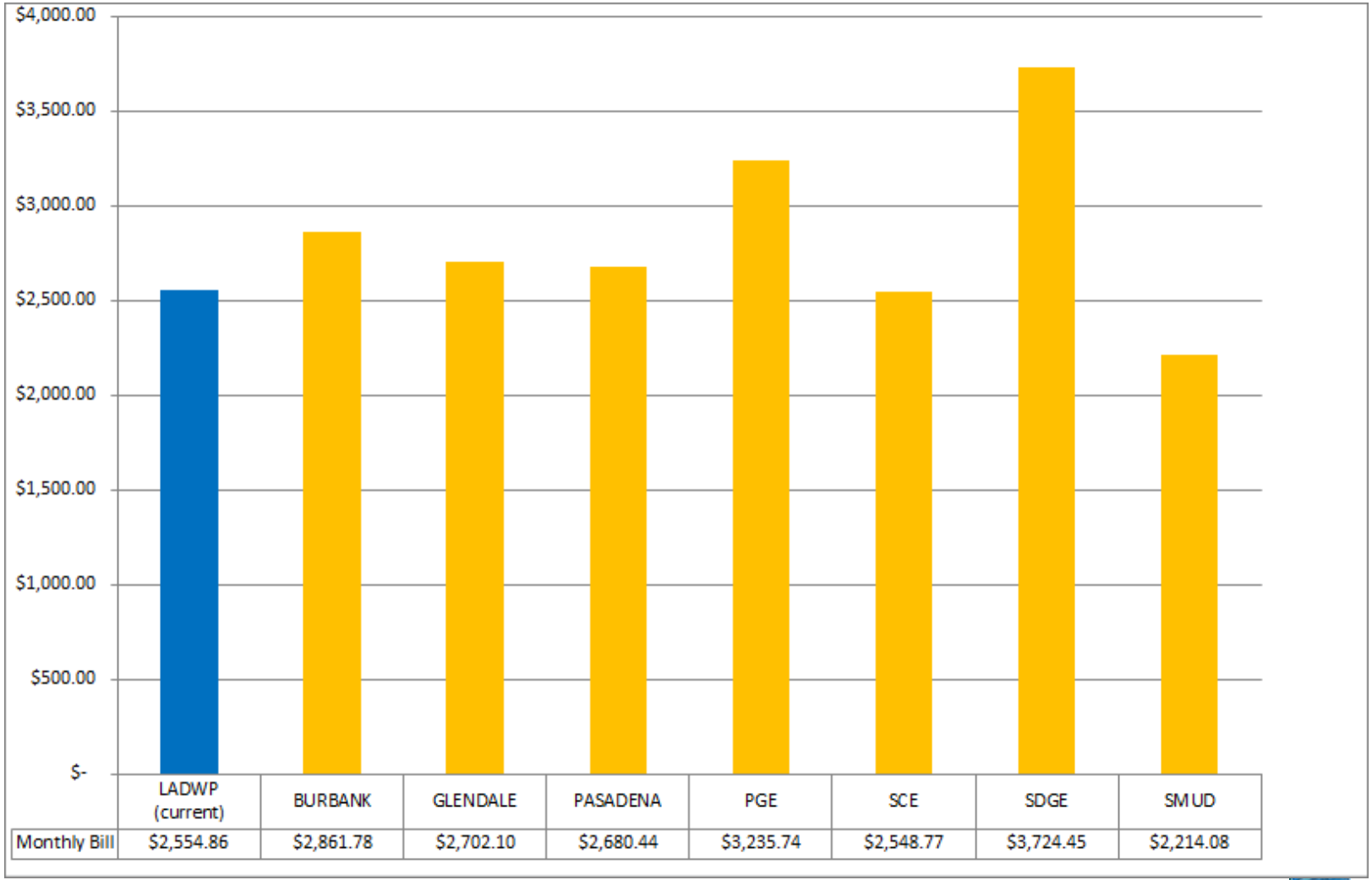


Electric Rates for Small Businesses



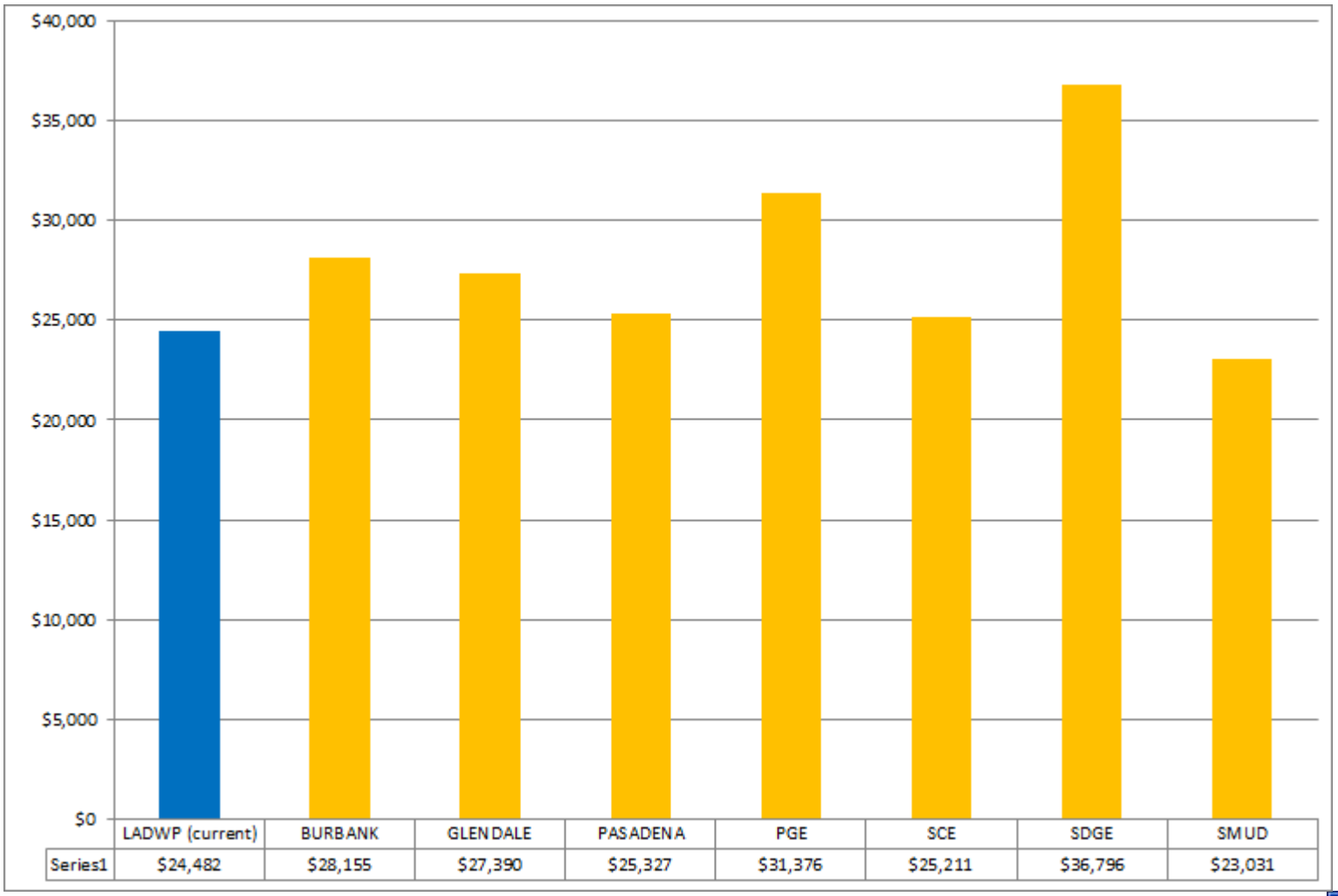
	LADWP (current)	BURBANK	GLENDALE	PASADENA	PGE	SCE	SDGE	SMUD
Monthly Bill	$95.00	$82.97	$96.16	$82.40	$109.38	$113.07	$113.38	$78.89

Electric Rates for Medium Businesses



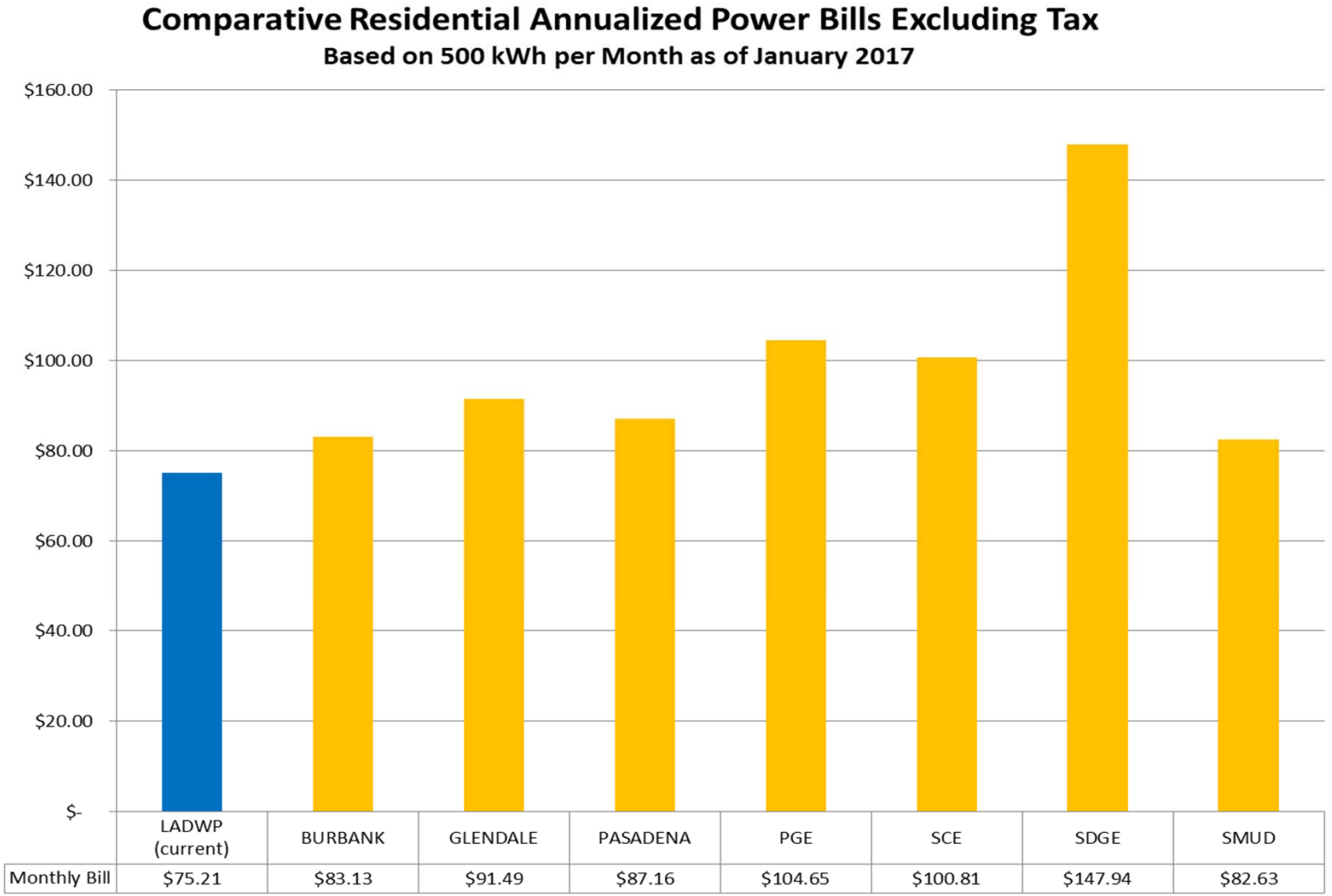
	LADWP (current)	BURBANK	GLENDALE	PASADENA	PGE	SCE	SDGE	SMUD
Monthly Bill	$2,554.86	$2,861.78	$2,702.10	$2,680.44	$3,235.74	$2,548.77	$3,724.45	$2,214.08

Electric Rates for Large Businesses



	LADWP (current)	BURBANK	GLENDALE	PASADENA	PGE	SCE	SDGE	SMUD
Series1	$24,482	$28,155	$27,390	$25,327	$31,376	$25,211	$36,796	$23,031

Competitive Rates - Residential Customers



	LADWP (current)	BURBANK	GLENDALE	PASADENA	PGE	SCE	SDGE	SMUD
Monthly Bill	$75.21	$83.13	$91.49	$87.16	$104.65	$100.81	$147.94	$82.63

Sources: https://www.sce.com/wps/portal/home/regulatory/tariff-books/rates-pricing-choices; http://www.sdge.com/rates-regulations/current-and- effective-tariffs/current-and-effective-tariffs; http://www.burbankwaterandpower.com/electric/residential-electric-rates-and-charges; http://www.glendaleca.gov/government/city-departments/glendale-water-and-power/rates; http://cityofpasadena.net/waterandpower/electric-rates/ Rates at other utilities subject to change