Platte River Power Authority

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Board of directors

April 28, 2022

WAPA hydropower update

Carol Ballantine, senior manager of power markets

Agenda

- Background
  - Colorado River Storage Project (CRSP)
  - Loveland Area Projects (LAP)
- What has changed since fall 2021
- Operational impacts
- Platte River hydropower resource cost impact
- Summary
- Next steps

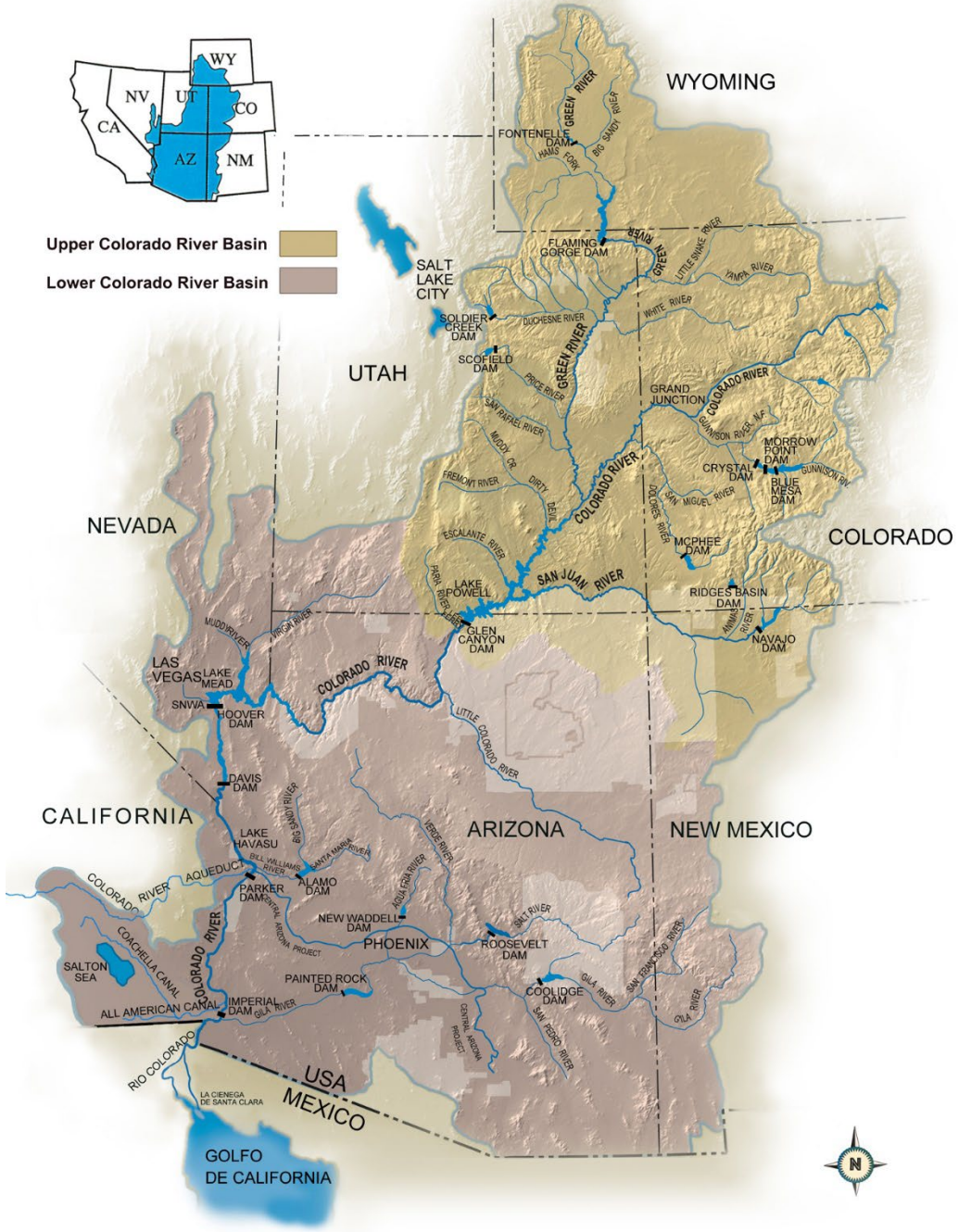
Background – Colorado River Storage Project

- Colorado River has been under drought conditions for 20 years
  - 2021 extreme drought has led to a significant reduction in CRSP energy
- The Bureau of Reclamation has declared a water shortage
- Western Area Power Administration (WAPA) distributes the electricity produced to its CRSP firm electric service customers
- Low hydropower output and high power and gas prices have negatively impacted WAPA's purchased power expenses
- Concerns that Glen Canyon Dam (main source) will dip below minimum power pool level

What has changed since fall 2021

- Drought conditions worsened
- Impact on CRSP
  - Further energy allocation reduction of approximately 5% from 2022 budget
  - Possible rate increase in 2024
- Impact on LAP
  - Proposed rate increase Jan. 1, 2023

CRSP resources



Glen Canyon dam

1984

- At full level

2022

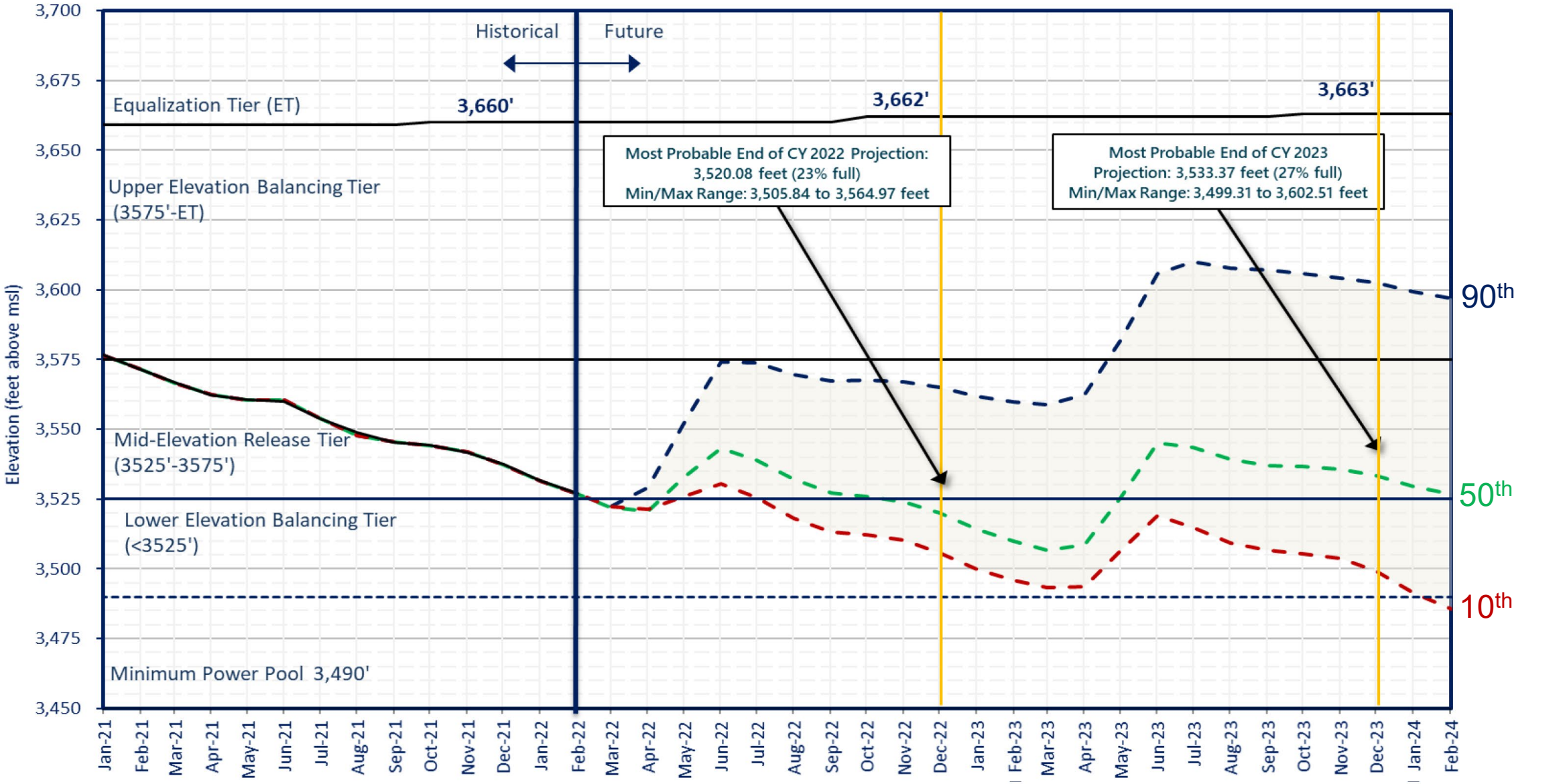
- 180 feet below full

Operational impacts resulting from CRSP purchases

- CRSP is the larger of Platte River's two hydropower purchase agreements from WAPA
  - Platte River's share of CRSP hydropower production has decreased from approximately 500,000 MWh in 2020 to approximately 330,000 MWh in 2022 under the most probable (50/50) scenario
  - Decrease has resulted in less scheduling flexibility
- Under the most probable scenario for 2023, Platte River's share of the annual CRSP hydropower production will be approximately 332,000 MWh
  - 10% possibility that minimum power pool level will occur in spring 2023
  - If minimum power pool level occurs, WAPA's annual hydropower production will be reduced by 85%
  - Reduced allocations are being modeled as a sensitivity
- Resource planning is considering long-term drought impacts to ensure Platte River's Resource Diversification Policy goals are achievable

Lake Powell End of Month Elevations

Projections from the March 2022 24-Month Study Inflow Scenarios



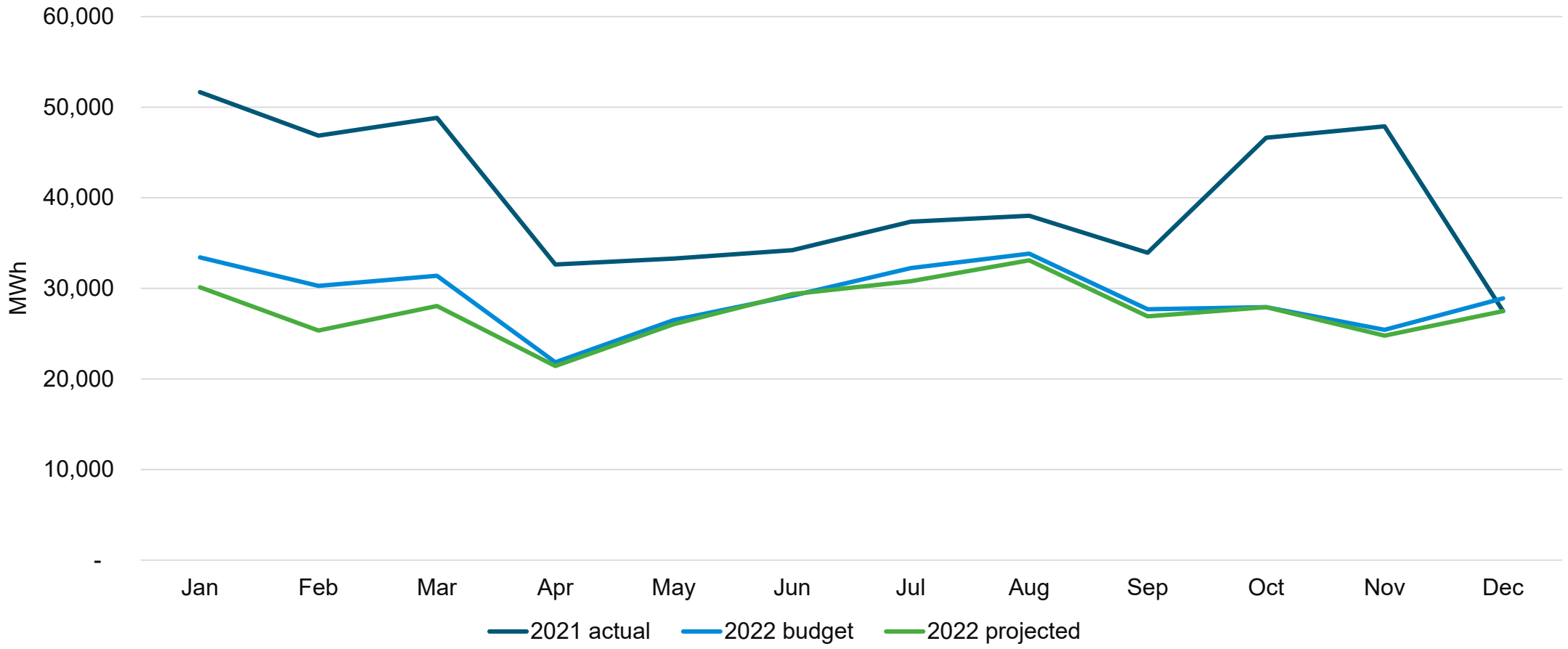
- February 2022 Maximum Probable Inflow - Lake Powell release of 7.48 maf in WY2022 and 7.48 maf in WY2023
- March 2022 Most Probable Inflow - Lake Powell release of 7.48 maf in WY2022 and 7.54 maf in WY2023
- March 2022 Minimum Probable Inflow - Lake Powell release of 7.48 maf in WY2022 and 7.0 maf in WY2023
- Historical Elevations

CRSP contract rates and purchases

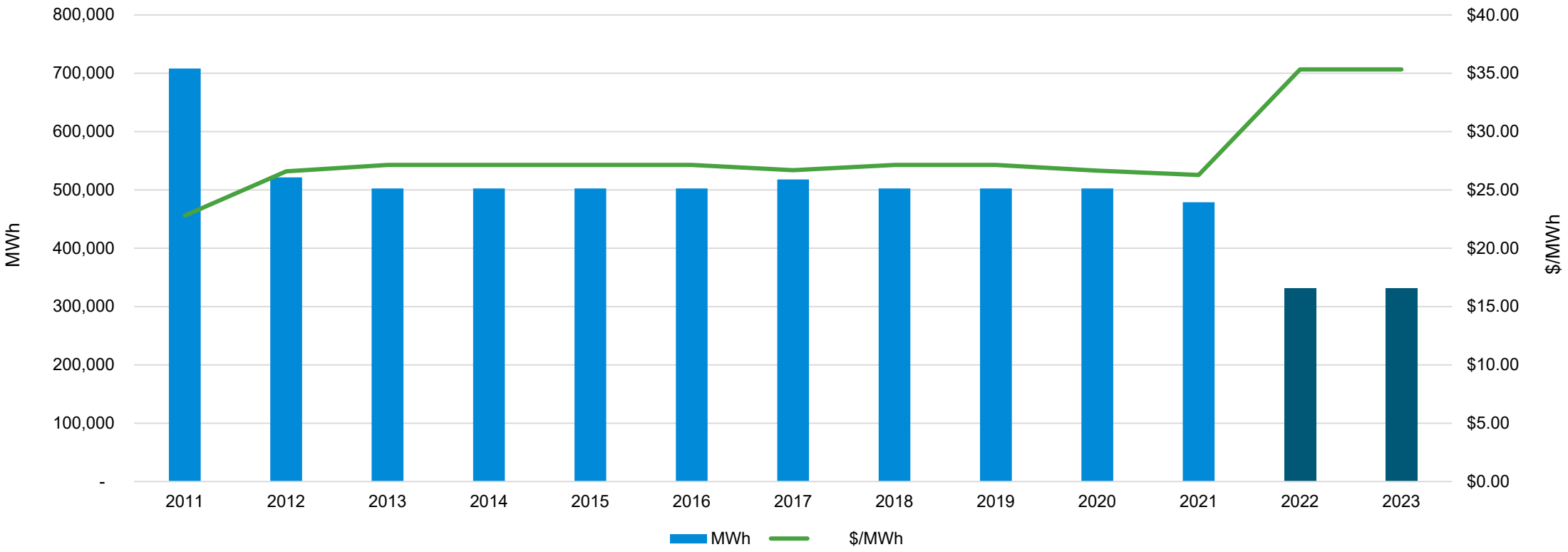
Current rates effective Dec. 1, 2021	
Capacity	$5.25/kW-month
Energy	$12.36/MWh
Blended rate 2022 budget	$34.20/MWh
Blended rate projections	$35.33/MWh

Platte River's CRSP energy purchases			
CRSP energy purchases	Annual total	Reduction	
2020 actual	502,467 MWh	--	--
2022 budget	348,637 MWh	(153,830) MWh	30.6%
2022 and 2023 projection	331,386 MWh	(171,081) MWh	34.1%

CRSP energy purchases in 2021 and 2022



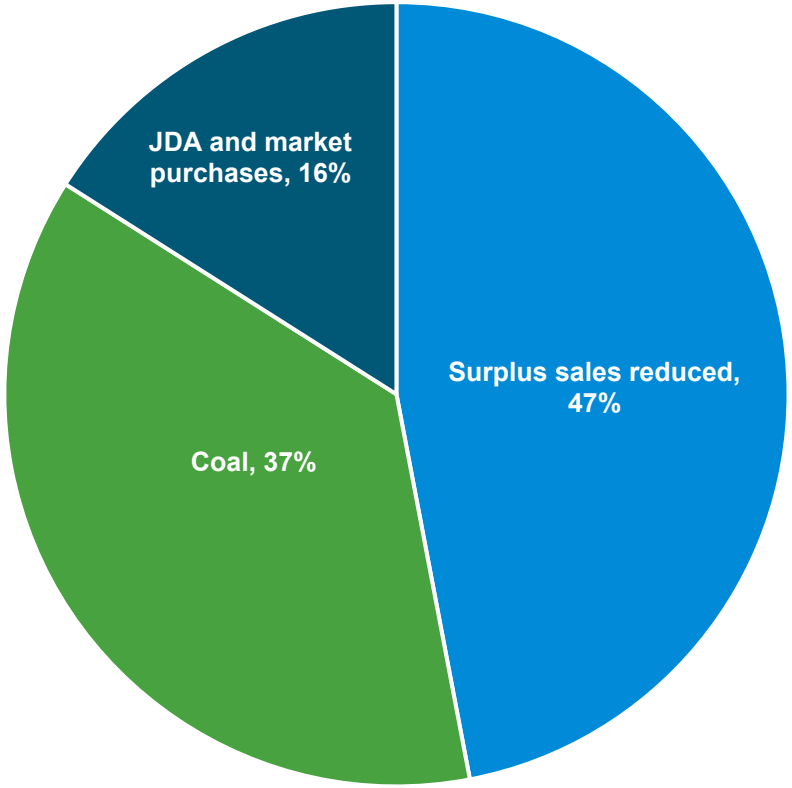
CRSP historical energy, blended cost and projections



- 2022 and 2023 are Platte River projections

Resource impact – 2022

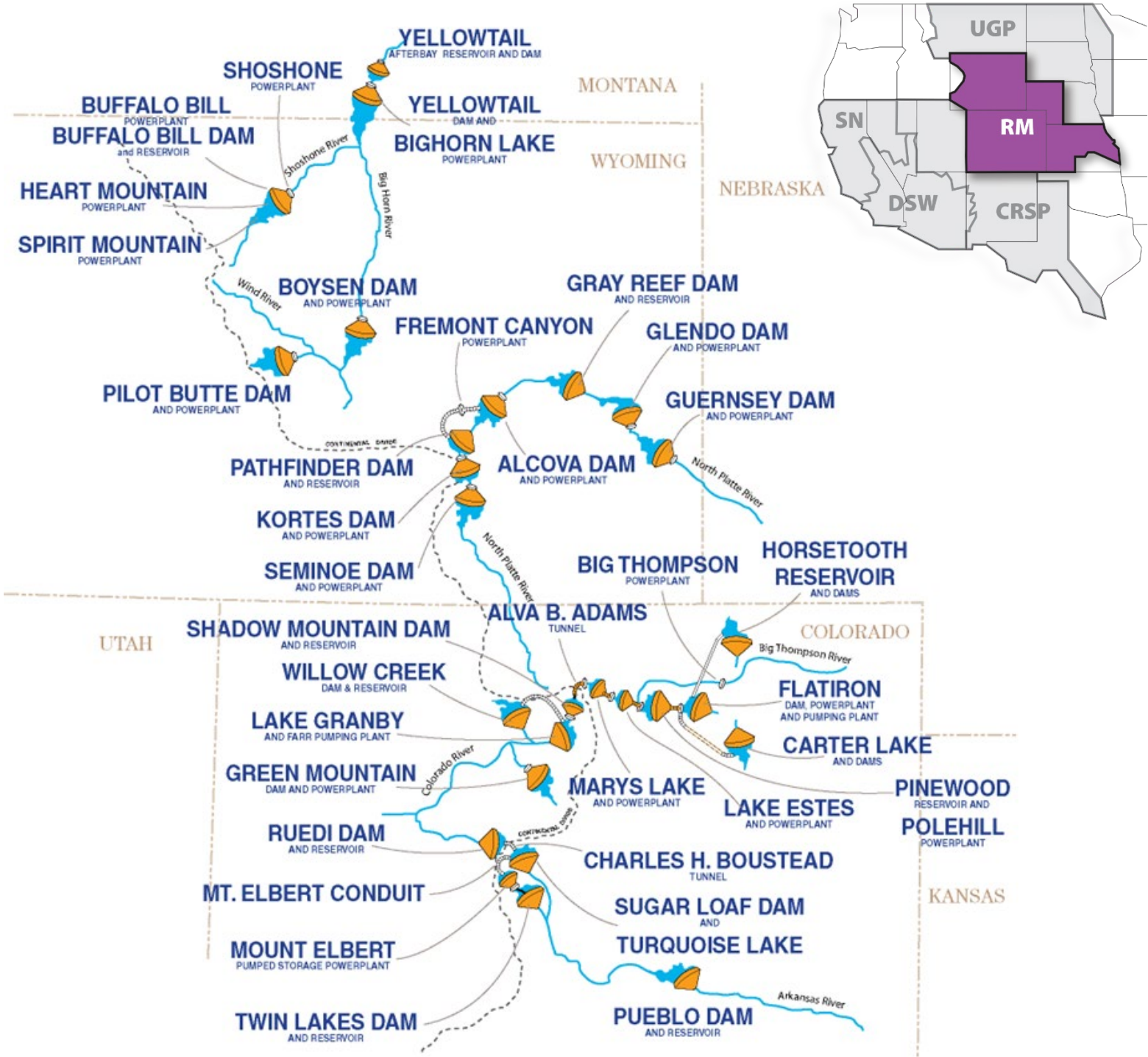
Replacement sources of the 171,081 MWh of reduced hydropower



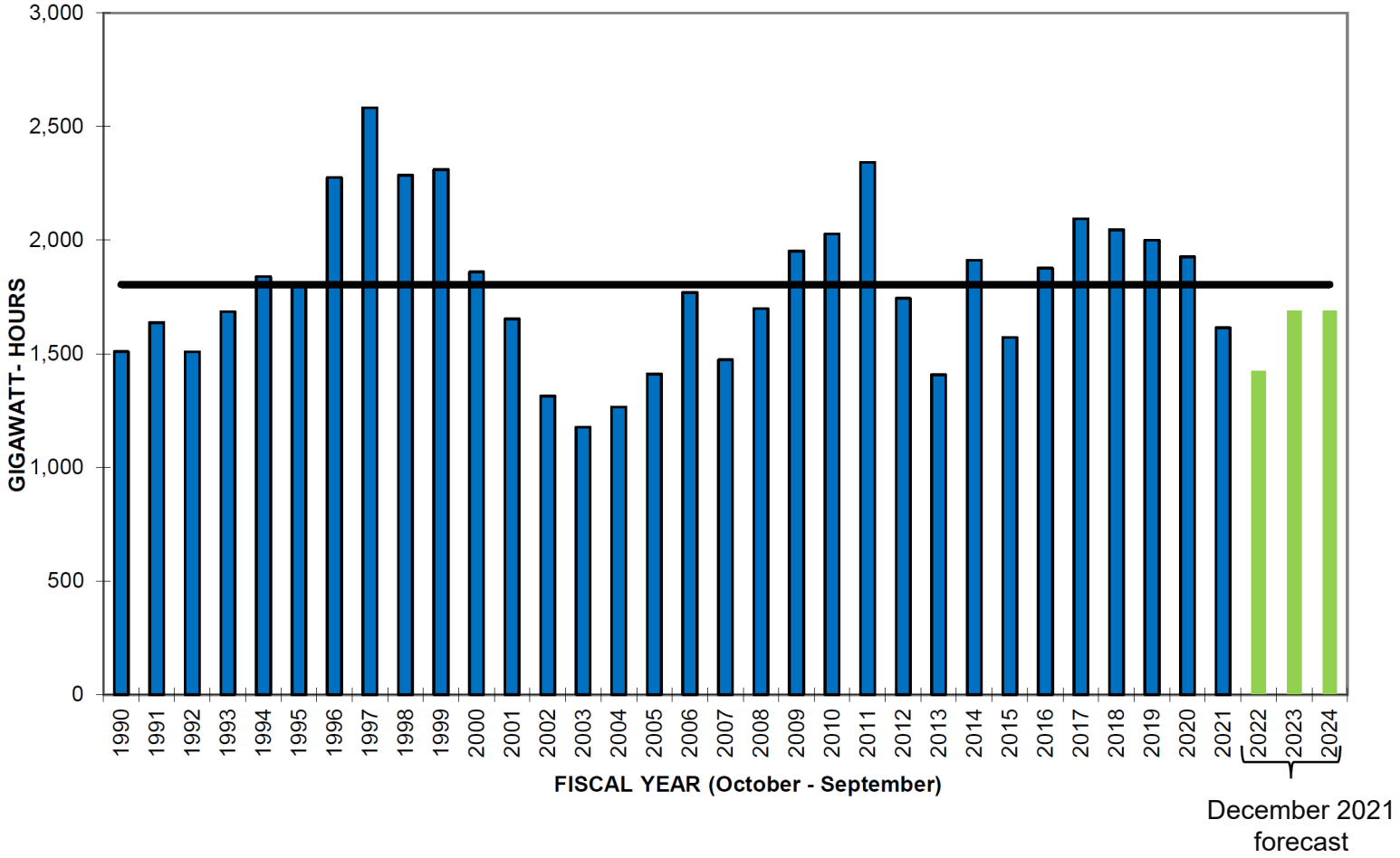
LAP background

- LAP hydropower on the front range has decreased each of the last four years
- WAPA distributes the electricity produced to its LAP firm electric service customers
  - Platte River, historically, purchases approximately 109,000 MWh per year
- WAPA has proposed a base rate increase and a drought adder, beginning January 2023
- Less hydropower and high power and gas prices have increased WAPA's purchased power costs

LAP resources



Historical LAP hydro generation

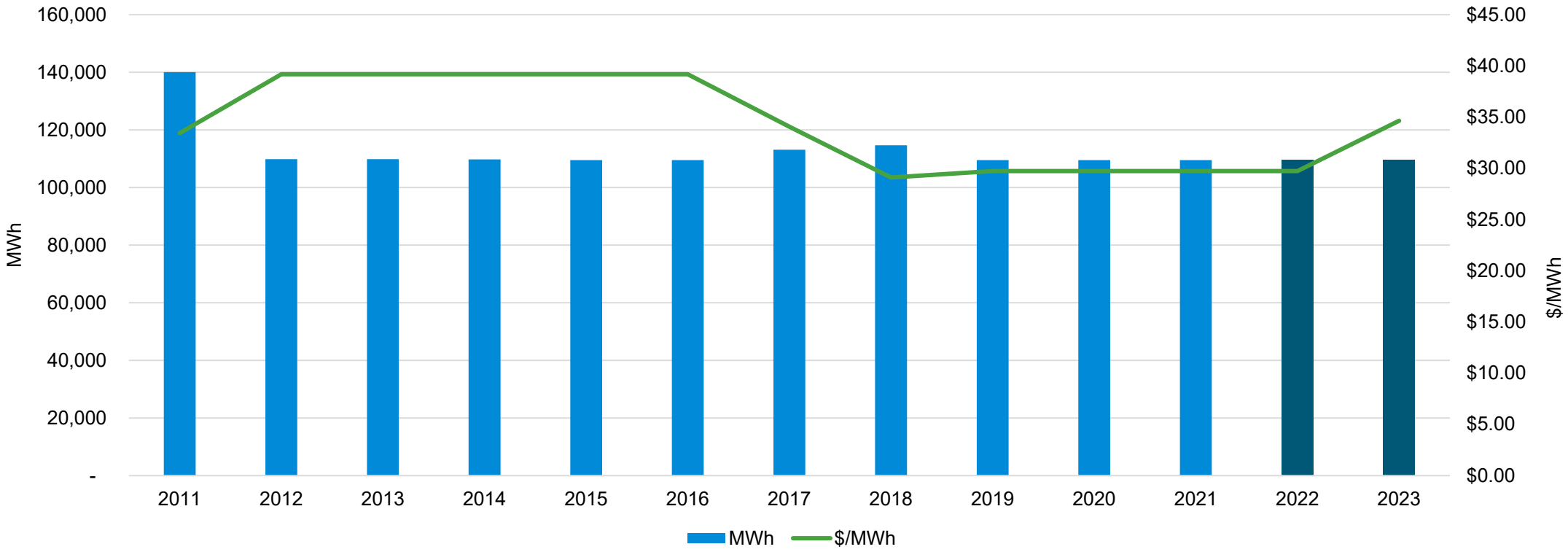


Proposed LAP rates

	Blended rate 2022 ($/MWh)	Blended rate 2023 ($/MWh)
2022 LAP rate	$29.73	$34.64

- Proposed rate increase of approximately 16% as the result of
  - Increase in base rate (1/3 of rate increase)
  - Reinstatement of the drought adder (2/3 of rate increase)

LAP historical energy, blended cost and projections



- 2022 and 2023 are Platte River projections

Platte River cost impact of CRSP and LAP changes

	Annual cost prior to changes ($/millions)	2023 projection ($/millions)	Incremental costs ($/millions)
CRSP demand	$7.5	$7.6	$0.1
CRSP energy	$6.1	$4.1	($2.0)
LAP demand	$1.5	$1.8	$0.3
LAP energy	$1.7	$2.0	$0.3
Total WAPA purchased power	$16.8	$15.5	($1.3)
Replacement cost impact	-	$4.3	$4.3
Total cost increase	$16.8	$19.8	$3.0
% change in resource cost impact			17.9%

Summary

- Severe drought conditions persist
- Losing significant flexibility in scheduling CRSP energy
- Risk of lower CRSP allocations, if Glen Canyon Dam dips below minimum power pool level
- Lower CRSP energy allocations and higher rates possible in future
- Resource impacts
  - Loss in surplus sales revenue
  - Replace with higher cost energy
- **Lower hydropower output and higher CRSP and LAP rates will increase Platte River's annual WAPA costs by approximately $3.0 million, a 17.9% increase over historical hydropower expenses**

Next steps

- Model future drought conditions with additional WAPA CRSP and LAP rate increases and deeper cuts in CRSP allocations
- Continue to pursue Platte River's Resource Diversification Policy
  - Find replacement resources for decreasing hydropower noncarbon energy
  - Evaluate the risk of operating below minimum power pool level for extended period
  - Develop a risk mitigation strategy for operating below minimum power pool level

Questions

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April 28, 2022

Energy storage performance and systems

Raj Singam Setti, chief transition and integration officer

Agenda

- Rawhide Prairie Solar battery
  - Statistics
  - Performance
  - Lessons learned
- Battery charging scenario
- Energy storage systems

Rawhide Prairie solar battery

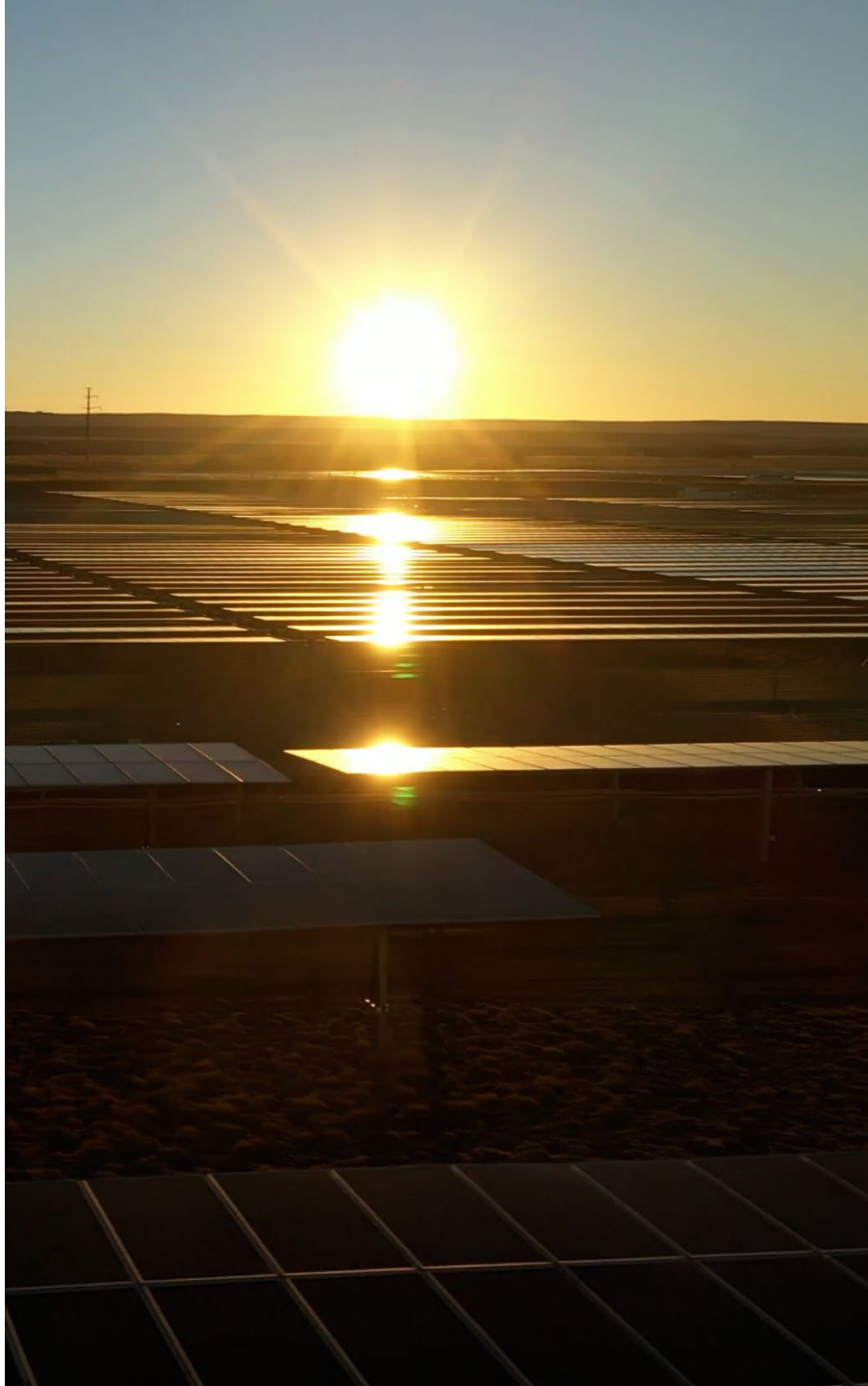
Stats

- 2 MWh Tesla Megapack, max dispatch – 1 MW, 2-hour discharge
- COD March 19, 2021
- 613 MWh as of March 31, 2022
- Approximately 90% availability

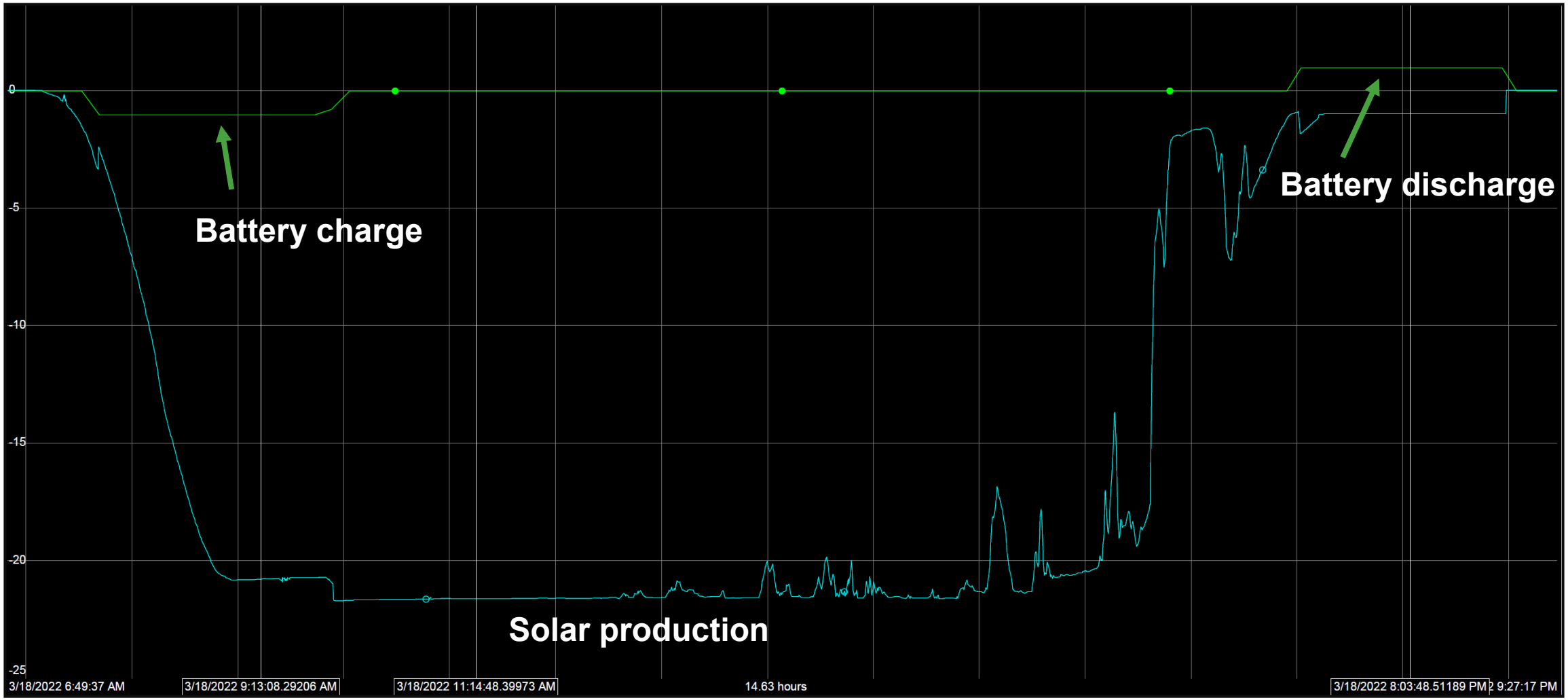
Rawhide Prairie solar battery

Performance

- **Charge** in the morning using solar
- Missed approximately 47 days
  - 17 non solar days
  - 30 days, automated scripts
- 2.5 hours to charge 2 MWh
- **Discharge** at 7 p.m. to manage evening peak (automatic)
- Discharges 1.8 MWh with 90% efficiency
- Expected 2% degradation per year, however after one year there is insignificant change



Dispatch profile



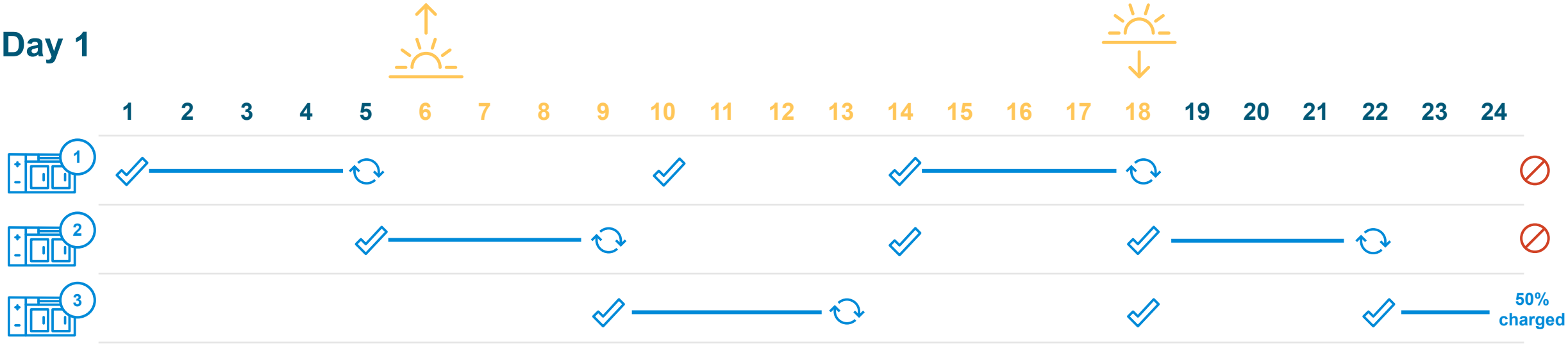
Rawhide Prairie solar battery

Lessons learned

- Tesla management of battery
- Algorithm is a black box

Battery charging scenario

Day 1



Day 2

- Batteries 1, 2, and 3 will start to charge at 6 a.m.
- Need to add batteries 4 and 5 for continued reliability from 2-10 a.m.

Energy storage systems

	Batteries	Thermal	Mechanical
Description	**Electro-chemical**	**Thermal**	**Kinetic or gravitational**
Types	• Lithium-ion • Lead acid • Sodium sulfur • Iron air • Redox flow • Hydrogen fuel cell	• Latent heat • Sensible heat	• Compressed air • Hydro pumped (gravity)
Advantages	Minimum degradation	• Scalable • Cost effective	• Long life • Large storage capability • Mature technology
Disadvantages	• Higher O&M • High operating temp.	• Heat loss • Geological requirement	• Low round trip efficiency • Geological requirement • High investment cost
Development stages	Limited track record	Limited track record	Proven technology
Vendors	• Tesla • Form Energy • Bloom Energy • Fluence		

Questions

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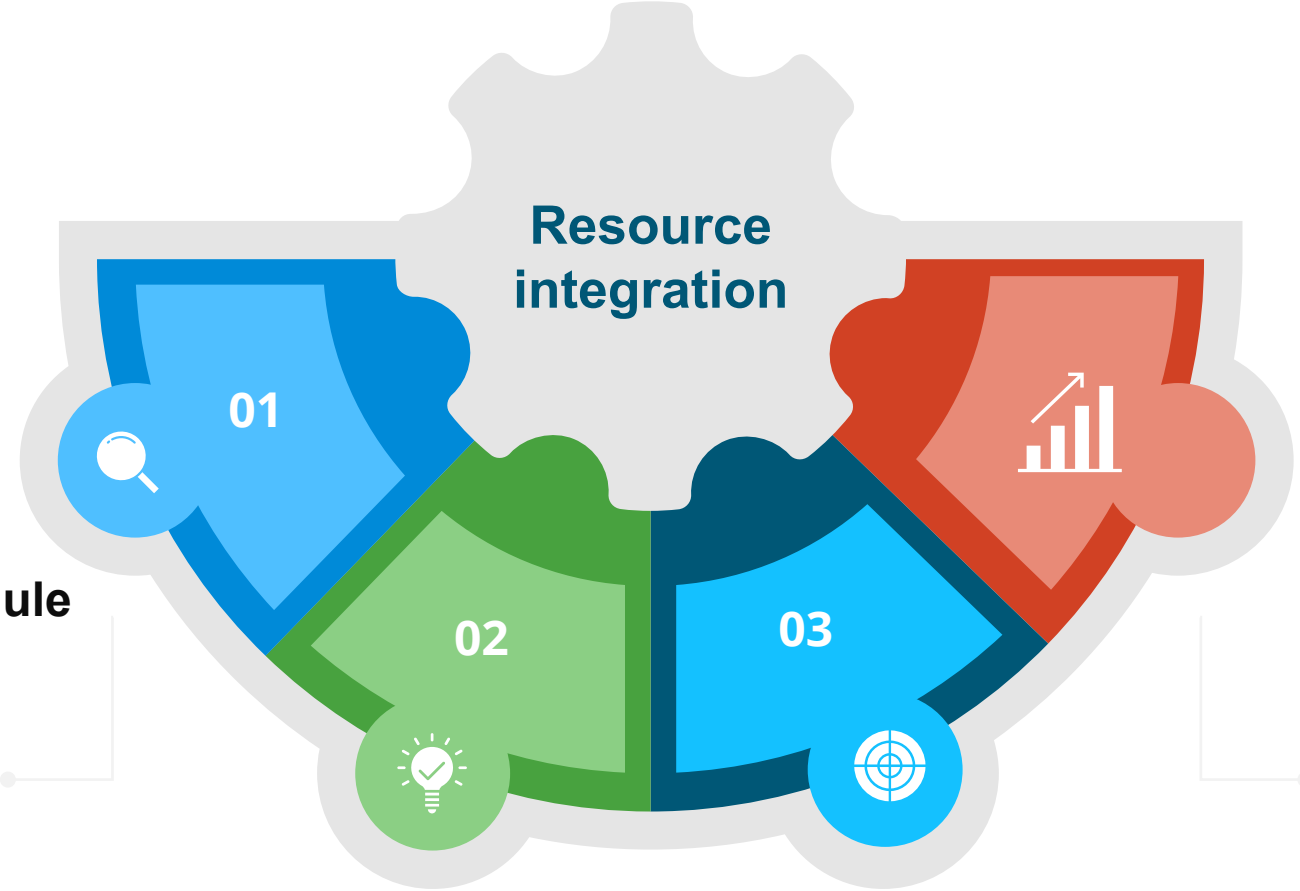
Resource diversification and system integration opportunities

Raj Singam Setti, chief transition and integration officer

Agenda

- Resource integration
  - Wind and solar purchase power agreement (PPA) cost
  - Resource integration schedule - resource plan 2022 (RP22)
  - Reliability
- 2030 distributed energy resources (DER)
  - Three Ds – digitalization, decarbonization, distribution
  - System integration
  - DER action plan
- Average generation cost comparison

Resource integration introduction



Asset integration schedule

Solar and wind resources integrated 2027-2028

Generation cost

Average generation cost is 21% higher than 2020 IRP

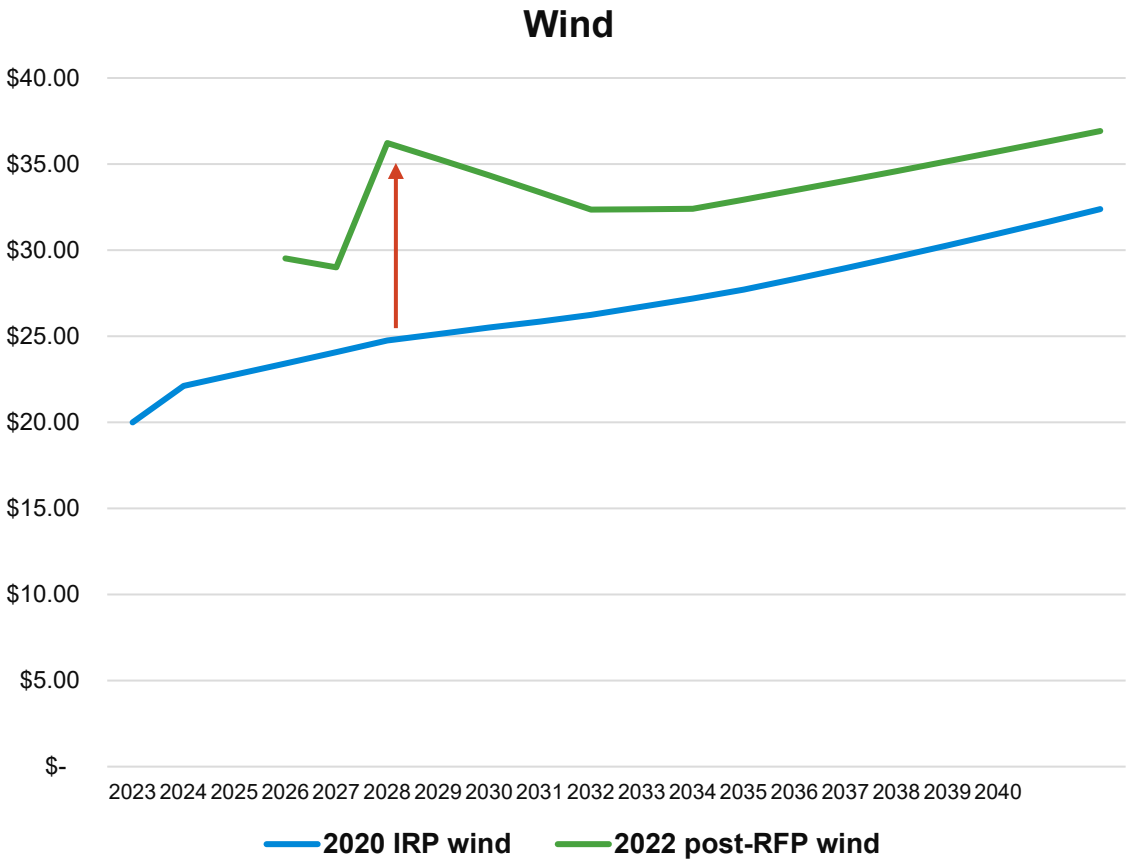
Reliability

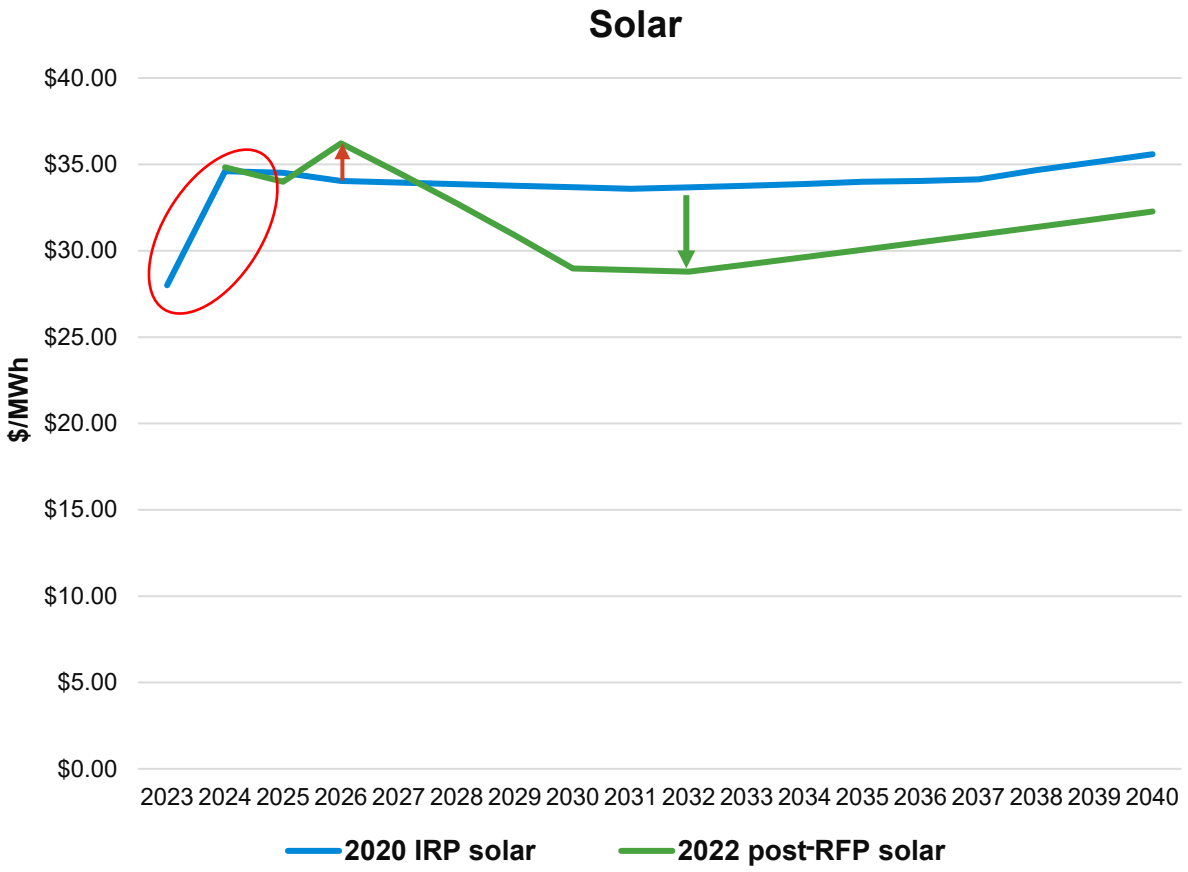
More wind and dispatchable resources in portfolio

Commodity cost run up

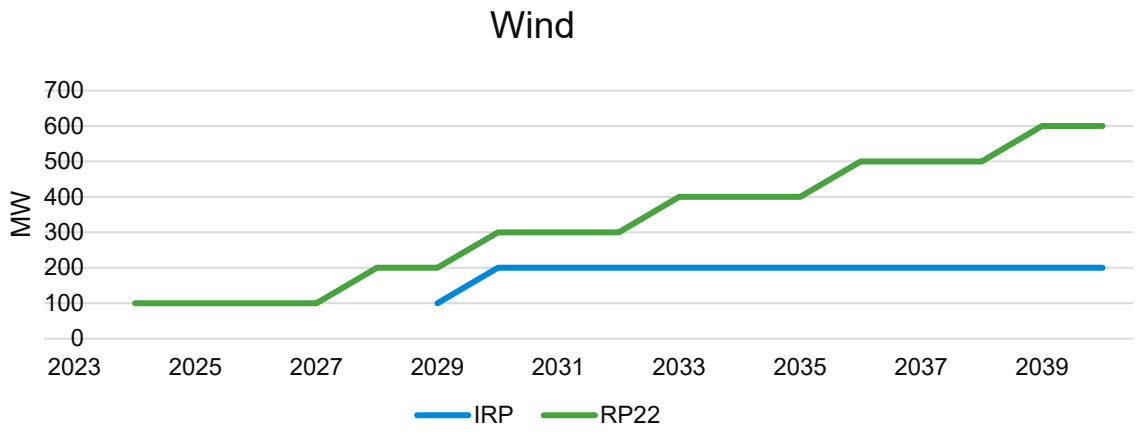
Solar and wind PPA prices higher than 2020 Integrated Resource Portfolio (IRP)

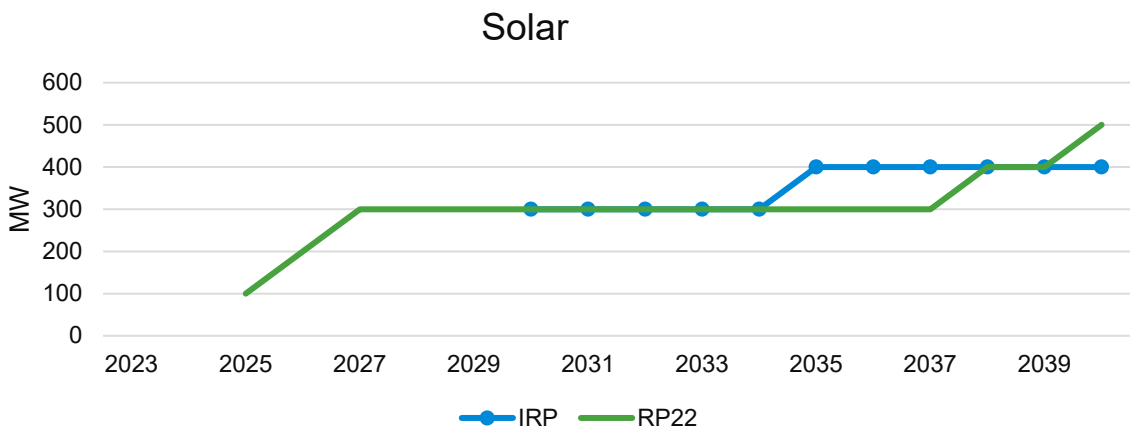
Wind and solar PPA cost

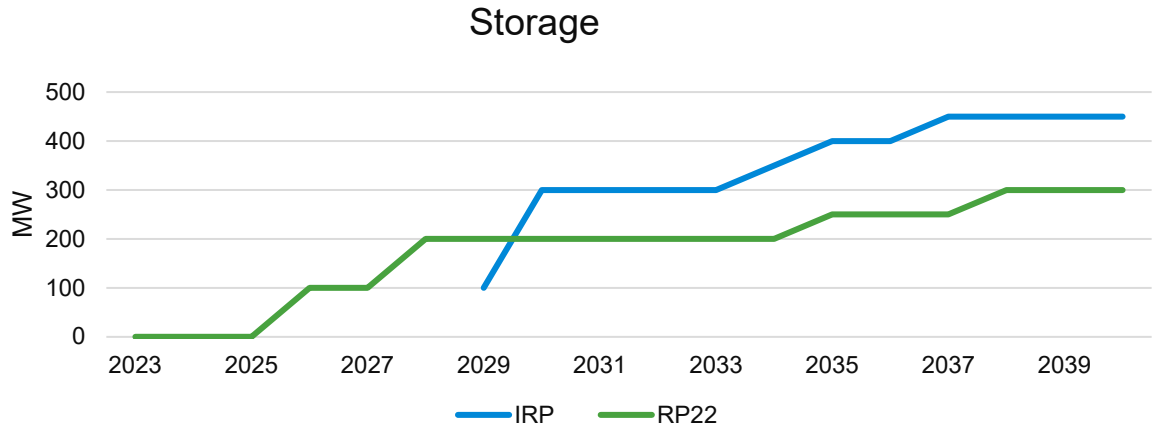


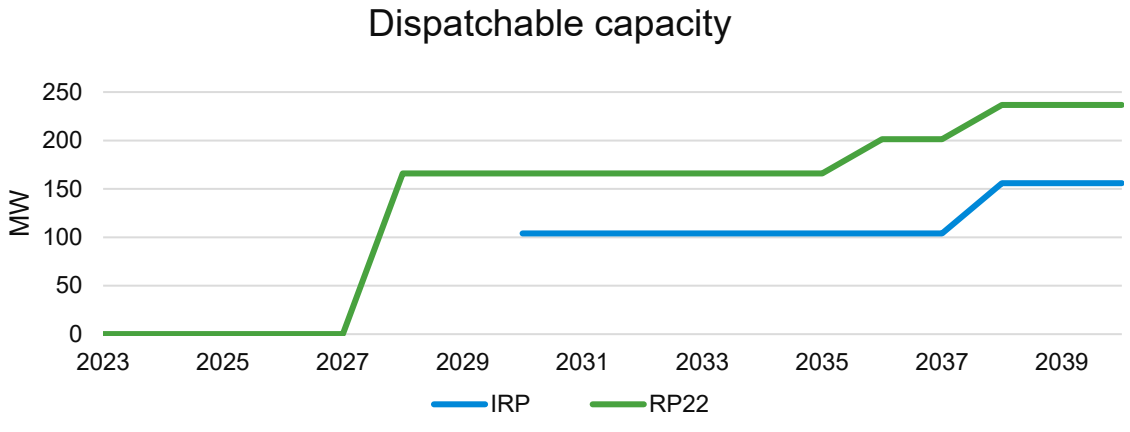


Resource integration schedule

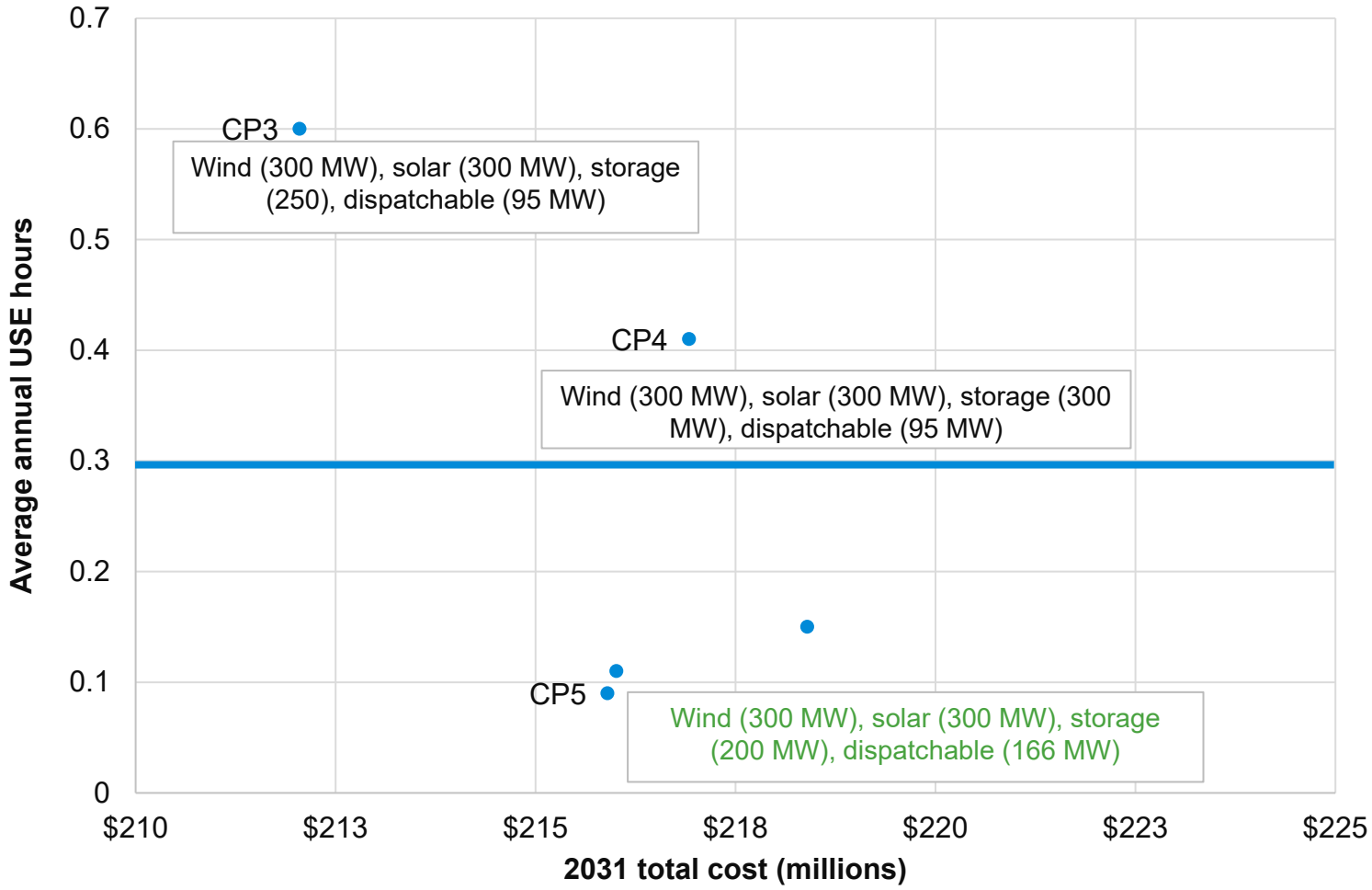








Reliability



- Loss of load hours in which resources may not meet the system demand entirely
- Unserved energy (USE) for this plan is 0.1 hours or 6 minutes

2030 distributed energy resources

DER capacity in MW

DER category	Maximum capacity	Summer peak capacity	Winter peak capacity	Average capacity
Distributed solar	87	25	0	12
Demand response/flexible load	30	30	30	5
Electric vehicles	62	10	10	14
Building electrification	20	0	20	8

Three Ds – digitalization, decarbonization, distribution

Integration

Digitalization

Operational technology

- DERMS
- SCADA/EMS
- DMS/ADMS

Information technology

- Infrastructure
- Data communication
- Cybersecurity

Data science

- Dashboard/KPI
- Predictive analytics
- artificial Intelligence/machine learning

Transition

Decarbonization

DER DER DER DER

Distributed energy resources

- Policy
- Energy solution
- Customer solution and engagement (CIS)

Organized market

- SPP
- Energy/ancillary services
- FERC
  - Order No. 2222
  - Order No. 841

New and existing assets

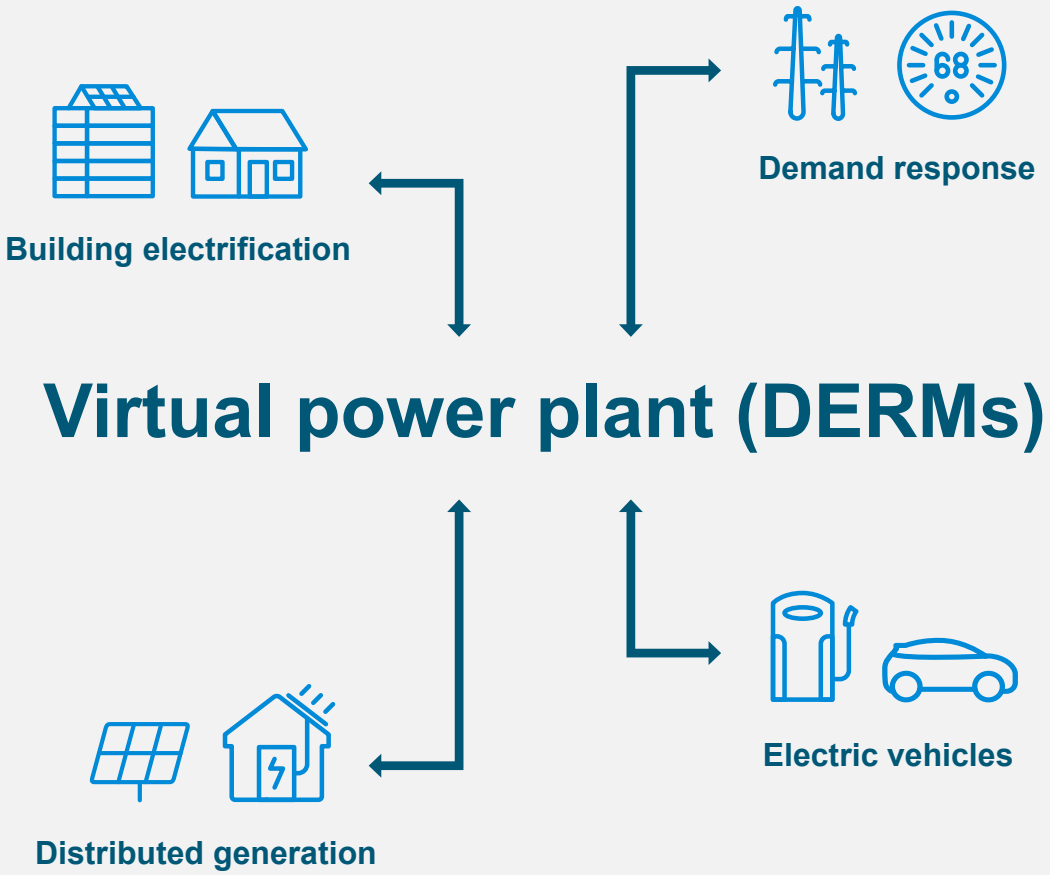
- Request for proposals
- Evaluation/ procurement
- Grid innovation
- Modeling
- Resource planning

● Platte River ● Owner communities

System integration

Information needed from the owner communities

- Distributed generation and DER availability
- Distributed generation and DER capability/derates
- Demand response status by program
- EV/devices aggregated status
    - Flex demand



System integration

Platte River's resources and community DERs will integrate with an energy market

Wind energy **Solar energy** **Energy storage** **Dispatchable resources**

Virtual power plant (DERMs)

- Market integration - energy/capacity/AS
- Flexible generation and flexible demand - forecast

Markets

- Price signal
- Energy dispatch

DER action plan

Grid infrastructure

- Technology, neutral sourcing
- Data communication and cybersecurity
- Utility “2.0” infrastructure
  - AMI/MDMS/ADMS
  - CIS
  - Planning
  - Interconnection

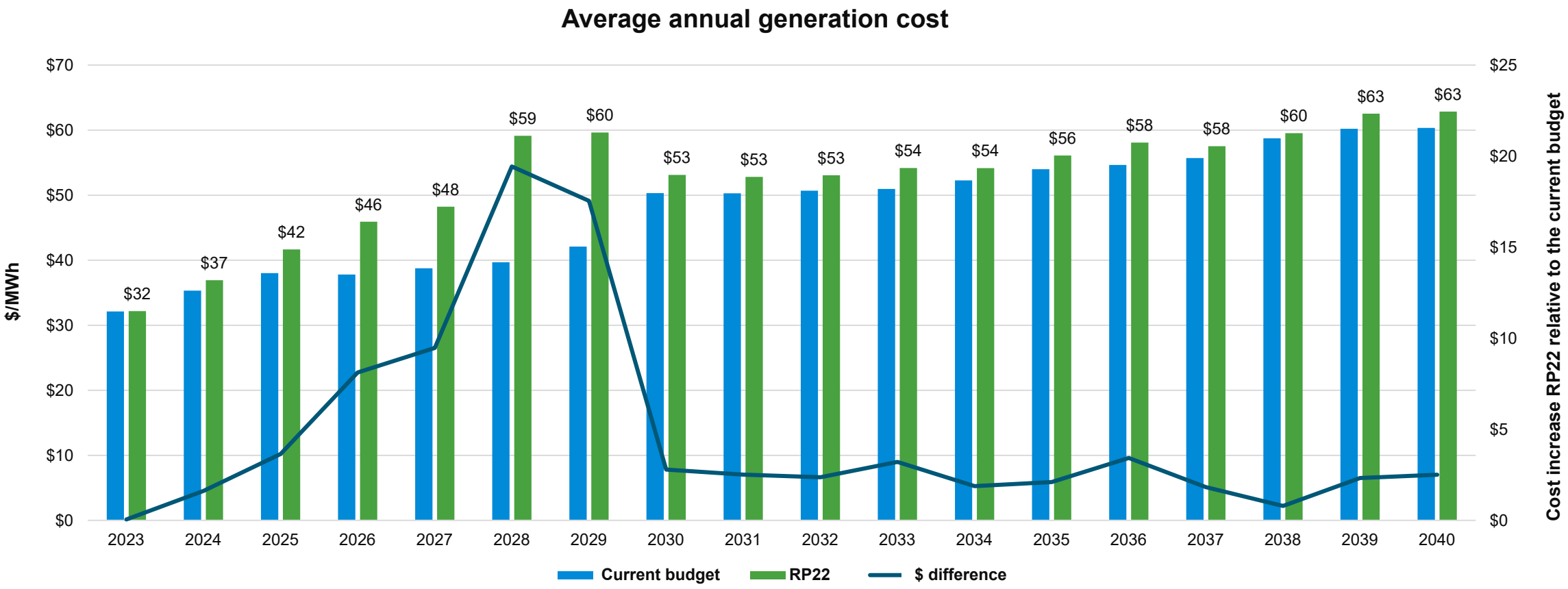
Market integration

- DER participation in wholesale market
- FERC 2222/841
- Dynamic pricing
- Ancillary services

Rates

- Value of DER (system support)
- Time varying rates
- Carbon reduction rates
- Affordable to non-DER customers

Average generation cost comparison



Questions

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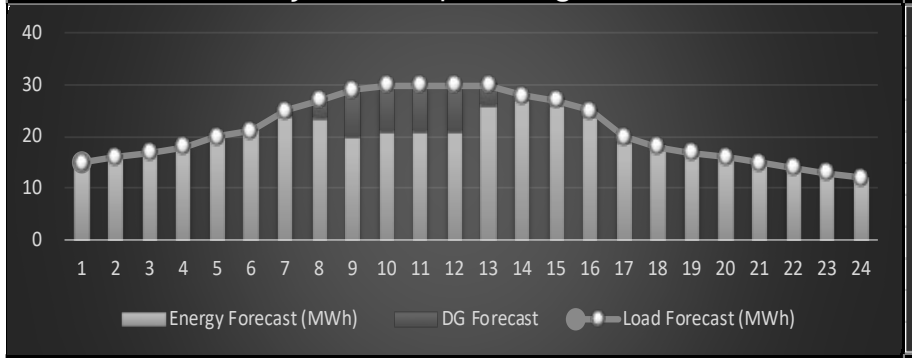
Appendix

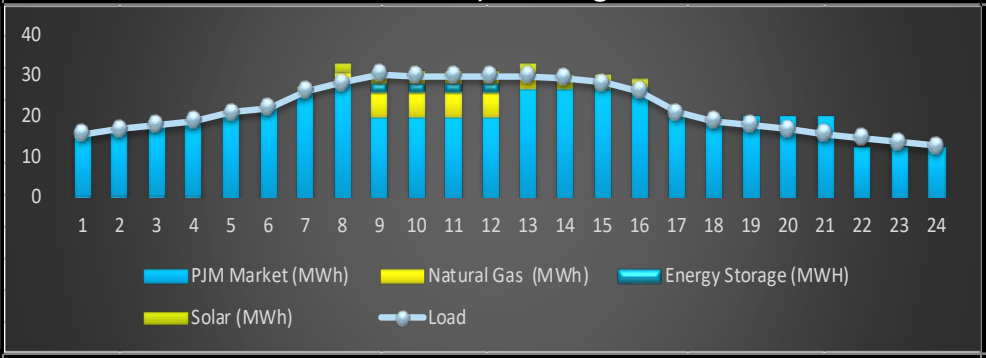
DER system of systems vendor landscape

Technology enablers for DER	Vendor landscape
DERMS	OATI, AutoGrid, enbala, OSI, mPrest, Spirae, CAMUS
ADMS	GE, SIEMENS, ABB, Survalent, Schneider Electric, OSI, mPrest
Demand management	enbala, AutoGrid, smarter grid solutions, Itron
EVC management	EnergyHub, evconnect

Day Ahead Operating Plan



Real Time Operating Plan

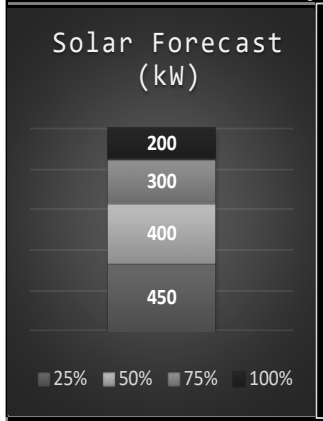


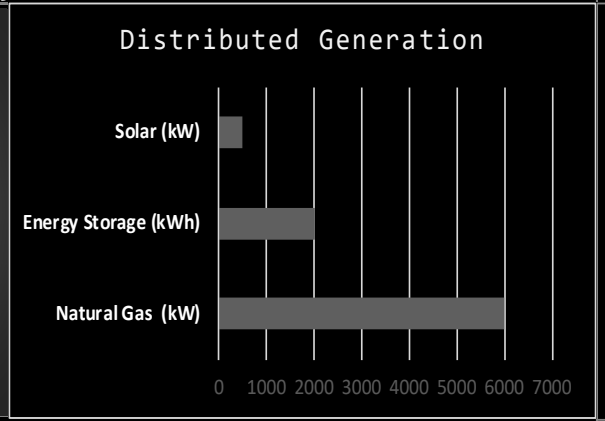
Operation Communication

NG Resource online Hour Ending 0800

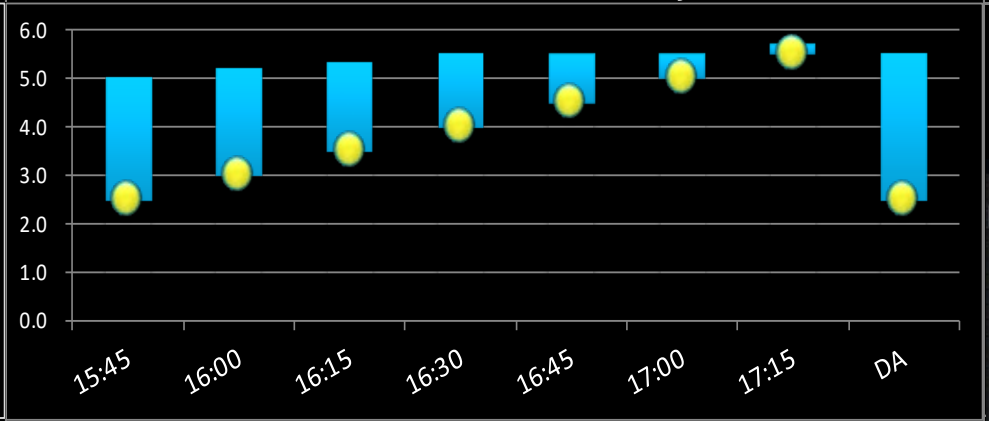
Storage discharge starting Hour Ending 0900

Day Ahead DG Forecast





Real Time DG Flexibility



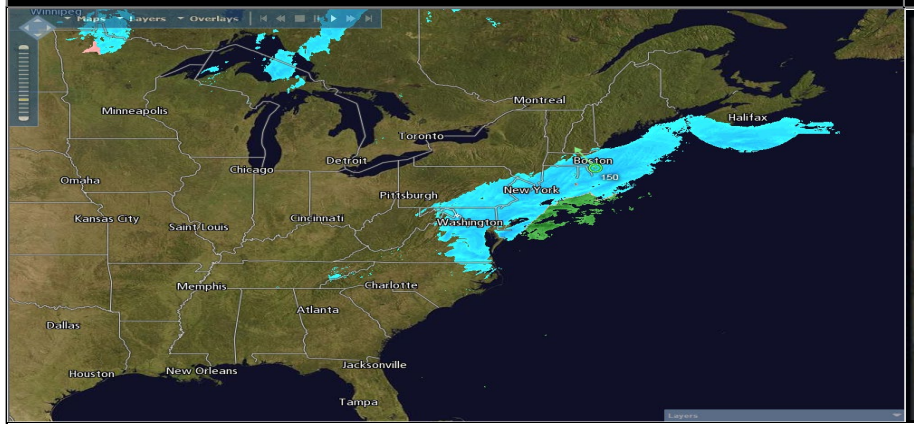
Workflow Status

Notify DTE NG Online Status

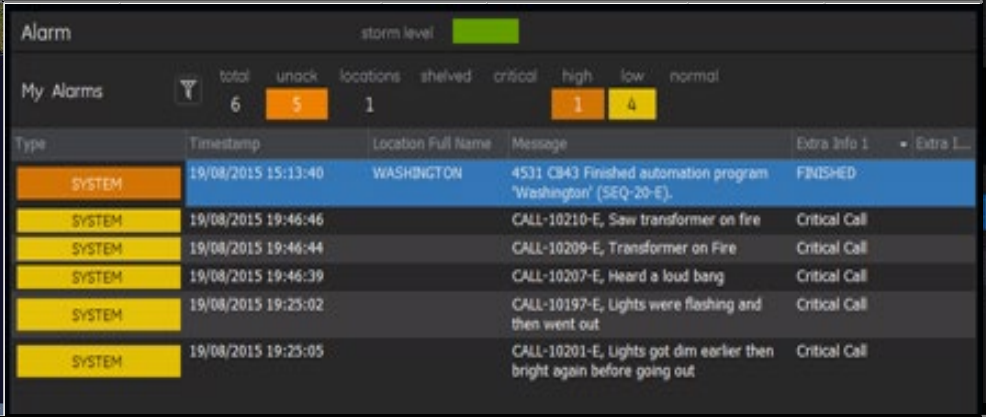
Confirmation from DTE

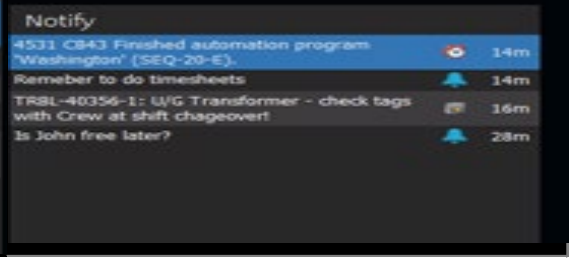
Inform Outage Status

Weather Alerts



Real Time Communication





PJM WEST HUB (LMP RT)

$45.43

change	% change	as of
$10.46	18.71%	10:41

GRAYSFER 13 KV LOAD1 (LMP RT)

$50.30

change	% change	as of
$0.95	1.93%	10:41

SWARK 13 KV NVYYRDBS (LMP RT)

$51.25

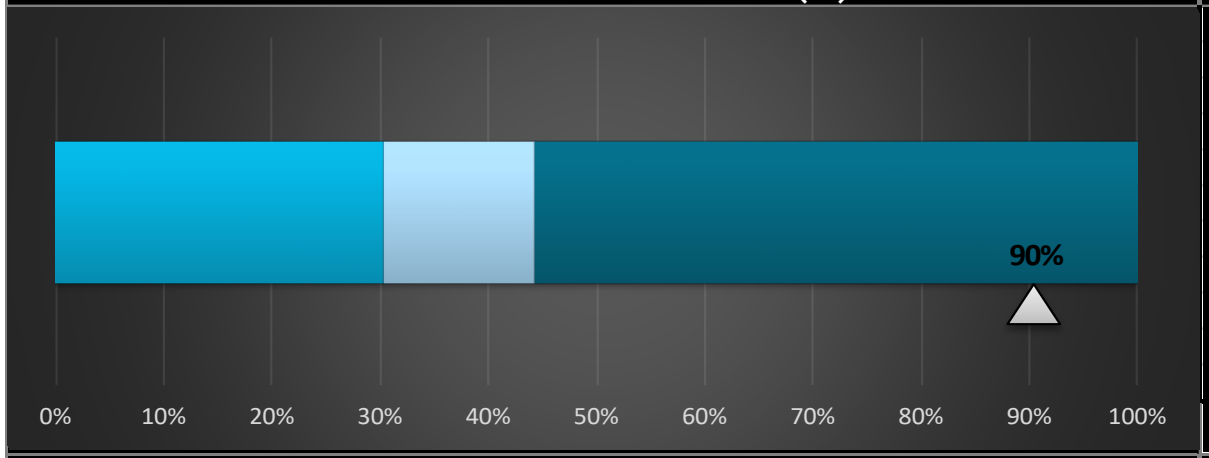
change	% change	as of
$1.01	2.00%	10:41

Load Served with DER

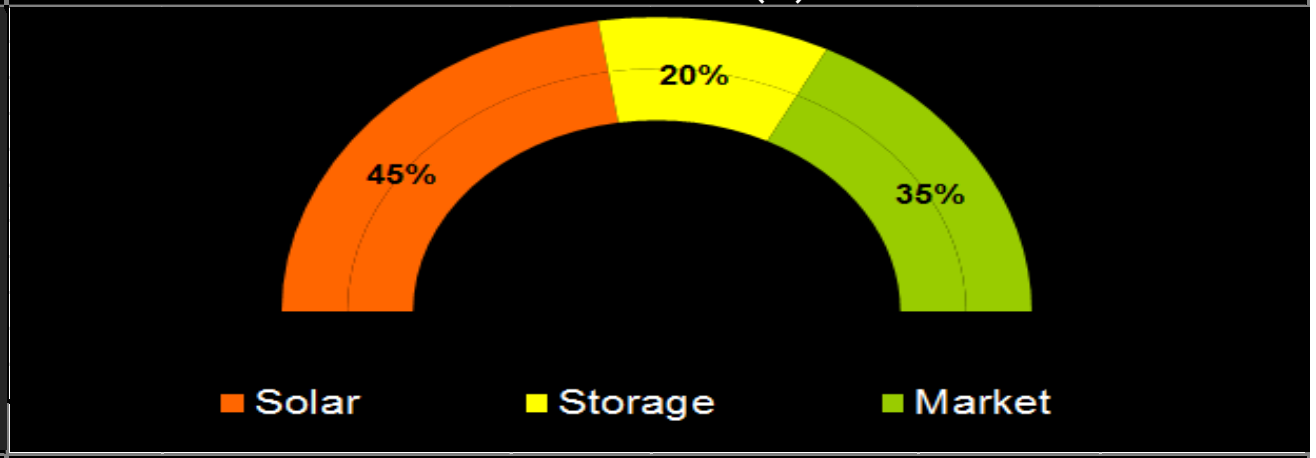
$40.22

change	% change	as of
$0.00	0.00%	10:41

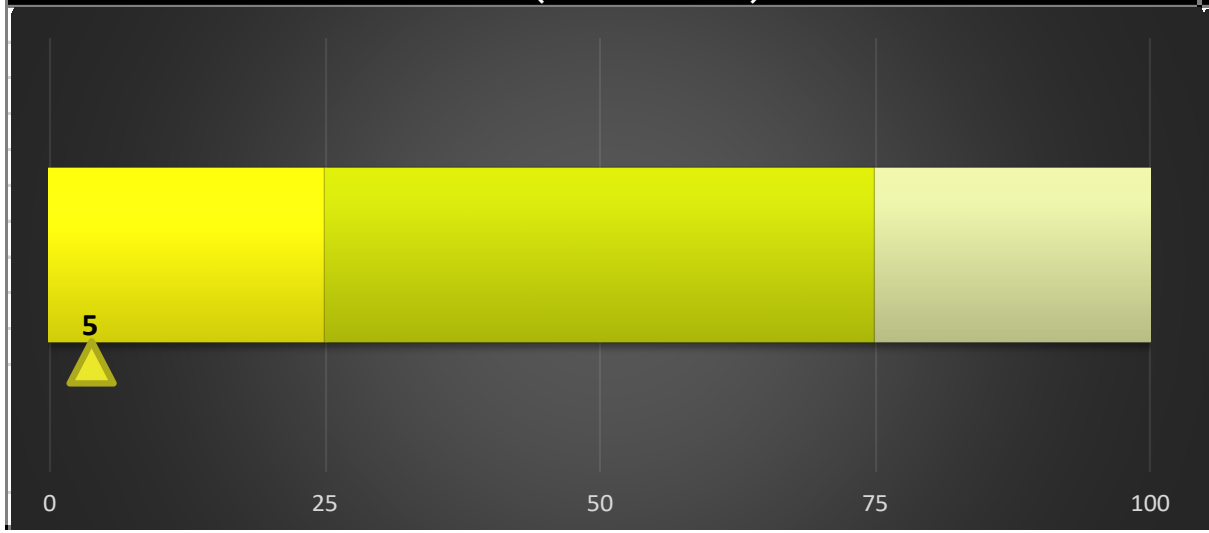
Environmental Index (%)

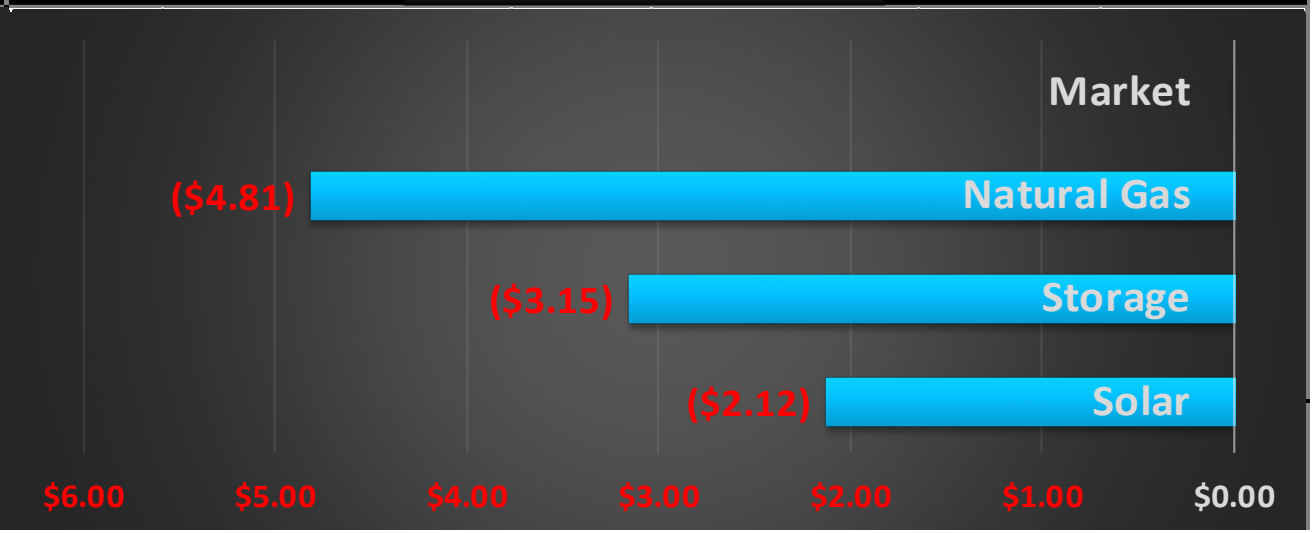


Load Served(%)



CO2 (tons/hour)





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Platte River Water Resources Reference Document

Heather Banks, fuels and water manager

Water resources reference document

- What it is
  - A report outlining Platte River's water resources (supplies, agreements, operations)
  - A summary of the key water-related items, updated annually
- Why it was created
  - Numerous water-related policies and resolutions
  - Needed to find a way to bundle the information
  - Supported the development of the water policy
  - Collaborative process with board and owner community staff (2012-2016)
- Updates to this April 2022 edition
  - Operational data through October 2021 (2021 water year)
  - Chimney Hollow Reservoir activities in the past year
  - Minor formatting and language changes

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March operational results

Category	March variance		YTD variance	
Owner community demand	6.2%	●	5.1%	●
Owner community energy	0.1%	◆	1.1%	◆
Wind generation	2.6%	●	4.3%	●
Solar generation	24.4%	●	10.4%	●
Net variable cost to serve owner community load*	(0.5%)	◆	(3.5%)	■

Variance key: Favorable: ● >2% | Near budget: ◆ +/- 2% | Unfavorable: ■ <-2%

*Total resource variable costs plus purchased power costs less sales revenue

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April 28, 2022

March financial summary

Category	March variance from budget ($ in millions)	Year to date variance from budget ($ in millions)
Net income*	$(1.0) ■	$0.4 ●
Fixed obligation charge coverage	.20x ●	.37x ●
Revenues	$0.3 ◆	$0.6 ◆
Operating expenses	$0.4 ●	$2.9 ●
Capital additions	$1.3 ●	$7.5 ●

2% ● Favorable | 2% to -2% ◆ At or near budget | < -2% ■ Unfavorable

* Net Income results impacted by unrealized losses on investments, $1.7M in March and $3.2M year to date

Platte River Power Authority

Estes Park • Fort Collins • Longmont • Loveland

Board of directors

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