

Exhibit to Agenda Item #2

Present the **2030 Zero Carbon Plan** for discussion and receive public comments.

Special Board of Directors Meeting

Wednesday, March 31, 2021, scheduled to begin at 5:30 p.m.

Virtual Meeting (online)

2030 Zero Carbon Plan

Powering forward.
Together.





Flexible pathway to zero carbon

**Natural gas
generation
repurposing**

**Goal to retire 2
power plants in
2024-2025 and
re-tool fleet**

to drastically reduce
operations and
emissions.



**Proven
clean
tech**

**90% reduction
of greenhouse
gas emissions***

>3,000 MW of new renewable
energy & storage –equivalent
to energy needs of more than
600,000 homes.

Growing rooftop solar and
batteries.



**New tech
& business
models**

**Pilot & scale
new projects &
programs**

Research game
changing technologies
and alternative fuels.



**Financial
impact
& options**

**Rate impacts
limited to rate
of inflation**

Expand partnerships
and grants to offset
costs & generate
operational
efficiencies.



Work with all our communities to reduce greenhouse gas emissions together.
Partner and collaborate with community organizations, attract business, innovation and jobs to Sacramento.

Alignment with SMUD's Sustainable Communities Initiative.

* ~ 1.8 million metric tons per year





Extensive outreach & engagement



7 stakeholder workshops

- 270 attendees (Dec. 2020 & Feb. 2021)



3 Customer & Community meetings

- 400 customers
- 336 surveys completed (Dec. 2020)



3 expert panel discussions @ Board Committee meetings

- 11 experts



Our 2030 Clean Energy Vision
smud.org/ZeroCarbon & ZeroCarbon@smud.org

- FAQs
- Meeting recordings
- Opt-in for updates
 - Video
- Email for feedback



Listserv notification emails

- Proactively customer notification of upcoming zero carbon meetings



Presentations

- External presentations by Board members, CEO & other key staff



CEO communications

- Video blogs
- All hands employee meeting
- Workgroup meetings



Employee resources

- SharePoint site
- Talking points
- 2 Brown bag learning sessions
- 15+ Intranet news stories & updates



Innovation leadership

- Innovation Leadership Team
- Call for employees' innovative ideas
- Centralized hub for idea vetting



Tailored workgroup presentations

- Project team leads @ staff roundtables
 - Q&A session



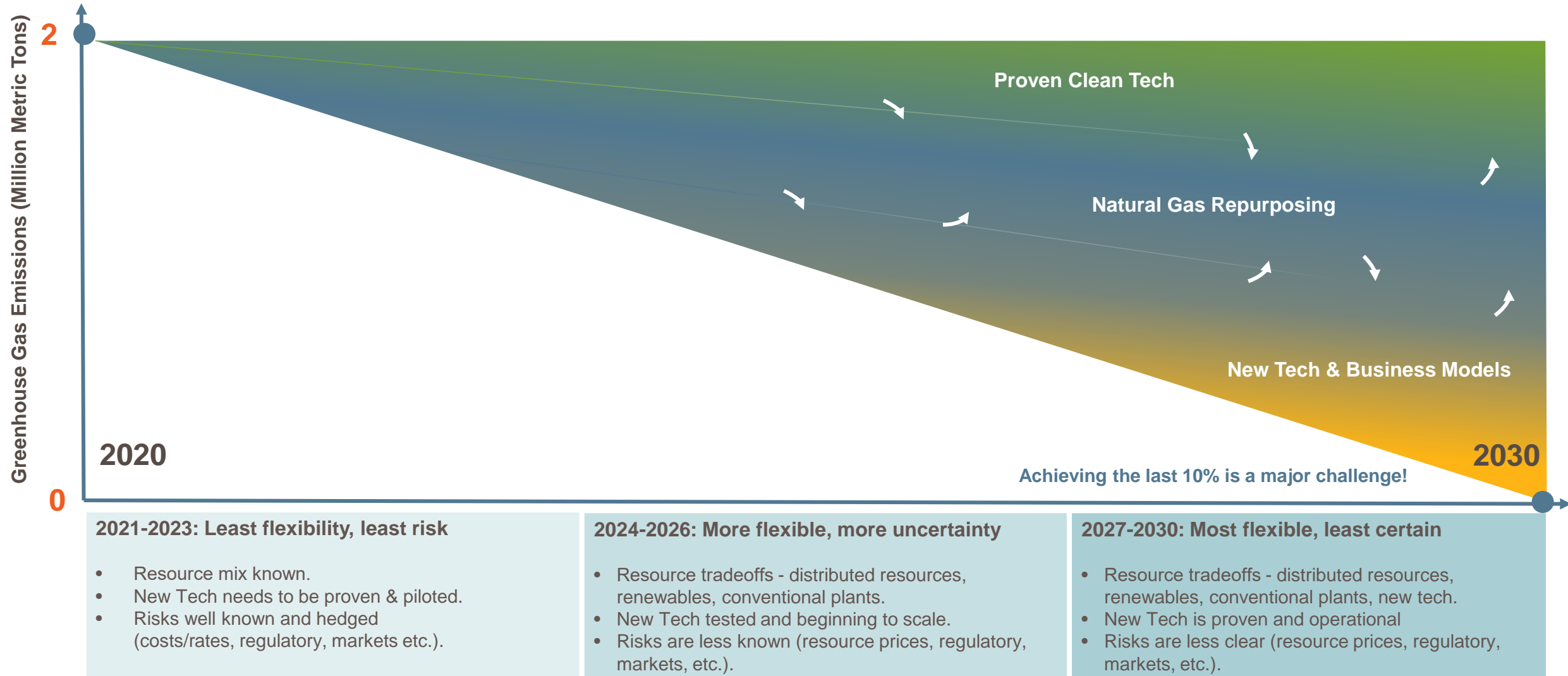
7 Board & Committee meetings

(Dec. 2020 – March 2021)

External
Internal



A flexible pathway with a firm commitment





Natural gas generation repurposing



3

Natural gas gen repurposing

Repurpose natural gas generation to:

Eliminate the use of fossil fuels in SMUD's power plants.

Plan

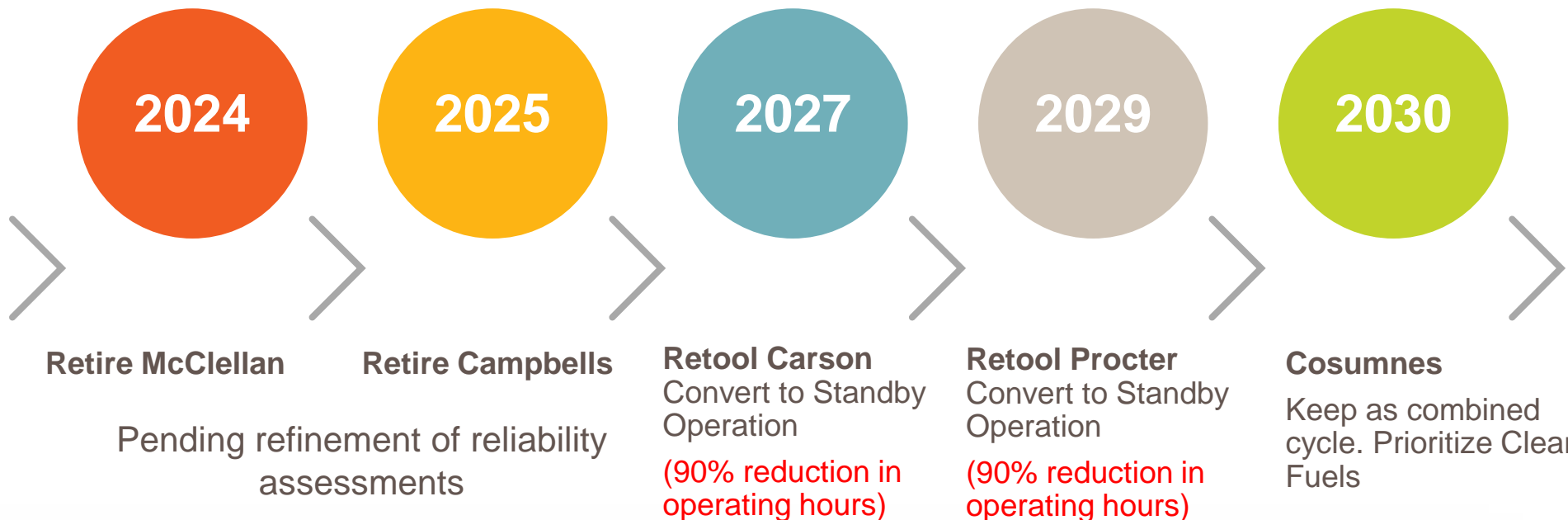


- Target retirement of 2 plants & re-purpose 2 plants for infrequent use to meet peak load and eliminate use of natural gas.

Research



- Reliability impact studies.
- New technologies to phase out the last 10% of GHG.



Pursue clean fuels to completely eliminate natural gas use

Dependent on Clean Tech, New Tech / Distributed Resources

Research plan: New large-scale technologies

- **Thermal/battery hybrid.** Enables plants to be online without burning fuel. Relatively mature today.
- **Clean fuels.** Research renewable natural gas and other zero or low carbon alternative fuels. Partnerships and grants will be critical.
- **SMUD pumped storage.** Research, design and potentially develop new pumped storage hydro with existing SMUD hydroelectric assets.
- **Long duration storage.** Research and pursue partnerships and grants (electro-thermal energy storage, liquid air energy storage, etc.).
- **Pre-combustion carbon capture.** Investigate Allam-Fetvedt cycle for CCS and explore venture partners and grants.
- **Green hydrogen.** Feasible in some of our plants but expensive and supply chain is unknown. Plan to follow development and be ready to invest if costs come down – major grant support or technology breakthrough needed.
- **Post-combustion carbon capture & storage.** Feasible and relatively proven technology but requires major capital investments on top of our aging plants.



Net Power's "Allam Fetvedt" Cycle Power Plant in La Porte, Texas

Success with these new technologies will alter the need & timing for other resources.



Natural Gas Generation Repurposing

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Comprehensive detailed analysis	Detailed analysis									
Industry outreach (utilities, manufacturers, research institutions)	Industry outreach									
				Retire						
McClellan		Add Solar and Battery Storage			Retire					
Campbell			Pending refinement of reliability & replacement studies							
Carson				Conversion to Standby Operation* 90% reduction in operating hours						
Procter							Conversion to Standby Operation* 90% reduction in operating hours			
Cosumnes	Investigate RNG-biomethane, hydrogen, long duration energy storage for post 2030 retool solution									

***Note:** Assumes 3 years for plant conversion, including conceptual design, permitting, detailed design, procurement and construction.

Retirements, retooling, renewable fuels and reduced utilization will dramatically reduce emissions



Proven clean technologies



Expand existing technology to:

Increase the amount of our electricity supply served by carbon free resources.

Resource diversity is critical

Plan



Target 90% of SMUD's electricity needs from renewable sources (excluding large hydro).

Research



More reliability & system impact studies.

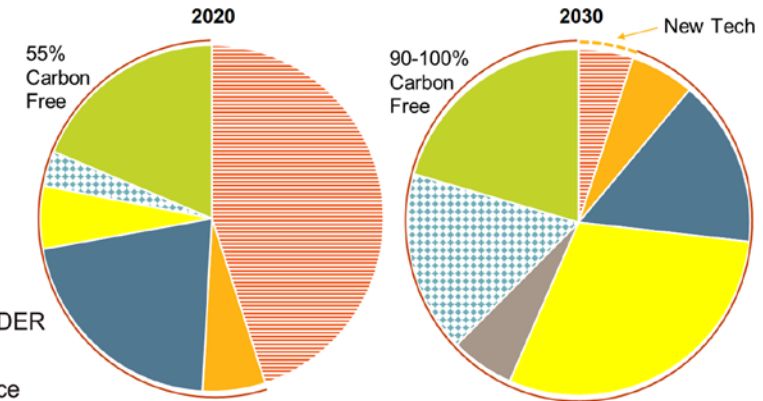
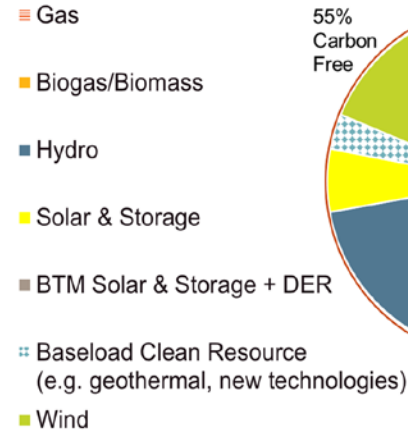
By 2030, build up to **3.5x** the amount of **renewables & battery** we have today.

- ~ 1,100 to 1,500 MW new local utility PV
- ~ 700 to 1,100 MW local batteries
- ~ 300 to 500 MW wind
- ~ 100 to 220 MW geothermal
- ~ 100 MW regional solar



Behind the meter resources

- ~ 500-750 MW solar
(add. ~30 to 55 MW per year)
- ~ 50-250 MW battery storage
(add. ~6 to 30 MW per year)



New utility-scale renewables equivalent to energy needs of >600,000 homes



Proven Clean Tech Investment Overview

Resource	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Drew Solar (regional)	100 MW									
Solano Wind Phase 4	91 MW									
Local solar	250 MW				850-1,250 MW					
Local energy storage	4 MW	100 MW				600-1,000 MW				
Regional wind							300-500 MW			
Regional geothermal						100-220 MW				
Rooftop Solar	(30-55MW per year)								500-750 MW	
Behind-the-meter batteries	(6-30 MW per year)								50-250 MW	

Additional analysis & research needed to firm up resource plan:

- **Siting:** Local utility solar & storage siting and interconnection studies.
- **Delivery options:** Of non-local renewables (transmission, market rules/participation, accounting, costs)
- **Low hydro impacts:** Normal hydro generation assumed for the study; low hydro scenario to be assessed.
- **Beyond 2030 impacts:** We need to study impacts of this plan past 2030 (load growth by 2040).
- **Reliability:** Further in-depth reliability studies needed.



New DER technologies, business models





What is a Distributed Energy Resource (DER)?

A small modular generator, storage or behavioral resource that's installed behind the customer meter or directly connected to SMUD's system. Customer-owned examples include:



Electrification & decarbonization to:

Help our region and customers partner with SMUD to reduce greenhouse gas emissions.

Plan



- Pilot new programs to electrify Sacramento.
- Engage under-served and low-income communities to achieve reduced energy bill burden.
- Partnering to reduce GHG and improve air quality.

Research



- Customer & market research.
- Community listening sessions.

- **Continue** foundation of energy efficiency
- **Pilot** innovative programs to strengthen customer investments in **zero carbon solutions**, including:
 - Electrifying Multifamily Retrofit, Schools, Commercial, and Underserved Communities
 - New Construction Smart Homes
 - Financing Options
 - Turnkey EV Charging Solutions for Residential & Commercial
 - Incentives for Used EVs
- **Engage with customers and community organizations** to further develop and implement zero carbon solutions, including ways to **bring economic vitality to our region**.
- **Seek external funding through grants and focus regional efforts through partnerships** to accelerate market transformation for the region.



Continuous refinement of targeted plan to 2030.



Education & demand flexibility to:

Help our region and customers partner with SMUD to reduce greenhouse gas emissions.

Plan



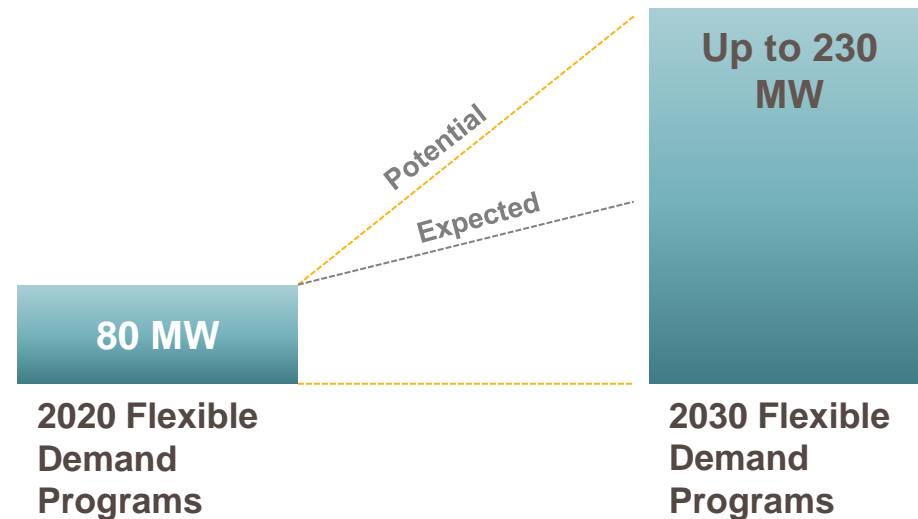
- Pilot Flex Alert programs to offset capacity needs without technology requirements.
- Pursue education and behavior-based opportunities.

- **Educate customers and community organizations** on how they can play a role toward zero carbon.
- **Pilot** behavioral-based **demand response and flexibility** such as “**Flex-Alert**” to help reduce customer bills and system peak demand **without requiring investment in technology**.
- **Assess pilots and programs** to ensure alignment with zero carbon goals.

Research



- Customer & market research to develop solutions.



Virtual Power Plants (VPPs) & Vehicle-to-Grid

Support the elimination of fossil fuels in SMUD's electricity supply.

Plan

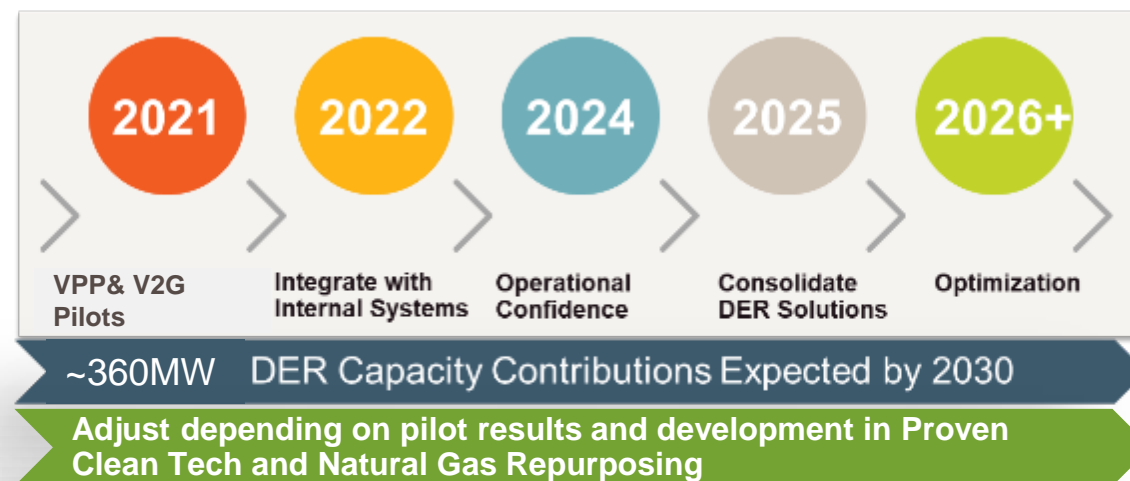
Partner directly with customers or third-party providers to pilot and then scale up solutions where customer-owned devices help manage the grid.

Research

Identify VPP partners to develop & test customer offerings.

Assess VPPs relative to alternatives to determine operational scale.

- Assess ability of **customer-installed devices** such as thermostats, pool pumps, water heaters to be aggregated into VPPs.
- Pilot Bring Your Own Device (BYOD)** using multi-DER approach that aggregate a variety of customer-owned devices including thermostats, EV Charging to manage load.
- Pilot Solar & Storage VPP** to test ability to deliver grid-type scale and services such as capacity and short-term energy.
- Pilot and scale **Vehicle-to-Grid (V2G)**.



- Develop **scaling** models and prioritize.



DERs and New Business Models

Electrification & decarbonization	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Building electrification	Implementation & pilots		Scale up & expand							
Transportation electrification	Implementation & pilots		Scale up & expand							
Cumulative equivalent all-electric homes (thousands)	54	57	60	65	71	81	93	119	131	154
Cumulative electric vehicle potential (thousands)	23	29	39	51	70	94	127	170	224	288
DER technology	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Energy education & behavioral DR				Consolidation of offerings						
	Implementation & pilots			Behavioral DR operation						
BYOD VPP	Implementation & pilots		Scale up & expand			BYOD VPP operation				
Contracted capacity VPP	Implementation & pilots		Scale up & expand			Contracted Capacity VPP operation				
Zero Carbon Base Case Capacity (MW)	7	15	27	44	64	95	141	201	275	364
Expected Trajectory (MW)	8	26	51	80	To be determined based on cost-effectiveness.					
*High DER Potential Capacity (MW)	22	74	164	254	384	529	724	919	1,114	1,325

*High DER Potential includes 66MW of behavioral DR in 2030.



Financial



Financial considerations to:

Help facilitate an affordable and inclusive zero carbon future.

Plan

- Keep annual rate increases to CPI% by finding operational efficiencies, seeking grants opportunities and partnering.

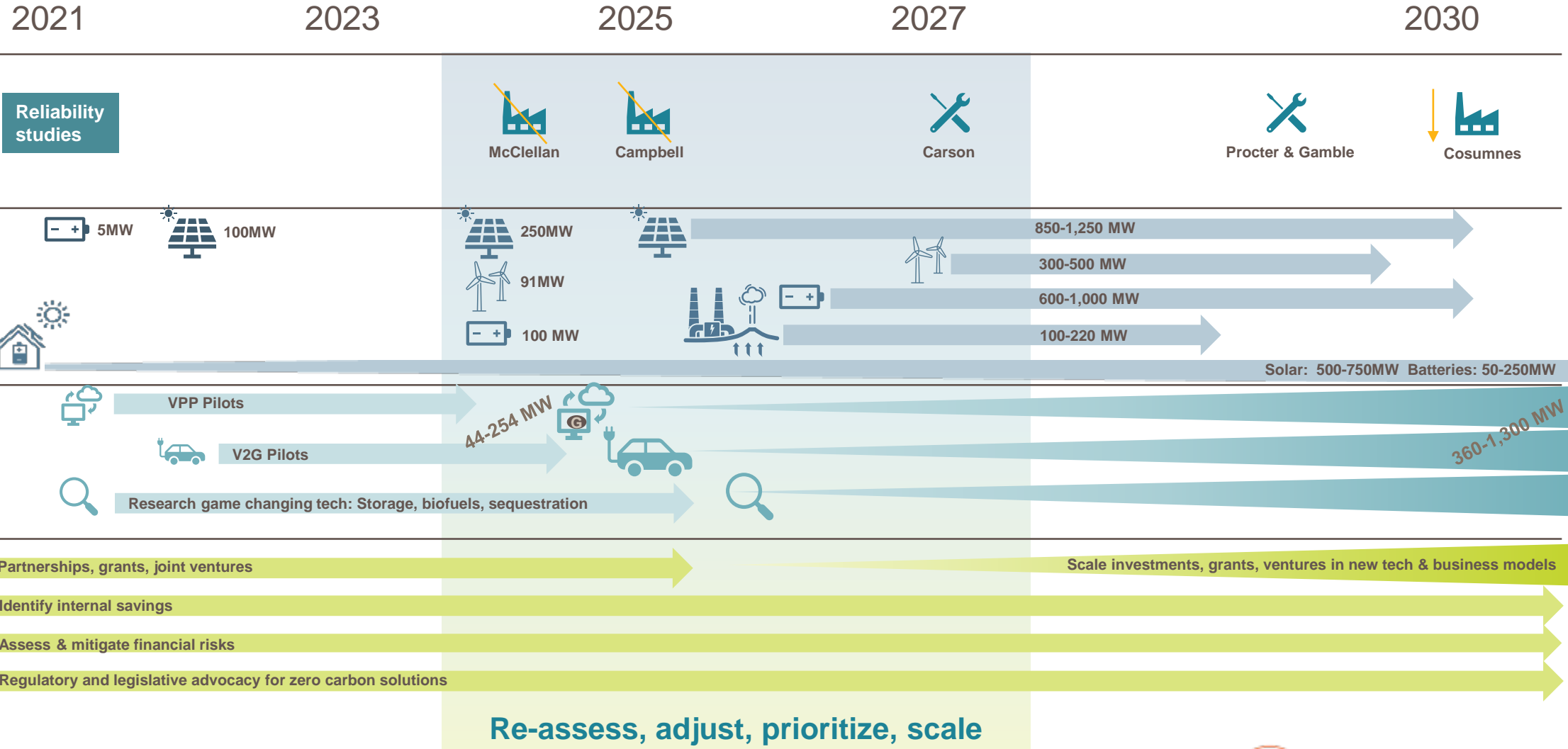
Research

- Partnering & financing options.

1. Identify **savings and cost reduction opportunities** to offset expected costs for Zero Carbon solutions.
2. Seek **grants and other funding opportunities** for new technologies to keep rate increases manageable.
3. **Partner** with local, state and federal governments to showcase new technologies and solutions under **shared cost arrangements**.
4. Seek **innovative financing solutions** to partner with our customers to enable an inclusive zero-carbon future for all SMUD customers.
5. Attract **clean technology investors** to our region for developing and scaling solutions in clean energy and electrification.

Financial outlook will be refined as plan is adjusted.

2030 Zero Carbon Plan summary





12-month action plan



Promote

Marketing, communication & outreach



Solicit

New proven clean technology projects



Launch

Pilot programs



Research

Grid-scale technologies



Execute

Additional detailed reliability studies



Identify

Opportunities for external funding, collaboration & internal savings



Collaborate

With policy makers on the 2030 Zero Carbon Plan



Find

Opportunities for workforce skills development & community involvement in 2030 Zero Carbon Plan



Public inputs on 2030 Zero Carbon Plan

- **March 26.** The 2030 draft Zero Carbon Plan is available at smud.org/zerocarbon, including draft technical report and executive summary. Written public input is welcome – submission via smud.org/zerocarbon. All comments will be published
- **March 31.** Presentation of 2030 Zero Carbon Plan and process for discussion and public comment
- **April 7.** Board Policy Committee meeting to discuss potential changes to SD-7 and SD-9.
Opportunity for public input
- **April 16.** Deadline for public comment on 2030 Zero Carbon Plan for inclusion in the staff summary at the Board meeting April 28
- **April 28.** Special Board meeting for consideration of the Zero Carbon Plan, public inputs received and adoption of resolution endorsing the Plan

Questions?

