ALBUQUERQUE PUBLIC SCHOOLS

Capital Master Plan

Strategies for Advancing Sustainability and Resilience in Public Schools Facility Planning

First DRAFT

Saturday, October 16, 2024

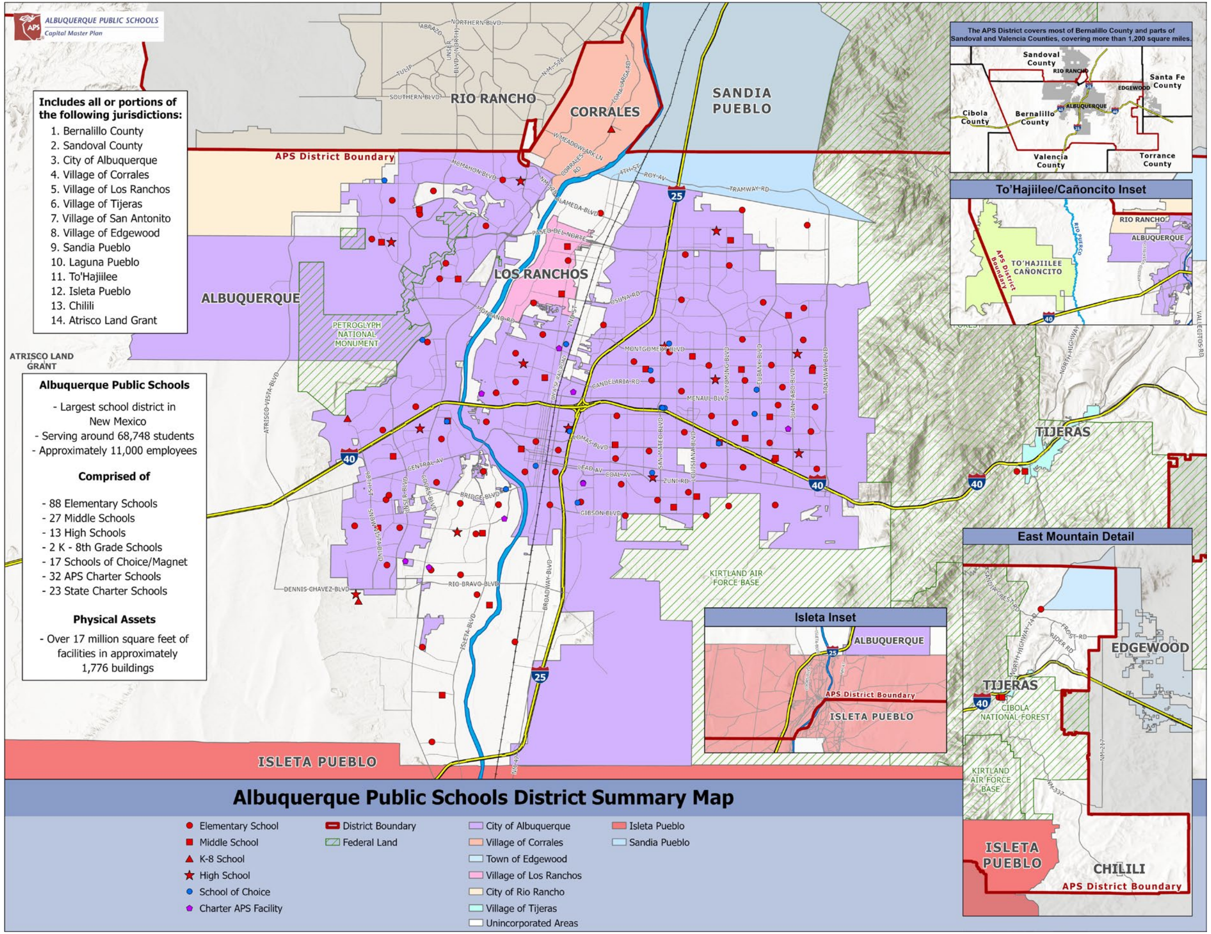
https://www.aps.edu/capital-master-plan

WIJENJE@aps.edu

Introduction: Geographic Context

Introduction: State & Region

Introduction: Albuquerque Public Schools



Introduction: Best Practices: Schools' Role in Climate Change & Energy Transition

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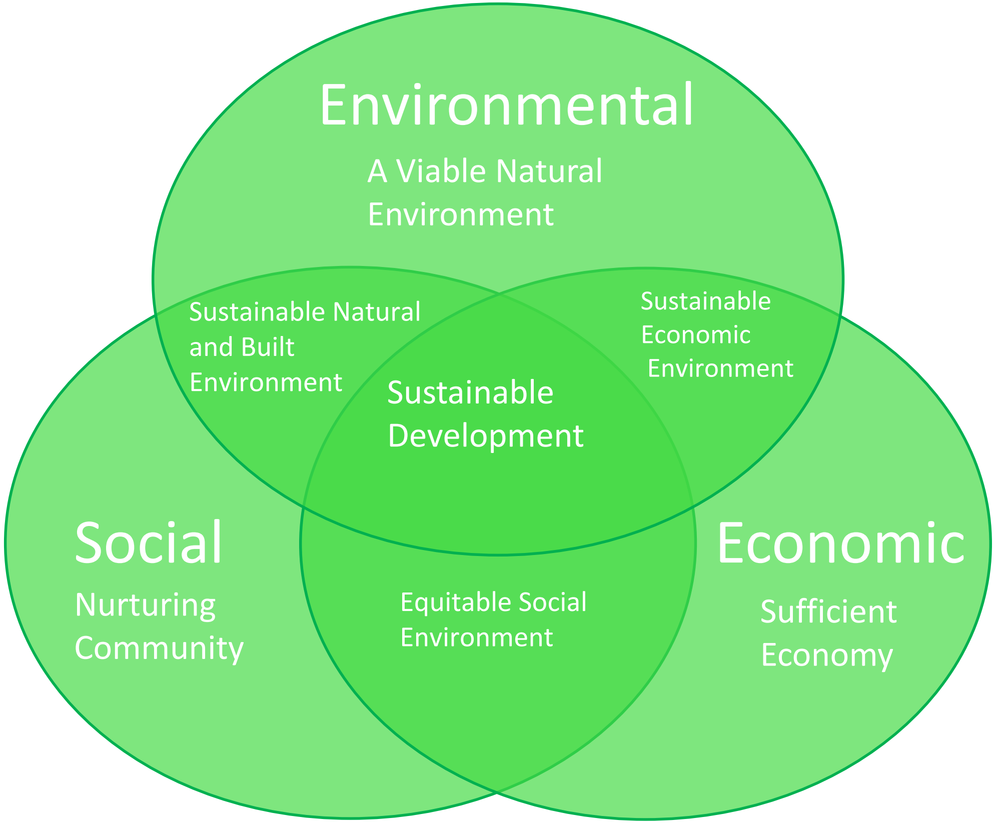

Introduction: Today's Panelists

Tony Sparks
Project Manager for HVAC Systems, Energy Efficiency & Sustainability at **Albuquerque Public Schools** Facilities Design + Construction
Coordinator of the APS Water and Energy Conservation Committee (WECC) and the APS Energy Team
Enthusiastic advocate for the betterment of our built environment, his teams have achieved impressive results and garnered numerous awards for their effective and progressive conservation strategies.

Alaric Babej
Principal of Customer Energy Solutions at the **Public Service Company of New Mexico**
Oversees utility programs focused on electrification, energy efficiency, and renewable energy to help customers achieve their sustainability goals. Designed and launched PNM's inaugural Transportation Electrification Program and company initiatives to accelerate electric vehicle adoption and infrastructure deployment.

Raghu Raghavan
Associate Vice President of Facilities and Service and Chief Facilities Officer at **New Mexico State University (NMSU**), in Las Cruces, New Mexico. Oversees a division with 210 FTE, an operating budget of $10 million, a repair and renewal budget of $5.2 million, a utility budget of $18 million and a capital construction project list approaching $150 million at any given time.
Raghu holds 3 master's degrees – one from NMSU, in environmental engineering, along with both an MBA and a master's in information management from Marymount University. His bachelor's degree in chemical engineering comes from University of Pune in India.

Todd Olinsky-Paul
Senior Project Director at the **Clean Energy States Alliance (CESA)**
CESA lead for state energy storage policy support and directs the Energy Storage Technology Advancement Partnership (ESTAP), which aims to accelerate large scale electrical energy storage deployment through collaborative efforts between state energy agencies, US DOE Office of Electricity and Sandia National Laboratories. Recent work has focused on virtual power plants, battery storage, the economics of energy storage, and the equitable incorporation of solar+storage into state clean energy policy & programs.

Introduction: Moderators

Kizito Wijenje, AICP
Executive Director, Albuquerque Public Schools, Capital Master Plan

Karen Alarid, AIA
Executive Director, Albuquerque Public Schools, Facilities Design & Construction

Rachel Hertzman, AICP
Planner II, Albuquerque Public Schools, Capital Master Plan

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Tony Sparks, EMP, CxA, LEED AP
Facilities Design & Construction Dept.

- Project Manager for HVAC & Sustainability
- District Design Standards
- Lead APS Energy Team
- Coordinate APS Water & Energy Conservation Committee

WECC
Water and Energy Conservation Committee
Making a Difference for Albuquerque Public Schools

Mission:

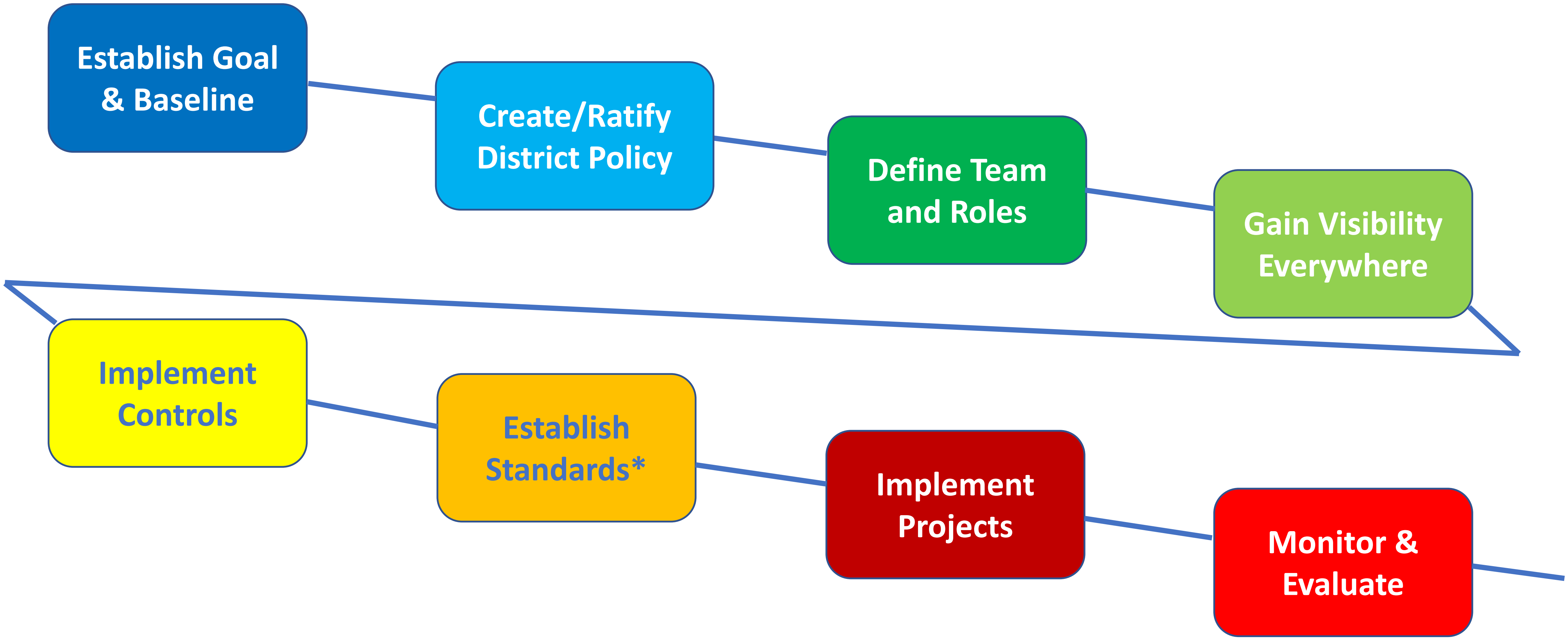
"We bring together the experience, perspective and resources of interested parties to foster healthy, efficient, sustainable environments for generations of APS students. We assess and implement best practices within a culture of respect, responsibility, cooperation, transparency, and education."

Vision:

"APS is a national leader in efficiency and sustainability with an imbedded culture of collaboration and environmental responsibility."

APS
ALBUQUERQUE PUBLIC SCHOOLS

Milestones and Steps



*Includes operational and design

WECC

Water and Energy Conservation Committee

Making a Difference for Albuquerque Public Schools

What is WECC?

- Standing Committee
  - High-level thinkers and decision-makers
  - Utility providers (gas, water, electric)
  - APS leadership and department managers
  - Community leaders
  - State Energy Conservation & Management Office
- ‘Think Tank’ for conservation and sustainability
- Meets Bi-Monthly
  - Review progress against goal
  - Provide support and ideas

APS Board of Education
Conservation Policy EC-1

Albuquerque Public Schools shall reduce net water consumption by twenty percent (20%) and net energy consumption by twenty percent (20%) by the end of the 2023-2024 school year as compared to an established 2013-2014 school year baseline.

To support this effort, the superintendent shall ensure full commitment by all employees and involved entities, including administrators, teachers, students, support personnel, contractors, suppliers and communities using APS facilities.

Ratification of this policy allowed WECC to build the necessary infrastructure to address water and energy management and create the APS Energy Team.

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APS Energy Team

For turning data into results.

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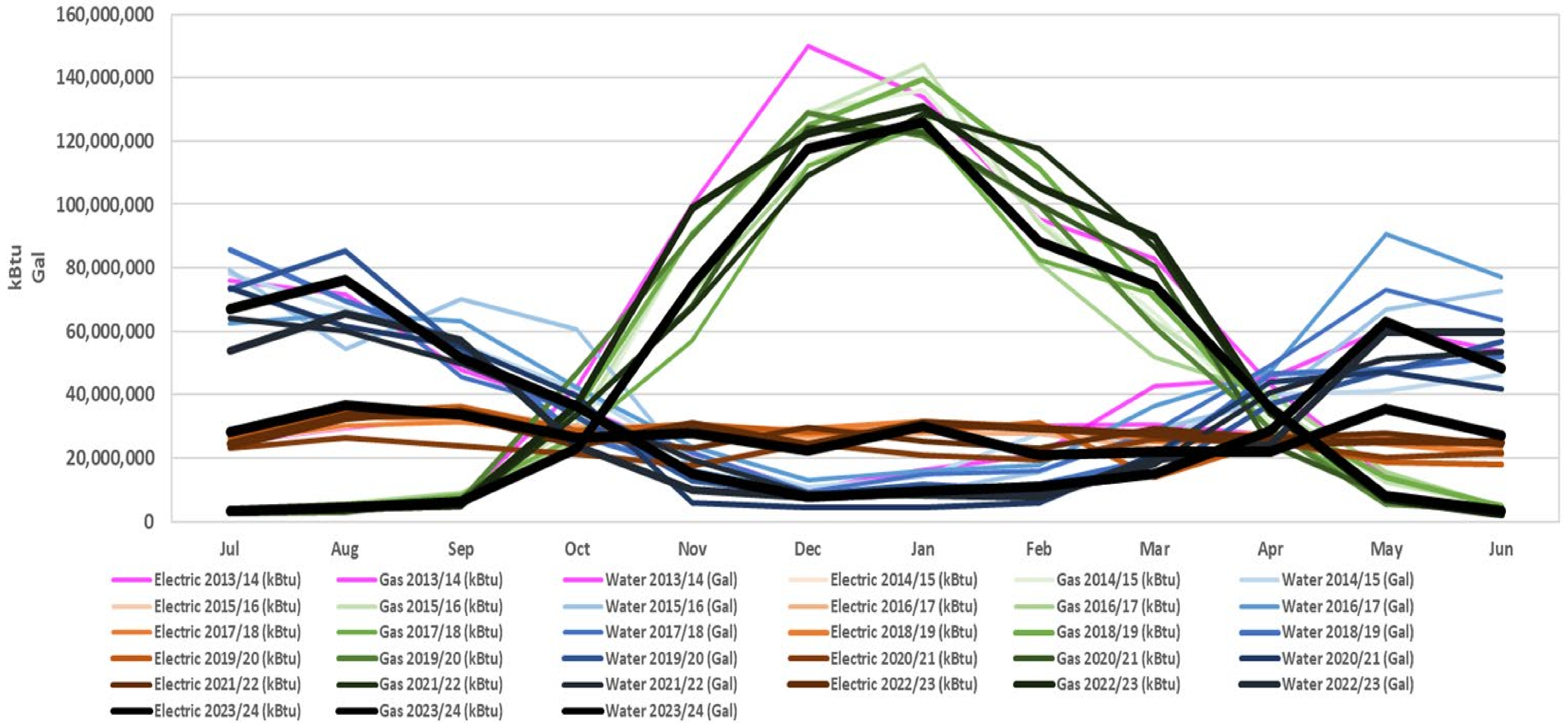
APS Water & Energy Conservation Update (Metrics)

APS Historical YTD Electric, Natural Gas, & Water Consumption



APS Water & Energy Conservation Update (Metrics)
2023-24 Year End

APS Change in Annual Spend – Baseline through 2023-24 – Historical Savings

	Change in Annual Spend (Positive Number = Savings)											
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	TOTAL
Electric	-	-$701,063	$555,208	$194,546	$58,719	-$372,363	$516,077	$1,022,151	-$2,220,523	-$535,207	$395,513	-$1,086,941
Gas	-	$284,400	$279,745	$749,964	$19,521	-$82,017	$300,485	-$544,883	-$741,916	-$2,428,579	$2,138,992	-$24,289
Water	-	-$64,718	-$602,811	$311,388	-$164,532	$54,948	$210,141	-$128,314	-$62,163	$113,575	-$508,679	-$841,164
Rebates*	$48,645	$113,279	$220,390	$336,476	$288,100	$287,559	$125,980	$120,901	$69,836	$69,054	$82,189	$1,762,408
Rentals	$349,114	$318,303	$296,427	$426,933	$299,654	$339,859	$217,665	$138,781	$452,785	$303,732	$469,099	$3,612,348
Summer School**	-	-	$183,606	Energy Only	Energy Only	TBD	N/A	N/A	N/A	N/A	N/A	$183,606
TOTAL	$397,758	-$49,799	$932,564	$2,019,307	$501,461	$227,985	$1,370,348	$608,636	-$2,501,981	-$2,477,426	$2,577,113	$3,605,967

Actual avoided spend if we had 'done nothing' in 10 years:
$18,528,651

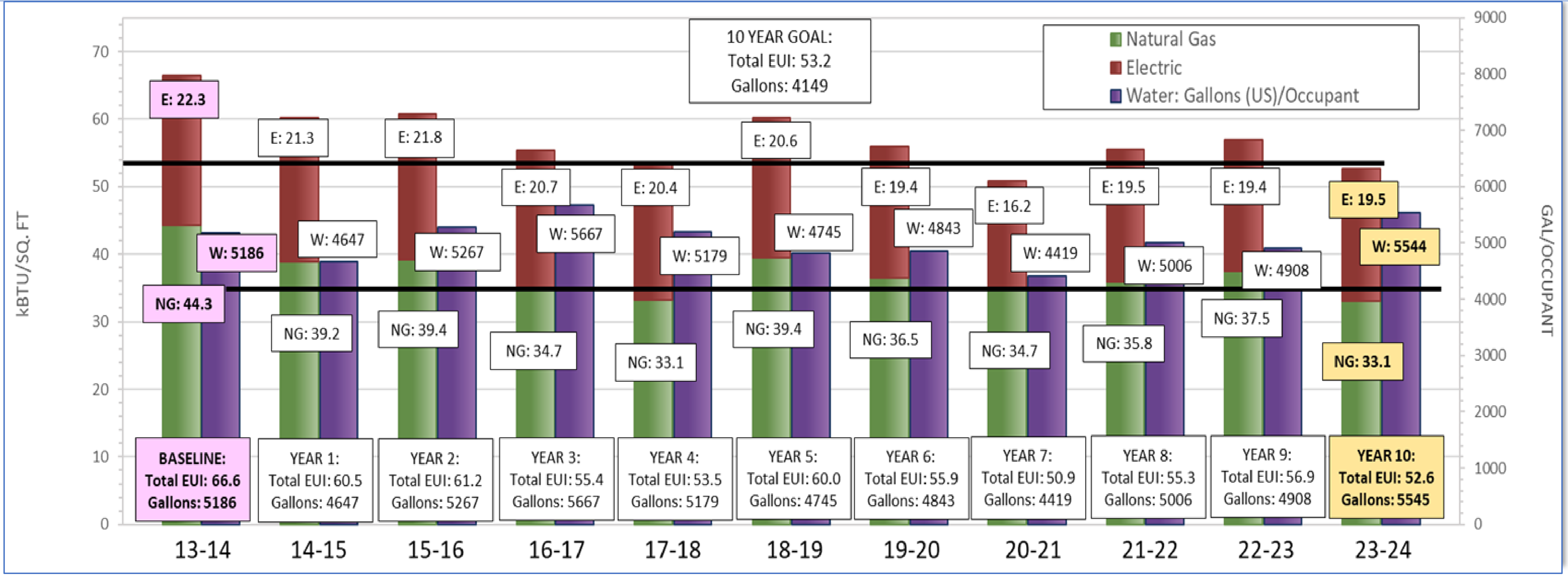
* Rebates include water meter corrections (if applicable)
** Summer School savings include neither energy and water savings nor facility usage revenue as those are captured in their respective rows

Mountain Vector Energy

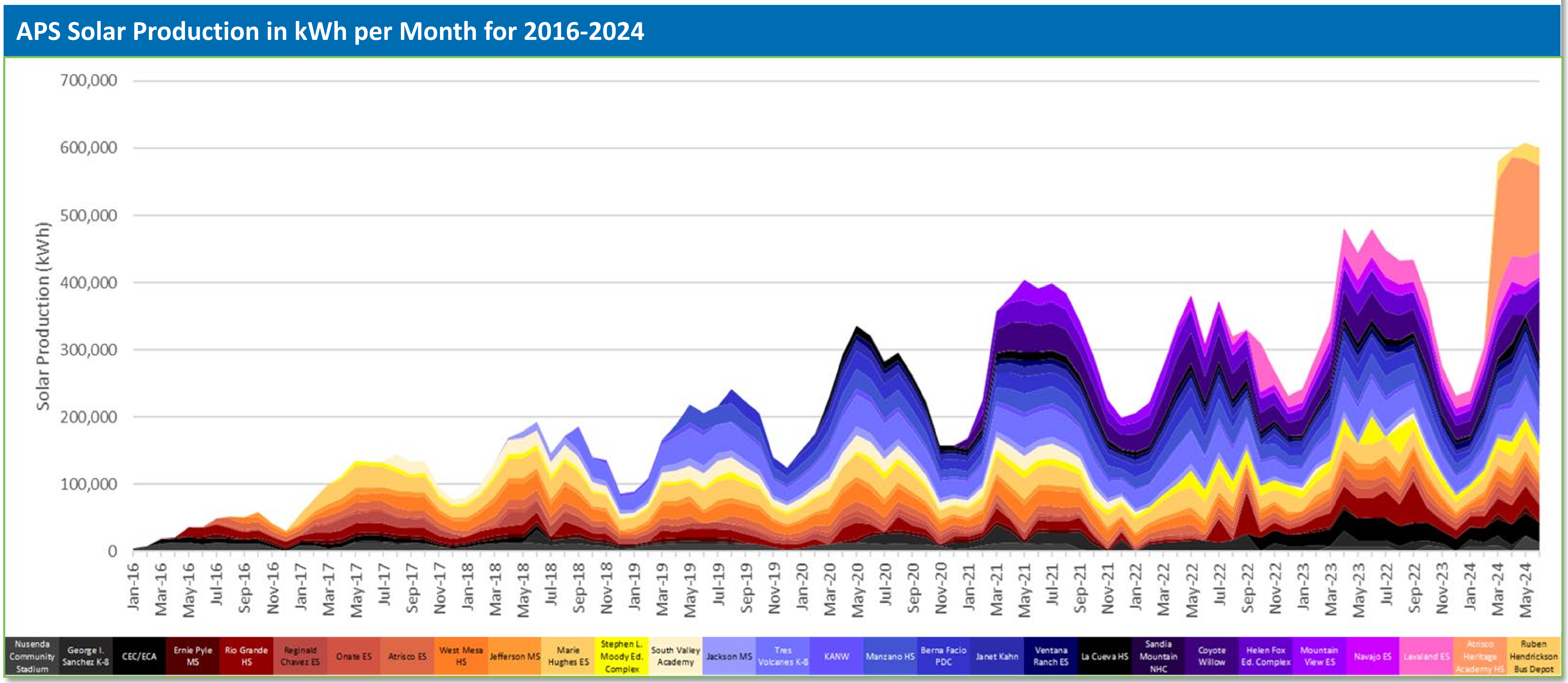
APS Water & Energy Conservation Update (Metrics)

Objective
- Reduce the entire school district's energy and water use

Reduction Goal: 20% in 10 Years.
- District Wide EUI: Total kBtu/Ft^2
- District Wide Usage: Total Gallons/Occupant
- Baseline Year: July 1, 2013 thru June 30th, 2014



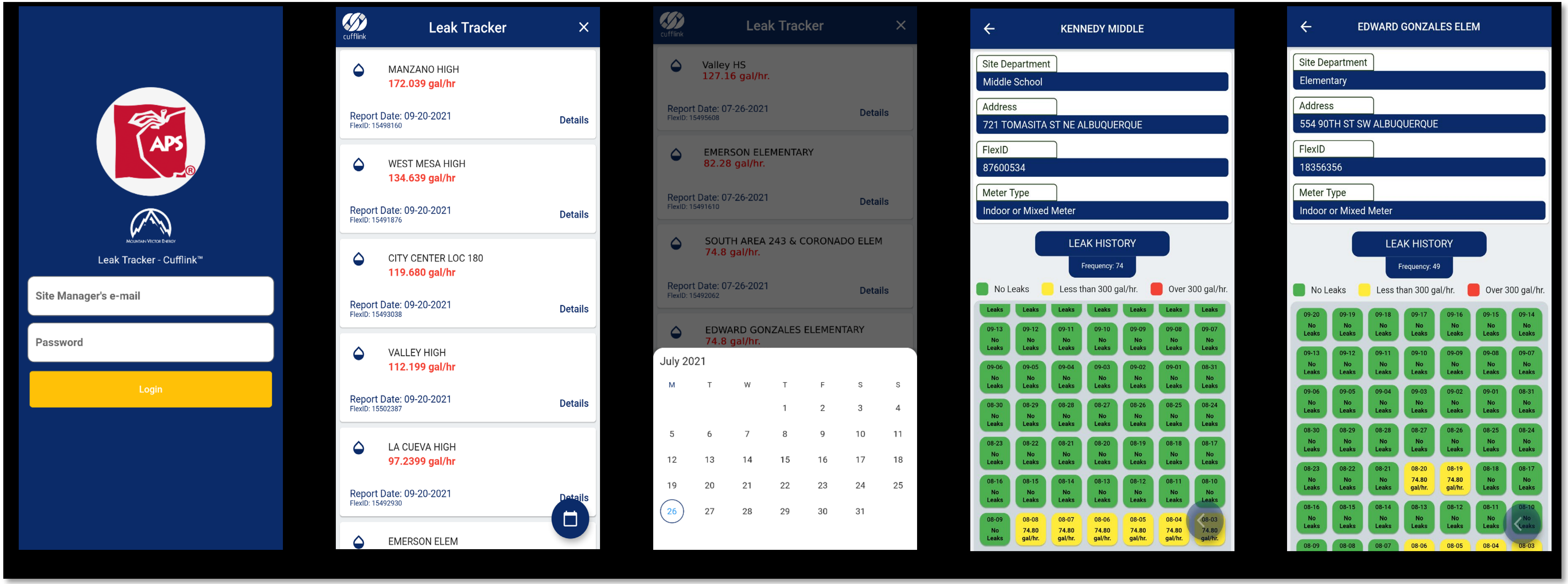
APS Historical Solar Production



APS Launched a Water Leak Detection Phone Application

An app to automate the process of water leak identification

- Distribute daily water leak notifications to site managers/maintenance directly.
- Track new and persistent leaks with access to historic data for each site – making stranded data useful.
- Compatible with Android/iOS/Web.



APS Leak Detection Potential Savings

1,432,220
gallons/month
(7-month average loss that could be avoided per month)

Translates to

$10,025
per month
(estimated at a blended rate of $0.007/gallon)

$0.07/gallon – blended rate

$1.6 million in a year if left

The greatest financial benefit is AVOIDED SPEND from eliminating wasted resources.

Sandia Mountain Natural History Center

Solar-Thermal Radiant Floor Heating fed from 32 collectors and 8 storage tanks. Propane boiler backup.

32 Absolyte GNB Batteries storing 48 kWh of electrical energy.

104 Roof-Mounted Solar Panels generating 37.4 kW. Propane generator backup.

NEW MEXICO MUSEUM OF NATURAL HISTORY & SCIENCE

APS®
ALBUQUERQUE PUBLIC SCHOOLS

Atrisco Heritage Battery Storage & Solar Project

Battery Storage Strategy for Peak Shaving

Tesla Mega-Pack 721/kW and 2900 kWh Integrated Battery System

850kW Roof-Mounted Solar

U.S. DEPARTMENT OF ENERGY

Sandia National Laboratories

NEW MEXICO emnrd Energy, Minerals and Natural Resources Department

Megapack is an all-in-one utility-scale energy storage system that is scalable to the space, power, and energy requirements of any site from 1 MWh to over 1 GWh. Megapack is optimized for cost, performance, and ease of installation, and includes a standard system warranty of up to 15 years.

FULLY INTEGRATED SYSTEM

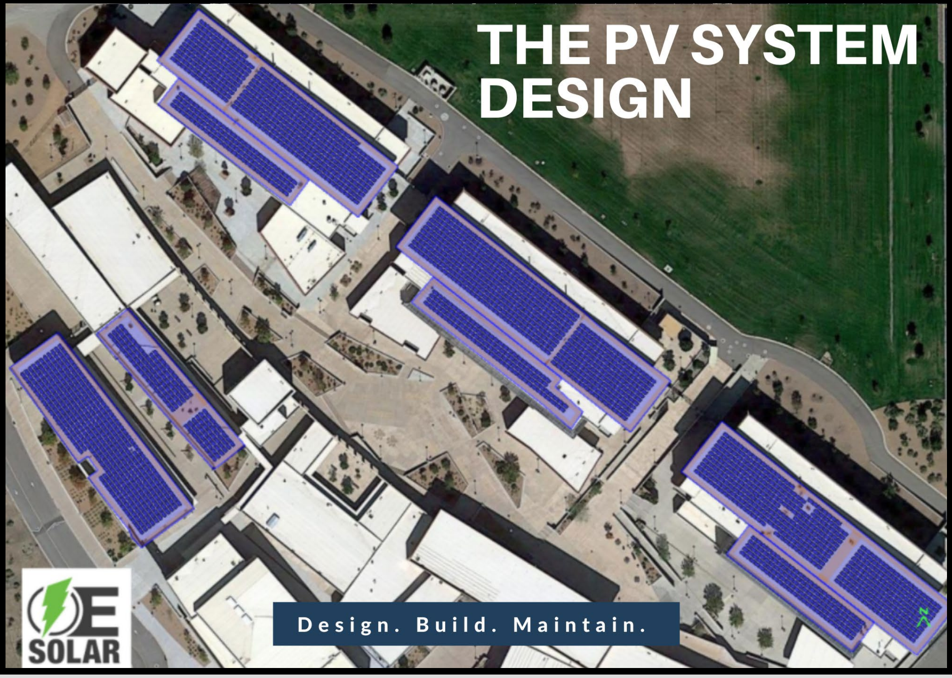
Megapack ships with battery modules, bi-directional inverter, thermal management system, and AC main breaker all pre-installed and pre-tested within a single enclosure. This turnkey system is designed to have the industry's fastest, lowest cost installation without sacrificing performance or reliability.

OPTIMIZATION SOFTWARE

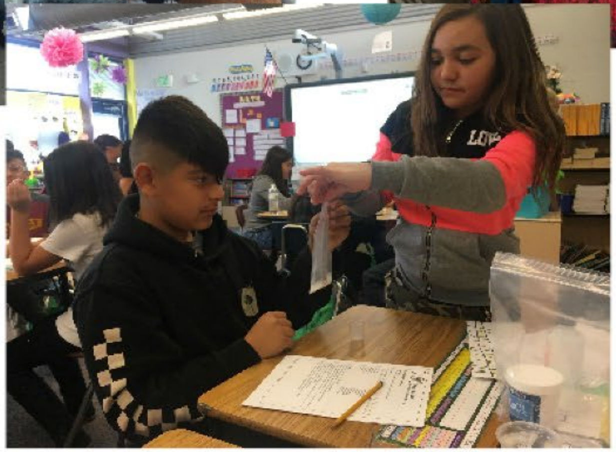
Proprietary optimization software, developed in parallel with the Megapack hardware, learns and predicts local energy patterns, offering autonomous charge and discharge and seamless SCADA integration. Fast-response controls can integrate co-located renewables and enable market participation.

ENHANCED SYSTEM SAFETY

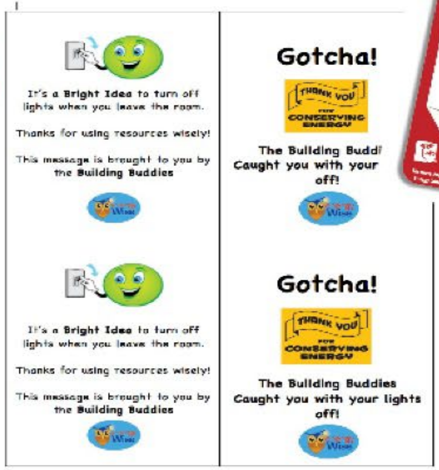
Parallel DC/DC converters, integrated heating and cooling at the cell level, and dedicated hazard venting are just a few of the safety and hazard mitigation features built into Megapack. Designed to meet international safety standards, Megapack helps ensure ease-of-permitting wherever it's installed.

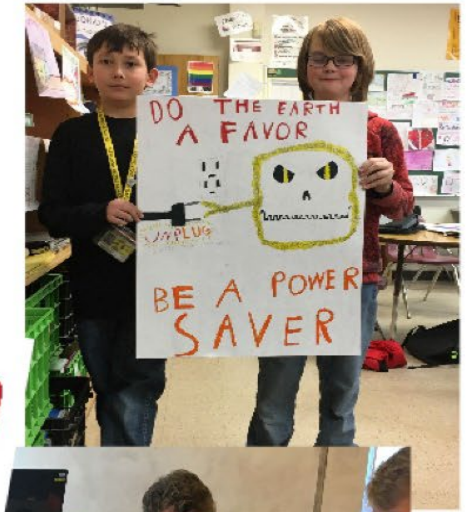


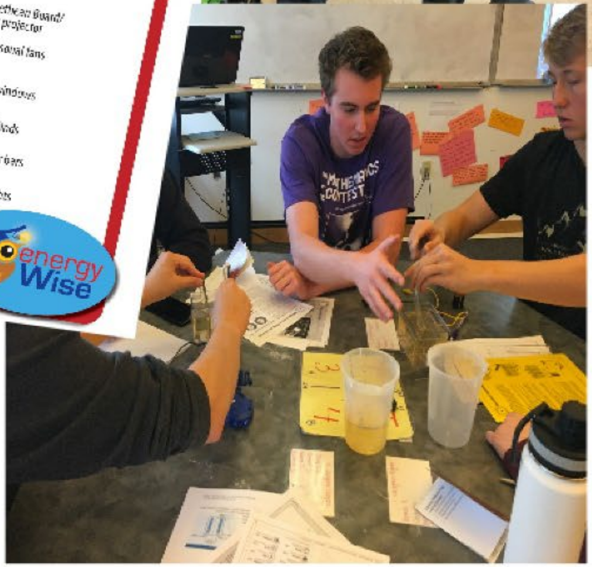
Building Buddies Program



energy Wise Building Buddies at Albuquerque Public Schools







Local Energy teams led by students with teacher/admin support.

STEM Curriculum-based; meets Common Core. Engages students.

Changes the culture at school and at home.

ALBUQUERQUE PUBLIC SCHOOLS

Thinking About Opportunities….. Next Steps ?

Battery Storage

Solar Projects

Electric Vehicles

LED Retrofits

WECC
Water and Energy Conservation Committee
Making a Difference for Albuquerque Public Schools

Artificial Turf

Utility Partnerships

Net-Zero or Off-the-Grid Sites
(like Sandia Mountain Learning Center)

Goals for WECC and the APS Energy Team

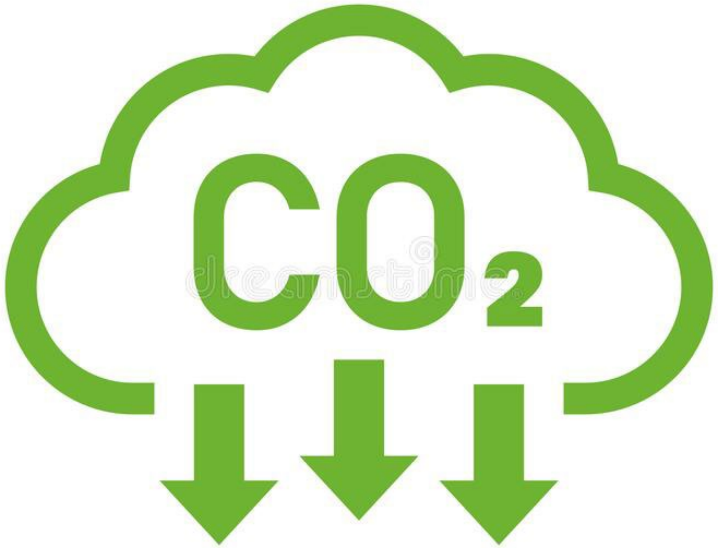
10-Year Look-Ahead

1. Carbon Reduction (ESG)
2. Electrification Strategies
3. Renewable Energy Targets
4. Behavioral Engagement

Goals for WECC and the APS Energy Team

10-Year Look-Ahead

Carbon Reduction (ESG)

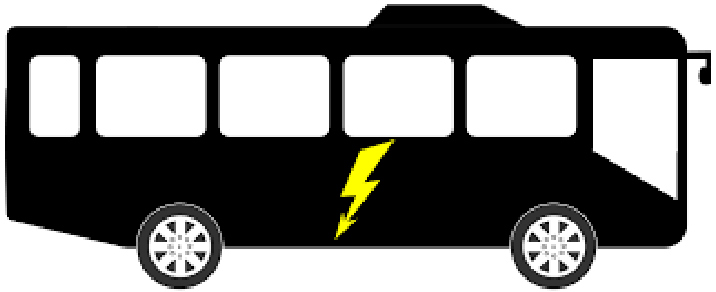


ESG = Environmental, Social, Governance

Goals for WECC and the APS Energy Team

10-Year Look-Ahead

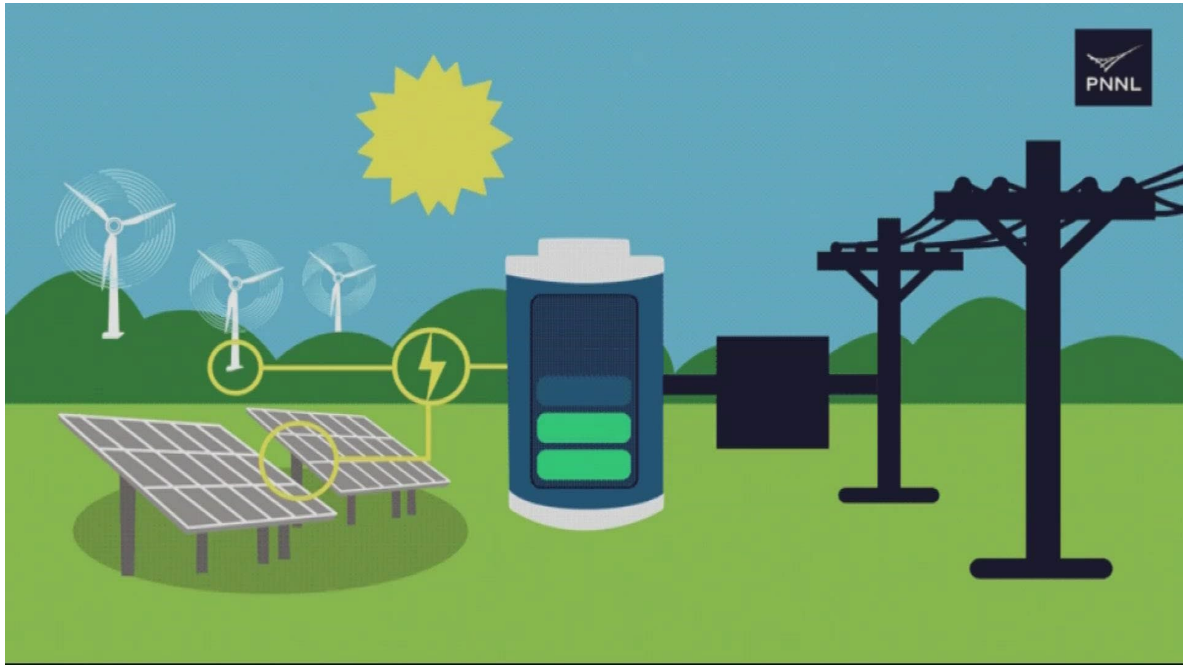
Electrification Strategies



Goals for WECC and the APS Energy Team

10-Year Look-Ahead

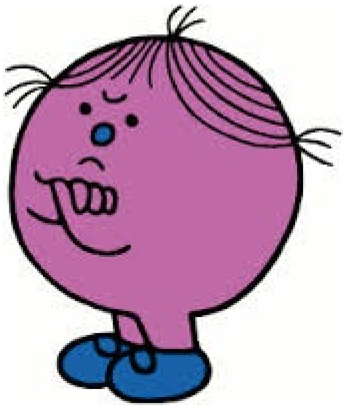
Renewable Energy Targets

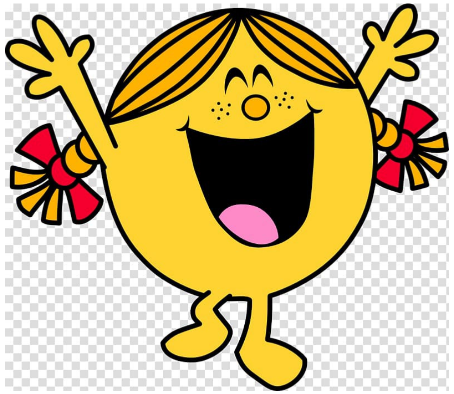


Goals for WECC and the APS Energy Team

10-Year Look-Ahead

Behavioral Engagement



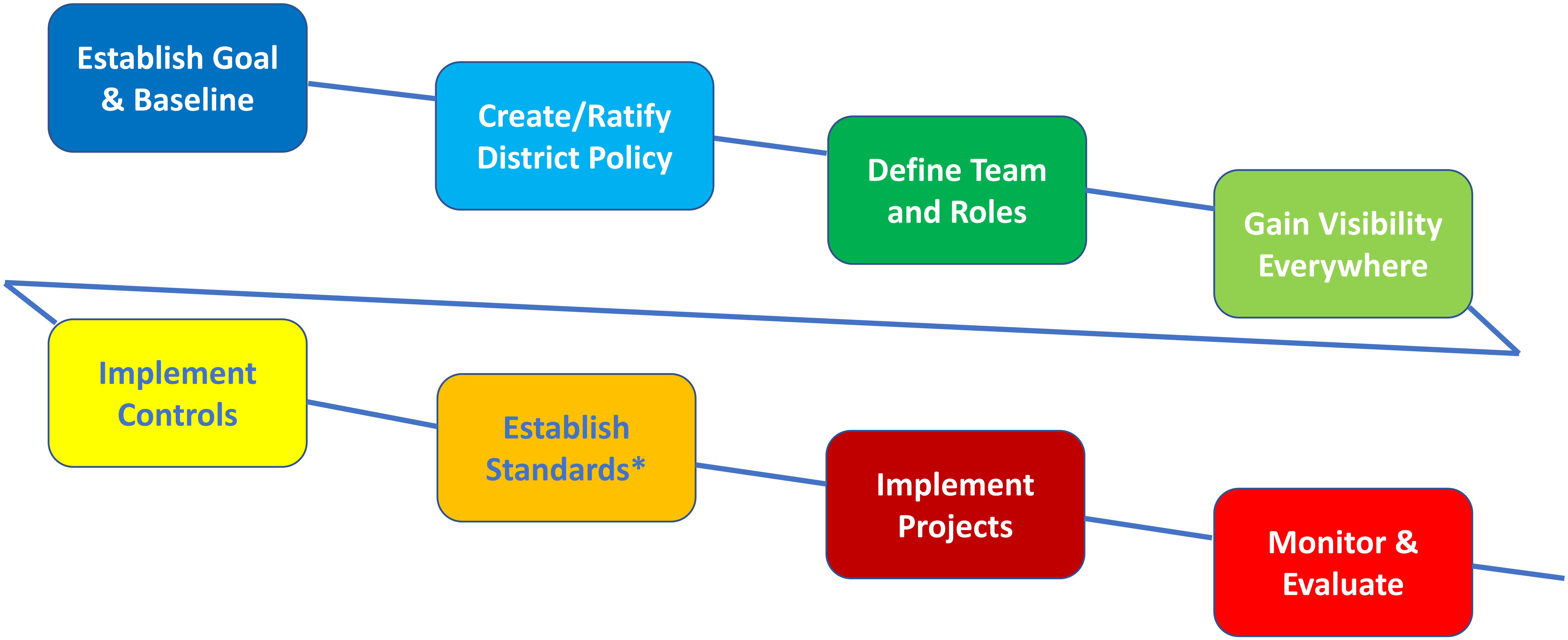


Goals for WECC and the APS Energy Team

10-Year Look-Ahead

What can we learn from each other?

Milestones and Steps



*Includes operational and design

Customer Energy Solutions:

Efficiency, Renewables, Transportation

ALARIC J. BABEJ – PRINCIPAL, CUSTOMER ENERGY SOLUTIONS

Talk to us.

PNM .com

SEPTEMBER 30, 2024

AGENDA

- Electricity Primer and the Role of the Utility
- Energy Efficiency Overview
- Solar Energy
- EV Adoption Forecasting and Customer Engagement
- Questions and Answers

PNM: PROUDLY SERVING NEW MEXICANS FOR OVER 100 YEARS

Public Service Company of New Mexico (PNM)

- Founded in 1917 as Albuquerque Gas and Electric Company
- 530,000 customers in 40 communities
- Over 15,000 miles of transmission and distribution lines
- 2,701 MW of generation capacity

Alaric J. Babej
Principal, Customer Energy Solutions

A SEMI-TECHNICAL REVIEW

Think of electricity like water

kW

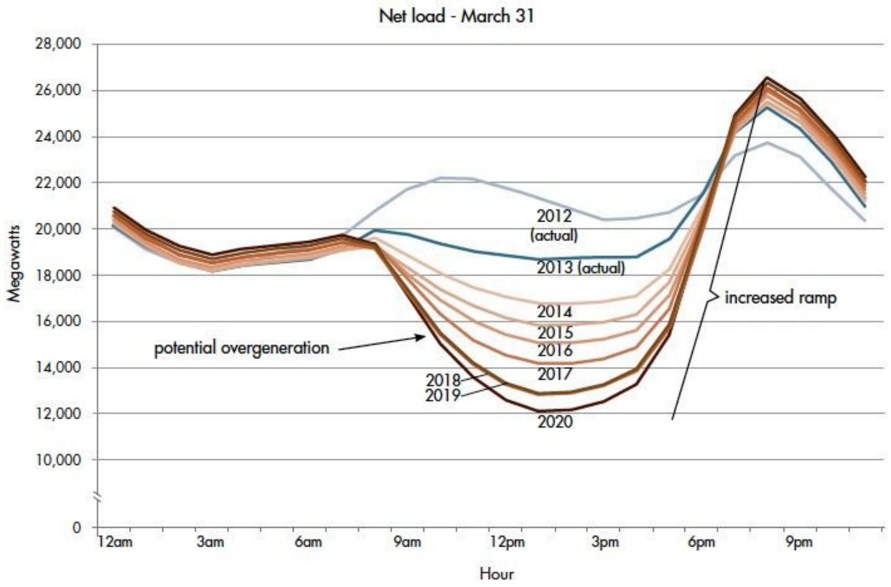
– Power (flow rate)

kWh

– Energy (volume)

ELECTRICITY 101

THE UTILITY ROLE

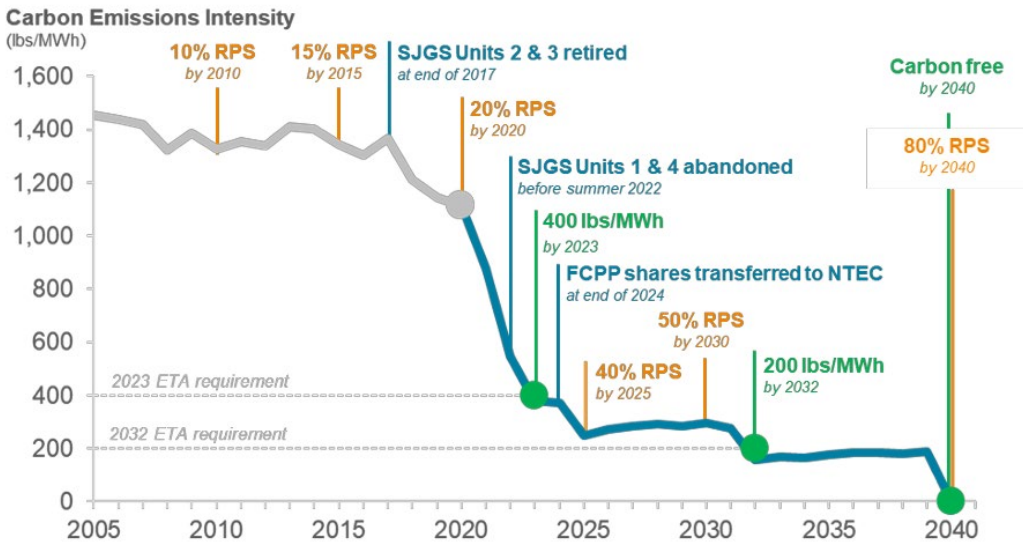


Source: https://www.energy.gov/eere/articles/confronting-duck-curve-how-address-over-generation-solar-energy

PLANNING FOR SUSTAINABILITY AT PNM

Integrated Resource Planning

www.pnm.com/irp



Talk to us.

ENERGY EFFICIENCY – JOIN IN TODAY!

Residential

- Residential Products
- Refrigerator Recycling
- Home Energy Checkup
- Cooling Rebates
- Home Weatherization
- PNM Home Works
- Easy Savings Kits
- Home Energy Reports
- PNM Power Saver

Business

- New Construction
- Retrofit Rebates
- QuickSaver
- Building Tune-Up
- Multi-family Improvements
- Advanced A/C Tune-Up
- Building Operator
- Strategic Energy Management

PNM ENERGY EFFICIENCY

REFRIGERATORS & FREEZERS | WASHERS & DRYERS | KITCHEN APPLIANCES | HEATING & COOLING | SMALL APPLIANCES

LIGHTING | HARDWARE & ELECTRICAL | INSULATION | VENTILATION | THERMOSTATS

www.CheckWithPNM.com

PNM®

ENERGY EFFICIENCY – TOTAL IMPACT

Since 2007…

Environmental

- Saved 5.9 Billion kWh of electricity
- Avoided 3.5 Million metric tons of CO_2 and saved 1.8 Billion gallons of water

Economic

- Over $121M in customer rebates
- More efficient equipment means lower energy bills for customers

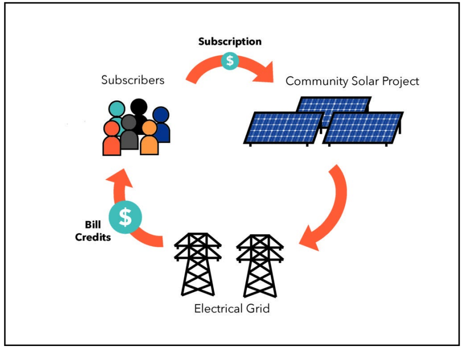
VOLUNTARY RENEWABLES PROGRAMS

PNM Programs

PNM Sky Blue
- Upgrade your usage to renewable energy
- Approximately $0.01 / kWh to enroll

PNM Solar Direct
- Shared 50 MW solar facility for large users and governmental customers

Community Solar



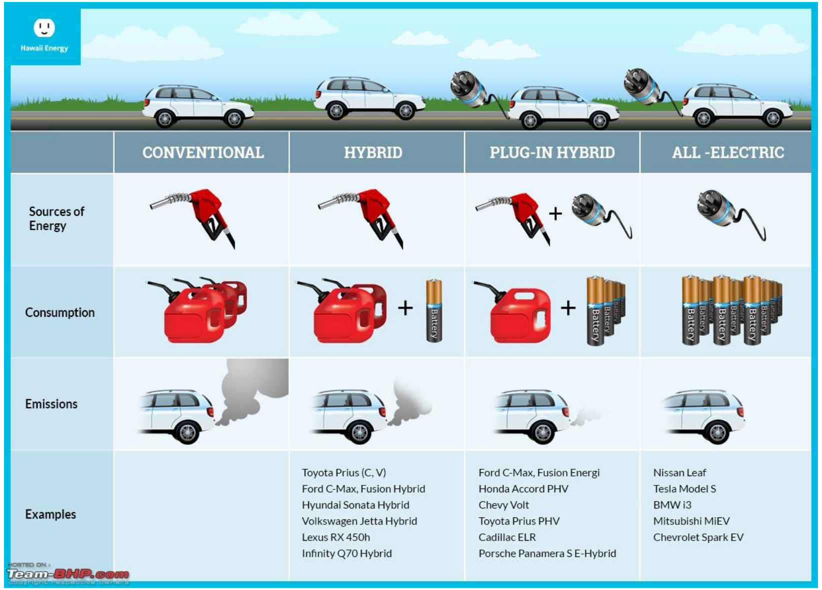
New Mexico Community Solar Program
- PNM will interconnect at least 125 MW of solar
- 3rd Party "Subscriber Organizations" sell subscriptions to PNM customers
- PNM provides a bill credit to subscribers

Note: program is new and facilities are just starting the interconnection screening process

ELECTRIC VEHICLES (EV)

TYPES AND DEFINITIONS

Type	Definition
ICE	Internal Combustion Engine
Hybrid	ICE that charges electric system
PHEV	Plug-In Hybrid Electric Vehicle
BEV	Battery Electric Vehicle



Babej, A. (8/4/20). https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.team-bhp.com%2Fforum%2Felectric-cars%2F171370-electric-vehicle-ev-landscape-deep-dive.html&psig=AOvVaw0uhY1AsrqxU-9OALOSxPVT&ust=1596655578594000&source=images&cd=vfe&ved=0CAIQjRxqFwoTCKCt-oOkgusCFQAAAAAdAAAAABAg

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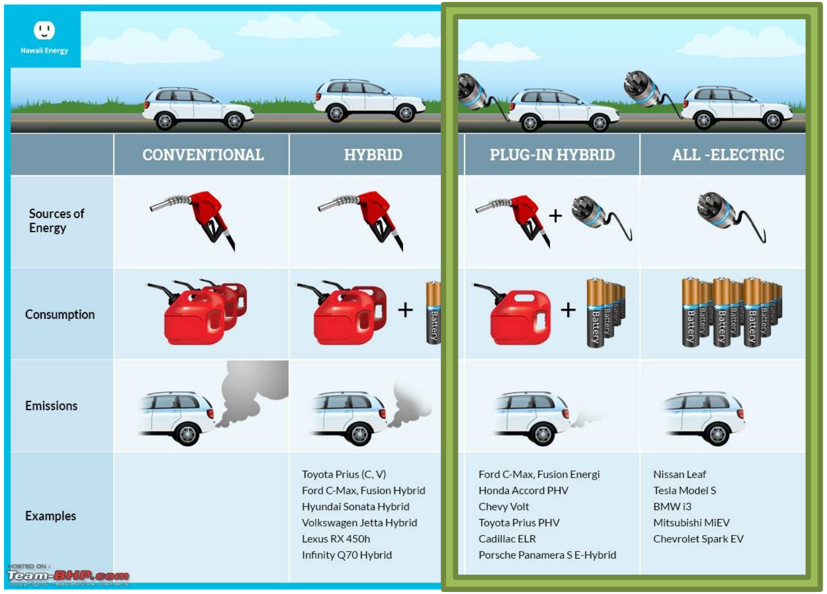
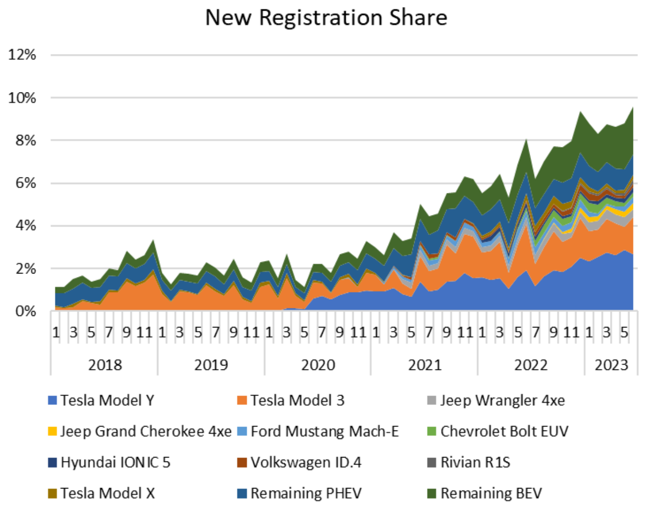


Babej, A. (8/4/20). https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.team-bhp.com%2Fforum%2Felectric-cars%2F171370-electric-vehicle-ev-landscape-deep-dive.html&psig=AOvVaw0uhY1AsrqxU-9OALOSxPVT&ust=1596655578594000&source=images&cd=vfe&ved=0CAIQjRxqFwoTCKCt-oOkgusCFQAAAAAdAAAAABAg

EV ADOPTION

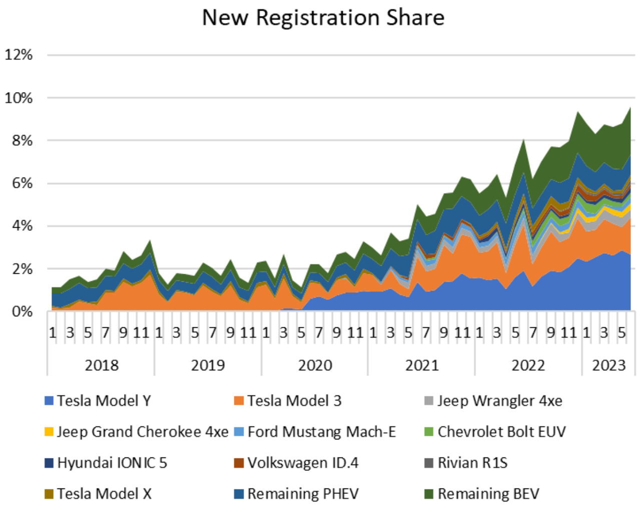
GETTING TO EXPONENTIAL GROWTH



EPRI Analysis of Experian Data, 2023

EV ADOPTION

GETTING TO EXPONENTIAL GROWTH



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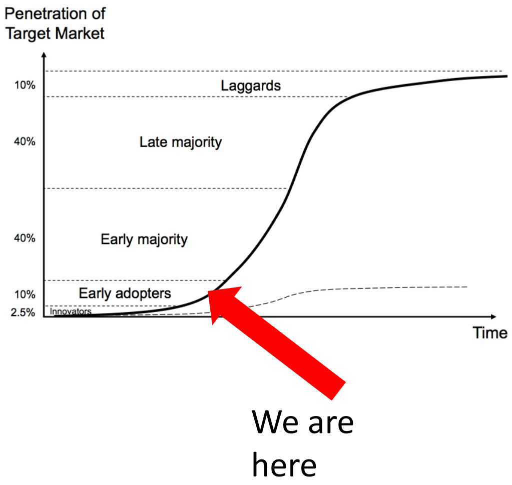

CHARGING INFRASTRUCTURE

TYPES AND DEFINITIONS

KNOW YOUR EV CHARGING STATIONS

	AC Level One	AC Level Two	DC Fast Charge
VOLTAGE	120v 1-Phase AC	208V or 240V 1-Phase AC	208V or 480V 3-Phase AC
AMPS	12–16 Amps	12–80 Amps (Typ. 32 Amps)	<125 Amps (Typ. 60 Amps)
CHARGING LOADS	1.4 to 1.9 KW	2.5 to 19.2 kW (Typ. 7 kW)	<90 kW (Typ. 50 kW)
CHARGE TIME FOR VEHICLE	3–5 Miles of Range Per Hour	10–20 Miles of Range Per Hour	80% Charge in 20–30 Minutes

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Home
Workplace

CHARGING INFRASTRUCTURE

TYPES AND DEFINITIONS

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AC Level One	AC Level Two
Home Workplace	Home Workplace Retail Businesses Public Parking Fleets

CHARGING INFRASTRUCTURE

TYPES AND DEFINITIONS

KNOW YOUR EV CHARGING STATIONS

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Home Workplace	Home Workplace Retail Businesses Public Parking Fleets	Corridors Retail Business Fleets

TRANSPORTATION ELECTRIFICATION

EV Charger Rebates

- Residential
  - Up to $500 for 3,900 customers
  - Up to $2,500 for IQ customers
- Commercial
  - $2,500 per Level 2 port
  - $25,000 per DC Fast Charger
  - $1.5 million for Mass Transit

EV Charging Rate Pilots

- Residential Whole-House EV
  - **10:00 pm – 5:00 am** ~$0.03 per kWh
- Commercial Rate 3F – no demand

ev.pnm.com - Marketplace

www.pnm.com/ev - Information

RECAP

- **Electricity –**
  - Power vs. Energy
- **Role of the Utility –**
  - Balance and Sustainability
- **Energy Efficiency –**
  - Greenest Option
- **Solar Energy –**
  - Available programs
- **Transportation Electrification –**
  - Terms and Programs

The Role of Schools in Climate Change & Energy Transition

Opportunities and Delivery Methods

October 19, 2024

V.S. (Raghu) Raghavan

Associate Vice President – Facilities & Services

New Mexico State University | Las Cruces, NM

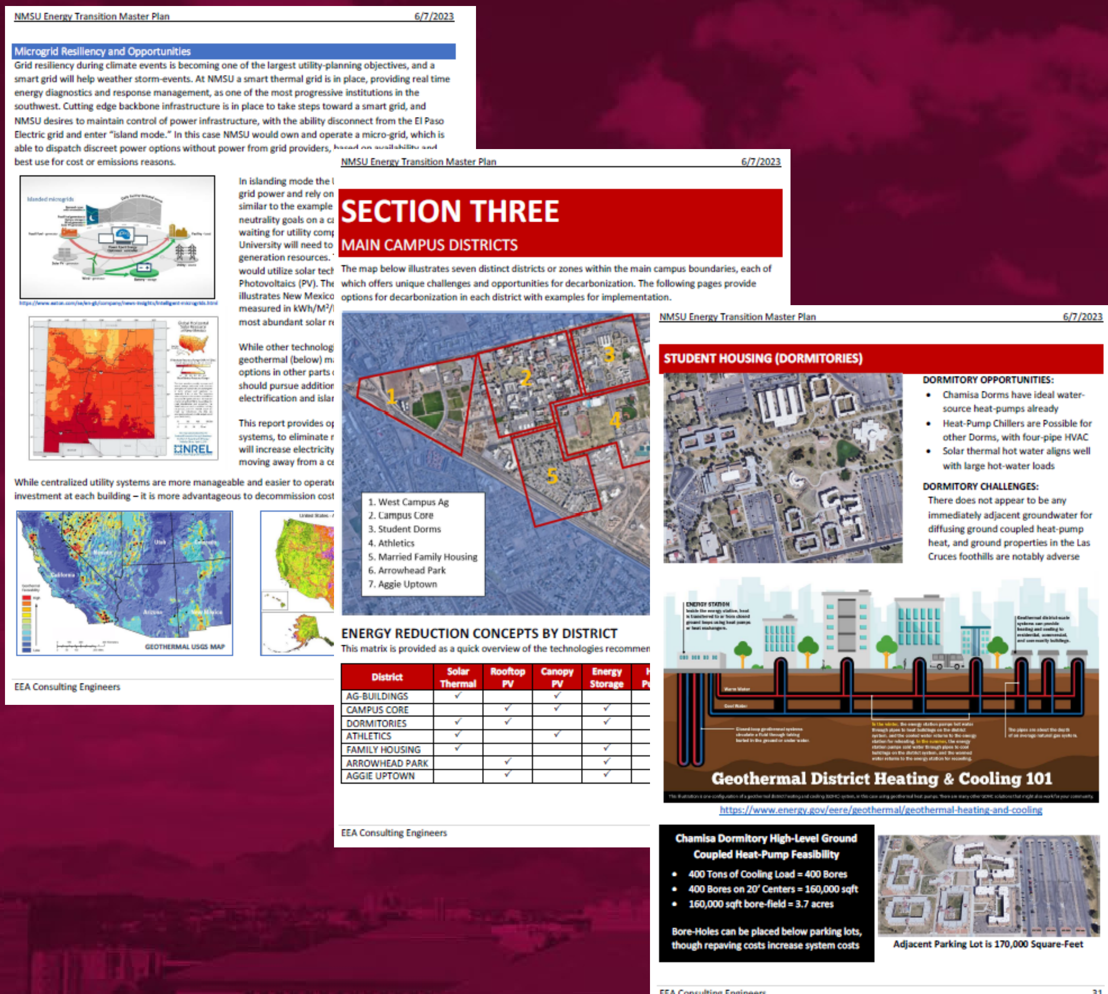
NM STATE UNIVERSITY

BE BOLD. Shape the Future.

Energy Transition in New Mexico

The Las Cruces Valley and the State of NM Provide Beneficial Geographical, Industry, and Policy to support Decarbonization

NMSU Energy Transition Master Plan



Augments the University's Capital Master Plan and provides guiding principles aimed at aligning institution and State carbon reduction goals.

20 LEED Certified Buildings

(Las Cruces, Alamogordo, Grants and DACC)

Leadership in Energy and Environmental Design (LEED), is a program of the US Green Building Council (USGBC) In 2006, New Mexico Governor Bill Richardson passed Executive Order 2006-001 that states that all new state buildings and remodels over 15,000 square feet will be built to LEED Silver certification or above. It is redefining the way we think about the places where we live, work and learn. LEED provides building owners and facilities managers with a framework for identifying and implementing practical and measurable green building design, construction, operations and maintenance solutions.

LEED v4.1

- LEED is always improving and with each new version the green building industry is raised. Thus improving energy performance to building design and health of people. LEED has encouraged project teams to go above and beyond the status quo.

NMSU Las Cruces Main Campus

ASNMSU Center for the Arts (Gold)
Agricultural Center (Gold)
American Indian Student Center (Silver)
Auxiliary Service Building – NMSU Bookstore (Gold)
Chamisa Village Residence Hall Phase II (Gold)
Football Coaches Office (Silver)
Gardiner Hall Remodel (Silver)
Health and Social Services Annex (Gold)
Devasthali Hall(Certified)
NMDA Addition (Gold)
Hardman and Jacobs Undergraduate Learning Center (Silver)
Domenici Hall (Silver)

- Upcoming Agricultural Modernization Project
  - Biomedical Research Bldg (In Design)
  - Food Science Learning and Safety Facility(In Design)
  - Feed Mill and Processing Facility(In Design)
- NMDA (In Design)

Doña Ana Community College Las Cruces Campus

East Mesa Phase 5 Auditorium (Gold)
East Mesa Phases 6 and 7 (Silver)
Gadsden Center Remodel and Addition (Gold)
Gadsden Center Phase 3 (Pending Silver with possibility of Gold)

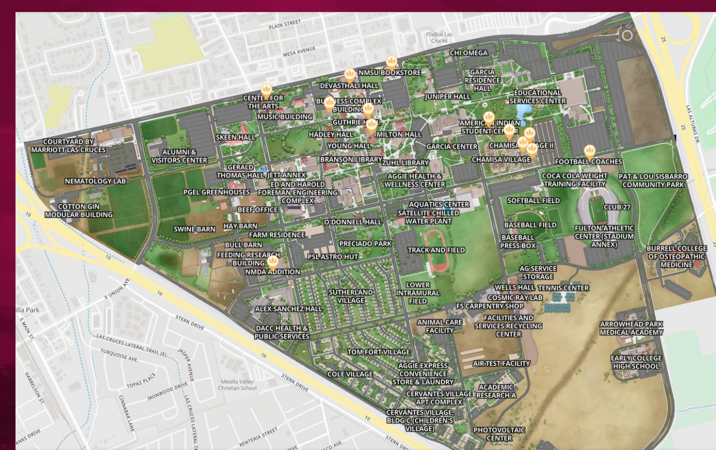
Alamogordo Campus

Advanced Technology Center (Gold)
Health Sciences Center, Alamogordo DACC (Gold)

Grants Campus

Child Development Center for NMSU Grants (Silver)

NMSU updates construction design guidelines to align with **Executive Order 2006-001**, passed by Governor Bill Richardson, requiring new state buildings and remodels over 15,000 ft^2 be built to LEED Silver certification or above.



NM STATE

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NMAEE 2015 Energy Performance Project of the Year

New Mexico State University contracted with Ameresco to make facilities more energy efficient.

Energy Reduction

AMERESCO
Green • Clean • Sustainable

The NMSU Board of Regents voted in 2013 to approve NMSU's **energy performance contract** with **Ameresco**. During a seven month process Ameresco conducted an investment grade audit of 46 of NMSU's buildings throughout the state, totaling nearly 2.7 million gross square feet. The proposed improvements were based on nine energy conservation measures indicated by Ameresco during the audit. This audit included the facilities at Alamogordo, Carlsbad, Dona Ana Community College, and Grants, the remote Agricultural Science Centers and all buildings on main campus. Ameresco's audit identified $45 million in potential energy-related projects through efforts similar to lighting upgrades, retro-commissioning and more. From there the university decided to move forward on a select group of those projects in order to prove the concept resulting in a $15.7 million bond to be paid off over 13 years, from the avoided costs from the project.

At the time the university's contract with Ameresco was one of the largest performance contracts in the state, and NMSU is often cited as an example by state officials of what other agencies in New Mexico could be doing to make their facilities more energy efficient.

This project was awarded the 2015 Energy Project of the Year by the New Mexico Association of Energy Engineers.

Energy Performance Contracting provides funding mechanisms to help facilitate the installation of high efficiency and renewable system technologies with realized energy savings.

NMSU initiated the first large scale Energy Performance Contract in the state which motivated New Mexico Energy, Minerals and Natural Resources Department (EMNRD) to create State Pricing Agreements with Energy Services Companies (ESCOs) helping to streamline the procurement process.

NMSU PV Installation

Research and Education Collaboration Agreement (RECA)

Project Type: Single-access tracking solar photovoltaic panels and a one-megawatt battery pack made by Tesla
Project Location: NMSU's Arrowhead Park
Project Owner: El Paso Electric
Fuel Source: Solar
Project Capacity: 3 MW
Commercial Operation Date: Fall 2021

Project Description

As part of our ongoing efforts to expand renewable energy resources and offset climate change, we've partnered with New Mexico State University (NMSU) to create Aggie Power — an advanced 3-megawatt (MW) solar facility + battery storage located on NMSU's Arrowhead Park.

Sharing mutual sustainability and environmental stewardship goals, Aggie Power was designed to complement the University's existing solar facilities with technology that includes single-access tracking solar panels and a 1 MW battery pack made by Tesla. Once completed, its generating capacity will be able to power close to one-third of NMSU's 900-acre campus.

In addition to its clean energy potential, the project will also serve as a living laboratory for faculty and electrical engineering students by providing research and hands-on training opportunities.

The Electric Company
El Paso Electric

AGGIE POWER!

NM STATE UNIVERSITY

The project is the result of a mutual beneficial working relationship between El Paso Electric and NMSU. NMSU's objectives are to have a portion of their electric load served with renewable energy and storage, and to provide NMSU's students and faculty a unique learning environment for educational and research purposes.

NMSU 1050 MW Wind Farm at Corona Ranch

The College of Agricultural, Consumer, and Environmental Sciences (**ACES**)


ACES IMPACTS

NMSU's Corona Range and Livestock Research Center joined Pattern Energy's Western Spirit Transmission project in September 2017 to build a wind farm in the Corona area through a public-private partnership. The center now has 39 turbines installed on ranch property and five additional ones on state trust land leased for grazing.

POWERED BY WIND

NMSU joins turbine project to capture clean energy and create educational opportunities

BY ADRIANA M. CHÁVEZ

16 | New Mexico State University | ACES Magazine | Fall 2022

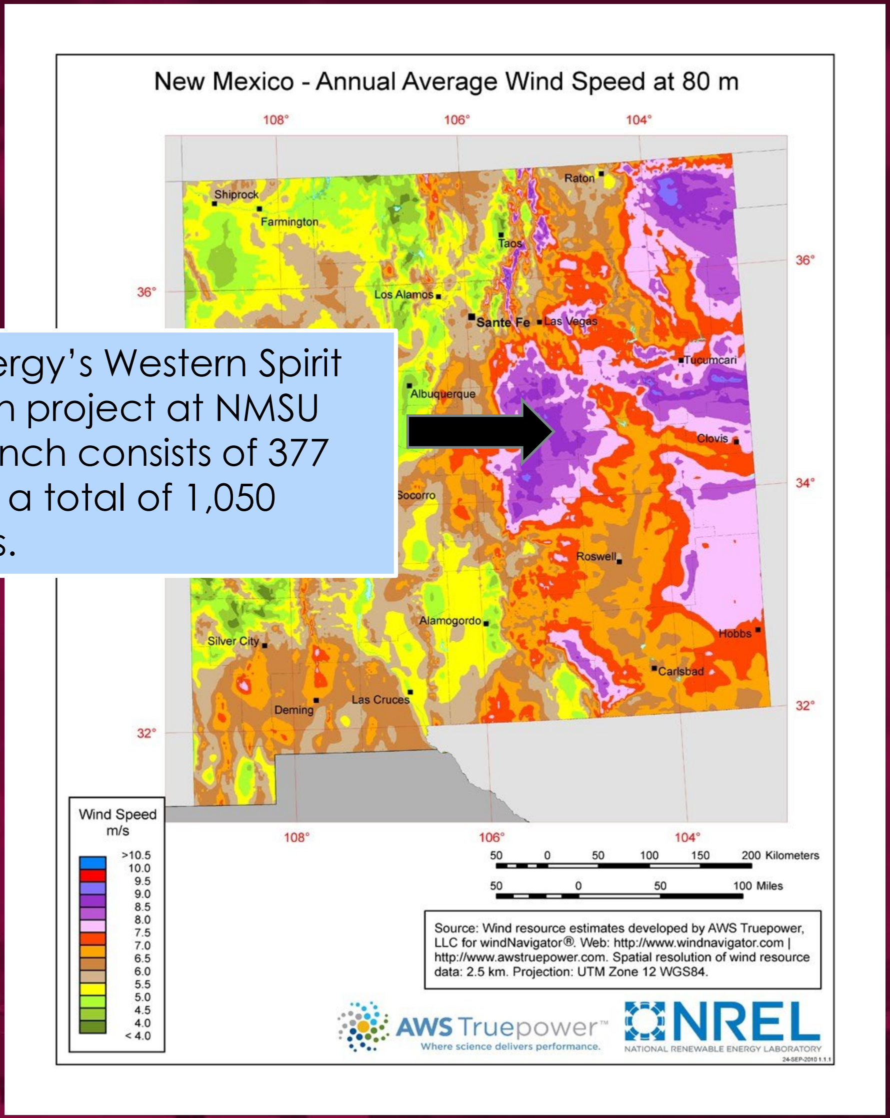
Fall 2022 | ACES Magazine | New Mexico State University | 17

Plans are in the works to expand the site another 3000 MW

Research is being conducted to study impacts to wildlife and habitat

NMSU is striving to make every renewable implementation a "Living Laboratory" opportunity

Shifting to Low Carbon Energy Sources-Wind



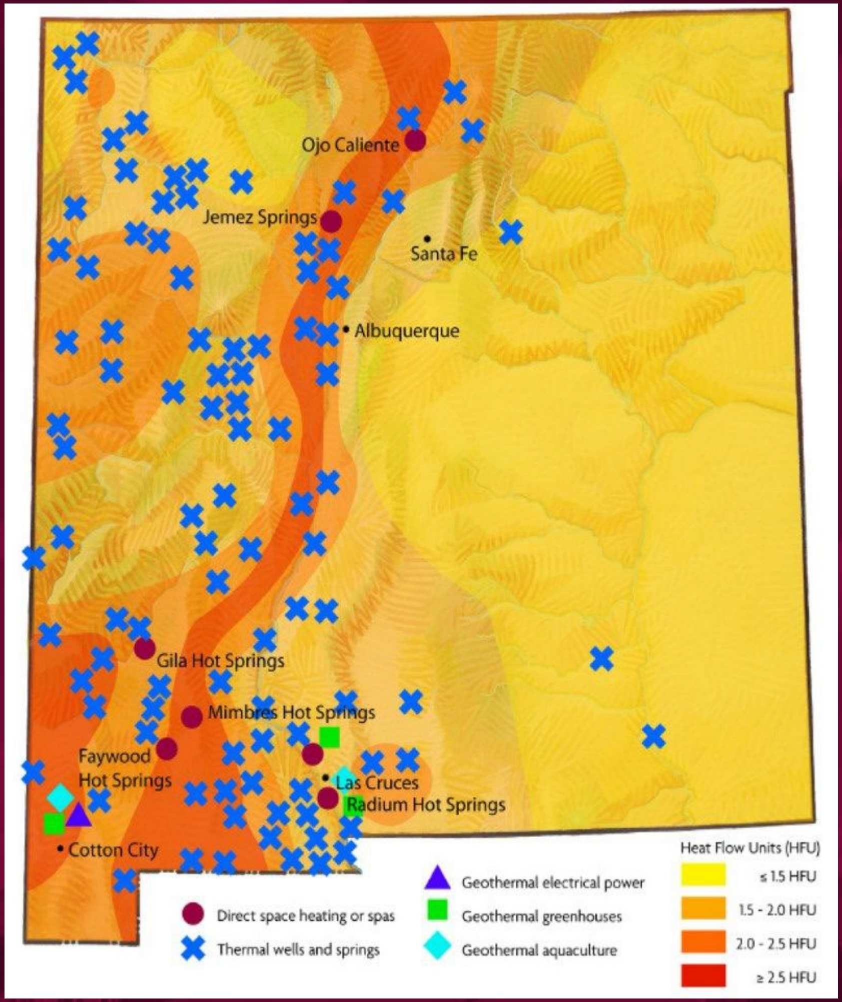
Pattern Energy's Western Spirit Transmission project at NMSU Corona Ranch consists of 377 turbines, or a total of 1,050 megawatts.

NMSU + Pattern Energy Public Private Partnership (PPP) Wind Project

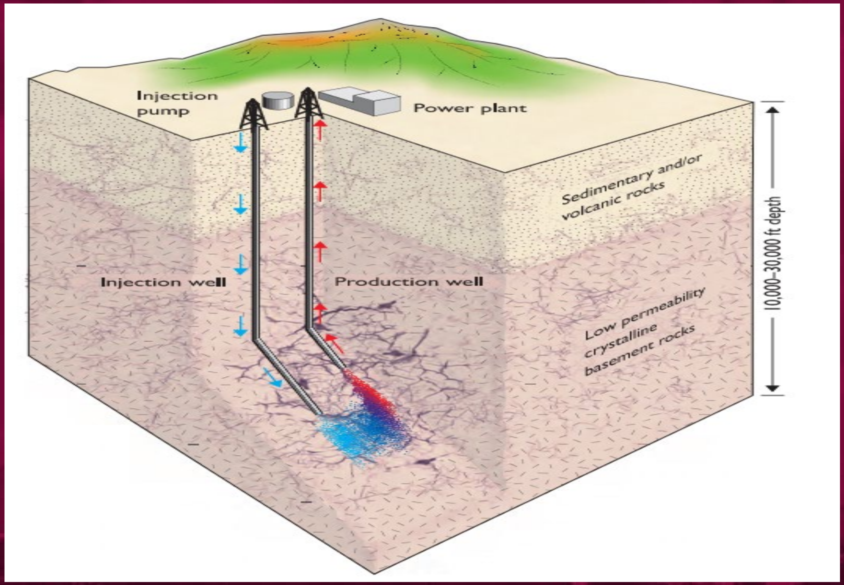
NMSU Ag Science Center located in Corona, NM

Source: NREL Wind Map

Shifting to Low Carbon Energy Sources-Geothermal



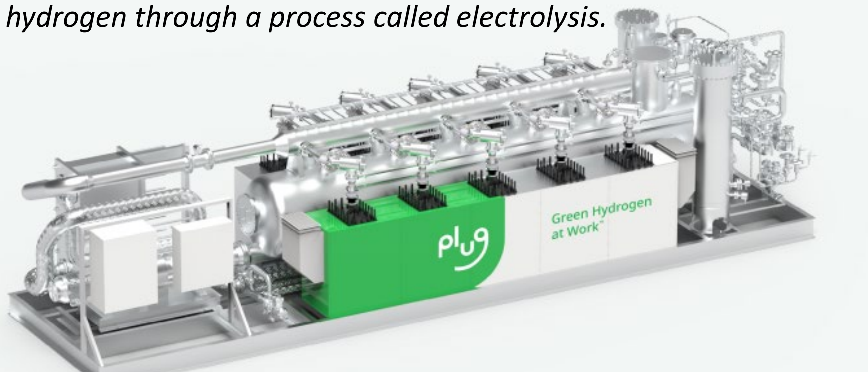
New Mexico Technical College and New Mexico State University received funds distributed through the State General Appropriation fund to partner in the development of a Geothermal demonstration project.



Source: New Mexico Bureau of Geology and Mineral Resources

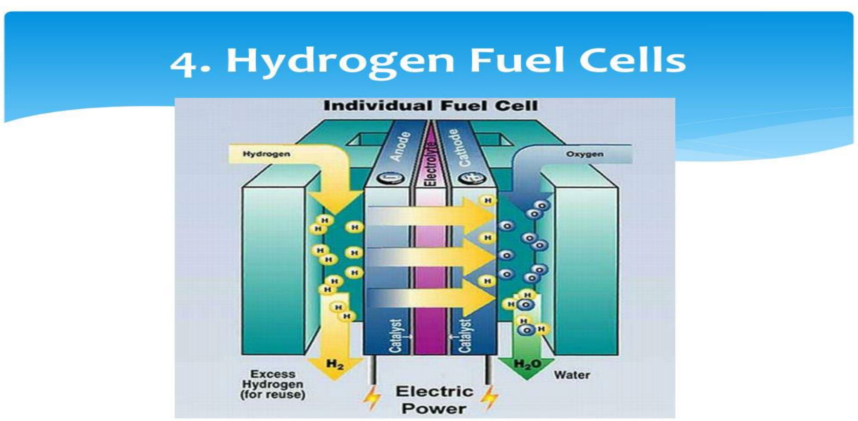
Shifting to Low Carbon Energy Sources-Hydrogen

Water can be separated into oxygen and hydrogen through a process called electrolysis.



Electrolyzers: Growing list of manufacturers

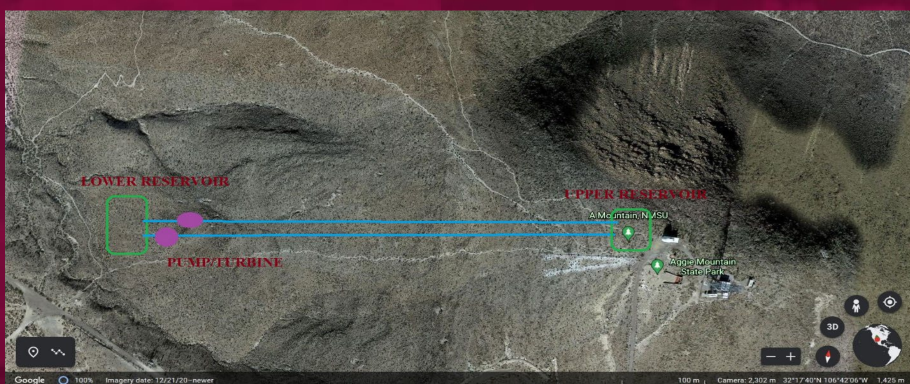
Earmark funds, provided by Senator Martin Heinrich and Senator Ben Ray Lujan, are in place to develop innovations in renewables. Hydrogen technologies are being discussed with industry partners to supply a 1MW Hydrolyzer and Fuel Cell for various demonstrations here at NMSU.



Electrolyzers can range in size from small, appliance-size equipment to large-scale, central production facilities

A fuel cell uses the chemical energy of fuels to produce electricity and thermal energy. A Fuel Cell is essentially an Electrolyzer running backwards.

Pumped Hydro Electrical Demand Management and Storage



Conceptual Engineering Study of a Demonstration Modular Pumped Hydro Unit at New Mexico State University
By Mark L. Bibeault, Los Alamos National Laboratory
July 16, 2021

Exploring opportunities to take advantage of Tortugas Mountain 1,000 foot elevation difference between the peak and main campus

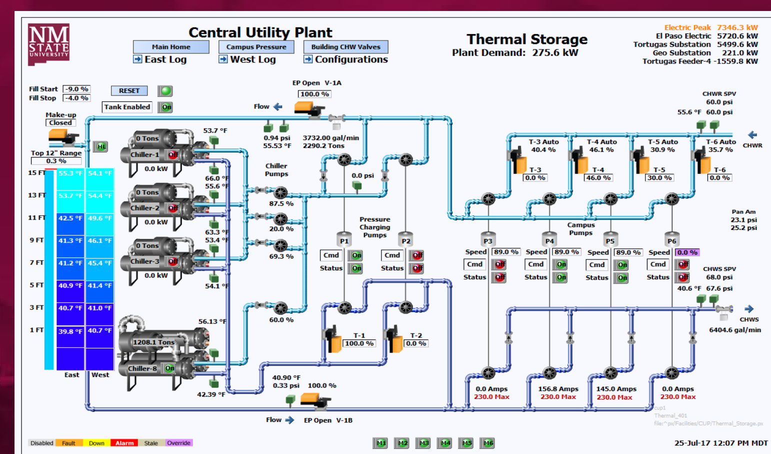
Allow for water storage at highest elevation during electrical off-peak periods for discharge through water turbine to produce electricity during on-peak periods

Initial calculations show a potential to produce 1 MW of demand power flow

Thermal Storage Facilities-Ice and Water

NMSU has two cold thermal storage facilities that allow electrical peak management strategies. The 3 million gallon cold water facility was built in 1984 and provides 20,000 Ton Hours of cold storage. The Ice Storage facility was built in 2012 and provides 9,000 Ton Hours of cold storage.

These systems, along with a steam driven HVAC Chiller produce all cooling for the campus during peak summer months. No electric chillers run during the summer electrical peaks.



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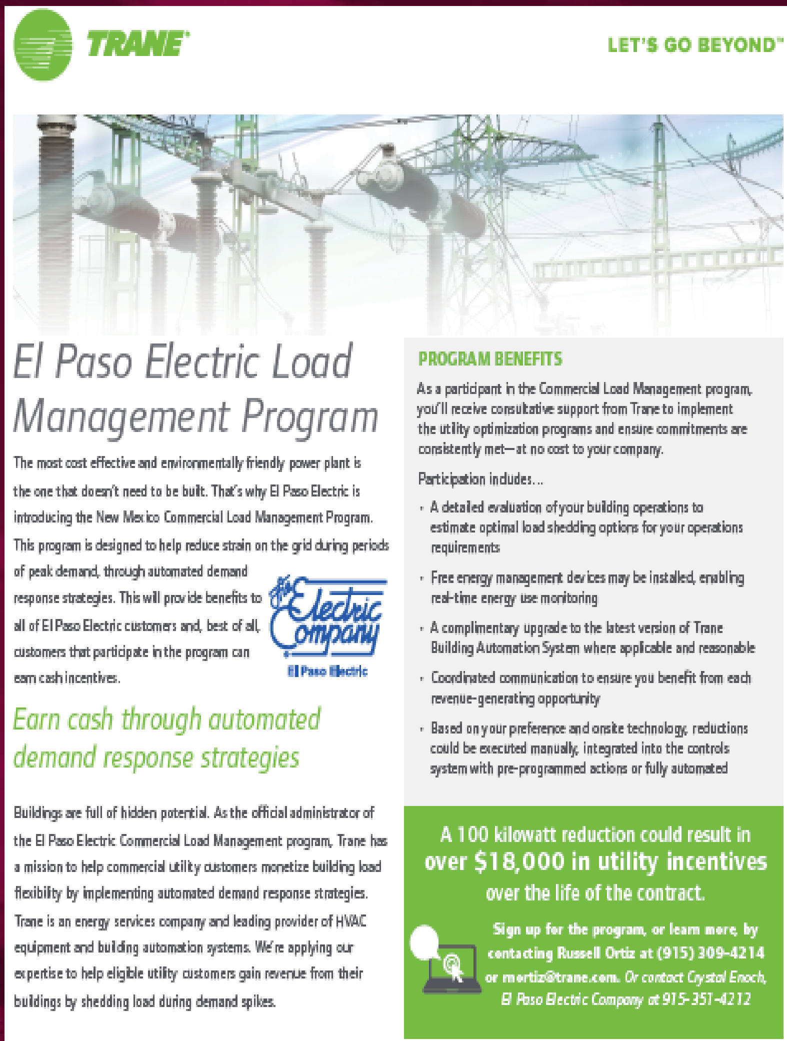
Utility Provider Load Management Programs


TRANE
LET'S GO BEYOND™

El Paso Electric Load Management Program

The most cost effective and environmentally friendly power plant is the one that doesn't need to be built. That's why El Paso Electric is introducing the New Mexico Commercial Load Management Program. This program is designed to help reduce strain on the grid during periods of peak demand, through automated demand response strategies. This will provide benefits to all of El Paso Electric customers and, best of all, customers that participate in the program can earn cash incentives.

The Electric Company
El Paso Electric

Earn cash through automated demand response strategies

Buildings are full of hidden potential. As the official administrator of the El Paso Electric Commercial Load Management program, Trane has a mission to help commercial utility customers monetize building load flexibility by implementing automated demand response strategies. Trane is an energy services company and leading provider of HVAC equipment and building automation systems. We're applying our expertise to help eligible utility customers gain revenue from their buildings by shedding load during demand spikes.

PROGRAM BENEFITS

As a participant in the Commercial Load Management program, you'll receive consultative support from Trane to implement the utility optimization programs and ensure commitments are consistently met—at no cost to your company.

Participation includes…

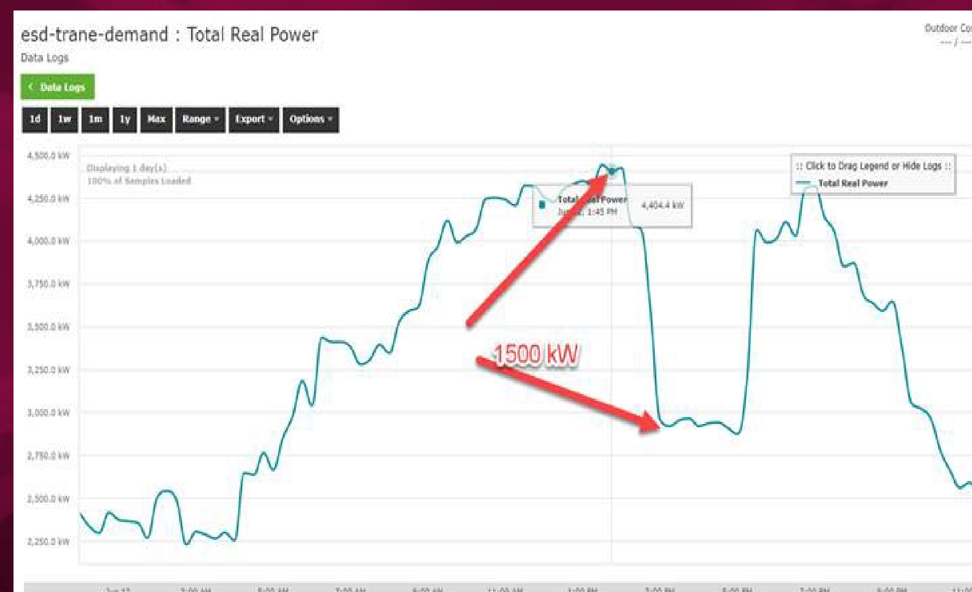
- A detailed evaluation of your building operations to estimate optimal load shedding options for your operations requirements
- Free energy management devices may be installed, enabling real-time energy use monitoring
- A complimentary upgrade to the latest version of Trane Building Automation System where applicable and reasonable
- Coordinated communication to ensure you benefit from each revenue-generating opportunity
- Based on your preference and onsite technology, reductions could be executed manually, integrated into the controls system with pre-programmed actions or fully automated

A 100 kilowatt reduction could result in over $18,000 in utility incentives over the life of the contract.

Sign up for the program, or learn more, by contacting Russell Ortiz at (915) 309-4214 or rortiz@trane.com. Or contact Crystal Enoch, El Paso Electric Company at 915-351-4212

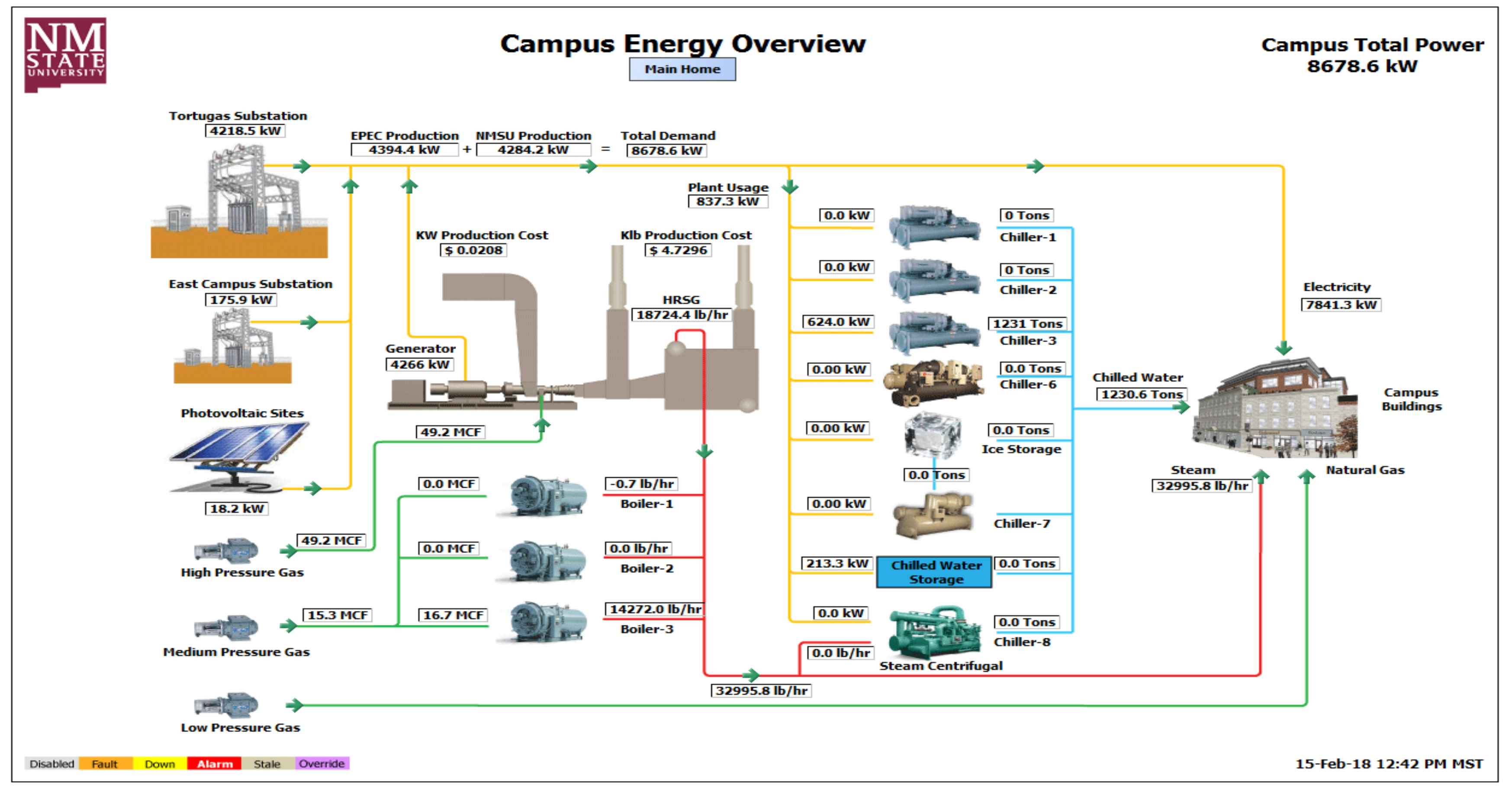
El Paso Electric program pays $40/kw when a load shed event is requested.

NMSU is on track to receive approximately $110,000 in rebates after year 3 of a 5-year program.



Energy Management System Investment

Capital Planning should include investments in smart metering technology and energy management platforms in order to collect and analyze energy data. NMSU has realized $18.5M dollars in avoided energy costs and rebate programs since 2014 implementation.



Public Facing KPI Dashboards

ELECTRIC CONSUMPTION, PRODUCTION AND COST

FACILITIES SERVICES UTILITIES PLANT

Adjusted Purchased KWH

Total Annual Cost

Data Last Updated: 11/6/2023 3:13:08 PM | Privacy Policy

NOTE: Solar KWH included beginning June 2022

Measure Owner: Patrick Chavez/Lorraine Silva

Measure Description: Purchased kilowatts per hour by each **fiscal year** and total electricity costs – NMSU produces approximately 50% of total campus usage and purchases the other 50% from El Paso Electric Company. Measure assists in manage consumption.

Formula: Expenses and usage directly from El Paso Electric billed costs.

Target:

Analysis/Discussion: Illustrates purchased KWH have declined as a result of energy savings initiatives over the last decade, including the performance contract with Ameresco. Note: other initiatives to be provided at a later date.

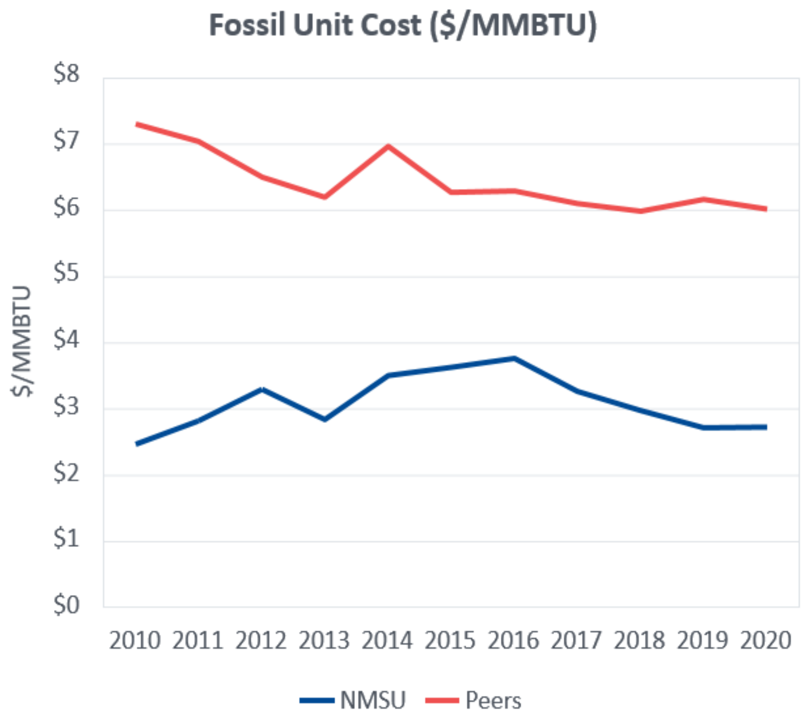
Action/Next Steps: As campus resumes to pre-pandemic activity levels systematic decisions will continue to be evaluated to determine whether to maintain increased levels of outside air intake on the HVAC systems for air quality due to its impact on energy consumption.

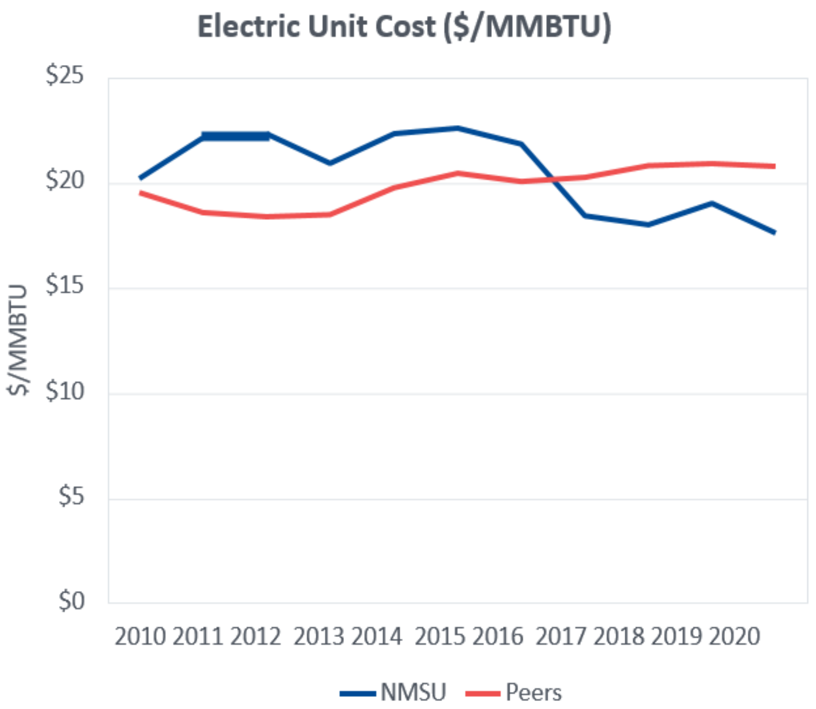
Updated: 10-25-22

Utility Provider Rate Negotiations

Energy Unit Cost by Fuel Type

Unit costs help NMSU to control total utility spend





GORDIAN

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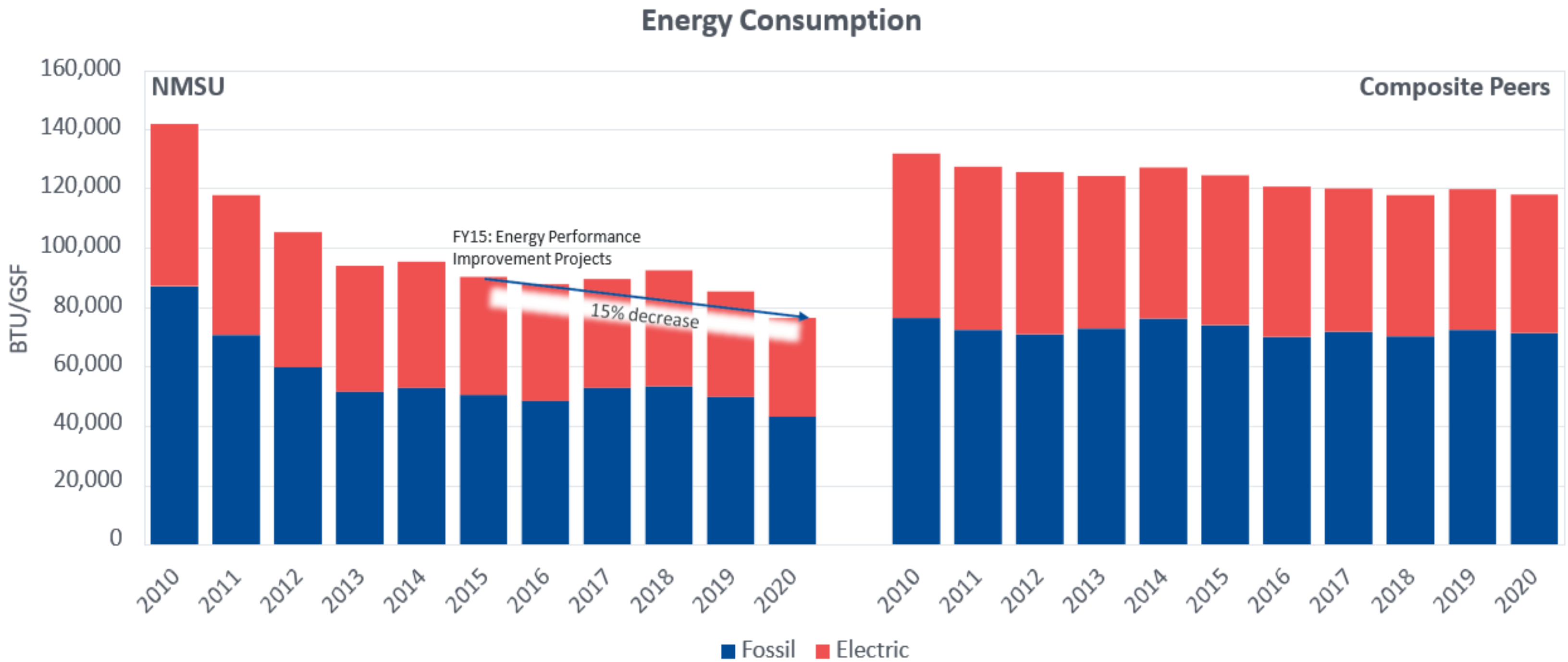
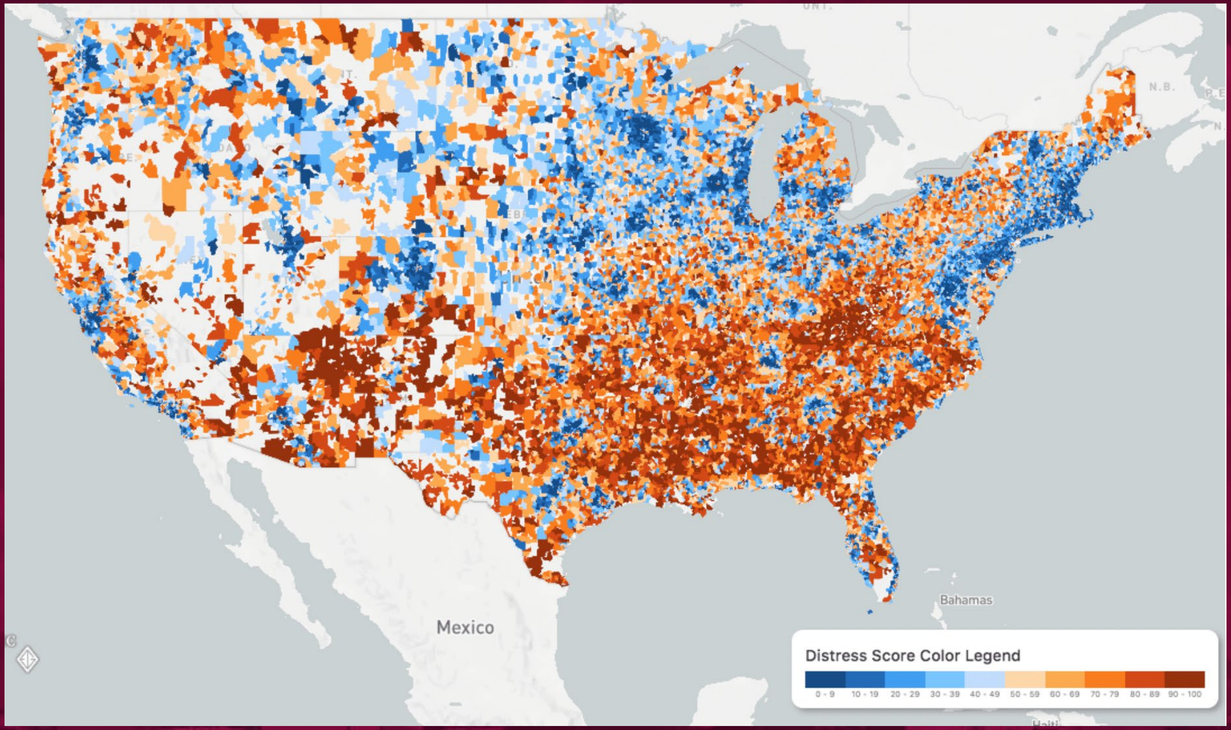
Building Energy Per Gross Square Feet

Energy Consumption Remains Lower



Opportunity Zones & Tax Increment Districts

Over 13,000 elementary or secondary public schools are located in opportunity zones. Qualified Opportunity Zone funds could be tapped into via Public Private Partnerships to make investments toward modernizing schools. Tax Increment Districts afford the opportunity to work with the area municipalities to fund infrastructure development.



Source: Economic Innovation Group (2018 Distressed Community Index)

Funding Mechanisms to Investigate

- School Internal Funds (Student Fees, Endowments, Revolving Funds)
- State Appropriations (General Obligation Bonds, Severance Tax Bonds, State Building Replacement & Renewal Funds)
- State Elected Official Special Interest Project Funds
- Federal (Grants/Relief/Research/Inflation Reduction Act)
- Federal Partnerships (NREL/DOE/USDA/Sandia Labs, Los Alamos National Labs)
- Debt Services (ESCO Energy Performance Contracts, Public Private Partnerships, State Finance Authority)
- Corporate Investors (Opportunity Zones)
- Tax Increment District/Financing (TID/TIF)
- NMSU 501c3 Non-profit creation (NMSU Arrowhead Center, NMSU Aggie Development)

*Funding considerations available in New Mexico

Some Additional Thoughts

- How much energy is enough? (Now with AI)
- Reduction in consumption?
- Connection to quality of life
- Appropriate technology (appropriate construction)
- Externalized costs

*Funding considerations available in New Mexico

Contact Information

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Role of Schools in Climate Change & Energy Transition

Todd Olinsky-Paul
Senior Project Director
Clean Energy States Alliance / Clean Energy Group
50 State St. Montpelier VT

APA Public Schools and Communities Division
November 9, 2023

Clean Energy Group
Innovation in Finance, Technology & Policy

Clean Energy States Alliance

About CESA

Celebrating 20 Years of State Leadership

20 CleanEnergy States Alliance

The Clean Energy States Alliance (CESA) is a national, nonprofit coalition of public agencies and organizations working together to advance clean energy.

CESA members—mostly state agencies—include many of the most innovative, successful, and influential public funders of clean energy initiatives in the country.

About CEG

Clean Energy Group

Affordable, reliable, clean energy for all.

Climate Resilience and Community Health

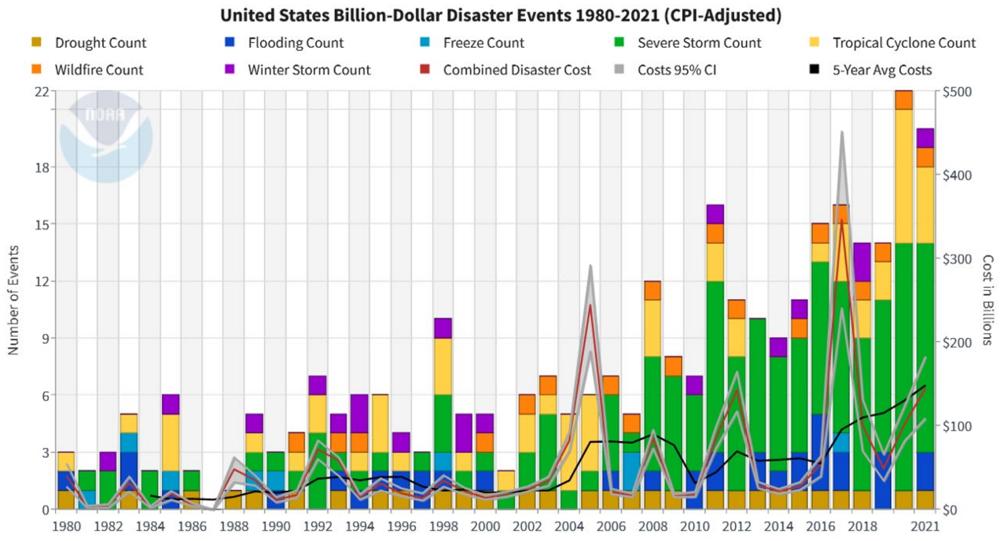
Distributed Energy Access and Equity

Energy Storage and Flexible Demand

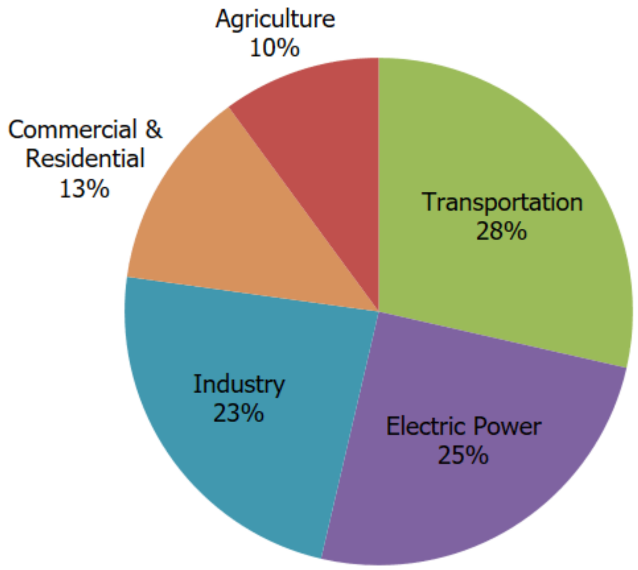
Fossil Fuel Replacement

Climate and decarbonization

US Billion-Dollar Disaster Events 1980-2021 (NOAA National Centers for Environmental Information (NCEI))



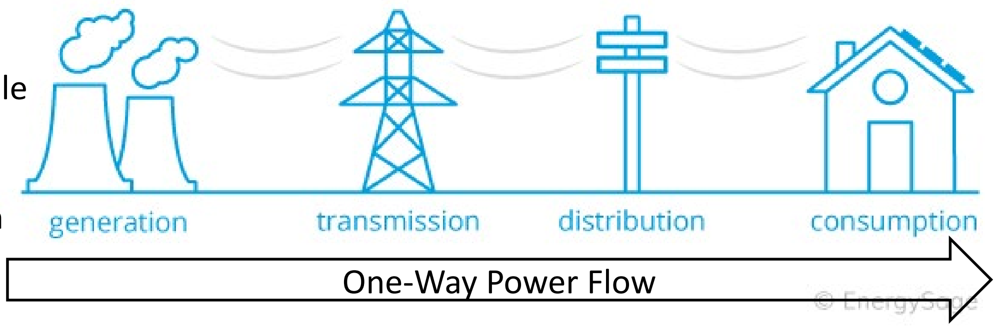
Total U.S. Greenhouse Gas Emissions by Economic Sector in 2021 (US EPA)



Why Storage?

Old Power Grid (world's biggest just-in-time delivery system)

Dispatchable (fossil and nuclear) Generation

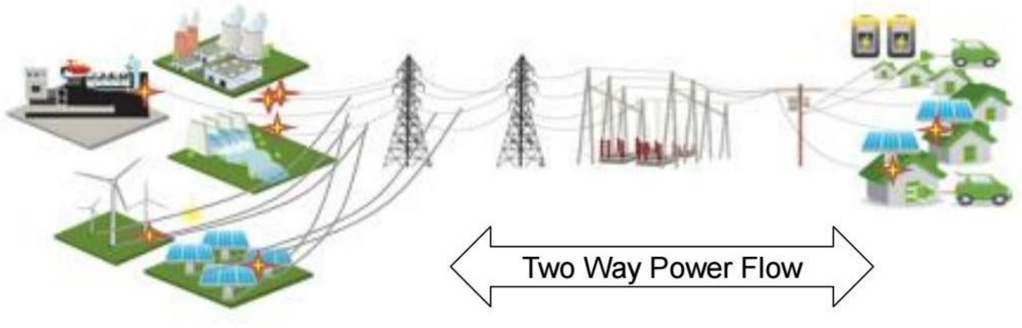


Variable Demand

- One-way power flow
- Generation must equal consumption in real time
- Overbuilt to accommodate peak demand
- Cannot handle too much variable (renewable) or distributed generation
- Vulnerable to outages

Modern Power Grid (decentralized, flexible, resilient, highly variable)

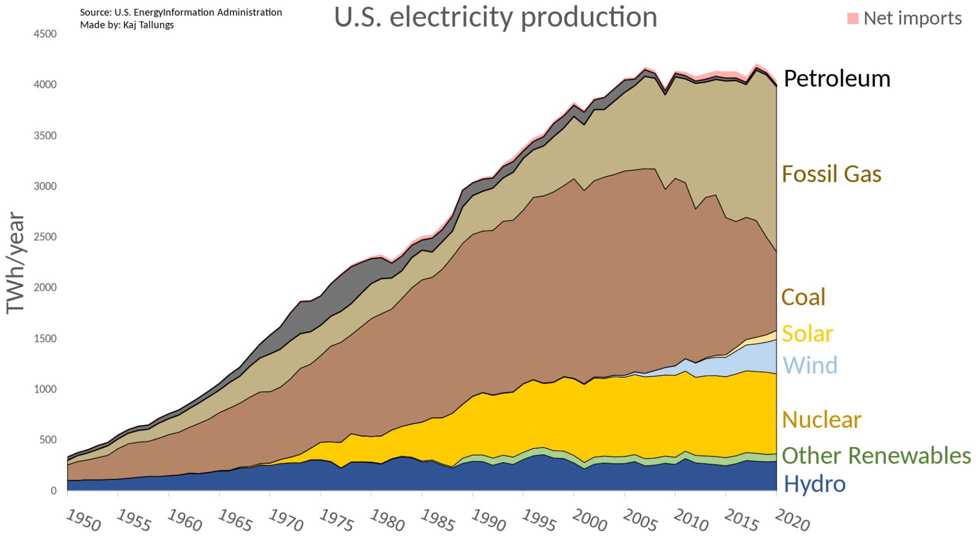
Dispatchabl
e
Generation
-AND-
Variable
(renewable)
Generation

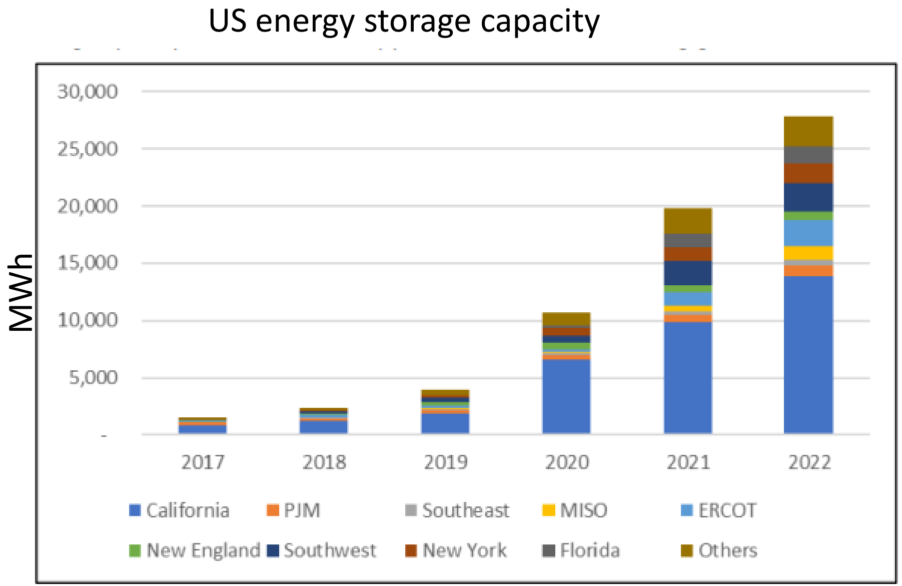


Variable
Demand
-AND-
Variable
Generation

We are good at storing everything… except electricity!

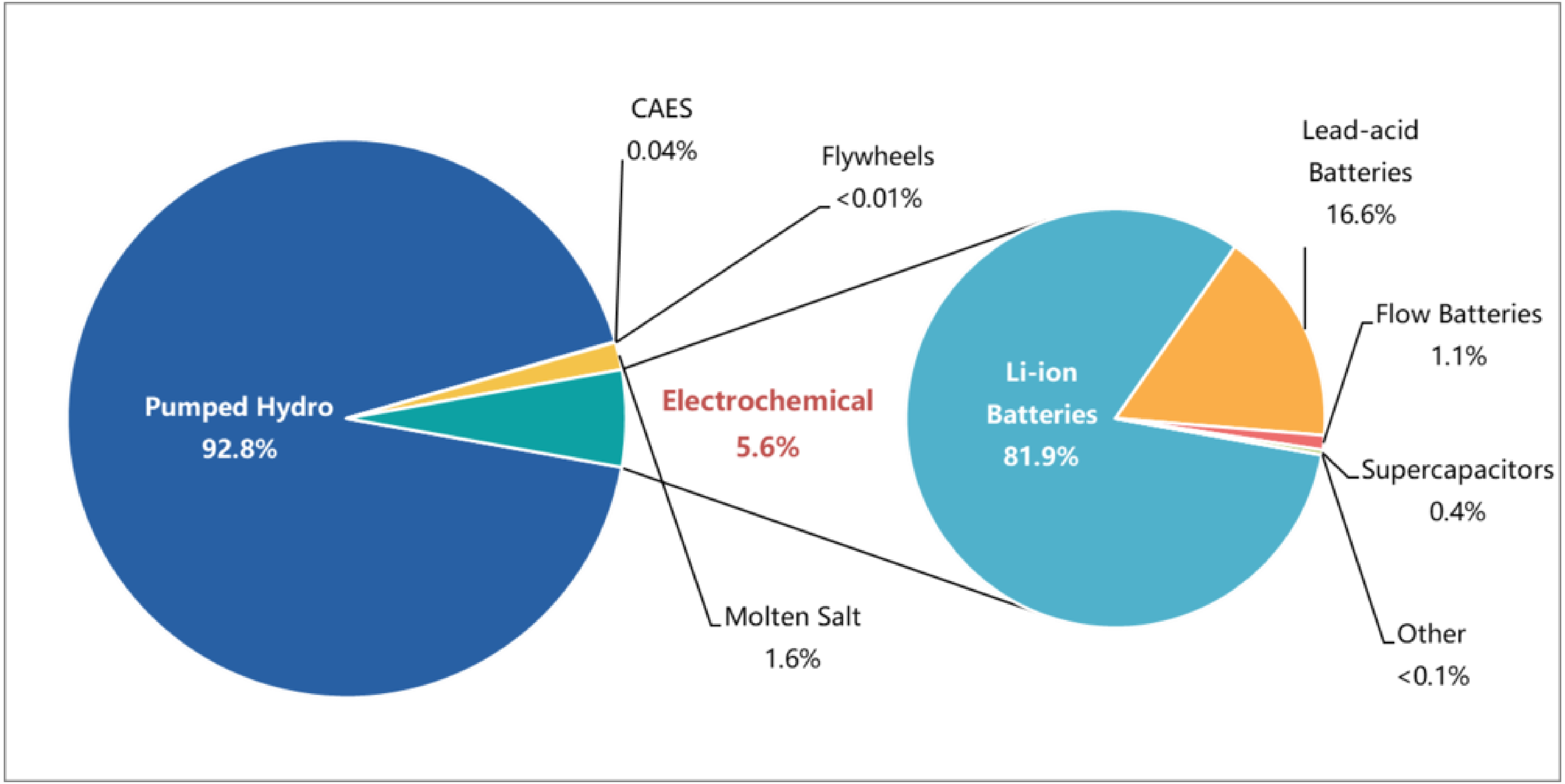
US electric generation vs energy storage capacity





1 Terawatt = 1 million Megawatts

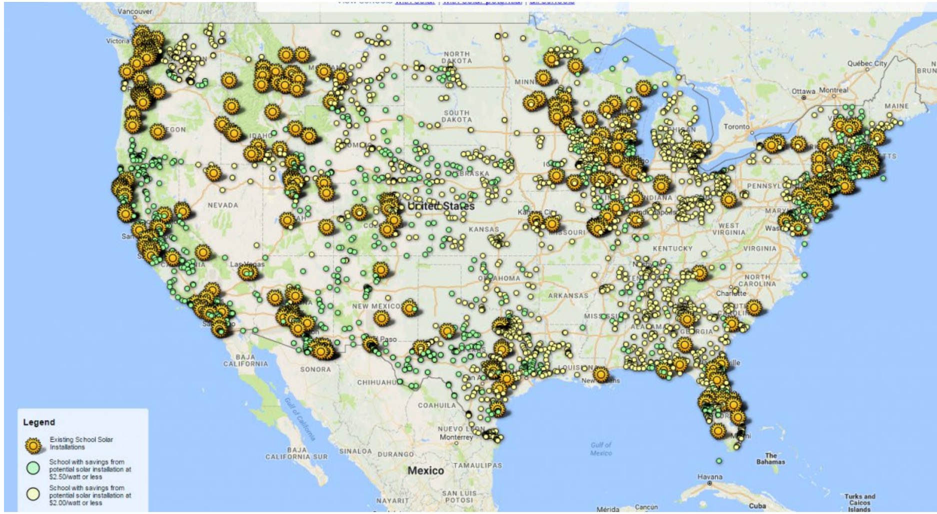
Global operational energy storage (MW) 2020



Role of Schools and Universities

- Why storage at schools?
  - Resilience (role as community emergency shelters)
  - Demand charge management (APS example)

- Schools with solar
  - More than 8,400 public and private schools serving 6 million students — or about 1 in 10 institutions nationwide — are now using solar power (source: Generation180)

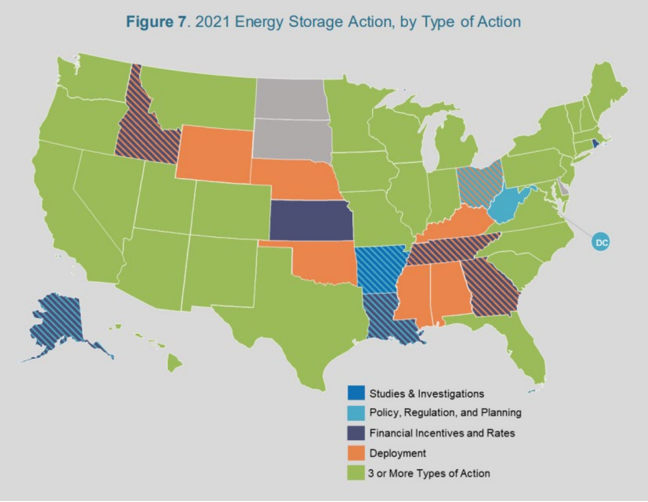


Source: SEIA/Solar Foundation

- Schools with storage?
  - The SunSmart E-Shelter Schools program was the first mass deployment of solar with battery back-up on schools that double as emergency shelters in the United States. More than 115 small solar+storage systems are installed at emergency shelter schools throughout Florida.

State policy tools for energy storage

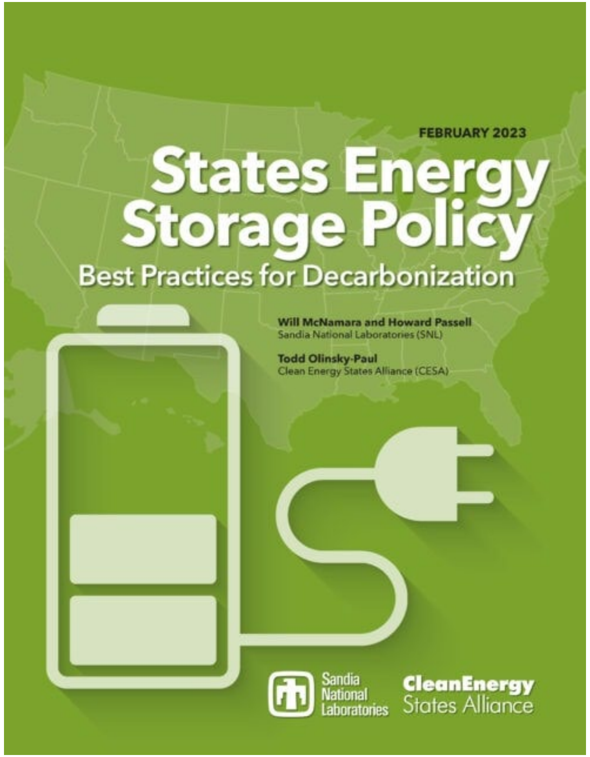
1. Studies and planning
2. Grants (demonstration projects and pilots)
3. Longer-term policy and programs
    a. Utility mandates/procurement targets
        i. Storage procurement targets
        ii. Storage in renewable portfolio standards (RPS)
        iii. Clean peak standards
    b. Customer incentives (rebates)
    c. Storage adders in renewable incentive programs
    d. Storage incentives in energy efficiency programs
    e. State tax incentives
    f. Financing/clea
    g. Regulatory refo
    h. Market creatio
    i. Removal of bar
    j. Technical assist

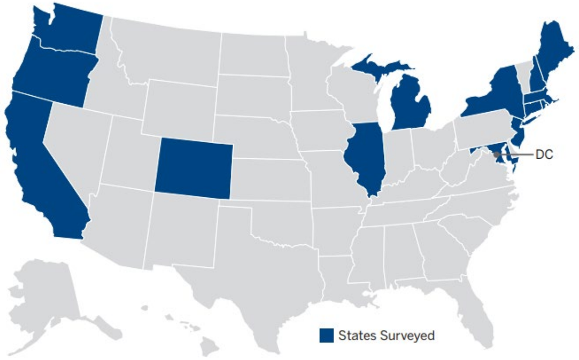


NOTE: State policy TOOLS should support state policy GOALS!

New Report by CESA and Sandia National Laboratories

The report is based on our 2022 survey of leading decarbonization states. The report provides insights into key state energy storage policy priorities and challenges being encountered by these states.





Surveyed States:

California	Maryland
Colorado	Michigan
Connecticut	New Jersey
District of Columbia	New Hampshire
Illinois	New York
Maine	Oregon
Massachusetts	Rhode Island
	Washington

Many more reports available at https://www.cleanegroup.org/publications-library/

State energy storage policy: current status

- 22 states (plus the District of Columbia) have adopted decarbonization goals, however, not all have adopted policies to advance energy storage deployment
- About 15 states have adopted energy storage policies (by contrast, 36 states and the District of Columbia have a renewable portfolio standard and nearly every state has an energy efficiency program). State energy storage policies mostly fall into three policy types:
    - Utility **procurement mandates, targets or goals** (11 states have adopted to date: CA, OR, NV, IL, VA, NJ, NY, CT, MA, ME, and MD)
    - Financial **incentives / subsidies** (CA, MD, NJ, NY)
    - Energy storage **demonstration projects** (MA, MD, NY, UT, WA)
- Requiring storage in **utility IRPs** is also becoming more common
- Policy approach is far from homogenous—i.e., vertically integrated versus restructured markets (one size does NOT fit all)

State energy storage policy challenges

- **Aligning storage deployment to scale** within the state's decarbonization timeframe (including electrification of transportation and building sectors)
- **Interconnection & permitting processes**: Delays & questions about approval authority, grid hosting capacity, cost allocation, safety
- **Lack of valuation metrics** – what are storage services worth? Where are the price signals?
- **Lack of clarity among policymakers** as to which use cases are best suited for storage, and/or the belief that storage will be needed in the future (but not today)
- **Immature/Nonexistent markets** for many storage services

State energy storage policy opportunities

- **Energy storage equity policies:** equity provisions and income-eligible incentives should be included in state energy storage programs and policy *from the start*
- **Creation of diverse, open, equitable markets:** markets must not only allow storage to participate but must also allow monetization of a broad range of storage services
- **Virtual Power Plants (VPP):** Performance incentives coupled with DERMS* should allow utilities and third parties to aggregate and dispatch distributed resources in concert to deliver local grid services and cost savings
- **Strategic program design**: States should adopt programs that require and/or incentivize the adoption of energy storage for specific applications that support state clean energy goals (decarbonization, resilience/grid reliability, renewables integration, peaker plant retirements, etc) – not just storage for its own sake

*DERMS = Distributed Energy Resource Management Systems

Thank You!

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Clean Energy Group
Innovation in Finance, Technology & Policy

Clean Energy States Alliance

ALBUQUERQUE PUBLIC SCHOOLS

Capital Master Plan

QUESTIONS & ANSWERS

https://www.aps.edu/capital-master-plan

Saturday, October 16, 2024

WIJENJE@aps.edu