IRP Implementation Plan Status and Update

October 5, 2022

Power Supply

LOS ALAMOS

WECC Recommends Entities to take Action to Mitigate Risks

NERC and WECC assessments highlight the risks of loss of load due to declining reserve margin, increasing load and resource variability.

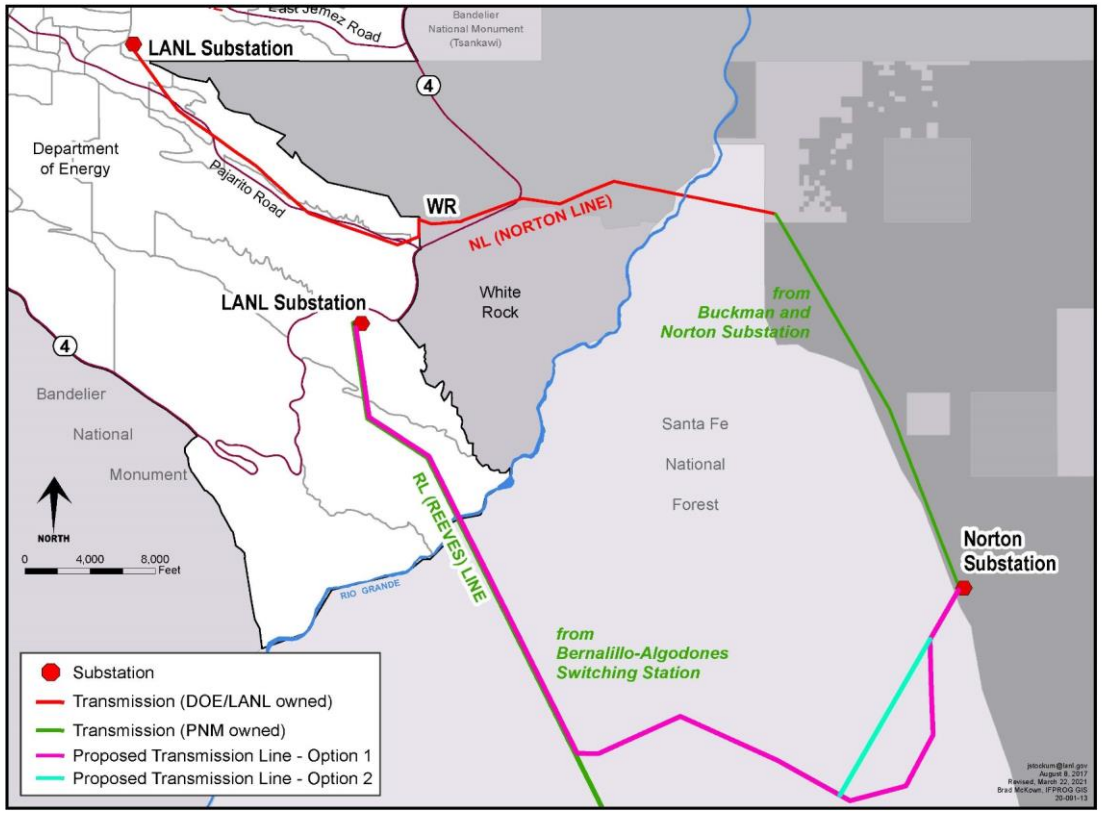
- Los Alamos County's Balancing Authority (BA) PNM is in the Southwest Reserve Sharing Group (SRSG), one of the three reserve sharing groups in WECC in addition to the California Independent System Operator (CAISO), and the Northwest Power Pool (NWPP).
- The North American Electric Reliability Corporation (NERC)'s 2021 Long-term Reliability Assessment has shown that CAISO, NWPP, and SRSG all face potential load loss hours in the near term (2022 - 2024).
- The 2021 Western Assessment of Resource Adequacy (WARA) concludes that resource adequacy risks to reliability are likely to increase over the next 10 years. WECC recommends entities take immediate action to mitigate near-term risks and prevent long-term risks.
- Climate change and extreme weather (cold snaps, high heat, drought, etc.) lead to increasing demand volatility and resource variability.
- Transportation electrification and Distributed Energy Resources (DERs) will continue to modify load pattern and levels.
- Increasing Variable Energy Resources (VERs), coupled with large planned baseload resource retirements contribute to declining reserve margins and pose supply-side challenges.
  - Nuclear (Diablo Canyon, 2.3 GW by 2024 - 2025)
  - Coal-fired generation resources (3.5 GW by 2026)
  - Coastal gas-fired generation resources (3 GW in 2024-2029) due to once-through cooling regulation.
- Potential Aliso Canyon closure could further stress the power grid.

WECC Reserve Sharing Groups

LAPP Transmission Constraints and Expansion Options

- The IRP models the LAPP transmission capacity of 116 MW during 2022 - June 2028, and 200 MW (July 2028 - 2041).
- The County has a Network Integrated Transmission Service Agreement (NITSA) with PNM.
- The County also has transmission service agreements with Jemez Electric co-op and NORA Electric Co-op to deliver the power from the hydroelectric facilities into the LAC load.
- The County also has a 10 MW firm point to point transmission service agreement from Ault to San Juan for the delivery of the LRS power.
- LANL owns and operates approximately 20 miles of 115kV transmission line with two interconnections with the PNM BA. The substations are referred to as the Norton and the Southern Technical Area (STA) substations. The community of White Rock is served from a substation of the LANL 115kV transmission line. Los Alamos Town-site is served from a LANL substation inside Tech Area, TA-3.
- The LAPP transmission capacity is currently at 116 MW and will expand to 200 MW once the EPCU project is completed in July 2028.

LAPP Transmission Expansion Options



Supply Side Technology Options

Types		Resources	Considerations
Baseload	Thermal	Combined Cycle (CC)	Inconsistent with carbon neutral goal
		Laramie River Station (LRS)	Exit when economical, no later than 2042[1]
	Nuclear	Carbon Free Power Project (CFPP)	Subscription levels: 0, 8, 36 MW
	Hybrid	ATC PPA with 28% Renewable[2]	Near term bridge PPA to replace San Juan Unit 4
	Firm Renewables	Solar + Wind	Uniper contract + more
		Solar + Battery	Solar weather dependent
		Geothermal	High cost, opportunistic and geography dependent
		Fuel Cells	< 5 MW size, implemented in other national labs
Peaking	Thermal	Reciprocating Internal Combustion Engine (RICE)	Explore in IRP for dispatchability and balancing
		Simple Cycle Gas Turbine (SCGT)	Explore in IRP for dispatchability and balancing
	Storage	Pumped Hydro	Cost and ownership of water rights; Opportunistic and geography dependent
		Lithium-ion Battery	Duration considerations
		Vanadium Redox Flow Battery	High-cost; lack of actual projects development
Intermittent	Renewables	Solar (onsite or offsite)	Weather dependent
		Onshore Wind	Weather dependent; transmission constraints

Portfolios Construction Summary: Base Case

- Under the Base Case, the cumulative new builds range from 561 MW (Portfolio 12) to 968 MW (Portfolio 7).
- All portfolios satisfy LAC's carbon neutral and LANL's renewable requirements.
- Wind builds are assumed to be sourced in resource rich regions such as the east of the state and will require transmission capacity.

Portfolio Composition: LAPP Cumulative New Builds during 2022 - 2041		Base Case							
		Avg PRM	BESS	PV	Wind	GT	RICE	SMR	**Total**
		%	MW	MW	MW	MW	MW	MW	**MW**
P1	SMR (8)+ solar + wind + storage	4%	55	380	135	0	0	8	**578**
P2	SMR (8) + solar + wind	4%	0	605	200	0	0	8	**813**
P3	solar + wind + storage	4%	70	370	145	0	0	0	**585**
P4	SMR (8) + solar + wind + SCGT	4%	0	480	180	24	0	8	**692**
P5	SMR (8) + solar + wind + RICE	4%	0	500	185	0	18	8	**711**
P6	SMR (8) + solar + wind + storage	14%	65	435	160	0	0	8	**668**
P7	SMR (8) + solar + wind	14%	0	760	200	0	0	8	**968**
P8	solar + wind + storage	14%	90	365	170	0	0	0	**625**
P9	SMR (8) + solar + wind + SCGT	14%	0	635	190	24	0	8	**857**
P10	SMR (8) + solar + wind + RICE	15%	0	650	200	0	18	8	**876**
P11	SMR (36) + solar + wind + RICE	4%	0	420	145	0	18	36	**619**
P12	SMR (36) + solar + wind + storage	4%	35	350	140	0	0	36	**561**

Min	Max
561	**968**
P12	**P7**

Note:
1) Portfolio 1, 2, 3, 4, 5, 11, and 12 has average Planning Reserve Margin of 4 percent during 2023 - 2041.
2) Portfolio 6, 7, 8, 9, and 10 have average Planning Reserve Margin of 14- 15 percent during 2023 - 2041.
3) Battery storage builds have the flexibility to charge from solar (as a hybrid project) or from the grid.

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IRP Results Summary

- Preferred Resources Identified
  - Solar
  - Wind
  - Energy Storage
  - CFPP
  - Simple Cycle Gas Turbine/Reciprocating Internal Combustion Engine (RICE) generators (as illustrated in the Executive Summary)
- Pivot Strategies to handle resource acquisition challenges

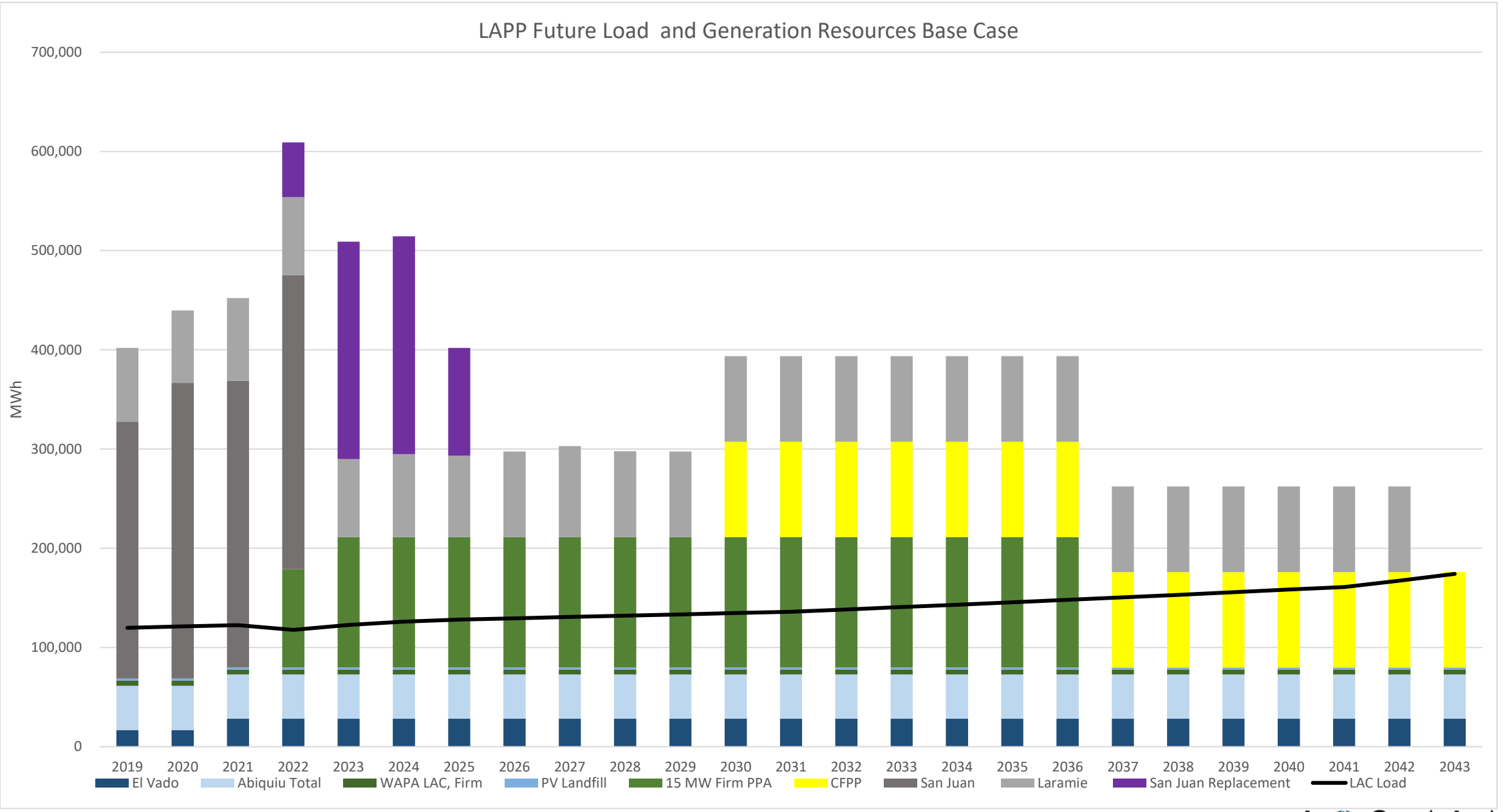
LAC Resource Position

- LAC Annual Load – FY2021 118,502 MWh Annually
- LAC resources
  - LRS 60,400
  - Uniper 15 MW PPA, firming 31,536
  - Abiquiu 25,226
  - El Vado 13,747
  - 1 MW Solar PV 586
  - WAPA Hydro 5,095
  - Uniper 15 MW PPA, Renewable 99,864

  Total Resource Energy 236,454 MWh

  Total carbon free energy 144,518 MWh

  Net Resource Energy (236,454 – 118,502 = 117,952 MWh)
- LAC approximately 100% oversupplied


LAPP Future Load and Generation Resources Base Case
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
MWh
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
2043
El Vado
Abiquiu Total
WAPA LAC, Firm
PV Landfill
15 MW Firm PPA
CFPP
San Juan
Laramie
San Juan Replacement
LAC Load

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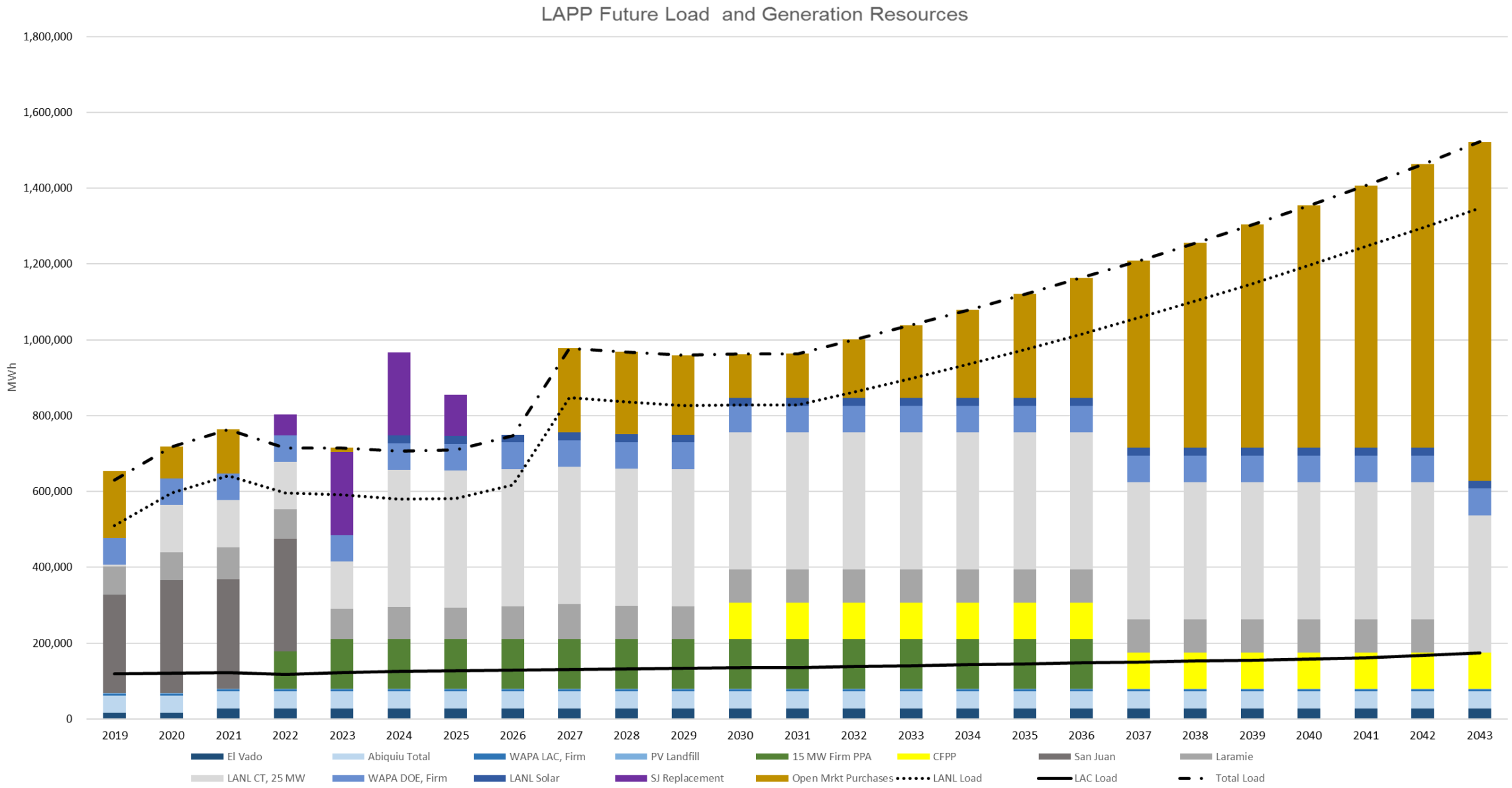
DOE-LANL Resource Position

- LANL Annual Load – FY2021 410,404 MWh
- LANL Resources - FY2021
  - Combustion Turbine 120,000
  - DOE-LANL WAPA Hydro 69,973
  - LANL 10 MW onsite solar 24% CF 21,024

    Total Resource Energy 210,997 MWh

    Total carbon free energy 90,997 MWh

    Net Resource Energy (210,997 – 410,404 = -199,407 MWh)
- Approximately 50% under supplied


LAPP Future Load and Generation Resources
MWh
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
2019
2020
2021
2022
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2038
2039
2040
2041
2042
2043
El Vado
Abiquiu Total
WAPA LAC, Firm
PV Landfill
15 MW Firm PPA
CFPP
San Juan
Laramie
LANL CT, 25 MW
WAPA DOE, Firm
LANL Solar
SJ Replacement
Open Mrkt Purchases
LANL Load
LAC Load
Total Load

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Implementation Plan Key Dates

- Los Alamos Power Pool (LAPP) May 12, 2022, conducted a Special Meeting to discuss implementation
  - LAPP has solicited DOE/NNSA input on implementation plan
- Staff presented the Draft Implementation Plan to BPU during a working Session on June 1, 2022
  - Electric Production Staff seeking BPU input on implementation plan
  - Staff will continue working with BPU and LAPP for final implementation
- Completion of Interagency-Agreement (IA) Quarter 4 2022
- Post 2025 ECA Tentative Agreement July 2023
- IRP Updated in 2025 under new contract

Implementation Plan Key Dates Cont.

- Carbon Free Power Project, Sept. – Nov. 2022
  - Class 3 estimate with decision point on Combined Operating License Application (COLA) submittal to Nuclear Regulatory Commission (NRC)
- Consider 2-year extension of the 25 MW Uniper resource will give the operation time to acquire and construct resources per the IRP Implementation plan
  - New builds will be difficult to have online by 2025

Agreements

- Post 2025 Electric Coordination Agreement (ECA) contract renewal
- DOE Interagency Agreement (IA)
- a. IA between DOE-NNSA and DOE-WAPA allows for contracts up to 30 years using WAPA authority
  - b. WAPA currently procures the Power Purchase Agreement for Sandia/Kirtland
  - c. Los Alamos National Laboratory and Sandia/Kirtland in resource acquisition - long term PPA (Like Uniper) have economies of scale for carbon-free energy, cost effective etc. Sandia just started conceptual (50-100 MW) design feasibility solar tower (concentrated solar with thermal storage). No current timeline
    - Sandia/Kirtland's Power Purchase Agreement (PPA)-Current Contract expires at end of 2023.
    - Contract responses are valuable to all of us for a glimpse of the Market.

Reliability

1. Prudent Utility Practice and PNM's expectations on balancing loads
   - COMPLIANCE (FERC, NERC, WECC, PNM BA)
2. Intermittency/Balancing generation to load
   1. Firm Energy may be required to be delivered into PNM's Balancing Area. We are running this to ground with PNM
   2. Firming of intermittent resources may add significant costs.
3. Timing of Production and load profile, resource adequacy

Operational Impacts

- Staffing
  - More Renewables require more name plate capacity
    - Current Real time Operation will not be able to handle the Marketing required for managing the over supply
    - Need for Additional full-time staff
- Third party support
  - Needed to maintain reliable, and economical operations

DOE-NNSA Feedback

May 12 ECA Mtg.

1. Supportive of 2-year Extension of 25 MW PPA with Uniper
2. Not interested in ownership of renewables, PPA preference
3. High value on reliability
4. In support of Interim transition resource, i.e., gas thermal unit
5. Finalizing Interagency Agreement
6. Awaiting Climate Action Plan Implementation instructions from Biden Admin.
7. Renewable Solar PV (10-20 MW) to fit daytime load curve

BPU Next Steps

- Resource Acquisition
  - What contractual agreements are required for LAC to procure resources on DOE-NNSA behalf?
  - Continue to explore resource options Review and update Strategic Plans for Electrical Energy Resources
- Review and update Strategic Plans for Distributed Energy Resources and Rate Structure
- Complete BPU plans for the Los Alamos Resiliency Energy & Sustainability (LARES) Task force recommendations

RFI-Results

On July 11th 2022, Staff issued a Request for 30 MW of 4 hour BESS, 70 MW of PV, and 50 MW of Wind

- The RFI was sent to 20 different parties and was forwarded by some others
  - Los Alamos received 3 responses
    - 1st was a kind response stating that they currently didn't have any projects but would like us to consider them in the future.
    - I will discuss the other options on the next two slides
- No offers for storage or wind

RFI-Results Continued

- The 2nd response was an option for Hydrogen Generation at a retired coal plant in PNM's BA- Proposed on-line date of 12/31/25 for 185 MW of dispatchable resource
  - Conditions Precedent
    - Sale of the output of the facility on term acceptable to EH2;
    - Completion of the onsite decarbonized hydrogen production facility construction and conversion of the power plant;
    - Securing the required natural gas to produce hydrogen;
    - Execution of a large generator interconnection agreement with PNM (or another utility); and
    - EPA permitting for carbon sequestration and other permitting (state and federal) requirements.
  - Pricing
    - Capacity-$10/kW-month around $14.00/MWh
    - Energy- $35-$50/MWh (varies with price of gas)
    - As Proposed Total Cost of $49 to $64.00 per MWh
  - Staff Recommendation
    - We will keep an eye on development of this project, but at this stage we cannot commit financially
      - Gas derived Hydrogen has pricing volatility
      - Conditions precedent of onsite decarbonized hydrogen production facility is a high bar to climb
    - The IRP recommended 8 to 36 MW of dispatchable base load power

RFI-Results Continued

- The 3rd response was two tiered with a Solar Site on PNM System
  - The response contained one option for PPA with Firming and the 2nd tier/option is a pre-paid ownership with a firm product delivered by vendor
  - Firming option for both options are the same
    - HL- $76.50/MWh
    - LL - $61.37/MWh

3rd Response Continued

- 1st Option- Traditional PPA with Firming 50-150MW available 7/1/2025
  - PV $42.50/MWh (Renewable Energy Only) for 15 years
    - Can be ATC or 7x16HL product (Pricing dependent on choices)
    - Listed Resources in Northern NM all in PNM's balancing Area
- 2nd Option- LAC Pre-Pay Equity Ownership 50-150MW available 7/1/2025
  - Utilize Municipal debt to pre-pay equity ownership, while 3rd party is the Tax equity partner
    - Can be ATC or 7x16HL (Pricing dependent on choices)
    - Adder to PV Price to HL/LL = TBD$/MWh (only for non-prepay option)
    - ~$9.00-$15.00/MWh but will be known at final build and duration of 3rd Party Ownership
- Both options are firmed using market pricing (with carbon producing resources)
- Staff Recommendations
  - Seek clarification on the Inflation Reduction Act changes because of PTCs and ITCs, then seek new offers
  - Availability of New Solar has been delayed due to supply chain issues
  - Pursue RFP for PV and battery storage on LANL site first, since is will be a carbon-free resource

Recommendations / Pivot Strategies

1. Continue to work with DOE on Interagency Agreement and post 2025 ECA
2. Pursue stand alone contract with DOE-NNSA for 2-year PPA extension with price negotiation of UNIPER 25 MW Block, 2025 to 2027 buys two years to procure replacement resources due to current constraints
   a) Building any new resources prior to 2027 in this environment will be difficult
   b) Pool Considerations
      i. If the Pool executes an extension now, pricing will be more favorable due to the timing and market dynamics.
      ii. Transition plan with UNIPER and DOE to ensure off take
3. Issue RFI for indicative pricing on carbon free resources with storage with all condition's precedent noted

Recommendations / Pivot Strategies

4. Issue RFI, then RFP if favorable responses on RFI
5. Further Investigate thermal resource options
6. Perform economic analysis on gas unit with payback period and including a 30% hydrogen fuel supply option
7. Update and Amend BPU's Strategic Plan and IRP
8. Update load forecasts and timing
9. Monitor viability of CFPP and make decision on continued participation

Update to Recommendations

- Interagency Agreement
  - The Interagency Agreement is still being worked through with WAPA very close to being concluded
  - A recent memo was released that gives the DOE/NNSA the opportunity to execute “10 Year contracts for CFE [Carbon Pollution-Free Electricity] may include options beyond the initial 10-year term…utility services contacts that may include option periods of up to additional 10-years…” and gives the Contracting authorities the ability to score RFP on Carbon Pollution-Free Energy attributes rather than just cost.
- Pursue PV on LANL Site

On-Site PV

- The IRP included 8-10MWs of PV on LANL Site
  - DOE/NNSA has approached LAC with a proposal
    - DOE/NNSA is interested in leasing land to LAC with the intention of LAC developing a PV site
  - LAC is very interested in this proposal and completed a site-walkdown

Other Resource Options

- Geothermal through UAMPS – RFP in November, results end of the year
  - 5MW LAC entitlement share, 80MW project total
- Natural Gas Plant with hydrogen option - RICE and/or Simple Cycle
  - Shared Ownership
  - Capacity and Call Options
- Keeping an eye on transmission expansion for potential wind

Much has changed in the past month

- IRA-Inflation Reduction Act
  - New investment tax credits (ITC) and production tax credit (PTC), extended through 2032+ pending GHG levels
  - New PV PTC, ≤ $26 / MWh for 2022, could be more valuable than PV ITC
  - ITC 6% to 50% depending on project timing, capacity, other eligibility criteria
  - New stand-alone energy storage ITC, don’t need to charge from PV
  - Big changes could be coming for renewable energy and storage as developers adjust to the new project economics
  - Waiting for detailed Treasury Department & Internal Revenue Service guidance
  - Hardware procurement will challenge developers

Supply Constraint Delays

- New Solar is not available to come on-line until 2026-2027
  - Supplies for the PV site
  - Interconnection Agreements running very behind, may take 2+ years for completion

Operational Path Forward

- Continue search for Solar, Wind, BESS, and Thermal resources bearing in mind the new developments with the IRA.
- Continue to evaluate CFPP's viability
- Explore Partnerships with other entities
  - CREDA Members-due to aridification
  - Navajo Tribal Utility Authority and resource development