

State Water Project

Flexible Resources Study – SB49 Update



November 2021

Agenda

- Project Objectives, Strategic Need, SB-49
- Project Scope of Work and Schedule
- Opportunities and Challenges
- Interim Action Plan
- Next Steps



Flexible Resources Study- SB49

Project Objective Statement:

Identify, Plan, and Recommend specific SWP improvements and strategies that add sustainable operational flexibilities needed to meet future power market opportunities, challenges, and obligations.

SB 49- Energy: appliance standards and State Water Project assessment:

“This bill would require the Natural Resources Agency, in collaboration with the Energy Commission and the Department of Water Resources, to assess the opportunities and constraints for potential operational and structural upgrades to the State Water Project to aid California in achieving its climate and energy goals, and to provide associated recommendations consistent with specified purposes and California’s energy goals. The bill would require that the assessment and recommendations include specified elements, including recommendations for state, federal, and other applicable funding sources, as specified. The bill would require that the assessment and recommendations be provided to the appropriate policy committees of the Legislature before January 1, 2022.”

SWP Assessment Goals:

Assess SWP’s potential to increase its potential to provide grid reliability support, further help the state meet its clean energy goals by positioning the SWP to help integrate renewable resources, reduce greenhouse gas emissions, and support clean energy policies, while sustaining reliable SWP water deliveries.



Flexible Resources Study - SB49 Goals

SB49 Goals:

- Increase ability to provide grid reliability support and services
- Enable the Integrate of Renewable Resources
- Reduce overall Greenhouse Gas Emissions
- Support Clean Energy Policies implementation
- Provide recommendations for State and Federal Funding for specific elements



Flexible Resources Study- Benefits/Challenges

Flexible Resources Study - Benefits/Challenges Summary

Track No.	Track Description	Grid Reliability Benefits						Clean Energy Benefits			Challenges			
		Load Shifting	Peak Shaving	Energy Storage	Frequency Regulation Capacity	Resource Adequacy Capacity	Fast Ramping Resource	Increased Grid Responsiveness	GHG Emissions Reduction	Integration of Renewables	Reduces Reliance on Fossil Fuel Generation	Market Design Changes Needed	Power Market Volatility	Additional Funding Source Needed
1	Shaping SWP Load & Generation: Shaping of SWP load and generation helps reduce the Grid needs for fossil fuel generation and increases the utilization of renewable resources generation.	●	●	○		○	○	○	●	●	●			
2	Reoperations of select SWP Pumping Plants (Unrestricted): Existing SWP flexibility limits are assessed, and the needed system improvements to unleash constrained capacities by Civil, Electrical and Mechanical system setups will be identified.	●	●	○		○	○	○	●	●	●	○	○	●
3	Pumped Storage: This track models future potential of restoring pump back operations at Hyatt-Thermalito complex and investigates the needed improvements and retrofits to resolve constrained operations due to physical setup or operational and compliance challenges.	●	●	●	●	●	●	●	●	●			●	●
4	Integrating Battery Storage with Renewable Resources: Energy storage is being investigated to shift SWP load in some locations in lieu of physical storage to add more operational flexibility.	●	●	●	●	●	●	●	●	●		○	●	●
5	Retrofit of select pumping plants: Variable Speed Pumps: Exploring SWP capital investments and system retrofits through selectively integrating variable speed drives at SWP plants.		○		●	●	●	●	○	●	●	●	●	●
6	SWP Hydraulic and Transient Modeling, and Aqueduct Stability: Developing hydraulic and hydrodynamic models to assess potential transient challenges (i.e. hydraulic instability) from the contemplated more responsive SWP operations.	○	○	○	○	○	○	○	○	○	○	○		○
7	Real-Time Market Load Bidding: Studies are being performed to find SWP safe limits in operating pump load in real-time markets. SWP is collaborating with CAISO to explore economical bid of pump load into the real-time market to aid in reliability services and respond to intermittent renewable resources variability.	●	●	●	●		●	●	○	●	●	●		○
8	Adding Pockets of Storage at Strategic Locations: Investigating the viability of adding pockets of storage in strategic locations along the Aqueduct to decouple interdependencies of the SWP conveyance system and pumping plants' operations.	○	○	○	○	○	○	○	○	○	○	○	●	●
9	Integration of On-Site Solar generation at Pumping Plants: Investigating the potential for on-site solar generation at various DWR pumping plants, including: direct grid interconnection and behind-the-meter with non-export interconnection. Solar plant capacity will be determined based on various operations and load profiles.	●	●			●		○	●	●	●	●	●	●

● - Direct Benefit/Challenge
○ - Indirect Benefit/Challenge



Flexible Resources Study- SB49 Project Scope of Work and Schedule



***Initiate
Reconnaissance
and Scoping***

- Concepts Discussion
- Scoping Assessment planning tracks
- Identify Project Expectations
- Define deliverables

***Identify Potential and formulate
Operational Scenarios***

- Historical SWP Operation Data Analysis
- Energy Market Data Analysis
- Model Development
 - Hyatt Pump-back Model
 - Hec-Ras Hydrodynamics model
 - SWP Reoperation Optimization

***Identify Potential and formulate
Operational Scenarios***

- Concepts/Planning tracks Investigation
- Operational and Markets analysis
- Analysis and Model Results
- Portfolio and strategic fit
- Cost Benefit Analysis

• Report Progress to Stakeholders and CWC

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***Perform Viability
Assessment***

- Project Constraints and limitations
- Alternatives implementation challenges
- Competing SWP priorities

• Report Progress to Stakeholders and CWC

***Develop
Preliminary
Alternatives***

- Finalize Viable Project Findings and Results
- Report Opportunities and Challenges

***Development of
Assessment
Report***

- Finalize Assessment report
- Present assessment findings to Core and Expanded participants groups

• Conduct meetings with Industry and Public

SWP Opportunities – Short Term (1-3 Years)

- **Continue to align and shape SWP load and generation to respond to grid needs** – SWP has and continues to optimize, when feasible, its operations to align pumping and generation with CAISO’s grid needs, by absorbing excess solar generation during the day and schedule owned hydropower generation to displace fossil generation in the evening hours
- **Procure renewables to achieve DWR’s Climate Action plan goals** – Continue implementing a progressive procurement plan to add renewables to its power portfolio.
- **Offer excess SWP Resource Adequacy (RA) Capacity** – Because SWP load operations are dependent on hydrology, the SWP may have excess RA capacity to sell, from year to year. This helps other load serving entities meet RA obligations and offsets the SWP’s costs of delivering water.
- **Actively participate in CAISO Stakeholder processes to influence market design changes** – The SWP actively monitors and participates in CAISO stakeholder processes and analyzes the impacts on SWP.
- **Maintain industry outreach and develop partnerships on initiatives and projects**– The SWP continuously engages with industry participants, stakeholders, and the public.
- **Monitor power market dynamics and adjust SWP operations and procurement strategies** – Subscribe to multiple advisory services and participate in energy forums (NHA, PANC, Stanford University, etc.) to stay abreast on power market dynamics, resource mix trends and impacts to the power markets.



SWP Opportunities – Short Term (1-3 Years)

- **Partner with the State Water Contractors (SWC) to develop the SWP Energy Roadmap** – The energy roadmap is meant to articulate the joint vision between DWR and the SWC to maintain a balance between water supply reliability, competitive energy rates, responding to energy market evolution and dynamics, and needed investments to achieve the clean energy portfolio goals.
- **Develop the Flexible Resources Study Plan: Phase 2** – The Flexible Resources Study plan is a dynamic vision plan for repositioning the SWP for future power markets and for adapting a proactive and progressive approach to managing the SWP power portfolio.
- **Maintain active participation in Investor-Owned Utilities (IOUs) Transmission rate case filings at Federal Energy Regulatory Commission (FERC)** – Transmission access charge (TAC) is one of the major cost components related to energy costs of the SWP operations. The SWP actively participates in multiple transmission rate cases at FERC and settlement negotiation efforts meant to negotiate down revenue requirements and return on equity filed by transmission owners seeking FERC approval.



SWP Opportunities – Mid Term (3-7 years)

- **Investigate and implement integration of solar and battery storage at main SWP pumping plants –** Integration of solar coupled with battery energy storage systems (BESS) can help integrate more renewables into the SWP power portfolio.
- **Work with CAISO to enable the SWP to have more latitude in offering more grid reliability services –** The SWP will collaborate with CAISO to propose market design changes that would allow for the SWP to offer more grid reliability services.
- **Implement physical improvements to reduce subsidence impacts on SWP operational flexibility –** Developing off-aqueduct storage near Valley String and Edmonston pumping plants can alleviate some of the subsidence impacts on shaping SWP pump load.
- **Integrate new technologies at SWP pumping plant to reduce wear and tear on equipment –** The SWP is investigating the integration of variable frequency drives to soft start and stop pumps, allowing SWP to be more responsive and offer more grid reliability services, without increasing the wear and tear on equipment.



SWP Opportunities – Mid Term (3-7 years)

- **Collaborate with the SWC on developing a program that coordinates water demand side flexibility** – The SWP is working with the SWC to develop a program to assess the water demand flexibility and potentially increase the responsiveness and grid reliability services that the SWP may offer to CAISO.
- **Update the SWP Integrated Resources Plan (IRP) to adjust plans and strategies** – The IRP is a comprehensive assessment to SWP power portfolio that assesses, plans, and strategizes mid-term and long-term SWP actions relevant to managing its power portfolio. It is updated every 2-3 years based on current and anticipated future changes in the power market.
- **Revitalize pump-back operations at the Hyatt-Thermalito complex to provide Long Duration Energy Storage services to the grid**– Pump back operations at the Hyatt-Thermalito complex ceased in 2006 due to temperature management constraints in the Feather River. In order to restore pump back operations at Hyatt-Thermalito, capital investments are needed to implement mitigation measures to enable more robust temperature compliance.



SWP Opportunities – Long Term (+7 years)

- **Develop plans to achieve zero emissions power portfolio by 2035** – SWP has in place a long-term progressive procurement plan to continuously add renewables and clean energy assets and contracts to its portfolio. More ambitious actions are being proposed by this assessment and will enable SWP to achieve carbon neutrality earlier than the present Senate Bill 100 (SB100) 2045 target, when implemented.
- **Develop plans to neutralize greenhouse gas (GHG) emissions from Lodi Energy Center (LEC)** – In accordance with SB100 targets, and as stated in DWR’s Climate Action Plan Phase 1, the SWP will develop plans to neutralize GHG emissions from LEC by 2040. Recent turbine replacements allow for blending green hydrogen with fossil fuel; and as technology advances, potentially displace fossil fuel for the plant with green hydrogen, altogether.



SWP Opportunities – Long Term (+7 years)

- **Develop plans to integrate energy storage in SWP operations and setup** - Energy storage is emerging as a key solution for absorbing excess solar generation and the displacement of fossil generation assets in California. Phase 2 of the Flexible Resources Study will further investigate potential new BESS installations as a short duration energy solution that the SWP needs to help hedge SWP's exposure to the super peak hours' emissions, volatility, and pricing.
- **Develop plans to fully resource SWP portfolio with clean energy** – Approximately half of SWP operation's energy needs is met with its own emissions-free hydrogeneration resources and another 20% from contracted renewables. Renewable and zero-emissions resources will continue to be procured and developed to meet all the SWP's energy needs.
- **Develop bidding strategies to fully hedge SWP positions in the power market** – Bidding strategies can be developed and tested to identify the feasibility of fully hedging the SWP's open position through deploying load shifting strategies and integration of energy storage assets in the SWP setup.
- **Neutralize power costs through deploying supply and demand side flexibilities** – The SWP may be able to neutralize a significant portion of its power costs by deploying supply and demand flexibilities.



SWP Opportunities – Long Term (+7 years)

- **Collaborate with CAISO and others to develop bi-lateral agreements that can utilize SWP capabilities to support grid reliability** – to ensure cost recovery for capital investments made to SWP owned assets that are meant to support grid reliability, there has to be an off-taker for these services and a market to enable offering these services.
- **Secure right-of-way needed for future power resources developments** – Investigations are currently underway to develop solar power resources adjacent to DWR-owned assets. Limited property is owned by DWR, and these projects will require securing the right-of-way needed. In collaboration with the SWC, some properties maybe identified for possible future developments.
- **Inform Energy policy and initiative to achieve resilient and efficient power market design** – SWP will maintain an active and proactive role in participating in and in proposing market design changes, that enables the industry to better participate and offer services to the grid.



SWP Challenges

- **Power market evolution** – In recent years, the power market (energy prices, grid reliability needs) has evolved as a result of the buildout of renewable capacity and retirements of fossil generation assets. SWP is continuously adjusting its operation profiles and business process to adapt to new changes.
- **Transmission access charge escalation** – To integrate mandated renewables, necessary transmission buildout in California has resulted in serious escalation of TAC. For the SWP, TAC costs represent a significant portion of the overall energy costs.
- **Changing Regulatory policies and mandates** – Clean energy policies are forcing early retirements of fossil fuel generators, which exacerbates grid reliability challenges. Policies must also be in place to ensure a reliable and resilient electric system while maintaining affordability.
- **CAISO market design changes** – CAISO's market design changes do not always consider the SWP's unique set-up, and proposed market design changes could negatively impact SWP operations and energy costs.



SWP Challenges

- **SWP aging infrastructure and inherent constraints** – The SWP was built in the 1960s with the primary purpose of delivering water. Its infrastructure was not designed to respond to current and anticipated grid reliability challenges - unless transformation for infrastructure and equipment is implemented.
- **Subsidence of California Aqueduct** – Continued aqueduct subsidence threatens to impair the functionality of the SWP.
- **Climate change impacts** – Climate change is resulting in new hydrological trends that are beyond the design limits of the SWP and require consideration in planning studies to ensure safety and water supply reliability.
- **Competing SWP priorities** – The SWP serves as a multi-purpose water and power system, and provides drinking water for 27 million people, irrigation water for 750,000 acres of farmland, generation of clean hydropower, flood protection, and a habitat for fish and wildlife. Water delivery obligations and environmental policies takes priority over power generation.
- **Financial impacts to the SWC** – Proposed changes to SWP’s operations or physical setups – in order to provide more flexible services to the grid – shall not increase costs of delivering water to the SWC.
- **Water demand inflexibility** – Limitations in water demand flexibility can constrain the amount of flexibility that the SWP can offer. A carefully developed framework including protocols, periodic check-ins, planning, coordination, and feedback from the SWC, will be needed to be in place to allow for flexibility in water delivery schedules.



Interim Action Plan (2021-2025)

- Continue planning work for a Phase 2 of the flexible resources assessment tracks and additional new tracks, advancing them toward implementation
- Continue to align SWP load and generation with CAISO's grid needs
- Monitor power market dynamics and evolution of resource mix, initiate, and influence needed market design changes, and assess their impacts on SWP
- Continue outreach to CAISO and other state agencies highlighting the SWP's plans for supporting the grid, and the need for partnerships and outside funding
- Collaborate with CAISO to enable the SWP to offer real time load bidding and frequency regulation
- Partner with SWC to investigate and deploy demand side flexibility.
- Investigate state and federal funding opportunities that may help the economics of the contemplated concepts for SWP improvements.
- Continue adding renewables to SWP power portfolio
- Sell excess SWP Resource Adequacy capacity to support CAISO's grid reliability needs
- Continue to maintain active participation in (Participating Transmission Owners) PTOs transmission rate case filings at FERC, and advocate for more control over escalating TAC cost.



Next Steps

- Finalize Draft Report
 - Circulate Draft to Industry Partners for Review
 - State Water Contractors
 - California Natural Resources Agency
 - California Energy Commission
 - Consult with CAISO
- Finalize Report and submit to Legislature by January 2022



Thank You

Questions?