
CampusEnergy2021
BRIDGE TO THE FUTURE
Feb. 16-18 | CONNECTING VIRTUALLY
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Making Resiliency Projects Sustainable

Exploring Power Supply Options for a Proposed California Oceanwater Desalination Plant

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Presentation Objectives

- Introduce Desalination Project, Purpose, and Challenges
- Identify Power’s Role in Resiliency / Sustainability
- Summarize Options Identified to Potentially Meet Needs
- Present Key Findings and California-specific Considerations

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COMMUNITY NEED

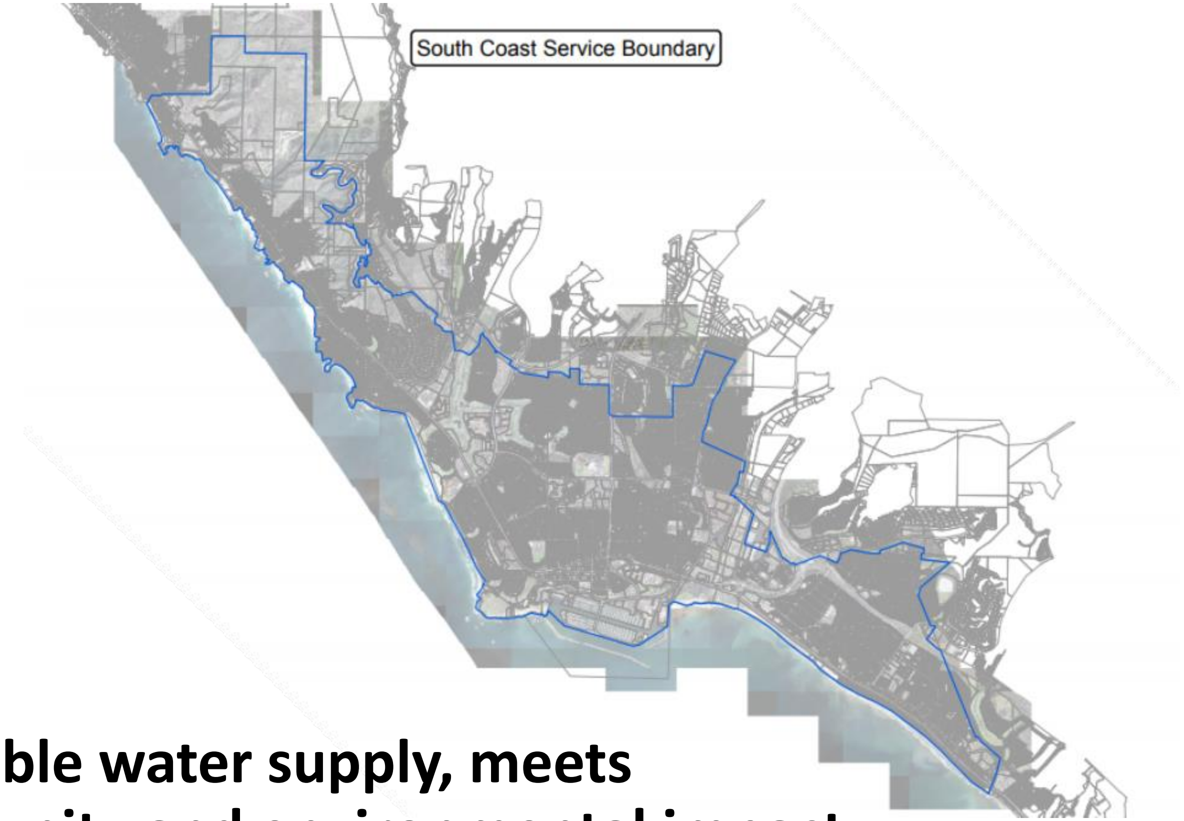
Community Served & Identified Need

- SCWD serves 35k residents, 1k businesses, and 2 million visitors per year in south coastal Orange County, CA

- 85-100% of drinking water comes from outside community

- Concerns: Natural disasters, droughts, and supply shortages

- **Solution: Local water source that provides reliable water supply, meets community water needs, and minimizes community and environmental impact**



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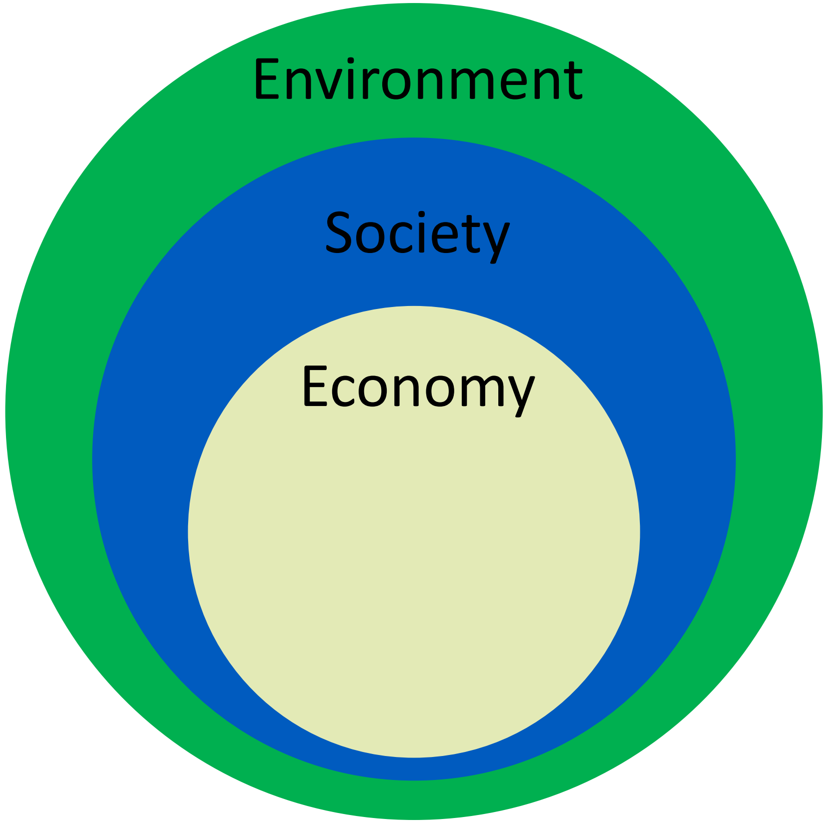
Project Goals Established

- Need-based Local Water Supply
- Cost-effective
- Community Service and Reliability
- 100% Carbon Neutral



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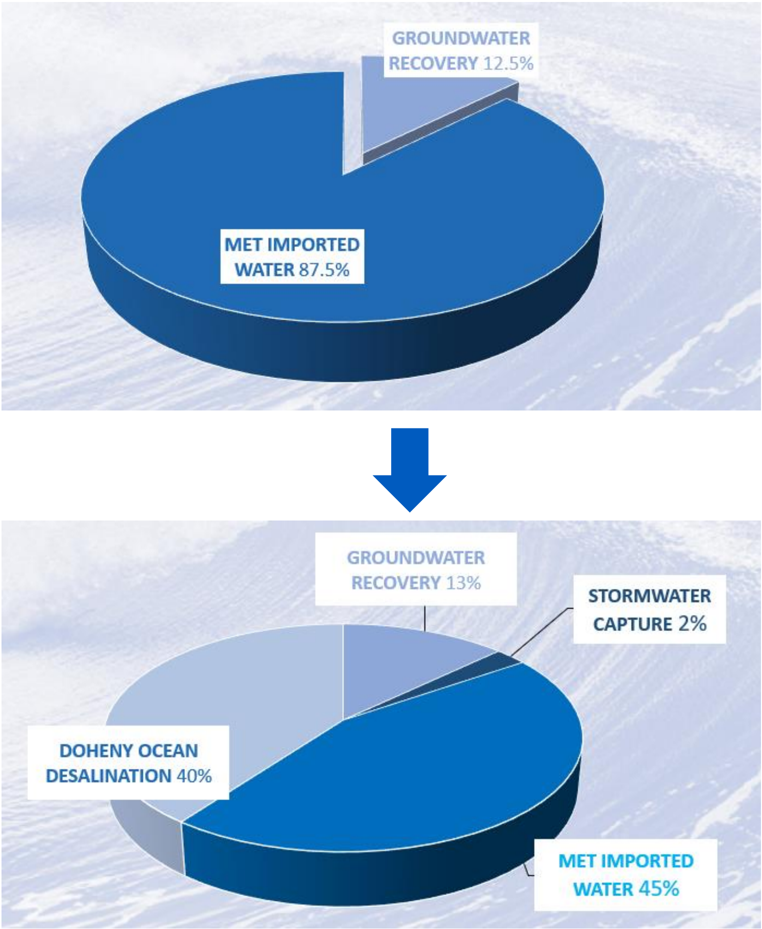
Moving the Project Forward

- ►GHD Hired as Program Manager
- ►Concept design using seawater reverse osmosis desalination technology
- ►Regulatory Compliance with Ocean Plan
- ►Community Engagement



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PROJECT DEVELOPMENT

Project History

2003
Feasibility Study

2004-2005
Hydrogeology Studies

2004-2007
Slant Test Well Pilot Study

2007
Engineering Feasibility Report

2008-2013
Phase 3 Extended Pumping & Pilot Plant Test

2014-2016
MWD Foundational Actions Funding Program

2018
$10 Million Prop 1 Grant Funding

2019
$8.3 Million USBR Grant Funding

2019
EIR Certification

2020
USEPA WIFIA Funding Shortlist

2020
Cost Studies

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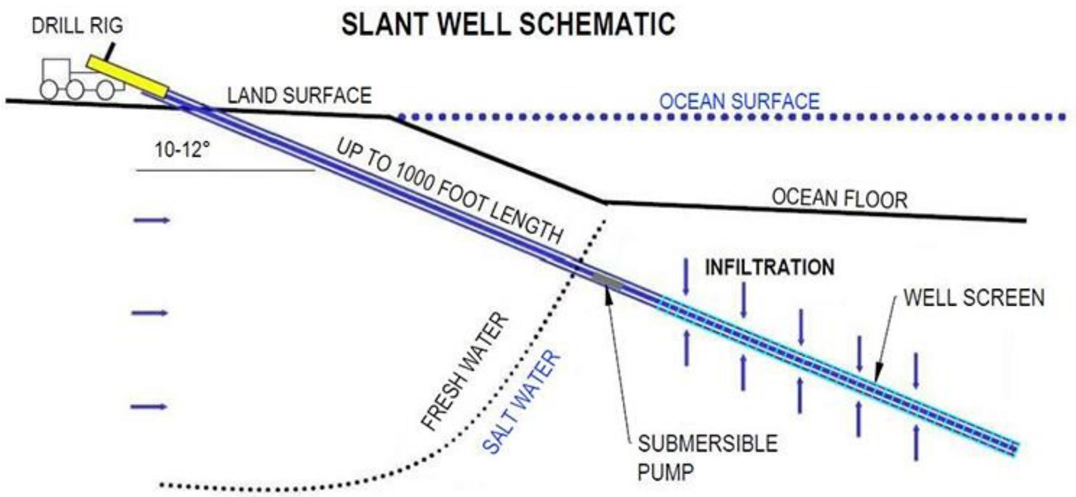
Project Highlights

- ▶ Seawater reverse osmosis desalination technology
- ▶ Subsurface intake approach
- ▶ Comingled brine discharge
- ▶ Ideal location
- ▶ Community and environmental considerations



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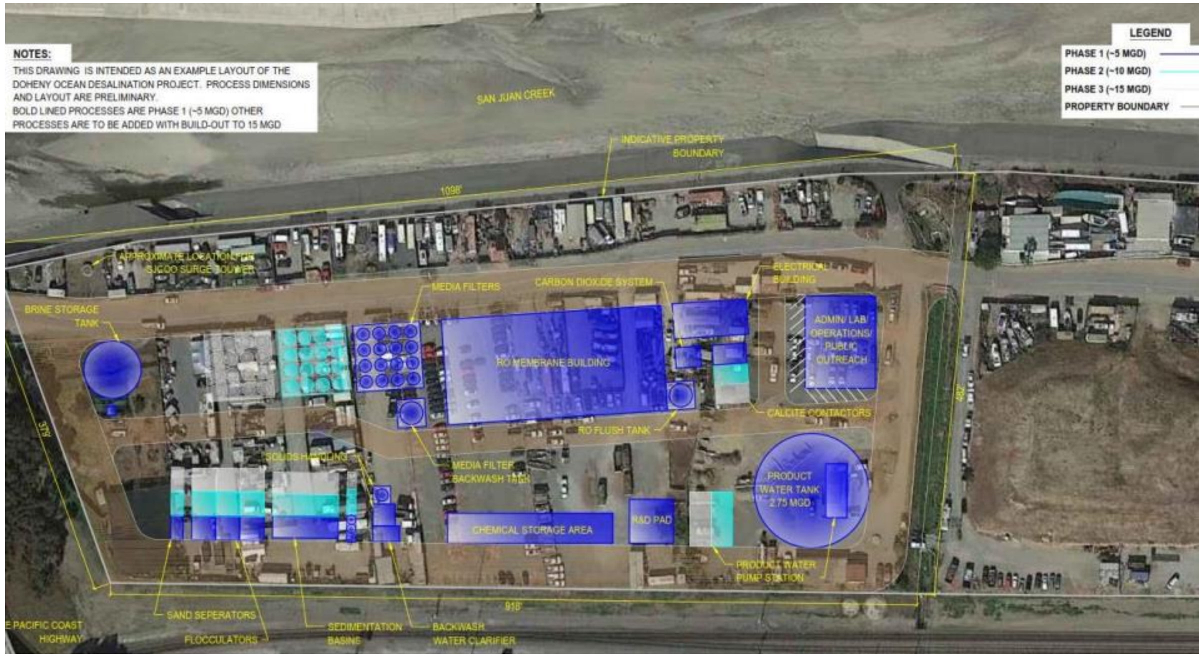
Project and Power Challenges

- ►Environmental concerns
- ►Community concerns
- ►Challenges to moving project forward
- ►Power and fuel



POWER NEEDS & OPTIONS

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Power Source Options

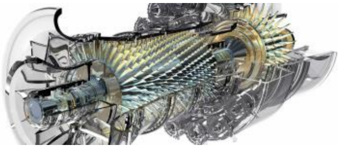
1. Utility Power

- *Lower capital, higher operating*
- *Perceived lower resilience*
- *Not carbon-neutral option*

OR

2. Self-Generation

- *Potential economic and resiliency benefit*
- *Potential for high-efficiency CHP*
- *Potential low carbon options*



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Utility Power – SDG&E; Reliability

OUTAGE INDICE	DEFINITION	SDG&E (Orange County)		PEER UTILITIES [1]	
		2018	3-Year Average	IEEE Large Utilities [2]	IEEE Southwest Region
SAIDI	Minutes Without Power / Customer	56.02	63.94	253	118
SAIFI	Sustained Interruptions / Customer	0.585	0.587	1.37	1.1
CAIDI	Minutes / Interruption	95.8	108.54	185	107.3
MAIFI	Momentary Outage Customer %	0.168	0.229	NA	NA

Notes:

1. Based on IEEE benchmark data for 2017 operation, as 2018 not available.
2. SDG&E classified as large utility with > 1M customers.

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Utility Power – SDG&E; Carbon

- 45% Renewables Now
- SDGE Emissions Factor ~28% - 45% of Fossil Fuel Self Generation Options
- California 2045 Carbon Neutrality = Built-In Carbon Reduction Plan

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Utility Power – SDG&E; Costs

- Service Extension Costs (credited back)
  - *Single feed*
  - *Redundant feeds from common substation*
  - *Redundant feeds from different substations*

- Tariffs
  - *Energy charges*
  - *Demand charges*

- Steady load means steady demand charges

- First Year Expected Blended Rates*: >$160/MWh with REC's

**2020 tariffs*

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Self-Generation Options; Summary

- Fuel consuming generators (CT, RICE, Fuel Cell) and Solar PV
  - *Solar PV for carbon*
  - *Alternate fuels considered*
  - *CHP considered but no use for thermal energy*
  - *Battery storage potential*

- Minimal utility import from utility
  - *Departing load and standby charges (beyond energy/demand charges)*
  - *Departing load = cost for removing load from system*
  - *Standby charges = cost for reserved capacity as backup*

- Offsite generation explored if economic benefit (less resiliency benefit)

Self-Generation Options; Resilient

Supply Option		Power Supply Configuration						
		1	2	3	4	5	6	7
Single Electric Feed		X	X	X	X	X	X	X
Redundant Electric Feed			X	X				
Redundant Substation Tie-In				X				
Dual Fuel CTG					X			
Gas Recip						X		
Fuel Cells							X	
Solar								X
Single Failure Scenario [1]	**Probability [2]**	**Operational Outcome**						
Loss of Main Unit	8							
Single Feeder Outage	5							
Substation Outage	4							
Loss of Natural Gas Service	4							
Multiple Failure Scenario [1]								
Total Electric Utility Outage	3							
Total Utility Outage (Gas / Electric)	2							
Total Utility & Main Unit Outage	1							

Outage Results
No Operational Impact
Not Applicable to Configuration

(1) Failure Scenario outages can be avoided by installing backup generators and site fuel storage.
(2) Subjective probability scale of 1-10, with 1 being the lowest and 10 being highest.

Self-Generation Options; Carbon

- Renewable Fuels Unavailable at Scale
- Fossil fuels require REC's long term (no built-in reduction like SDGE)
- Fuel cells have similar carbon to reciprocating engine but lower overall emissions
- Fuel cells have more hydrogen fuel capabilities (future-proofing)

Self-Generation Options; Carbon

Option		Self-Generation (Scope 1 Emissions)		Purchased Power (Scope 2 Emissions)		Total Annual Carbon Footprint w/o RECs	
		MWh	MTCO2	MWh	MTCO2	MTCO2	Delta PP
Base	Purchased Power (PP)	0	0	25,445	5,089	5,089	-
1	PP + Solar PV	Reductions depend on magnitude of solar deployment					
2A	Combustion Turbine	24,173	17,872	1,272	254	18,126	256%
2B	Reciprocating Engine	24,173	11,029	1,272	254	11,284	122%
2C	Fuel Cell	23,206	11,451	2,239	448	11,899	134%

Purchased power decreases over time but not self-generation (except fuel conversion).

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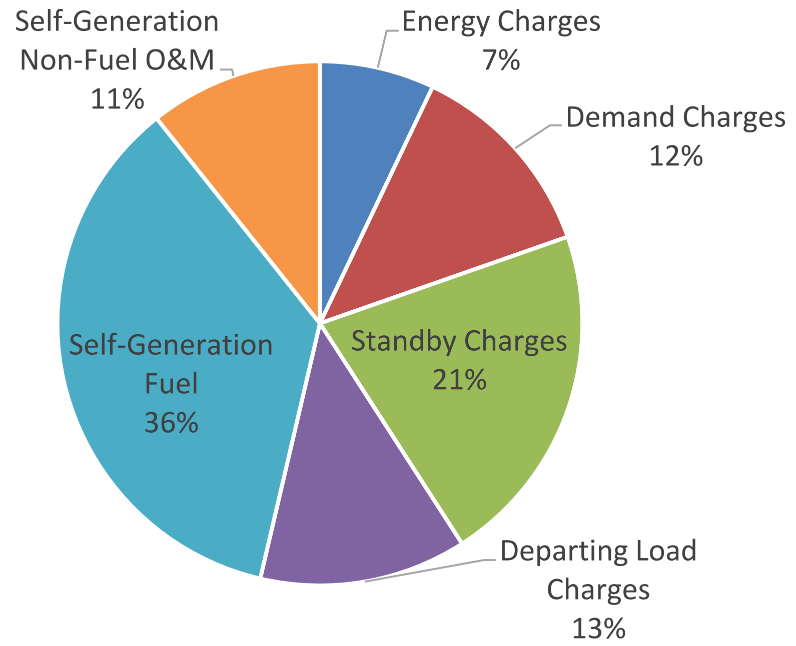
Self-Generation Options; Cost

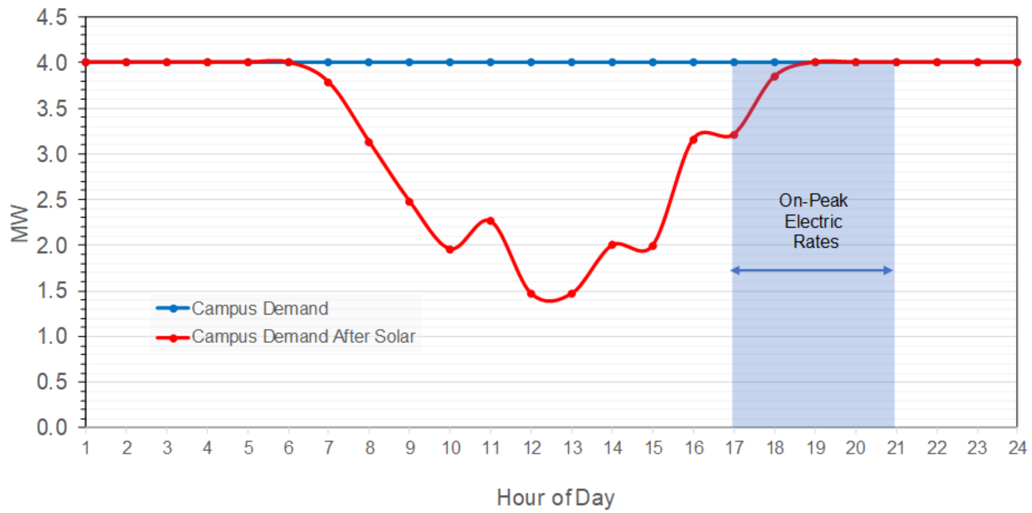
- Traditional fossil fuel generators have lower production costs than purchased power, except:
  - *Standby and departing load charges substantially impact economics (~50% increase)*
  - *CTG blended power cost > purchased power*
  - *RICE blended cost slightly less than purchased power*

- Fuel cells financially attractive with soon-to-expire incentives (~30% less than PP)

- Solar PV attractive due to incentives, but supplements only

- Battery storage value not seen for site power, incentives or grid service could improve value





Considerations Moving Forward

- "Greening" of grid has built-in future-proofing and carbon reductions
- Reliable utility power allows for resiliency
- Onsite generation only cost effective with state incentives
  Departing load charges apply and greatly impact economics
- Onsite generation less attractive with no CHP application
- No clear alternative fuels. Remote LFG option may be an option
- Resiliency may be best addressed with standby generators

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