



Salton Sea Water Restoration: Engineering Disclosure & Pilot Feasibility Proposal

Response to Request for Information
From California Department of Natural Resources



Prepared and Submitted By:
Transform Water & Power
Lane Sharman, CEO

Submitted Via Email To Bruce Wilcox, Bruce.Wilcox@resources.ca.gov
California Natural Resources Agency
See <http://transform.energy/ssresponse>

Table of Contents

Executive Overview	2
Solar Floatation Engineering and Power Supply	5
Atmospheric Water Generation Engineering and Applications	9
Feasibility & Pilot Proposal	11
Operating Facts, Assumptions, Dependencies	11
Phase: Q & A Stage with Stakeholders	12
Phase: Technology & Model Specification	12
Phase: Pilot Feasibility Report	13
Phase: Size and Location of Pilot	13
Phase: Pilot Engineering, Permitting, Construction	13
Phase: Pilot Report, Decommissioning	13
Engineering Partners	14
References	15
Statement of Qualifications	16
Lane Sharman, CEO and Systems Integration Engineer	16
Joseph Mount, Atmospheric Water Generation Technology Advisor	16
Charles Ansbach, Atmospheric Water Generation Project Advisor	17
Jonathan Lambert: Data Collection and Management Mgr.	17
About Transform Water & Power	17
About New World Water	18
About ABB	18
About Development, Design & Engineering	18

Executive Overview

The Systems Engineering team proposes to demonstrate the feasibility of using an environmentally sound, scalable, cost-effective Floating Solar and Water Generation System (FSWGS, System) to arrest the imbalance of the Salton Sea caused by net evaporation.

The System consists of solar modules on racking supported by floats. Adjacent and on the same hardware forming a barge sits an industrial atmospheric water generation unit whose fresh water is returned to the water body or used for dust containment.

Depending on the amount of electricity provided from the solar and augmented from the grid, the System will result in a minimum net 50% to 200% inflow relative to the evaporation outflow. The inflow from water generation captures atmospheric condensate available at night and during monsoon conditions. During the day, the production is less because the floating solar reduces the water vapor input and the relative humidity is generally low (20-40%) in the locale.

The floating racking hardware is manufactured by FloatoRack Corporation, a California business founded by the inventors Kenneth Forest and Troy Helming. Patents are pending. There is a competing technology from France. FloatoRack technology is available for license and purchase and there are two commercial projects underway, Sonoma County Water Authority and San Diego County Water Authority. The latter is a 6MW Project. FloatoRack completed a pilot successfully for SCWA in 2017. Other than the solar being mounted on water, there are no material differences in the performance of a water-based solar farm than a terrestrial one.

Atmospheric Water Generation has improved considerably thanks to advances in material and nano science. The knowledge of molecular affinity to H₂O now allows for improved production per unit of electricity (KWH). The current state of the art is not less than 1 Gallon Per KWH in standard conditions. While this equation has been used in our calculations for this project, it could be higher due to vapor density.

This disclosure does not purport to answer these questions:

1. Given current warming trends, what today is the evaporation per year of the Salton Sea?
2. The USGS Report¹ compiles measurements from 1968 to calculate a 5.9 feet per year loss of water. Is this data point now accurate?
3. Blocking irradiation and capturing surface evaporation results in some evaporation escaping. How much?

¹ Evaporation and Radiation Measurements at Salton Sea, by Alex M. Sturrock, Jr., 1978

4. How much money can and should be allocated to convert vapor not originating from the Salton Sea?
5. What environmental objections (visual, et al) to the System are relevant relative to the environmental destruction underway?
6. Other factors which could lead to infeasibility?



Floating Solar on Barges

The floating solar will cover the surface and arrest evaporation from surface irradiation and produce electrical energy.

A comprehensive study shows that a unit area of water like the Salton Sea evaporates 2-3 feet per year.



Floating Water Generators on Barges

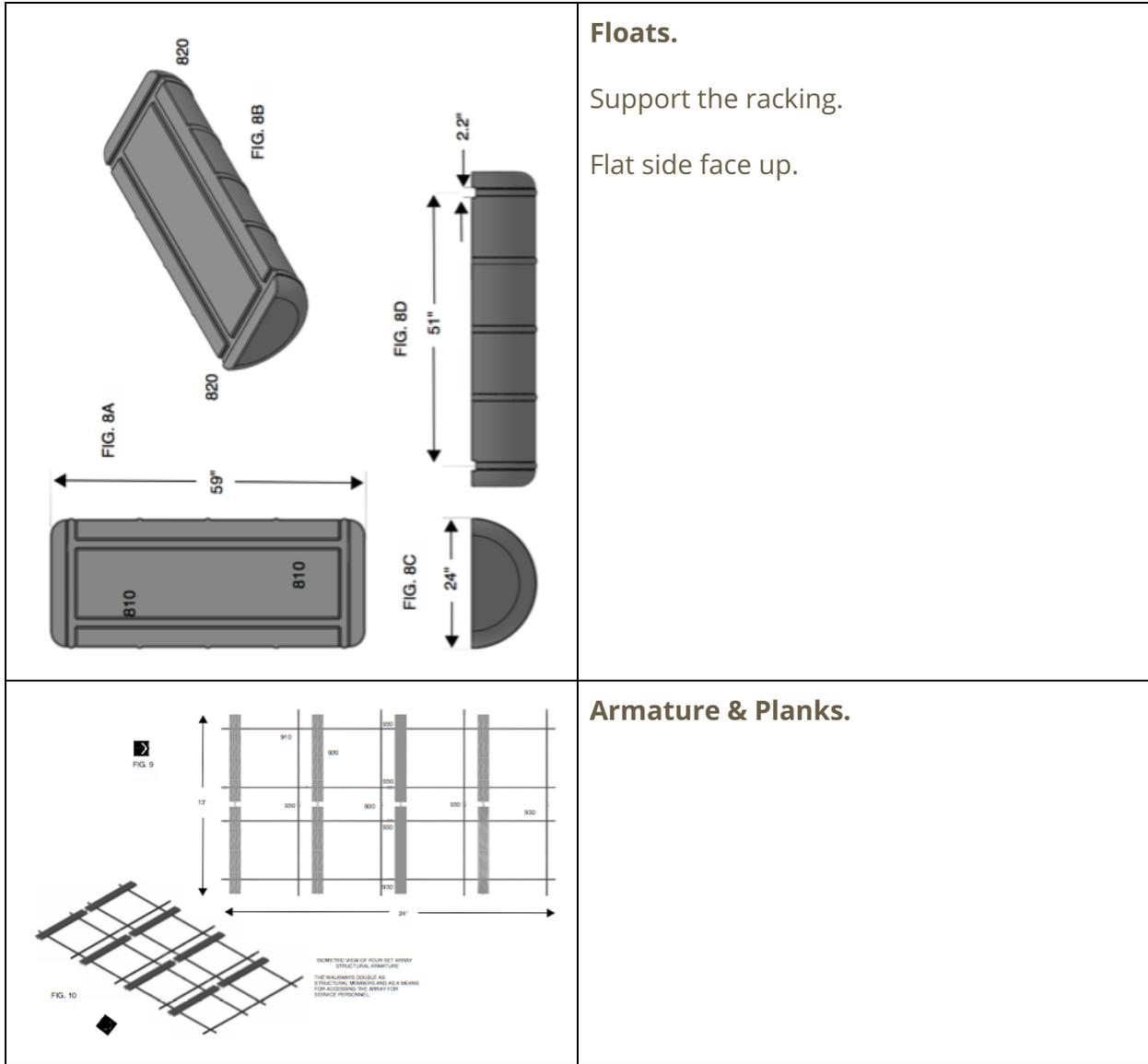
Intermixed with the solar on the same structures are industrial atmospheric water generators using the power supplied by floating solar and the local grid. Fresh water generated is returned to the Salton Sea for further mitigation.

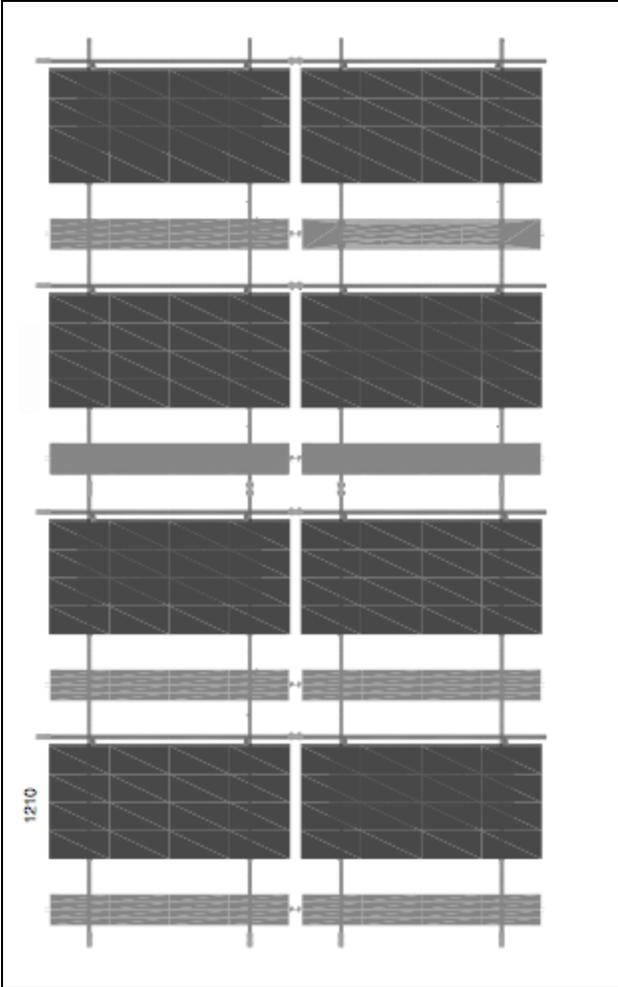
The solar optionally may have a storage component or may rely on shore power to operate the water generators at night.

It is worth noting that the System is a profound improvement over the many Trojan and supernatural proposals submitted over the decades to rectify the Salton Sea Environmental Armageddon in slow motion. The System carries none of the imponderables of remote importation, new pipelines, water transfers, or geophysical surgery. The Floating Solar and Water Generation System is a remarkable innovation easily verified by a Feasibility Pilot.

Solar Floatation Engineering and Power Supply

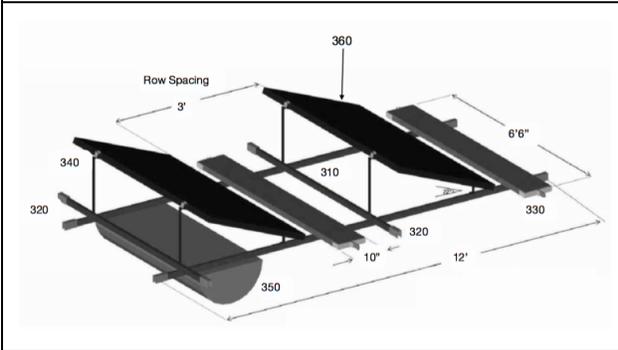
The Solar System covering the body of water consists of these parts starting from the surface of the water up to the exposed solar panels followed by the electrical networking of the System.





Solar Panels.

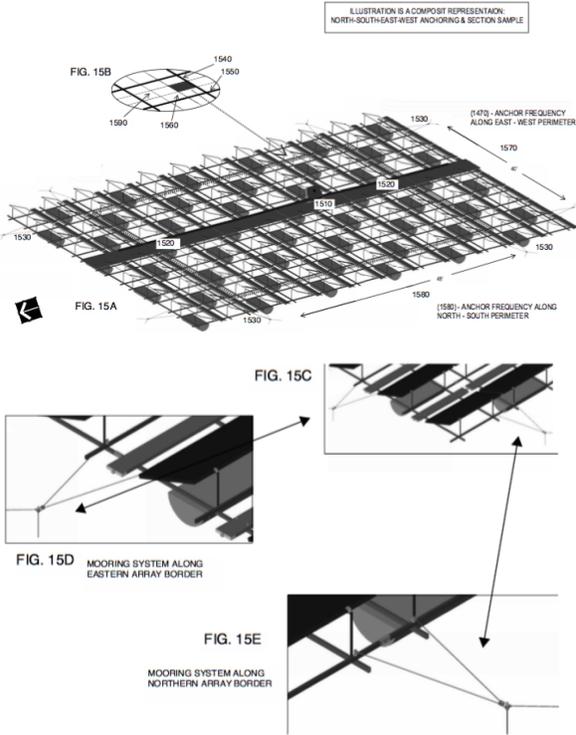
Mounted on armature.



Isometric View.

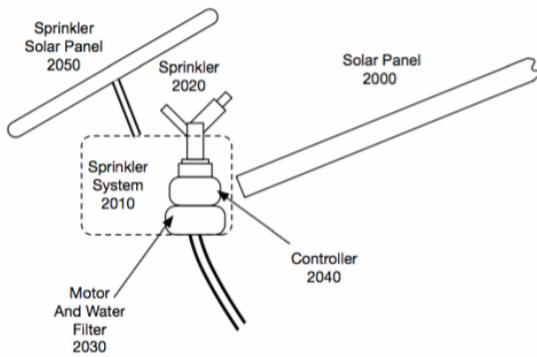
Floats, Armature, Panels Pitched.

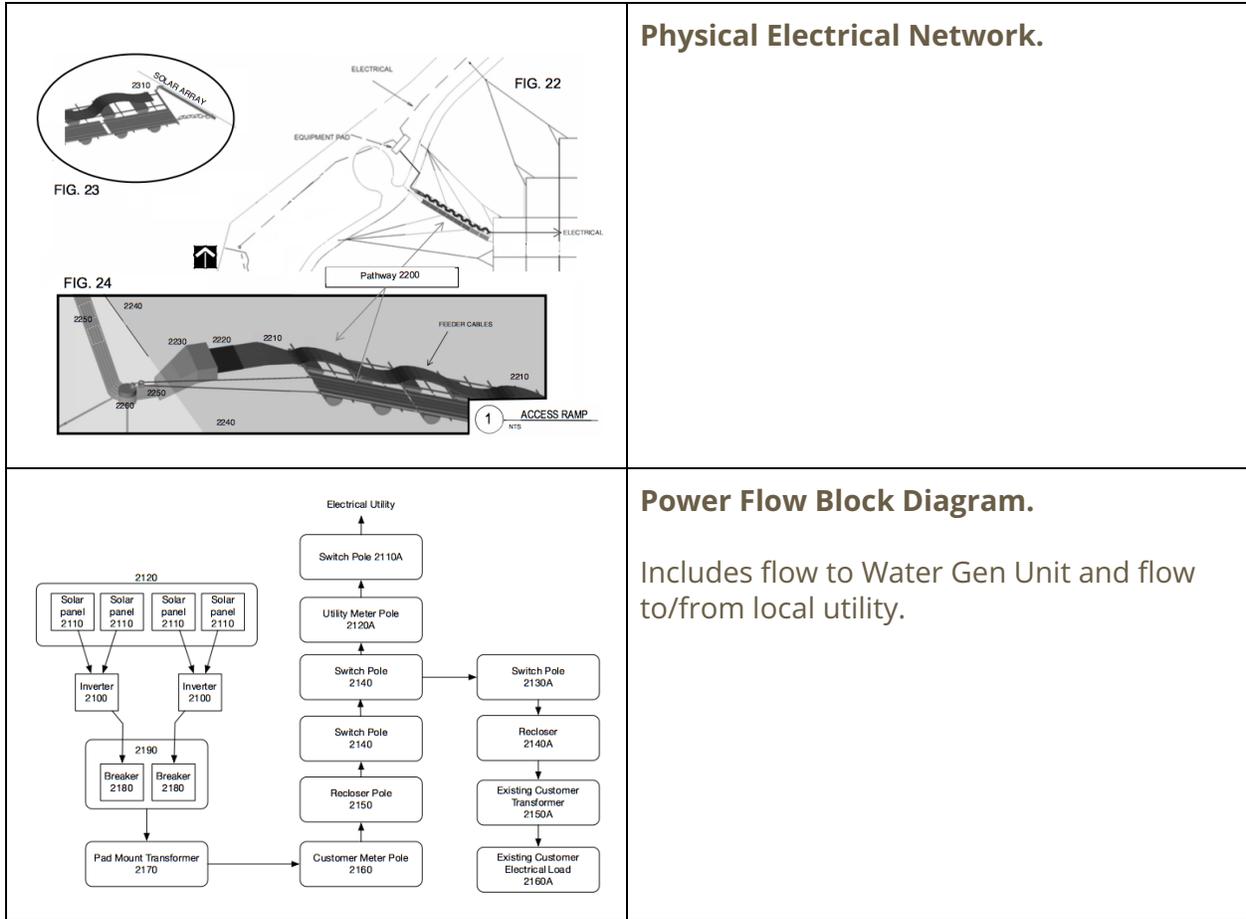
Anchoring & Mooring.



Solar Surface Sprinkler.

Water generation supplies fresh water for automated module cleaning.





The above invention and patent was perfected by Troy Helming and Kenneth Forest, both residents, engineers and entrepreneurs of California. Sharman, Helming and Forest have been combining efforts since 2017 to refine the system and to commercialize its use. Presently, the California Department of Dams is seeking anchoring modifications to prove that installation on a dammed reservoir will not stress the foundation. No such requirement exists for the Salton Sea System.

Atmospheric Water Generation Engineering and Applications

There is currently more fresh water in the air than all the rivers and lakes of the world (USGS²). Water Vapor is a potent greenhouse gas³. And it is increasing. Improvements in material science, molecular physics and energy efficiency have improved both the volume and cost of production.

Capturing evaporation vapor to produce clean, fresh water has been going on for thousands of years and new technologies now make it possible and cost effective to do it at commercial levels.

The System consists of these parts.

	<p>Air Intake and Water Generator.</p> <p>Rests on barge. Intakes air from atmosphere and air saturated from Salton Sea evaporation.</p> <p>Fresh water returns immediately to the Salton Sea,</p>
	<p>Continuous Monitoring.</p> <p>Each unit is continuously monitored in the cloud for sub-average performance. Operating parameters can be set remotely.</p>

² <https://water.usgs.gov/edu/watercycleevaporation.html>

³ https://www.nasa.gov/topics/earth/features/vapor_warming.html



Option: Water for Dust Treatment.

Some water may be diverted for the treatment of contaminated dust along the shoreline.

In addition to producing clean, fresh water to help recharge the Sea, this project includes small area tests at a select shore site to determine the most effective design for an atmospheric water generation-based shoreline spray system to effectively retard dust and abate the related negative health consequences currently being experienced around the lake from airborne contaminants. The results will be included in our final feasibility project report.

Feasibility & Pilot Proposal

The Feasibility and Pilot proposal consists of several stages each of which produces the confidence to move forward to the next stage.

Operating Facts, Assumptions, Dependencies

Salton Sea USGS Calcs	
12 Month 1968 Data Set Averaged Across the Methods - Inches Lost to Evaporation	71.47
Converted to Feet	5.96

Estimate of Reduction from the Coverage by Floating Solar	
Coefficient Gained from System Surface Coverage	0.75
Reduction from Coverage with Solar, Feet	4.47
Coefficient Gained from Capture of Evaporation from Water Generation	0.1
Coefficient of Continuing Loss to Evaporation	0.15
Net Reduction in Evaporation from Coverage with Solar and Water Generation (Feet)	5.06
Capture of Water Vapor attributable to Salton Sea Evaporation	20%
Capture of Water Vapor attributable to Atmospheric Conditions	80%

Water Generation Engineering		
Number of System Units	2	
Production Capacity Per Unit, Gallons Per Day	5,000	
Total Gallons Per Day	10,000	
Electrical Energy Requirement Per Day	8,496	KWH
Power Requirement, KW	354	
Gallons Per KWH	1.18	1.88 Gallons Theoretical Max

Pilot Project Energy Budget	
Annual Energy Requirement	3,101,040
KWH Per KW of Solar Anticipated Using Least Cost Panels	1,500
KW Requirement	2,067
Surface Area [acres] = (0.002 acres/kWp) * (Capacity [kWp]) + 0.201 acres:	
Surface Area Requirement Using Formula in Acres	4.3
KW Per Acre	477

Pilot Project Material Cost Budget (Before G&A, Labor, Other Phases)	
Cost Per KW - Panels & Inverters	\$750
Cost Per KW - FloatoRack Racking	\$300
FloatoRack Cost Per Square Foot	\$3.28
Material Cost of System with Solar	\$2,170,728
Material Cost of (2) 5,000 Gallon Per Day Unit	\$896,000
Total Material Cost of System	\$3,962,728

Phase: Q & A Stage with Stakeholders

The Team will spend up to 120 days with stakeholders to present the approach and System. The stakeholders live and work principally in Imperial, Riverside and Sacramento Counties. Allocate meeting time to exchange knowledge and concerns about the System. Develop a sense of confidence that the System and the components can “Do the job in an acceptable manner”.

Phase: Technology & Model Specification

Evaluate the technology proposed. Assure that it is the best and commercially available. Verify there are no Intellectual Property issues pending. Write a detailed report on the manufacturers supplying the technology. Finalize all engineering, material and construction costs.

Phase: Pilot Feasibility Report

At this stage, the Team prepares a Pilot Feasibility Report for the Pilot including costs, milestones, deliverables and anticipated results. This is a Go / No-Go point for which the Department of Natural Resources could cancel, delay or amend the Pilot Project.

Phase: Size and Location of Pilot

With input from the State, determine a Size and Location for the Pilot Feasibility Project which will produce sufficient measurable data and which will test all components sufficiently. Provide a cost estimate for the Pilot. We strongly recommend a Pilot of not less than 5 acres so that the Pilot can deliver the energy required without purchasing energy at retail from the IID or SCE.

Phase: Pilot Engineering, Permitting, Construction

Engineer the pilot with respect to solar panels, FloatoRack, inverters, and two water generators centered and equidistant in the configuration. Obtain a Temporary Operating Permit. Sensors would measure and record evaporation rates above the System as well as above nearby open areas of the Salton Sea. Operate the Pilot for 24 months collecting data leading to a definitive understanding of the System merits:

- A. Prove the system recharged the Salton Sea with 10,000 gallons per day of safe, recaptured evaporation or a minimum of 2 acre feet per month.
- B. As an option to be considered for an addition to the scope and budget of this project, supply water generated by a third 2,000 gallon/day unit, adding a thickening agent, pumps and a stationary shoreline water spray array to apply to contaminated shoreline.
- C. Significantly reduce the carbon footprint of the Sultan Sea's water reclamation project by eliminating or drastically reducing the need for installing new water transmission pipelines and/or trucking water to the site.
- D. Produce and manage data on equipment operation, water production, and air quality during the demonstration as a basis for determining the value of post-demonstration service continuation.
- E. Complete the demonstration in 24 months from date of system start-up in order to test the outcomes under all seasonal conditions.

Phase: Pilot Report, Decommissioning

The Team will produce a comprehensive report of the results of the Pilot and decommission the System restoring the Salton Sea to its prior condition.

Engineering Partners

- New World Water, Inc, Sacramento
- FloatoRack Corporation, Oakland
- ABB - US Division
- Development, Design & Engineering - El Centro

References

1. <https://pubs.usgs.gov/wsp/2053/report.pdf> USGS Evaporation Rates of Salton Sea.
2. https://www.nasa.gov/topics/earth/features/vapor_warming.html Vapor Contributions to Global Warming as a Negative Feedback, NASA.
3. <https://water.usgs.gov/edu/watercycleevaporation.html> Source of evaporation measures, USGS.

Statement of Qualifications

Lane Sharman, CEO and Systems Integration Engineer

Mr. Sharman is a mathematician and computer scientist by training with a degree from San Francisco State University and a year in France at the American University of Paris. His work, talks and publications are principally in the areas of decarbonization of energy, water management, software and finance. He founded the Borrego Water Exchange. This was the first independent exchange for the transfer of water rights as environmental mitigation credits, used today in Borrego Springs on a 4:1 Mitigation Ratio.

He consults extensively on the design and implementation of Distributed Water and Power Resources. He has several patents under development to advance the combination of carbon-free energy types and water production and distribution. He actively works to distribute small-scale atmospheric water systems to homes, schools, hospitals, airports, parks and public spaces domestically and internationally. Water vapor is a potent, increasing greenhouse gas circulating everywhere as a result of increasing surface and ocean temperatures.

He actively supports California as a leader in solving the Climate Crisis now imperiling nature and culture. The San Diego Energy District Foundation was founded by Bill Powers and Lane Sharman to advance energy choice in San Diego and California. Sharman has been instrumental in the City of Solana Beach to educate stakeholders in Community Choice Aggregation, scheduled for June 2018 Implementation. Sharman has extensive ties in Imperial County where, along with other locales, he helped to develop 130 MW of utility scale solar projects.

Joseph Mount, Atmospheric Water Generation Technology Advisor

Mount has over 10 years of experience as an investor and project developer in the atmospheric water generation industry in product design, installation, sales and service. He has established working relations with the leading water generation and related businesses needed to bring the right technologies and engineering to each project and solve each specific problem. He will manage the individual atmospheric water generation equipment installation, monitoring, maintenance, and reporting activities of this project. For this project, Mount has engaged Ocean Breeze Corporation in Stuart, Florida to provide the core atmospheric water generation technology. Ocean Breeze is a 15 year-old company serving Boeing, Raytheon, and other corporations.

Charles Ansbach, Atmospheric Water Generation Project Advisor

Charles Ansbach is an experienced social entrepreneur, business manager, and university professor. He will oversee the performance and reporting deliverables of the atmospheric water generation portion of this project. Mr. Ansbach is the CEO of New World Water Company, Inc. which aggregates effective technologies in the water generation industry to meet the specific requirements of each project the company serves. New World Water Company, Inc. is a California corporation designed to bring distributive water solutions to businesses, public service, and underserved communities with the goal of helping to solve the challenges of the changing distribution of clean water worldwide. Mr. Ansbach developed a nationally recognized, successful program for the US Department of Labor, built and sold an international firm providing funding services to NGOs and government agencies and led the board of one of the world's leading landmine removal/agricultural restart organizations. Mr. Ansbach currently is an advisor to several companies on issues of corporate responsibility and addressing market failures profitably. He is a visiting lecturer in social entrepreneurship and corporate responsibility at the Graduate School of Business at University of California, Davis.

Jonathan Lambert: Data Collection and Management Mgr.

A dedicated hands-on senior-level executive from New World Water Company with twenty-years of expertise leading technology projects, Jonathan will oversee the technology integration, as well as key operational aspects of the project, delivering the tools, technology and processes required to deliver the project successfully. With a twenty year track record in technology, and more than 450 complex projects delivered to companies like NYSE, Hearst, Pfizer, Nike, Apple, Oracle, and Autodesk, Jonathan brings the kind of honesty and commitment to projects that gets them done on time and budget. Jonathan has created two of his own companies and brought them to solid multi-million-dollar revenue positive positions, in addition to several funded startups. His key deliverables will include overall data project management, team facilitation, cloud and data integration, as well as management reporting.

About Transform Water & Power

Transform Water and Power is a Consulting and Systems Engineering firm dedicated to the development of Distributed Water and Power Resources on a global basis. Clients, Projects, and Professionals convene around the vision of energy decarbonization and water

abundance. The principals of the firm have long and successful histories of effective project management and will ensure the success of this proposed Pilot.

About New World Water

New World Water Company Inc. (NWW) is a Sacramento, California company. It has aligned with the Ocean Breeze company in Florida to manufacture and take to market the largest, most reliable and efficient atmospheric water generators in the world. The largest machine produces 10,000 gallons per day or an acre foot or more per month, and requires 354 KW of power or 8,500 KWH per day resulting in 1.18 gallons per KWH. (See video⁴).

All units run on conventional AC power. All NWW/Ocean Breeze units run 24/7 for up to 20 years with little or no major maintenance aside from quarterly adjustments and cleaning. All units are made of stainless steel, copper coils, and highly efficient compressors and heat pumps. All units are assembled entirely in the USA.

About FloatoRack Corporation

FloatoRack solves several problems with putting solar panels on water, or “floating solar”, which is a fast growing niche market in the energy industry. Instead of using plastic for structural strength, the Floatorack uses aluminum. Instead of a 20-year possible design life, the Floatorack has a 60-year design life due to the materials used (HDPE, aluminum, and some stainless steel) and the design (the HDPE are UV resistant but are exposed to little or no sunlight and the aluminum rails absorb all structural torque and other forces).

FloatoRack can easily withstand a freeze / thaw cycle, is convex at the bottom so if the body of water is drained or fully evaporates for any reason it won't get stuck in the mud at the bottom, can accept any solar panel type or size (unlike most of the existing prior art from competitors), is modular to accommodate project sizes from 5 kW to 50 GW.

The floating portion of the Floatorack is borrowed from dredging floats, which have a successful 50+ year operating history in some of the most demanding marine environments worldwide. Its manufacture is roto molded, rather than blow or vacuum forming like the competition, which provides for a uniform wall thickness and incorporates engineered ribbing for strength and durability.

Floating solar has several advantages over ground-mounted solar, including reduction of evaporation and algae growth (up to 90% reduction of both), cooler panels due to the cooling effect of the water which makes them up to 10-20% more efficient, use of surface that would have been an under-utilized or unutilized asset before floating solar, and can

4

https://www.google.com/search?q=ocean+breeze+320+ton+atmospheric+water+generator&rlz=1C1GGRV_enUS751US751&oq=ocean+breeze+320+ton+atmospheric+water+generator&aqs=chrome..69i57j69i61.23669j0j8&sourceid=chrome&ie=UTF-8

generate energy closer to its local use (many ponds, including wastewater treatment ponds, are near urban areas where land available for ground mounted solar arrays is scarce).

About ABB

Operating in more than 100 countries with over 150,000 employees, ABB is a pioneering technology leader in electrification products, robotics and motion, industrial automation, and power grids, serving customers in utilities, industry, and transport & infrastructure globally. Continuing more than a 125-year history of innovation, ABB today is writing the future of industrial digitalization and driving the Energy and Fourth Industrial Revolutions. ABB has unmatched expertise in the design and performance of off-grid and grid-connected remote power systems with a portfolio that encompasses the full range of enabling technologies including conventional and renewable power generation, automation, grid stabilization, grid connection, energy storage, and intelligent control technologies. With over twenty years experience and projects deployed around the globe, ABB technologies have been deployed in the full spectrum of extreme environments, including geographies from Alaska to remote desert communities in Australia, as well as modern urban centers.

About Development, Design & Engineering

DD&E is a full-service civil engineering, land surveying, land planning, project/construction management consulting firm that started in 1998, and is located in El Centro, CA and Yuma, AZ. From a primary market focus on residential development in Southern California during its early days, DD&E now provides civil engineering, surveying and development consulting services for all market sectors including utility-scale renewable energy projects, and public-agency contract work.