DRAFT PROPOSAL

The Los Angeles Desalination Project

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CALIFORNIA WATER

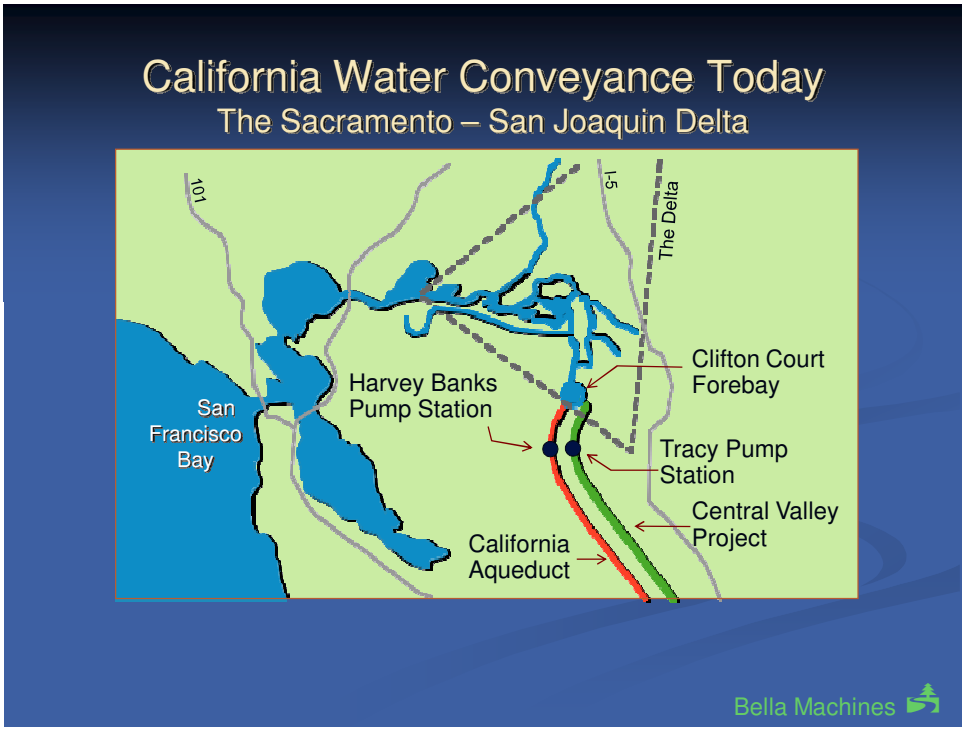
The California water crisis has been a problem that has been percolating for decades. With two-thirds of California's population living in Southern California, but two-thirds of California's annual precipitation falling in Northern California, finding reliable water sources is a constant struggle. As troublesome as things have been for California in the past, conditions are only expected to worsen. Water exports from the Delta to Southern California have been limited to protect fish, and the population of Southern California is projected to increase dramatically. California's protracted water wars have pitted farmers against municipalities.

Here at Bella Machines, we have developed and patented a special water system to harness the power of falling water and convert it directly into power for pumping. This new system is called Transformed Hydraulic Power. Transformed Hydraulic Power is a different way of thinking about hydraulic power because its end purpose is to pump water, not to generate electricity.

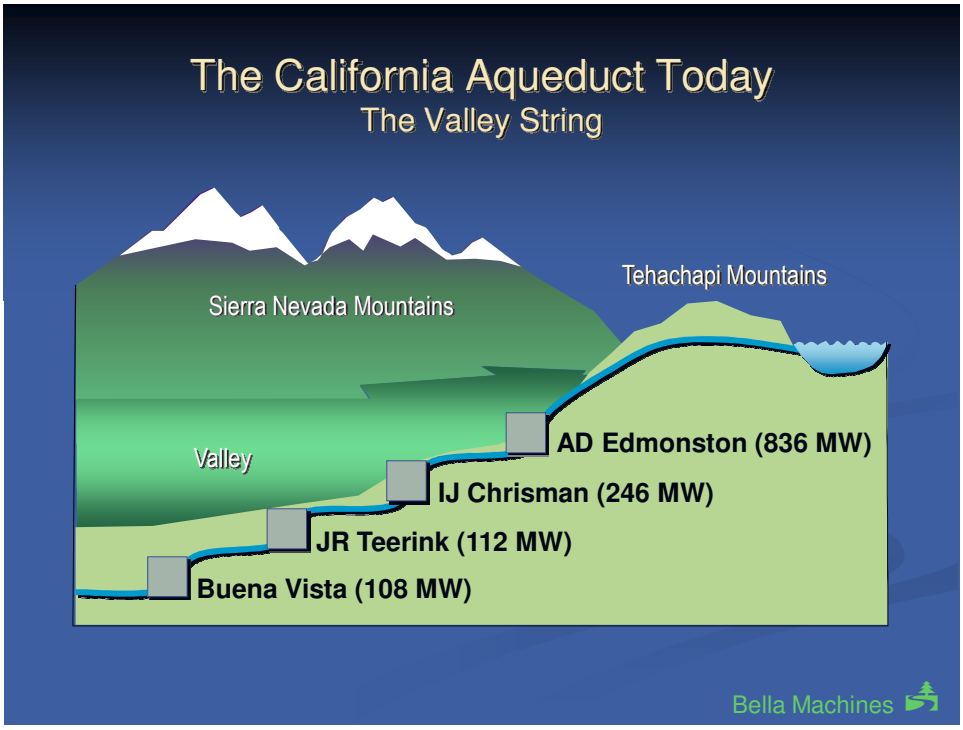
Water has an extremely high density. This fact enables it to have the capacity to generate great amounts of power. Likewise, pumping water consumes great amounts of power. Transformed Hydraulic Power takes the power from falling water and uses it directly to pump water from a second source, like the sea. By eliminating electricity as a conversion step, a greater Overall System Efficiency can be achieved.

The ideal location for implementing a massive desalination project would be Los Angeles. This would create a local, large water supply which would ease tensions over water in California and will benefit future generations. Despite the escalation of the California water crisis, there is a solution. Most importantly, it is a renewable energy solution.

CONVEYANCE VS. DESALINATION



In order to understand the necessity for the Los Angeles Desalination Project, it's helpful to understand how the current water conveyance system works. The Delta is the source of water. On the southern end of the Delta is the Clifton Court Forebay where two large pumping stations, the Tracy Pumps and the Harvey O. Banks Pumps, export Delta water south. The Tracy Pumps are part of the Federal Central Valley Project and serve mostly agricultural consumers in the Central Valley. The Harvey O. Banks Pumps are part of the State Water Project (SWP) and serve mostly urban consumers within the Central Valley as well as Southern California. The California Aqueduct is the longest conveyor of the SWP and has a string of pumping stations that convey water as far south as San Diego. The California Aqueduct is owned and operated by the California Dept. of Water Resources.



Before California Aqueduct water can reach the Metropolitan Water District (MWD) of Southern California consumers, (the LA and San Diego area) it must be lifted 2,000 ft up and over the Tehachapi Mountains. This is made possible by the AD Edmonston Pumping Station. With a capacity of 836 MW, the Edmonston Pumping Station is by far the largest user of electricity among the energy hungry pumps around the State. The current high cost of conveyance and the lack of protection for the Delta ecosystem begs for a better solution. New water generation in LA will not only reduce water demand on the Delta, but will be a wiser use of our energy resources. Reducing flow through the California Aqueduct Pumps, and specifically the Edmonston Pumps, will save substantial amounts of energy. This energy would be better utilized for new water generation.

Pumping water from the Delta to LA starting from the Clifton Court Forebay, through the California Aqueduct, has an energy requirement of 3.81 MW*Hr/Acre*ft. [1] Pumping

[1] Department of Water Resources, Division of Operations and Maintenance. State Water Project Annual Report of Operations 2001, California: April, 2005. Retrieved from:

that same volume of water to LA starting from the Sacramento River, through the proposed Delta Tunnels, and then through the California Aqueduct would increase that energy requirement to 4.11 MW*Hr/Acre*ft. [2] Compare and contrast those conveyance costs to local new water generation. Running a 100% electric desalination plant in LA would consume 5.12 MW*Hr/Acre*ft. [3] However, the LA Desalination Project with 26% of its' power coming from built-in renewable energy, would consume only 3.78 MW*Hr/Acre*ft. [4] Often the most compelling argument against desalination is the high cost of energy. Ironically, in California, water conveyance is even more expensive. Why pump water 500 miles south, and over mountain tops, when it is cheaper to produce locally?

Delta water exports to the MWD are important because it is 25% of the overall water taken from the Clifton Court Forebay, and 56% of the California Aqueduct's annual volume.[5] The MWD's water demand is only expected to grow due to population growth and continued reductions from the Colorado River Aqueduct. Population growth in Southern California is relentless. The California Business Roundtable predicts that 20 million more people will live in Southern California in the next 20 years.

The reductions from the Colorado River Aqueduct are a result of the seven-state Quantification Settlement Agreement (QSA) which allowed the MWD to take Colorado River Basin surplus water that was previously unclaimed. As Nevada and Arizona grow and claim more water, California's share is reduced.[6] The MWD (which owns and operates the Colorado River Aqueduct) has turned to the California Aqueduct to make-up for these reductions, almost gallon for gallon. In 1998, the MWD received 500,000

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http://www.water.ca.gov/pubs/operations/state_water_project_annual_report_of_operations_2001/annual01.pdf2001, plus pumping energy ratio calculations. Available by request

[2] Ibid

[3] Bella Machines, 2016 LA Desalination energy balance calculations without THP. Available by request

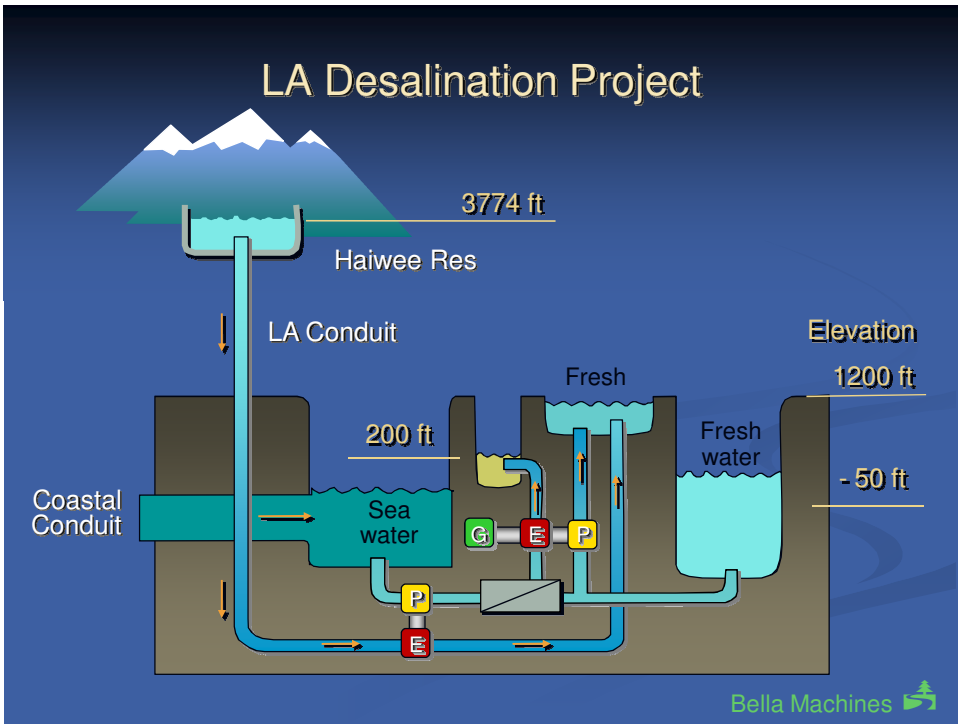
[4] Bella Machines, 2016 LA Desalination Project energy balance calculations for output of 720 MGD. Available by request

[5] Department of Water Resources, Division of Operations and Maintenance. State Water Project Annual Report of Operations 2001, California: April, 2005. Retrieved from: http://www.water.ca.gov/pubs/operations/state_water_project_annual_report_of_operations_2001/annual01.pdf2001

[6] Metropolitan Water District of Southern California. Annual Progress Report to the California State Legislature February 2004, California: February, 2004. Retrieved from: http://www.mwdh2o.com/mwdh2o/pages/yourwater/sb60/archive/SB60_04.pdf

Acre*ft from the California Aqueduct, and by 2010 it had risen to 1,500,000 Acre*ft. [7] Continuing down the path of taking more water from the Delta year after year to feed a rapidly growing demand is unsustainable. Desalination is inevitable for Southern California; it is just a matter of time.

WHAT IS TRANSFORMED HYDRAULIC POWER?



This diagram is a rendering of what the LA system might look like. However, the elevations, flows and locations are subject to change pending a survey being completed of the LA Aqueduct. This diagram is designed to give an overview of how the system could work. The power source is the mountain reservoir at a high elevation that connects to the LA Conduit. This conduit travels down to the city and the desalination plant located underground. One of the benefits of the conduit being located underground is that it avoids the risks of terrorist threats and it avoids right-of-way

[7] Metropolitan Water District, "MWD Water Sources" Retreived from: http://www.inkstain.net/fleck/wp-content/uploads/MWD.png

issues. Beach wells will be dug and covered, then connected to the Coastal Conduit. The Coastal Conduit will convey sea water by gravity to the desalination plant. The desalination plant is not located on the coastline where property values are extremely high and public recreation areas are valued. Sylmar, CA is the city that has been chosen to use in this example.

The heart of the Transformed Hydraulic Power system is the Water Engine-Pump. Two of these are utilized. The Membrane Engine-Pump, which is located at the bottom of the diagram, is the main work horse of the system. It takes the power of falling water and drives the high pressure pump. The sea water is forced through the membrane. Two liquids exit the membrane; the brine and the fresh water. The brine is still at high pressure so it is used to power the Recovery Engine-Pump. The task of this pump is to lift the newly generated fresh water to the surface.

THE POWER BENEFITS

The Power that can be derived from falling water is equal to the Flow times the Fall. The total Fall from the Owens Valley to LA is over 5,000 ft. There is tremendous potential to expand on this energy resource. The LA Aqueduct was built 100 years ago and has very few hydroelectric plants. By replacing the LA Aqueduct with the LA Conduit, the power of falling water can be fully utilized to pump sea water through membranes. Although some hydroelectric plants along the LA Aqueduct will see a loss in power production, the power losses will be outweighed by substantial power gains.

The power gains include:

- Power savings by reducing demand on the California Aqueduct Pumps that convey water from the Delta to Southern California. The A.D. Edmonston Pumping Plant is the largest Lift in the world and is tasked with pumping water over the Tehachapi Mountains. Every gallon of water that is generated in LA is one less gallon that must be pumped out of the Central Valley.

- Greater generating capacity from the new LA Desalination Plant compared to the loss of generating capacity from the LA Aqueduct. The LA Conduit will have a continuous and unbroken Fall, unlike the LA Aqueduct, with its sporadic hydroelectric plants along its length.

- Greater Overall System Efficiency, by cutting electricity out of the loop and utilizing direct water-to-water energy conversion.

THE WATER BENEFITS

Another benefit of Transformed Hydraulic Power is that it multiplies the usable water leaving the system. Even after filtering sea water at a sizable pressure drop and after rejecting brine water from the new LA Desalination Plant, it is still conceivable that the filtered sea water flow may be equal to the LA Conduit flow. The LA Aqueduct historically serves about 50% of LA's water needs. Assuming this water is transferred to the LA Conduit, this new system could supply the other 50% of LA's water by using the sea! This would be a major achievement. There are other water benefits:

- Only new water will reduce water demand on the Delta and be a positive impact on the health of the Delta ecosystem. The LA Desalination Project does this.

- By combining the free water from Transformed Hydraulic Power and the electric water made from energy savings, this project will generate 735 MGD (824,235 Acre*ft/yr) of new water at net zero grid impact (3.81 MW*Hr/Acre*ft).

- Blending unsalted water from Stormwater Capture (or recycled water) with seawater produces brackish water. Brackish water is known to require substantially less energy to generate fresh water. This technique could double the new water generated at net zero grid impact.

- With a proposed build out capacity of 1000 MGD (1,120,000 Acre*ft/yr), this project has the most promise of being a long term solution to California's water problems.

LA DESALINATION PROJECT BENEFITS

Jobs

There may be debate about how many jobs have been lost since the Recession started. There also may be debate about how many have been regained. However, there is no doubt that more jobs are needed in the United States. This project would provide those jobs. It would be a home-grown U.S. project, providing jobs for Americans.

Water

Water is not a luxury. It is a necessity. It is needed for agriculture and for personal use. Southern California population growth over the next decade will only further the conflict between agriculture and municipal water demand. If Southern California can become less dependent on the Delta, then more water can stay in the Central Valley for farming. California is the nation's number one farm state. The economic impact of farming affects the whole state, and surrounding states as well. Food security and food inflation are important issues that impact every American. In the future, water needs will compete with energy needs for our attention. The LA Desalination Project will address both needs.

Environment

The uniqueness of this project is that it provides water while being kind to the environment. Transformed Hydraulic Power has a positive environmental impact.

- It is fish friendly. There is no way for fish to enter system and be harmed.
- It protects the California Delta by reducing water demand. Further, it provides a back-up plan for Southern California water supply, in case the Delta experiences any problems.

- It is a renewable energy source that produces no Green House Gas emissions and has no ongoing fuel costs.

- The power supply requires a high elevation reservoir. This will also provide a counter measure to loss of snowpack in the mountains caused by Global Warming. Snow is nature's water storage system. It regulates water flow throughout the year. Without it, other measures must be taken to make up for this lost storage.

NEXT STEP

Transformed Hydraulic Power is intended for large scale public utility and can play an integral role in solving California's water crisis and creating jobs in America. The next step in the process is to have a Feasibility Study completed. This study would examine the geographical issues and any construction issues for the region selected. The Feasibility Study would analyze the capacity and cost of this proposed project.

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