

How Do You Reduce Potable Water Use in a District Energy System by 80M Gallons per Year?

Presented by:

Gordon Judd, General Manager
Energy Center San Francisco, LLC



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**Clearway Energy
Center San Francisco**

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Criteria for Evaluation



1. **Innovative & Unique** – technical, operational, or business practice
2. **Operational & Sustainable** – working and productive
3. **Replicable** – not a singular application
4. **Economical & Environmental** – yielding tangible benefits



Introducing our Presenter:

Gordon Judd

General Manager
Energy Center San Francisco, LLC
Clearway Energy

Agenda

01 The Setup

02 The Opportunity

03 The Design

04 The Execution

05 The Results and Lessons
Learned

06 Questions & Answers

How Much is 80 Million Gallons?

- Enough to Fill the Largest Oil Tanker That Can Go Through the Suez Canal



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- 120 Olympic-sized Pools



The Setup

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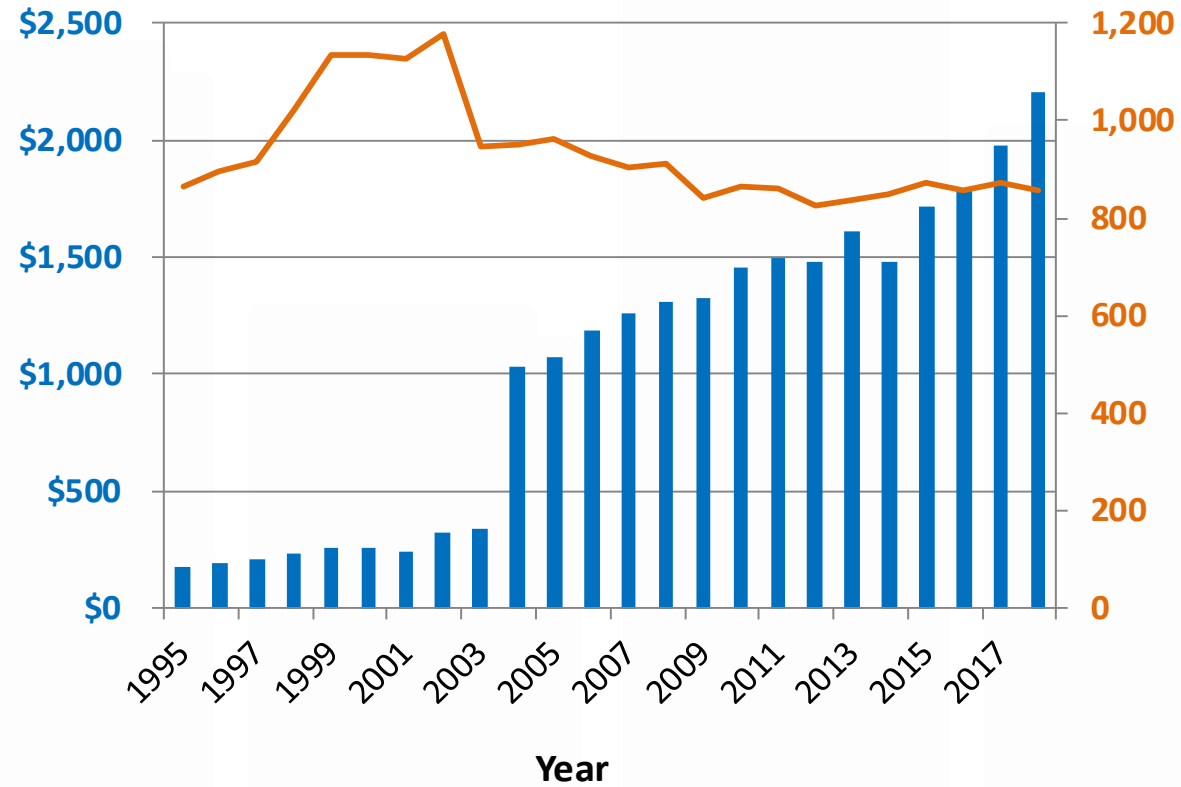
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- The City of San Francisco is aggressively trying to reduce potable water usage to conserve natural resources.



ECSF Water Costs 1995 - 2018

Annual
Water / Sewer
Cost
(\$ x 1000/yr)

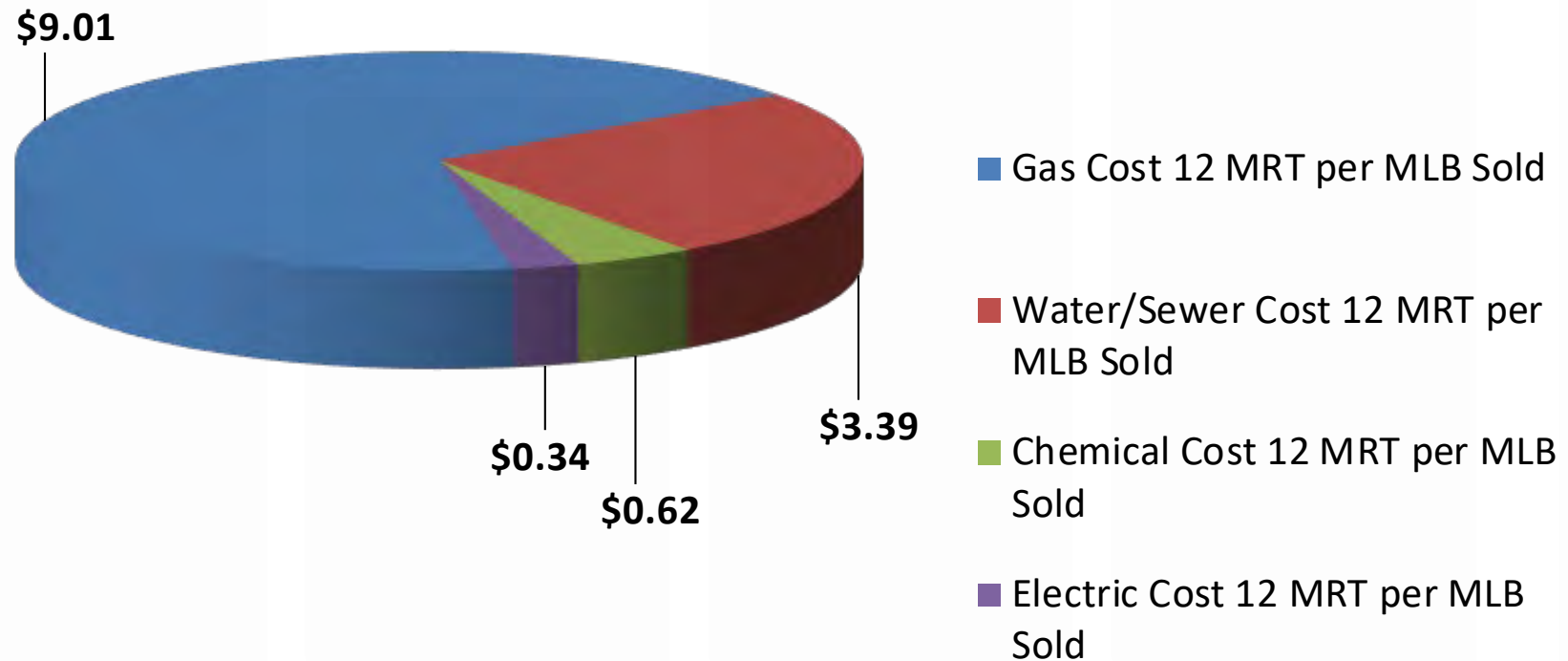
Annual
Water Use
(MMLBs/Yr)



12-Month Running Water/Sewer Cost (\$ x 1000)

12-Month Running Water Use
(MMLB/yr)

**Steam Cost of Sales
(as of Jan 2019)
\$13.36/MLB Sold**



NOTE: 12 MRT = 12-Month Running Total

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- The San Francisco Public Utilities Commission was aggressively looking for large, water reuse projects and was offering up to \$500k grants to bring them about.
- Was there a way to bring the needs of Public and Private entities together to create a solution that is a win for everyone?



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- Move from:
 - 90% makeup water in 2016
 - To 0% makeup water by 2026.

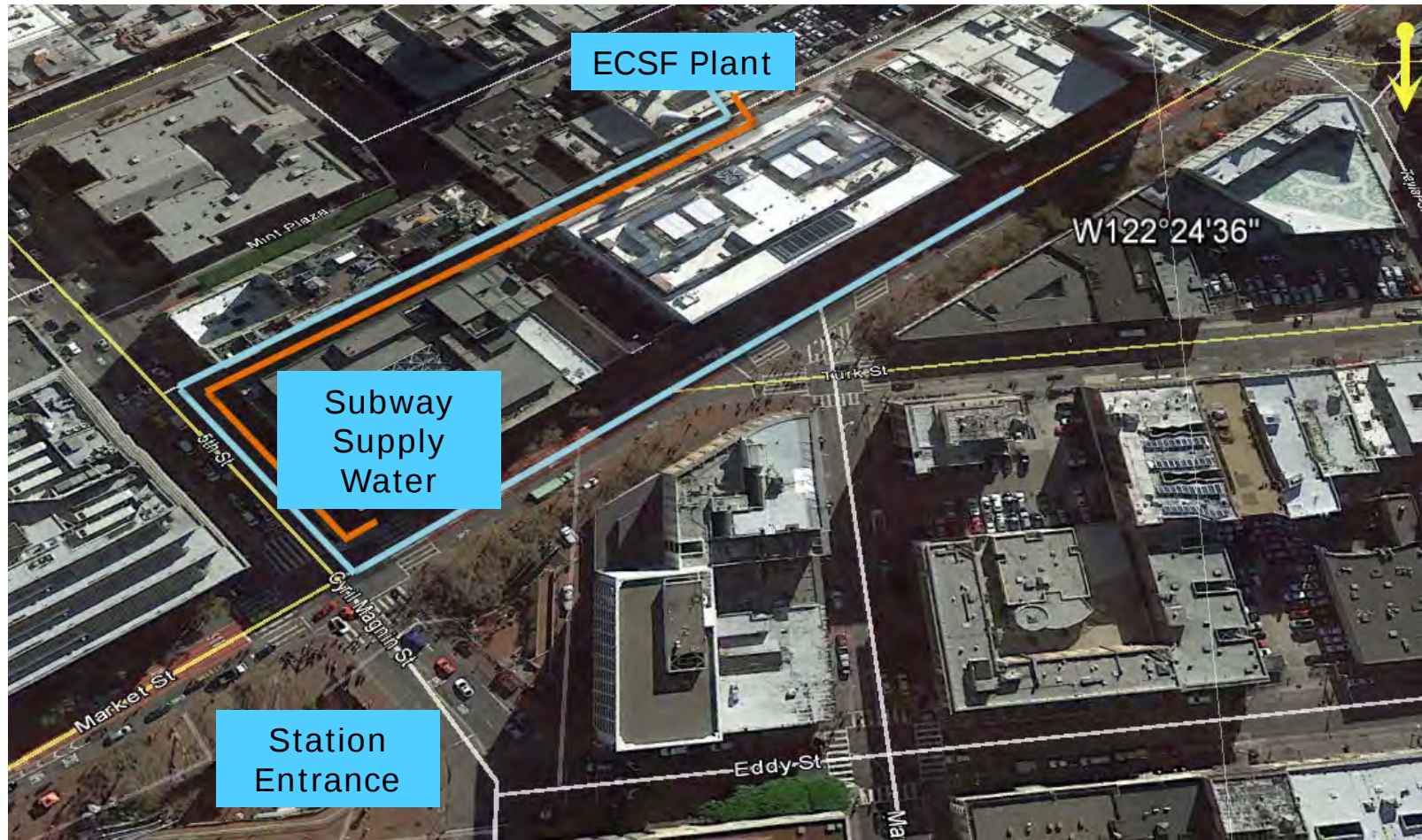


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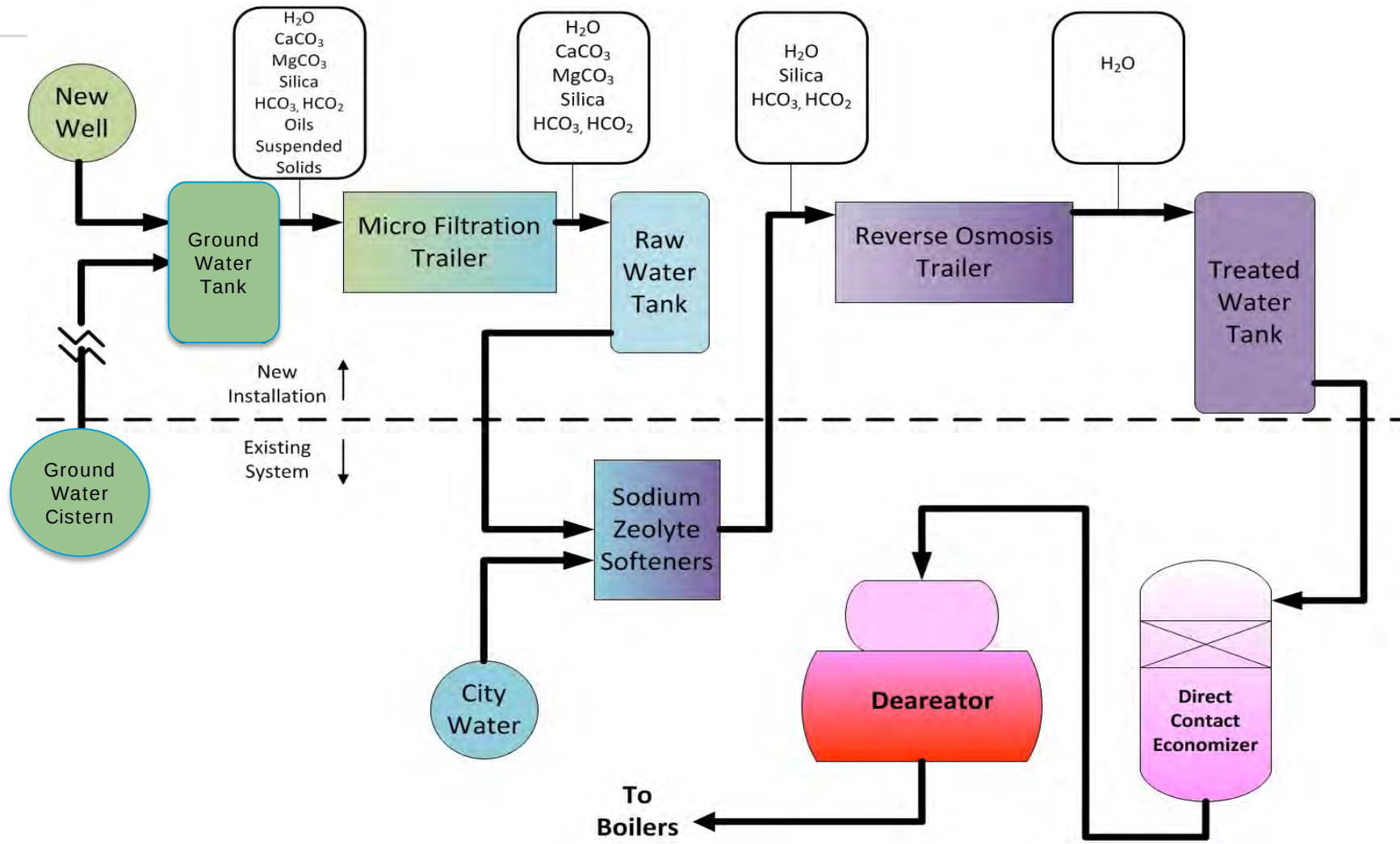


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- Target Project Payback: < 3 years.

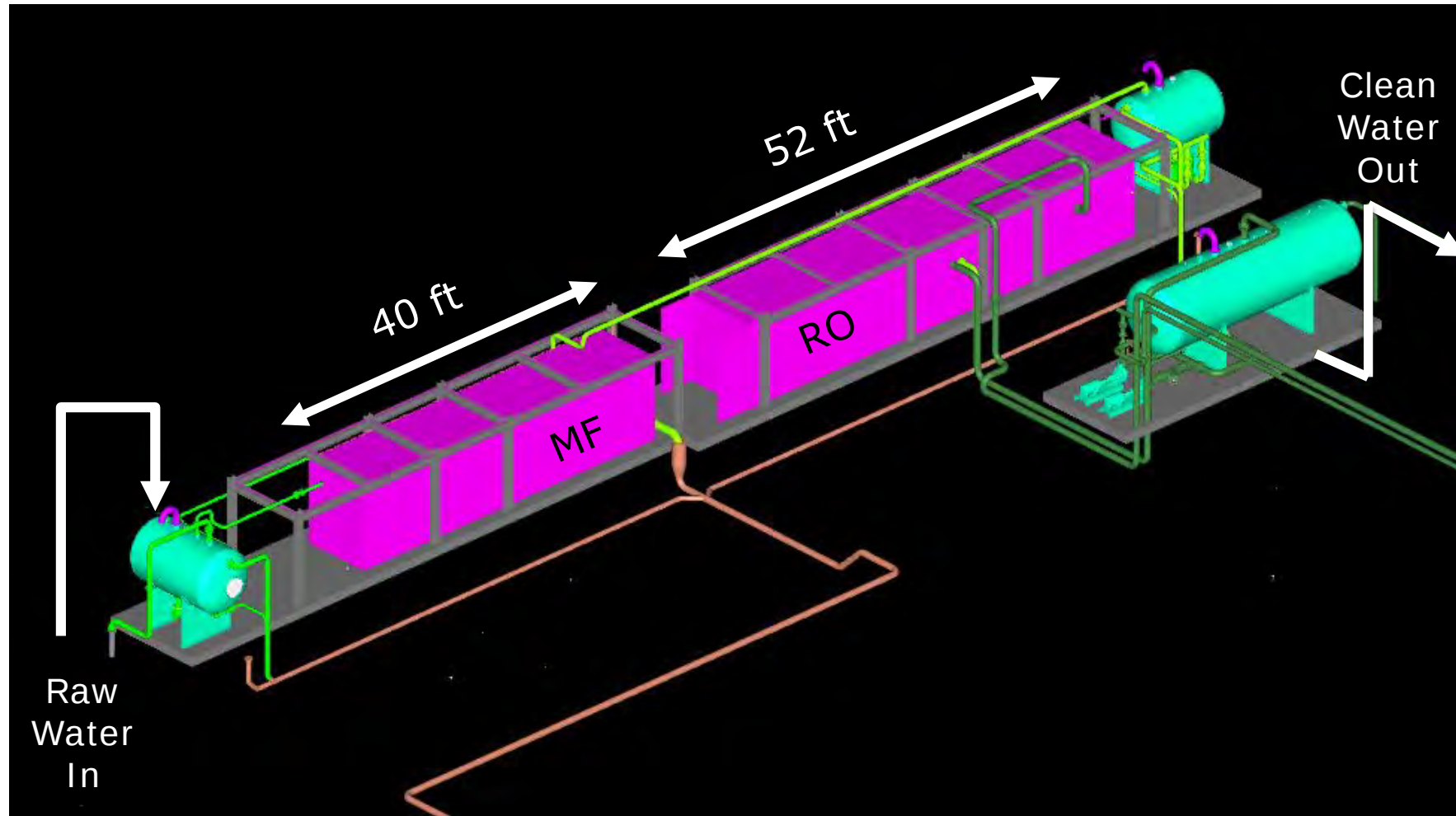
The Execution - Pipeline



The Design

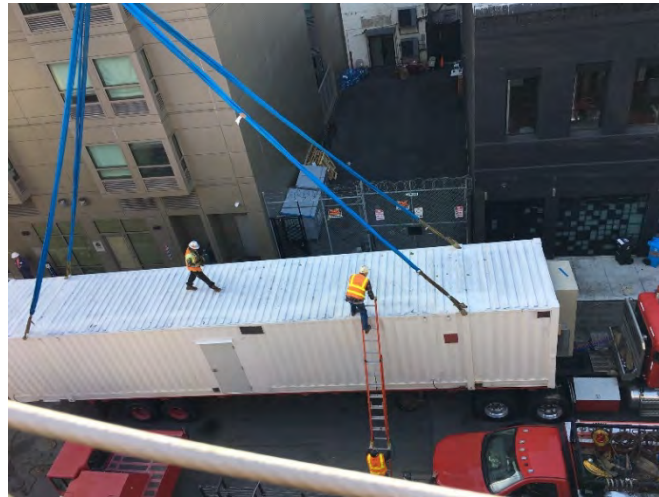


The Design



The Execution - Plant

- All Piping & Structural Steel Work Done by Employees
- MF & RO Water Treatment Modules Simplified Construction



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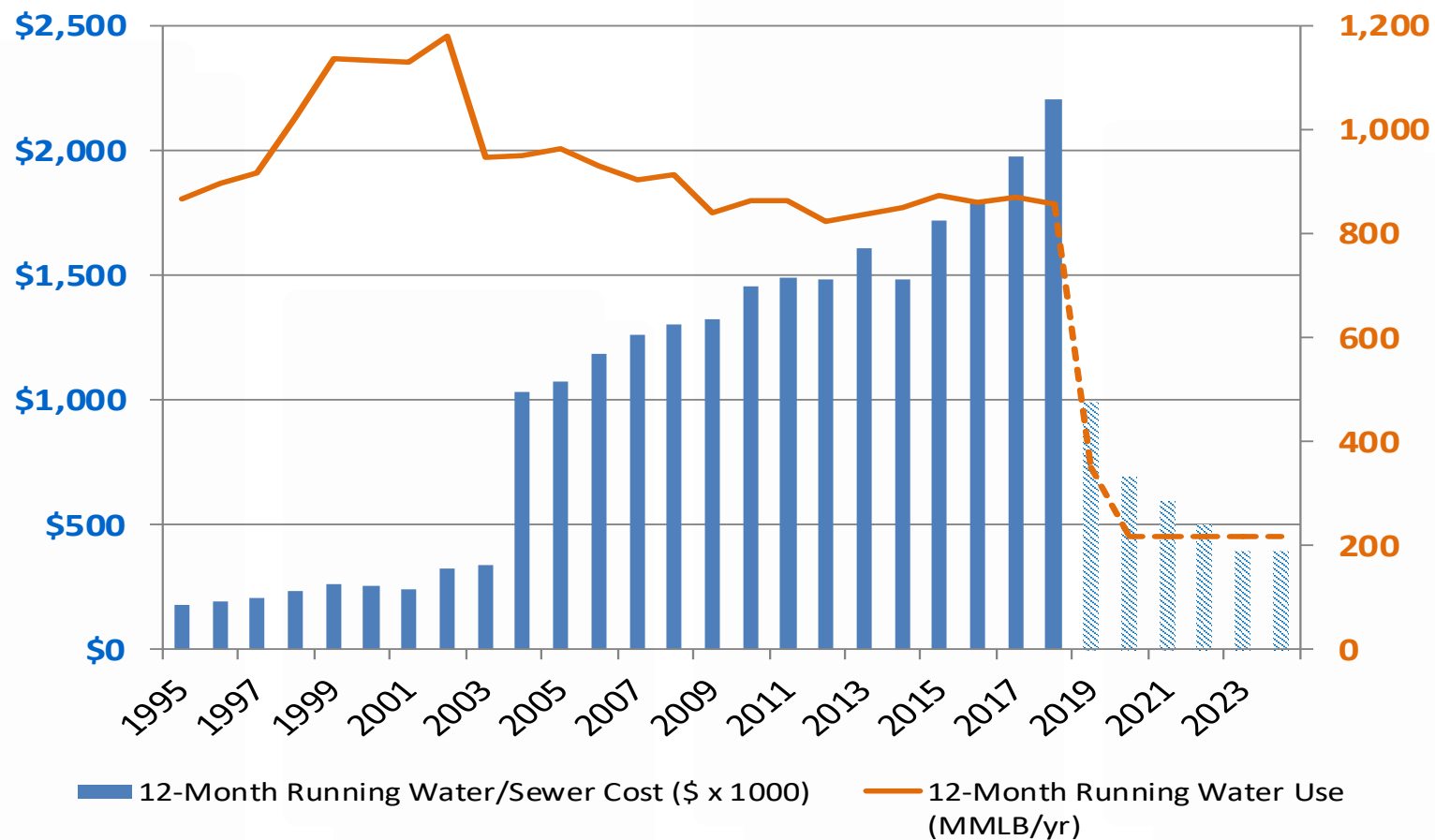
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- Using a Combination of Ground Water and Well Water Will Allow ECSF to Market a New Product Called “Sustainable Steam”
 - Goal Would be to get USGBC LEED Points to Enhance Marketing of Steam in San Francisco

Annual City
Water/Sewer
Cost
(\$ x 1000/yr)

ECSF Projected Water Cost Improvement w/ Ground and Well Water 2018-2024

Annual City Water
Use
(MMLB/yr)



Lessons Learned

Lesson Learned #1

- Integrating New Equipment into Old Plant is Hard

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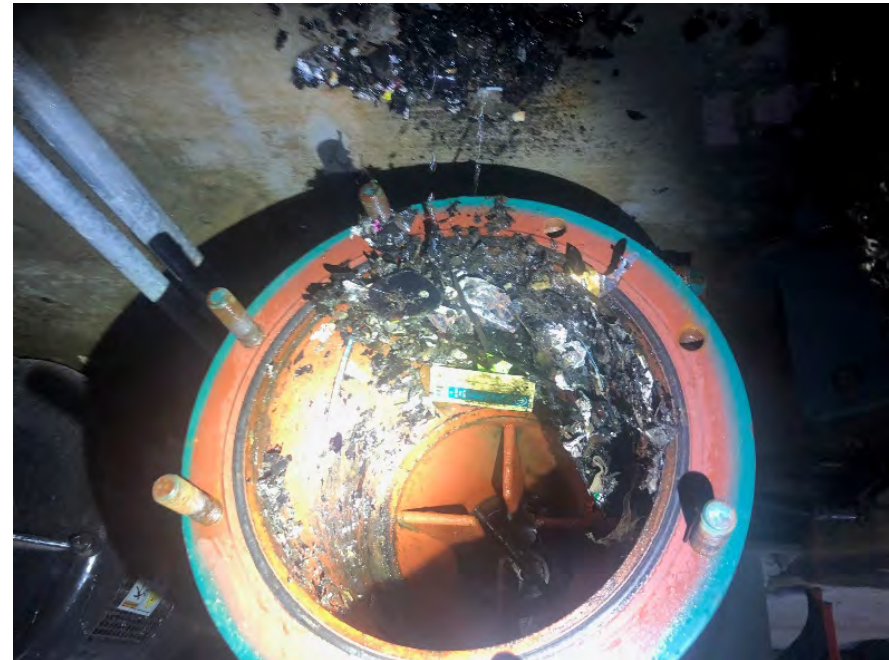
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 - Carbon Steel Piping Corrosion
 - Higher Load / Shorter Runs on Existing Water Softeners

Lesson Learned #2

- Not What We Expected in Subway Water

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- Not What We Expected in Subway Water
 - Not Everything Shows Up in Samples
 - Debris Caused Clogging of Pumps and Strainers



Lesson Learned #3

- Chemicals

Lesson Learned #3

- Chemicals
-Lots of Chemicals

Lesson Learned #3

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Chemicals Prior to RO Installation

Chemicals	Gal/Mo.	Size	pH	Comments
BL4350	90-150	1000	high	Boiler Scale Inhibitor
BL1555	120+	1000	High	Amine
BL122	50-100	405	High	Sodium Bi-Sulfite

Chemicals After RO Installation

Chemicals	Gal/Mo.	Size	pH	Comments
Bleach	30-120	TBD 405	Hi	Bleach tank
RL124	120	405	Low	Cl2 destruct
RL9909	90	405	Low	RO anti-scalant
RL2016	90	405	Low	CIP cleaner
CL206	10	65	biocide	Biocide
RL1700	90	550	High	CIP Cleaning
BL1240	70	405	high	Sulfite
BL4350	90-150	1000	high	Boiler Scale Inhibitor
BL1555	120+	1000	High	Amine
BL1304	50-100	405	High	405 gal dual wall tank = 4'D, 59" H

Lesson Learned #4

- Chemistry is Different

Lesson Learned #4

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 - De-min Water and Carbon Steel Piping

Lesson Learned #4

- Chemistry is Different
 - De-min Water and Carbon Steel Piping
 - De-min Water in Direct Contact Economizer
 - Higher CO₂ Absorption with No Alkalinity to Buffer
 - Will Convert to Indirect Contact

Lesson Learned #5

- Better Than We Thought
 - Adding Well Tripled the Water/Sewer Savings
 - with only additional 10% Cost to Project
 - Desalitech Process Works Well
 - RO is Running 85-90% Permeate

Questions?

Gordon Judd, General Manager

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The IDEA Innovation Award showcases examples of technology, engineering and operational innovation within the district energy industry.

Presented annually at IDEA's Annual Conference & Trade Show, submittals are evaluated in four main categories:

- **Ingenuity:** the technology has to be a new technical, business, or operating practice that shows ingenuity.
- **Measured Success:** the technology must be working for a sustained period of time with demonstrated efficiency success that can be measured.
- **Replicable:** the innovation must be replicable, meaning that this idea can be easily applied elsewhere.
- **Economic & Environmental:** the innovation must demonstrate economic and environmental benefits.

Thank You



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<http://bit.ly/InnovationAwardIDEA>

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Submission Deadline: Friday, March 27, 2020

Thank You

- Please complete brief survey to follow.
- All participants will receive email with information on posting of presentation.
- Tune in next week on Wednesday, November 6 for a webinar by Trane:
“Renewables Procurement: Creating New Ways to Raise Sustainability”
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