



EASTERN MUNICIPAL WATER DISTRICT

The Roadmap to Energy Excellence

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Agenda



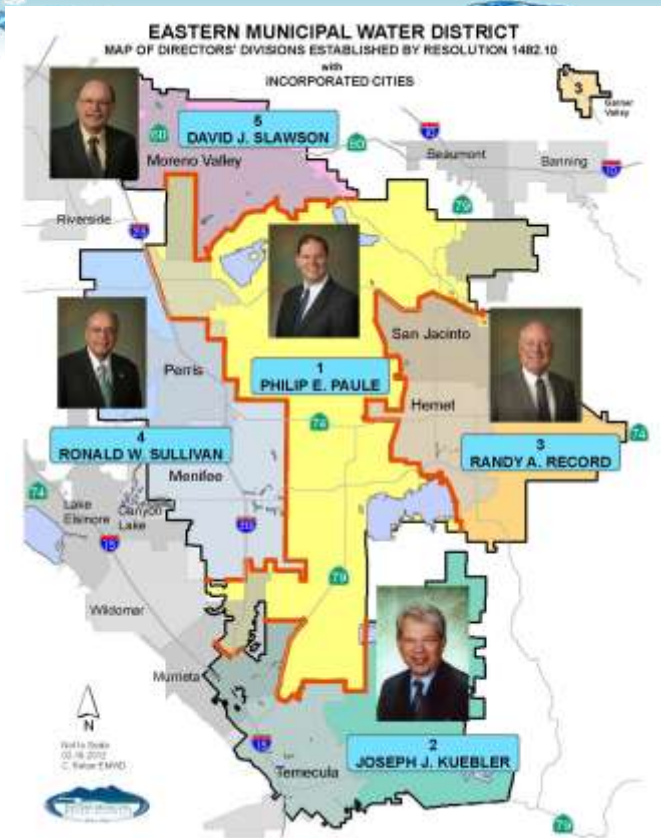
- EMWD Background
- EMWD Products and Services
- Purpose of Energy Management Plan (EMP)
- Findings
- Recommendations
- Path Forward



- Established in 1950
- One of 26 MWD member agencies
- Unique agency, serving:
 - Potable Water
 - Wastewater
 - Recycled Water
 - Wholesale and retail

Service Area

- 542 square mile service area
- 768,000 service population
- Moreno Valley to Temecula
- Seven cities and unincorporated areas
- \$225 Mil Annual Operating Budget
- 5-Member Board of Directors



Products and Services



- Potable Water: ~137,000 accounts
90,000 AF of fresh water sales per year
 - Perris/Hemet Water Filtration Plant
 - Menifee/Perris I Desalter
 - Perris II Desalter (design)
 - Groundwater Wells/Imported Water
- Wastewater: ~200,000 accounts
4 wastewater treatment plants
 - Capacity: 56 MGD
 - Currently treating: 46 MGD
- Recycled Water: 4th largest in California!
 - EMWD treats 100% of wastewater generated
 - 67% of effluent is sold for RW application



Hemet Water Filtration Plant



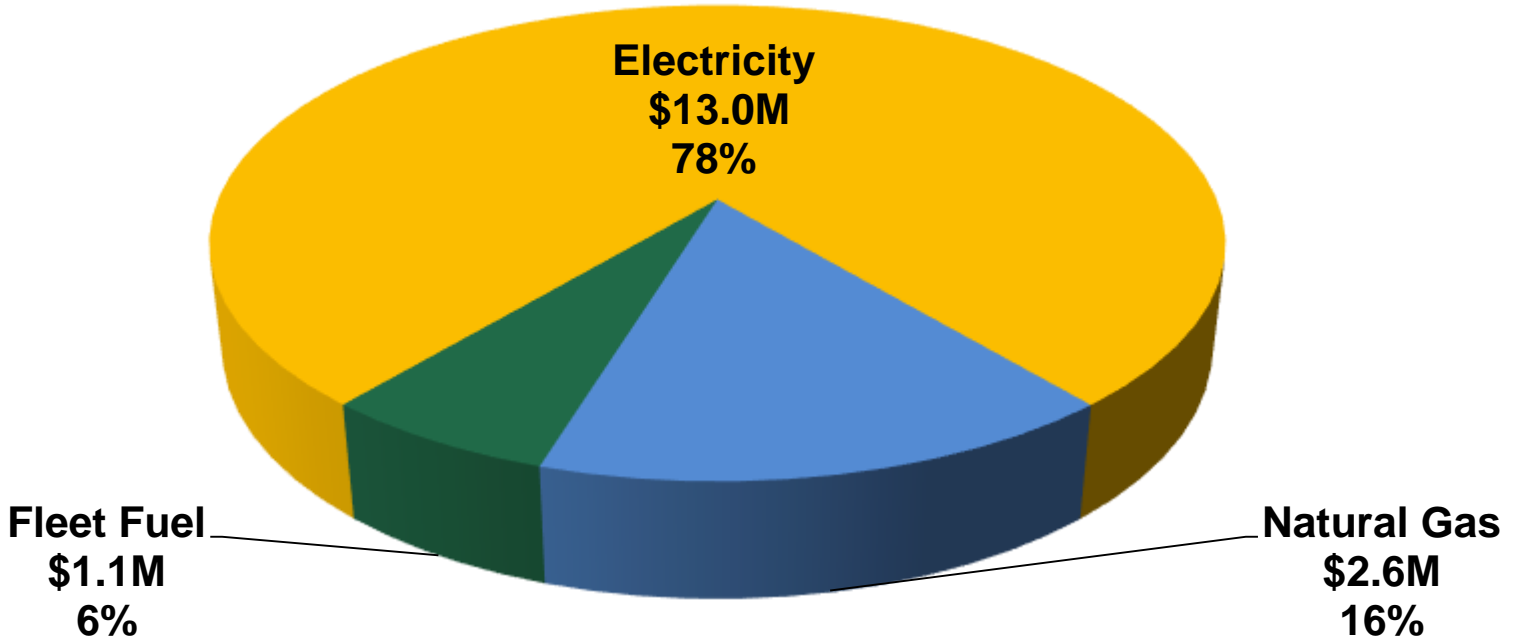
Perris I Desalter

Annual Energy Use and Cost



2014

Total \$16.7M

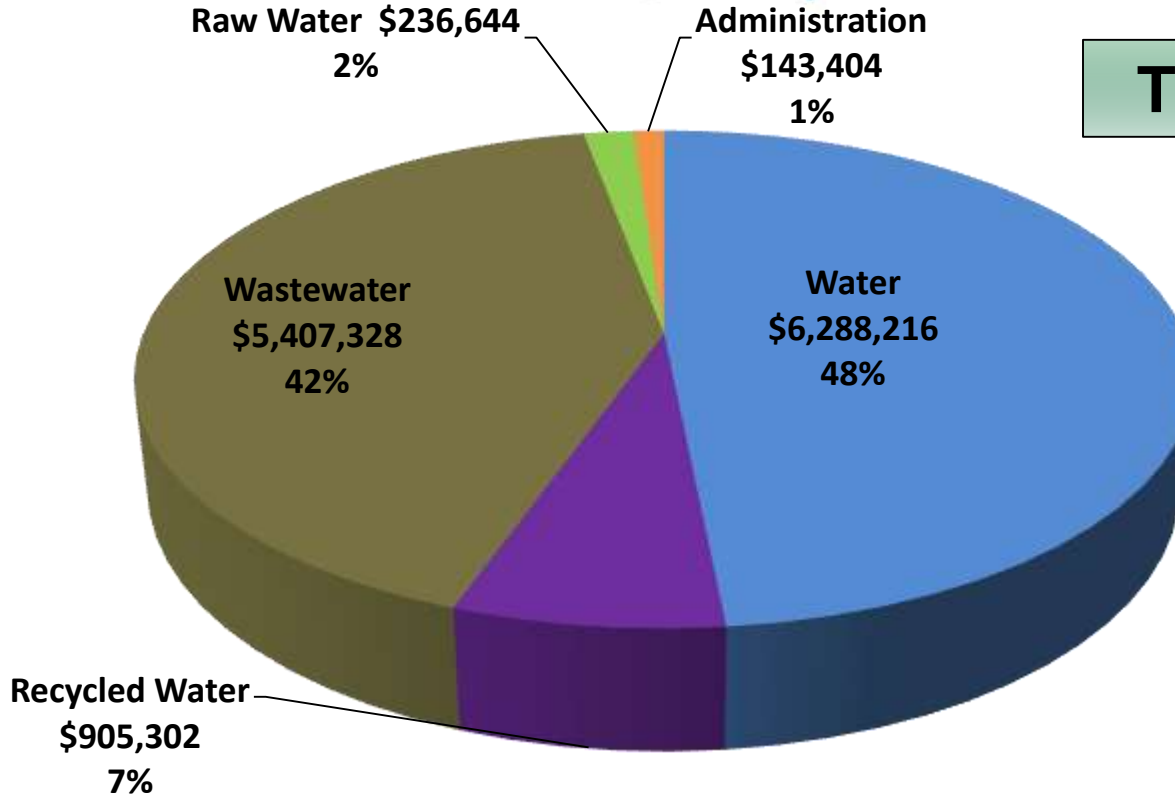


Annual Electricity Use and Cost



2014

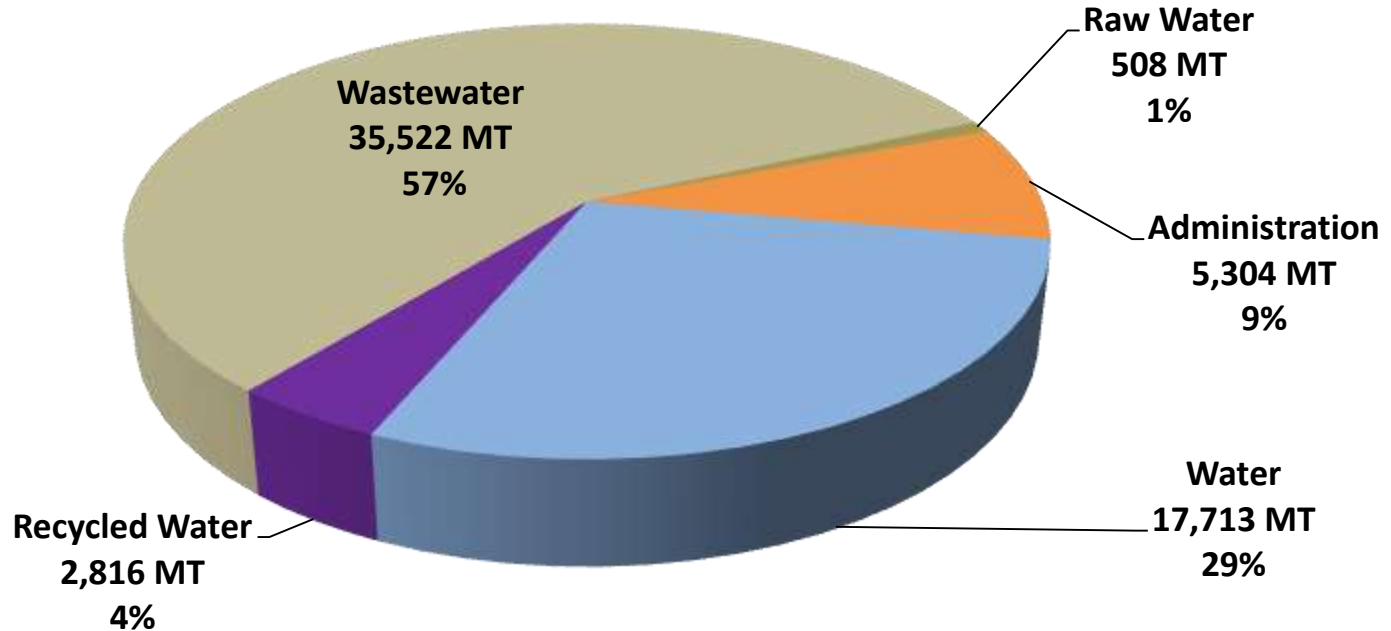
Total \$13.0M



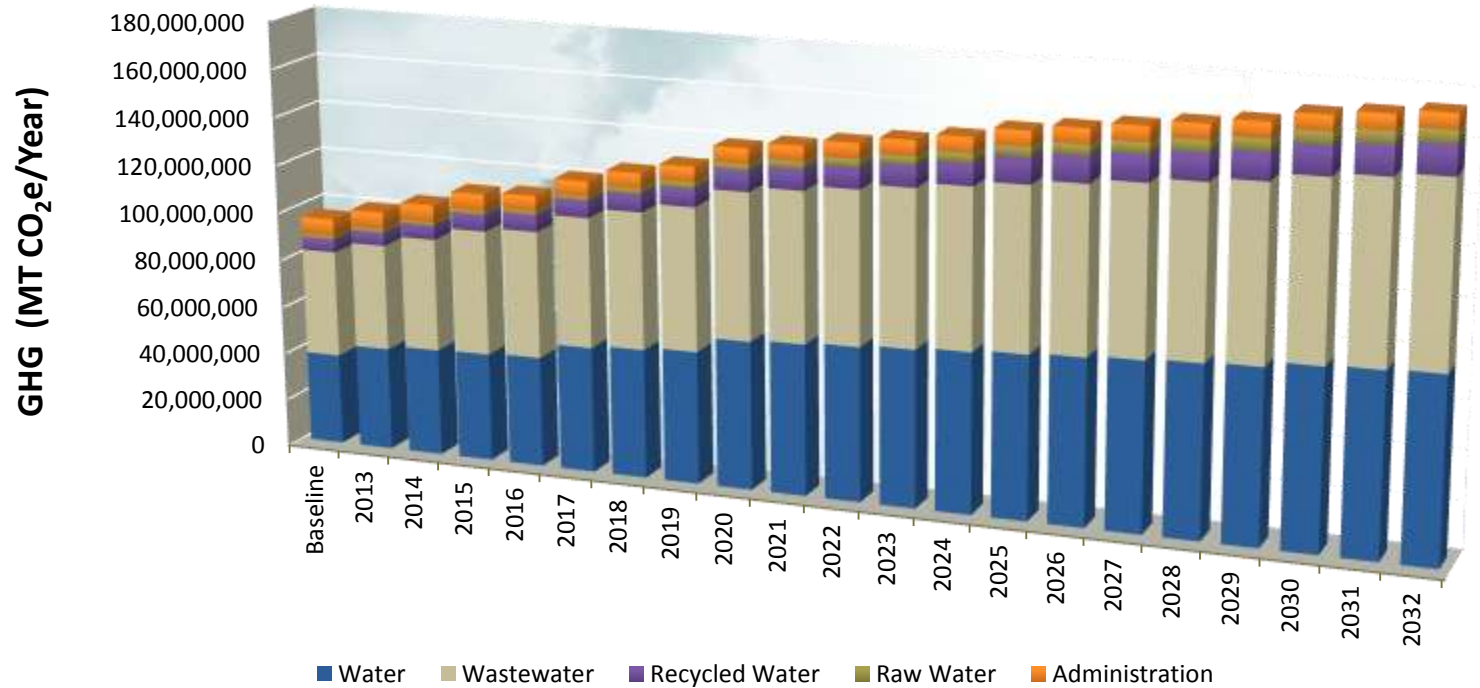
Annual GHG Emissions by Category



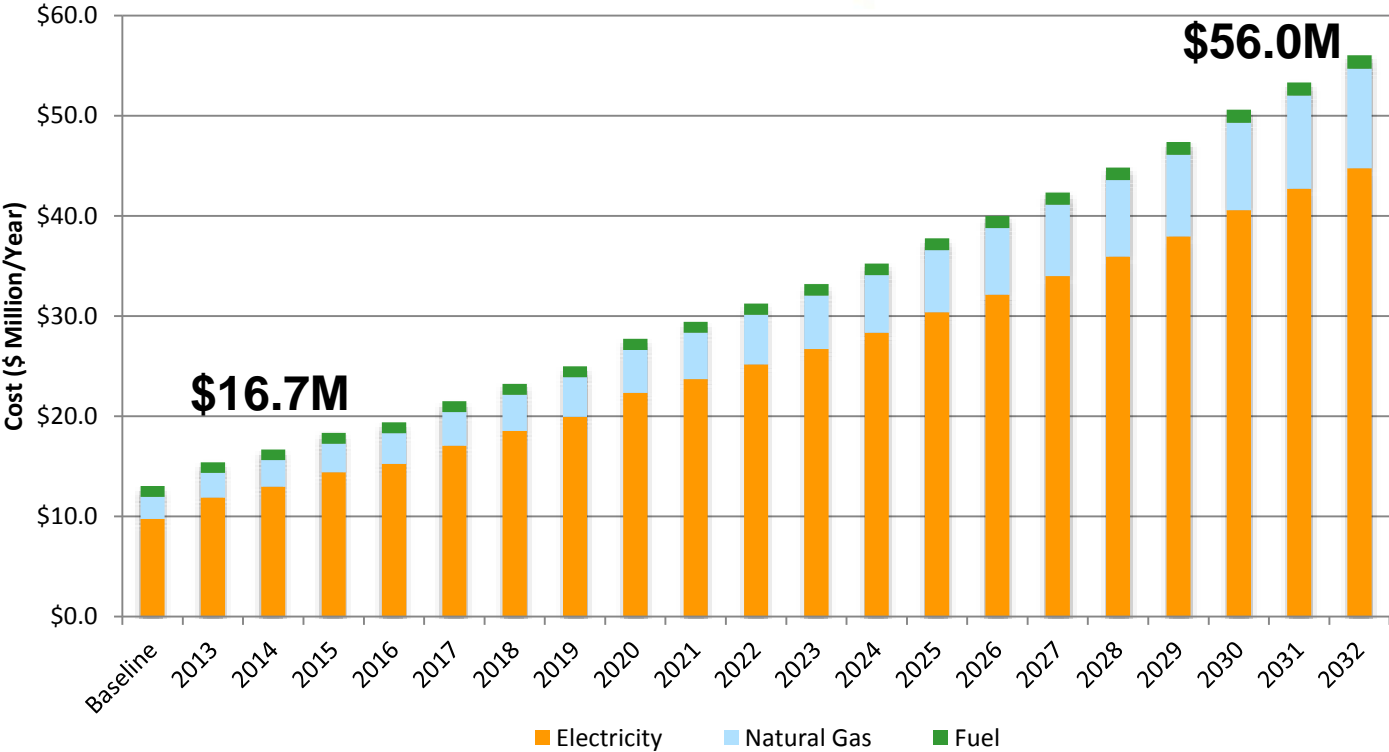
Annual Greenhouse Gas Emissions by Category - 2011/2012 (MT CO₂e)



Annual GHG Forecast



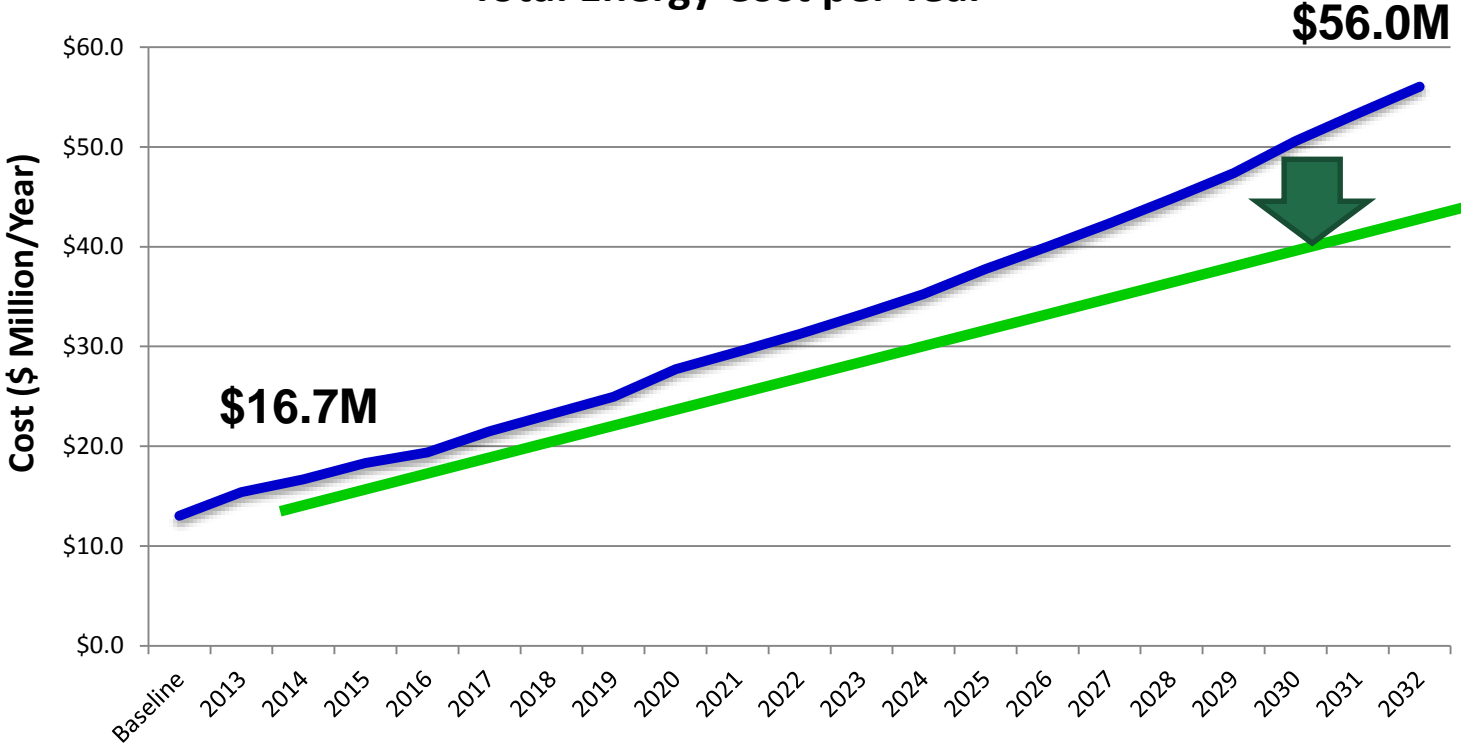
Forecast of Energy Costs



Forecast of Energy Costs



Total Energy Cost per Year



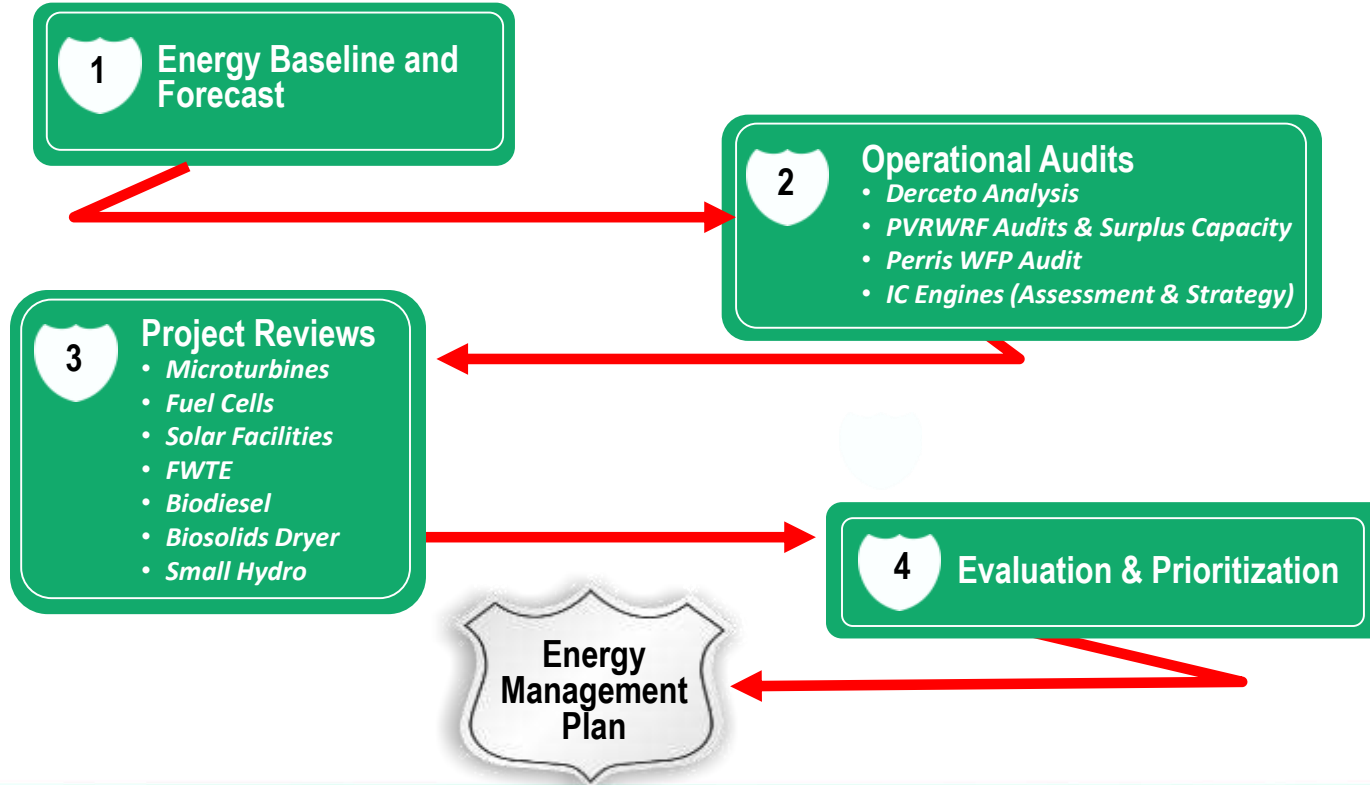
Purpose of an Energy Management Plan



- Strategic and comprehensive look at energy use and cost, as well as Green House Gas (GHG) emissions.
- Identify portfolio of potential projects to reduce the District's existing and future energy use and costs; and thereby reduce GHG emissions and improve air emissions compliance.
- Advance the District's strategic plan goal of net energy independence.



The Road Map



Planning Process



Operational Audits and Project Reviews



Operational Audits:

- A – Derceto System Audit
- B.1 – PVRWRF Energy Audit
- B.4 – Surplus Capacity Strategy
- C – Perris WFP Energy Audit
- D – IC Engines vs Electric Motors

Project Reviews:

- A – Microturbines
- B – Fuel Cells
- C – Solar Facilities
- D – Food Waste To Energy
- E – Biodiesel
- F – Biosolids Dryer
- G – Small Hydro

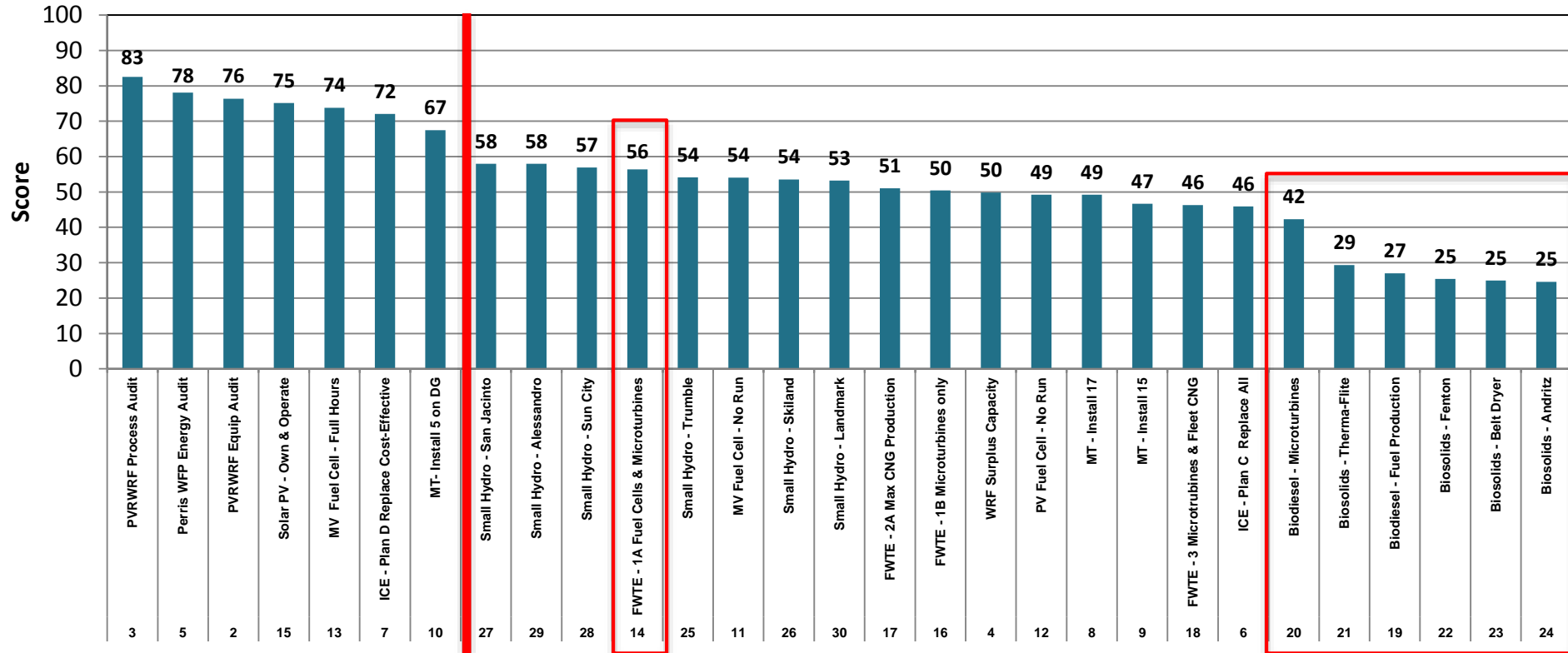
30 Complete and Independent Projects Analyzed

Evaluation Criteria and Weighting



Criteria	Weight
1. Cost/Cost-Effectiveness	40
2. Alignment with Strategic Goals	20
3. Operational Impacts	15
4. Risk and Uncertainty	15
5. Environmental and Regulatory	10

Scoring and Ranking



Short-List of Projects



#	Project Name	Score	Rank
3	PVRWRF Process Audit	83	1
5	Perris WFP Equipment and Process Audit	78	2
2	PVRWRF Equipment Audit	76	3
15	RWRFs Solar PV - Own and Operate (5 MW)	75	4
13	MV Fuel Cell - Optimization Project	74	5
7	IC Engines - Convert Only Cost-Effective	72	6
10	PVRWRF Microturbines (5) on Digester Gas	67	7

Includes continuing to use Derceto and continue to operate existing Fuel Cells.

- Mix and Match Short-Listed Projects and Other Projects to Develop Portfolios
- Portfolios Represent Different Themes or Mixes of Projects
- Portfolio Comparison Matrix
 - NPV of Cumulative Net Savings
 - Average Annual Net Savings
 - Capital Cost
 - Electricity Generated or Saved
 - Natural Gas Saved
 - GHG Reductions

Preferred Portfolio



- Which Portfolio makes the most sense?
- **Portfolio #7** because:
 1. Highest NPV and Avg Annual Savings
 2. Moderate Capital Costs
 3. High Electricity Generated/Saved
 4. Relatively High Natural Gas Savings
 5. High GHG Reductions

Preferred Portfolio Projects



- IC Engine Conversion
- PVRWRF Equipment and Process Audit
- PWFP Equipment and Process Audit
- PVRWRF Microturbines (5 on Digester Gas)
- MVRWRF Fuel Cell – Improve Capacity Factor
- RWRFs - Solar PV: 5 MW Own and Operate

Includes continuing to use Derceto and continue to operate existing Fuel Cells.

IC Engine Conversion

- 59 Total Engines Running on Natural Gas
- 18 Decommissioned or in CIP to Convert to Electric Motors (31%)
- 16 Cost-Effective to Convert (29%)
- 25 Not Cost-Effective to Convert (45%)



• Capital Cost = \$3,293,000

• Incentive = \$0

• Net Cost = **\$3,293,000**

• Annual Electric Savings = **-4,219,300 kWh**

• Average Annual Net Savings = \$308,700

• NPV of Cumulative Savings = **\$4,356,000**

Overall IC Engine Conversion Benefits

- Improved reliability
- Standardized equipment
- Reduction in O&M costs
- More favorable cost competition for capital equipment
- Reduction of GHG emissions
- Reduction of Air Quality restrictions
- Safety



PVRWRF Process Audit



Recommended EEMs for Immediate Implementation

Priority	EEM #	Category	Title	Avg Annual Net Savings (\$/Yr)
1	14	Digested and Solids Storage	Digester Off-Line	\$67,730
2	17	Chlorination	Chlorine Basin Cover	\$50,072
3	12	Secondary Clarifiers	Remove Clarifier	\$37,026
4	16	Digested and Solids Storage	Change Mixing Strategy - Dewatering	\$28,221
5	15	Digested and Solids Storage	Change Mixing Strategy - Digester	\$22,577
6	11	Secondary Clarifiers	Reduce RAS Rate	\$18,061
7	2	Raw Pumping	Wet Well Level	\$7,526

11 other recommended EEMs

<ul style="list-style-type: none"> • Capital Cost = \$10,500 • Incentive = \$0 	<ul style="list-style-type: none"> • Annual Electric Savings = 1,582,200 kWh • Average Annual Net Savings = \$268,700
<ul style="list-style-type: none"> • Net Cost = \$10,500 	<ul style="list-style-type: none"> • NPV of Cumulative Savings = \$2,260,600

PVRWRF Equipment Audit



Recommended EEMs

EEM #	Category	Description	Avg Annual Net Savings (\$/Yr)
1	Lighting	Install lighting controls in all unoccupied spaces.	Best Practice
2a	Lighting	Replace Interior Lighting with higher efficiency lighting systems	\$2,465
2b	Lighting	Replace Exterior Lighting with higher efficiency lighting systems	\$10,087
3	HVAC	Lock temperature range of HVAC systems	TBD
4	HVAC	Provide an alternative HVAC system for main control room instead of heat pump	TBD
7	Plug Load	Remove all portable space heaters	Best Practice
8	Plug Load	Replace microwave above sink made in 1992 with a microwave/convection system	Best Practice
9	Process	Replace computers and monitors with Energy Star equipment at end of life	Best Practice
10	Operational	Reduce ramp response of Turblex blowers during blowdown cycles.	TBD
11	Operational	Replace Turblex blower with Neuros blower	\$45,511
12	Operational	Route aeration system blowdown to the blower building exterior	TBD
15	Operational	Enroll in SCE pump optimization program	\$122,792

<ul style="list-style-type: none"> • Capital Cost = \$1,965,000 • Incentive = \$205,000 	<ul style="list-style-type: none"> • Annual Electric Savings = 1,741,200 kWh • Average Annual Net Savings = \$142,300
<ul style="list-style-type: none"> • Net Cost = \$1,760,000 	<ul style="list-style-type: none"> • NPV of Cumulative Savings = \$2,140,000

PWFP Equipment and Process Audit



List of Recommended EEMs

EEM #	Category	Title	Avg Annual Net Savings (\$/Yr)
1	Lighting	Lighting – Interior	\$8,546
2	Lighting	Occupancy Sensor - Bathrooms & Kitchen	Best Practice
3b	Lighting	Occupancy Sensor - Finish Water Building	Best Practice
4	Lighting	Lighting - Exterior LED	\$11,787
5	Lighting	Lighting - Delamp Control Room (per fixture)	Best Practice
7	Plug Load	New Appliances (Refrigerator)	Best Practice
10	Process	Pump Efficiency	\$42,782
16	Process	TOU Analysis	TBD
17	Process	Managing Overproduction	Ops Change
18	Process	Off-Spec Water	Ops Change
19	Process	Wet Well Level	\$12,528

<ul style="list-style-type: none"> • Capital Cost = \$462,000 • Incentive = \$42,000 	<ul style="list-style-type: none"> • Annual Electric Savings = 458,400 kWh • Average Annual Net Savings = \$63,700
<ul style="list-style-type: none"> • Net Cost = \$420,000 	<ul style="list-style-type: none"> • NPV of Cumulative Savings = \$930,000

Solar PV - Own and Operate

- Up to five 1 MW Solar PV Projects (5 MW)
- EMWD Own and Operate
- Offset Load at RWRFs
- CSI Reservation Obtained



• Capital Cost = \$25,091,000	• Annual Electric Savings = 8,537,000 kWh
• Incentive = \$5,051,000	• Average Annual Net Savings = \$179,500
• Net Cost = \$20,040,000	• NPV of Cumulative Savings = \$2,829,000

Summary Results



Average Annual Net Savings	\$1.2 Million/Year
Net Present Value (NPV) of Average Annual Net Savings	\$17.9 Million
Cumulative Total Net Savings by 2033	\$24.2 Million

Average Annual Electricity Generation/Savings	10.2 Million kWh/Year
Total Electricity Generation/Savings by 2033	203.1 Million kWh

~1,500
Homes

Annual Reduction in GHG Emissions	4,940 MT CO₂/Year
Total Reductions in GHG Emissions by 2033	97,990 MT CO₂

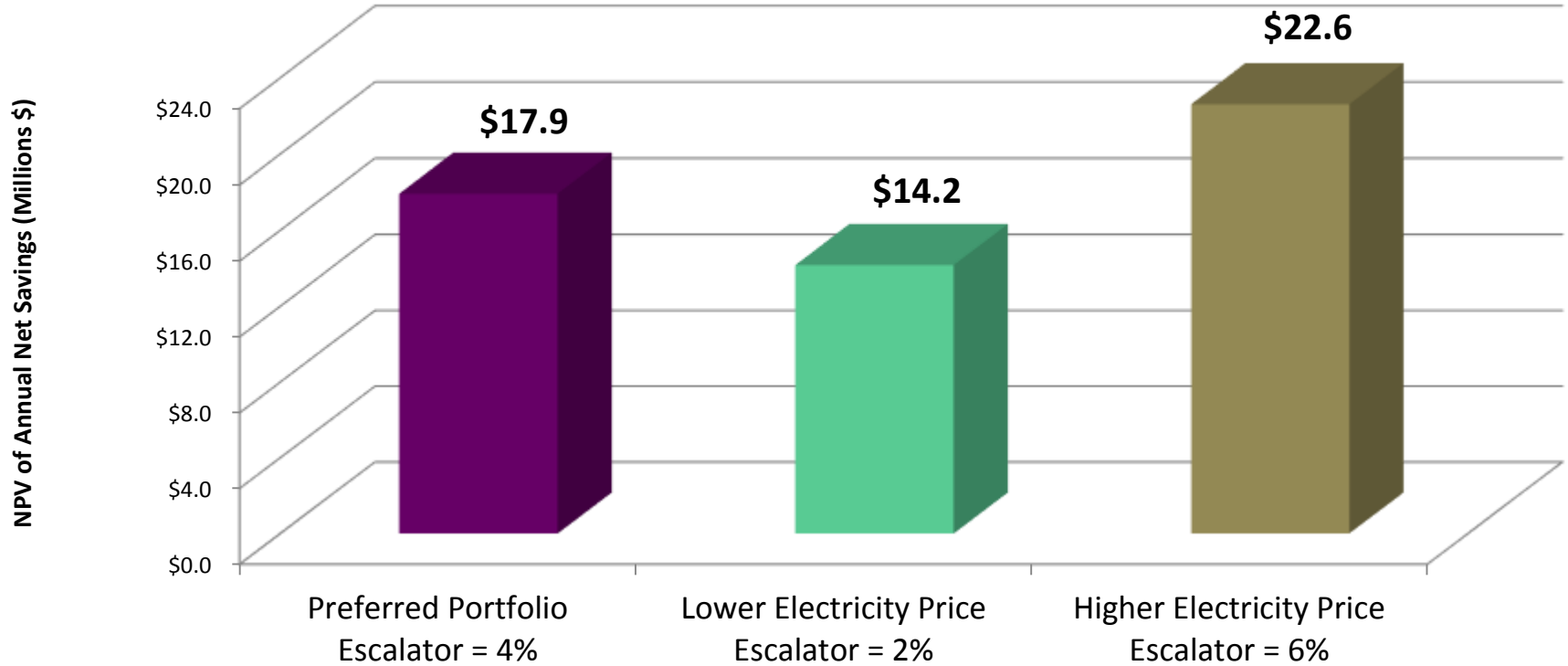
~1,000
Cars

Sensitivity Analysis



- Provides guidance in responding to future changes in regulatory, political or economic environment
- Scenarios/Sensitivities:
 1. Electric Cost
 2. Natural Gas Cost
 3. GHG Fee
 4. Discount Rate
 5. Bond Interest Rate

Sensitivity - Electric Rates



Sensitivity Analysis - Conclusions



- Some scenarios reduce the Preferred Portfolio's savings
- In all scenarios the Preferred Portfolio remains cost-effective
- Robust Plan under these future scenarios

Implementation Plan



Project	Status
PVRWRF Process Optimization	Initiated and Partially Implemented
IC Engines – Convert Cost-Effective Only	Initiated (Phase 1)
PWFP Equipment and Process Optimization	Initiated and Partially Implemented
PVRWRF Microturbines (5)	Initiated
PVRWRF Equipment Optimization	Initiated and Partially Implemented
Solar PV – Own & Operate (5MW)	Initiated
MV Fuel Cell Optimization	Initiated

Thank you for your time!
Questions?



EASTERN MUNICIPAL WATER DISTRICT

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