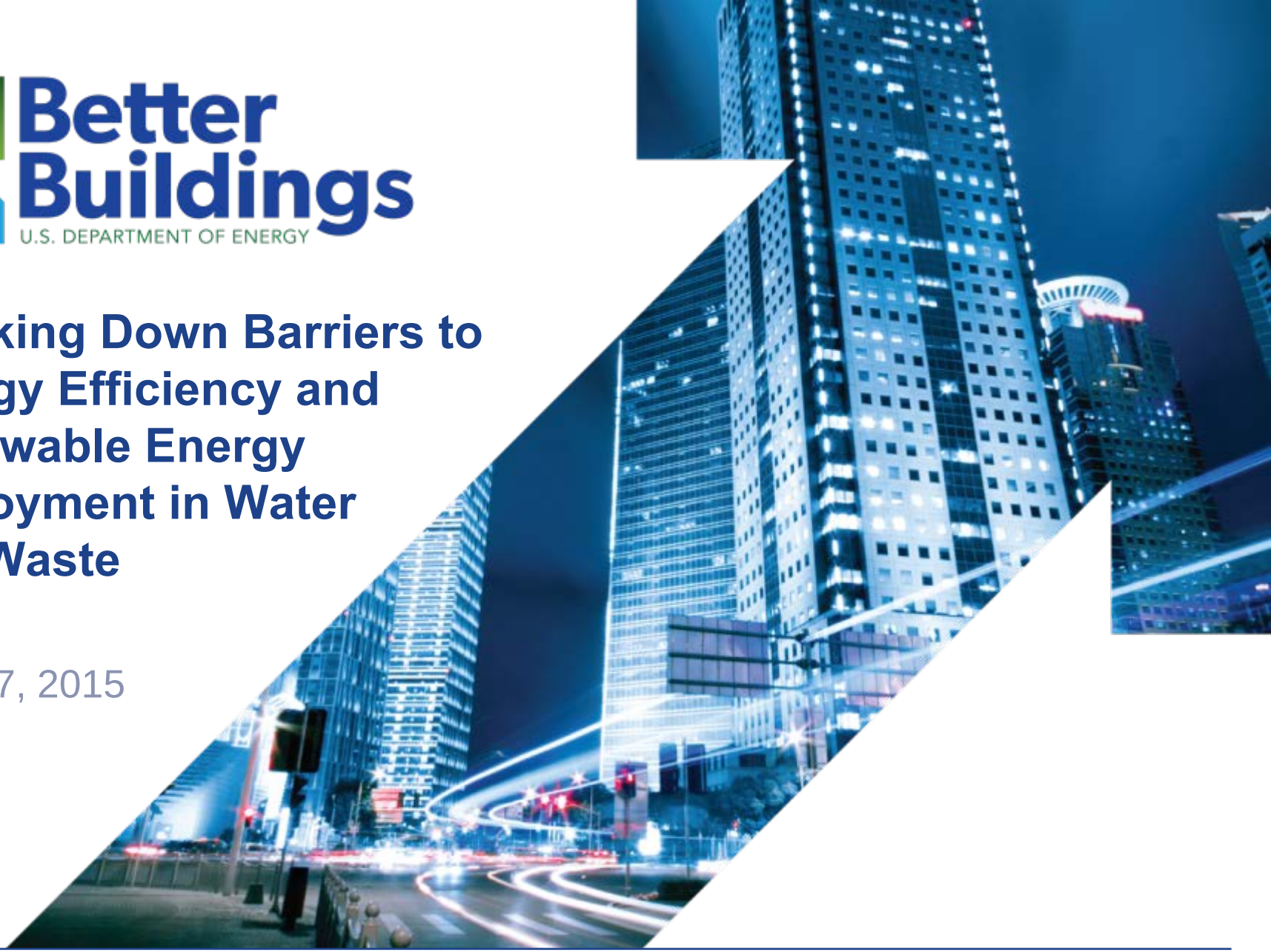
Better Buildings
U.S. DEPARTMENT OF ENERGY

Breaking Down Barriers to Energy Efficiency and Renewable Energy Deployment in Water and Waste



May 27, 2015

U.S. DEPARTMENT OF ENERGY

Los Angeles Department of Water & Power

Barriers and Solutions to Energy Efficiency and Renewable Energy in the Water Facilities

Better Plants Challenge

U.S. Department of Energy

May 2015

Martin L. Adams, P.E.
Senior Assistant General Manager – Water System
Los Angeles Department of Water and Power

Los Angeles Department of Water & Power

Water System Overview

Our Water System infrastructure:

- Service Area (473 sq. miles)
- About 697,100 water service accounts
- About 7,260 miles of distribution mains
- 114 local tanks / reservoirs
- 9 LAA reservoirs
- 88 pump stations
- 421 regulator stations
- 23 chlorination stations
- 7 fluoridation stations
- 60,400 fire hydrants
- Advanced water treatment facility uses ozone as disinfectant

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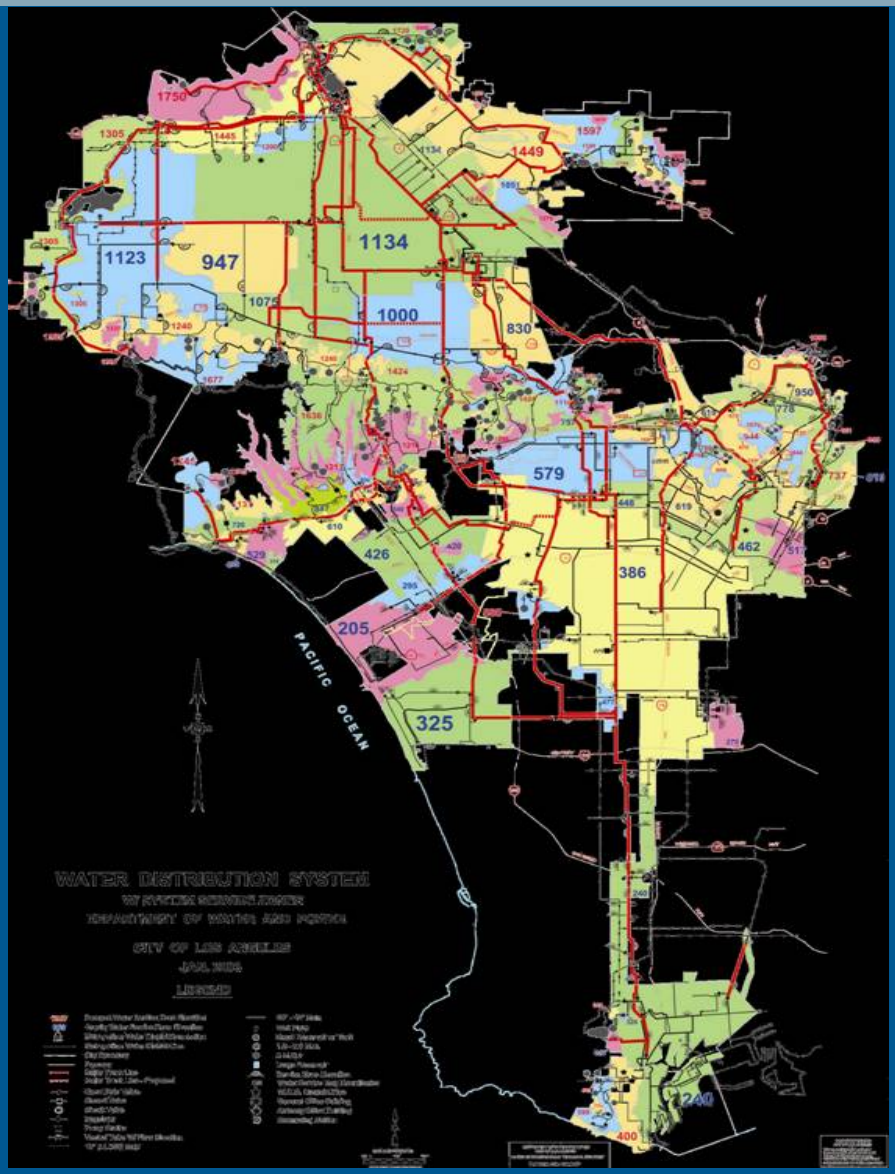
Distribution

- Much of the hydraulic head required for water distribution is provided by gravity
- The average energy intensity for LADWP water distribution is approximately **196 kWh/AF**



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ADDRESSING THESE CHALLENGES, EARLY ACCOMPLISHMENTS, AND WHAT'S AHEAD

To Date:

- Use of energy efficient pumps and motors
- Planned start –up and testing to reduce grid and bill impacts

The Future:

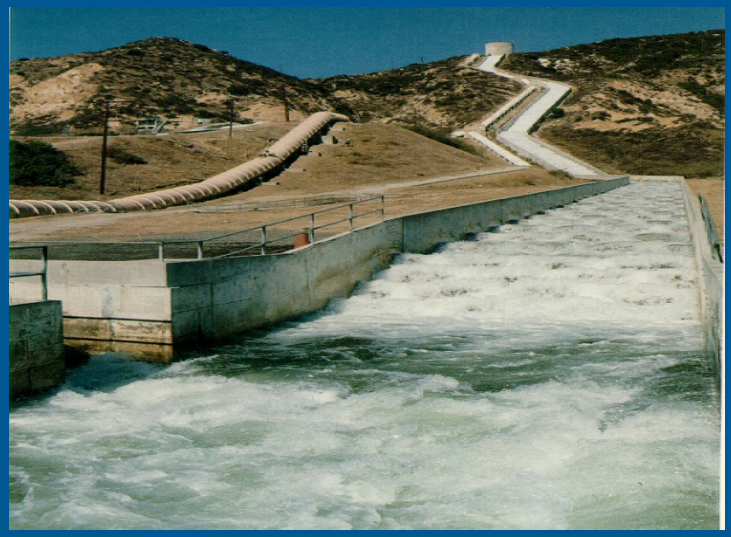
- Optimizing equipment selection
- Time of day pumping
- Set realistic pricing structures
- Reduce overall water usage

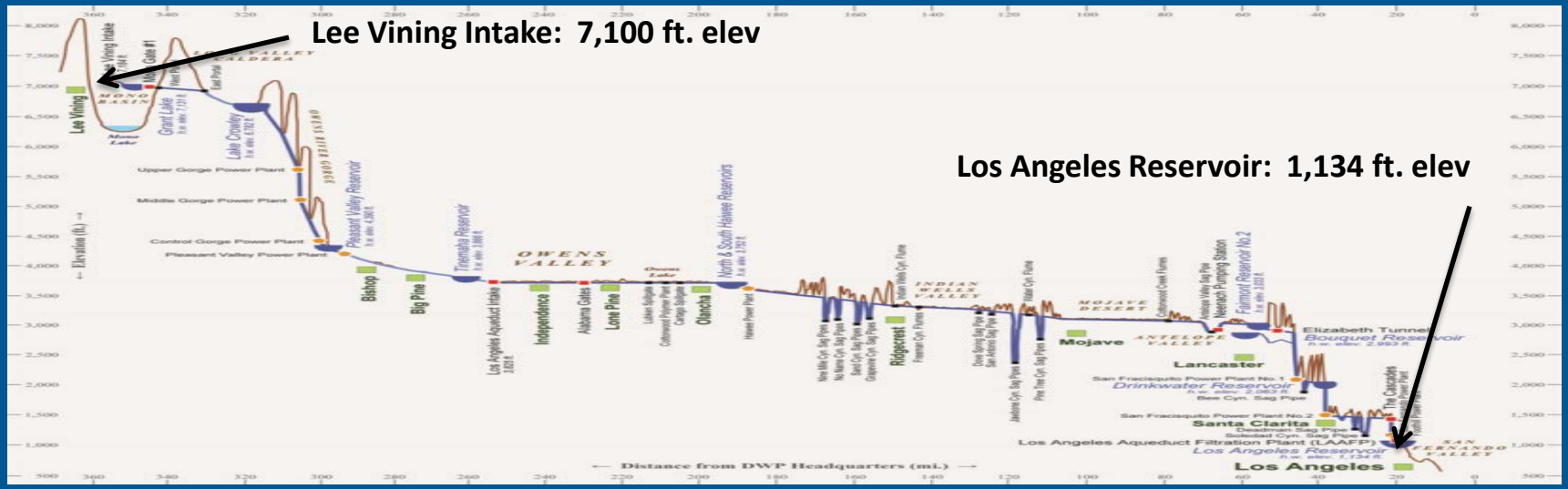
Sources of Water for Los Angeles

Los Angeles Aqueduct (LAA) System

- The 233-mile long LAA provides water from the Eastern Sierra watershed and is entirely gravity fed.

- 14 Hydro-generation plants along the aqueduct system. On average, the LAA system generates approximately **2,456 kWh/AF**





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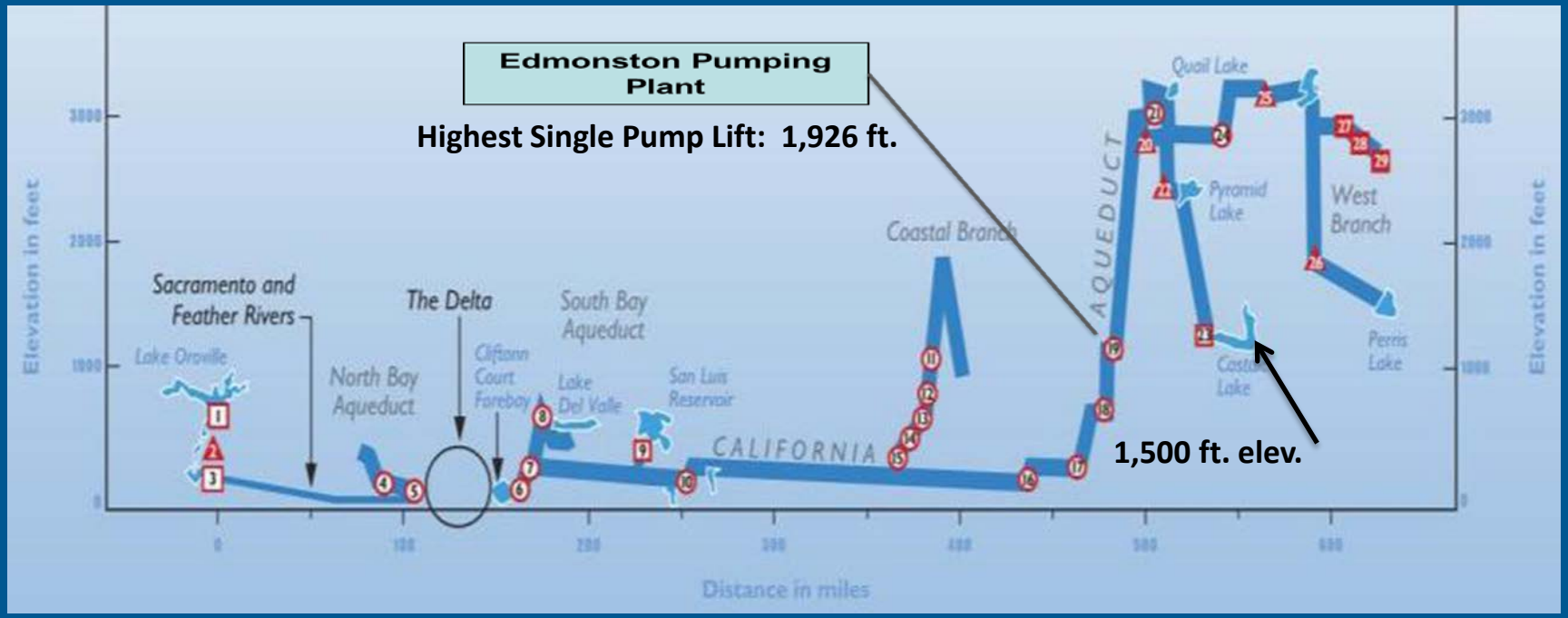
State Water Project (SWP)

- Water supplies are conveyed along the 444-mile California Aqueduct
- Energy intensity of the West Branch is **2,614 kWh/AF**
- Energy intensity of the East Branch is **3,263 KWh/AF**



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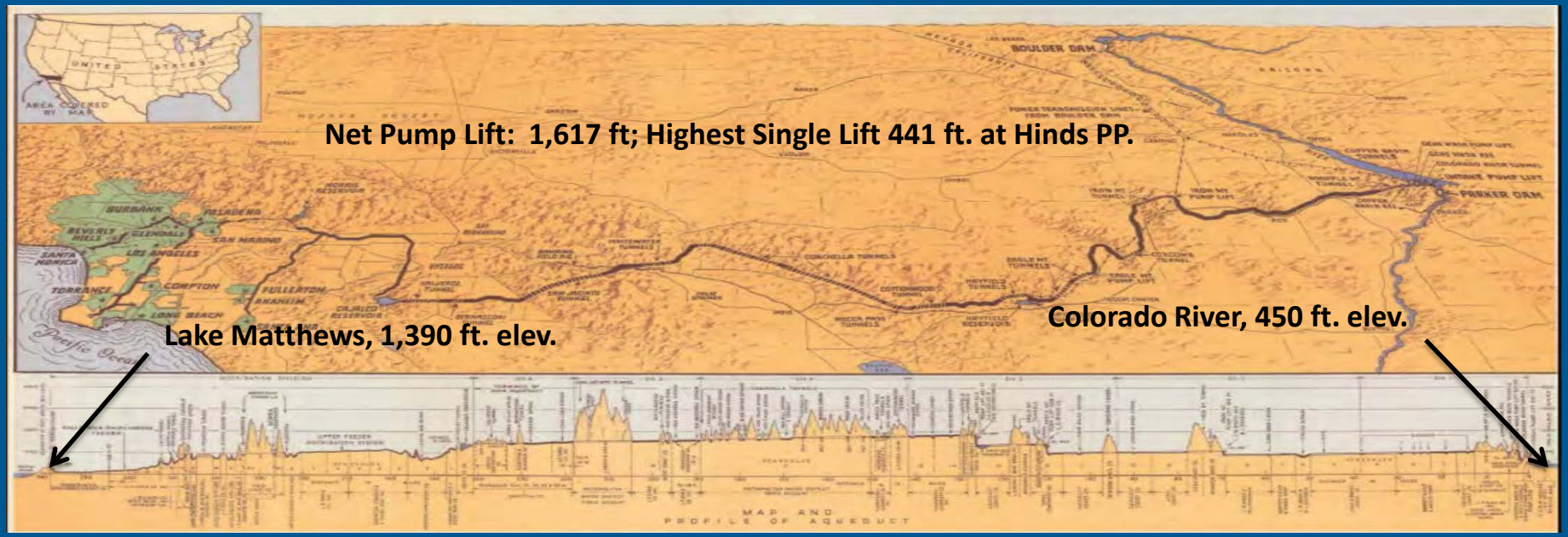
Colorado River Aqueduct (CRA)

- Water supplies are conveyed along the 242-mile CRA Aqueduct
- CRA Energy Intensity is **2,027 kWh/AF**



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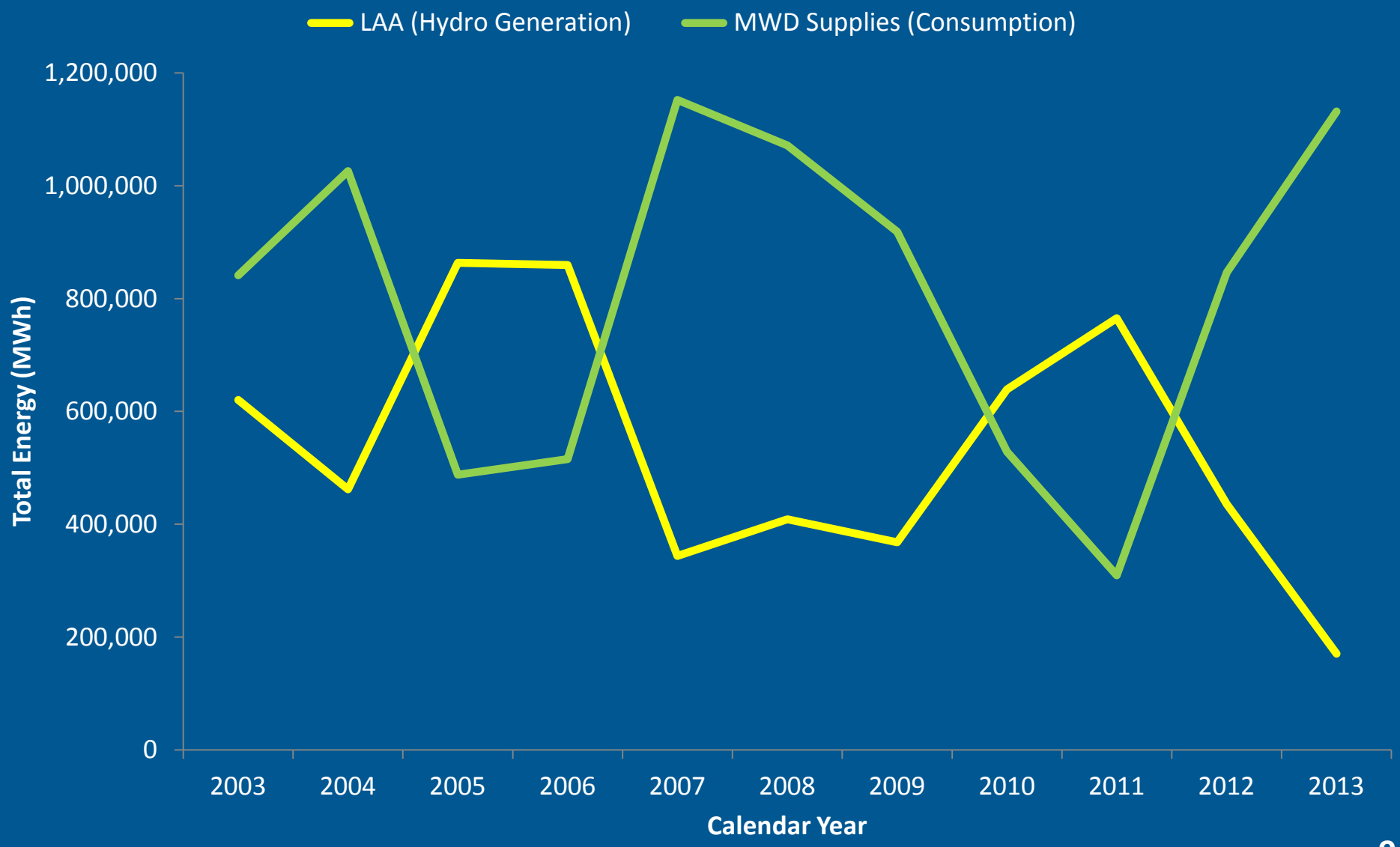
LADWP Imported Supplies Water Conveyance Energy Profile



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Local Groundwater

- City has 115 groundwater production wells
- More than 50% of the wells are inactive due to GW contamination
- The average energy intensity is approx. **580 kWh/AF**

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Why Energy Efficiency and Renewable Energy Warrants Attention in Water and Wastewater Systems

- Power costs can be a key component of water costs, depending on source
- Most local and sustainable sources come with energy costs
- Sustainability in Water and Power resources can oppose each other when it comes to energy usage

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LADWP Water Supply Energy Consumption

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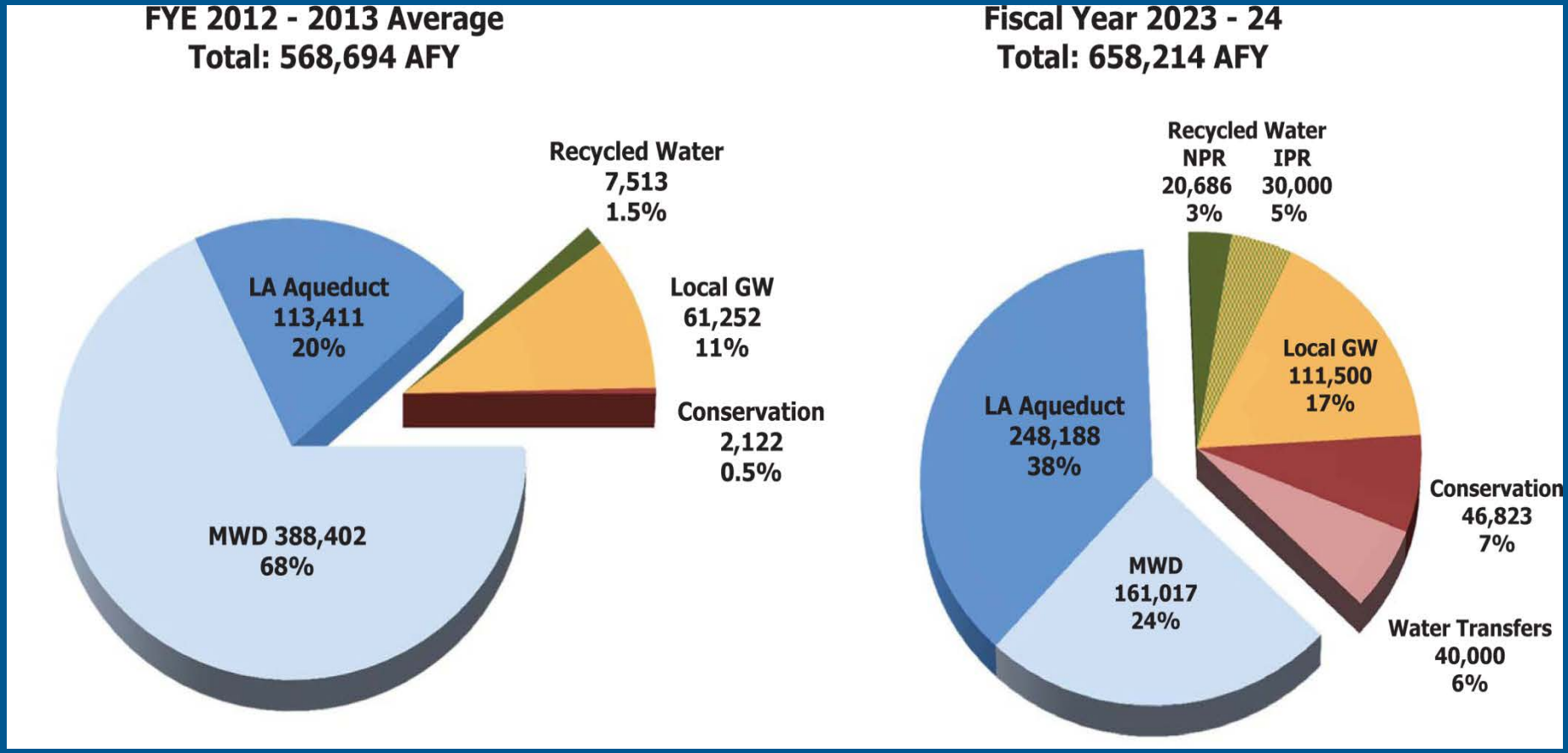
Local Water Supply Goals



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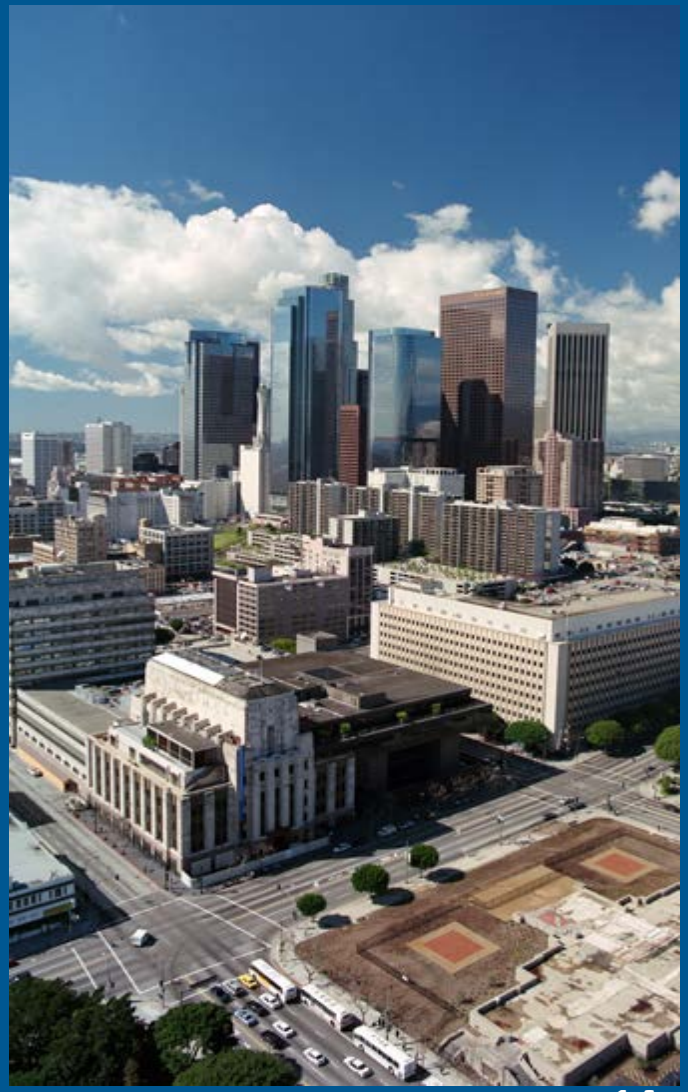
Benefits of Water Conservation

- Cumulative water conserved from FY 2007/08 to FY 2013/14 by LADWP customers is 578,141 acre-feet.

- Equivalent to:
  - Powering over 308,000 homes in L.A. for 1 year
  - Eliminating 1.48 billion pounds of CO2 emissions
  - Eliminating 134,772 passenger vehicle emissions for 1 year
  - Avoiding GHG emissions by recycling over 244,000 tons of waste instead of sending it to the landfill



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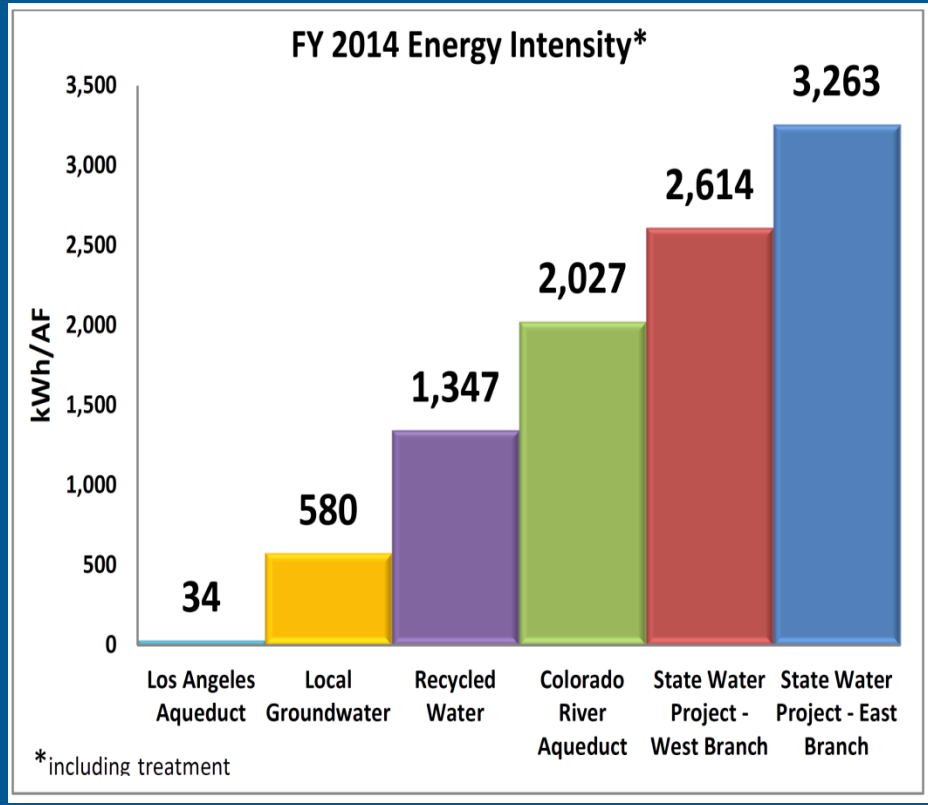
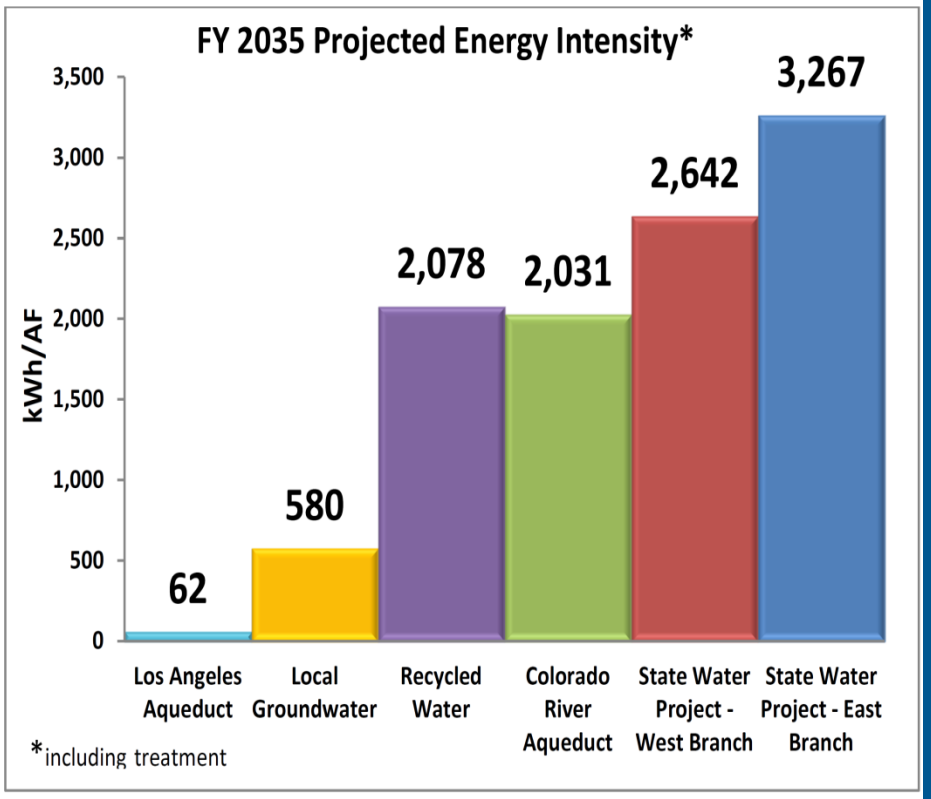
Summary Comparison of Energy Intensity





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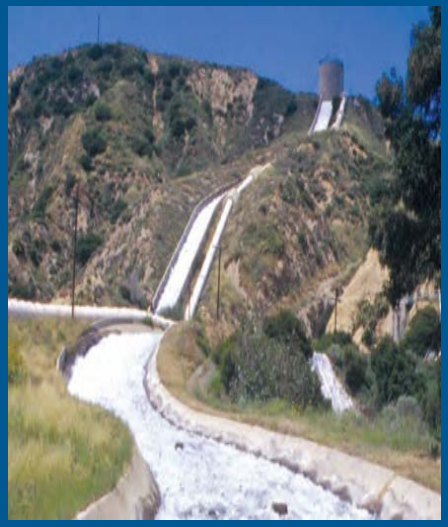
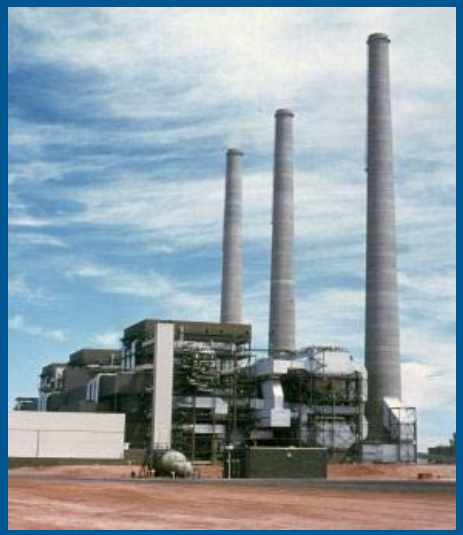
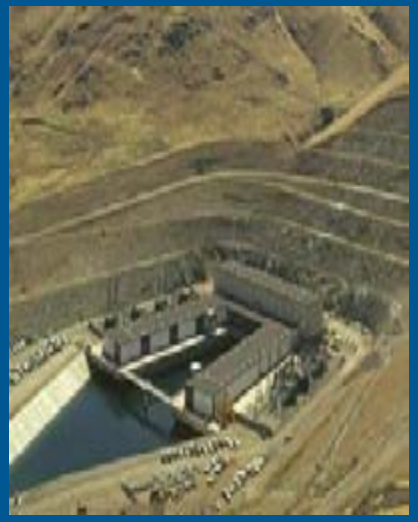
The Challenges Faced

In contrast to other forms of energy efficiency typically addressed by local or state governments, meaningful savings in the water sector brings into question:

- Large scale energy efficiency
- Reliability of energy supply
- Substantial cost impacts to an historically cheap commodity
- Absorbing energy needs of new water sources



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Recycled Water System

- LADWP directly receives recycled water from three WW treatment plants operated by the City of Los Angeles, Bureau of Sanitation (LASAN).

- The weighted average of recycled water energy intensity is approximately **1,347 kWh/AF**

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Water Treatment

- LAA and SWP (west branch) water is treated at the Los Angeles Aqueduct Filtration Plant (LAAFP)
- The average LAAFP treatment energy intensity is **37 kWh/AF**

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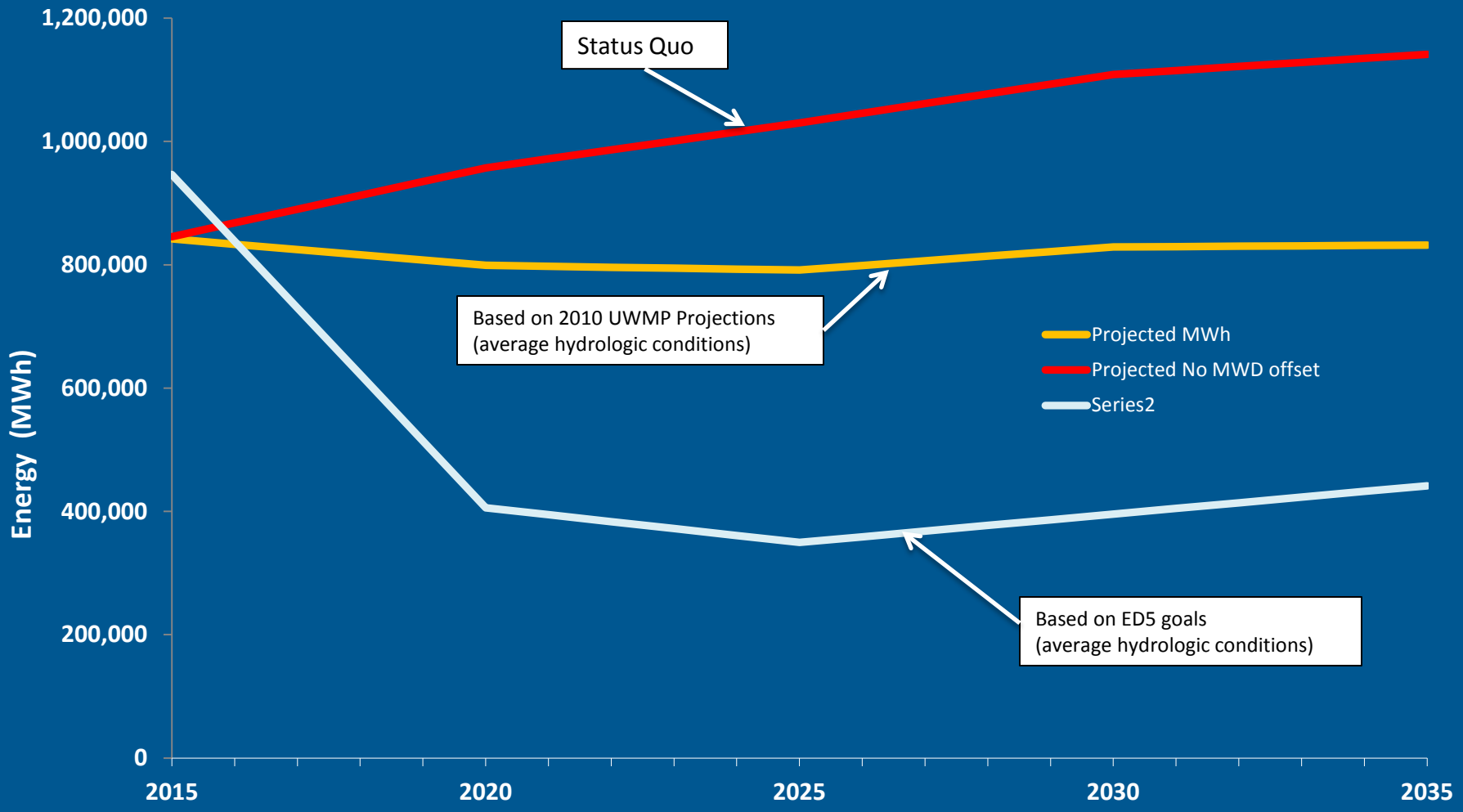
Projected Water Supply Energy Demands



* including MWD estimates

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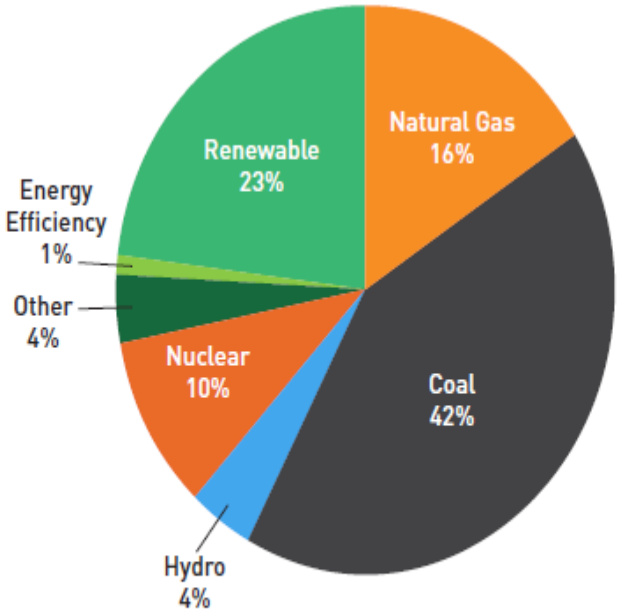
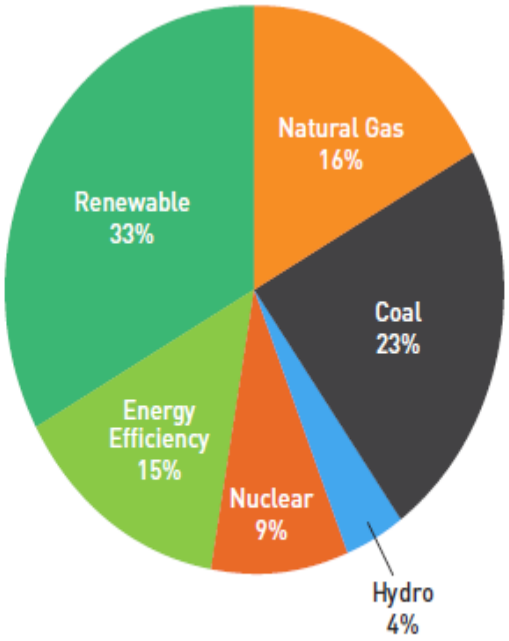
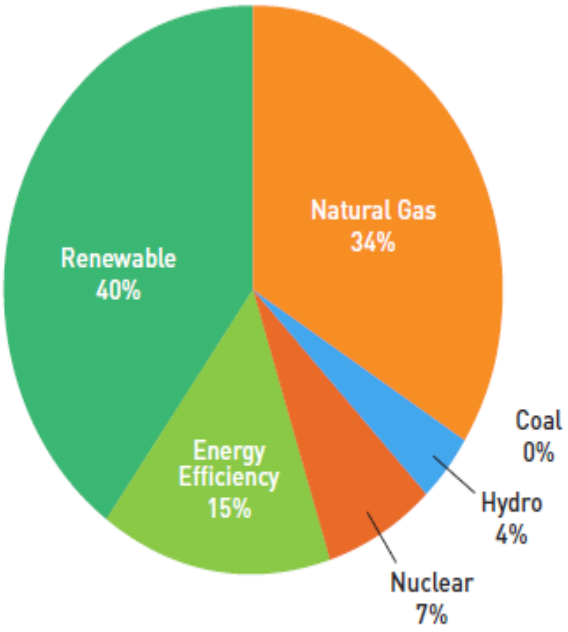
LADWP – Power System Increasing Renewable Energy and Energy Efficiency



2013



2020



2030

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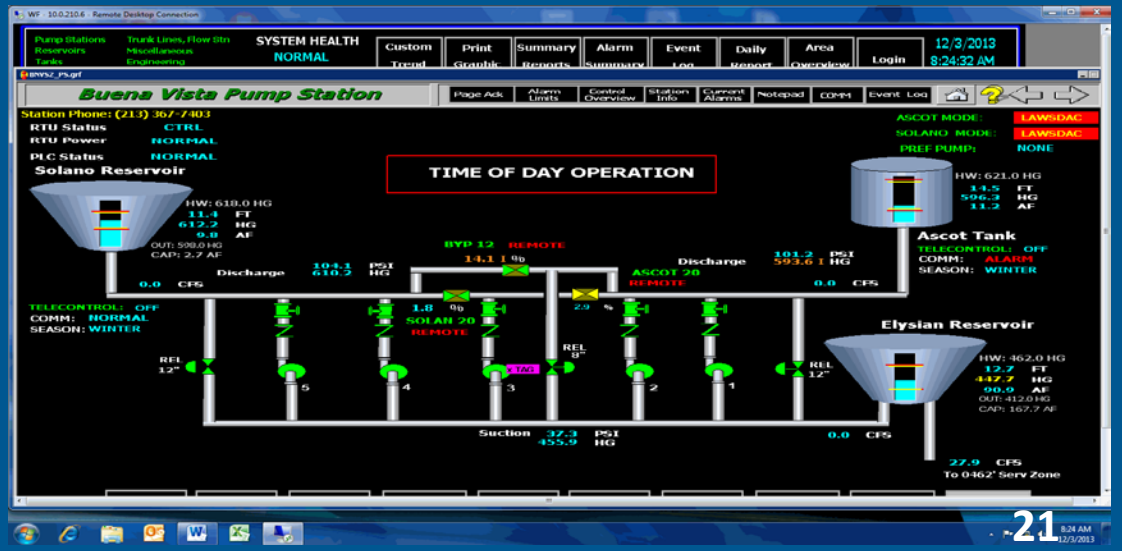
Less Obvious Energy Savings In Operations

- Filtration Media
- Data Mining and Operational Intelligence



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Water Loss Control

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Remote Testing & Monitoring

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Shade Balls

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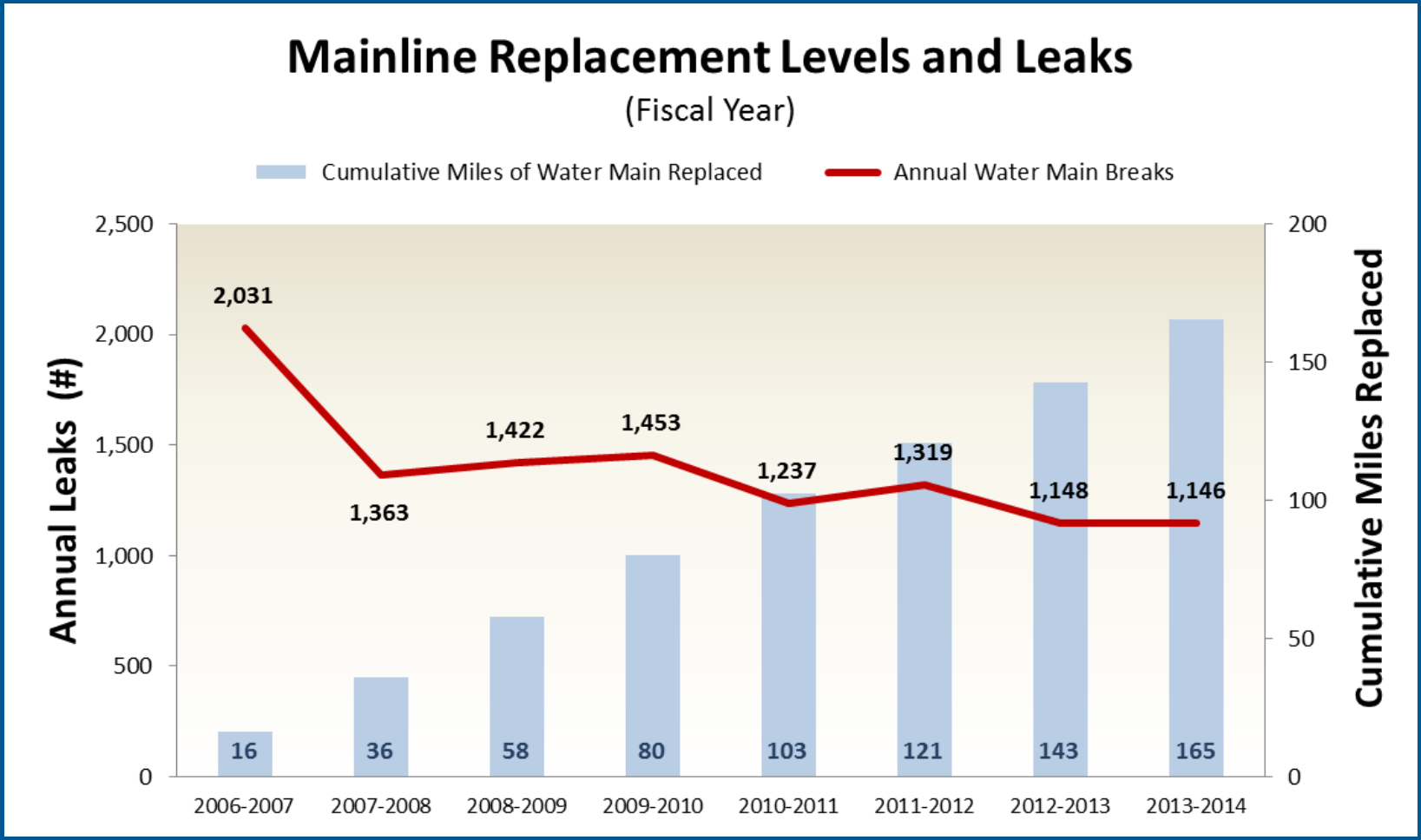
Infrastructure Replacement and Upgrade



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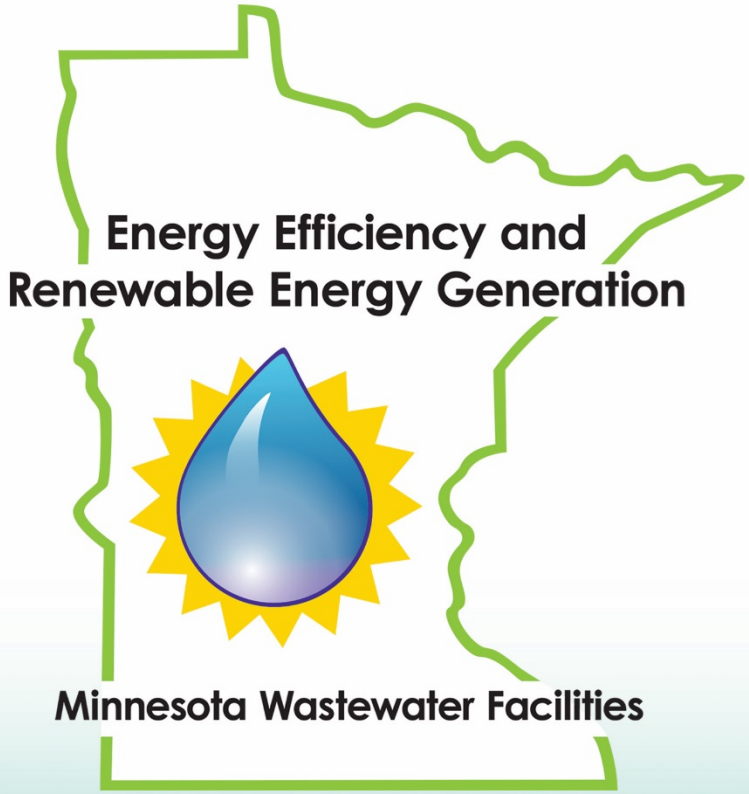
Conclusions

Energy Efficiency and Renewable Energy in the Wastewater Treatment Sector

Better Buildings Summit

May 27, 2015



Minnesota Department of Commerce
Division of Energy Resources

MnTAP Minnesota Technical Assistance Program

Minnesota Pollution Control Agency

Energy Efficiency and Renewable Energy Generation
Minnesota Wastewater Facilities

Agenda

- Project Description
  - Why this project
  - How could it work
- Partnerships
  - Introductions
  - Organizational strengths to leveraged
- Timeline/Milestones

Energy Efficiency and Renewable Energy Generation

Minnesota Wastewater Facilities

Why This Project?

Minnesota Department of Commerce
Division of Energy Resources

MnTAP Minnesota Technical Assistance Program

Minnesota Pollution Control Agency

Project Goal

Decrease energy use in Minnesota municipal wastewater facilities and scope opportunities for energy generation

Energy Efficiency and Renewable Energy Generation

Minnesota Wastewater Facilities

Project Objectives

Motivate energy efficiency in MN WWTP

Assess opportunity for energy generation

Provide plan for energy generation at select sites

Minnesota Department of Commerce
Division of Energy Resources

MnTAP Minnesota Technical Assistance Program

Minnesota Pollution Control Agency

Approach

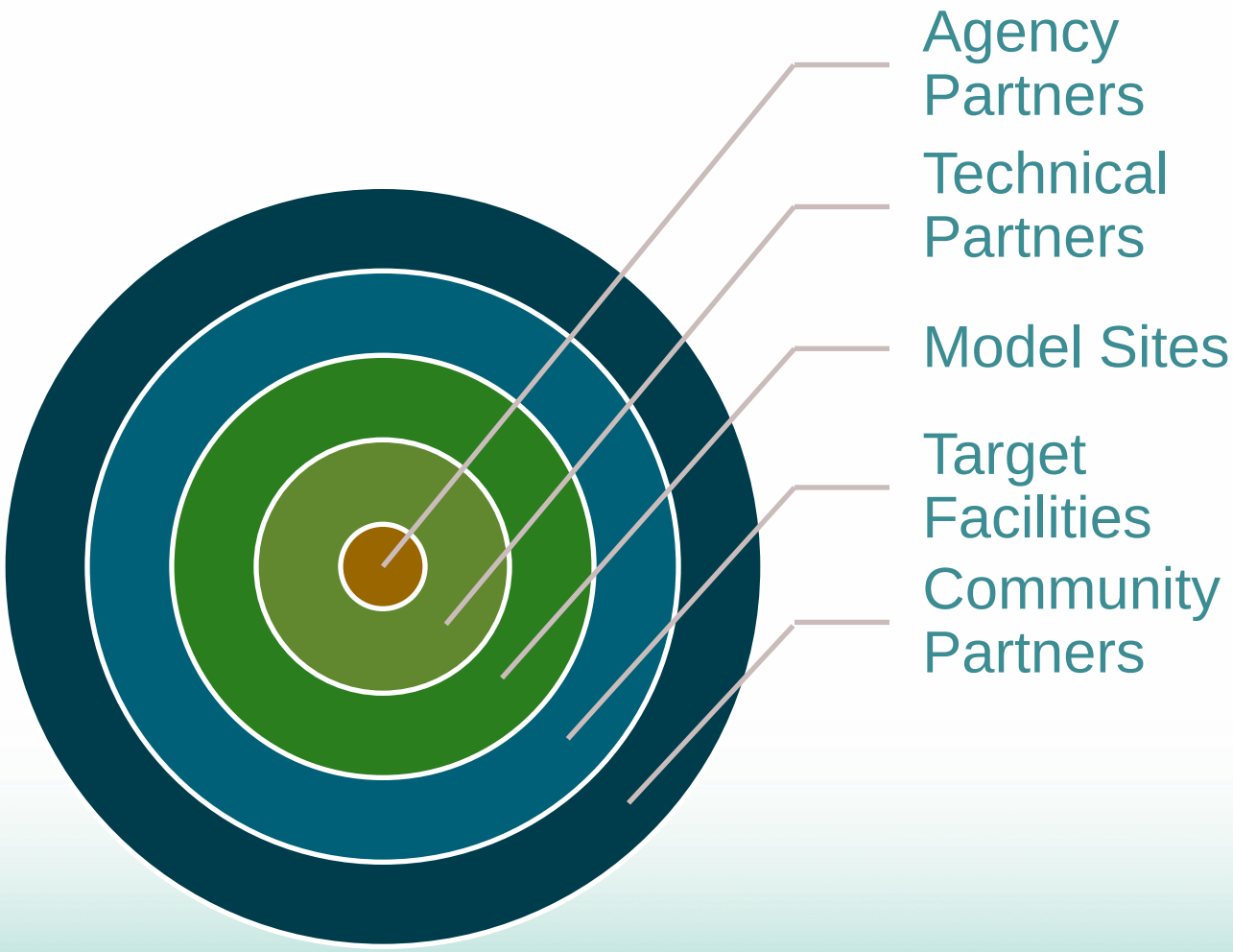
Capitalize on the strengths of state and local resources

- Commerce DER
- PCA Water
- DEED
- GESP
- Loan Programs
- Grant Programs
- Energy Resources Center
- Vendors
- Utilities
- Regional Partnerships
- Technical Assistance
- University Engagement
- Rural Water Association
- Municipalities

Energy Efficiency and Renewable Energy Generation

Minnesota Wastewater Facilities

Develop Partnerships



Minnesota Department of Commerce
Division of Energy Resources

MnTAP Minnesota Technical Assistance Program

Minnesota Pollution Control Agency

Implementation Plan

Develop partnerships for E2

- Engage wastewater community
- Identify TA resources
- Leverage state resources

Conduct E2 assessments

- Identify prospective sites
- Train for self assessment
- Complete site evaluations

Facilitate site investment

- Develop impact story
- Identify and apply resources
- Promote and encourage success

Assess renewable energy opportunity

- Conduct preliminary evaluations
- Partner for detailed assessments

Energy Efficiency and Renewable Energy Generation

Minnesota Wastewater Facilities

Anticipated Project Outcomes

WWTP E2

- Engage Minnesota WWTP on E2 and DG
- 50 operators trained on E2
- 10 energy efficiency assessment conducted

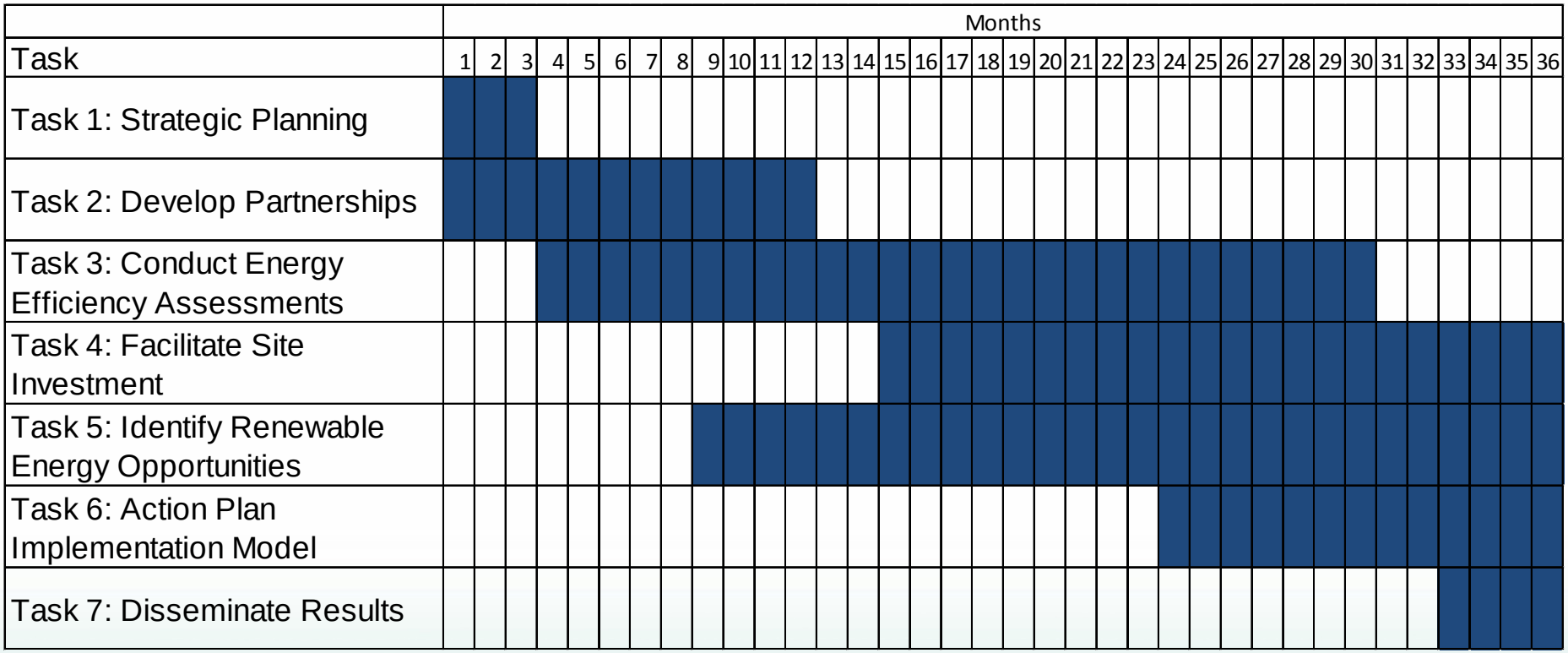
Implement E2

- 2-5 million kWhr/yr identified conservation opportunity
- 10 regional discussions on WWTP E2 implementation planning

Distributed Generation

- 5 distributed generation screening evaluations
- 1-2 detailed distributed generation assessments
- 1-2 stakeholder discussions on DG implementation opportunity

Project Timeline



Energy Efficiency and Renewable Energy Generation
Minnesota Wastewater Facilities

Next Steps

- Continue developing partnerships
- Engage model sites for informational interviews
- Promote project opportunities
- Identify/engage candidate assessment sites
- Compile publicly available site data
- Develop WWTP benchmarking capabilities
- Establish training opportunity and curriculum

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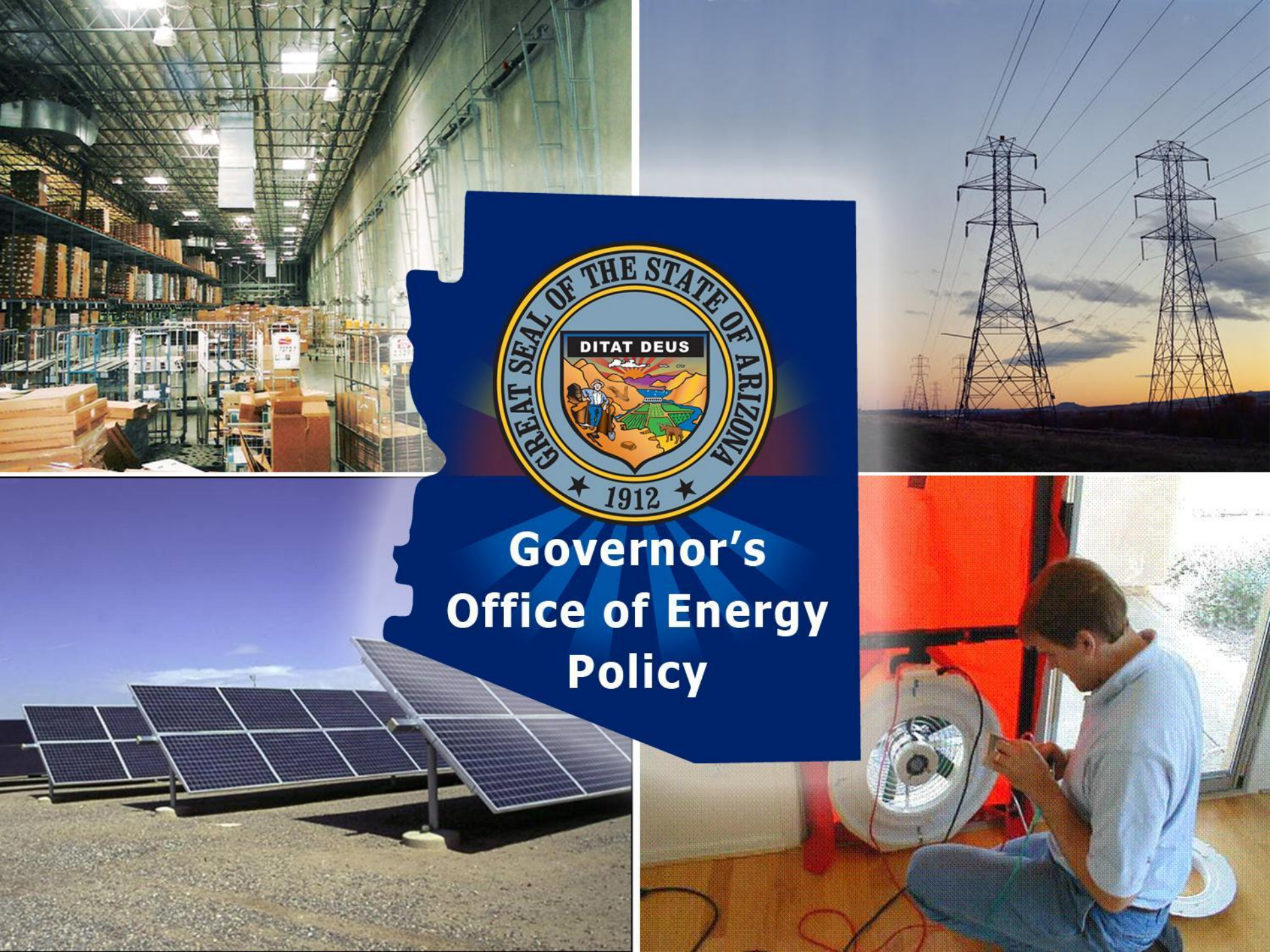
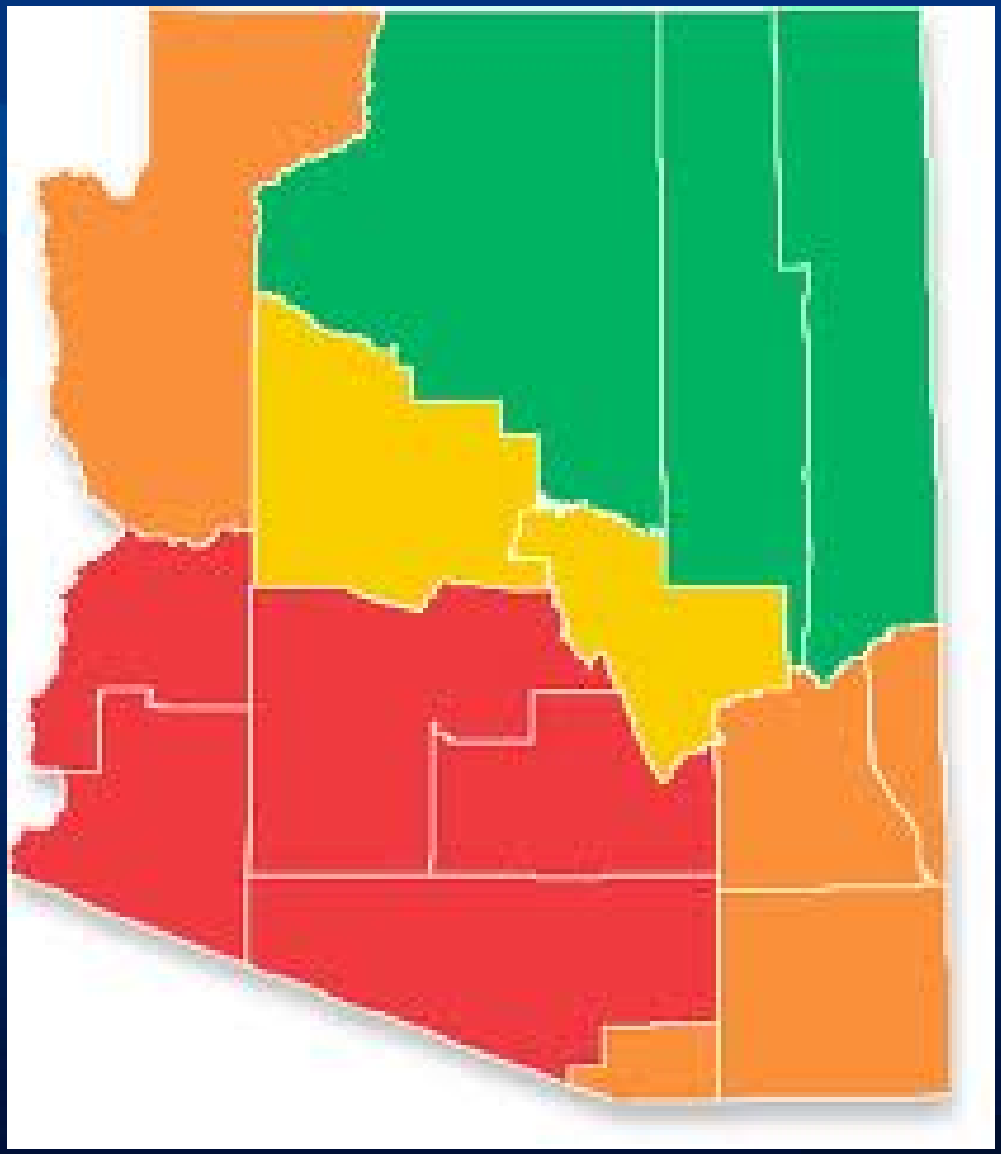

GREAT SEAL OF THE STATE OF ARIZONA
DITAT DEUS
1912
Governor's
Office of Energy
Policy

Arizona Facts

- 6th Largest State
- 15 Counties
- 30 State Parks
- 22 National Parks
- 22 Native American Indian Tribes
- Lack Hwy Infrastructure
- 4 IECC Climate Zones



Community Energy Program

Top 5 Problems for the Next 50 Years

1. Energy
2. Water
3. Food
4. Environment
5. Poverty

What's the Energy Cost in Water

EPA estimates **3-4 percent of national electricity consumption.** Water and wastewater utilities are typically the largest consumers of energy, accounting for **30-40 percent of total energy consumed.**

Energy costs make up the majority of an annual operating budget within a community, typically **second only to labor costs**.

Energy costs have a direct impact on an area's economic health through inefficient energy use and high utility rates.

Future Energy Demand

- Energy demand increase » 20% - 30% in 15 years
  - *In water and wastewater*
- Population & more stringent regulations
  - *Aging infrastructure*
  - *Increasing threats to watersheds and aquifers*
  - *Changing compliance and public health standards*
  - *"Rising cost" industry*
  - *Higher customer expectations*
  - *Emerging contaminants (pharmaceuticals)*
  - *Increasing competition for raw water sources*

GOEP Action

In February 2012 the U.S. Department of Energy (DOE) issued a funding opportunity announcement (FOA) to state energy offices. GOEP received 3 years of funding to:

- Benchmark wastewater facilities into EPA Portfolio Manager
- Identify Energy Efficiency Opportunities and match facilities with funding
- Conduct Energy Efficiency Training

Water Energy Partnership in Arizona

INVESTIGATION

- Facility Identification
-Benchmarking
- Education/Training

TECHNICAL ASSISTANCE

- Needs Assessment
- Funding Options
-Education/Training

IMPLEMENTATION

- Project Upgrades
- Education/Training

Coordination/Collaboration

Water Energy Partnership in AZ

Status:

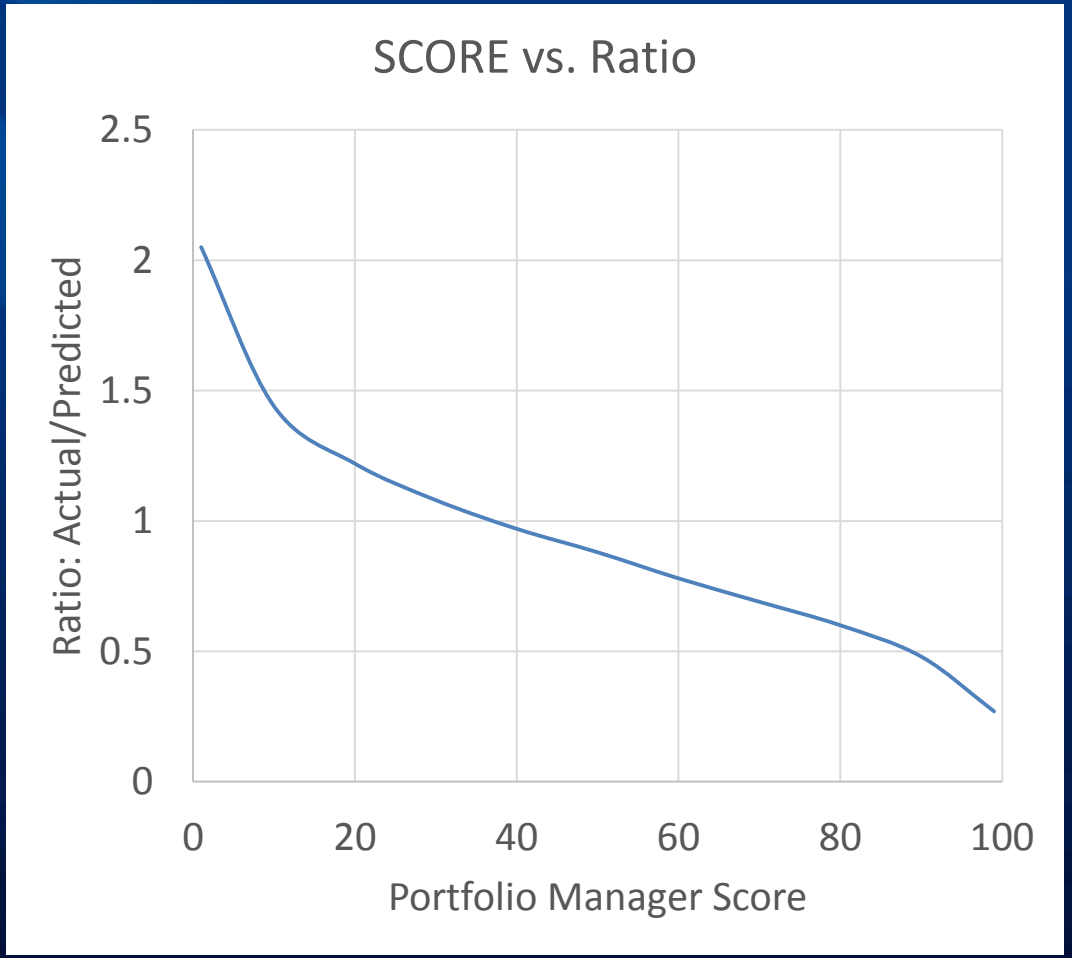
- 72 WWTP Benchmarked into Portfolio Manager
- Preliminary Analysis
  - ✓ Visits to 6 facilities and 3 EPA Energy Audit
  - ✓ Technical Assistance to 15 facilities
- Developed WWTP Benchmarking curriculum and presented 10 energy education trainings
- Developing resource guide for facilities

Portfolio Manager WRRF Factors

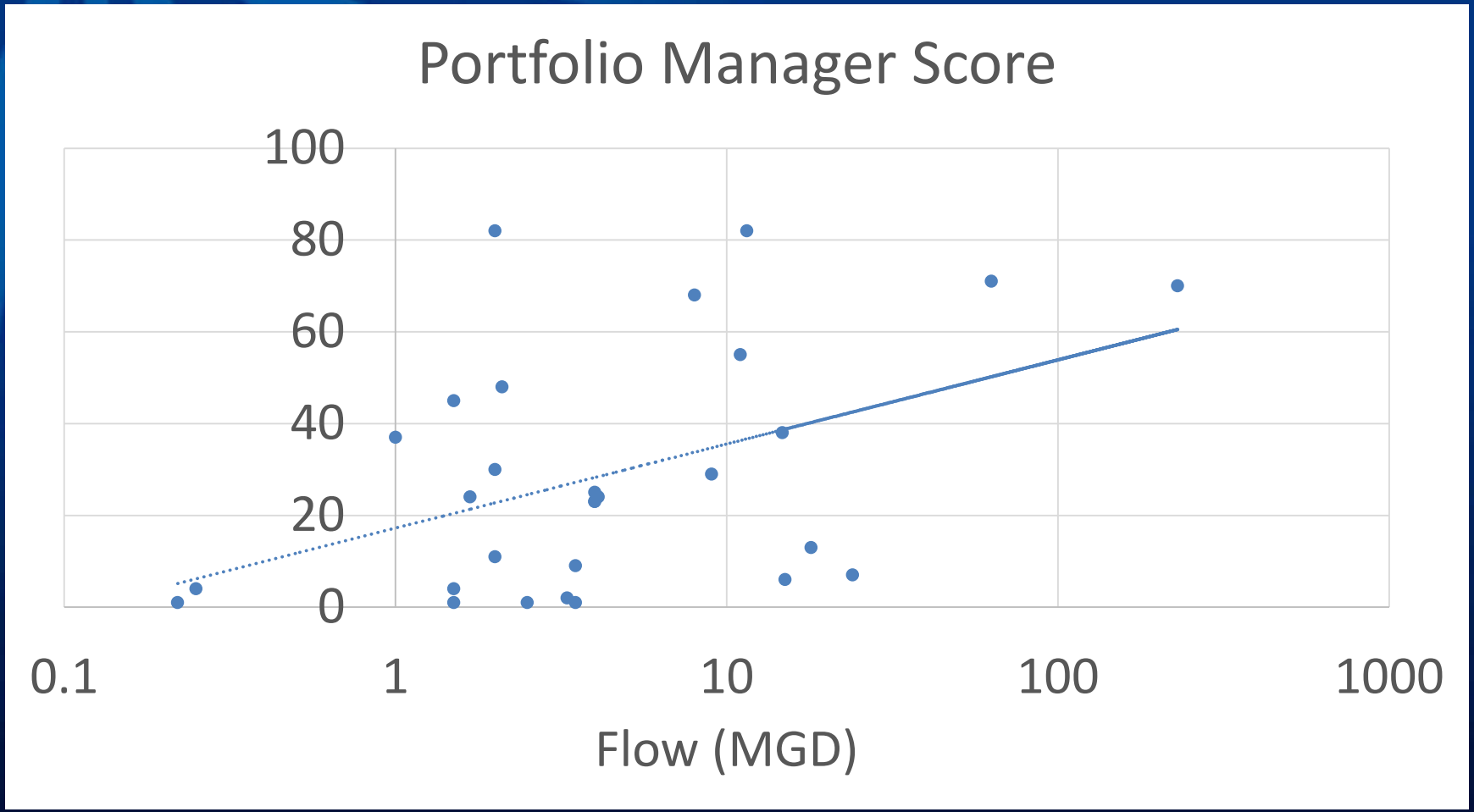
- Average Influent Flow (MGD)
- Average Influent BOD (mg/l)
- Average Effluent BOD (mg/l)
- Plant Design Flow Rate (MGD)
- Fixed Film Trickle Filtration Process
- Nutrient Removal
- Heating Degree Days
- Cooling Degree Days

Portfolio Manager Scores

SCORE	Ratio Act./Pred.
1	2.05
10	1.44
20	1.22
30	1.08
40	**0.97**
50	**0.88**
60	**0.78**
70	**0.69**
80	**0.60**
90	**0.48**
99	**0.27**



AZ WRRF PM Score Distribution



Grant Application Partners

State:

Arizona Department of Environmental Quality
Water Infrastructure Finance Authority

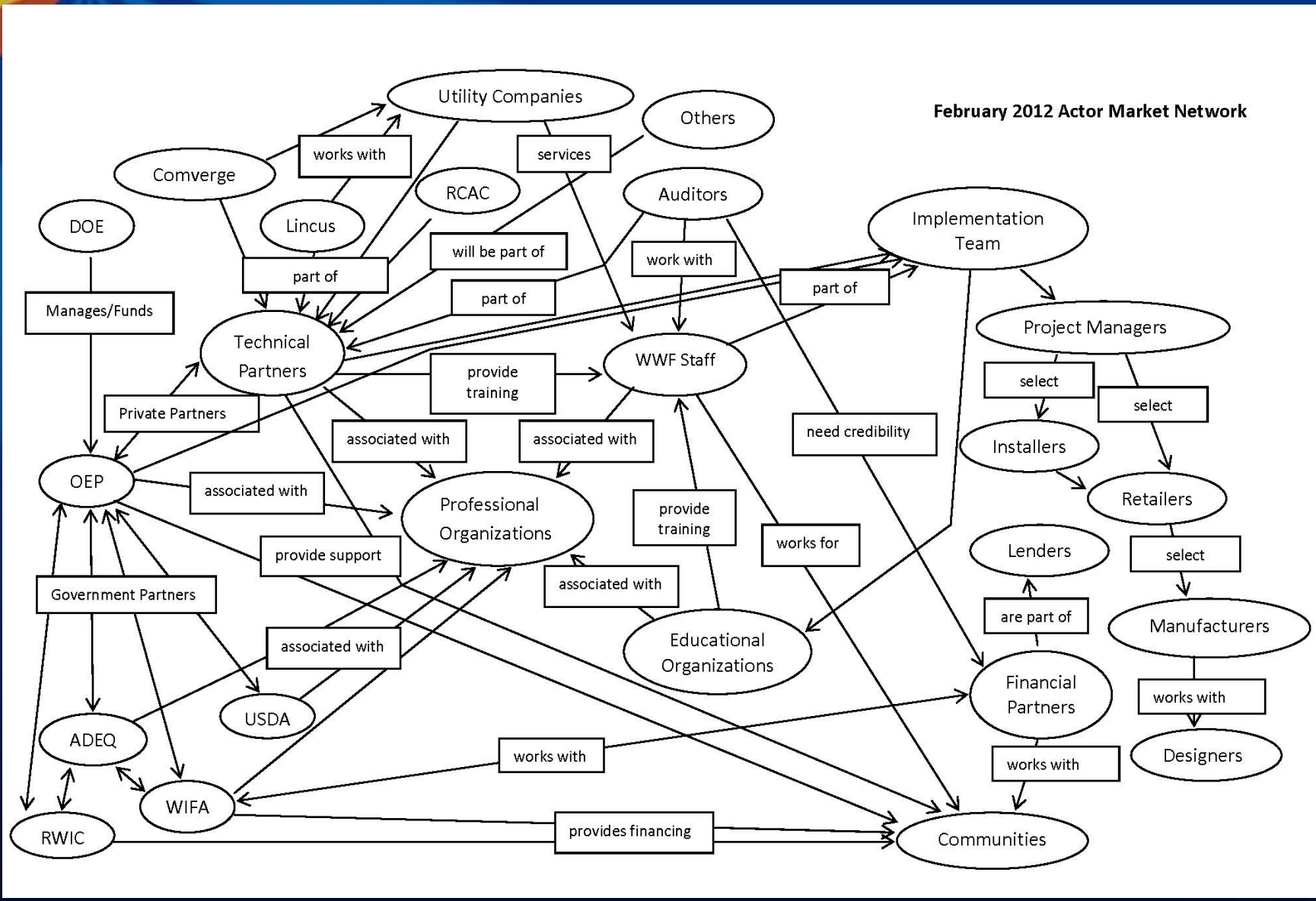
Federal:

U.S. Department of Agriculture Rural Development

Private:

Arizona Public Service
Honeywell
Lincus Energy
Rural Community Assistance Corporation

Partners Market Network (2012)



Current Partners (2015)

State: AZ Department of Environmental Quality, Water Infrastructure Finance Authority, AZ Department of Water Resources, AZ State Parks, AZ Department of Transportation, Arizona Corporation Commission

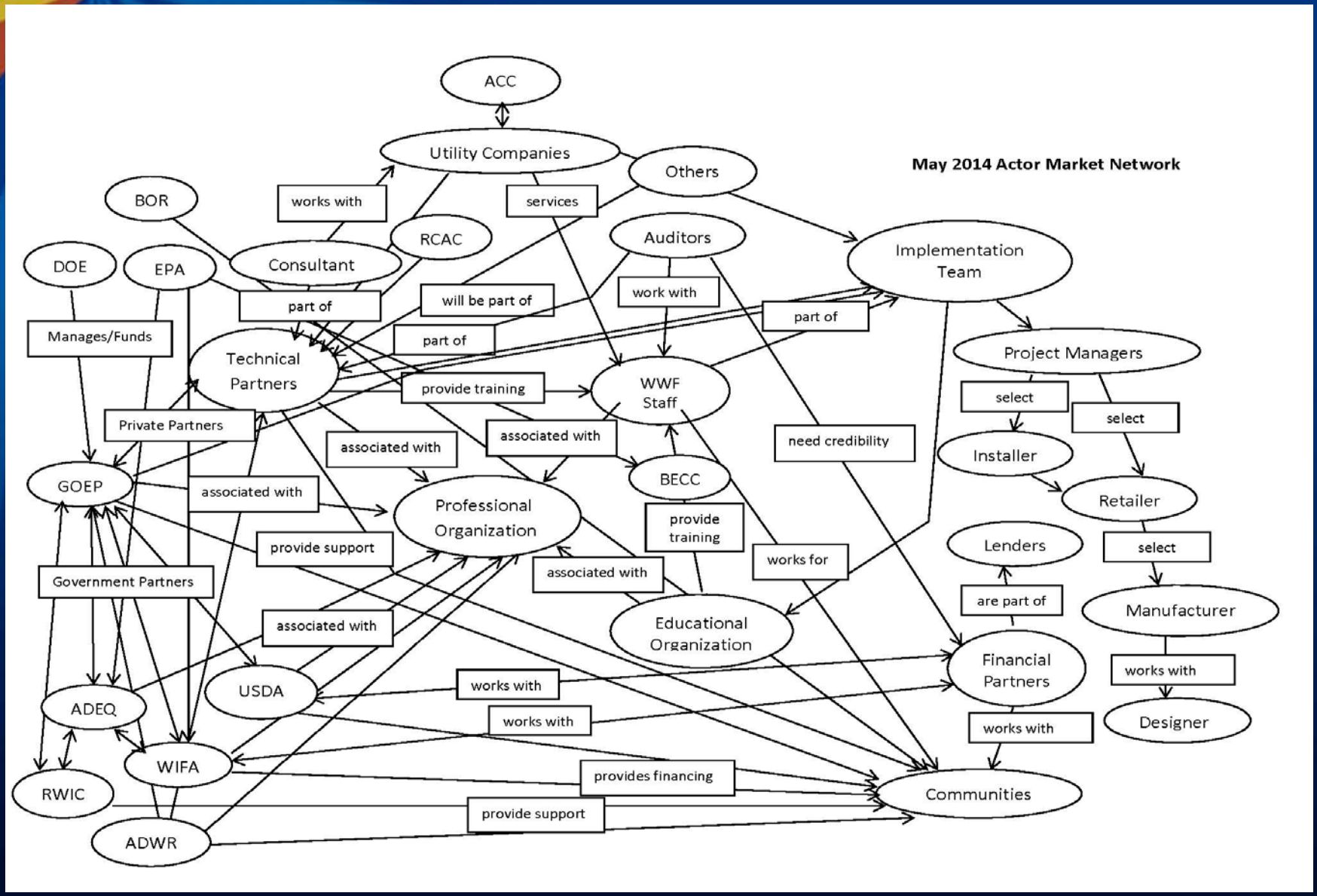
Federal: USDA Rural Development, EPA, U.S. Bureau of Reclamation

Utility: Arizona Public Service, Unisource, Salt River Project, Sulphur Springs, AZ Electric Power Cooperative, Mohave Electric Co-op

Private: Honeywell, Lincus Energy, AMERSCO, TRANE, Chelsea Group, Border Environment Cooperation Commission (BECC)

Professional Organizations: AZ Water Association, Rural Water Association, AZ Electric Co-op Association

Partners Market Network (2014)



Challenge


PICK UP THE
phone
AND MAKE SOMETHING HAPPEN


Get Out of the office

Thank You

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