12 Things to Consider Prior to Reuse of Process Water

Florence, KY
April 20, 2016

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Air & Waste Management Association – KY Chapter
One-Day Environmental Practitioners' Workshop

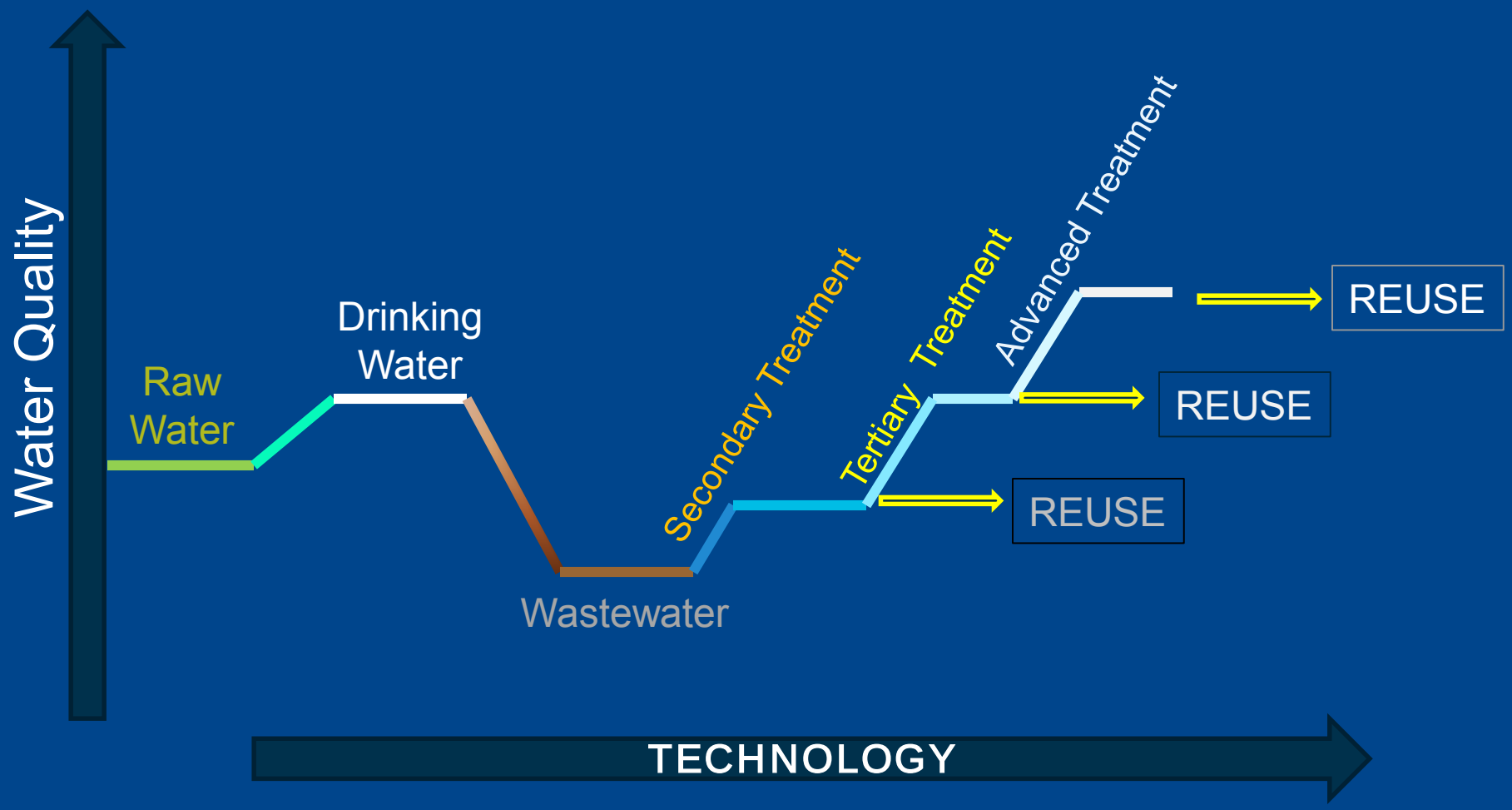
CDM Smith

Overview

- Information based on two Process Water Treatment and Recycle Plants
- Factors:
  - Upper management decisions
    - Risks
    - Reliability
    - Cost factors
  - Design, construction, startup, and O&M

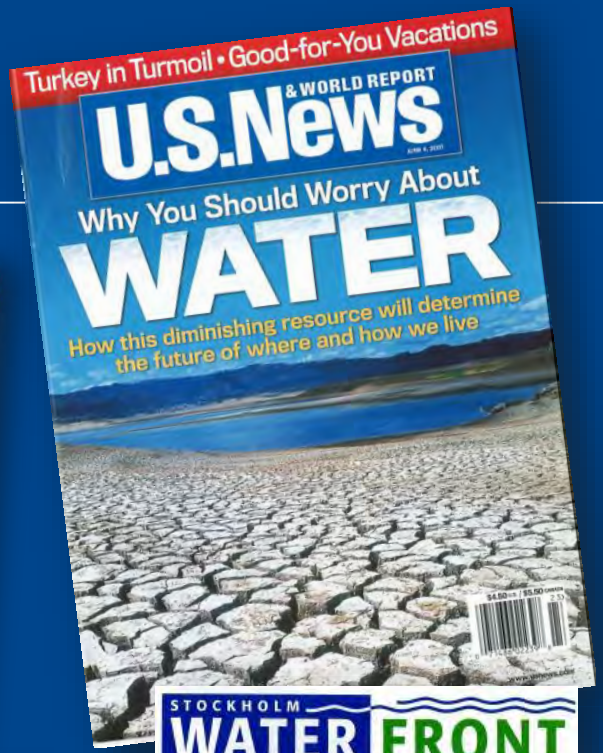
  - Snack Foods – 650,000 gal/day (0.65 mgd)
  - Potato Processing – 3,200,000 gal/day (3.2 mgd) - ZLD

TREATMENT FOR WATER REUSE



Water Reuse Drivers

1) Water scarcity
2) Water availability
3) Water costs
4) Sustainability goals
5) Public acceptance
6) Improved technology
7) Lower treatment costs



Water Reuse Options

Irrigation Landscape Cooling Sanitation CIP Food preparation Ingredient

Increasing Water Quality

Increasing Treatment Technology

Increasing Capital and O & M Costs

Perception Concerns

1. Economics

- Corporate ROI
  - Accounting "traditional"
    - Water savings
    - Sewer savings
    - Surcharge savings
    - Energy costs
    - O&M costs – labor, electrical, sludge, chemicals, and maintenance
  - Non-traditional = Progressive
    - Sustainability = Sales
    - CSR goals
    - Community values
      - POTW Load Reductions = Community Savings
    - Water Rights
    - Value of recycle water

2. Water Quality Decision

- How “clean” is clean?
  - Reuse for ?
    - Irrigation
    - Landscaping
    - Cooling towers / HX
    - Boilers
    - Sanitation / CIP
    - Food contact
    - Ingredient quality

Reuse for Landscaping

- Landscape Irrigation
  - Available land (owned, leased)
  - Agronomic limits (same as irrigation)
  - NIMBY
  - Residential proximity
  - Aerosols
  - Seasonal limits
  - Disinfection
  - Pan evaporation rates

3. Design Basis

- Determine:
  - Existing process water sources
  - Production variations
    - Flow volumes
    - Flow rates
    - Seasonal
    - Shift – CIP
  - Stream segregation choices
    - Sanitary – sanitation separation
    - Process – cooling
  - Equalization
  - Pumping versus gravity

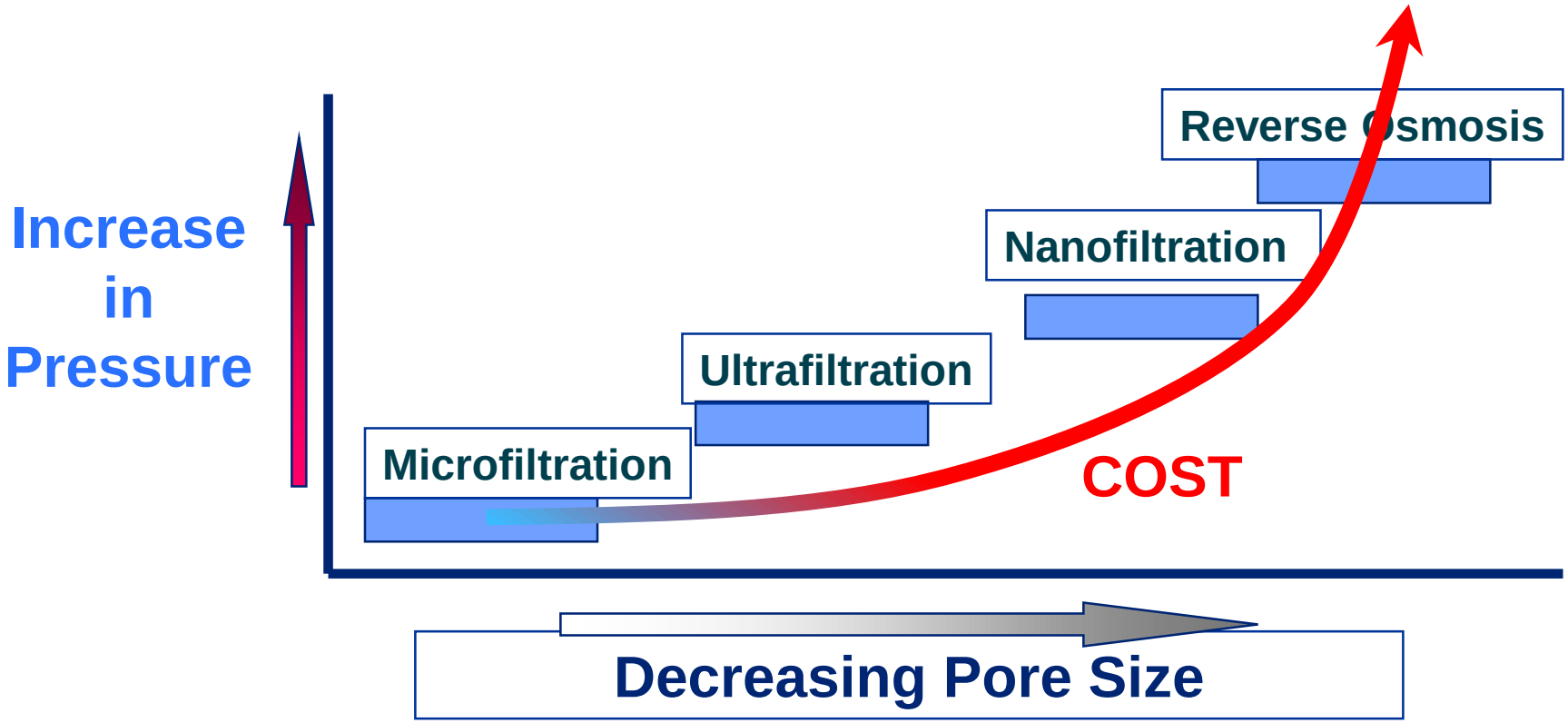
4. Design Approaches

1. **Internal design within company**
   a) Corporate support
   b) Facility selections
2. **Consultant Method**
   a) Develop Request For Proposals (RFP)
   b) Complete design
3. **Alternate project delivery – One firm**
   a) Qualify firm and team
   b) Design-build (DB)
   c) Design-bid-build (DBB)
   d) Design-build-operate (DBO)
   e) Design-build-operate-finance (DBOF)
   f) Other: Open book delivery, fixed cost, GMAX, etc.

5. Technology Selection

- **Owner chooses treatment technology**
  - Research versus sales pitches
  - Confirm performance
  - Treatability and/or pilot testing
- **Consultant chooses treatment technology**
  - Treatability and/or pilot testing
  - Justification of recommended technology
  - Performance guarantees
- **Design-build delivery**
  - Lower equipment purchase costs
  - Shorter startup schedule
  - Lower design costs (minimal specifications)

Membrane Spectrum



Trace put into perspective
1 Part Per Trillion = 1 nanogram/Liter

Is The Same As:

- 1 inch in 16,000,000 miles
- 1 second in 320 centuries
- 1 cent in $10 billion
- 1 pinch of salt in 10,000 tons of potato chips
- 1 drop of vermouth in 500,000 barrels of gin
- 1 bogey in 3.5 billion golf tournaments
- 1 bad apple in 2 billion barrels
- 1 dented fender in 10 million car lifetimes

0.000000000001 = 1 ng/L

6. Customer Acceptance

- Prepare for customer meeting:
  - Document efficiency of treatment
  - Define quality controls on reuse water
  - Describe where reused relative their product production
  - Describe treatment performance testing procedures
  - Identify other installations
  - Research and prepare internal marketing staff
  - Develop promotional information
  - Provide QA/QC data after startup and ongoing

7. Reliability

- After design – perform failure analysis
- Determine redundancy for critical components / processes
- Implement production staff training of critical impacts
- Establish monitoring protocols and notifications
- Determine instrumentation and alarms
  - Online continuous
  - Reliability / calibration / accuracy
- Remote monitoring options
- Adequate spare parts and “on-shelf” replacements
- Allowance for lab testing delays
- Plant security

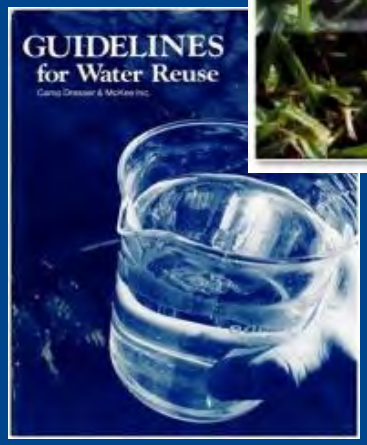
8. Perceptions

- Internal staff
  - Informational meetings
  - No cross-connections
  - Production changes:
    - CIP makeup changes
    - Boiler softening changes
    - Cooling tower changes
- External facilities
  - Cross-training staff
- Competitors!

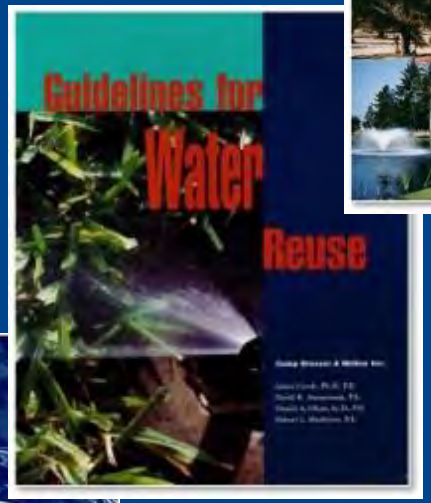
9. Permitting

- Determine which permits are required:
  - Building permit
  - Construction permit
  - Environmental permits
    - "Water treatment"
    - "Wastewater treatment"
    - "Water reuse" (reuse, reclaimed, recycled, return definitions)
    - Discharge permits
      - NPDES
      - Sewer – Industrial waste permit
    - Sludge disposal permits
  - Water rights permits!
  - Other Agencies
    - Pasteurized Milk Organization

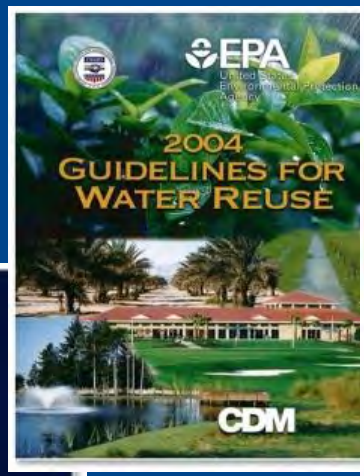
Guidelines – Not REGULATIONS



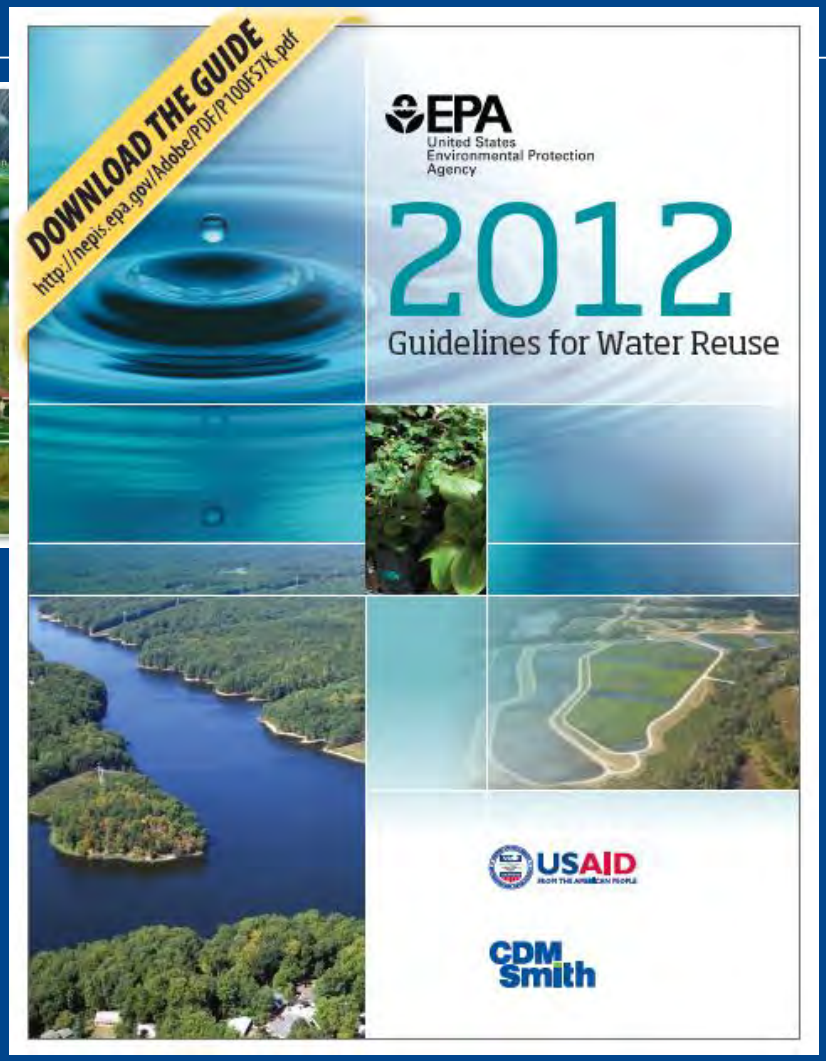
1980



1994



2004



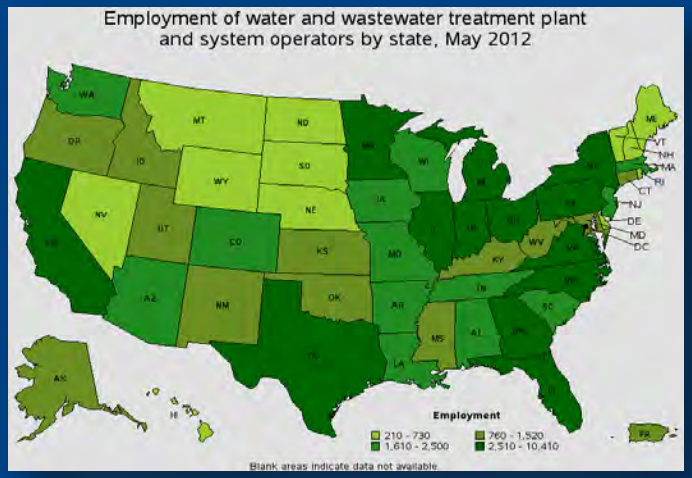
http://nepis.epa.gov/Adobe/PDF/P100FS7K.pdf

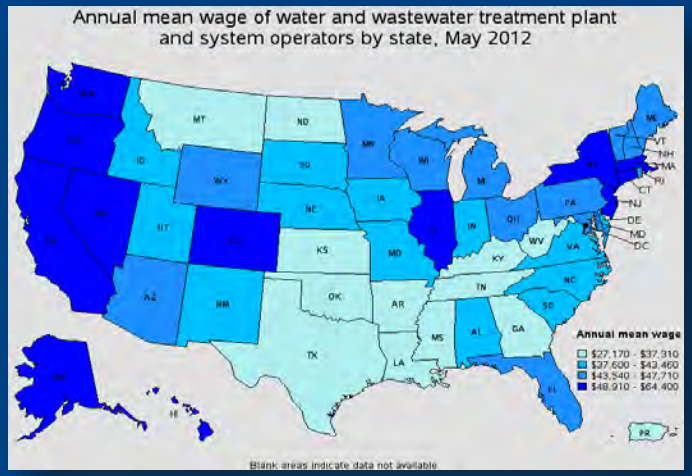
10. Legal and Contractual

- Water rights
- Contractual performance criteria
- Warranties
- Liquidated damages
- Bonding
  - Performance bonds
  - Payment bonds
- Insurance requirements
- Land application restrictions
- For contract operations:
  - Fines and penalties

11. Operations and Maintenance

- Internal staff
  - Availability
  - Training
  - State certification requirements
    - Continuing education requirements
  - Laboratory testing
    - Internal – impact on food lab
    - External – contract lab
- Contract operations
  - Selection process
  - Liability
  - Staff turnover
  - Cost savings – offset maintenance

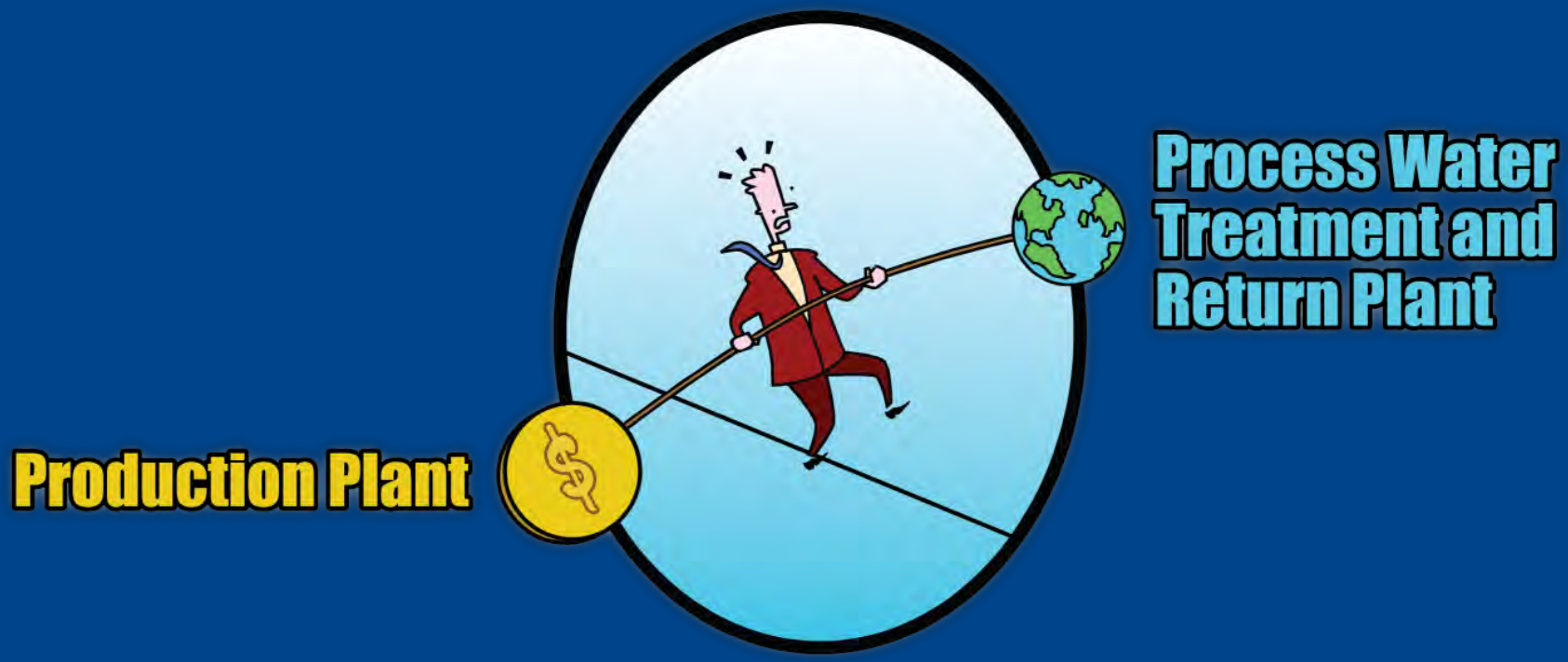




12. Project Footprint

- Type of technology (chosen or required)
  - Biological treatment
    - Fixed film or MBBR process versus lagoon
- Zero-Liquid Discharge (ZLD)
  - Brine disposal
- Weather impacts
- Geotechnical / soils / groundwater
- Access
- Pumping versus gravity

Conclusions



Sustainable Water Reuse:
Process Water Treatment and Recovery Plant
Frito-Lay

Casa Grande, AZ

CDM Smith

Project Overview & Objectives

- Produce Sun Chips and other products at Casa Grande facility using solar power.
- Area used for waste process water land application converted to solar fields.
- A treatment plant was installed on site to treat process wastewater to meet EPA Drinking Water Standards.

Project Achievements

- 75 - 80% Water Reuse Achieved
- <1% of Waste to Landfill
- 67% of Energy Generated from Renewable Sources
- Collective Actions Reduced Greenhouse Gas Production by 50%

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The New York Times

National

THURSDAY, NOVEMBER 15, 2007

In Eco-Friendly Factory, Low-Guilt Potato Chips

By ANDREW MARTIN

CASA GRANDE, ARIZ.

At Frito-Lay's factory here, more than 500,000 pounds of potatoes arrive every day from New Mexico to be washed, sliced, fried, seasoned and portioned into bags of Lay's and Ruffles chips. The process devours enormous amounts of energy, and creates vast amounts of wastewater, starch and potato peelings.

Now, Frito-Lay is embarking on an ambitious plan to change the way this factory operates, and in the process, create a new type of snack: the environmentally benign chip.

Its goal is to take the Casa Grande plant off the power grid, or nearly so, and run it almost entirely on renewable fuels and recycled water. Net zero, as the con-

PETER DaSILVA FOR THE NEW YORK TIMES

Thank You!

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