A SHARED RESOURCE,
A SHARED RESPONSIBILITY

Energy and Water

Oklahoma Governor’s Water Conference

October 27, 2010

Trish Horn, OGE Energy Corp.
PRESENTATION OVERVIEW

• Energy and water both critical resources that are inextricably linked
• Security and economic health of U.S./Oklahoma depend on maintaining a supply of both electricity and water
• Utility industry is in transformation; changes will affect future amount and type of water needed
• Future energy generation - and its link to water usage and need - depends on a variety of factors
• Employing water stewardship is critical
ENERGY AND WATER ARE LINKED

Energy Requires Water
• Thermoelectric generation (fossil and nuclear)
• Cooling
• Emissions Control
• Fuel Production
• Hydropower
• Minerals Extraction

Water Requires Energy
• Water production, processing, distribution and end-use needs
• Pumping
• Conveyance and Transport
• Treatment

With all your power, what would you do?

Adapted from Sandia National Laboratory 2009
TRENDS – ENVIRONMENT AND BEYOND

• Electric industry in transformation
• Electric demand predicted to grow substantially (21% by 2030)
• New customer efficiency, renewable energy and service options and programs
• Environmental regulation implications
  – Coordination/impacts/rationale
  – Timing to plan
  – Technology availability/cost
• Challenge: supply affordable, reliable electricity
ENERGY AND WATER

• Availability and cost of one of these resources directly affects the other
• Increased demand for both
• Energy independence is critically linked to water availability
• Critical challenges – Security
  – Population growth, urbanization, regulation, climate change debate, demographic changes
WATER – ELECTRICITY LINK

• Water supply and reclamation consumes 4 percent of U.S. electric power generation
  – Approx 42 GW or 32 million homes

• 75 % of cost of municipal water processing and distribution is for electric power

• Up to 20% of electricity consumed in western states (arid) is used for water infrastructure
## WATER WITHDRAWALS, MWh GENERATED AND EFFICIENCIES

![EPRI July 2009](image)

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<td>Withdrawals</td>
<td>14,500</td>
<td>36,500</td>
<td>62,100</td>
<td>77,000</td>
<td>71,000</td>
<td>71,000</td>
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<td>(billion gal)</td>
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<tr>
<td>Power Generated</td>
<td>0.23</td>
<td>0.61</td>
<td>1.28</td>
<td>2.00</td>
<td>2.68</td>
<td>3.45</td>
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<tr>
<td>(billion MWh)</td>
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<tr>
<td>Water</td>
<td>63,000</td>
<td>60,000</td>
<td>49,000</td>
<td>39,000</td>
<td>27,000</td>
<td>21,000</td>
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<tr>
<td>Withdrawal</td>
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<td>Efficiency</td>
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<td>(gal/MWh)</td>
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- Industry has reduced water withdrawal per unit of electricity by a factor of 3
- Energy output has increased by a factor of 15
- Net water withdrawal level since 1980

WITH ALL YOUR POWER 🌟 WHAT WOULD YOU DO?
ELECTRICITY GENERATION WATER USE

• Cooling
• Environmental control
• Ash handling
• Turbine performance enhancement
• Fuel processing
• Boiler/reactor makeup water
• Housekeeping
TYPICAL WATER REQUIREMENTS

Water Use by Plant Type

EPRI 2008
WATER CONSUMPTION BY SECTOR

U.S. Freshwater Consumption, 100 Bgal/day

Irrigation 80.6%
Livestock 3.3%
Thermoelectric 3.3%
Commercial 1.2%
Domestic 7.1%
Industrial 3.3%
Mining 1.2%
Irrigation

Utility Industry – approx 3% of water consumed

WITH ALL YOUR POWER WHAT WOULD YOU DO?

Sandia National Laboratory 2008
OGE Energy Corp. (NYSE: OGE)
WHO WE ARE

WITH ALL YOUR POWER WHAT WOULD YOU DO?
LOCATION OF OGE FACILITIES
OUR INTEREST IN WATER

WITH ALL YOUR POWER ➕ WHAT WOULD YOU DO?
2009 OG&E WATER USAGE/RECYCLE COMPARISON

2009 OG&E Water Usage

Billions of Gallons

Stream Water: 49.24
Groundwater: 0.08
Wastewater: 2.10

2009 OG&E WATER USAGE /RECYCLE

Trillions of Gallons

Stream Water: 0.0492
Groundwater: 0.0001
Wastewater: 0.0021
Water Re-circulated: 1.0286
OG&E - WATER USAGE - ELECTRIC GENERATION COMPARISONS

-with all your power △ what would you do?

Gallons

Typical Fossil
Redbud/McClain
Wind

0 100 200 300 400 500 600
OG&E COOLING WATER -REUSE

In 2009 two facilities used approximately 2.1 billion gallons of treated municipal wastewater as cooling water.

McClain

Redbud
OGE 2020 PLAN
OGE 2020 PLAN

• Implemented plan to defer new capacity required until after 2020

• Research/monitor generation technologies

• Deploy energy efficiency/load curtailment programs

• Build wind to extent supported by economics – today commitments equal 11% of capacity

• Deploy Smart Grid to drive:
  • Demand Response – 5% reduction 2020
  • Energy efficiency
  • Distributed generation/storage
  • Increase customer satisfaction, options and cost savings
OG&E’s Wind Development
**OG&E – WIND DEVELOPMENT**

1. **Construct Transmission Lines**
   - Needed to deliver wind energy to load centers
   - Enhanced reliability of regional grid

2. **Add Wind Generation**
   - Hedge against changing fuel prices
   - Environmental benefits

3. **Offer Customers “Renewable” and energy management programs**
   - Provide customers “green” option
   - Means to offset rising costs

WITH ALL YOUR POWER WHAT WOULD YOU DO?
OKLAHOMA WIND POTENTIAL

Existing/Construction In-Progress OG&E Wind Farms by EOY 2010 551 MW

Crossroads Wind Farm 227.5 MW (12/2011 COD)

OG&E Transmission Line: Wind-speed

Total 780 MW of wind (12/2011)
OG&E’s Positive Energy Smart Grid
OG&E SMART GRID RATIONALE

• Empower customers with the information and tools necessary to better manage their individual energy usage and costs

• Create opportunities to reduce higher cost, peak energy consumption as well as the need for additional fossil-fueled power plants

• Reduce utility operating costs while improving the ability to respond to customers

• Improve the ability to anticipate, manage, and respond to outages and other system disturbances
Customer Programs
New In-Home Technologies

Smart Thermostat

In Home Display

Customer Web Portal

WITH ALL YOUR POWER – WHAT WOULD YOU DO?
Smart Grid Timeline

2008: 6,600 Smart Meters installed in Northwest Oklahoma City

2009: OG&E awarded $130 million in federal stimulus money to build Positive Energy™ Smart Grid across OG&E’s Oklahoma service territory

2010: Over 100,000 smart meters have been installed

2011+: Roll out Smart Meters to all OG&E Oklahoma customers
A view of a customer’s Positive Energy Home in 2020

- Solar Photovoltaics: 3 kW to 40 kW solar array on the roof to meet energy requirements of the home.

- In-Home Display: The central nervous system for the net zero energy home helps homeowners optimize energy consumption. Communicates via Internet and cell phone.

- Small Wind: Supplementary renewable generation.

- Fuel Cell: Provides efficient power generation for the home’s energy needs.

- Plug-in Electric Hybrid Vehicle: On board battery can provide energy storage.

- Smart Meter: A communication gateway between the Smart Grid and the home.

- Geo Thermal Heat Pump: Reduces HVAC and water heating energy requirements by 30%.

- Water Heater: Linked to Geo Thermal Heat Pump. Uses less than half of a conventional electric water heater.

- Energy Storage: Battery storage for backup power and peak loads.

- Energy Efficient Lighting: High efficiency CFL, LED, and OLED lighting.

- Demand Response Appliances: High efficiency Energy Star Appliances shed load from the grid and help consumers save money during peak demand.

Positive Energy Together

With all your power, what would you do?
WHAT OG&E IS DOING ...

• Water Stewardship
  – Conservation of fresh water
  – Recycle/Reuse
  – Employing uses for waste water
  – New generation – more efficient water usage
  – Public uses of cooling lakes – recreation/wildlife

• Installing Smart Grid
  – Empowering customers with information to make energy choices that conserve and are efficient

• Providing Programs for Energy Conservation
  – Less energy used – less water required

• Expanding Renewable Energy

WITH ALL YOUR POWER • WHAT WOULD YOU DO?
IN CONCLUSION – WATER AND ENERGY

• A reliable water supply source is indispensable to OG&E and the citizens of Oklahoma
• A reliable and affordable source of electricity is vital to a good quality of life for Oklahoma
• By partnering and working together, we can make energy choices and decisions that conserve and protect our valuable water resources
• OGE wants to empower you to make energy choices that are good for you, good for our Oklahoma water plan and good for Oklahoma.

WITH ALL YOUR POWER WHAT WOULD YOU DO?
WATER AND ENERGY
SHARED RESOURCE – SHARED RESPONSIBILITY

WITH ALL OUR POWER WHAT CAN WE DO TOGETHER?