



Water Use in Utility Power Generation

October 30, 2017

OG&E Operations

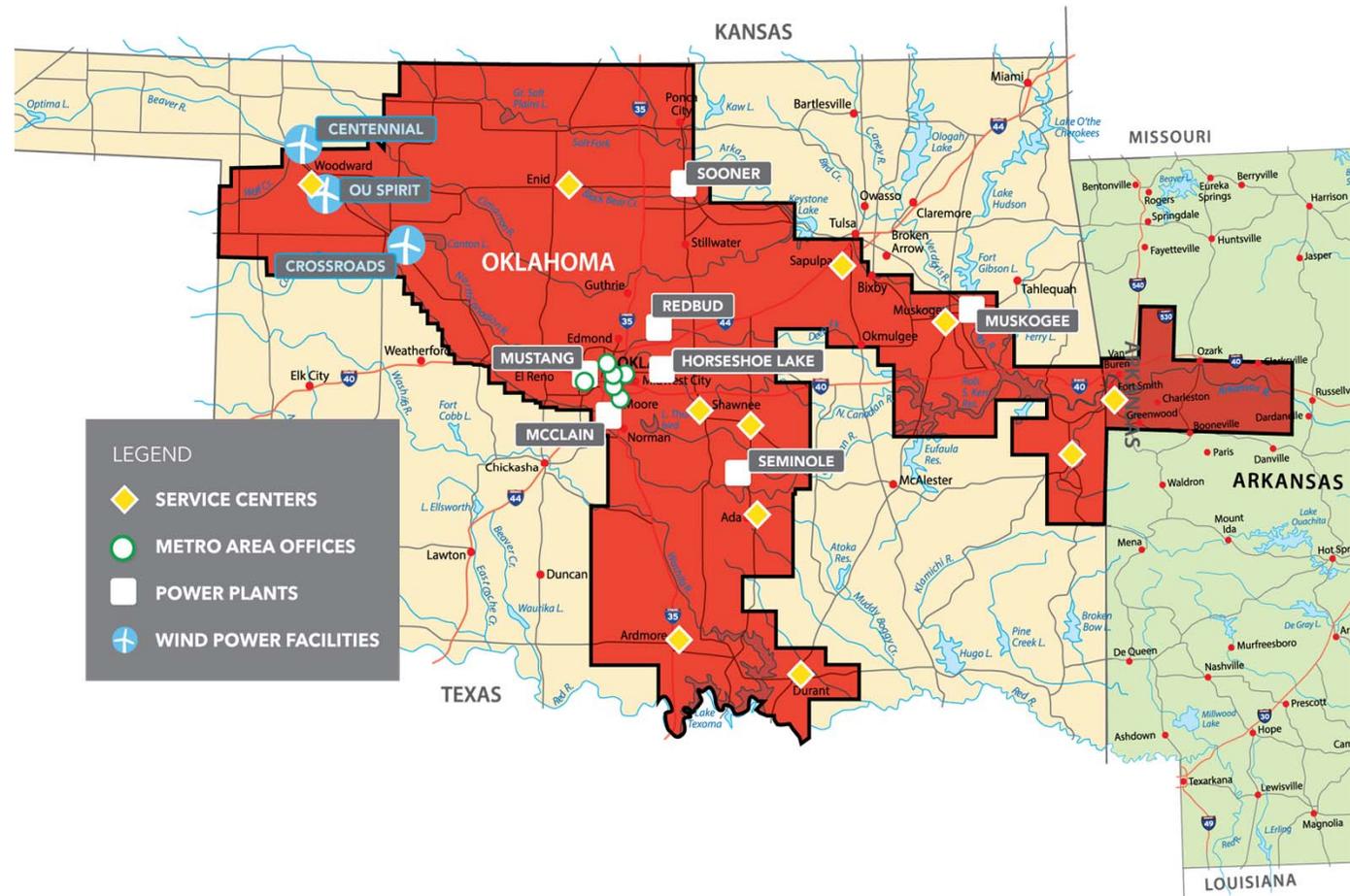
Largest electric utility in Oklahoma

Regulated electric utility:
> 830,000 customers

Generating capacity of
6,771 megawatts:

- 7 power plants,
- 3 wind farms
- 2 solar sites

Service territory:
30,000 square miles in
Oklahoma and western
Arkansas



Water Use in the U.S Electric Utility Industry

Investment of > \$100 Billion/yr in infrastructure with long-term planning horizons

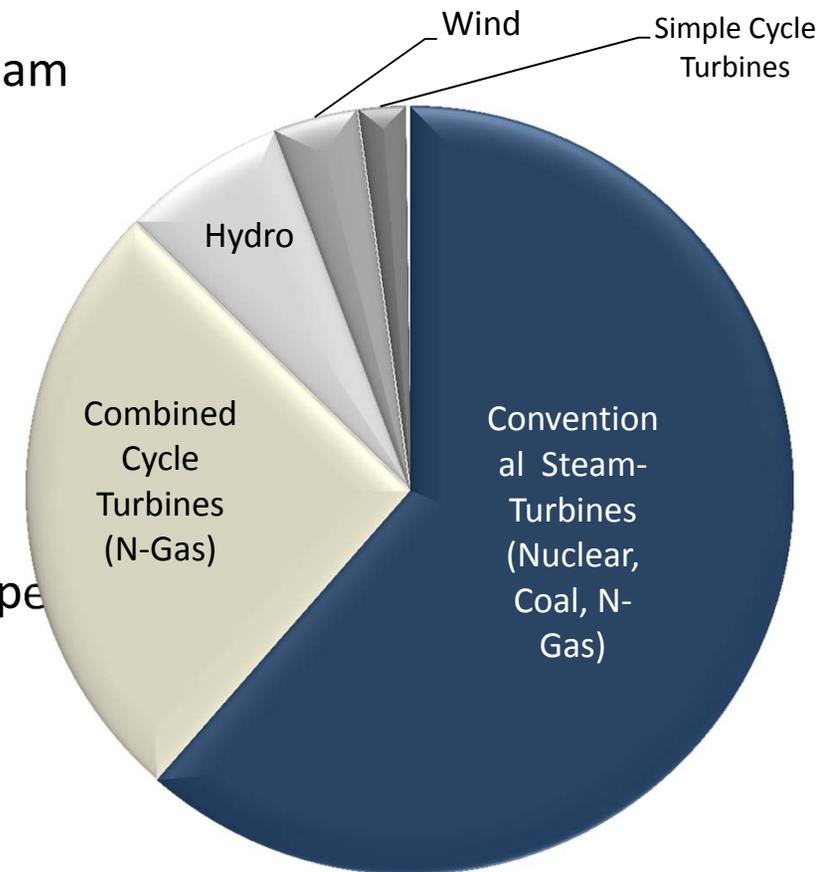
>80% of all electricity produced in the U.S utilizes steam generation however from a diverse set of sources

Water needs within a steam generator:

- Cooling: ~ 97% return to source
- Steam production
- On-site process management: reuse e.g Mustang

Water withdrawal for thermoelectric power has dropped steadily since the 1980s and continues

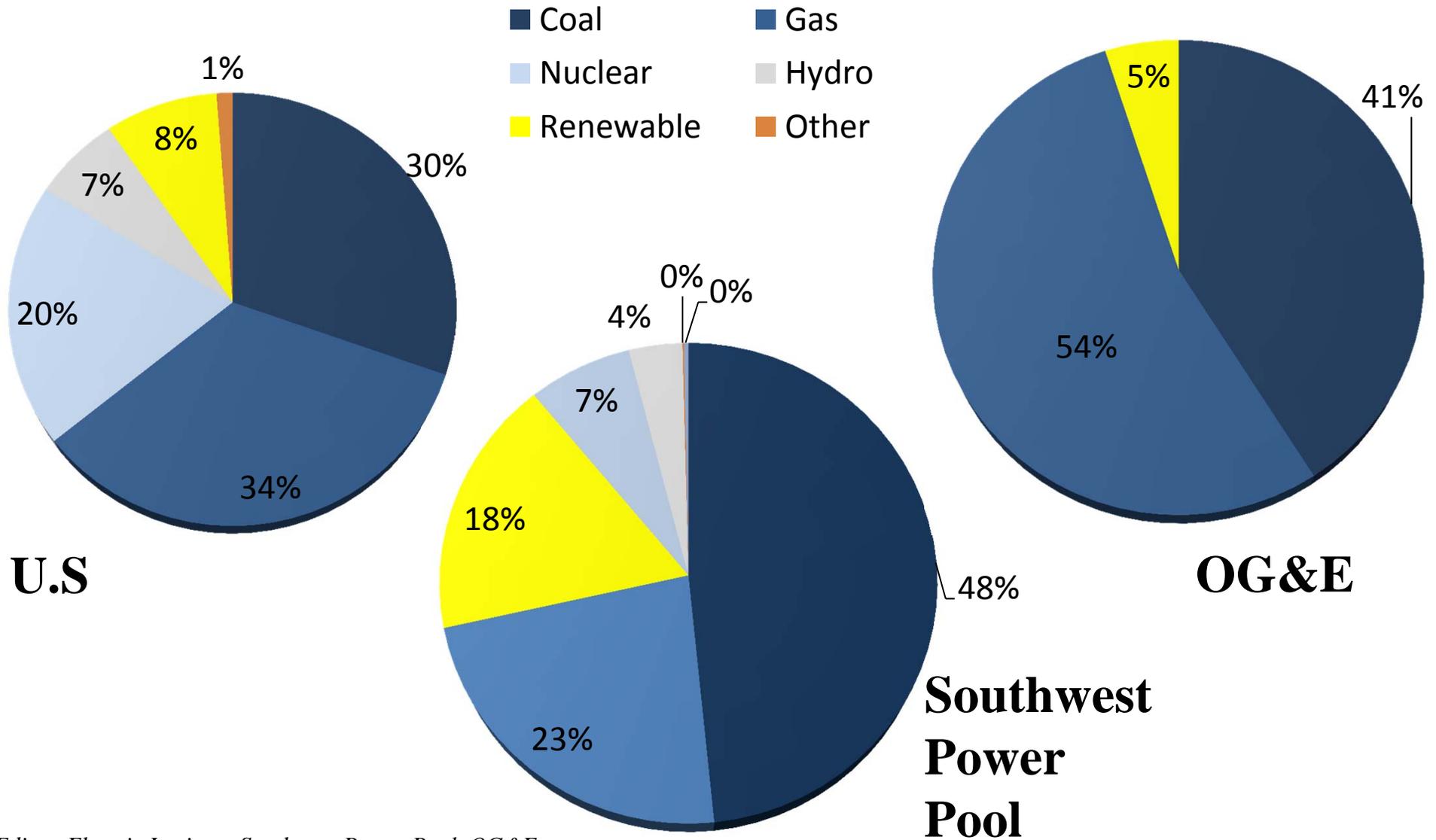
- Greater efficiency in newer generators by 25-40%
- Increased diversity in fuels and technology



Water reuse has been a long-standing practice in the industry by design

Source: Department of Energy, Energy Information Administration 2012

2016 Generation (MWh) by Fuel



Source: Edison Electric Institute, Southwest Power Pool, OG&E

National Electric Utility Water Use Relative to Others

Municipal & Domestic

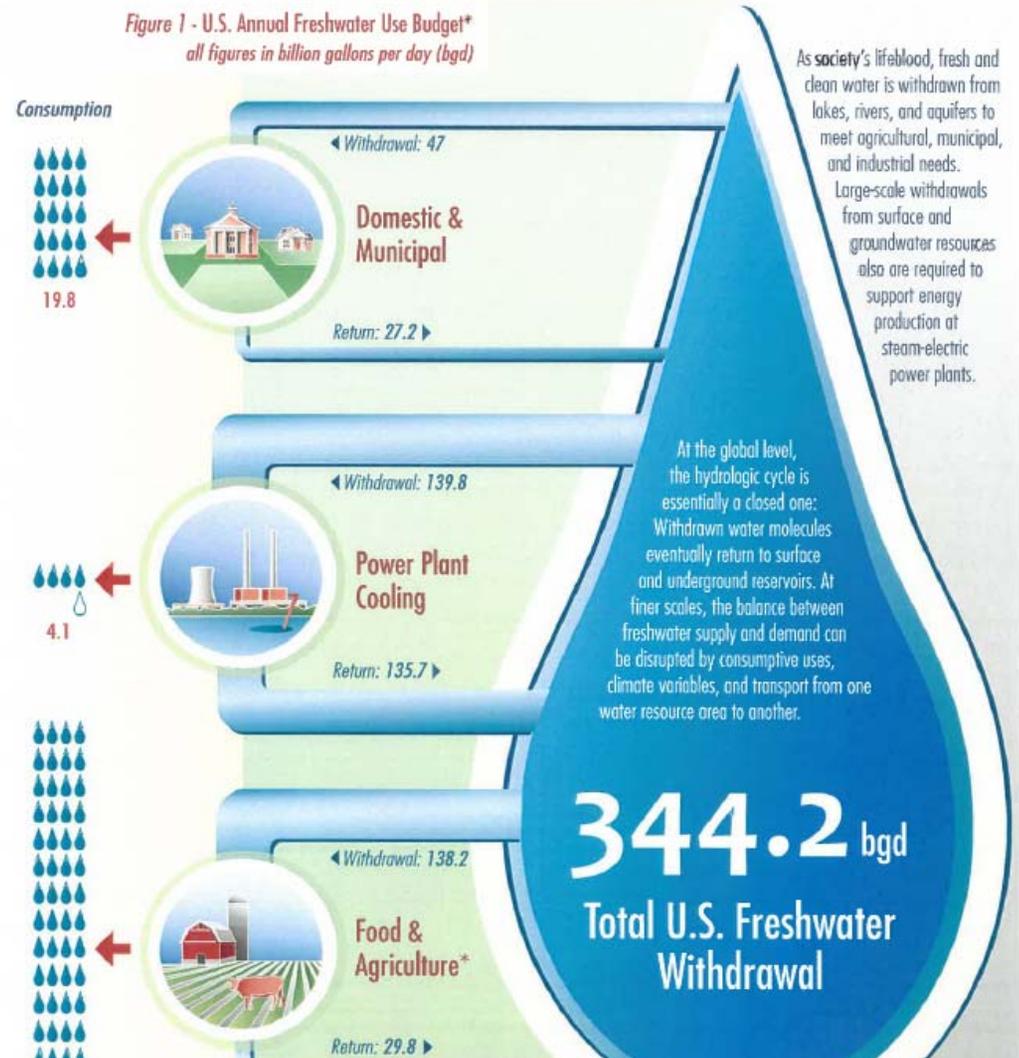
- 47 Billion gals/day
- 58 % consumption

Thermoelectric

- 139.8 Billion gals/day
- 3 % consumption

Agriculture

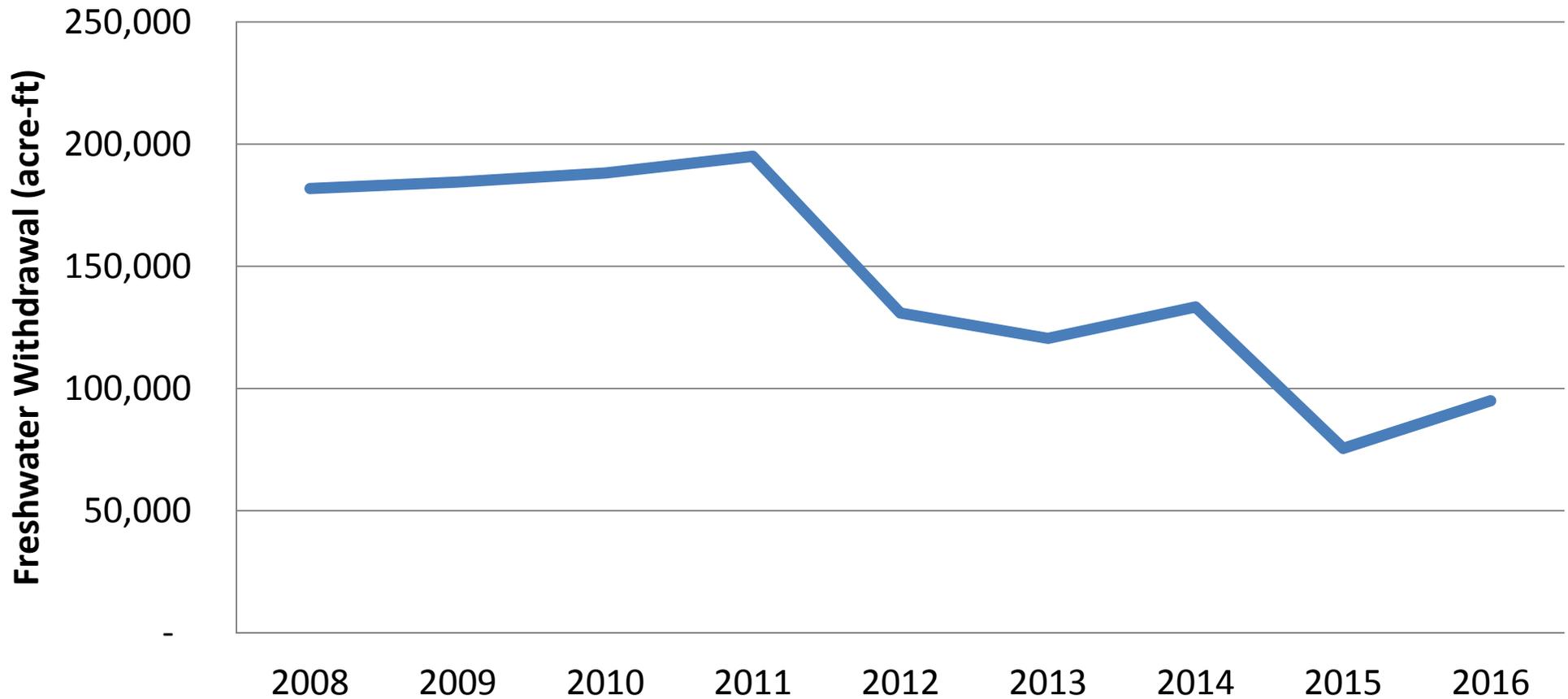
- 138.2 Billion gals/day
- 78 % consumption



Thermoelectric Consumption Accounts for Only 4% of All Consumption

Source: EPRI "U.S. Freshwater Availability and Power Plant Cooling", July 2015

Oklahoma Utility Power Plant Freshwater Withdrawal



Weather, generation /technology changes, market prices, customer growth

Source: Oklahoma Water Resources Board

Does not include GRDA or non-freshwater withdrawal

Questions?

Water Cycles in Typical Steam Generation Facility

