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Southern Alliance for  
Clean Energy



# Nuclear Power: Water Impacts

Part 4 of NIRS [#NuclearIsDirty Project](#):

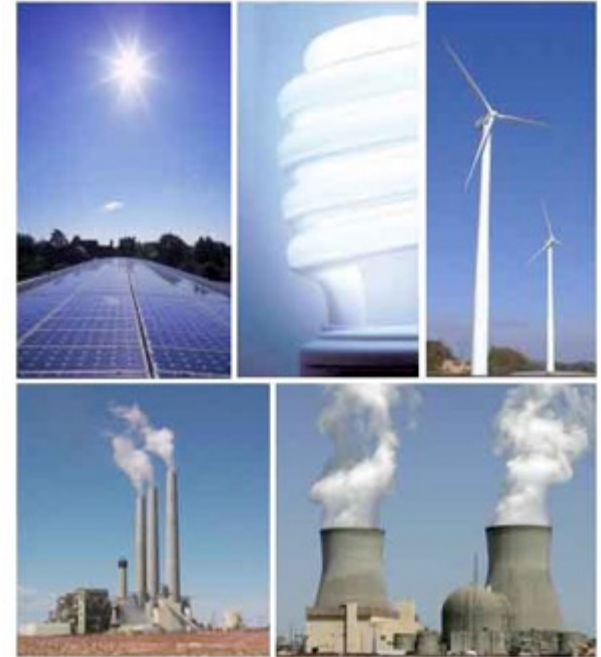
*Abusing our Waters: Nuclear Power Threats  
to Water and Ecosystems*

*Sara Barczak*

*Southern Alliance for Clean Energy  
High Risk Energy Choices Program Director*

# About Us

**For over 30 years the Southern Alliance for Clean Energy has worked to promote responsible energy choices that work to address the impacts of Global Climate Change and ensure clean, safe and healthy communities throughout the Southeast.**

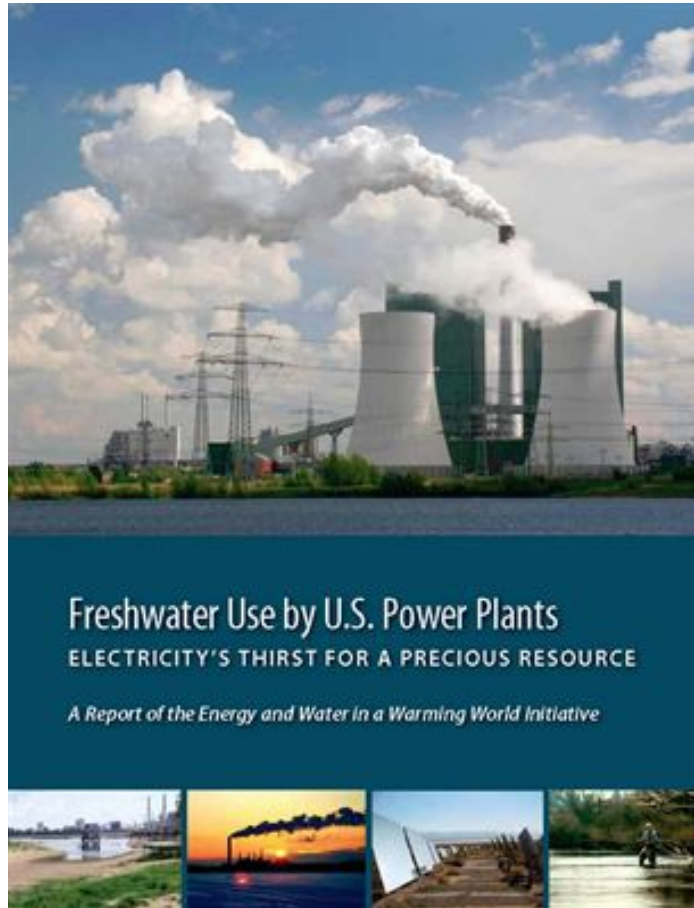


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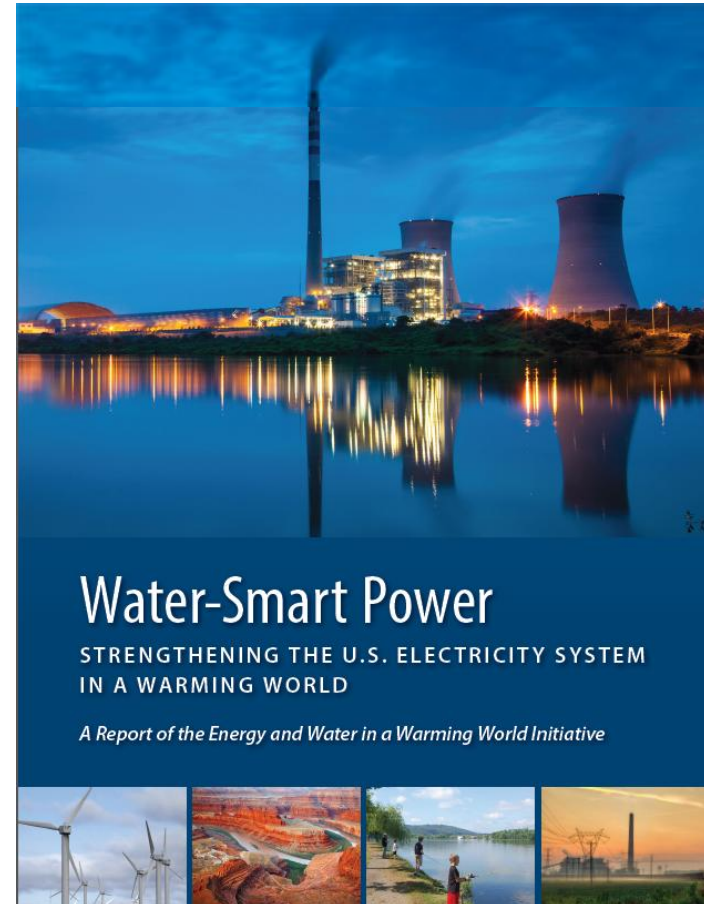
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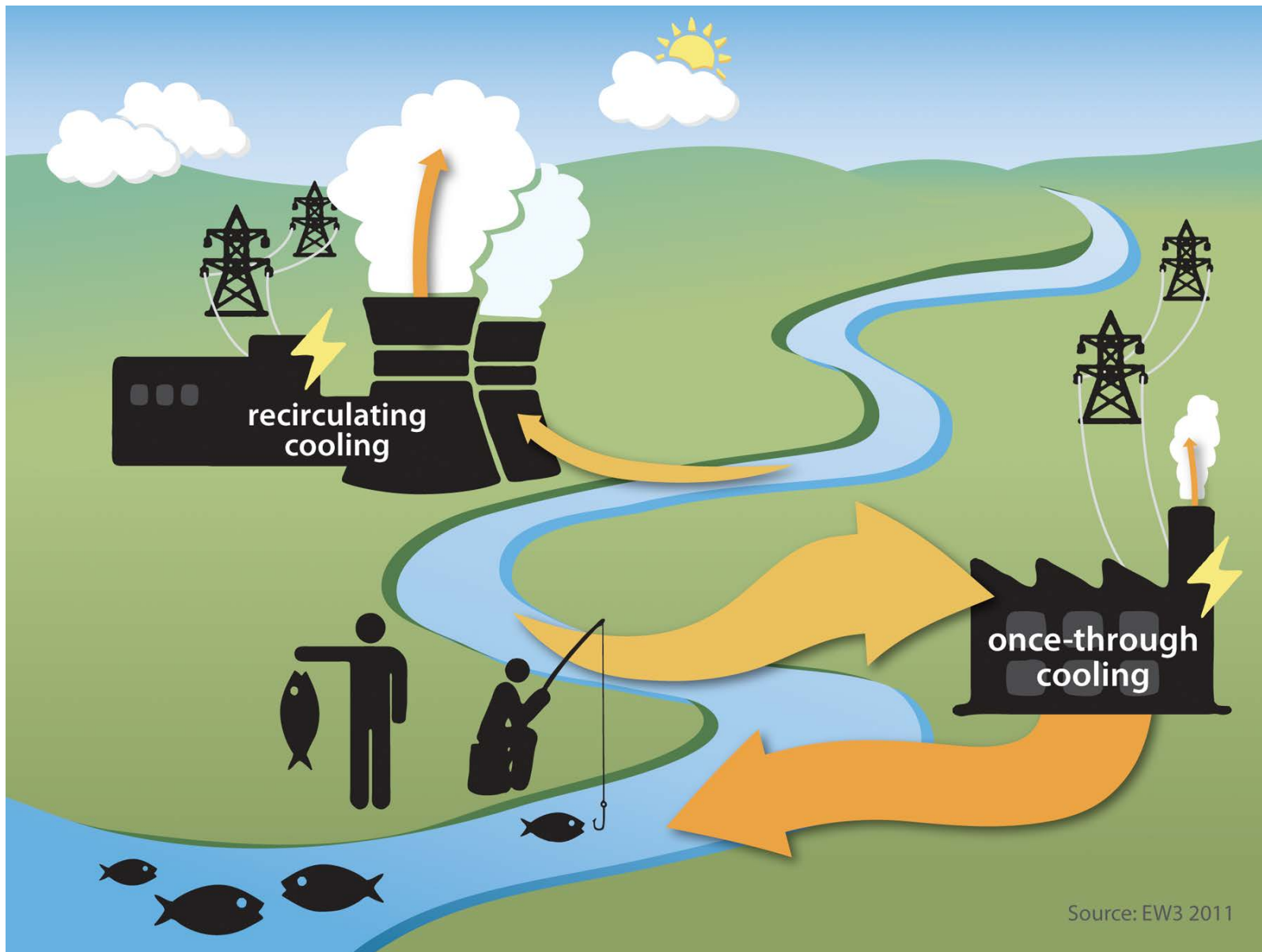


2011



2013

Union of Concerned Scientists: <http://bit.ly/1T9tpmg>

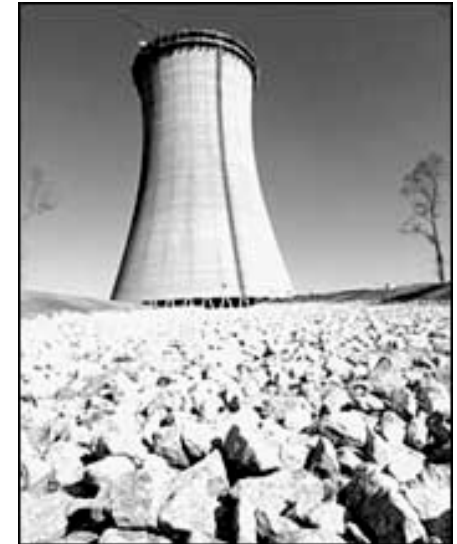


Source: EW3 2011



# Water Use by the Electricity Sector

- A large portion is returned to the supply source, albeit at higher temperatures, but some is “consumed” or lost, primarily as evaporative loss during cooling
- Evaporative loss can be significant
- Nuclear power is generally the most water intensive



# Water Intensity for Various Power Generation Sources

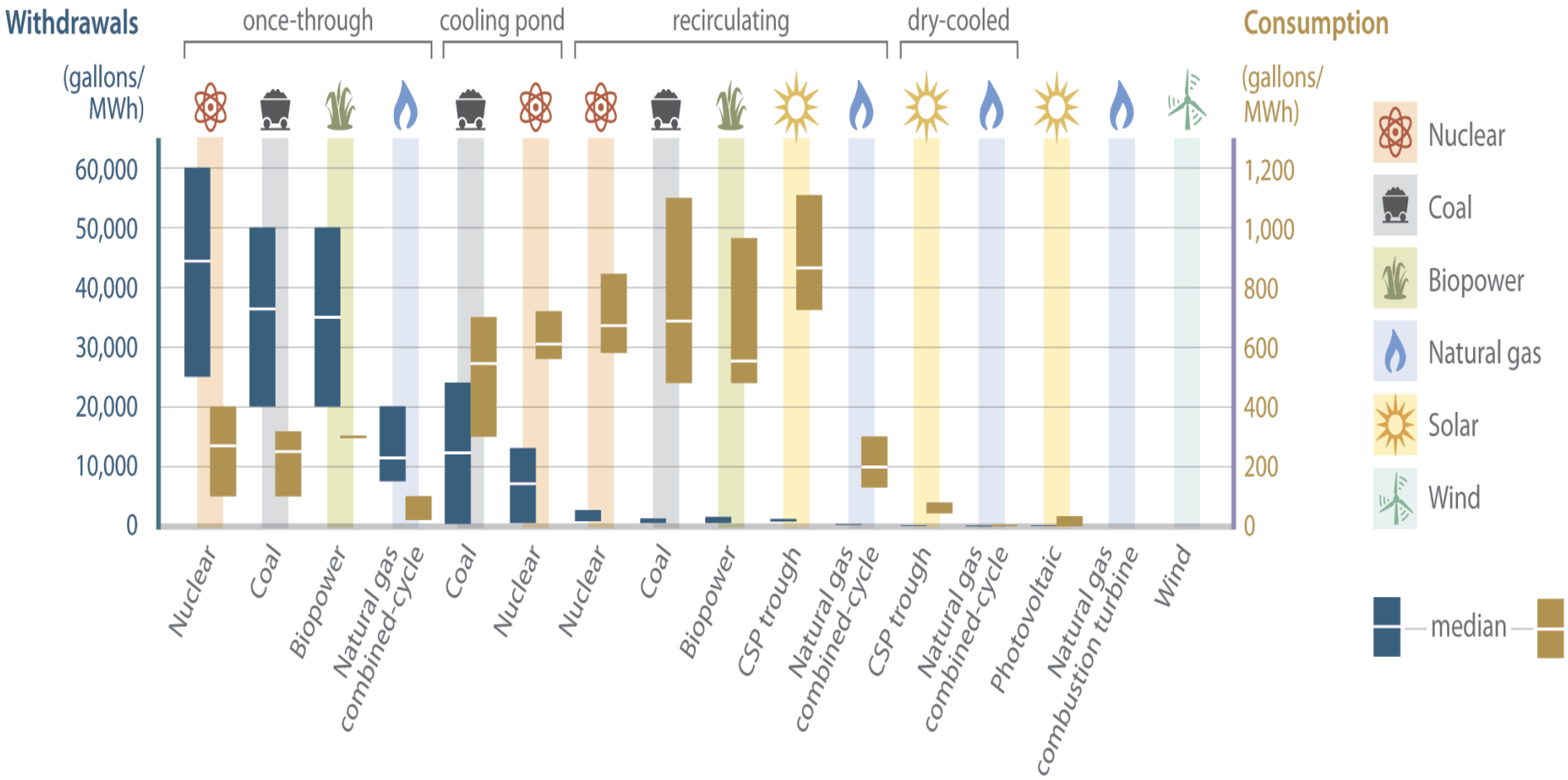
	Water Intensity (gal/MWh <sub>e</sub> )		
Plant-type	Process	Steam Condensing	
Steam		Withdrawal	Consumption
Fossil (coal)	CL Tower	300-600	300-480
Nuclear	CL Tower	500-1100	400-720
Natural gas CC	CL Tower	~230	~180
Coal IGCC*	CL Tower	~230	~180

CL=closed loop cycling, CC=combined cycle

\*IGCC=Integrated Gasification Combined-Cycle, includes gasification process water

U.S. DOE, Report to Congress on the Interdependency of Energy and Water, Energy Demands on Water Resources, December 2006. Table V-1.





EW3 2011

# New Nuclear Reactors: Water Use

**Southern Co.'s under-construction Vogtle reactors near Augusta, GA along the Savannah River**

- **2 Toshiba Westinghouse AP1000 reactors (~2200MW)**
- **Water Use: ~55-88 million gallons per day (gpd)**
  - **50-75% consumptive loss**
  - **More water will be lost as steam from the two existing and two proposed reactors at Plant Vogtle than is currently used by all residents\* of Atlanta, Augusta, and Savannah combined**
  - **Or enough water to supply 1.4 million to 2.3 million Georgians**

**\* With the average per capita daily water use in GA at 75 gallons from surface and ground water sources, <http://water.usgs.gov/watuse/tables/dotab.st.html>**

Sources: Southern Nuclear Operating Company, COL Application, Environmental Report, Revision 0, March 2008, p. 3-14; Climate Change Implications on Georgia's Water Resources & Energy Future, 2007.



# New Nuclear Reactors: Water Use



- With average surface water use (public and industrial) in Cherokee County, SC at ~8.4 million gallons per day, **on a daily basis Duke's proposed Lee plant could use 6-10 times the amount of surface water used by every other user in the county combined**
- In Florida, FPL estimates public & commercial water use in Miami-Dade will increase by 35% by 2025 **while thermoelectric power plant water use in the county will increase 3224% in the same time span**

Lee COL application, Enviro. Rpt. Ch. 2, TABLE 2.3-14 Estimated Surface Water Withdrawal and Consumption for Station Operations <http://www.nrc.gov/reactors/new-licensing/col/lee.html#appDocuments>; and FPL, Turkey Point COL Application, Rev. 0, p. 2.5-34, June 30, 2009.

# Problems at FPL's Turkey Point



# Future Threats at Turkey Point



# Competing Demands for Water

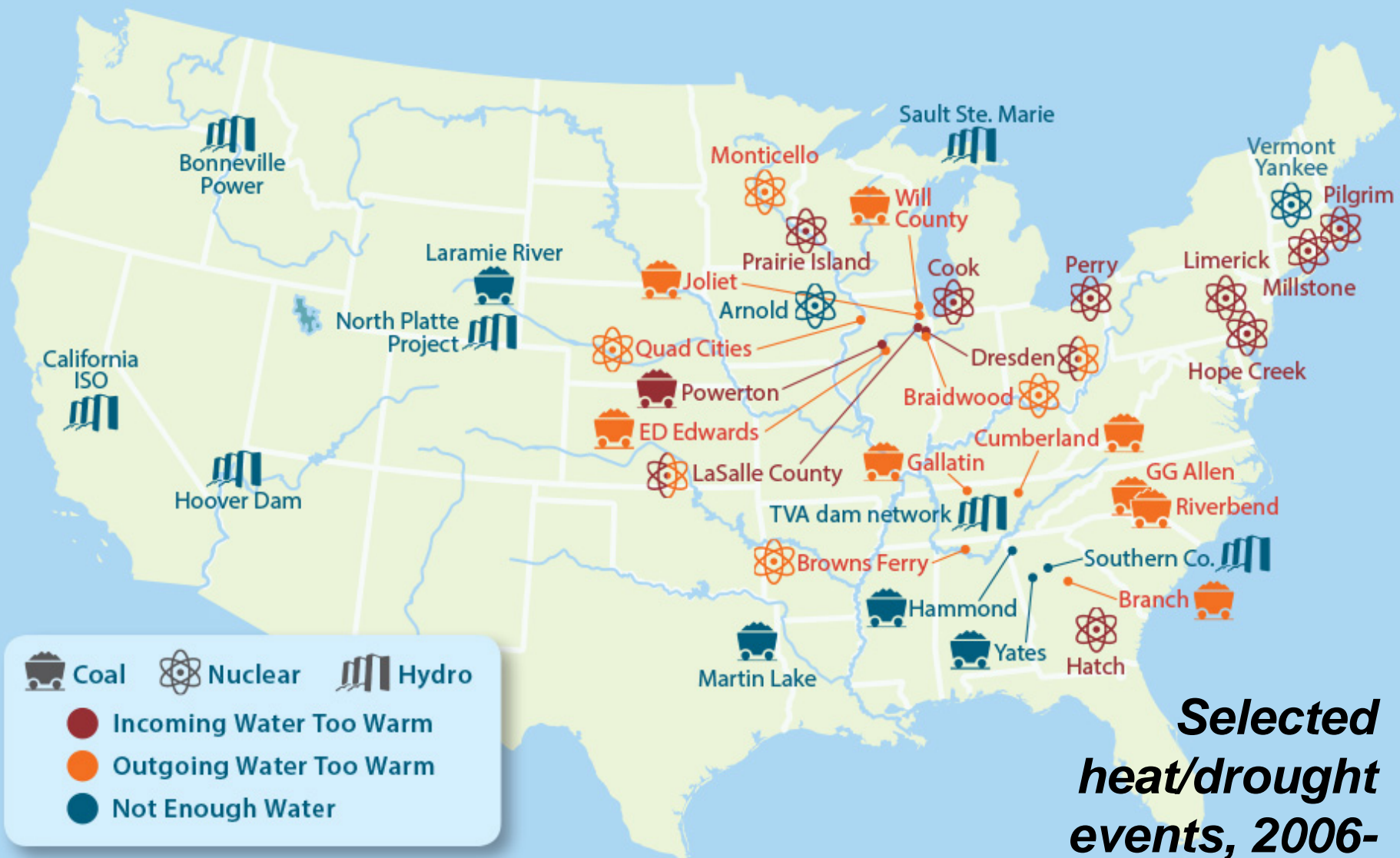
2004 DOE report predicted that in the West and SE, to meet increasing electricity demand, power plants:

***“...will have to compete with a growing population for limited supply of freshwater--coupled with the increasing competition for freshwater from other use sectors such as agriculture, mining, industrial and instream uses.”***



- Climate change models predict that summer and early fall months may constitute what we would currently classify as drought conditions
- Models pose a future possibility for long-term mega-droughts in the SW and subtropics, including areas in the SE





UCS 2013

# Energy Reliability Concerns

- Power plants can be negatively impacted by summer heat waves or droughts; predicted global warming impacts may make this worse
- During 2006 summer heat wave, nuclear power plants had to power down in France, Germany, and across Europe because the water temperatures were too high for safe operation
- 8/16/2007 -- TVA shuts down Browns Ferry reactor in AL
  - water drawn from the Tennessee River exceeded 90F degree average over 24 hours, amid a blistering heat wave across the Southeast

***"We don't believe we've ever shut down a nuclear unit because of river temperature," said John Moulton, TVA spokesman.***



# Save Water by Saving Energy



**Although water savings can be achieved through improved energy “supply” sources, energy efficiency measures on the “demand” side of the energy equation can be effective for saving both water and money.**

# Save Water with Renewable Energy



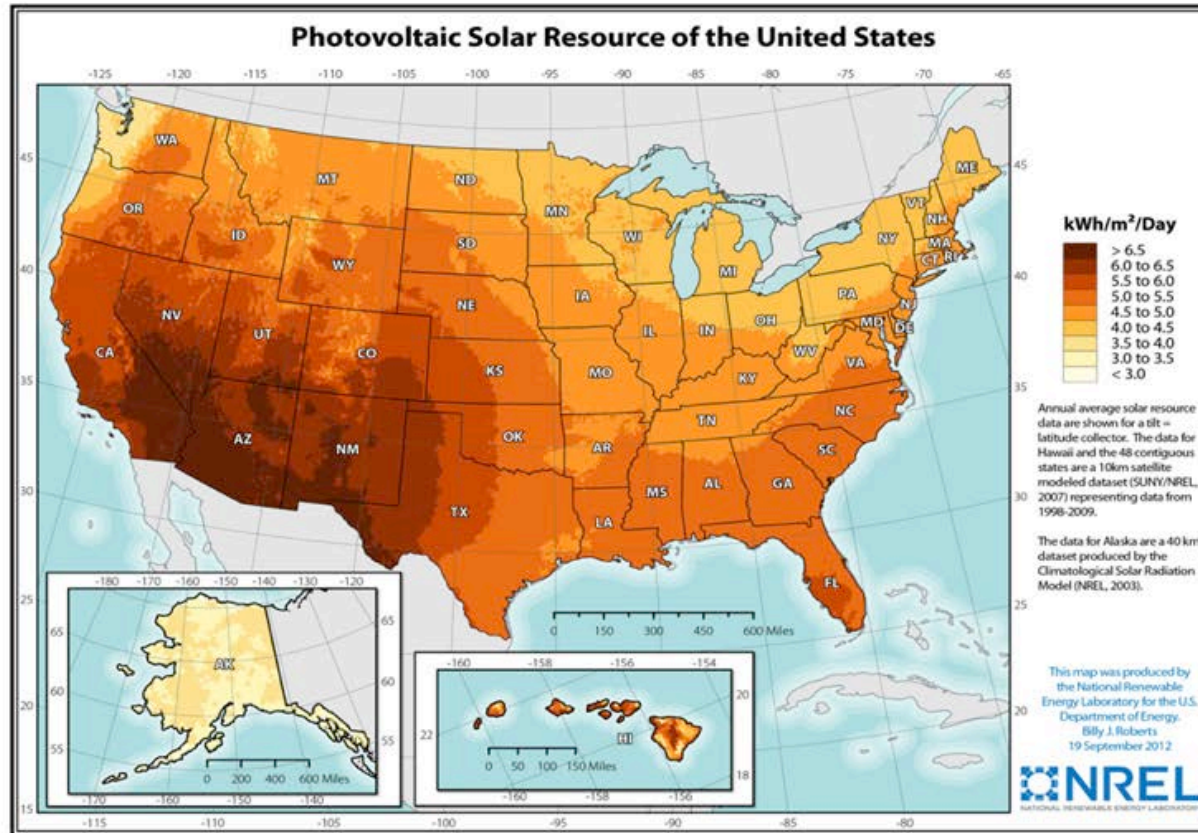
**Georgia has good wind potential**

- **with development of 700 MW offshore and 300 MW on land, Georgia could:**

- **save 1628 million gallons of water per year**
- **reduce 3 million tons of CO<sub>2</sub> per year**
- **realize \$2.1 billion in economic development benefits**

National Renewable Energy Lab, Economic Benefits, Carbon Dioxide (CO<sub>2</sub>) Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts (MW) of New Wind Power in Georgia, June 2008

# Solar PV Uses NO Water



# Recommendations

- **Consider current and future energy production in terms of limited water availability**
  - **Study how existing or proposed power plants may be negatively impacted or unable to generate electricity under drought conditions, including climate modeling; research alternate cooling technologies**
- **Integrate water, energy, and climate planning**
- **Weave the water benefits of transforming our energy infrastructure into educational materials, outreach, etc.**



# How You Can Help

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✓ **Join NIRS and support the #NuclearIsDirty Project:**

[https://org2.salsalabs.com/o/5502/shop/custom.jsp?donate\\_page\\_KEY=341](https://org2.salsalabs.com/o/5502/shop/custom.jsp?donate_page_KEY=341) &  
<http://nuclearisdirty.nirs.org/>

✓ **Join Beyond Nuclear:**

<https://donatenow.networkforgood.org/BeyondNuclear?code=BNWebsite>



# Thank You!



Photo Credit: Paul Marcellini

Contact: Sara Barczak, 912-201-0354, [sara@cleanenergy.org](mailto:sara@cleanenergy.org)

