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A Risky Option: Expanding Nuclear Power in the Southeast

Webinar Presentation

February 2009

About Us

- **Southern Alliance for Clean Energy (SACE) has been a leading advocate for clean, responsible energy choices that better our communities, our region and our world for over 20 years.**

- **Since its formal inception in 1985, SACE has grown from a small group of individuals into a dynamic organization, with five offices across the Southeast and initiatives at federal, state and local levels. SACE continues to expand organizationally, to address the needs of a rapidly changing planet.**

- **As we look towards the future, SACE's commitment to preserve, restore and protect our environment through the use of innovative technology, community outreach, grassroots and grasstops education, and pioneer policy work remains steadfast.**

For more information on Southern Alliance for Clean Energy please visit
www.cleanenergy.org

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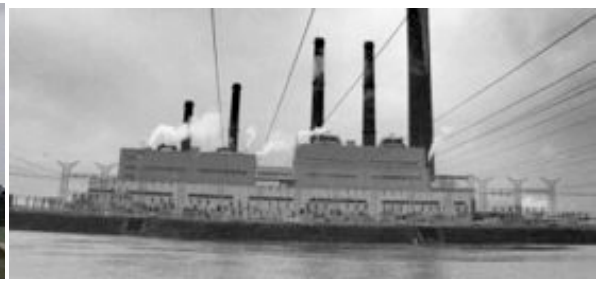
The Southeast's Energy Profile

- Heavy reliance on coal and nuclear that are large water users
- Very little electricity generated from renewable energy sources (e.g. solar, wind, bioenergy)
- Coal plants are the largest industrial source of carbon dioxide (CO_2) in the country
- Nearly all the SE states have proposals for more nuclear plants



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A Nuclear Southeast

- ☢ 25% of its electricity generation from nuclear
- ☢ 30 of 104 U.S. nuclear power reactors are in the SE
- ☢ Region's large utilities--Duke Energy, Entergy, FPL, Progress Energy, SCANA, Southern Company and Tennessee Valley Authority--hold operating licenses for the nuclear plants in the region
- ☢ Many small utilities in region have partial ownership
- ☢ Nearly all utilities in SE are pursuing new nuclear plants

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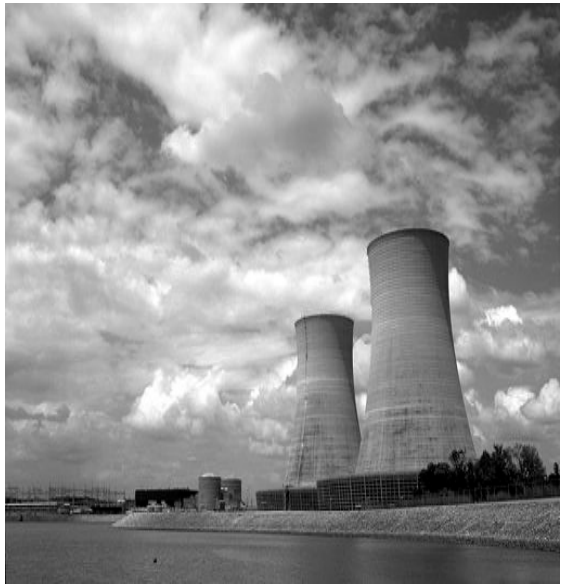
Nuclear Plant Impacts

- Require large amounts of water in order to operate
- Contribute to thermal pollution of waterways, release hazardous chemicals, & radioactive contaminants
- Create dangerous, long-lived radioactive waste for which no safe storage currently exists
- Contaminate land & water resources in case of accidents



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New Nuclear Plant Proposals

According to the U.S. Nuclear Regulatory Commission (NRC), the federal agency in charge of licensing new nuclear plants, as of Dec. 2008:

- **23 new power plant applications have been applied for or will be filed for by 2010**
- **34 total new reactors proposed**
- **16 reactors are proposed for the SE**

http://www.nrc.gov/reactors/new-reactors/new-licensing-files/expected-new-rx-applications.pdf

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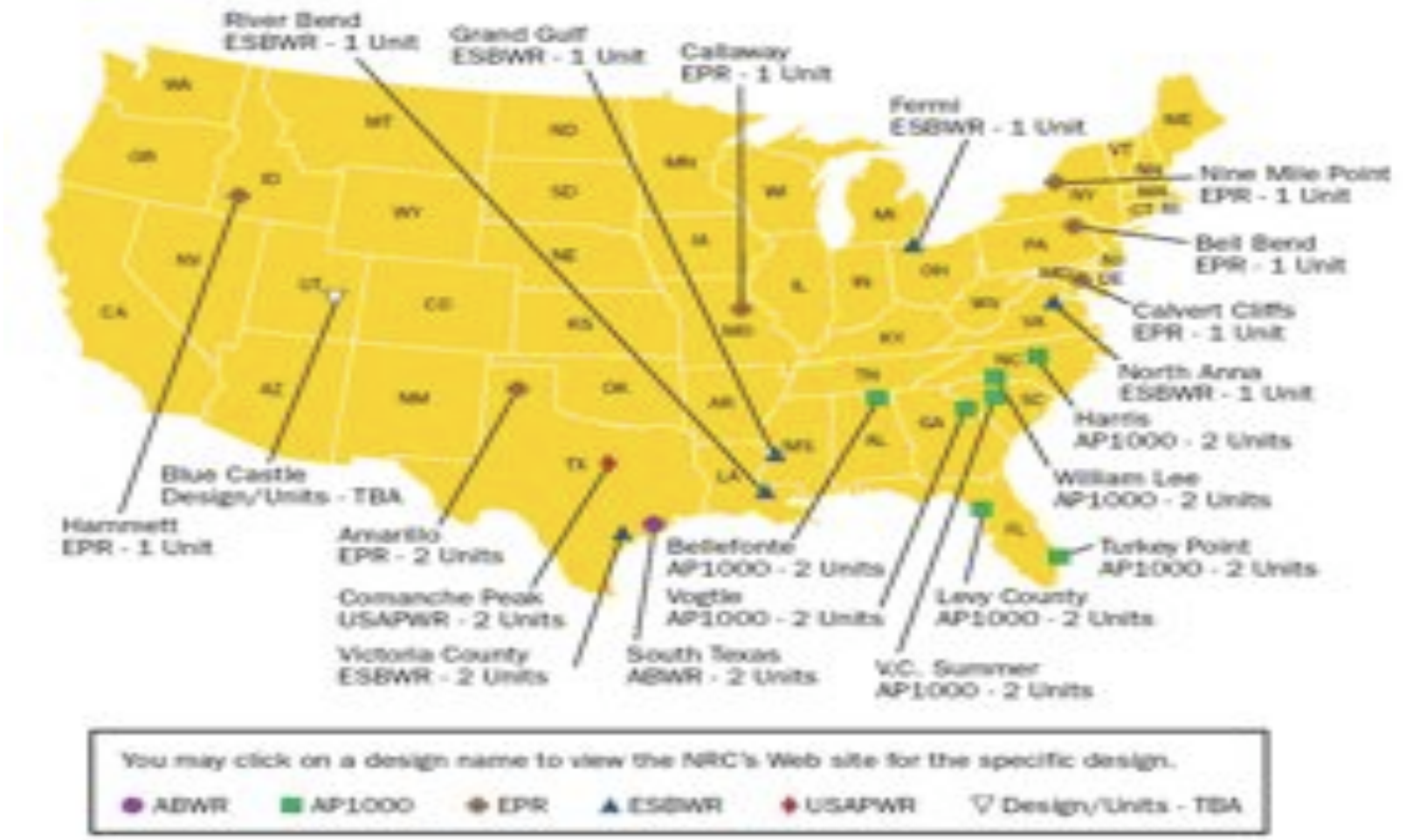
New Nuclear Plant Proposals



http://www.nrc.gov/reactors/new-reactors/col/new-reactor-map.html

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A Problem, Not a Solution

Why? Remember the 4 "Ws":

- **Water**
- **Wall Street (Cost & Scale Up)**
- **Waste**
- **Weapons (Security & Proliferation)**

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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, especially for nuclear plants

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Water Intensity for Various Power Generation Sources

	Water Intensity (gal/MWh$_e$)		
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.

Water Consumption Rates* for Electric Sources

Technology	Gallons per kilowatt hour (g/kWh)
CONVENTIONAL SOURCES	
Nuclear	0.62
Coal	0.49
Oil	0.43
Combined Cycle Natural Gas	0.25
RENEWABLE SOURCES	
Solar	0.030
Wind	0.001
Biomass	See information in text

*Through evaporative loss, not including water that is recaptured and treated for further use

Gipe, Paul. *Wind Energy Comes of Age*. John Wiley & Sons, 1995. Tables 12-6, 12-7.

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Water Use for Proposed Lee Plant

- **The proposed two new Westinghouse AP1000 nuclear reactors at Duke's Lee site in SC would withdraw from the Broad River:**
  - **47-81 million gallons per day (gpd) normal & maximum withdrawal**

- **Estimated consumption (water loss), ~50-75%**
  - **35-41 million gpd (average and max. consumption)**

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

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Water Use for Proposed Lee Plant

The application mentions that average surface water use (public and industrial) in Cherokee County was 8.4 million gallons per day.

To put this in perspective, this means that on a daily basis the Lee plant could use 6-10 times the amount of surface water used by every other user in the county combined.

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Water Use for Proposed Vogtle Plant

Proposed Vogtle expansion near Augusta, GA

- **2 new Westinghouse AP1000 reactors (~2200MW)**
- **Water Use from the Savannah River: ~55-88 million 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

Southern Nuclear Operating Company, COL Application, Environmental Report, Revision 0, March 2008, p. 3-14.

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Water Use for Proposed Bellefonte Plant

- **The proposed two new Westinghouse AP1000 nuclear reactors at TVA's Bellefonte site in Alabama will:**
  - **Withdraw ~71 million gallons per day (mgd)**
  - **Consume ~46 mgd**
  - **Approximately 50-75% will be consumptive loss, that is, lost as steam**

To put this in perspective, this represents more water consumption than all public water systems in the Guntersville watershed combined.

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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**

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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 shutdown 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.

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A Problem, Not a Solution

- **Water**
- **Wall Street (Cost and Scale Up)**
- **Waste**
- **Weapons (Security and Proliferation)**

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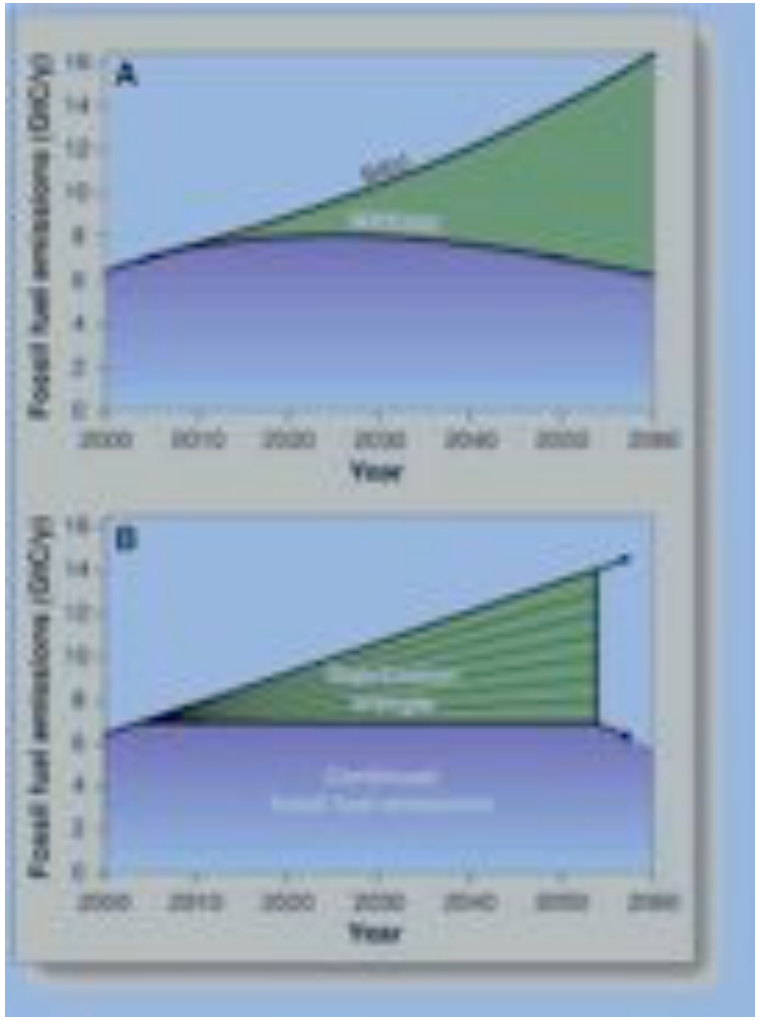
Climate Change: Reason for Study



Source: Pacala, Socolow. Carbon Mitigation Initiative. Princeton U.

- Under "business as usual" projections, global CO_2 emissions from fossil fuels are expected to *double* by 2050 – from 7 GtC/yr to 14 GtC/yr.
- But stabilizing the atmosphere at 500 PPM CO_2 requires avoiding this growth and then rapidly shrinking CO_2 emissions after 2050.
- To get to 2050, theory states a need for seven "wedges" of low-carbon energy, each enough to displace 25 GtC over 50 years.

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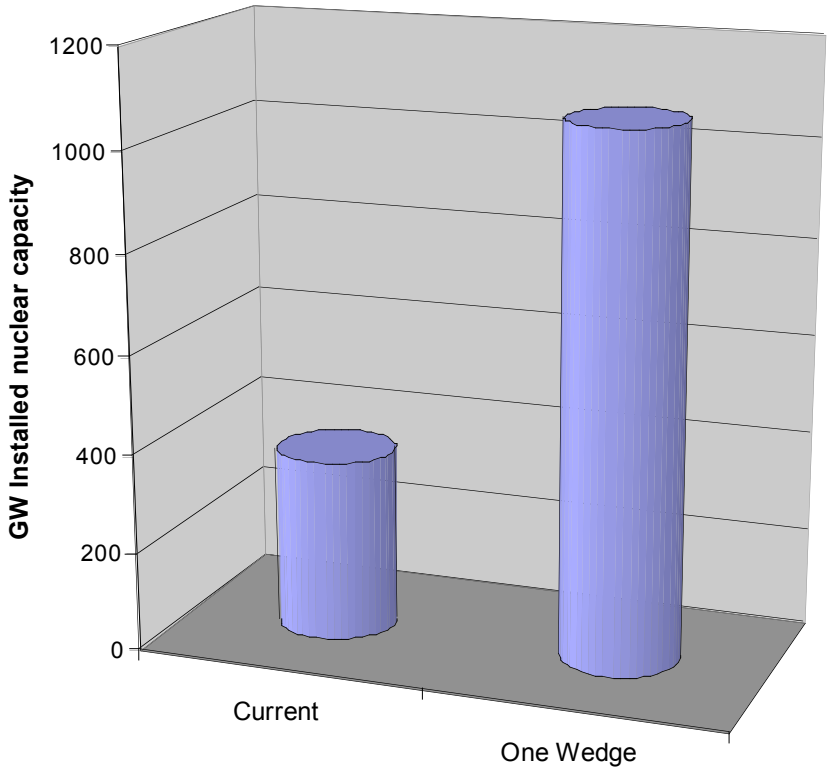
How much nuclear capacity would that mean?

One wedge would require that we roughly triple the size of global nuclear power plant capacity, from 370 GW to 1070 GW, or about 700 net GW.



Source: The Keystone Center, Nuclear Power Joint Fact-Finding Report, June 2007.
http://www.keystone.org/

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What a nuclear 'wedge' would require?

- **Approximately 441 reactors worldwide (367 GWe)**
- **104 reactors in U.S. (98 GWe)**
- ***To maintain current worldwide capacity, industry would need to build 7-9 new nuclear reactors per year until 2050***
- **Industry would need to build ~20-25 new reactors a year worldwide until 2050 (840-1050 total) or (5-6 new reactors per year in the US = 200+ new) for 1 of 7 needed "wedges"**
- **Cost estimates $6-8.5 billion per reactor (& climbing)**

The Keystone Center, Nuclear Power Joint Fact-Finding Report, June 2007.

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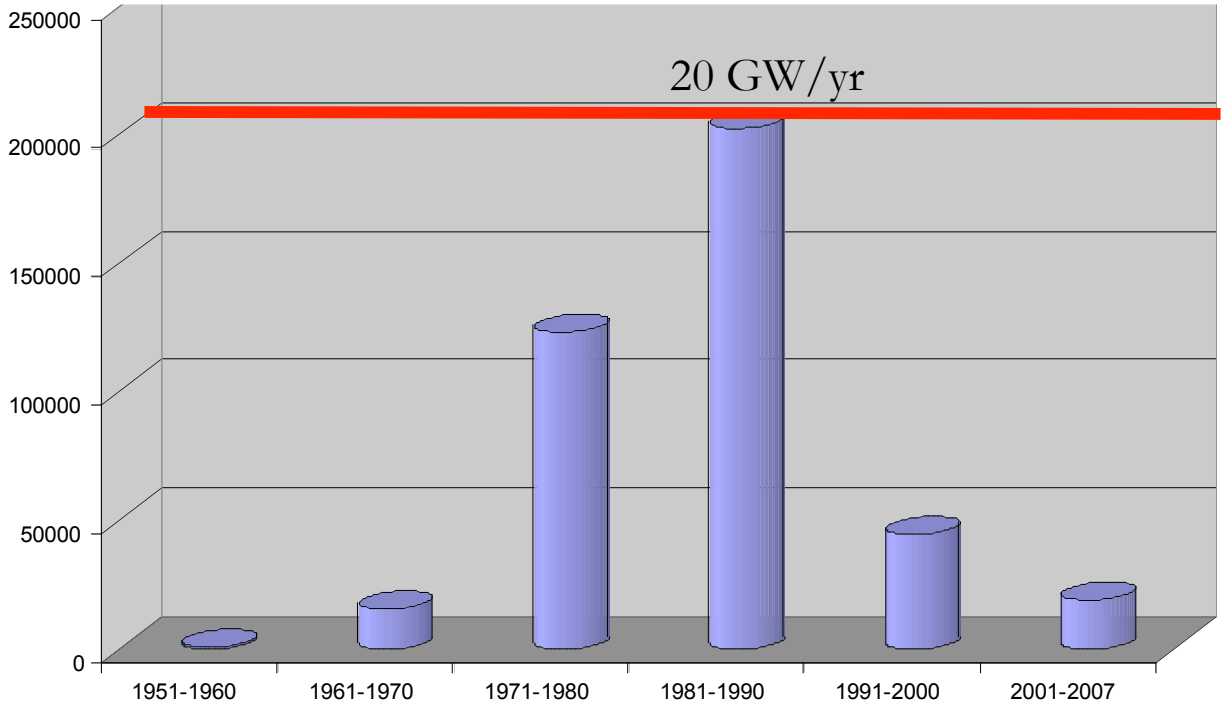
Build Rate for a Nuclear Wedge

1070 GW means an average build rate of ~20 GW per year for 50 years, comparable to the rate achieved during the fastest ten-year period of world nuclear expansion (1981-90).

Historic nuclear build rate by decade (MW)



Source: IAEA data

The Keystone Center, Nuclear Power Joint Fact-Finding Report, June 2007.

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How does this wedge option compare to current projections?

- **More optimistic than current announcements reported by World Nuclear Association for new plants**
- **Higher than average 40-year historical growth rate**
- **More rapid than rate forecast by U.S. Department of Energy (DOE)**

The Keystone Center, Nuclear Power Joint Fact-Finding Report, June 2007.

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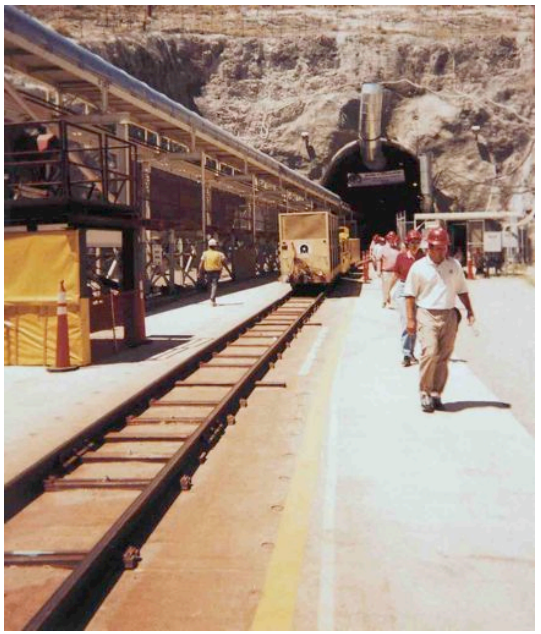
Additional infrastructure industry needs to support nuclear wedge option

- **11-22 large enrichment plants**
- **18 fuel fabrication plants**
- **10 nuclear waste repositories the size of the statutory capacity of Yucca Mountain—713,000 tons of spent fuel**



IMAGINE WHAT THIS WILL COST

The Keystone Center, Nuclear Power Joint Fact-Finding Report, June 2007.

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A Problem, Not a Solution

- **Water**
- **Wall Street (Cost & Scale Up)**
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Fairness and Global Warming

- **Technologies should be chosen and promoted for their accessibility to all countries**
- **U.S. should not demand action from the developing world and then promote the limited options**
- **Due to the uncertainties in security infrastructure among countries worldwide, nuclear power is not a technology that should be promoted as a global solution to global warming**

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Proliferation & Security

- **Expansion of nuclear power could increase the likelihood of the spread of nuclear weapons**
- **IAEA safeguards and the international community have not demonstrated effective enforcement**
- **A principal proliferation concern is the diversion or theft of material from bulk fuel handling facilities**

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Reprocessing & Global Nuclear Energy Partnership (GNEP)

Reprocessing is the separation of uranium and plutonium from irradiated (used) nuclear fuel & is the most polluting part of the nuclear fuel cycle.

- **Expensive:** DOE's near term cost estimates (next 5 yrs) are $3-6 billion. Nat'l Academy of Sciences estimates it could be easily more than $100 billion.
- **Polluting**: The only private U.S. commercial reprocessing facility was in West Valley, NY & is now an environmental disaster, with radioactive waste threatening groundwater and the Great Lakes watershed--$5.2 billion estimate for clean up
- **Proliferation-prone**: Cannot prevent theft by terrorists

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What Southern Alliance for Clean Energy is Doing

- ✓ **Advocating for and promoting safe global warming solutions for our energy future**

- ✓ **Challenging new coal and nuclear power plant proposals**

- ✓ **Organizing with and outreaching to concerned interests**

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Promoting Safe Solutions

- **Renewable Energy** (methane capture, solar, wind, geothermal, tidal, and certain biomass)
- **Energy Efficiency** - use what we have more efficiently
- **Energy Conservation** – use less energy
- **Advanced Technologies** - capturing pollution
- **Clean, Efficient Vehicles** – electric, hybrid, biodiesel, cellulosic ethanol

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Efficiency & Global Warming

Each dollar invested in electric efficiency in the U.S. displaces nearly seven times as much carbon dioxide as a dollar invested in nuclear power.

Source: "Return of the Nuclear Salesmen: Global Warming Gives Them a New Sales Pitch," Dave Reed, Rocky Mountain Institute Newsletter, Vol. XVI, #1, Spring 2000, pages 25 and 15, available at http://www.rmi.org/images/other/Newsletter/NLRMIspring20.pdf.

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Bellefonte Nuclear Plant Proposal

INITIAL VICTORY ON BELLEFONTE!!!

On 9/12/08 the Atomic Safety & Licensing Board accepted four contentions raised by BREDL & SACE:

1) TVA did not adequately address impacts of operating two reactors on the fishery and aquatic resources of Guntersville Reservoir

2 & 3) TVA failed to offer a viable plan for disposing of 'so called' low-level radioactive waste or assessing the impacts of keeping waste at the Bellefonte site

4) TVA failed to provide reasonably up-to-date and accurate information on the estimated electrical generation costs of the proposed new plant

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Vogtle Nuclear Plant Proposal

Three contentions accepted for the early site permit (ESP) at the NRC, all dealing with water:

- **impacts of withdrawing large amounts of water and the resulting thermal discharge including impacts on two sensitive fish species, the shortnose sturgeon and the robust redhorse**
- **lack of analysis of other cooling technologies, such as dry cooling, that could reduce water impacts**
- **impacts from possible dredging and restoration of Savannah River navigation for barging necessary for construction of new Vogtle reactors**

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V.C. Summer Nuclear Plant Proposal

South Carolina Electric & Gas (SC&EG) wants to build two new reactors in Jenkinsville, SC and increase rates by 37%

Community Profile:
- **90 % African American**
- **Rural, absolutely no local economy**
- **High poverty rates, high unemployment**

Over the summer, young people from both Carolinas participated in listening projects, sitting in living rooms, kitchens, on front porches to hear the feelings & concerns of the people who will be most directly impacted by the expansion and by listening this helped the community realize that their thoughts were important, that someone *should be* listening to them!

SEN is working with the Mayor and a county councilman to host local meetings to air the concerns and questions of the community and communicate those into action!

Recent points of intervention:

- **Rate Increase hearings before the SC Public Service Commission**
- **Environmental Impact Statement scoping hearings held by the NRC**

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How You Can Help

✓**Join Us! Become a member**.
Join other like-minded individuals who want clean air, clean water and safe and healthy communities. Join at www.cleanenergy.org

✓ **Sign Up! Join our E-action alert team.**
Help rapidly respond to energy issues. Visit www.cleanenergy.org to get on board.

✓ **Volunteer!** Join in the fight for clean air and clean water by volunteering your time and energy in our office and at special events.

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Get Involved with the Southern Energy Network

1. Join our new High Risk Team to work with others from around the SE on strategy & resource creation to fight these dirty plants & to create clean energy.
   Contact: mandy@climateaction.net
2. Contact our staff to get involved on your campus & in your community
   FL: mandy@climateaction.net SC: sara@climateaction.net
   NC: russ@climateaction.net GA: imran@climateaction.net
3. Stay posted on this work via our blog, twitter and more.
   Find us a w w w . c l i m a t e a c t i o n . n e t

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Contact Us & Thank You

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