



Nuclear—Clean Energy

FLC Regional Meeting

Harold McFarlane

*Deputy Associate Laboratory Director for
Nuclear Programs*

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NUCLEAR ENERGY INSTITUTE

Data supplied by NEI and Entergy

- **Scott Peterson—Nuclear Energy Institute**
 - Generic NEI environmental presentation
- **Dan Keuter—Entergy**
 - Presentation to Utility Working Conference 8/8/2005

U.S. Department of Energy Vision for INL

- What**
- Become the preeminent internationally-recognized nuclear energy RD&D laboratory
 - Become a major center for national security technology development and demonstration
 - Become a multi-program national laboratory with world-class nuclear capabilities
 - Foster academic, industry, government and international collaborations to produce the needed investment, programs and expertise

- When**
- By 2015

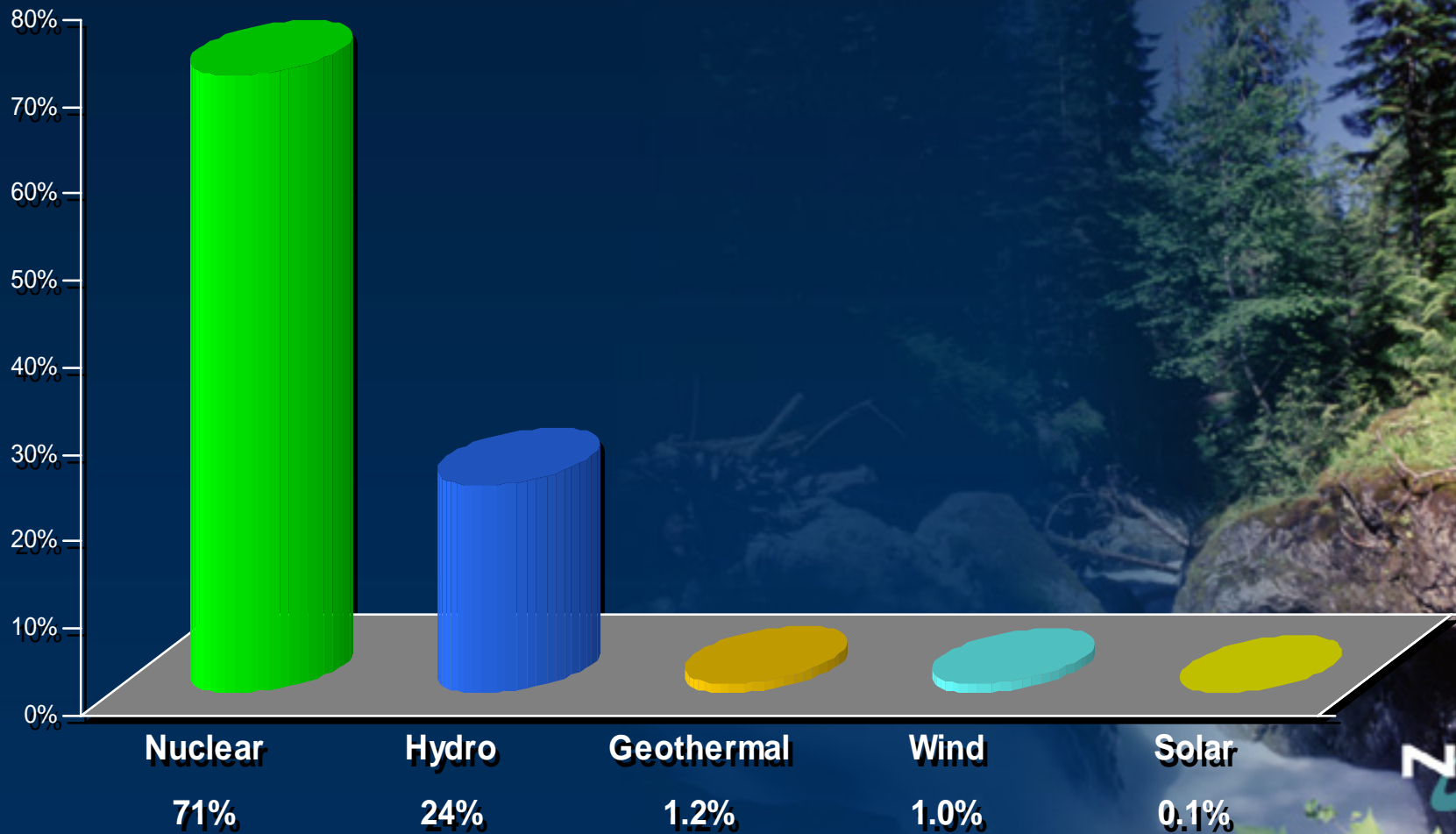
- Why**
- To enhance the nation's energy security

“Another advantage of nuclear energy is that it is a clean source of power ... which does not contribute to the current burden of air pollution.”

– Joe Lieberman

***Atomic Energy Commissioner
1968***

U.S. Emission-Free Electricity (2003)



Nuclear Energy Prevents Carbon Dioxide Emissions

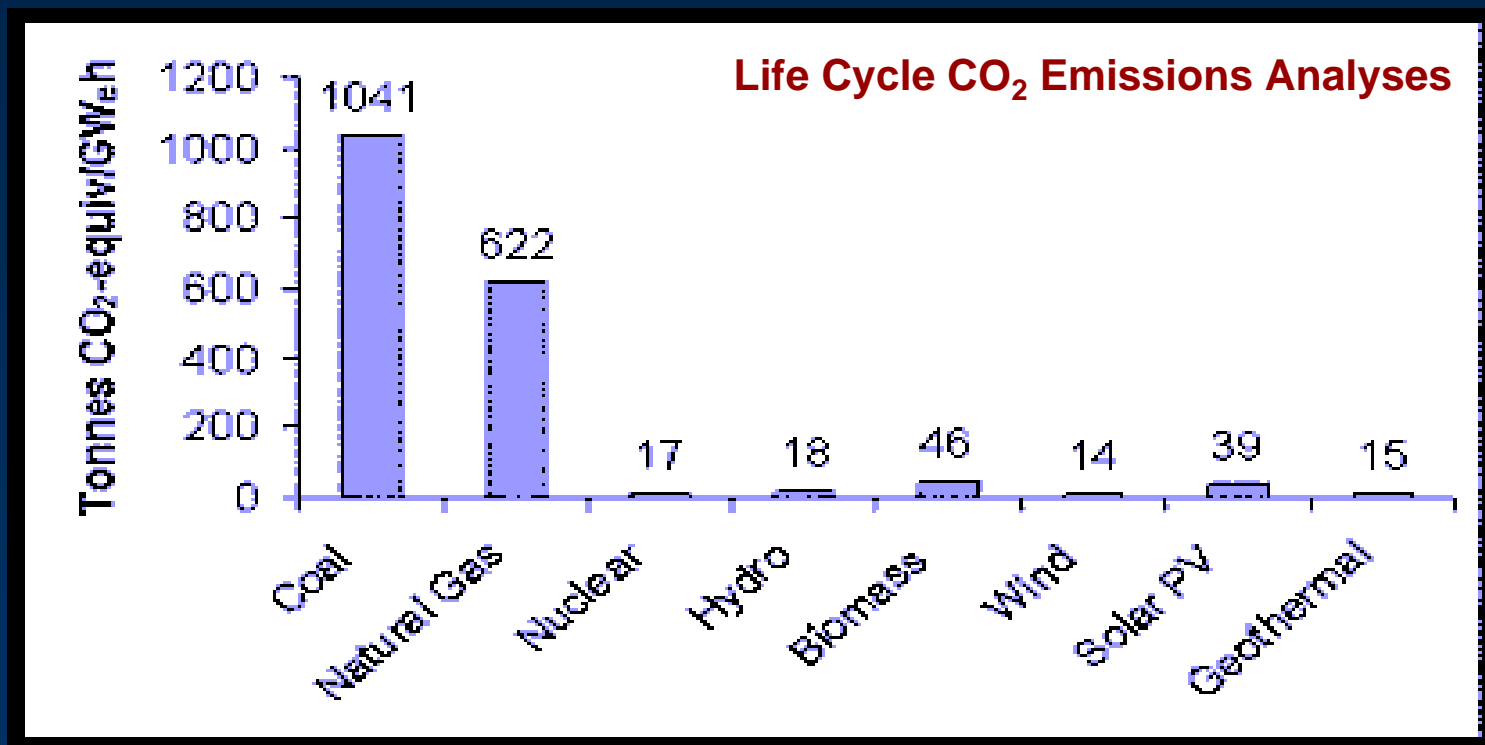
- U.S. nuclear plants prevent the same levels of CO₂ as produced by 9 out of 10 U.S. passenger cars.



In 2004 U.S. nuclear power plants avoided CO₂ emissions equal to 94% of all U.S. auto emissions (138 million automobiles)



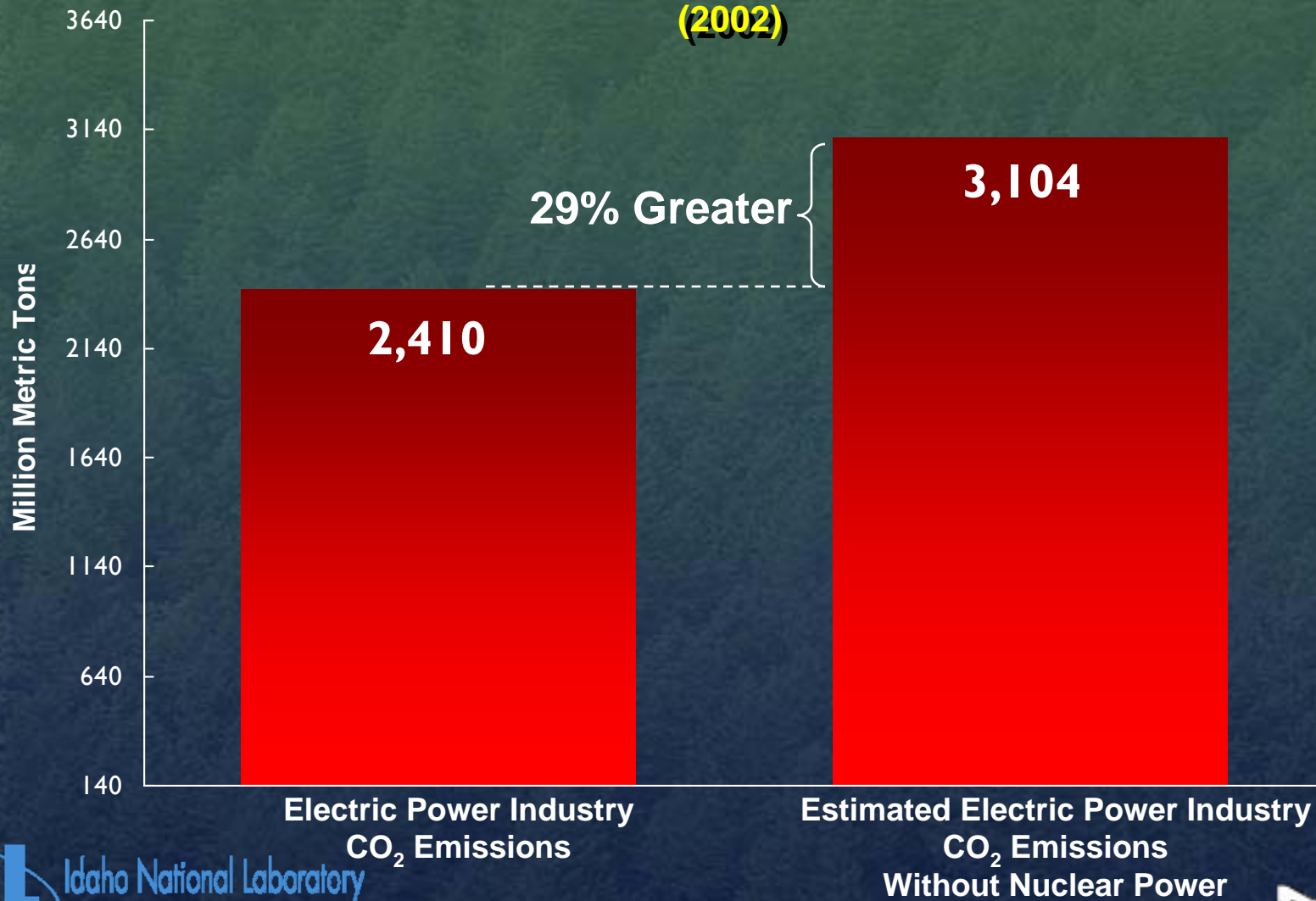
Life Cycle CO₂ Emissions



Source: "Life-Cycle Assessment of Electricity Generation Systems and Applications for Climate Change Policy Analysis," Paul J. Meier, University of Wisconsin-Madison, August, 2002.

Nuclear Energy Limits Carbon Dioxide Emissions in Power Sector

(2002)

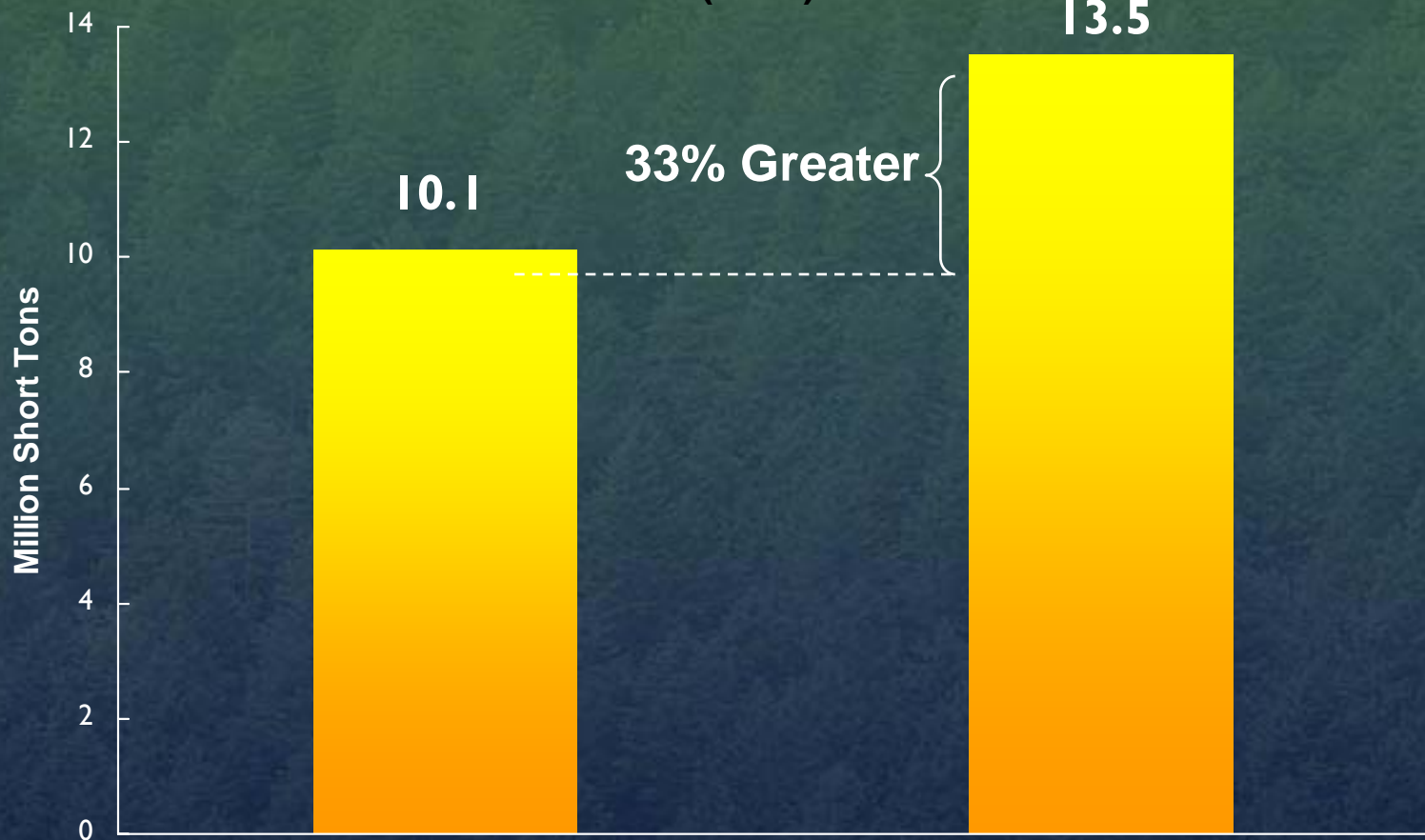


Nuclear Energy Prevents Nitrogen Oxide Emissions

- U.S. nuclear plants prevent the same NO_x emissions as produced by 6 out of 10 U.S. passenger cars.



Nuclear Energy Limits Sulfur Dioxide Emissions in Power Sector (2002)



New Hampshire's NO_x Program

- New Hampshire revised nitrogen oxides (NO_x) regulations in 2003.
- New non-emitting energy sources, such as nuclear, may receive allowances.
- An uprate at Seabrook nuclear power plant is eligible for these allowances.

Pollution emissions displaced by nuclear in the U.S.

2004

- 3.43 million tons of SO₂
- 1.11 million tons of NO_x
- 700 million tons of CO₂

440 worldwide nuclear plants save more than twice
the Kyoto Accord CO₂ targets annually

Nuclear reduces these health effects from fossil fuels

<input type="checkbox"/> <u>Health Effect</u>	<u>Study</u>	<u>Cases/Yr</u>
<input type="checkbox"/> Mortality	HEI, Pope	30,100
<input type="checkbox"/> Respiratory Hospitalizations	4 pooled	20,100
<input type="checkbox"/> Asthma ER visits	Schwartz	7,160
<input type="checkbox"/> Chronic Bronchitis	Pooled	18,600
<input type="checkbox"/> Asthma attacks	Whittemore	603,000
<input type="checkbox"/> Lost work days	Ostro	5,130,000
<input type="checkbox"/> Minor restricted activity	Ostro	26,300,000

Abt Associates, Clean Air Task Force, October 2000.

“We have no time to experiment with visionary energy sources; civilization is in imminent danger and has to use nuclear—the one safe, available, energy source—now or suffer the pain soon to be inflicted by our outraged planet.”

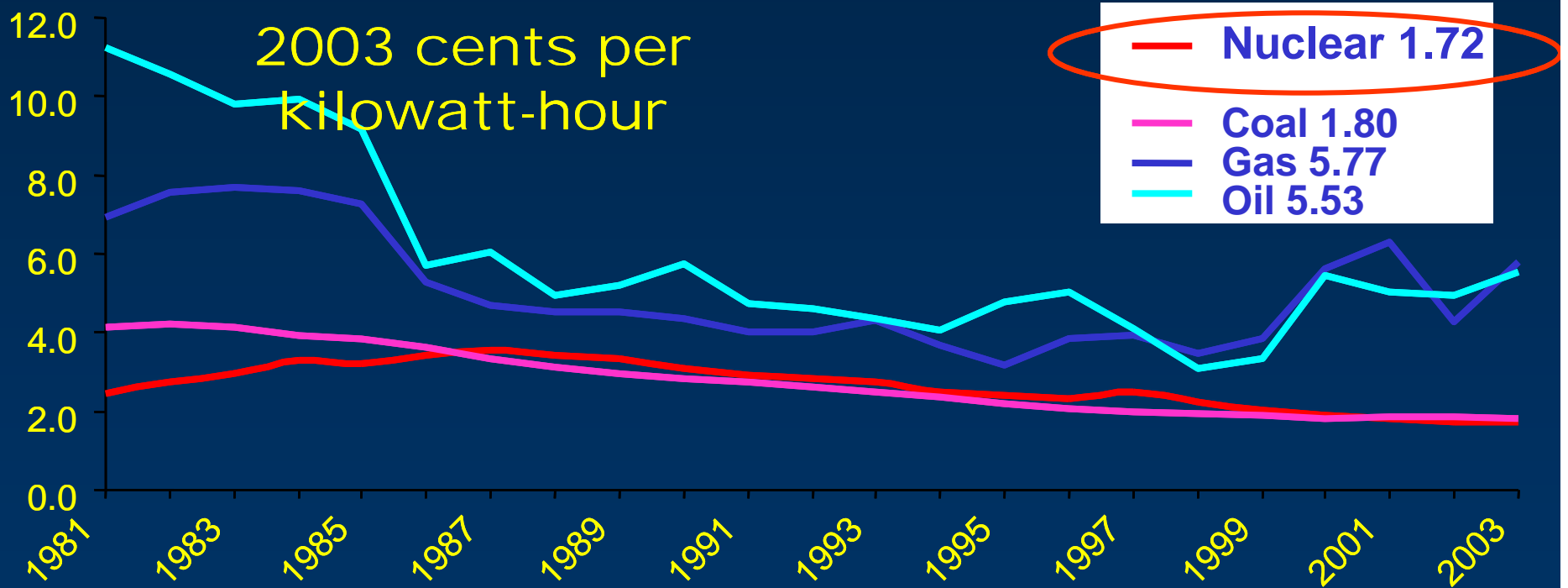


– James Lovelock
Leading Environmentalist
May 2004

International Programs

- Fifth reactor in Finland to meet Kyoto commitments, satisfy energy demand
- “Cap-and-trade” programs begun in Europe, most excluding nuclear
- Similar EU program planned
- Canada considering program for greenhouse gases
- China adding reactors near cities to meet energy demand and enhance air quality

Nuclear is competitive



Nuclear is the lowest of all except hydro.

Nuclear power can reduce dependence on foreign oil

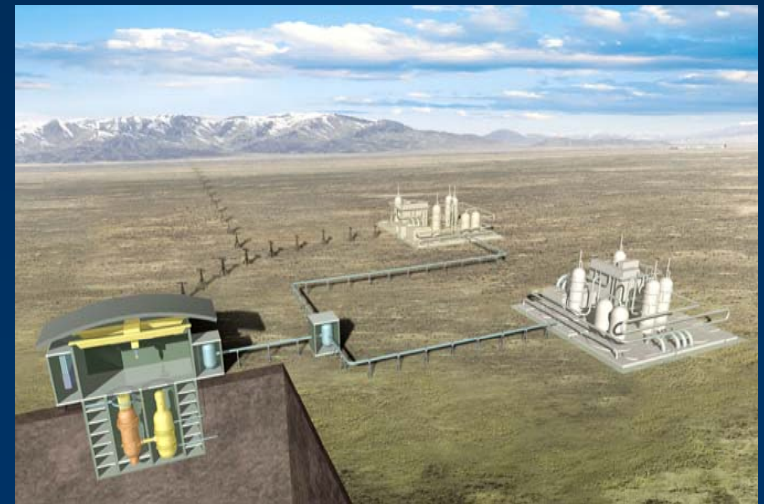
Short-Term

Nuclear power can displace natural gas-fired generation. Natural gas can also be used in cars, trucks, buses and trains.



Long-Term

Nuclear power can directly reduce dependence by producing low-cost hydrogen for fuel cell vehicles



Total amount of nuclear waste is relatively small and manageable

Current high-level waste volume after 40 years of operations would fill an area about the size of a football field five yards deep

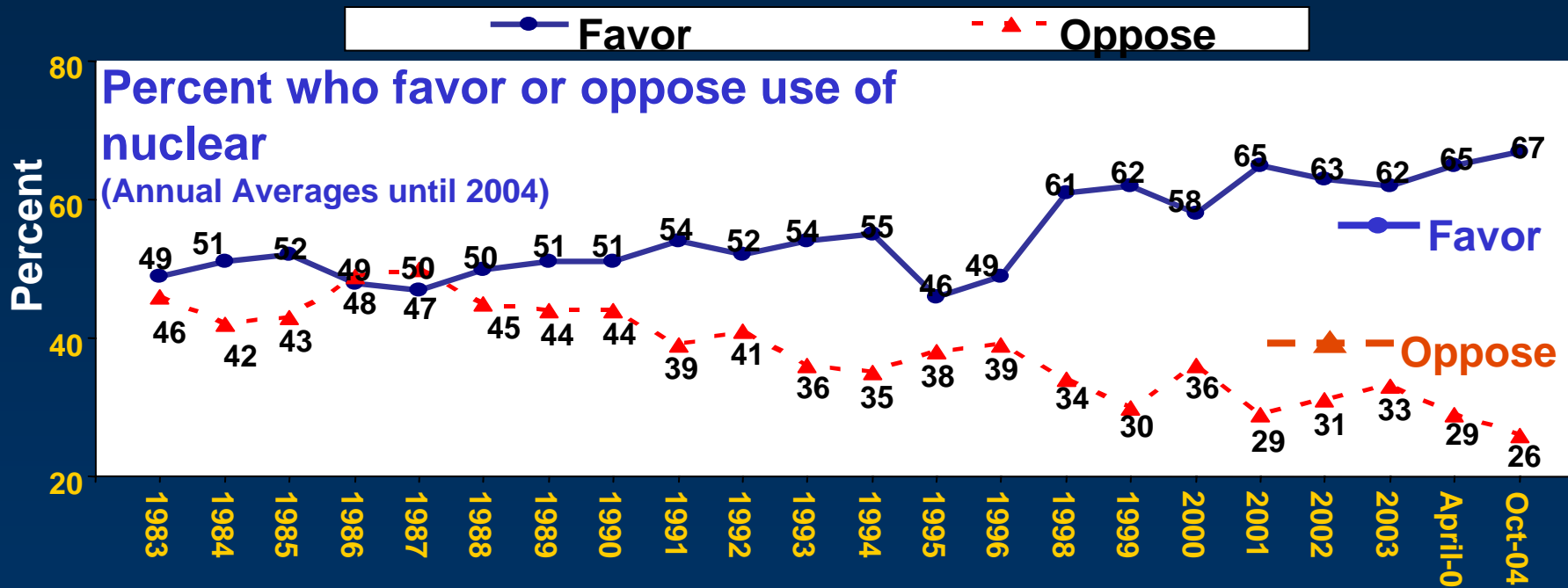
Reprocessing has benefits

- Decreased waste volume
- Converts long-lived isotopes into short-lived waste (10,000 years → 300 years)
- Extends fuel resources
- There is no waste problem in the rest of the world
- U.K., France, Japan are reprocessing, including other countries' waste



For the long term, the U.S. needs to reprocess to reduce waste volume and to reclaim the 96% of remaining usable fuel

Americans support building more nuclear power



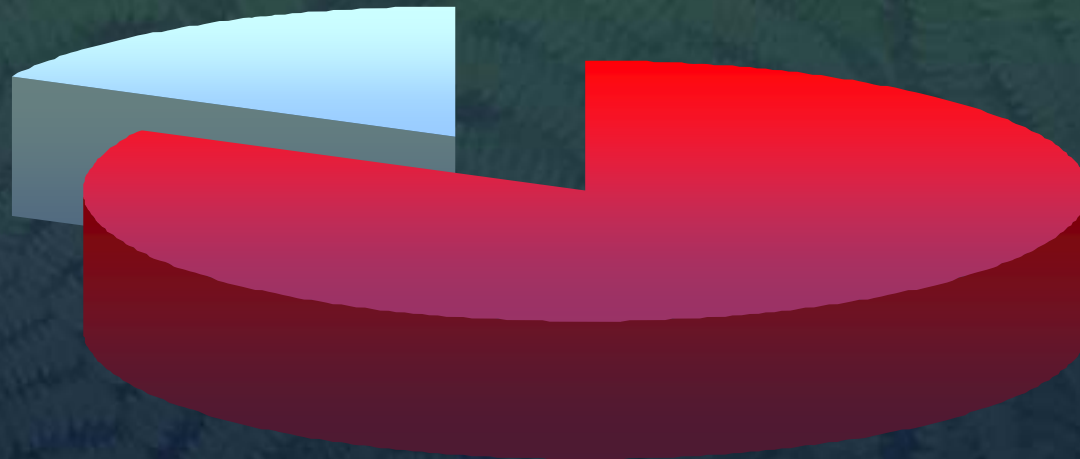
Support increases substantially when people realize that nuclear power emits no air pollution or greenhouse gases

President Bush's Climate Change Initiative

- Goal: Reduce greenhouse gas intensity of the U.S. economy by 18% by 2012.
- Nuclear energy expansion will satisfy 20% of emissions reduction goals.

Nuclear Energy Will Meet 20% of Carbon Reduction Targets in 2012

Nuclear energy sector commitment:
22 million metric tons of carbon



Bush administration's target:
106 million metric tons of carbon

MIT-Harvard Study: The Future of Nuclear Power

- Nuclear energy “is an important carbon-free source of power.”
- Tripling world nuclear capacity by 2050 would avoid 25% of added carbon emissions from coal plants.
- The U.S. should provide a production tax credit for nuclear equal to the current credit for wind power.

Columbia Univ. Earth Institute: More Nuclear, Renewables

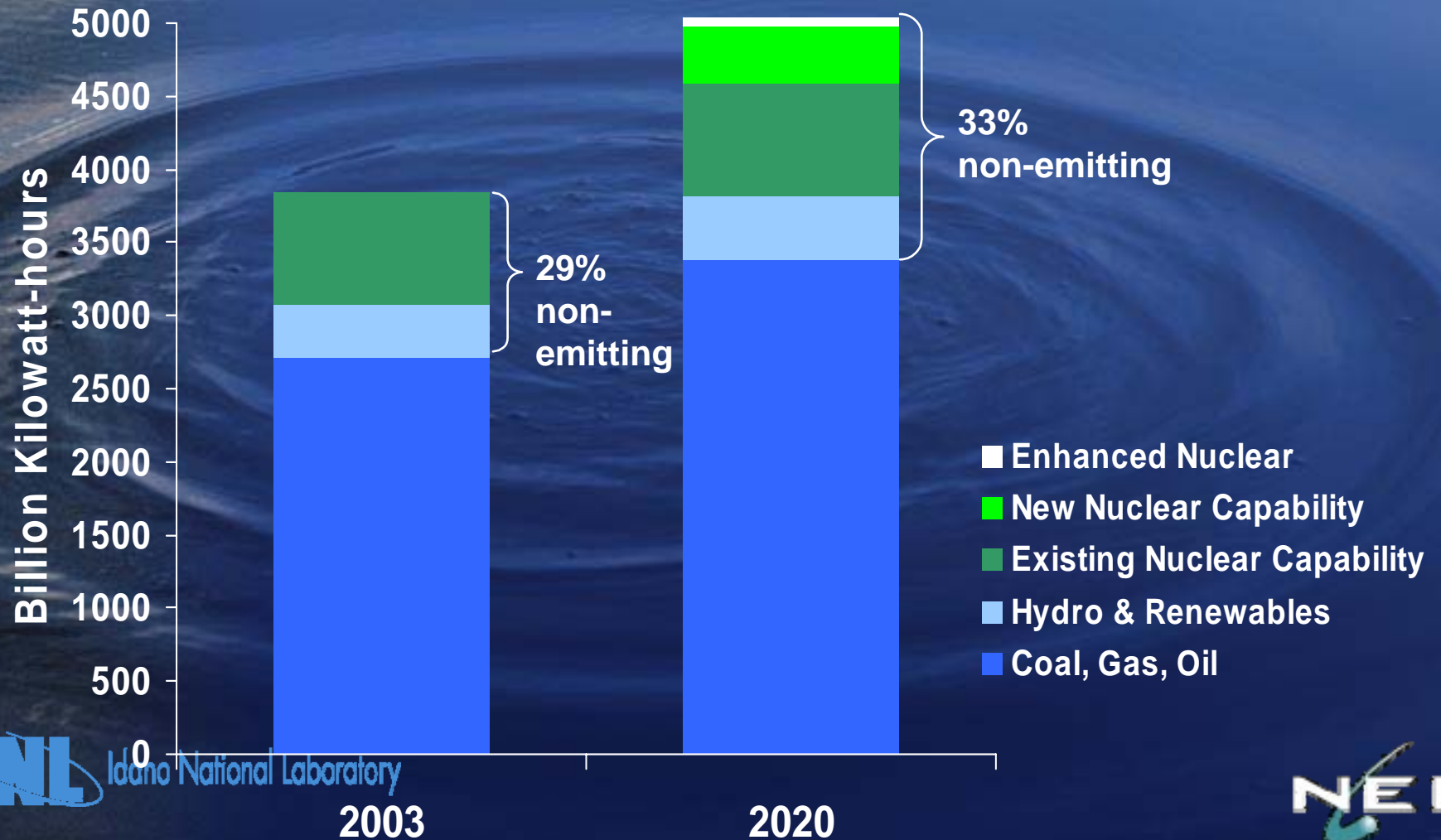
State of the Planet 2004
conference recommends
“some combination of
renewable and nuclear
energy, energy conservation
and industrial carbon
sequestration” for the
future.

Vision 2020

50,000 megawatts of new nuclear energy by 2020



Emission-Free Electric Generation With Vision 2020



The 7 Lab Initiative: overarching recommendation



Argonne National
Laboratory



Lawrence Livermore
National Laboratory



OAK RIDGE
NATIONAL LABORATORY

Pacific Northwest
National Laboratory

Operated by Battelle for the
U.S. Department of Energy



Sandia
National
Laboratories



Idaho National Laboratory

- *Deploy new commercial reactors as planned, but also develop and deploy advanced:*
- Reactor technology
- Fuel separation and recycle technology
- Proliferation prevention and detection technologies

