Innovation in the U.S.

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Outline

- How do we know if there is a problem?
- *Gathering Storm* recommendations
  - America Competes Act implementation
- The energy challenge

Assessing the Nation's Future Competitiveness

- Preserving and enhancing the quality of life for our children depends upon continued increases in productivity
- Prowess in engineering & science is a major underpinning for the innovation that leads to productivity
- Compete effectively or decline!

U.S. Innovation – How Do We Know if There is a Problem?

- Capability evolves – over years, decades
- No single determinant
- Hard to predict
- Constant changes

What matters?

- Globalization increases the interdependence of economies ➔ competition
- Educated engineers, scientists, & managers available
- A nation can establish a lead

  For example, the Celtic Tiger, Ireland

U.S. Innovation – Telltales

- Ribbon on line of sailboat
- Hint or indication
- Measure of “now”

Telltale Sources:

Gathering Storm report
Testimony of Norm Augustine
Various news articles

Telltale

U.S. trade balance:

in 1990 – plus $54 billion

in 2001 – negative $50 billion

Telltale

New jobs created recently:

low wage – 44%

high wage – 29%

Telltale

Cost of healthcare exceeds:

- Starbucks – exceeds cost of coffee
- General Motors – exceeds cost of steel

Telltale

Transfer of business:

- US airlines outsource aircraft maintenance to China & El Salvador
- IBM sold its personal computer unit to Lenovo in China

Telltale

Ford & GM both have junk bond ratings
Toyota has 8 times the market capitalization of Ford & GM combined
Daimler (German) bought Chrysler; now they don't want it

Telltale

U.S. investors put more new money into foreign stock funds than in U.S. funds

Telltale

77% of the new research & development laboratories to be built will be in India and China

Telltale

Gathering Storm recommendations "cost"
$9 billion (over some years)
U. S. citizens gambled $7 billion on the last Super Bowl

Telltale

U. S. firms spent more on litigation than on research & development

Telltale

Cost of a factory worker in America is nine times that in Mexico

Cost of a young professional engineer in America is eight times that in India

Telltale

U.S. ranks 12th among OECD countries in number of broadband connections per 100 inhabitants

Broadband service in Japan is eight to 30 times faster than in the U.S. & much less expensive

Telltale

In 2004, China overtook the U.S. to become the leading exporter of information technology products

Telltale

Standardized tests of U. S. children showed moderate improvement in lower grades & further deterioration in the 12th grade

Telltale

U. S. children spend more time watching television than in the classroom

Telltale

U. S. university engineering enrollment remains flat

Telltale

Measure of “now”, not of the future

Sources of “telltales”:

- *Gathering Storm* report
- Testimony of Norm Augustine
- Various news articles

Gathering Storm Report

4 recommendations
20 implementation actions
21 months later

Gathering Storm report

- National Academies – informed debate
- Much congressional applause
- Much political talk
- Still 21 months later
- Authorization bill through conference
  - COMPETES – America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education and Science Act
- Appropriation still in the future

Ten Thousand Teachers, Ten Million Minds

- **Recruit 10,000 teachers, educate 10 million minds:** Attract bright students through competitive 4-yr. merit-based scholarships for BS in sciences, engineering, or math with concurrent K-12 science & math teacher certification in exchange for 5 years public service teaching in K-12 public schools
- **Strengthen 250,000 current teachers' skills:** Summer institutes, Master's program, AP/IB (Advanced Placement/International Baccalaureate) training
- **Enlarge the Pipeline:** Create opportunities and financial incentives for pre-AP/IB and AP/IB science & math courses

Sowing the Seeds

- **Increase federal investment in basic research**—10%/year over next 7 years focusing on physical sciences, engineering, mathematics & information sciences. Double budget at NIST, NSF and DoE Office of Science (7–10 years)
- **Provide early-career researcher grants**—200 grants at $100,000/year over 5 years to best researchers
- **Institute National Coordination Office for Research Infrastructure**—$500 million/year over 5 years
- **Catalyze high-risk, high-payoff research**—technical program managers allocate 8% federal research agency budgets for discretionary spending
- **Institute Presidential Innovation Award**—identify and recognize persons who develop unique scientific and engineering innovations at the time they occur

Best and Brightest

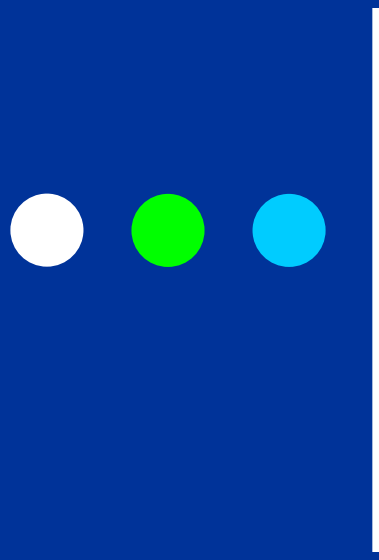
- **Increase number of US citizens earning science, engineering, and math degrees:**
  - 25,000 new 4-year undergraduate scholarships per year
  - 5,000 new portable graduate fellowships per year
- **Encourage continuing education of current scientists and engineers**: Federal tax credits to employers
- **International students and scholars**
  - Less complex visa processing and extensions
  - New PhDs in S&E: 1-year automatic extension and (if find job) automatic work permit and expedited residency status
  - Skills-based, preferential immigration points system to prioritize US citizenship; Increase H1B visas by 10,000
- **Reform "deemed exports" policy:** Allow access to information and research equipment except those under national security regulations

Incentives for Innovation

- **Enhance Intellectual Property protection**, while allowing research
  - Sufficient resources for Patent & Trademark Off.
  - Institute “first-inventor-to-file" system and administrative review after patent granted
  - Shield research uses of patented inventions from infringement liability
  - Change IP laws that impact industries differently
- **Increase Research & Experimentation tax credit** from 20 to 40% of qualifying increase
- **Incentivize long-term investment in innovation by industry**
- **Provide affordable broadband access -broadly**

ARPA-E

- Focus on creative out-of-the-box transformational energy research that industry by itself cannot or will not support
- High risk, but potentially dramatic benefits to nation
- Address environment, energy, and security
- Based on DARPA Model—lean, agile, independent with ability to start and stop programs based on performance
- Research not performed by agency, but universities, start-ups, established firms, labs
- Staff turn over every 4 years; performance assessments
- Spin-off benefits expected include education of next generation of researchers
- Report to DOE Undersecretary of Science



Energy Challenge

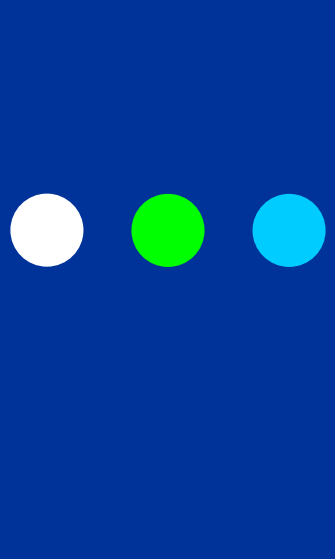
Make the U.S. self-sufficient in energy

Energy Challenge

Urgent

Big business – affects the economy

Political



Wish/want

… a family term

A lot of political “wish/want”s

Wish/want

Political wish/wants:

hydrogen economy – White House

ethanol economy – corn farmers

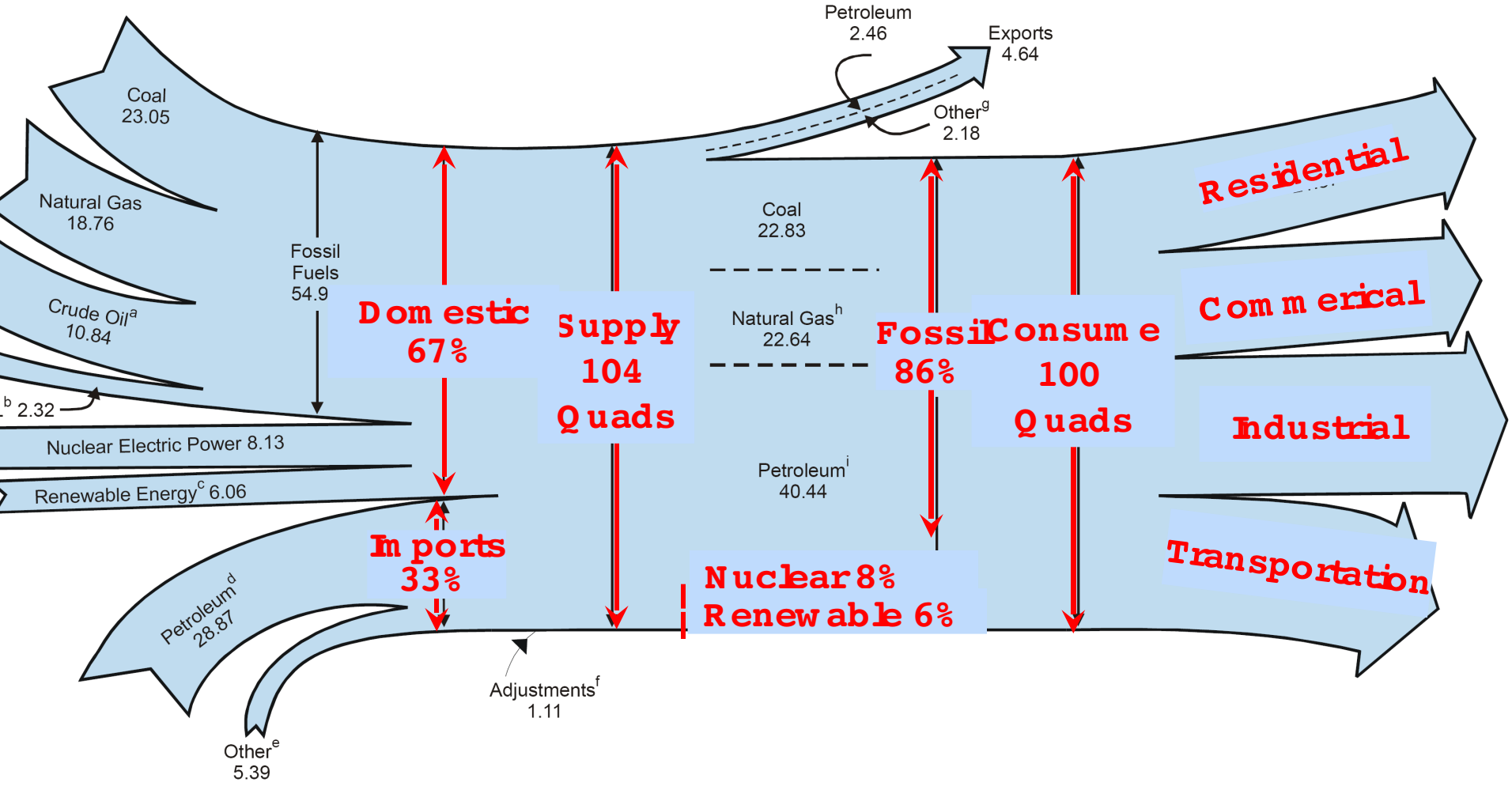
nuclear economy – nobody

(except maybe you?)

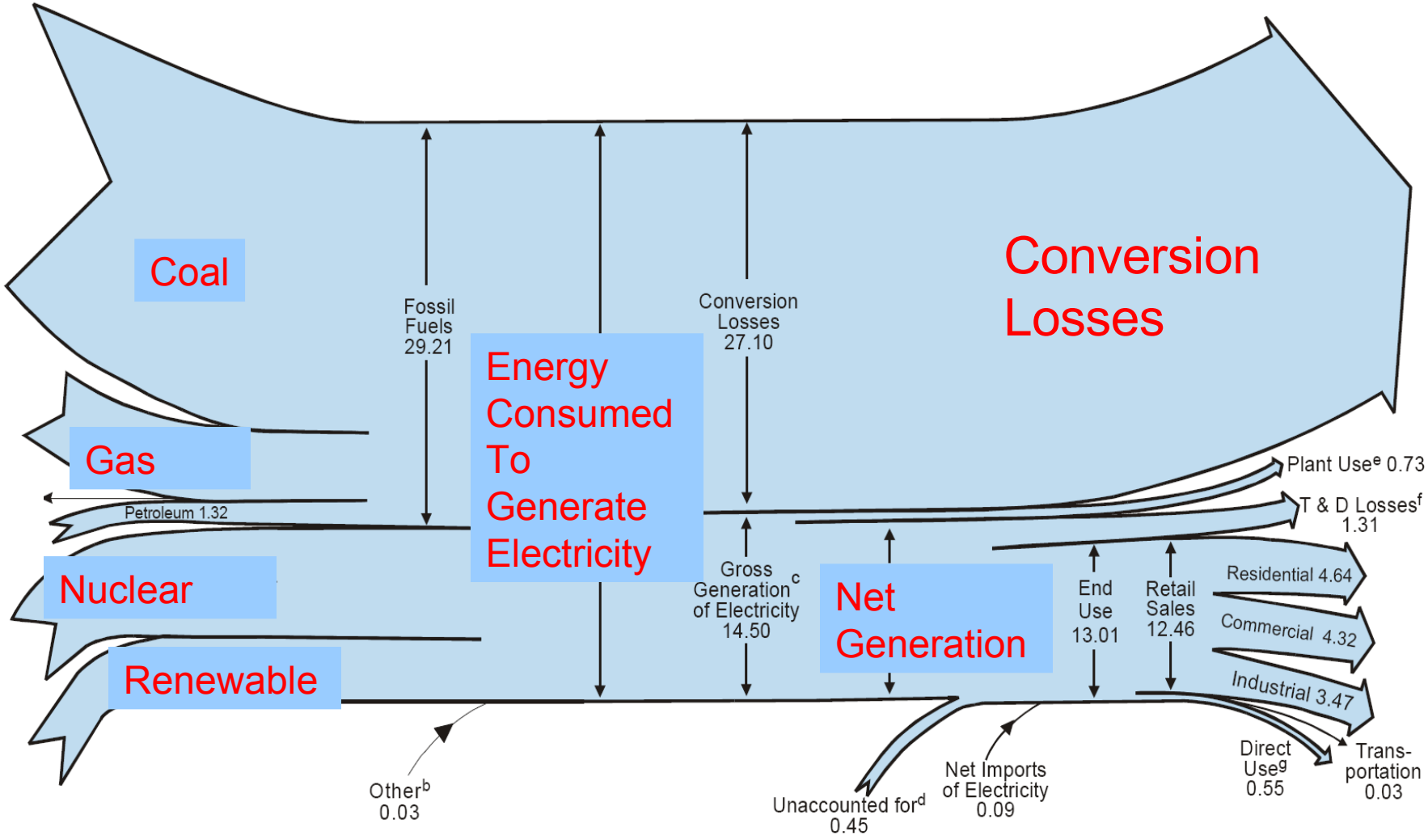
Critical to national choices

- What is technologically possible?
- What makes economic sense – to industry – for deployment?
- What is consistent with the Second Law of Thermodynamics?

U.S. Energy Flow, 2005 (Quads – BTUs)

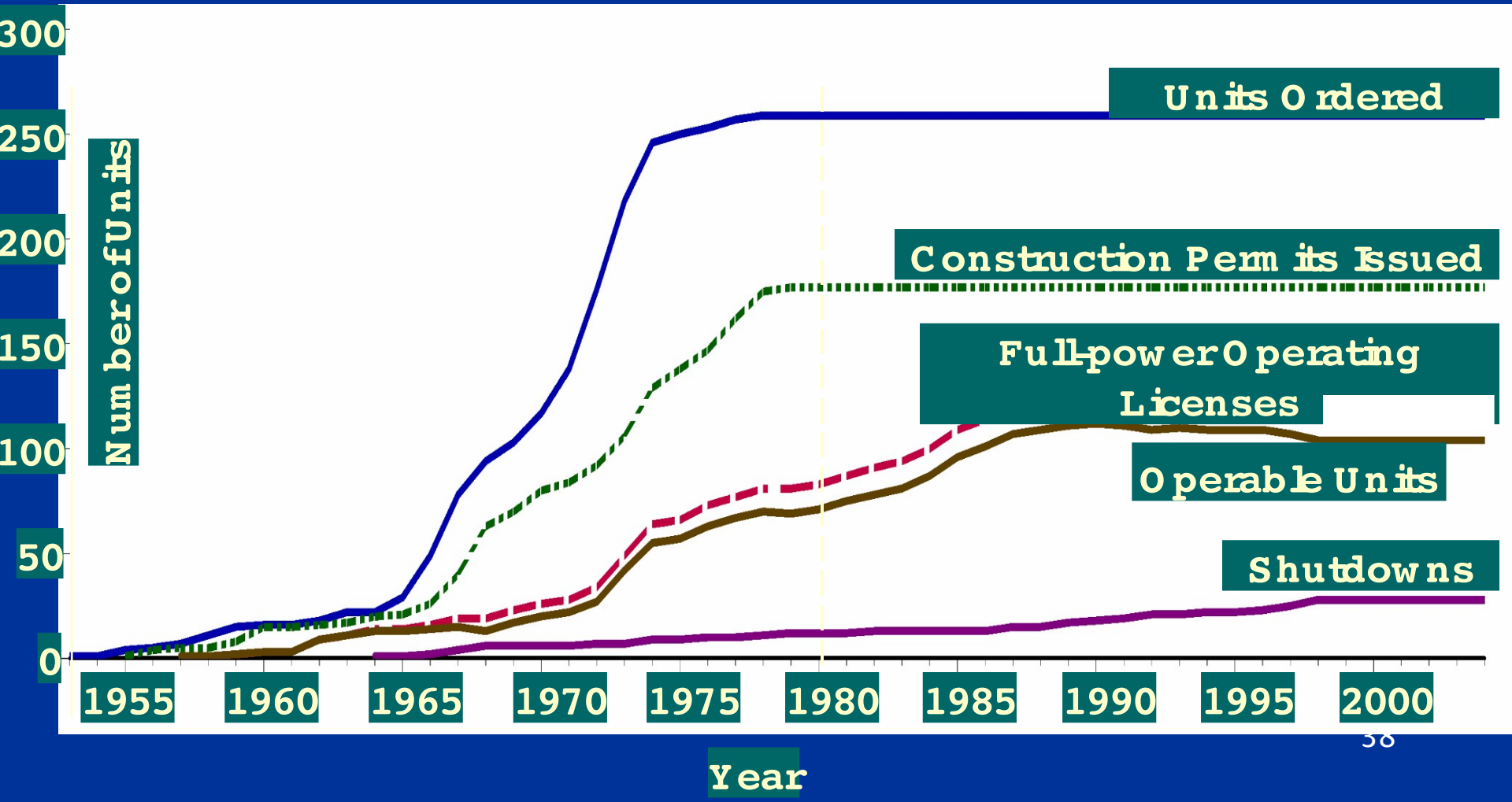


Electricity Flow, 2005 (Quads)

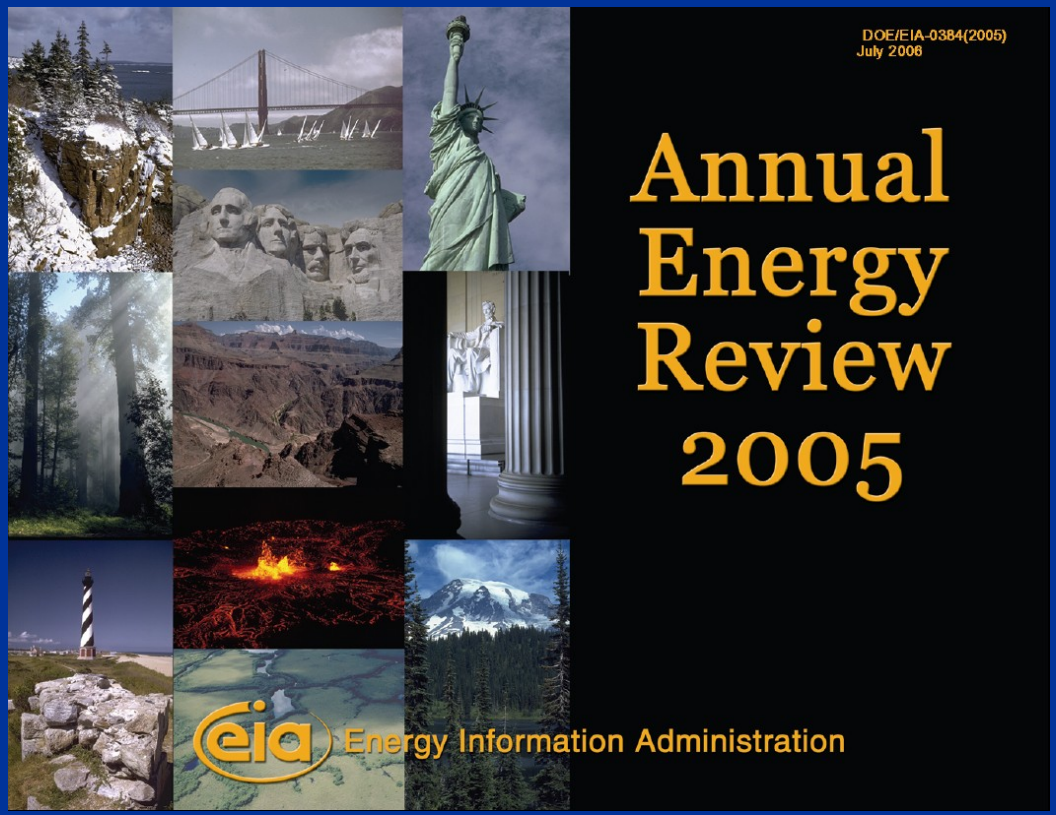


Construction Permits for U.S. Power Nuclear Reactors

8.23 Quads produced by 104 U.S. nuclear power plants



Source of Graphs



Innovation in Energy

- Determined by confluence of
  - What is technically feasible
  - What is reduced to practice
  - Wise regulation
    - Including wise taxation
  - Infrastructure that industry deploys

  - Mostly by, enlightened citizens!

The end