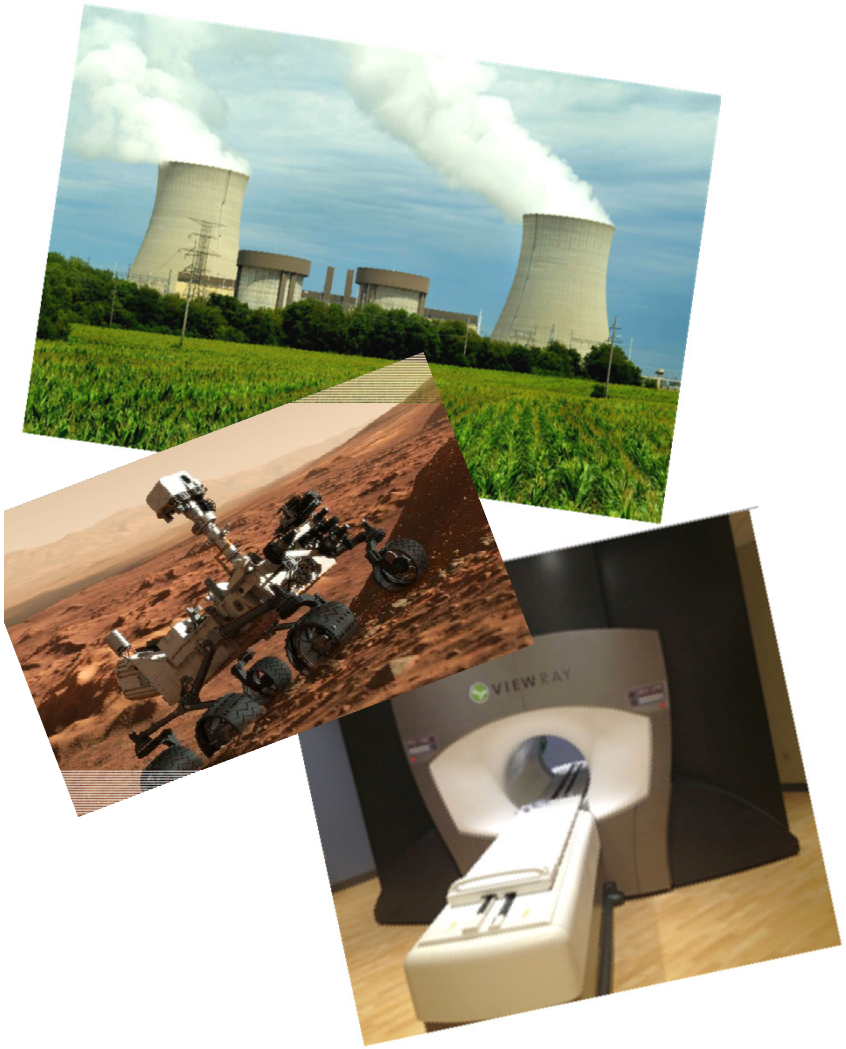


Challenges and Opportunities:

Nuclear Technologies and ANS

Presentation to Trinity Section
Eugene S Grecheck
Vice President/President Elect

May 1, 2015

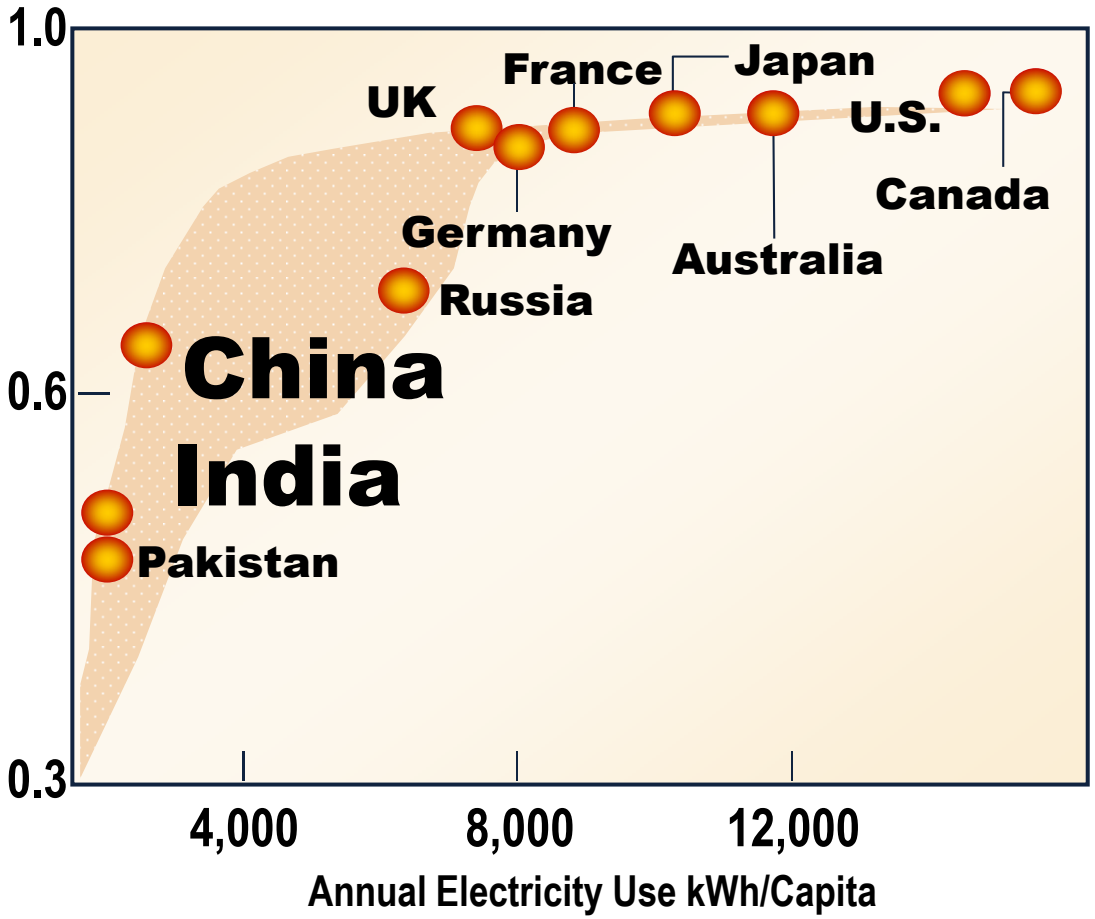
Just a little about me

- BS Physics, MS Nuclear Engineering, RPI
- MBA, Virginia Commonwealth University
- 38 years with Dominion
  - Licensed SRO at Surry
  - Plant Manager at North Anna
  - Site VP at Surry and Millstone
  - Executive responsibility at one point or another for engineering, project management, licensing, nuclear training, emergency planning, fuel management
  - 8 years chairman of fleet wide Nuclear Safety Review Board
  - Over a decade leading new plant development; ESP and COL submittals
- Extensive involvement with EPRI, NEI, INPO, DOE, GIF, and various academic, laboratory and industrial review boards
- Consulting since January 2014

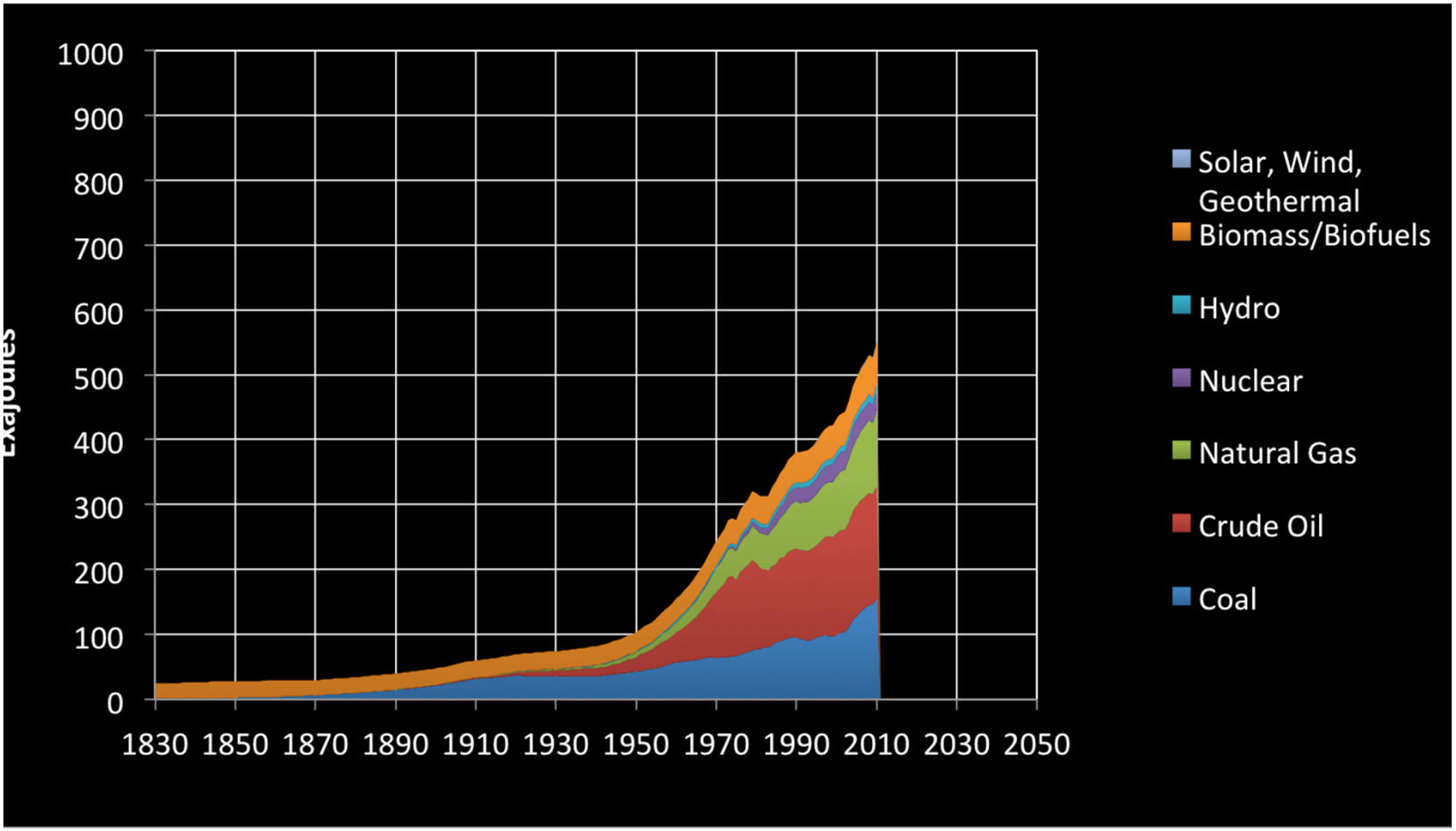
Access to Energy = Quality of Life

80%

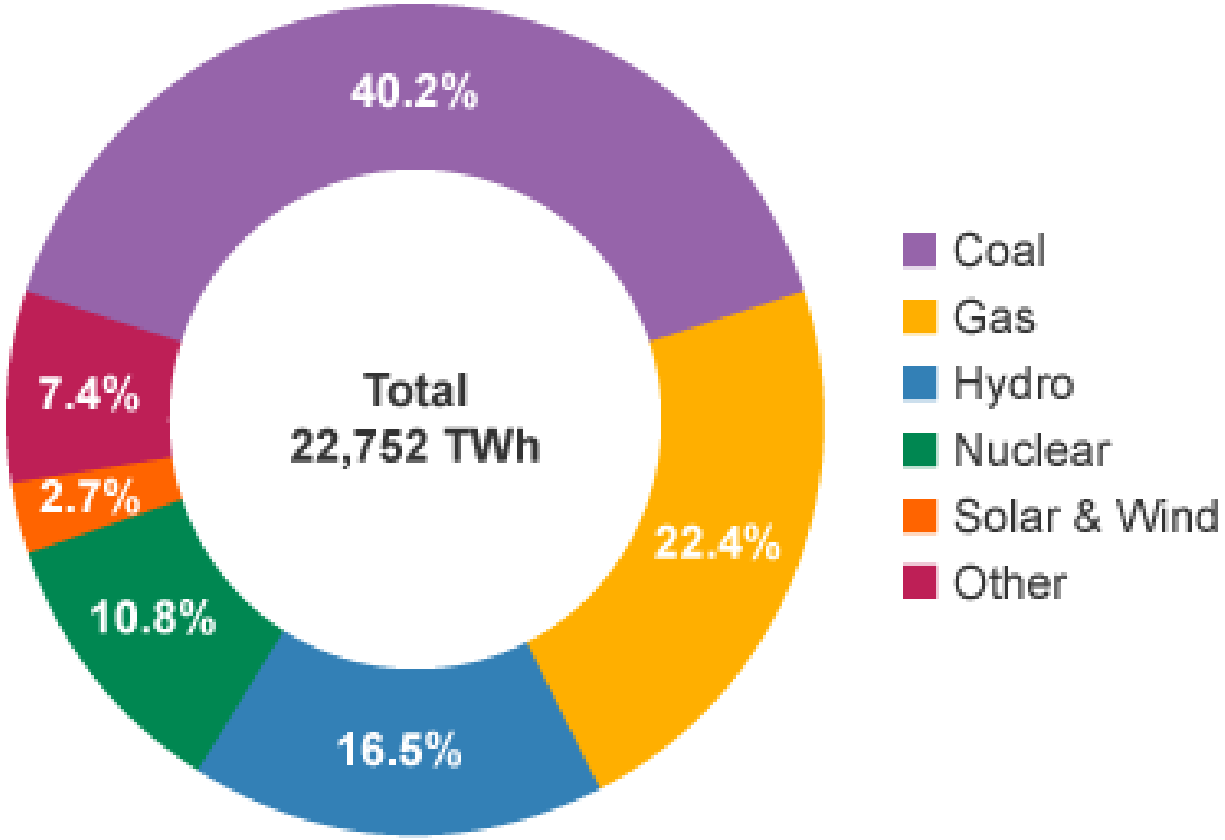
of the world's population is below 0.8 on the UN's Human Development Index (HDI)



World Primary Energy Consumption



Bulk of World Wide Energy Consumption is Carbon Based



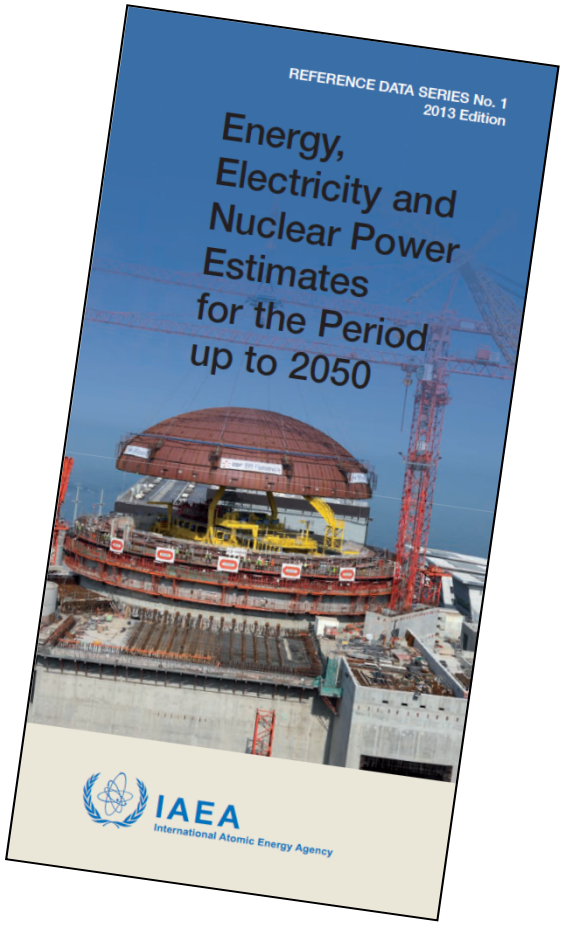
WNA, 2012

International Nuclear Energy Growth

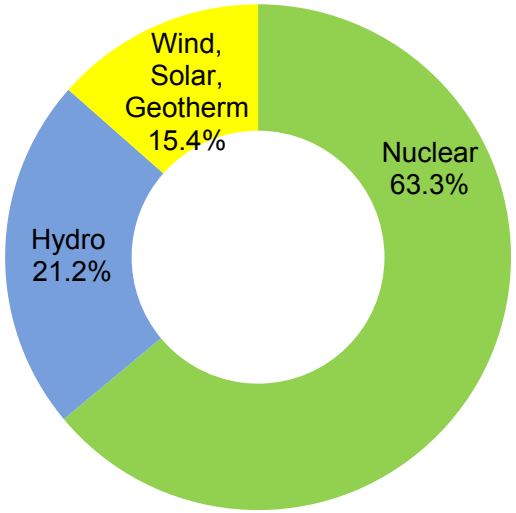
According to the International Atomic Energy Agency (IAEA) annual report:

- **"Low Case" nuclear power capacity is expected to expand 67 GW(e) by 2050**

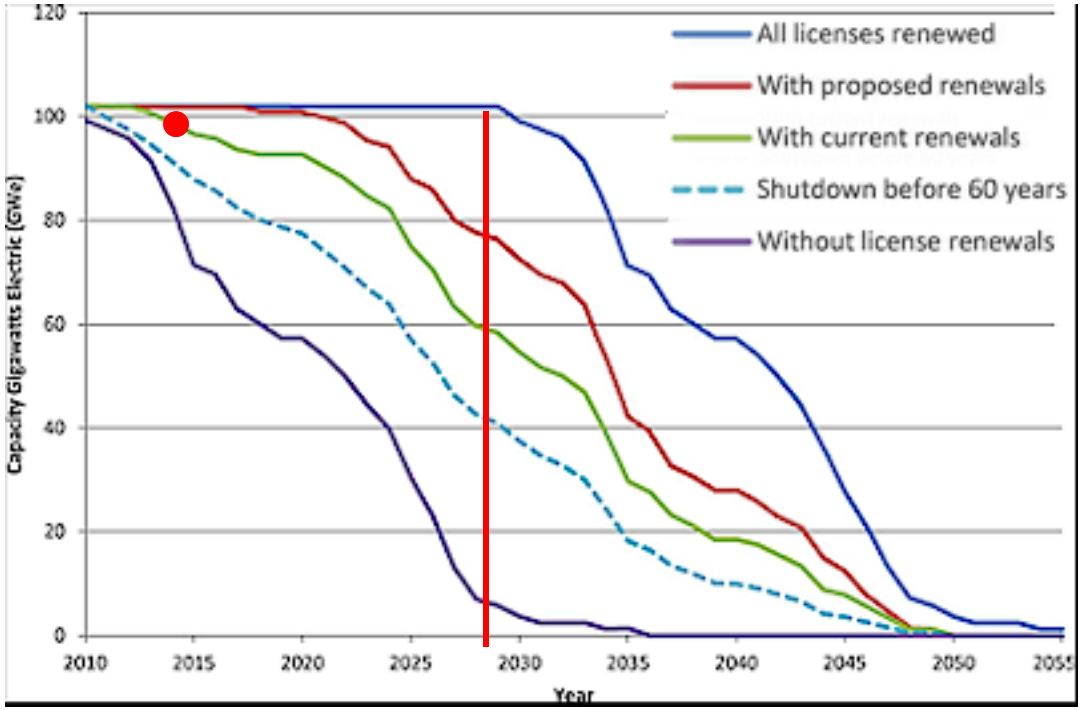
- **"High Case" increase 740 GW(e) by 2050**



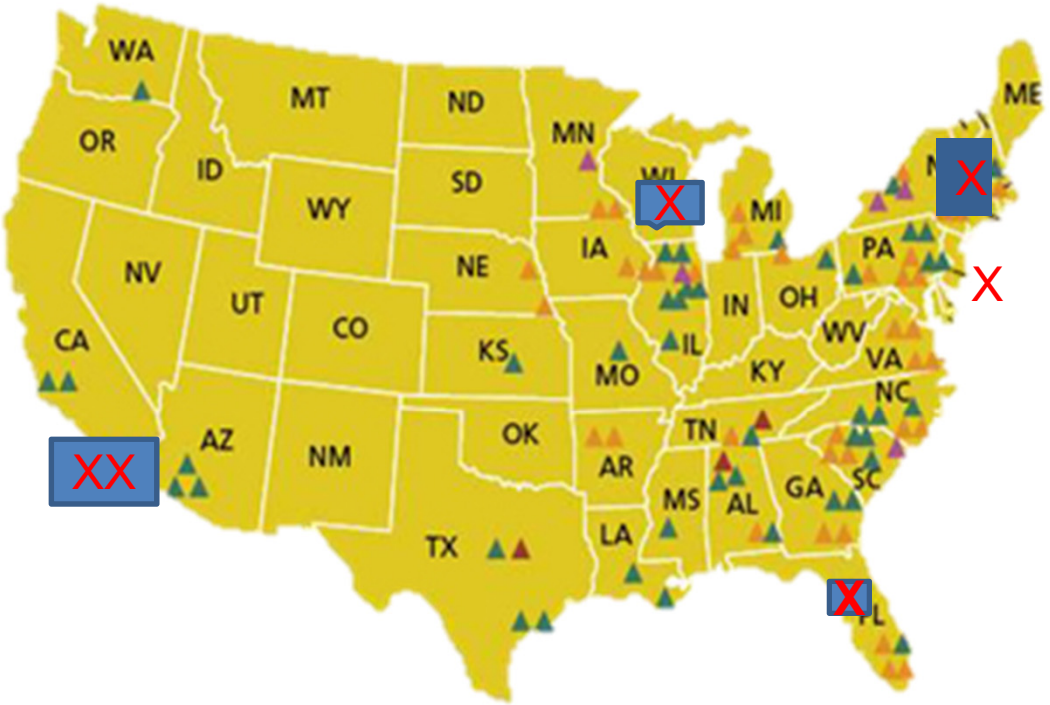
Clean energy contributions of the current U.S. nuclear fleet



2013

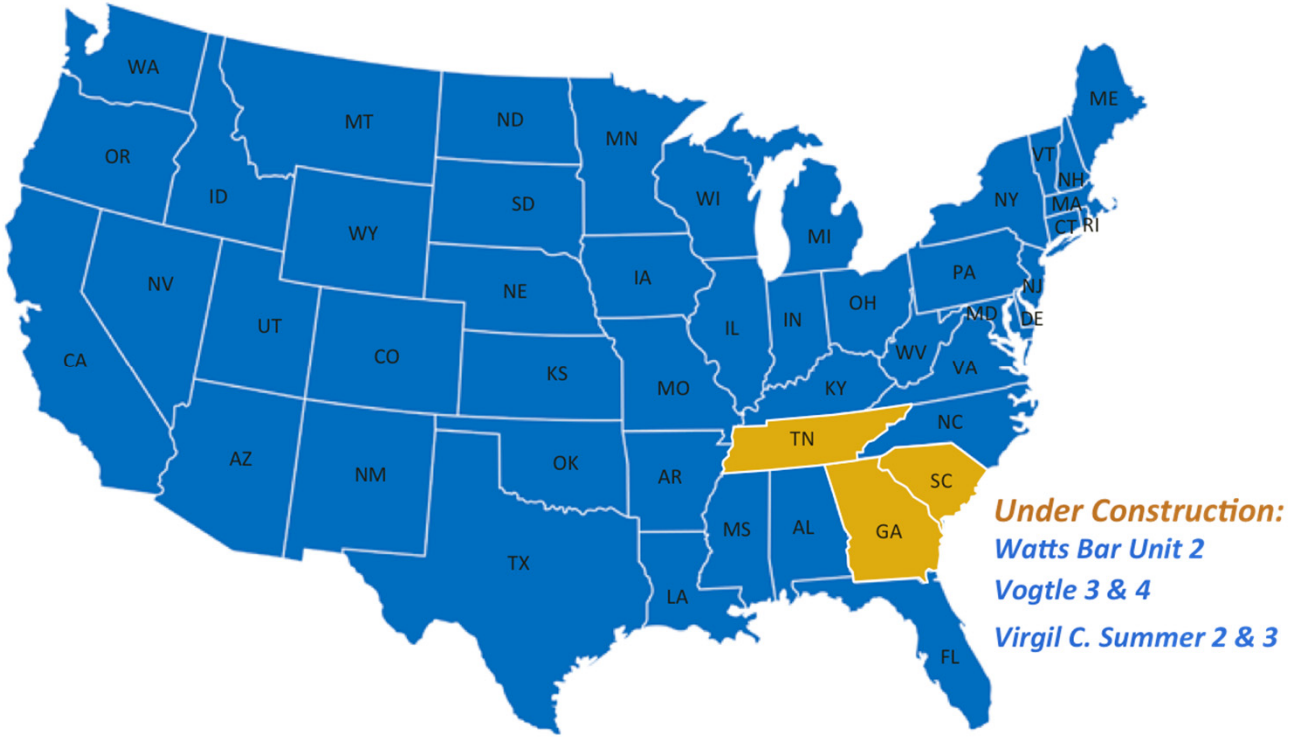


Five US nuclear units shut down since 2013



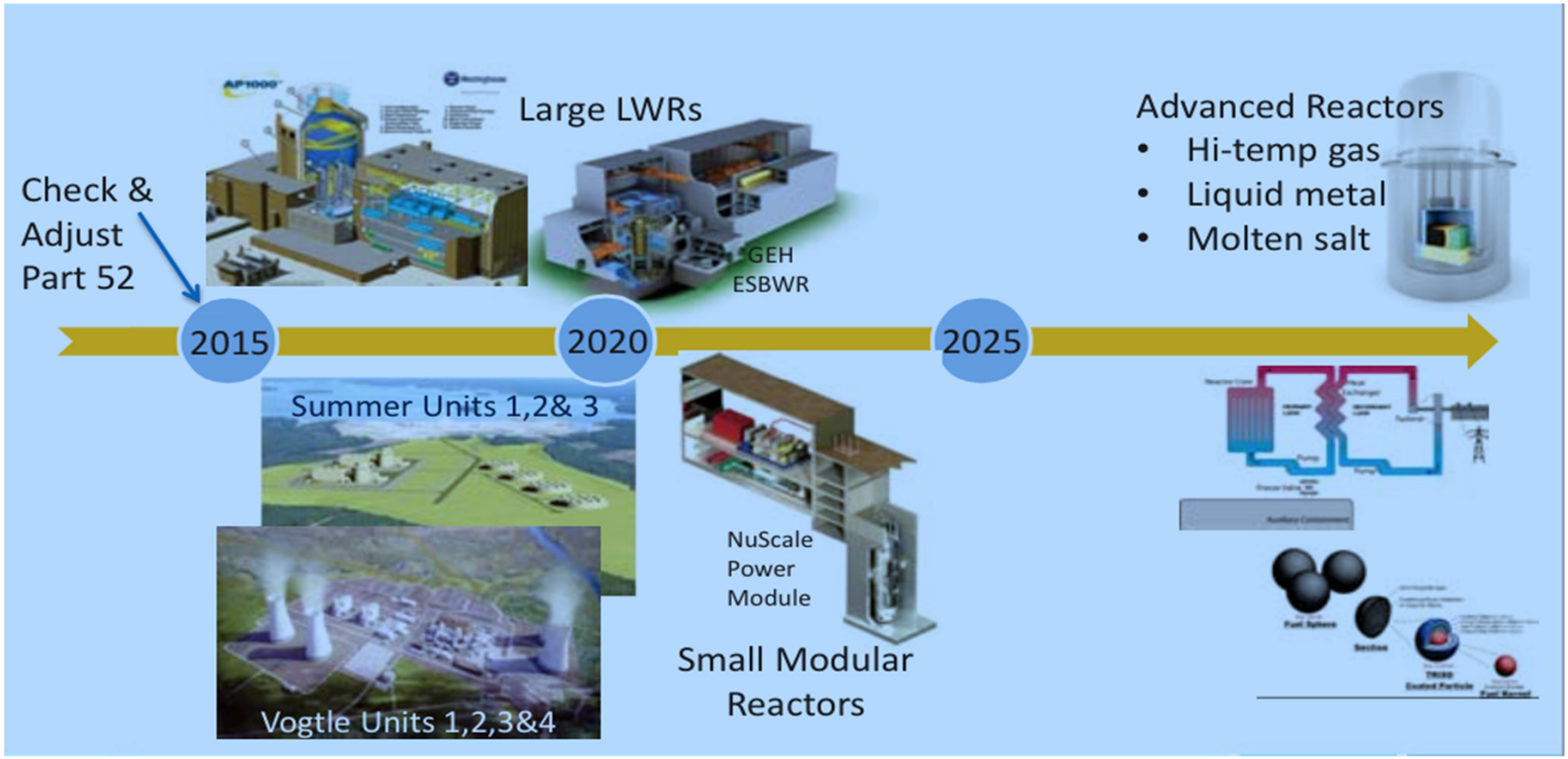
Oyster Creek (NJ) scheduled to close in 2019

Five New Units Under Construction in the US



Source: NEI - Nuclear Units Under Construction Worldwide

One Industry View of the Future….



But how does this technology ever reach the market?

The Path Forward May Not Be Familiar

- The gas bubble will probably be with us for awhile…this is good news for the US economy overall
- Large scale coal plant retirements are probable
- Will there be a carbon policy?
- Are there better technological options?

- Is the current power generation business model even sustainable?

Challenges to the current model

- Government actions are hostile
  - Demand suppression by policy
  - Intermittent sources subsidized and guaranteed a return
  - Coal under attack
- No consistent energy policy
- Grid model questioned

- "A history of replacing what worked with what sounded good" (Thomas Sowell)

Technology Change over 40 years causes disruptive industry change

- Just one example: Entertainment Media
  - 1974 music on 8 tracks, records and cassettes (not portable)
  - 1975 first mass market VCR's
  - 1979 Sony Walkman personal cassette player
  - 1982 First home CD players
  - 1985 First Blockbuster store opens
  - 1997 first DVD titles available
  - 1998 Netflix founded
  - 2001 First generation iPod
  - 2008 CD sales drop 20% from peak
  - 2013 Blockbuster closes all remaining stores
  - 2014 All physical media sales and rentals down significantly

Over this same period, the Nuclear and Utility business model has been relatively static

- Present model of regulated electric utilities dates to 1935 (PUHCA)
- Merchant generation (and deregulation) grows in the 1990's
- 1970-1990: bulk of US nuclear units; last new unit in 1996
- 2005-2008: "Nuclear Renaissance", planned units as large as 1600 Mwe
- Fundamental power plant design looks much as it did 40 years ago

Are there technological solutions?

- Small modular reactors *promise* lower capital investments and ability to better match demand
- Passive designs and core protection not dependent on AC power *could* reduce emergency planning zones to site boundary
- Integrated fuel cycle solutions, including fast reactors, *could* address the long lived used fuel issue

From Challenges Come Opportunities

- Regulated utilities are required to meet demand
- New reactor designs to better reflect future needs
- Nuclear for non electric power generation applications
- Fuel cycle and safety improvements
- Influencing public opinion and policy

A Few Recent Examples of Policy Missteps

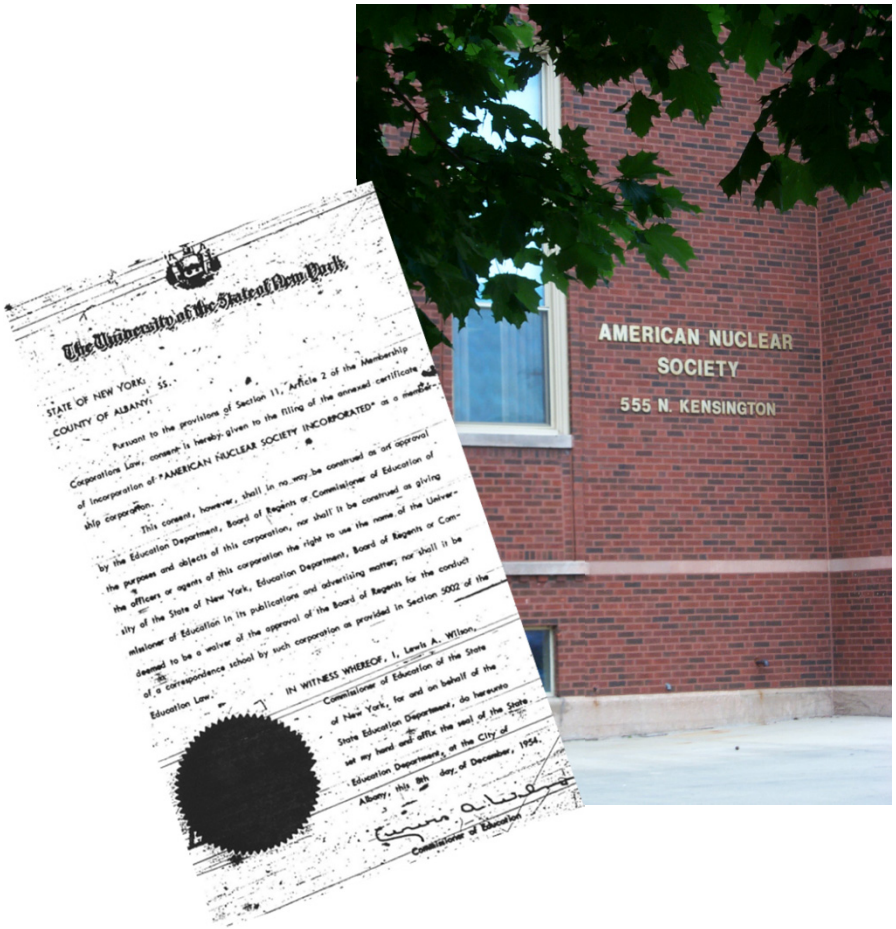
- EPA proposed Clean Power rule did not recognize nuclear contribution adequately
- Proposed Senate language last year in Section 402 (Appropriations) to remove isotope regulation from NRC
- Proposed NRC changes to 10CFR20 to reduce allowable occupational dose
- Export controls

Rising to the Global Challenge

The American Nuclear Society through its position statements and interactions with policy makers is committed to:

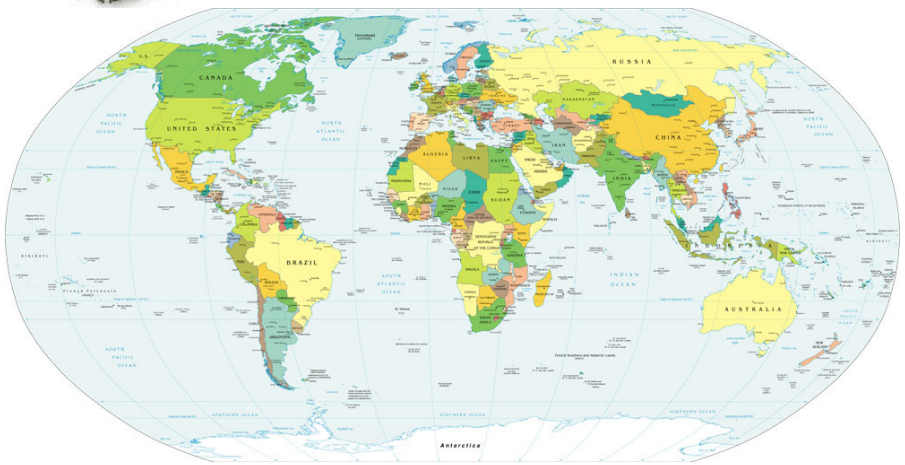
- Treat our existing reactor fleet as a national asset
- Encourage DOD to be an eager lead customer of SMRs
- Be timely and flexible negotiating 123 agreements
- Improve the 810 process
- Be aggressive with export financing
- Invest in human infrastructure
- Develop a sensible waste policy
- Promote and encourage research
- Establish policy based on real science

About ANS



- Founded in December 1954
- Creates a forum for knowledge sharing
- Convenes countless conferences
- Stimulates discussion and debate among professionals
- Fosters interest in the profession
- Provides recognition for excellence
- Influences the conversation about nuclear with those outside the field

Some Vital Statistics



- More than 11,000 individual members
- Nearly 100 organizational members
- International alliances, bilateral agreements with some 30 nuclear societies outside the U.S.
- Over 60 local sections
  (including 9 outside the U.S.)
- 20 specialty professional divisions and technical groups including the Young Members Group
- More than 30 local student sections

Some Recent ANS Initiatives

- "Nuclear Equality" comments to EPA
- Radiation Dose Communications Summit (with HPS)
- Radioisotope language coalition
- Special Committee on Radiation Effects and Dose (coming soon)
- Special Committee on Nuclear in the States (coming soon)

Challenges facing ANS Threaten Long Term Viability…but Opportunities Beckon

- Woefully low participation by the utility sector
- Decreasing meeting attendance
- Decreasing publication revenue (changes in the journal model)
- Cutbacks in government travel
- Aging of the membership

ANS must seek to consistently Add Value

What You Can Do

- Actively promote ANS membership among your friends and colleagues
- Confront junk science and misinformation wherever you encounter it
- Promote ANS conferences as site for topical meetings

The **WORLD** needs…..

NUCLEAR

NUCLEAR needs….