



**Second License Renewal**  
**Bill Pitesa, Chief Nuclear Officer**  
 U.S. NRC Regulatory Information Conference March 9, 2016




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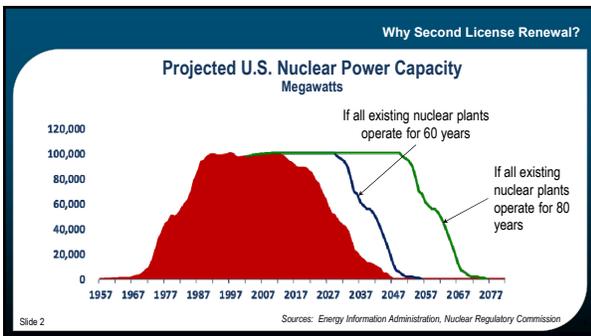
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- Environmental Benefits of Nuclear Power**
- During operation, nuclear plants emit essentially no greenhouse gases
  - The U.S. produces more than 5 billion metric tons of carbon dioxide each year
    - In 2014, U.S. nuclear energy facilities avoided 595 million metric tons of carbon dioxide
    - Nuclear energy's life-cycle emissions, which includes emissions from processes used to construct and fuel plants as well as generation, are comparable to wind, solar, geothermal and hydroelectric
  - Nuclear energy also prevents approximately half a million tons of nitrogen oxide (equivalent to that released by 52 million cars) and nearly 1 million tons of sulfur dioxide annually in the U.S.
  - Nuclear plants are vital for our local, state, and national clean air goals
  - Steady, reliable baseload electricity production from nuclear plants allows for investment in intermittent sources such as solar, wind and other options
- Slide 3 Source: NEI

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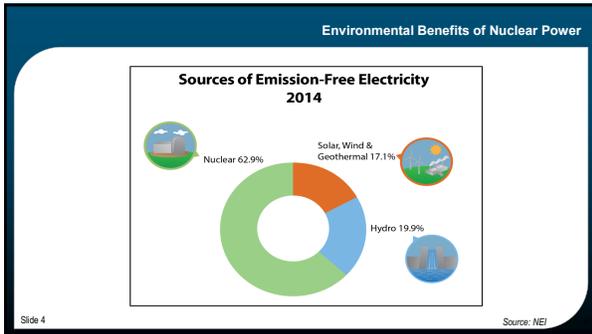
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- ### Economic Benefits of Nuclear Power
- Nuclear power accounts for 19 percent of U.S. electricity production
  - The nuclear industry has substantial direct and secondary economic impacts
    - Contributes approximately \$60 billion annually to the gross domestic product (GDP)
    - Accounts for about 475,000 full time jobs
    - Provides \$9.9 billion in federal tax revenues and \$2.2 billion in state tax revenues
  - Without nuclear generation retail electricity rates would be about 6 percent higher on average
- Slide 5 Source: The Nuclear Industry's Contribution to the U.S. Economy (2015 – The Brattle Group)

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### Economic Benefits of Nuclear Power

- Workforce Income Impacts
  - Nuclear plants typically employ 400 to 900 workers
  - Nuclear plant jobs on average pay 36 percent more than average salaries in the local area
  - Second License Renewal provides job opportunities for new workers (39 percent of nuclear workforce, approximately 25,000 employees, is eligible to retire in 2016)

Comparison of the number of jobs, average salaries, and workforce income among different energy technologies

Technology	Jobs/MWe	Average Size (MWe)	Direct Local Jobs	Average Salary (\$/hour)	Workforce Income (\$Million/year)
Nuclear	0.50	1,000	504	\$31	\$32.49
Coal	0.19	1,000	187	\$28	\$10.99
Gas Combined Cycle	0.05	630	34	\$28	\$2.02
Solar Photovoltaic	1.06	10	11	\$15	\$0.33
Wind	0.05	75	4	\$35	\$0.29

Slide 6 Source: NEI

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**Nuclear Plants Are Well Maintained**

- Over the past 25 years, companies that own nuclear energy facilities invested a total of approximately \$105 billion in capital facility improvements
- Industry's average capacity factor has been within a few percentage points of 90 percent\* every year since 2000.
  - Only possible if facilities are well managed and well maintained
  - Continual upgrades and investment in plant systems and equipment made as part of preventive maintenance program

\* The 2015 U.S. nuclear fleet capacity factor was a record high 91.9 percent

Slide 7 Source: NEI

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**First License Renewal Lessons-Learned**

- Aging management programs effectively implemented
  - NRC inspections verify adequacy of aging management programs
- Nuclear Energy Institute License Renewal Task Force
  - Generic issues
  - Information sharing
- Industry documents supplement NRC regulations and guidance documents
  - NEI 14-12, "Aging Management Program Effectiveness"
  - NEI 14-13, "Use of Industry Operating Experience for Age-Related Degradation and Aging Management Programs"
  - INPO 15-003 "Conduct of Engineering Programs at Nuclear Power Stations"
- Extensive inspections and surveillances assure safe operation
- Identified issues are repaired or mitigated commensurate with risk or code requirements

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**Technical Work Supporting Second License Renewal**

- The Electric Power Research Institute is working collaboratively with the Department of Energy, national laboratories, universities and international partners to support the technical basis for extended operations (up to 80 years)
- Purpose is to adequately understand aging-related impacts such as thermal exposure, radiation exposure, stress corrosion cracking, fatigue usage and wear on important structures and components
  - Reactor pressure vessel
  - Reactor coolant system metals
  - Electrical cables
  - Containment and concrete structures
- Goal is not perfect knowledge but the ability to identify and manage aging effects

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**Familial Regulatory Process for 60 to 80 Years**

- Nuclear Regulatory Commission (NRC) licenses nuclear plants and renews licenses only after comprehensive safety inspections
  - NRC inspectors are on site at every plant conducting inspections every day
  - Every nuclear plant receives a minimum of 2,000 hours of inspections annually by NRC personnel
  - NRC has authority to shut down a plant that fails to meet the agency's safety requirements
- Operating licenses of 81 operating units have been extended from 40 to 60 years
  - License renewal applications are currently under NRC review for 11 additional operating units
- License Renewal regulation, 10 CFR Part 54, remains unchanged for Second License Renewal thereby utilizing a proven process

Slide 10 Source: NRC

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**Familial Regulatory Process for 60 to 80 Years**

**License Renewals Granted for Operating Nuclear Power Reactors**

Licensed to Operate (100)  
 ● Original License (119) ● License Renewal Granted (81\*)  
 \* The NRC has issued a 50% of 81 License Renewals, two of these units have previously been shut down.

As of January 2016

USNRC  
U.S. Nuclear Regulatory Commission  
Protecting People and the Environment

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**Familial Regulatory Process for 60 to 80 Years**

- Draft guidance documents for Second License Renewal issued by NRC in December 2015
  - Generic Aging Lessons Learned (GALL)
  - Standard Review Plan (SRP)
  - Industry reviewed and commented on draft guidance documents in January/February 2016
- Technical reviews by the nuclear industry are expected to demonstrate nuclear plants can operate safely beyond 60 years
  - Nuclear plant aging management programs and processes will continually validate that conclusion
- Beginning with Oyster Creek in 2009, 40 operating units have now entered periods of extended operation beyond their initial 40-year operating license
- No degraded performance identified for those plants associated with extended operation

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**Continual Learning**

- Industry and regulators have substantial experience with aging effects over the past 40+ years of service
- Diagnostic and non-destructive evaluation techniques continue to improve
- Ongoing research programs are projecting aging effects on key structures and components
- Aging management has been incorporated into industry's standard processes

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**Conclusion – Why Shut Down A Perfectly Good Nuclear Plant?**

- U.S. nuclear industry has proven it can properly maintain nuclear power plants through investment and maintenance
- License Renewal regulation, 10 CFR Part 54, is unchanged for Second License Renewal
- Thorough technical reviews will ensure plants can operate safely beyond 60 years
- Beginning in 2032, without Second License Renewal, the U.S. will start to experience a significant decline in nuclear energy's contribution to clean electricity generation

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