

**NOVEMBER FUN LUNCH HIGHLIGHTS KAY GALLOGLY,
WHO SHARES NUCLEAR POWER GENERATION
INFORMATION**



Kay Gallogly is founder of The 42 Group, LLC, a performance improvement consulting firm which focuses on organizational troubleshooting in the nuclear power generation industry. Kay began her presentation by handing out lollipops to each attendee. Attached to the lollipops was this message: "If this lollipop were made entirely of Uranium -235:

It would supply the average American's energy needs for 84 years.

The waste would be the size of this lollipop after 84 years. It would eliminate 624 tons of greenhouse gas from equivalent coal generation.

Uranium is a naturally occurring element. The isotope Uranium -235 is used as a fuel for a nuclear reactor."

Ms. Gallogly cited the advantages of nuclear energy over the other energy technologies available to society: It matches the scale of global energy demand.

Nuclear fuel resources are vast.

Estimates of total uranium and thorium supplies far greater than of fossil fuels, even taking into consideration enormous methane hydrate formations in the oceans.

Nuclear energy has an unrivaled public health and safety record.

Its generation causes fewer deaths, injuries, and illnesses than fossil fuel technologies. It is more compact, better contained, and easier to monitor than fossil fuel. Requires less energy, less land for mining, lesser impacts on the environment than fossil fuels or proposed renewables.

It's reliable.

Renewables require electric storage technologies that do not exist in an economic form. Nuclear energy provides electricity day and night without the need for expensive energy storage.

It's a low carbon source of energy.

The first man-made nuclear reaction was created in Chicago in 1942 by Enrico Fermi. There are one hundred reactors at 62 sites in 31 states. The Vermont Yankee site is slated to start decommissioning in the near future. Watts Bar in Tennessee is preparing to start up.

Types of Reactors

The Nuclear Regulatory Commission (NRC) regulates commercial nuclear power plants that generate electricity. There are several types of these power reactors, though only two designs are used commercially in the U.S.:

Pressurized Water Reactors (PWRs) and Boiling Water Reactors (BWRs).

Fukushima Daiichi

This nuclear disaster was caused by an earthquake and tsunami in 2011. Ms. Gallogly said that much of the lack of preparedness in the facility had a large cultural aspect. A colleague had gone to the facility a few years prior to the disaster and was escorted from the premises when he mentioned shortcomings in the set-up and maintenance. It was a great source of pride to the Fukushima management that all details of the plant were in exemplary condition, and therefore, needed no change. Therefore, plant modifications that were the result of lessons learned in the United States were not incorporated in Japan. These modifications would have reduced the consequences of the tsunami. As a result of this disaster major modifications are currently in progress at power plants throughout the world.

Thorium vs. uranium

Thorium has long been discussed as an option for generating electricity. Positives are that:

It is four times more abundant in the world than uranium,

It is less easy to weaponize than uranium

Believed to be safer and cleaner – the radioactivity is significantly lower than uranium

There is less fuel waste

There are two primary disadvantages to using thorium as an energy source. The first is the cost to fabricate the raw material thorium to usable fuel. The process to fabricate the raw thorium material from a fissile material to a fissionable fuel is extensive. Thorium in a natural state is fissile. The processing / fabrication processes are required to transform the raw material to a fissionable fuel. This is a large process that has considerable expense. The expense of the fabrication is such that the utility would not be financially viable. The second primary issue is that it is not easy to sustain the nuclear chain reaction, thus reducing its efficiency as an energy source.

Shutdowns and Accidents

There are four typical references to describe a power plant that is not operating. One term is accident. This term represents a catastrophic event. There have only been three events that could be classified as an event. The three events are: Three Mile Island (March 28, 1979), Chernobyl (April 26, 1986) and Fukushima Daiichi (March 11, 2011).

Plant shut downs to lesser degrees include maintenance and refueling outages, and unplanned shutdown, and an automatic shutdown. Maintenance and refueling outages are planned as far as years in advance. These outages allow work on the plant that cannot be performed. The difference in the two is whether or not fuel is removed and replaced in

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the reactor. Refueling outages are scheduled for anywhere from 17 to 100 days depending on the amount of work to be performed. An unplanned shutdown occurs when there is indication that key equipment is not operating as desired. In this situation the plant will take several hours or a couple of days to take the plant off line, (not generating any electricity that would go out to the outside world.) An automatic shutdown occurs when a piece of plant equipment fails as a function of overheating or pressure. In this case the plant shut down systems 'turn off' the plant automatically through the designed safety functions. This type of shutdown occurs without people intervention and can occur in a matter of sections. The average cost per day is typically viewed as \$1 million to cover replacement electricity, labor, and parts

Employment

About 550 people work at a one-unit facility. About 750 people work for a two-unit facility, with maybe 2,000 consultants and specialists coming in and out in addition.

Terrorist Threats

Since 9/11 the NRC has activated a comprehensive security program to protect against both physical threats and cyber threats. Reactors are designed to withstand a force such as the impact of an airplane flying into the side.

There is a strong relationship between the NRC and Homeland Security.

Nuclear Power Plant Subsidies

There are currently no active subsidies to support operating nuclear power plants. These plants are funded by the rate payers in the service areas. President Bush created a subsidy to support new construction in the form of a loan guarantee.

Strategies for Long-Term Waste Storage

In 2010 President Obama appointed a bipartisan commission to reassess the federal government's program to manage used nuclear fuel and to make recommendations for a long term program. The commission recommended central permanent deep geologic storage. Before this recommendation can be developed, on-site waste storage is utilized.

Several questions following the talk focused on the issue of nuclear waste storage. Ms. Gallogly said that the concrete containers into which the spent rods are placed, within a container, have proven to be secure.

Many strides have been taken to reduce non-fuel waste. New innovations have resulted in protective clothing materials that have dramatically reduced the amount of material going to radwaste storage facilities. Improved work and radiological practices have further reduced the

radioactive waste. The cost and availability of the shipping and storage have prompted significant improvements.

Future of Nuclear

New plants are under construction in both Georgia and South Carolina. New technologies are continually being developed, including pebble bed reactors and small modular reactors.

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