



# POWER NUCLEAR

Engineering  
the Future of Nuclear

COOPER NUCLEAR STATION

**ZACHRY**

# CURRENT OPPORTUNITIES AND CHALLENGES IN NUCLEAR POWER

1

## GROWTH

- Potential significant new growth in demand for nuclear from EPA's Clean Power Plan
- Low-carbon footprint of nuclear relative to gas and coal

2

## EFFICIENCY

- Opportunities to use advanced analytical tools to boost performance and asset life
- Industry self-funding innovation R&D through EPRI

3

## COSTS

- Aging plants require upgrades that challenge economic competitiveness in a low-cost natural gas era
- Management of complex retirement and refurbishment schedules
- Increasing standards for safety and environmental

4

## UNCERTAINTIES

- Increased safety and waste scrutiny
- Uncertainty over regulatory and environmental demands
- Current economic environment impeding commercialization of new technologies

**“If other energy sources – especially coal and natural gas – were expected to account for the lifecycle impacts of their fuel sources, including carbon, it would make all the difference. When you put in all these costs, nuclear becomes viable.”**

*American Nuclear Insurers*

# ZACHRY ADDS VALUE ACROSS THE LIFECYCLE OF NUCLEAR POWER FACILITIES



## PLAN

We plan with the end in mind – engineering a facility that makes the optimal use of its site, and is designed for maximum efficiency, ease of maintenance and upgradability. We plan this way because we understand the priorities across the full lifecycle of nuclear power facilities.



## BUILD

The construction phase is where the majority of the project risk in power generation resides. That is why Zachry has a self-perform model that allows us to manage project risk more effectively, and to respond to changing customer requirements more swiftly.



## RENEW

We work on the assumption that nuclear power facilities can operate for 80 years or more - that with strategic maintenance and thoughtful capital investments, our customers should be able to extend the productive lives of these facilities for generations.

# DISTINGUISHED SERVICE ON NUMEROUS NUCLEAR POWER OPPORTUNITIES

## THE SCALE

- ✓ Our software, GOTHIC, PROTO-Series, and RADTRAD-NAI, is used at more than 90 percent of US nuclear power plants for critical system analysis.
- ✓ Our engineering and design capabilities have been used at over 50 percent of America's operating nuclear fleet.

## THE SKILLS

- ✓ Zachry Nuclear, Inc. combines more than 40 years of power plant design/engineering experience with more than five decades of power plant construction history.
- ✓ We've expanded our industry leading analysis products and services with our acquisition of Numerical Applications, Inc.

## THE SAFETY

- ✓ Our nuclear Quality Assurance Program and Corrective Action Program are among the most robust in the industry.

# CREATING AND SUSTAINING AMERICA'S NUCLEAR POWER CAPACITY



# OUR VALUE-ADDED DURING THE PLAN STAGE OF NUCLEAR POWER PROJECTS

Our capabilities in the '**PLAN**' phase of nuclear power project execution include:

- ✓ Full service engineering design
- ✓ Extensive safety analysis capability
- ✓ System performance prediction
- ✓ Component capability analysis
- ✓ Licensing and design basis requirements
- ✓ Component in-service testing acceptance criteria



# ANALYSIS BACKS KEY AMENDMENT CHANGE FOR MILLSTONE UNITS



## THE CUSTOMER'S CHALLENGE

As the US nuclear industry faces a trend of increasing Ultimate Heat Sink (UHS) temperatures, some operators are requesting a license amendment to increase temperature limits to avoid the possibility of shutting down during periods of elevated UHS temperature. Dominion approached Zachry to perform engineering and analysis at its Millstone Station in Waterford, Connecticut to support its request to raise the UHS temperature from 75 degrees to 80 degrees to provide additional margin to accommodate warmer summertime intake water temperatures.



# ANALYSIS BACKS KEY AMENDMENT CHANGE FOR MILLSTONE UNITS



## THE ZACHRY APPROACH

Zachry Nuclear performed a thorough engineering analysis of how Millstone Units 2 and 3 would respond at the increased temperature limit while maintaining or increasing safety margins. This included validating thermal performance of heat exchangers in a higher temperature service water scenario. It also examined potential impacts to other components and maintenance schedules, as well as containment and emergency core cooling system impacts.

## THE BUSINESS OUTCOMES

After extensive regulatory review, the Nuclear Regulatory Commission granted license amendments to both Millstone units to accommodate higher water temperatures in Long Island Sound. The ruling reduces the need to shut down Connecticut's largest source of power during the peak air conditioning months of summer. The amendment allows the units to operate with an UHS water temperature of up to 80 degrees; the prior licensing limit was 75 degrees.

# OUR VALUE-ADDED DURING THE BUILD STAGE OF NUCLEAR POWER PROJECTS

Our capabilities in the '**BUILD**' phase of nuclear power project execution include:

- ✓ Project management
- ✓ Staffing
- ✓ Implementation support
- ✓ Plant modification testing and turnover



# FPL TURNS TO TRUSTED CHOICE FOR NUCLEAR PLANT IMPROVEMENTS



## THE CUSTOMER'S CHALLENGE

Florida Power & Light Company (FPL) is the third-largest electric utility in the United States, serving approximately 4.7 million Florida customer accounts. Over the years, FPL and Zachry have enjoyed a long and productive relationship. Zachry was responsible for constructing major FPL power plants at Cape Canaveral and Riviera Beach as well as numerous engineering and maintenance assignments for other plants in the utility's fleet. When FPL needed modifications to its Turkey Point Nuclear Plant in Homestead, Florida, Zachry once again was awarded the assignment.



# FPL TURNS TO TRUSTED CHOICE FOR NUCLEAR PLANT IMPROVEMENTS



## THE ZACHRY APPROACH

During the scheduled refueling outages of Units 3 and 4, Zachry replaced the Turkey Point facility's traveling water screens and cathodic protection system with new state-of-the-art equipment. Additional related modifications were installed to support the new system structure.

## THE BUSINESS OUTCOMES

The new equipment and related modifications were successfully installed within the prescribed timeframe, allowing the plant to resume operations as scheduled. Thanks to such proper attention to maintenance, the Turkey Point Nuclear facility, with two units originally installed in 1972 and 1973, currently generates about 1,400 million watts of electricity – enough to supply the annual needs of more than 450,000 homes.

# OUR VALUE ADDED DURING THE RENEW STAGE OF NUCLEAR POWER PROJECTS

Our capabilities in the '**RENEW**' phase of nuclear power project execution include:

- ✓ Reliability analysis
- ✓ Plant optimization and modifications
- ✓ Quality assurance and training
- ✓ Capital projects



# ENGINEERING CALCS HELP CLIENT AVOID MAJOR EXPENSE



## THE CUSTOMER'S CHALLENGE

After a tsunami severely compromised Japan's Fukushima nuclear power plant, the Nuclear Regulatory Commission (NRC) issued an order modifying requirements for Beyond-Design-Basis (BDB) extreme external events at domestic nuclear plants. As a result, an East Coast client hired Zachry Nuclear Engineering to study and propose options to expand the backup power capability at one of its plant's generating units.



Battery Bank

# ENGINEERING CALCS HELP CLIENT AVOID MAJOR EXPENSE



## THE ZACHRY APPROACH

Zachry Nuclear Engineering went beyond the requested solution of upgrading battery backup capacity. Zachry's engineers determined that, in a BDB incident, the two battery banks would not run simultaneously (per design basis), but instead one would be taken off line and used only after the first battery bank was depleted.

## THE BUSINESS OUTCOMES

Computer modeling showed the NRC order could be met without the customer spending millions of dollars in upgrades. The customer was so impressed by Zachry Nuclear Engineering's approach to the issue that they ordered a second calculation for the batteries of the plant's other unit.

**“This project proves that we don’t just blindly provide what our customers ask for. We really look out for their best interests and for ways to provide the best solutions.”**

**Electrical Engineering Manager**  
*Zachry Nuclear Engineering, Inc.*

# OUR ABILITY TO ADD VALUE TO YOUR PROJECT IS THE PRODUCT OF OUR DISTINCTIVE APPROACH

## Zachry's approach to business is based on four key principles

### Focus on Distinctive Value

We're always looking for ways to deliver distinctive value to our customers – through performance on immediate work and through using the freedom that our structure allows to focus on value beyond today's bottom line.

### Priority on Customer Success

We recognize customer success is the basis for our success. We work to understand your goals so we can collaborate effectively and identify opportunities to enhance your business outcomes.

### Right Team in the Right Place

We've assembled an extraordinary professional workforce. We continue to invest in training and development to keep their skills on the leading edge.

### Adaptive Excellence in Execution

We believe every project is unique. Our self-perform model, integrated capabilities, loyal workforce and stable project teams allow us to deliver outstanding execution safely under any conditions.

## WHAT WE WANT YOU TO KNOW

The Zachry Group's approach to doing business is purpose-built to help you take advantage of your biggest opportunities and tackle the challenges that you will face along the way.

Like you, we are completely focused on accountability for results. Our entire operating model is designed to deliver that accountability – from our lifecycle mindset to our self-perform execution capabilities.

We recognize that the projects we do represents some of the biggest commitments that our customers make – not just for them, but for the customers, communities and employees that depend on them.

# LET'S CONTINUE THE CONVERSATION IN PERSON

We would welcome the chance to learn more about your needs.



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