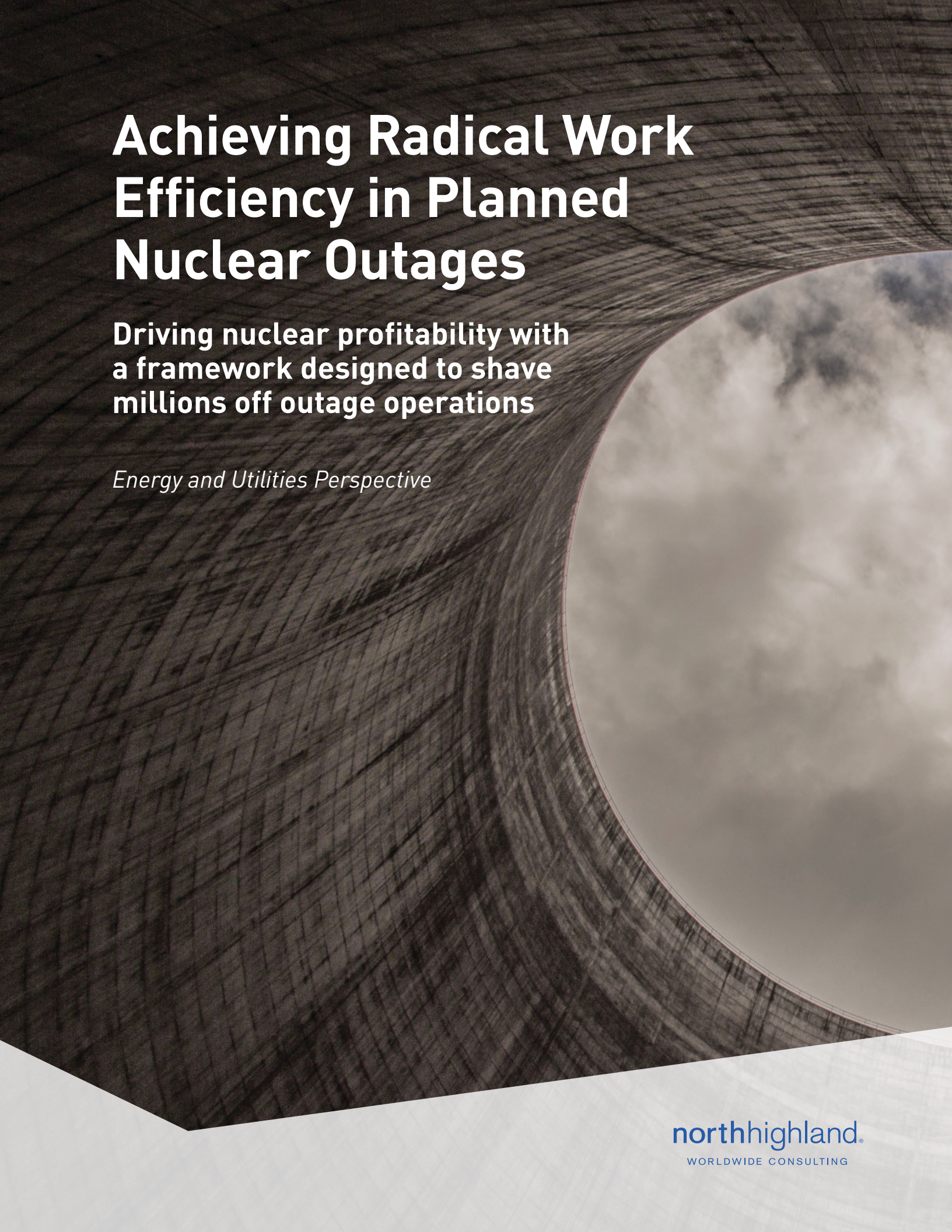


Achieving Radical Work Efficiency in Planned Nuclear Outages

Driving nuclear profitability with a framework designed to shave millions off outage operations

Energy and Utilities Perspective

northhighland
WORLDWIDE CONSULTING

THE NUCLEAR ENERGY INDUSTRY IS FACING AN UNPRECEDENTED SET OF ECONOMIC PRESSURES. TOTAL ELECTRIC GENERATING COSTS HAVE INCREASED 28 PERCENT IN THE LAST 12 YEARS.[1]

The nuclear energy industry is facing an unprecedented set of economic pressures. Total electric generating costs have increased 28 percent in the last 12 years.[1] Over the same time period, industrial natural gas prices have fallen more than 60 percent, the renewable energy's marketplace competitiveness has risen significantly, and spot market prices have plummeted.

These pressures, when coupled with the billions of dollars the U.S. nuclear power industry spends to upgrade infrastructure, are making it increasingly difficult for nuclear to operate profitably. In fact, several stations have closed or announced plans to close in the next five years, and the challenges impacting vendors are impacting production capability—from new construction to maintenance activities. The decision to cancel the Virgil C. Summer Nuclear Generating Station, units 2 and 3 new construction project is simply the most recent in a long line of financial challenges to the nuclear industry.

In response, a working group headed by the Nuclear Energy Institute (NEI) was formed in 2016. NEI developed 40 efficiency bulletins aimed at increasing the nuclear industry's long-term financial viability. Published as "Delivering the Nuclear Promise," the bulletins offer opportunities for the industry to generate incremental and one-time efficiencies.

COSTS AT U.S. NUCLEAR PLANTS HAVE INCREASED BY ABOUT 20 PERCENT IN REAL TERMS SINCE 2002, LARGELY AS THE RESULT OF OUTAGE ACTIVITIES.[2]

Unfortunately, to thrive in nuclear today, incremental efficiencies are not enough.

Before embarking on any transformational activities, an organization must be aligned under a focused vision from leadership. Without a clear path forward, the impacted levels of an organization can have misaligned priorities causing halted initiatives, wasted resources and an overall resistance to change.

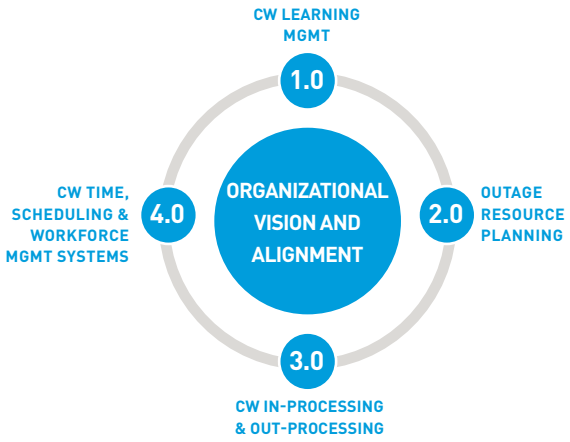
It's time for nuclear to transform. The conventional ways of doing business in nuclear are riddled with obstacles to efficiency and profitability. To generate significant savings and to truly realize the nuclear promise, it's imperative that nuclear leaders identify and eliminate obstacles now and establish new ways of working that are radically efficient with resources and operations.

Another massive obstacle is the critical but costly maintenance outage. Costs at U.S. nuclear plants have increased by about 20 percent in real terms since 2002, largely as the result of outage activities.[2] As often as every 12 months, a nuclear site must completely transform its operating model, from producing and selling nuclear power to buying replacement power and fixing infrastructure. It requires onboarding, training and managing an entirely new workforce—primarily contingent workers (CWs)—and an entirely different set of value measurement and monitoring metrics.

Through a history of engagements with one of the largest utilities in the U.S., North Highland conducted a series of studies to identify the most impactful opportunities to realize radical value in outage operations. From those findings, the CW Optimization Framework was born.

Tested at one of the nation's largest nuclear operation sites (one that involved a significant fleet of multi-unit interdependencies), the framework's graded approach is designed to generate immediate and significant cost savings. The resulting efficiencies are not incremental but transformative, and they enable nuclear leaders to establish a shared purpose of delivering value now to spark sustainable and profitable growth into the future.

CW OPTIMIZATION FRAMEWORK



1.0 CW LEARNING MANAGEMENT:
What type of training needs to exist for each CW?

North Highland estimates that the nuclear industry employs tens of thousands of CWs annually solely to support refueling outages. Each position—from administrators, welders and nuclear fuel handlers to cafeteria workers and scaffold builders—requires very different training. Historically, training curricula for CWs have been very broad, rather than focusing on the specific requirements of a job.

As part of "Delivering the Nuclear Promise," the industry has agreed to a standardized set of "hard-hat-ready" courses that meet its regulatory, licensing and safety requirements.

This alignment is a great start, but there is still a significant opportunity to do more. Nuclear organizations must seek ways to further standardize training and to eliminate redundancy through a process that includes:

- A thorough requirements analysis
- An assessment of the current training portfolio
- The development of an optimized training portfolio
- A change management strategy
- An intentional training program for full-time employees (FTEs) to drive standardization and optimization of all resources

Following a process built around these five tactics, our team helped one of the nation's largest utility companies save an estimated $7 million per year in recurring savings by eliminating 37 percent of the required training time across all CWs.

2.0 OUTAGE RESOURCE PLANNING:
What is the scope of work, and what resources are needed?

Conventionally, CW requests have not been scrutinized, as utilities err on the side of risk mitigation and safety rather than on cost efficiencies. As a result, overestimates on the number of CWs needed commonly lead to not only high daily resource costs but also significant onboarding and in-processing costs.

We don't believe safety and savings should be opposing forces. By changing the paradigm, cost efficiencies can be gained while safety standards are maintained or even improved.

To optimize outage resources, utilities should adopt a methodology that allows them to capitalize on pooled resources (including CWs among different job sponsors) and more efficiently use FTEs with outage skills and experience.

To optimize scope, utilities should identify efficiencies before resources are addressed, particularly during times when prices are high. In those times, moving as much non-critical scope online as possible can significantly shorten a plant's outage, each day of which can mean millions of dollars in lost revenue.

Conversely, the application of a few best practices—including training FTEs in lower-skill roles and near real-time reporting and analytics aimed at releasing CWs as soon as their assignments are complete—can generate massive cost savings. On a recent project with a major utility client, a well-designed skill-set management and reporting system enabled tight resource management and contributed to more than $15 million in savings over a four-month fall outage season.

WE DON'T BELIEVE SAFETY AND SAVINGS SHOULD BE OPPOSING FORCES. BY CHANGING THE PARADIGM, COST EFFICIENCIES CAN BE GAINED WHILE SAFETY STANDARDS ARE MAINTAINED OR EVEN IMPROVED.

3.0 CW IN-PROCESSING AND OUT-PROCESSING:

Where is each CW, what is the CW working on, and how long should the task take?

Most planned outages are organized for large volumes of CWs to arrive at the site within a narrow time period. This arrival period is a stressful time for site team members, who are responsible for conducting the training and processing activities, and for the CWs. In addition, the process is time consuming and redundant. Large repetitive meetings to communicate expectations and long lines and longer waits between in-processing activities are all par for the course. North Highland estimates that this in-processing dead time (billable time CWs spend performing non-value-add activities) costs sites $800,000 to $1.2 million per outage.

NORTH HIGHLAND ESTIMATES THAT THIS IN-PROCESSING DEAD TIME (BILLABLE TIME CWS SPEND PERFORMING NON-VALUE-ADD ACTIVITIES) COSTS SITES $800,000 TO $1.2 MILLION PER OUTAGE.

By applying lean principles, utilities can identify opportunities for improvement in the process—from the moment a CW arrives at the site to when the CW is released upon completion of the work—and generate flow that allows CWs to move quickly from one function to the next.

Simple adjustments to flow can generate significant savings. Studies show that the average CW waited nine to 14 hours total between in-processing functions. This dead time can be reduced in multiple ways, including putting all processing functions under one roof, strategically coordinating CW rollovers between nuclear sites, and/or requiring that background screens be completed before arrival by way of electronic methods at the site. This step alone—requiring CWs to complete their Personal History Questionnaire (PHQ) prior to arrival—has been shown to reduce processing time by more than 60 percent, according to North Highland's client experience.

4.0 CW TIME, SCHEDULING AND WORKFORCE MANAGEMENT SYSTEMS:

How can I ensure accuracy with CW invoicing and work order accounting, and the most efficient use of time for "covered workers"?

Work management systems in the energy and utilities industry, especially within nuclear, have not adopted technology advances at the same pace as more nimble industries. The negative impact is evident: resource scheduling is limited to the required skill set and supervisors' immediate needs; fatigue management is reactive; and paper timesheets and handwritten accounting codes are error-prone and delayed.

The implementation of technology and data systems to manage the mobile workforce and overall resource scheduling, time and attendance, provide an immediate way to improve efficiency and lower costs though optimized scheduling and an accurate, comprehensive and holistic account of a CW's time during an outage.

To mitigate the cost and time barriers to technological adoption, consider taking an agile approach, where technology solutions are released in phases. Start by engaging all key stakeholders and vendors to prioritize and implement the tech functionality that will first generate the greatest value (or eliminate the greatest sources of pain). By implementing functions via multiple releases over time, utilities will achieve ROI sooner and gain best practices with each implementation.

ACHIEVING RADICAL EFFICIENCIES STARTS WITH OUTAGE OPERATIONS

Outage work accounts for as much as 25 percent of a site's operating and maintenance budget, and it burns through upwards of $1.3 million per day in direct and indirect costs. The application of any combination of best practices from the CW Optimization Framework offers nuclear leadership an immediate opportunity to streamline operations, empower team members to adopt a shared value-driven purpose, and ultimately take the critical first steps to radically transform for the future.

These best practices allow for operations that are agile and disruption-resistant, and they help utilities generate significant savings by identifying and eliminating the obstacles to achieving the nuclear promise. These best practices also allow nuclear organizations to transform themselves now to be radically efficient in how they power the world tomorrow.

1. "Delivering the Nuclear Promise: Advancing Safety, Reliability and Economic Performance", Nuclear Energy Institute (NEI), June 2016

2. "Market Impacts of a Nuclear Power Plant Closure," Energy Institute at Haas, Lucas Davis and Catherine Hausman, May 2015

ABOUT NORTH HIGHLAND

North Highland is a global management consulting firm known for helping clients solve their most complex challenges related to customer experience, performance improvement, technology and digital, and transformation. We add value and support our clients across the full spectrum of consulting, from strategy through delivery. We bring the big ideas, then we make them real. North Highland is an employee-owned firm, headquartered in Atlanta, Georgia, with more than 3,000 consultants worldwide and 60+ offices around the globe. The firm is a member of Cordence Worldwide (www.cordenceworldwide.com), a global management consulting alliance. For more information, visit northhighland.com and connect with us on LinkedIn, Twitter and Facebook.

For more information about this topic, please contact:

Charlie Morn
Senior Business Analyst
Charlie.Morn@northhighland.com

Charlie worked for 6 years for the Institute of Nuclear Power Operations and is Senior Reactor Operator certified. He is a Senior Data Analyst for North Highland.

northhighland.
WORLDWIDE CONSULTING