

# NUCLEAR POWER

*Corrosion control for nuclear power plants*



## Nuclear Buried Pipe – The Issue

Operators of nuclear power generating plants throughout the world have a daunting task maintaining safe and reliable plant operations while dealing with an aging infrastructure. They also face close scrutiny by regulators and the public as they seek license renewal and/or want to increase generating capacity through the construction of additional reactors.

One critical aspect recognized by the Nuclear Regulatory Commission (NRC) and the nuclear power industry is the increasing need to maintain the health of aging buried pipelines, especially safety-related pipelines. In addition to being extremely costly to repair, an underground pipeline failure can present safety and environmental issues and negatively impact critical plant operations.

Often, coal tar epoxies, multi-layer tapes and/or bitumastic coatings were applied to buried pipelines during original plant construction. All coatings degrade over time allowing for corrosion to occur, sometimes at very high rates.

**Cathodic protection is a proven cost-effective solution to control corrosion and extend pipe service life**, even after many years of coating degradation. The Electric Power Research Institute (EPRI), the Institute of Nuclear Power Operations (INPO) and the NRC have identified cathodic protection as a critical step towards license renewal.

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## Nuclear Pipeline Assessment

Corrpro employs a well-founded risk-based approach to assessing nuclear buried pipelines. The corrosion history and corrosion control maintenance for each pipeline system is carefully analyzed through records review and field investigations by working closely with plant operations. This typically includes electric potential measurements, potential mapping, current mapping and soil corrosivity evaluations.

Direct examination of buried pipelines requires a thorough assessment of the excavation logistics in the very dense maze of structures at a nuclear power plant. When direct examinations are in order, Corrpro assures the locations are strategically determined so that the most valuable information is obtained with the least amount of disruption to plant operations. For external corrosion assessment of high risk piping, Corrpro often finds it possible to directly assess lower risk pipelines that may be more easily accessible. Meaningful inferences can then be drawn for corrosion rates and remaining useful service life of the high-risk pipelines.

Corrpro's cathodic protection and buried pipe integrity work involves very minimal digging. Strategic planning, risk ranking and the selection of the most appropriate assessment tools and construction equipment eliminates many costly and often unnecessary excavations.

Nuclear plant staff can accurately perform critical assessment work during the course of day-to-day operations and maintenance. Corrosion examinations, coating inspections, repairs and pipe strength calculations can be incorporated into these tasks. Additionally, the installation of corrosion monitoring equipment such as coupons and corrosion rate probes can have considerable merit and help track the health of buried pipelines over time.

## Corrpro Cathodic Protection Solutions

When operational and site conditions warrant, cathodic protection is a well-proven technology for effectively extending the service life of nuclear buried pipelines. Corrpro cathodic protection designs are provided by registered professional engineers and NACE certified cathodic protection specialists and corrosion specialists.

When designing cathodic protection systems for nuclear buried pipelines, Corrpro engineers consider many factors. All designs must be site-specific to the particular plant and a thorough evaluation of pipeline electrical continuity characteristics, pipe to plant ground electrical interconnectivity, pipeline coating quality and cathodic current distribution is required. With this information well characterized, Corrpro devises a cathodic protection strategy that is practical, economical to construct and maintenance friendly.

Corrpro develops suitable monitoring procedures and guide manuals for use by plant personnel, including data management for trending cathodic protection performance. Classroom and field training is also available as part of a comprehensive O&M program which allows plant personnel to perform other critical preventative maintenance activities.



## Industry Expertise

Corrpro engineers are active in technical forums such as EPRI's Buried Pipe Integrity Group (BPIG) and Cathodic Protection User's Group (CPUG). Corrpro also provides industry guidance through the Institute of Nuclear Power Operations (INPO). Corrpro is instrumental in the development of consensus standards relating to nuclear plant facilities.

Corrpro is one of the largest and foremost corrosion control engineering and service organization in the world. The vast knowledge base and service offering available through Corrpro assures sufficient technical expertise to assist nuclear power plant operators with their buried pipeline integrity programs. Corrpro also assists with effectively extending the service life of other plant facilities.

## Other Services Available Through Corrpro

Corrpro is a proud member of Aegion Corporation's family of infrastructure preservation companies. Other services for nuclear power plants offered worldwide by the Aegion family include:

- Cathodic protection for intake structures and condenser waterboxes
- Cathodic protection for atmospherically exposed reinforced concrete structures, such as cooling towers and containment structures
- Cathodic protection of above and below grade tanks
- Protective coating inspection and analysis
- Field coating repair material and services
- Cathodic protection of steel pilings and bulkheads
- Cured-in-place pipe and other pipe linings
- Structural/pipeline repairs, seismic strengthening and blast protection using carbon fiber and other composites
- Extensive fleet of deep anode drill rigs, vacuum excavators, water jetting equipment, horizontal directional drilling equipment and trenchers



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