THE HAZARDS OF NATURAL GAS AT U.S. NUCLEAR ENERGY FACILITIES

Expert Witness Statement

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Summary: Gas Pipelines and Uranium Enrichment

Uranium and natural gas, when combined, are mutually combustible. Whereas natural gas is highly explosive, finely divided uranium metals, “being pyrophoric, present a fire hazard.” In addition to processing hundreds of millions of kilograms of uranium and burning 12,000 cubic feet of gas per hour, the proposed National Enrichment Facility’s (“NEF’s”) processes for separating radioactive materials into different grades are extremely electricity-intensive, consuming, in one building, enough electrical capacity to power 30,000 residential apartments.

As a “high consequence area,” the proposed NEF’s (<500 ft) proximity to two natural gas pipelines would be unacceptably vulnerable to a catastrophic explosion, whether by accident or terrorism. Together, these four factors of gas pipelines, uranium, onsite combustion of a large volume of natural gas, and an extremely high voltage electricity use combine to significantly increase the probability of a substantial natural gas explosion which could easily render the proposed NEF inoperable, and could even compromise the NEF’s uranium hexafluoride gas (“UF6") containment systems as currently designed. The Nuclear Regulatory Commission (“Commission”) should at minimum require Louisiana Energy services to conduct a second Integrated Safety Analysis (“ISA”) based on module-specific rather than merely facility-specific data, and should consider requiring that the pipelines be relocated at least 1000 ft from the facility’s perimeter, and that the proposed natural gas steam turbines be replaced with a technology employing a less combustible fuel source.

In my opinion, a substantial natural gas leak or pipeline leak explosion, whether by accident or terrorism, could indeed compromise the containment of any one of the three UF6 Handling Areas.

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1 Local Power research director Robert Freehling assisted in the preparation of this statement.

of the NEF. In particular, an El Paso/Sid Richardson Pipelines Explosion and/or an explosion of the NEF’s 10.045 Million BTUH gas tap into the El Paso pipeline cause a UF6 release at the proposed National Enrichment Facility.

Louisiana Energy Services claims that a natural gas explosion would have to be “substantial” to have an impact on facility buildings:

“A risk assessment of the hazards posed by the pipeline has been performed. The assessment used a hazard model to estimate the likelihood of a gas line leak and subsequent explosion that could impact NEF operations. The model incorporated historical data on pipeline accidents obtained from the Department of Transportation (DOT, 2002) and accounted for the conditional probability that if an explosion were to occur, it would have to be substantial to have an impact on facility buildings.”

Thus, a potential explosion could be described as “substantial,” that would compromise the containment systems for catastrophic volumes of highly radioactive gases. Louisiana Energy Services does not attempt to define “substantial,” nor does it make any attempt to address the specific potential for a “substantial” explosion resulting from the 16 inch, 30 PSI unrefined gas pipeline within 500 feet of critical facilities, the 14 inch commercial grade natural gas pipeline that shares the same trench, or the NEF pipe transporting gas from the 14 inch pipeline into the Central Utility Building for combustion.

Louisiana Energy Services admits that there is a high “consequence category” given to a release of UF6 gas were such a substantial natural gas explosion to occur, but asserts that the probability of such an event is very low:

“Potential adverse impacts to the facility from natural gas release in the Central Utilities

3At issue in particular is the extent to which a worst-case scenario explosion could compromise the UF6 Handling Areas of Cascade Halls 1 & 2, 3 & 4, or 5 & 6.

4NEF Safety Analysis Report, December, 2003, 3.2.2.4.
Building (CUB) and subsequent explosion. Natural gas used to fire plant boiler...The initiating event is an assumed explosion in the Central Utilities Building that would potentially impact nearby UF6 areas in nearby adjacent buildings Hazard shown by probabilistic analysis to be less that 1E-05 which meets definition of “highly unlikely,” therefore initiating event index of (-5) is appropriate and no IROFS are needed. Consequence category conservatively assumed as high.”

So while conceding that the consequences of a “substantial explosion” would be categorized as “high,” Louisiana Energy Services rests on the assertion that such an explosion is improbable.

On review, however, the criteria employed by Louisiana Energy Services to determine probability appear speculative. The General Intrgrated Safety Analysis (ISA) clearly does not specifically address the particular risk factors introduced to the NEF by the conspicuous presence of two natural gas pipelines. Within these limitations, the ISA Team assembled by Louisiana Energy Services reviewed the hazard identified for the "credible worst-case" consequences. All credible high or intermediate severity consequence accident scenarios were assigned accident sequence identifiers, accident sequence descriptions, and a risk index determination was made. The risk index method is regarded as a screening method, not as a definitive method of proving the adequacy or inadequacy of the IROFS for any particular accident. In addition, “The ‘Fire’ and 'External Events' guidewords were handled as a facility- wide assessment and were not explicitly covered in each system hazard evaluation. The results of the HAZOP are used directly as input to the risk matrix development.”

An ISA Team was formed and performed the External Events and Fire Hazard Assessment for the entire facility. The developer’s Integrated Safety Analysis team reported that the presence of extreme or severe quantities of transients (bulk quantities of flammable/combustible liquids or

5NEF External Events and Fire Accident Description,” Table 3.7-4

gases, etc.) would connotes a “failure of the IROFS,” and indicates that the ISA representatives of Louisiana Energy Services’ partner, Urenco, “all indicated that these types of transient combustible conditions do not occur in the European plants.”

“In order to assess the potential severity of a given fire and the resulting failures to critical systems, the facility Fire Hazard Analysis was consulted. However, since the design supporting the license submittal for this facility is not yet at the detailed design stage, detailed in- situ combustible loading and in- situ combustible configuration information is not yet available.”

This would appear to render Louisiana Energy Services’ 1E-05 “highly unlikely” probability initiating event index of (-5) for a “substantial” natural gas explosion is merely speculative and inappropriate and IROFS are needed on the presence and specific hazards of pipeline and facility gas explosions at the proposed site. In addition, the Integrated Safety Analysis team formed by the developer recommends that the Fires involving additional in- situ or transient combustibles from outside each respective fire area could result in exposure of additional uranic content being released in a fire beyond the quantities assumed above:

“For this reason, fire barriers are needed to ensure that fires cannot propagate from non-uranium containing areas into uranium (U) areas or from one U area to another U area.”

Indeed, fire barriers would be a good start, but as no specific analysis has yet been undertaken to determine what sort of fire walls would be advisable based on the potential force and heat of a substantial natural gas explosion, fire walls are similarly speculative measures, and may be wholly ineffective.

After miscalculating the probability of a substantial natural gas explosion and declaring that no

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IROFS are needed for such a low risk, Louisiana Energy Services’ Safety Analysis indicates it will provide training to “prevent” “unacceptable” accumulations of natural gas vapor:

“Accordingly, and given the orientation and training that facility employees will receive indicating that these types of fire hazards are unacceptable, the administrative IROFS preventing severe accumulations has been assigned a high degree of reliability.”

Clearly, IROFS cannot prevent a pipeline leak that might originate at a location outside the NEF compound. In order to determine the actual probability of a substantial natural gas explosion that would release UF6 from the NEF, it essential to create a module-specific analysis of the impacts of a worse-case scenario pipeline and facilities fire. This design-specific module analysis should be based on specific data on the volumes, pipeline sizes, pressure levels and types of gas that will pass within 1000 feet of both the Cascade Halls and the Central Utility Building. It should include data on the specific volumes of gas that would be transported into the Central Utility Building, and data on the impacts of nearby gas processing facilities explosions on the Sid Richardson (unrefined gas) and El Paso pipelines (which will carry commercial grade gas) that adjoin the proposed site’s property lines.

While Louisiana Energy Services says that the such an explosion is improbable, there is no controversy concerning the fact that the release UF6 gas could be deadly to a small nearby town and to surrounding communities. The proposed National Enrichment Facility site is already home to 68,515 residents in two surrounding New Mexico and Texas counties - with 2,500 residents five miles just away in Eunice, the town’s four schools, and church located between them:

“The hazards of concern for this facility are all related to either a loss of confinement (of UF6) or criticality. All of the consequences of concern are the result of initiating events

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10NEF Site Plan Figure 1.1-4
due to hazards that would result in accidents of these types. The initiating events considered for this facility are the result of failures in process components, human error or misoperation including maintenance activities, fires (external to the process), and external events (e.g., severe weather, seismic, transportation and industrial hazards). These initiating events or potential causes could result in a loss of enrichment system containment or criticality.\textsuperscript{11}

Terrorism is a significant omission as the source of an “initiating event, but the severity consequences are clear:

“In general, the loss of confinement would initially result in an in-leakage of air because the systems are at subatmospheric pressure. Moisture in the air would react with the UF\textsubscript{6} forming UO\textsubscript{2}F\textsubscript{2} and HF as by-products. The HF, which would be in a gaseous form, could be transported through the facility and ultimately beyond the site boundary. HF is a toxic chemical with the potential to cause harm to the plant workers or the public. A criticality event, if one should occur, is a potential source of damaging energy and would result in the release of prompt gamma rays and airborne fission products. The gamma rays and airborne fission products result in direct radiation and chemical/radiological inhalation dose exposure to plant workers and the public.”

Yet while conceding that a substantial explosion could threaten the lives of 65,000 people, the Louisiana Energy Services assigns a “1E-05” rating to the probability of such an event, calling it “highly unlikely,” giving it an initiating event index (-5) and declaring that no IROFS are needed.

Thus Louisiana Energy Services’ claims that the probability for such an event to be low is based entirely on the developer’s estimate of the probability that the event would ever occur:

• The developer does not claim that the NEF UF\textsubscript{6} containment system as designed would withstand a “substantial” natural gas explosion.
• The developer admits that the consequences of such an explosion should be assumed to be “high.”

\textsuperscript{11}NEF Integrated Safety report, 3.1.4 “Hazards Analyzed.”
Thus the security of the NEF hangs on the probability of the explosion itself. On this score, it is not at all clear that the NEF developer’s criteria of probability reflect changes in energy facilities security issues since the events of September 11, 2001.

**U.S. Energy Facilities a Terrorist Target**

Since then it has become clear that important U.S. energy facilities are among the nation’s most likely terrorist targets. Since September 11, 2001, the U.S. Government has reevaluated its standards for energy facilities, particularly its nuclear facilities, and has determined that specifications for the nation’s existing nuclear power facilities do not protect radioactive material containment systems from the massive impacts of large commercial airliner explosions such as those involved in the 911 attacks.

In the United States, federal warnings about Al Qaeda threats since September 11, 2001 have repeatedly mentioned energy infrastructure. In June of 2003, for example, U.S. Intelligence agencies warned about possible Al Qaeda attacks on energy facilities in Texas.  

The National Enrichment Facility is made particularly vulnerable to terrorist attack by the presence of natural gas pipelines surrounding and penetrating the Facility. On the morning of Sept. 11, 2001, top officials in the White House situation room expressed an almost immediate fear of an attack on Boston through the Liquefied Natural Gas port in Everett, warning the Coast Guard that Boston Harbor may be an Al Qaeda target, according to the former White House

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terrorism chief Richard A. Clarke, who coordinated the government's response to the attacks.\textsuperscript{13}
With well-marked pipelines buried in shallow trenches along highway- and railroad rights-of-way, terrorist attacks on natural gas pipelines are relatively simple, requiring no explosives or other illegal materials to undertake - a backhoe will suffice.

**Nearby Natural Gas Pipelines**

Gas Pipelines and processing facilities - particularly those that might endanger a federal nuclear energy facility’s containment system - have been singled out as terrorist targets. Yet current government regulation of pipeline companies is lax and outdated. While the United States Department of Transportation, Federal Energy Regulatory Commission and the New Mexico Public Regulation Commission have jurisdiction over the safety of New Mexico gas utilities’ facilities, existing state and federal regulation is weak. Few if any permits are required for the location and construction of pipelines. There are few or any federal or state regulations requiring even minimal inspection and maintenance of pipelines - a major terrorist risk - and failure to adhere to federal regulations is only caught in the event of a pipeline failure, which is a major safety concern apart from the growing terrorist threat to vulnerable U.S. energy facilities.

Lea County, New Mexico is an oil and gas development area. The region surrounding the proposed NEF site is replete with dozens of interconnected gas & oil pipelines and pump stations, and over half a dozen oil and gas-fired power plants and substations within a ten mile radius of the site.\textsuperscript{14} Just four miles from the proposed site lies the Dynegy Midstream Services Plant, engaged in the gathering and processing of natural gas for the subsequent fractionation, 


\textsuperscript{14}NEF December 2003, Figure 1.3-1
storage and transportation of natural gas liquids - and also a severe terrorist target.

There are three pipelines present on site at the proposed NEF site:

- First, a 25.4 cm (10 in) diameter CO2 pipeline runs underground southeast-northwest owned by Trinity Pipeline LLC.
- Second, a 40.8 cm (16 in) diameter natural gas pipeline owned by Sid Richardson Energy Services Company runs underground along the south property line paralleling New Mexico Highway 234;
- A parallel 35.6 cm (14 in) diameter gas pipeline runs alongside the 16in pipeline, and is currently unused.

As the natural gas requirements of the NEF are considerable and there is no provision for storage tanks on site, the developer will have to contract for supply with one of the local pipelines.

Among the two gas pipelines adjoining the site, the 16 inch pipeline owned by Sid Richardson does not carry commercial grade natural gas, but delivers gas from Sid Richardson wellheads to its nearby gas processing facility 15. Therefore the developer will have to contract for gas supply with the owner of the now unused 14 inch pipeline that shares the same trench.

The sixteen inch pipeline contains unrefined wellhead gas at a pressure of approximately 30lbs pressure. 16

In the 1990s, 3,923 natural gas and oil pipeline releases were reported to the federal Office of Pipeline Safety (OPS), part of the US Department of Transportation. Those releases caused the deaths of 201 people, injuries to another 2,829 people, and cost approximately $780 million in property damages. Major pipeline accidents which cause deaths, injuries, or property damage

15Telephone conversation with Sid Richardson Energy Service Co pipeline engineer Rick Pittam, April 1, 2004.

16Telephone conversation with Rick Pittam, April 1, 2004.
greater than $50,000 occur approximately 4 times per week.

Old pipelines, buried in trenches and often immersed in stagnant water for decades with little or no monitoring, corrode, which presents a particular hazard to nuclear energy facilities that are near pipelines or are served large volumes of natural gas for HVAC purposes. Corrosion leads to explosions. Corrosion is responsible for 59% of pipeline failure rates, according to a Canadian government report. Most of the corrosion-related leaks were on sweet gas pipeline systems in southeastern Alberta, the report said. Internal corrosion was to blame for 59% of pipeline failures during the period from April 1, 2000, to March 31, 2001. The board said it has formed a corrosion team to review requirements and examine all opportunities for avoiding corrosion-related incidents in the future. Of the total of 855 pipeline incidents identified during 2000-01, 89.6% were leaks, 4.1% were ruptures and 6.3% were hits that did not result in a release, the EUB said. The report said the decrease in the number of priority one releases -- ones that require an immediate response -- is attributed to the province requiring the use of sensitive leak detection systems, automated shut-in equipment and pipeline patrols from the air and on the ground.

The 12 members of two extended families killed in one of the nation's deadliest natural gas pipeline explosions at a Carlsbad, New Mexico campsite in 2000 are not forgotten. The Carlsbad disaster caused the worst loss of life from pipelines since the November 1996 Enron Corporation natural gas explosion killed 33 people in San Juan, Puerto Rico. The Carlsbad explosion in a corroded 50-year-old pipeline about 1000 feet from the family's campsite left a crater in the ground 86 feet long, 46 feet wide and 20 feet deep. The National Transportation Safety Board has found the pipe had corroded. The U.S. Transportation Department levied a $2.5 million fine against El Paso Energy Corp., which owns the pipeline, for failing to take safety precautions that


could have prevented the explosion. It is the largest fine sought against a gas transmission company in the history of the federal pipeline safety program. El Paso Energy has said it disagrees with the fine, but the company has settled with some of the surviving family members. On June 19, El Paso agreed to pay $14 million to the surviving family of Bobby Smith.

Seven others are still pending. In the aftermath of the explosion, El Paso Energy has reconfigured its pipeline system to simplify pipeline inspections to uncover corrosion. According to a company spokeswoman, the lines with dips and turns where internal inspection was difficult have been corrected and El Paso has replaced pipes in order to make the system more inspectable. The accident also prompted members of Congress to call for strengthening federal pipeline safety programs. In New Mexico, the Legislature passed a bill this year to strengthen pipeline safety measures by requiring pipeline companies in the state to adhere to federal pipeline safety rules. As of July 1, the state Public Regulation Commission can levy fines of up to $25,000 if companies that own pipelines don't comply with federal safety regulations. Previously, the fines were $500.¹⁹

In June 2000, the National Pipeline Reform Coalition called for a Strong Pipeline Safety Law following the Carlsbad blast, urging federal officials “to commit to reining in the irresponsible and dangerous activities of the pipeline industry," said NPRC President Bob Rackleff. "Support amendments to federal pipeline safety bills that will ensure stricter safety standards, mechanisms for public input into pipeline decision-making, and liability for ruptures."

Three federal investigative agencies -- the Department of Transportation's Inspector General, the General Accounting Office and the National Transportation Safety Board -- recently issued scathing reports about OPS' deficiencies and adverse industry trends. The General Accounting Office's May 2000 report noted that OPS had reduced its use of fines by 90% since 1990, with

¹⁹Corrosion News, August, 2001,
only 1 in 25 pipeline violators now receiving fines. The El Paso Natural Gas Company, whose pipeline ruptured in New Mexico in 2000, had received several violation letters from OPS going back to 1997, but was never fined until after the catastrophe had already occurred. Additionally, in contrast to the hundreds of civil enforcement cases the U.S. Environmental Protection Agency refers to the Department of Justice annually for prosecution, OPS has not referred a single civil enforcement case to Justice in recent years. "Congress must pass a bill this year that ends the Office of Pipeline Safety's lax approach to pipeline safety," Rackleff said.

Pipeline safety reformers have suggested a radical reform of pipeline regulation, including specific, minimum standards for pipeline testing, re-testing and subsequent repairs; leak detection; emergency shut-off; and failsafe mechanisms to prevent overpressurization. Additionally, laws have been proposed to ensure effective civil, criminal, and citizen enforcement, a public right-to-know database which includes data on pipeline segment performance, the types of major risks associated with pipeline segments, segment testing and repair history, credible, independent regional advisory councils (i.e., not selected or funded by the Office of Pipeline Safety) to greatly improve the public's role in pipeline oversight; and liability provisions for ruptures to ensure that releases, not just violations of (sometimes inadequate or non-existent) standards, result in penalties.

Moreover, the NEF appears unsafe in light of recent USDOT pipeline safety standards for “high consequence areas,” which Louisiana Energy Services have conceded to be the appropriate description of a natural gas explosion at the proposed NEF. The NEF proposal would enrich uranium just 500 feet away from two pipelines, and tap into one of the pipelines with a new 12,000 cubic feet per hour pipe running through the compound to a natural gas steam turbine in constant operation in the Central Utility Building.

Under the USDOT standards, the threshold radius is considered a reliable standard for safety in the sense that it reflects the distance from a natural gas leak that could reasonably be expected
to risk direct damage. The parameters are the diameter and maximum test pressure of the pipe.

The general range of actual effect would be around 100 feet for the likely rated level for the low pressure, Sid Richardson 16 inch pipeline carrying unrefined gas, were it the only pipeline to consider, but as we have seen, it is not the only pipeline to consider. As the second El Paso 14 inch pipeline providing commercial grade natural gas will be needed to fuel the proposed NEF’s hot water system, this pipeline will very likely contain commercial grade natural gas a significantly higher pressure to serve the proposed NEF with 12,000 cubic feet per hour. This additional risk factor, to which Louisiana Energy Services hardly even refers, may expand the general range of actual effect above 300 feet. If the 14 inch pipeline’s operating pressure is 500 PSI with a threshold of a 1000 PSI, for example, the actual combined general range of actual effect from an explosion of the two pipelines would exceed 300 feet. Under the USDOT standards, this scenario would require a 660 foot buffer zone in order to give all pipelines an extra margin of safety. Thus the USDOT standards raise their threshold radius to certain fixed values:

“Threshold Radius--Threshold Radius is a bounding radius intended to provide an additional margin of safety beyond the distance calculated to be the potential impact radius. If the calculated potential impacted radius is less than 300 feet, the operator must use a threshold of 300 feet. If the calculated potential impacted radius exceeds 300 feet but is less than 660 feet, the threshold is 660 feet. If the calculated potential impacted radius exceeds 660 feet, but is less than 1000 feet, the threshold is 1000 feet. And, if the calculated potential impact radius exceeds 1000 feet, the threshold is 15% greater than the actual calculated impacted radius.”

20 United States Department of Transportation, Research and Special Programs Administration, 49 CFR Part 192; [Docket No. RSPA-00-7666; Notice 4], RIN 2137-AD54; Pipeline Safety: Pipeline Integrity Management in High Consequence Areas (Gas Transmission Pipelines), AGENCY: Office of Pipeline Safety (OPS), Research and Special Programs Administration (RSPA), DOT.; ACTION: Notice of proposed rulemaking.[Federal Register: January 28, 2003 (Volume 68, Number 18)] [Proposed Rules]
Our calculations indicate the following:

<table>
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<th>Max Allowable Pressure</th>
<th>Pipeline Diameter</th>
<th>Diameter Squared</th>
<th>P x D Squared</th>
<th>Square Root</th>
<th>Natural Gas Factor</th>
<th>Threshold Blast Radius</th>
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<td>200 psi</td>
<td>16 in</td>
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<td>.69</td>
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Clearly, the explosion of either the El Paso or Sid Richardson pipeline could cause the other pipeline to ignite. Accordingly, an estimate could be made of the actual combined general range of actual effect from an explosion of the two pipelines. Under any combination possible in the table above, the combined actual effect would exceed 300 feet, and therefore requires a 660 foot buffer zone under the 2003 USDOT standards for high consequence areas.

The proposed NEF project’s construction could present its own risk factor on the El Paso and Sid Richardson pipelines integrity. There are many examples on the record of construction equipment, drilling and digging equipment colliding with pipelines during excavation, causing metal fatigue that further weakens corroded pipe. Thus, conducting heavy construction to build the proposed NEF could itself cause undetected leaks that might later result in a substantial explosion after the proposed NEF is in operation.

On December 17, 2002, President Bush signed the Pipeline Safety Improvement Act of 2002. According, the U.S. Department of Transportation Research and Special Programs Office of Pipeline Safety (OPS) has formulated rules to change pipeline safety regulations to require operators of certain pipelines to validate the integrity of their pipelines in high consequence areas.
areas. The rules, which will take a decade or more to implement, would apply to operators of natural and other gas transmission lines. The objective of the change is to reduce the risk of pipeline incidents in these areas.

To validate the integrity of their pipelines in high consequence areas under the regulatory change, pipeline operators must implement an Integrity Management Program for such pipelines including periodic inspection and testing and integration of information related to pipeline integrity. The purpose of this report is to assess the benefits and costs of the regulatory change.  

“Natural and other gas pipeline breaks can result in explosions and fires that can impact on human health and safety. The magnitude of this impact differs. There are some areas in which the impact of a pipe break will be more significant than it would be in others due to concentrations of people near the pipeline and who thus could be affected. Because of the potential for dire consequences of pipeline failures in certain areas, these areas merit a higher level of protection. The OPS is promulgating this regulation to afford the necessary additional protection to these ‘high consequence areas’.”

USDOT standards require that Integrity Management Plans be used for regulated pipelines, including analysis of corrosion, including a wide range of measures, including requiring periodic inspection to identify corrosion or damage, establishing criteria to determine appropriate intervals for inspections and tests, and determining hazards to public safety from electric resistance welded pipe. An Integrity Management Program involves integration of all safety significant information about the pipeline....The Office of Pipeline Safety concludes that validation of operators’ Integrity Management Programs through audit and review by outside parties, i.e. the regulator, is necessary to help assure that appropriate actions are taken.

21 DRAFT U.S. Department of Transportation, Research and Special Programs Administration, Draft Final Regulatory Evaluation, Pipeline Integrity Management in High Consequence Areas, (Gas Transmission Pipelines), Docket RSPA-00-7666, June 21, 2002.


On Site Natural Gas Use

The natural gas requirements of the plant are 354 cubic meters/hour or 12,500 cubic feet per hour, but neither propane storage tanks nor available pipelines are identified in the LES proposal.\(^{24}\)

Two (1 operating, 1 spare) natural gas-fired “Fire Tube” hot water boilers heat circulating hot water to 82.2°C (180°F), each operating at a peak duty of 2943.3 kilowatts, 10.045 Million BTUH nominal capacity. Manufactured by Cleaver-Brooks. At operating capacity, one of these boilers will burn $56,000 \(^{25}\) worth of methane gas per year and emit 4990kg (5.50 tons) of CO2 per year, 3910kg (4.3 tons) per year of Nitrogen Oxides (NOX).

Natural Gas Turbine Failure

The hot water powers the NEF’s HVAC Systems via a centrifugal water pump operating at 63.1 L/s (1000 gallons per minute), allowing the HVAC systems to use hot water to heat air in the HVAC AHUs.\(^{26}\)

The natural gas combustion on site is controlled by temperature controllers on the outlets of the two hot water boilers, which increases or decrease natural gas burning rates as required. A constant hot water supply temperature of 82.2°C (180°F) to the HVAC air handler units is maintained. Hot water supply to the HVAC equipment has a high temperature alarm and a high-high temperature shutdown control to ensure that the supply hot water temperature does not

\(^{24}\)NEF Environmental Report December 2003, 2.1.2.5.

\(^{25}\)“Annual Impact of Energy Purchases,” NEF December 2003, Table 7.1-5

\(^{26}\)NEF December 2003, 3.5.4..4.2 and 3.5.4.4.3
The hot water system is located in the Central Utilities Building. The Hot Water System consists of two, 100% capacity systems, with one system serving as redundant back up for the primary system. Each system consists of a hot water expansion bladder type tank, a natural gas fired hot water boiler with boiler circulation pump, a chemical feeder unit, dual primary hot water loop supply pumps, and the associated distribution piping, instrumentation, and controls.

On Site Electricity Use

Projected electricity demand of the plant are 30 MW - enough to power 30,000 residential apartments. Electrical service to the site will be provided by Xcel Energy, which is the local investor-owned electric utility. In order to provide for its 30 MW electricity demand the NEL will build a substation.

Other Onsite Combustibles: Uranium

In addition to distributing and consuming 30 MW of electrical capacity and burning 12,500 cubic feet of natural gas per hour, the proposed NEF will process hundreds of millions of kilograms of pyrophoric uranium materials.

Significantly, these activities will take place in great proximity. The UF6 Handling Area in Cascade Halls 1 & 2 is approximately 150 ft from the Central Utility Building, which contains the natural gas turbines and burns 12,500 cubic feet of natural gas per hour. The Central Utility Building’s Electrical Switch Gear, which distributes the 30 MW into the NEF, lies within 50 feet.

\(^{27}\)NEF December 2003, 3.5.4.4.1
of the gas turbine. Approximately 150 feet east on the other side of the Blending and Sampling Area, the UF6 Handling Area of Cascade Halls 5 & 6 lies within thirty feet of a Liquid Nitrogen Tank. Within each of the three UF6 Handling Areas there are four high voltage electrical distribution stations directly adjacent to uranium feed and product stations, and are specially fitted with two protected low voltage rooms, indicating high voltage electromagnetic fields are anticipated.

The plant is designed to separate a feed stream containing the naturally occurring proportions of uranium isotopes into a product stream enriched in the uranium-235 (U-235) isotope, and a byproduct stream depleted in the U-235 isotope. The process proposed in the application will enrich natural UF6 containing approximately 0.7% U-235 to a UF6 product containing up to 5% U-235. The facility would process 106,442,000 kilograms of Uranium Flouride 6 (UF6) Tails over the 30 year license period of the plant. It will process 5,832,700 kilograms per year of uranium source material UF6 solid and gas Feed, 5,283,300 kilograms/year of UF6 uranium Tails, and will generate 27,220 kg/yr of Special Nuclear Material UF6 product, Uranium 235, every year.

Depending on wind conditions natural gas leaks do not necessarily disperse, but often form a massive column over its source, and can be ignited by a small spark. While the proposed NEF contains extensive gas containment systems to restrict the release of gases from UF6 Handling Areas, the proposed NEF is highly dependent on outside air for its operations, and would not prevent ambient explosive natural gas from a pipeline leak from penetrating every module of the facility - including uranium processing areas, the Central Utility Building and other high voltage areas that could precipitate a substantial explosion.

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28NEF, “Facility Layout Plan,” December 2003, Figure 1.1-4.

29NEF, “Separations Building Module, First Floor,” Figure 1.1-5.

30aType, Quantity and Form of Licensed Material,” NEF, December 2003, Table 1.2-1.
Conclusion

Given the presence of 30 (14 plus 16) inches of natural gas pipeline capacity within 500 feet of the proposed NEF’s UF6 Handling Areas, over 12,000 cubic feet of natural gas being burned per hour and 30 Megawatts of electrical capacity being distributed in a Central Utilities Building adjacent to the Cascade Halls, the presence of large volumes of pyrophoric uranium metals on site, the generally insecure condition of U.S. natural gas pipelines and the more recent targeting of vulnerable U.S. energy facilities by terrorists, the Commission should require Louisiana Energy Services to either relocate the pipelines (as they are doing with the CO2 pipeline) and replace the natural gas-based steam boilers with steam boilers that do not require large amounts of highly combustible fuel; or, at a minimum, the Commission should require the developer to resubmit a new, module-specific analysis of the impact of a worst-case scenario natural gas blast on UF6 containment facilities, including a scenario involving total electricity substation, steam boiler, diesel backup, and Liquid Nitrogen containment failure scenario.

Respectfully submitted,

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