

October 9, 2015

TO: Sam Williams, Senior Consultant, Infrastructure and Government Services - LeighFisher

FROM: Clarence Lyons, Project Manager, Environment & Energy Analysis - EPRI

SUBJECT: **THIRD PARTY REVIEW OF
ELECTRICITY GENERATION COSTS AND HURDLE RATES LOT 3**

OBJECTIVE

In compliance with the guidelines set forth by the United Kingdom's Department of Energy and Climate Change (DECC) in the tender, Electricity Generation Costs and Hurdle Rates (TRN 966/01/2015), LeighFisher secured the Electric Power Research Institute (EPRI) to provide technical review of their findings.

EPRI was requested to review the report in its entirety, with specific focus on LeighFisher's work compared to industry standards, as well as EPRI's internal practices in five (5) specific areas:

- **Assumptions and Methodologies:** sense check on robustness/consistency with best practice of assumptions and methodologies used in the report
- **Values Stated:** view on whether, from evidence seen or from the peer reviewer's experience, the values stated in the report appear accurate
- **Completeness of Analysis:** Understanding on whether there are any gaps in the report/analysis/whether or not the report is complete in its approach.
- **International/Outside perspective:** consistency with Peer Reviewer's experience and knowledge of international approaches/values
- **Uncertainty/Ranges:** provide a view on the approach to calculating and communicating uncertainty around estimates

REVIEWER BACKGROUND

The Electric Power Research Institute, headquartered in Pal Alto, California – USA, conducts research, development and demonstration (RD&D) relating to the generation, delivery and use of electricity for the benefit of the public. An independent, nonprofit organization, we bring together scientists and engineers as well as experts from academia and the industry to help address challenges in electricity. Our work spans nearly every area of electricity generation,

delivery and use, management and environmental responsibility. We provide both short- and long-term solutions in these research areas for the electricity industry, its customers and society.

The worldwide membership that supports EPRI's work and mission comprises more than 1,000 organizations. While most members are electric utilities, many are firms, government agencies, corporations, or public or private entities engaged in some aspect of the generation, delivery or use of electricity. Members work collaboratively in advisory councils that help inform the development of our annual research portfolio. These advisors are fundamental to identifying the critical and emerging electricity industry issues that our research will address.

The specific work outlined in the request from LeighFisher for this tender was managed by a division of EPRI's Environment & Energy Analysis organization that focuses on assessing power generation and storage technologies, specifically the cost, performance, and market trends.

SUMMARY OF REVIEW

The main findings from EPRI's review of the report developed by LeighFisher are as follow:

- **Assumptions and Methodologies:** There were no discernible differences in LeighFisher's approach and assumptions as outlined in the report provided to EPRI.
- **Values Stated:** Based on a review of publicly available documents and EPRI's internal research, the cost and performance estimates outlined in the report are similar in magnitude and nature, given the stated assumptions.
- **Completeness of Analysis:** In comparison to EPRI's review of publicly available information and understanding and expertise in the power generation sector, there were no significant gaps that would significantly alter the presentation of the data in the report.
- **International/Outside perspective:** The report prepared by LeighFisher was consistent with international industry practices and standards.
- **Uncertainty/Ranges:** The uncertainty outlined in the report was consistent with the level of detail for similar scopes of work, in which the goal is to provide higher, screening-level cost and performance estimates for resource planning and energy modelling. Further discussion around accounting for uncertainty in cost projects is discussed below.

As outlined above, EPRI's review found no major concerns regarding the approach and methodology undertaken by LeighFisher in this analysis. In addition, the resulting power generation cost and performance estimates were comparable to values and assumptions held internal to EPRI, as well as those in the public space. Although there were no critical flaws or concerns raised, EPRI did discuss three specific items with LeighFisher.

Treatment of Cost Reduction Profile

EPRI understands that as part of its submittal to the DECC, LeighFisher must address any significant cost variances from the previous year's estimates. The one of particular concern in this year's report was the cost of carbon capture and sequestration (CCS). The approach of first developing three point estimates – low, medium, and high and then applying a cost reduction profile that assumes 100% in the current year for each case coincides with EPRI's development of future cost estimates. Much effort is taken to establish the three point (low, medium, and high) estimate in the current year. This includes a review of commodity, metals, and labor markets. Using any other percentage besides 100% in the first year would introduce more uncertainty and to some degree, undermine the effort of developing low, medium, and high estimate points. In addition, using a percentage other than 100% could lead to misleading cost projections that are overly optimistic or pessimistic.

Technology Performance Availability

As with new technologies that are in early deployment, care should be taken in developing performance expectations for newly commercialized technologies or technologies that are still early in deployment. As mentioned in the report developed by LeighFisher, there is significant uncertainty in CCS plant design and performance. In light of this, it is an appropriate economic assumption to reduce the availability of CCS technologies to reflect it being in earlier stages of deployment, compared to more mature technologies, i.e. GTCC.

Treatment of Cost Reductions for NOAK Nuclear Costs

In discussing the allocation of the 10.2% cost reduction in nuclear costs from the first of a kind (FOAK) installation to a nth of a kind (NOAK) installation with LeighFisher staff, EPRI understands their assertion that the full cost-reduction may not be entirely in capital expenditures for nuclear generation costs. It is highly plausible that some of the cost-reduction may be realized in pre-development costs due to reduced design requirements and stream-lined permitting processes.