

April 13, 2010

CCN 220682

Distribution

SUBJECT: Contract No. DE-AC07-05ID14517 –Report of Meeting with URS on April 7, 2010

Place: URS Offices, 7800 E Union Avenue
Denver, Colorado

Date: April 7, 2010

Persons Attending:

URS:

Navroze Amaria, Project Manager, Energy and Environment Group
Pamela Spath, Senior Consulting Process Engineer
Richard Wisbaum, Technology Director, Oil, Gas and Chemicals
Industrial/Process Business Unit
Edward Sheehan, Senior Consulting Process Engineer
John Jechura, Technology Manager, Biofuels Industrial/Process
Business Unit
Fred Rosse, Mechanical Engineer (via telephone)

Idaho National Laboratory:

Anastasia Gribik
Bruce Wallace
Lee Nelson
Michael McKellar
Vincent Maio
Rick Wood (via telephone)

Purpose:

The Process Engineering group at Idaho National Laboratory (INL) is performing a two part study to describe integration of a High-Temperature Gas-Cooled Nuclear Reactor (HTGR) into process heat applications. The HTGR would be used to supply process heat, hydrogen, and electricity to selected chemical processes. Part one of this study was to develop mass and energy balances for both a conventional process and a nuclear-assisted process. Part two of this study was to perform an economic analysis. The processes evaluated in this study were:

- Hydrogen production (nuclear only)
- Electricity production (nuclear only)
- Synthetic diesel production (via Fischer-Tropsch)
- Synthetic gasoline production (via methanol to gasoline)
- Ammonia production
- Steam Assisted Gravity Drainage (SAGD) of oil sands
- Substitute natural gas production from coal

Under contract with INL, URS completed a review of the documents used to describe the results of the two-part study described above. Written comments were provided to INL in two separate transmittals; the second of which included a list of comments that required additional discussion and clarification. It was decided that the best approach to resolving these differences was to hold a one-day meeting wherein reviewers and authors could discuss the studies and resolve differences of opinion. The meeting accomplished the objectives and proved to be very valuable to both URS and INL. A summary of the major points of discussion are described below.

Discussion:

1. Mr. Amaria welcomed the INL team to URS offices in Denver and provided a brief safety and health overview. This was followed by a brief introduction of all participants.
2. Mr. Nelson provided a description of the objective and purpose of the meeting. The subsequent discussion included resolution of a number of URS general comments.
3. Dr. McKellar provided a brief presentation of the electrical power generation work. Following the presentation, a discussion was held regarding the power cycle heat balance. Based on the results of this discussion, the language of the power generation document will be modified to include a recommendation to improve the heat balance of the power cycle in an effort to further increase the efficiency of the process.
4. Mr. Wallace provided a description of the cost estimating approach and general URS comments related to costing of the conventional and nuclear-assisted processes were discussed and resolved. Additional descriptive narrative will be included in the *Cost Estimate Support Data Recapitulation*, which identifies scaling from publicly available capacities instead of converting them all to common or more preferred capacities. The reported units were maintained in this manner to provide additional transparency and traceability. Mr. Amaria indicated a more complete list of inclusions and exclusions from the cost estimate should be provided, as well as a better basis and costs of the Inside Battery Limits and Outside Battery Limits should be included. Mr. Amaria suggested that the Association for the Advancement of Cost Estimating International cost estimate classification matrix should be used. Mr. Wallace indicated that the estimates were Class 5. It was decided that the class level of the estimate would be described more prominently in the Technical Evaluation documents, particularly focused on the level of accuracy and the basis of the contingency. Further, a clearer discussion should be provided for the 18% contingency, assumption of the nth of a kind plant, and that the estimate does not include any development costs etc. It would be beneficial if a discussion of what the implications of the cost basis being nth of a kind should be provided. Also, URS identified a study prepared by RAND Corporation that could be used to clarify the difference between First of a Kind and "nth" of a Kind cost estimates.
5. URS recommended that a separate study be performed and documented regarding the impact of varying the Internal Rate of Return.
6. Dr. McKellar provided a brief presentation of the hydrogen production work. URS comments on this topic were particularly helpful in improving the quality of the final product. The reviewer was especially helpful in providing guidance on a number of different topics. Also, URS concurred with INL that a separate analysis for conventional hydrogen production via steam methane reforming would allow a better comparison of nuclear-assisted and conventional hydrogen production. URS was provided a copy of the latest update of the TEV dated March 29, 2010, which contained the updated economic evaluation for review.
7. Ms. Gribik provided an overview of synthetic diesel production via the Fischer-Tropsch (FT) process. Mr. Sheehan and Mr. Wissbaum identified some concerns with the process modeled by INL. For example, URS was skeptical that 300 psi steam could be raised from the slurry bubble column and felt that a more appropriate value would be 150 psi. Also, there was a question regarding the model results, particularly the flow rates into the FT reactors. There should have been a difference in FT capital costs between the Coal to Liquids and Gas to Liquids cases due to the large recycle gas flow rates. The cost basis configuration will be updated to reflect the higher recycle gas flow rates. Additional discussions regarding configuration of the FT reactors will be covered in the comment resolutions. Other difficulties associated with the production of synthetic diesel were discussed. These difficulties include loss of organic product into wastewater, large land requirements to support wastewater treatment, trace contaminants found in wastewater, and other realities associated with the process. This discussion regarding wastewater will be included as a recommendation in the final report describing synthetic diesel and gasoline production.

8. Mr. Wood provided an overview of synthetic gasoline production via the methanol to gasoline process. One potential area of concern that was raised during the subsequent discussions is that the value of the final gasoline product may need to be discounted up to 40% because it may not be suitable for sale as a gasoline product. However, the two processes are comparable and it is acceptable to compare the economics of the nuclear-assisted and conventional processes. One additional area of concern is the need to include transportation of synthetic fuels from where they are produced to where they are sold; including any additional processing needed to prepare the fuel for sale.
9. Mr. Wood led a brief discussion regarding the ammonia process model. Several minor issues were discussed and resolved.
10. Mr. Maio provided a brief description of the SAGD process. Following the presentation, a brief discussion was held relative to the format of the study results. Mr. Wissbaum suggested that the cost of nuclear-generated steam be added to the SAGD analysis and compared to the cost of steam from the conventional process. Other minor comments were discussed and resolved.
11. Ms. Gribik provided a brief description of the substitute natural gas process. A brief discussion regarding the approach to presenting the study results was conducted. Also, Ms. Gribik indicated that she would prepare a master reference list that would be used in place of the hyperlinks in the excel spreadsheets to indicate the appropriate sources of information.
12. Mr. Nelson identified some potential additional work for URS associated with the Next Generation Nuclear Plant (NGNP) project and committed to sending draft work documents to URS for consideration. Mr. Amaria commented that URS had some suggestions for future work that he would send to Mr. Nelson.

This meeting was valuable to all participants, particularly to INL personnel who are currently finalizing the integration study results. Subsequent to these meeting minutes, INL will issue revised URS comment resolutions in redline strikeout format. The final comment resolutions will be documented in a URS report and will be used as objective evidence that an independent review of the INL documents has been completed.

If you have any questions, please contact me at (208) 526-3093.

Sincerely,



Lee Nelson, NGNP Project Engineer
Next Generation Nuclear Plant Project

AAM

Distribution

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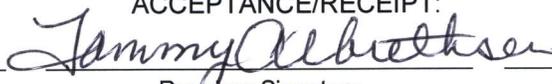
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