Atomic Energy of Canada Limited | L'Énergie Atomique du Canada, Limitée
CANDU Operations | Opérations CANDU

Memorandum

File/Dossier

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1984-07-09

TO: J. Liederman

FROM:: N.-B. Dinh

SUBJECT: SAN ONOFRE NUCLEAR GENERATING STATIONS #1, 2 AND 3 (2650 MWe TOTAL) DECOMMISSIONING COST ESTIMATE. JOB APPRAISAL

This report is prepared with the intention to provide you an overall picture of the performance of the above project and some suggestions for improvement for the future similar projects.

1. DURATION: 84-05-21 to 84-06-12

2. HOURS SPENT: 226 (P), 99 (T), 16 (A)

3. BASIC COST: (Expenses excluded) $ 8,383 CAN [This excludes fringes (14.1% and mark-up (66%)]

   BILLING: (Expenses excluded) $20,395 CAN ($15,436 U.S. @ Exchange rate of 1.320)

5. INVENTORY ITEMS: 650 (SONGS #1)
   940 (SONGS #2 and 3)

6. RESULTS (activity dependent cost only): $ 33.07 M (SONGS #1)
   $160.31 M (SONGS #2 and 3)

7. COMPARISON OF TOTAL ESTIMATES:

N.U.S.	TLG
$ 62.0 M	$ 57.0 M (SONGS #1)
$142.8 M	$238.6 M (SONGS #2 and 3)

8. DIFFICULTIES ENCOUNTERED:

8.1 Incomplete Information: The inventory information provided by the client was limited and vague in many cases. We often had to guess the size of an item and its quantity based on the description and the construction cost respectively. Following are the only documents that we had to do the inventory take-off:

- San Onofre #1 Construction Cost Data
- San Onofre #2 and 3 Construction forecast
- San Onofre #2 and 3 Station Manual - Equipment Data

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8.2 Short Duration: We had only two (2) weeks to do inventory take-off and to prepare computer inputs sheets for all three (3) stations (1590 items). This rush program, in my opinion, tended to create a high percentage of errors.

8.3 ADRS Version Incompatibility: IBM had replaced the old ADRS version (supervisor system) with a new version which did not "understand" fully the data base structure definition software written under the old ADRS version, therefore all commands to produce reports were aborted. This problem appeared to us only when we asked the computer to compute and run the reports after we had finished the input of SONGS #1 inventory in the data base (of which the structure was defined under the old ADRS version). This problem resulted in time loss to redefine the data base structure under the new ADRS version.

8.4 Pumps and Heat Exchangers: The volume and weight of pumps and heat exchanger depend on many design factors such as types, capacity, flow, pressure, material, etc. Therefore, they cannot be estimated quickly and without difficulties, specially when some of the factors are not known.

8.5 Volume Calculation: A software for volume calculation is not yet established and tested in our "Decom" code therefore all volumes had to be calculated by hand. This required more "man" effort.

8.6 Error checking of the take-off data and proof reading of the computer input typing are both tedious tasks. They require good eyes, high level of concentration and a lot of time.

9. SUGGESTIONS

9.1 It is desirable, for this kind of job with tight schedule, to have a written contract which describes clearly the precise scope of work, the conditions and necessary protective clauses.

9.2 We shall perform a trial run of the "decom" code every time the ADRS version is modified or replaced, in order to avoid surprise of incompatibility.

9.3 We can improve our efficiency in the estimation of pumps and heat exchangers by establishing ahead a series of tabulations of volume and weight, similar to the ones published in the decommissioning handbook (DOE/EV/10128-1), but covering larger ranges of design factors.

9.4 It would be very useful to develop and to implement the following software in our "decom" code:
- for volume calculation (from dimensions and shape codes)
- for error checking (rational check and highlight of anomalies)

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9.5 It is worthy to consider the elimination of the unnecessary step of work for filling-up computer data sheets by having the estimators working directly on the computer terminals.

9.6 It may be possible to formulate the correlation between the inventory and the schedule in the "decom" code for the calculation of time dependent cost. If this can be materialized, our "decom" code would be complete and would have a great potential for selling services.

10. CONCLUSION

The job was done on time and to the satisfaction of the client (based on my verbal communications with the client during and after the delivery of final reports). A formal complimentary letter is expected to come shortly.

This is due to the enthusiastic help from the following peoples:

D.J. Partington, C. Pappas, S. Leelananda, G. Pratapagiri, I. Kachef, M. Mayer, and S. Price.

Now I know that we have adequate experienced people and computer code to perform this kind of job (decom. estimates) quickly. However, in order to improve our performance and to render the task easier I would recommend that some development and preparation work, per above suggestions, be authorized to proceed.

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NBD/CG

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