THE DESALINATION PROJECT

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Contents

1. Phase I: Project Feasibility Assessment
1.1. Establish the required output
1.2. The location of the area to be supplied and the nature of the water resources available for the development, e.g.
1.3. The overall water supply development plan and the area/location of the new source having been established, the requirement relating to timescale must now be addressed:-
1.4. Having established the technical feasibility of the development plan on a time base, the cost of the project can now assessed.
1.5. The basic data under 4 will allow an estimate of the probable costs of the project to be compiled including estimates for all the alternative processes.
1.6. The other major factors which must be addressed and resolved during phase I are:-
1.7. How is the product (i.e. the water and/or power) exported from the plant going to be paid for.
1.8. Phase I must also address in detail the resources, timescale and costs required to complete Phase II: the preparation of the detailed engineering study and specifications to enable tenders to be obtained for the completion of the project.
2. Financial Engineering
2.1. Project Finance
2.1.1. Development Grant Funding
2.1.2. Multilateral Agency Funding
2.1.3. Self Financing
3. Phase II: Project Design and Procurement
3.1. Project Management
3.2. Engineering
3.3. Estimating
4. Phase III : Contract Phase
4.1. Organization
4.2. Documentation
Bibliography and Suggestions for further study

Summary

Phase I - Project Assessment: To develop the original concept to satisfy clearly defined objectives. To establish the requirements and select the optimum processes from all the available alternatives to satisfy the requirement at the most economical cost. The aim should be to establish the main parameters and the feasibility of the scheme together with a probable completion cost ±25 per cent.

Phase II - Project Design and Procurement: To develop the project parameters and criteria established in Phase I into a fully evaluated engineering proposal which satisfies all the requirements. The aim should be to provide a detailed design of the project to enable all the equipment to be specified, the civil works and construction to be detailed to enable a cost to completion estimate of ±15 per cent to be prepared. Tenders can then be obtained and contracts awarded for the completion of the project. This should enable a cost to completion, estimated within ±10 per cent, to be achieved.

Phase III - Manufacture, Supply, Construction Testing, Commissioning, Setting To Work And Completion: The contract management role is to ensure that the approved/authorized project criteria have been achieved and that all of the works have been completed to the specified standards within the approved completion cost and on time.

Project Organization and Staffing: The management, staffing and control must be carefully established in each phase of the project and will vary depending on the owner's administration requirements, the country, the area/location and the type and complexity of the proposed project.

1. Phase I: Project Feasibility Assessment

Starting from the original concept it is essential to establish clearly defined objectives which are agreed by all the participating parties.

These must include what the project is expected to achieve, who is going to pay the Phase I project feasibility assessment costs, who is responsible for the management and control of the project assessment team, who will provide/recruit the staff for the project assessment team, and the criteria which will determine if the project is to proceed past the project assessment feasibility stage.

The feasibility study stage of a project should aim to establish five basic criteria:-

1. Identify the required output of the project.
2. Establish possible means of meeting the requirements.
3. Establish the possible cost of meeting the requirements.
4. Establish how the project will be funded. i.e.,

– How will the capital be provided to pay for the completion of the project,
– How will the running (operating) cost of the plant be paid, and
– How will the capital invested in the project be repaid to the investors.

5. How will the capital outlayand running cost be recovered from the revenue generated by the output exported from the plant.

The project assessment team should be staffed by unilateral thinkers who will concentrate on the essential elements to establish the technical feasibility of the scheme, the probable cost and how the project can be financed.

The key stages of Phase I are:-

1.1. Establish the required output

1. Identify clearly the requirement, i.e. the total amount of water required to meet the current needs of the study area for the population, agriculture and industry.
2. Carry out an assessment of the current sources of supply, establish the maximum potential availability with and without development.
3. Prepare in conjunction with the development plan for the area a 5, 10, 15, and 20 year projected total water demand graph.
4. Establish from (2) and (3) above the amount of additional water required to meet the projected total requirement for the 5, 10, 15 and 20 year periods.
5. Examine the potential of the existing sources of supply and establish how much if any can be meet by development.
6. The projected demand which must be fulfilled from a new source of supply for the 5, 10, 15, and 20 year periods can now be established.

1.2. The location of the area to be supplied and the nature of the water resources available for the development, e.g.

Coastal regions:

- River outlet to the sea
- River which can be dammed
- Underground water (wells or boreholes)
- Seawater

Inland regions:

- River
- River which can be dammed
- Underground water (wells or boreholes)
- Piped water from a distance (i.e desalinated sea water from the coast as for example the Al Jobial desalination complex on the Arabian Gulf supplies a major proportion of the fresh water for Riyadh)

A comprehensive study must be carried out to establish the best and most reliable source of water (feed for the desalination plant) to meet the current and future requirements of the area.

The area and the source of supply having been established, the work on the selection of the site can now proceed.

1.3. The overall water supply development plan and the area/location of the new source having been established, the requirement relating to timescale must now be addressed:-

1. How urgent is the current situation?
2. How can the requirements of the 5, 10, 15 and 20 year projections best be achieved?

3. The immediate plan should be based on meeting the requirements of the 5-10 year periods with a phased development taking into account the best available technology. Be conservative when providing for future projected developments; two major factors may change:-

– The projected development demand may not materialize.
– Improvements in technology may provide a more economical alternative solution (very unlikely in the short to medium term i.e. 5-10 years).

1.4. Having established the technical feasibility of the development plan on a time base, the cost of the project can now assessed.

The accuracy of the estimate at this stage will depend on a number of factors such as:-

4. Information on the site conditions.

– Type of feedwater supply source i.e. intake type.
– Foundation conditions.
– Access to site.
– Transport to site.
– Services available to the site.

5. Outline of proposed site layout.
6. Process flow sheets (preliminary).

– Water production (intake to product water delivery) with terminal conditions identified for all supplies and services.
– Power requirement schedule.
– Electrical supply flow diagrams, with power requirements.
– Services requirement schedule.

7. Schedule of major plant and equipment specifications.

At this stage all possible options, i.e. alternative processes and specifications, should be considered to meet the main parameters and criteria established in steps 1 to 4 above.

1.5. The basic data under 4 will allow an estimate of the probable costs of the project to be compiled including estimates for all the alternative processes.

The accuracy of the estimates will also depend on how good the available information proves to be when the detailed engineering assessment is completed in Phase II, and the costing databank available to the estimator from previous projects of a similar type.

To enable estimates to be prepared on a realistic basis it is essential that a databank of information is available such as:-

8. Up to date equipment prices.
9. Civil works costs.
10. Historical pricing on similar type and sized projects.
11. Statistical cost data, e.g. cost per cubic meter of installed capacity for similar type and sized projects.

12. Budget quotations from potential suppliers where possible. The time and man-hours available to assemble the information and prepare the estimate, together with the experience of the staff, will have a major effect on the accuracy of the estimate.

The Phase I, feasibility study stage of a project should not plan to achieve an accuracy greater than ± 25 per cent for the total capital cost of the proposed project.

1.6. The other major factors which must be addressed and resolved during phase I are:-

13. The criteria and procedure for approval for the project to proceed.
14. How the project will be funded, i.e. who will provide the funds to meet the capital cost of the project, and how the funds will be made available during the progress of the project.
15. How are the estimated costs of the possible alternative solutions to be evaluated i.e:-

– Lowest lump sum capital cost.
– Plant life depreciation, based on design life guarantees (formula to be established).
– Lowest life cycle cost (formula to be established).
– Lowest product water cost (formula to be established).
– How are the running costs of the project to be taken into account in the project evaluation.

Clearly if the most economic solution is to be established all of the above must be evaluated for each of the alternative solutions and a formula/method agreed

1.7. How is the product (i.e. the water and/or power) exported from the plant going to be paid for.

In other words, who is responsible for collecting the revenue earned from the sale of the output from the plant or who is going to meet the costs.

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