• Objectives of the implementation studies
  – Establish detailed project schedule and cost estimate for each alternative
  – Input data for economic and financial analysis

• Structure of presentation
  – Project schedule
  – Cost estimate
Project schedule
Project

– Objectives:

- Produce the schedule of works for each dam alternative [1290; 1255; 1220] m asl;
- Identify critical activities and critical path.

– Methodology:

- Software: MICROSOFT PROJECT;
- Identify the main works (hydraulic tunnels, powerhouse, ...);
- Identify the main task (excavation, concrete lining, ...) for each work, and evaluate their duration.

• A detailed implementation schedule (about 270 items)

- Contract activities (technical specifications, tender, evaluation and contract Award, mobilization);
- Roads, site installations, transportation structures;
- River diversion structures and sequences, flood management structures;
- Power system structures;
- Dam works.
Project schedule – Main hypotheses

– Embankment works:
  • 9 months per year, with 3 months of stoppage because of weather conditions (rain, snow and frost);
  • Shell: 11 months per year because of frost.

– Open air works:
  • Aggregate processing: 11 month per year because of frost;
  • Open air concrete: 11 months per year because of frost

– 25 working days per month
– 18 working hours per day.

– Construction rates:
  • Underground works: tunnel excavation and lining (12.5 m/week);
  • Dam: material placement rates (300 000 to 800 000 m³/month)
Project schedule – Critical paths and tasks

– Two critical paths identified

  • **Early generation phase**
    • Powerhouse cavern stabilization works;
    • Powerhouse excavation of units 5 and 6;
    • Concrete and installation of units 5 and 6.

  • **Main dam works**
    • Construction/rehabilitation of transport facilities;
    • Core foundation abutment excavation;
    • Core foundation excavation below elevation 1000 m asl;
    • RCC slab located under the core;
    • Core / embankment.
Project schedule – Contract periods

– Two contract periods in order to reduce as much as possible the overall construction time

• Pre-contract (preliminary works realised by a local contractor)
  • Extracting and stockpile material from quarry 15;
  • Rehabilitation of access roads, Rogun town building, fresh water supply and sanitation, telecommunication;
  • Completion of access tunnel;
  • Rehabilitation of access tunnel;
  • Works diversion tunnel;
  • Contract activities (Technical specifications, tender, evaluation and contract award, mobilization).

• Main contract (works realised by an international contractor)
  • Dam works;
  • Underground works;
  • Permanent equipment;
  • Resettlement works.
Project schedule – Conclusion

– Two contract periods in order to reduce as much as possible the overall construction time:
  • Pre-contract (2 years);
  • Main contract (between 8 years and 11,6 years).

– Total duration of construction:
  • Between 10 and 13,5 years from TEAS validation and GoT’s decision to proceed with the Project;

– Early generation phase:
  • 6 years after river diversion for 1290 and 1255 alternatives;
  • 6,8 years after river diversion for 1220 alternatives.

– A realistic schedule, that nevertheless requires:
  • A good coordination of all activities;
  • An adequate mobilization of equipment and labour as soon as construction begins.

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<thead>
<tr>
<th>Phase</th>
<th>2014 07 08</th>
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<tr>
<td>PHASE 2 – Consultations – Implementation studies</td>
<td>2014 07 08</td>
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<tr>
<th>Key Dates in months counted from the TEAS validation and GoT decision to proceed with the Project</th>
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<tr>
<td>Time from Pre-Contract (in months)</td>
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<tr>
<td>TEAS validation</td>
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<td>River Diversion date</td>
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<tr>
<td>End of cofferdam construction</td>
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<td>End of stage 1 dam construction</td>
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<td>End of dam construction</td>
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<tr>
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<th>1290 masl</th>
<th>1255 masl</th>
<th>1220 masl</th>
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<td>73</td>
<td>73</td>
<td>82</td>
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<td>Commissioning U5 Temp.</td>
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<td>End of Erection U4</td>
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<td>End of Erection U2</td>
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<td>Minimum Reservoir level reached</td>
<td>112</td>
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<td>Temp U5 and U6 shut down</td>
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Cost estimate
Cost estimate

– Objectives:
  • **Terms of References**: “The Consultant shall prepare a project definition stage cost estimate for each option for the Rogun HPP with break down in local and foreign currency”.
  • Establish a detailed **Cost estimate** for each alternatives (9)
    • 3 dam alternatives: FSL = [1290; 1255; 1220] m asl;
    • 3 installed power capacities: High, Intermediate, Low.

– Methodology:
  • Identified main items (dam works, underground works, mitigations measures,...)
  • Define a list of **Unit prices**;
  • Establish **Bill of quantities**;
  • Cost = Sum of (Unit prices * Quantities).

– Hypothesis:
  • Basic case: alternative 1290 m asl (a specific analysis);
Cost estimate – Methodology

– Phase 1 cost estimate: existing works
  • A separated cost estimate is included in Phase 1 report;
  • Useful to identify future works included in Phase 2 cost estimate;
  • Total cost of Phase 1 is not considered as input data for economic and financial analysis.

– Phase 2 cost estimate: future works necessary to complete Rogun project
  • Civil works (TEAS)
    • General project cost (mobilizations/demobilization, camps, roads);
    • Dam works (dam fills, dam excavations, grout curtain, grouting galleries);
    • Underground works (Powerhouse works, hydraulic tunnels, access tunnels).
  • Permanent equipment (TEAS)
    • E&M: electro and mechanical equipment;
    • TL/SS: transmission lines;
    • HSS: hydro-mechanical equipment.
  • Administration and engineering (TEAS): respectively 3% and 2% of “civil works + permanent equipment” costs
  • Operation and Maintenance costs (O&M)
  • Environmental and resettlement costs (ESIA)
Cost estimate – Methodology

– Civil works
  • Basic wages of labour;
  • Basic costs of materials delivered to the site;
  • Capital and operating costs of the construction equipment;
  • Site construction contingencies;
  • Overhead and profits.

– Permanent equipment
  • E&M:
    • Based on installed capacity: cost per KW;
    • Evaluating separately turbines, generator;
    and remaining equipment (balance of plant -BOP).
  • HSS:
    • Doesn't depend on installed capacities;
    • Evaluating main components (gates,...)
Cost estimate – Methodology

– Cost estimate does not include:
  • Land acquisition and right of way (both permanent and temporary);
  • Interests during construction;
  • Taxes, duties and levies in Tajikistan, except for the Contractor’s income tax.

– Physical contingencies are considered:
  • Analysis performed for each specific item (civil works and permanent equipment);
  • Mean value is about 11% of civil works + permanent equipment costs.
Cost estimate – Dam works evaluation

– Evaluation takes into account:

  • Material:
    • Type (rockfill, alluvium shell, core,...)
    • Sources of materials
    • Material stockpiles
    • Conditioning processes
  
  • Ways of transport
    • By trucks / conveyor
    • By roads / tunnels
    • Considered slope and velocities
  
  • Dam phasing (material placement)
    • 6 dam phases

[Diagram showing stages of dam construction with legend for materials and phases]

Legend:
- Core
- Alluvium shell
- Concrete foundation
- Fine filter
- Rockfill shell
- Bituminous core
- Coarse filter
- Rip rap

Stage 1
Stage 2
Loading station 1
Loading station 2
C1
C2
T1
T2
Implementation studies - Conclusion

• Input data for economic and financial analysis are:

  – Cost estimate:
    • Total cost of the project;
    • Local and foreign components.

  – Implementation schedule:
    • Total duration of construction: between 10 and 13.5 years from TEAS validation and GoT’s decision to proceed with the Project;
    • Capex disbursement curve.
THANK YOU FOR YOUR ATTENTION