The Challenges Facing Contracting in Hydropower

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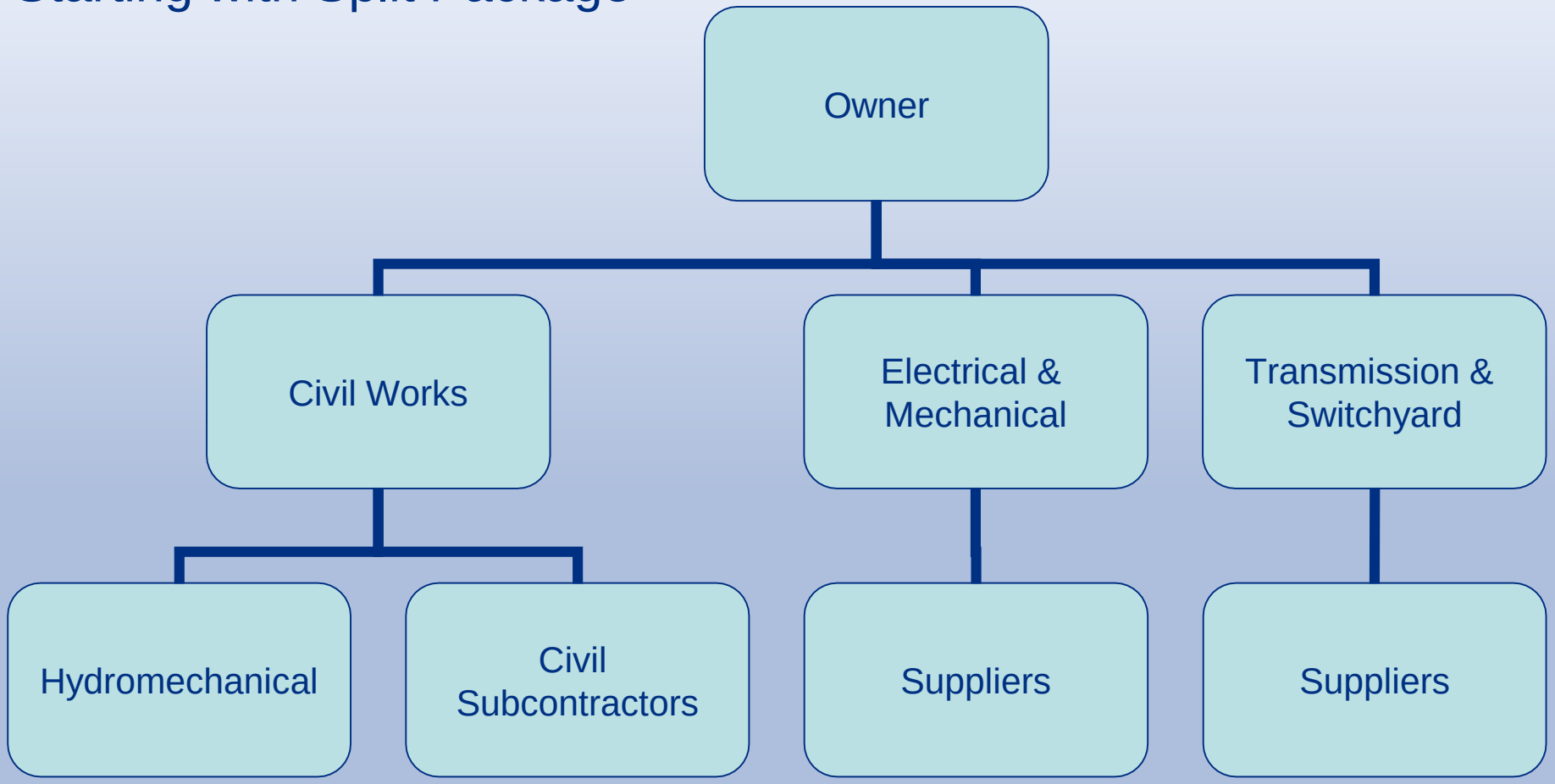
The Challenge

Split Package or EPC

Starting with Split Package



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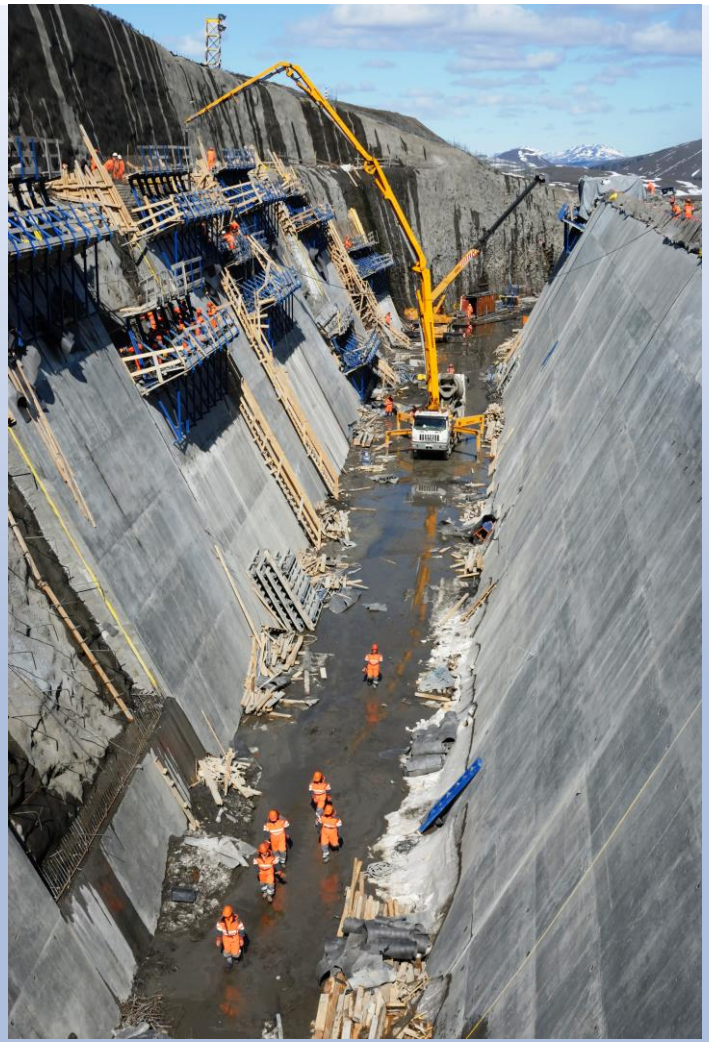
Tendering

- Quality v Cost
  - Most ICB tenders have PQ hurdles, but then are adjudicated on lowest cost;
  - Contractors with good understanding of risk can lose to ones with poor understanding;
  - Little consideration given to performance history, quality, programme, health & safety and other quality factors;
  - “Transparency” requirements often dictate public tender openings and lowest price awards;
  - Financed and ECG requirements can preclude well qualified bidders.

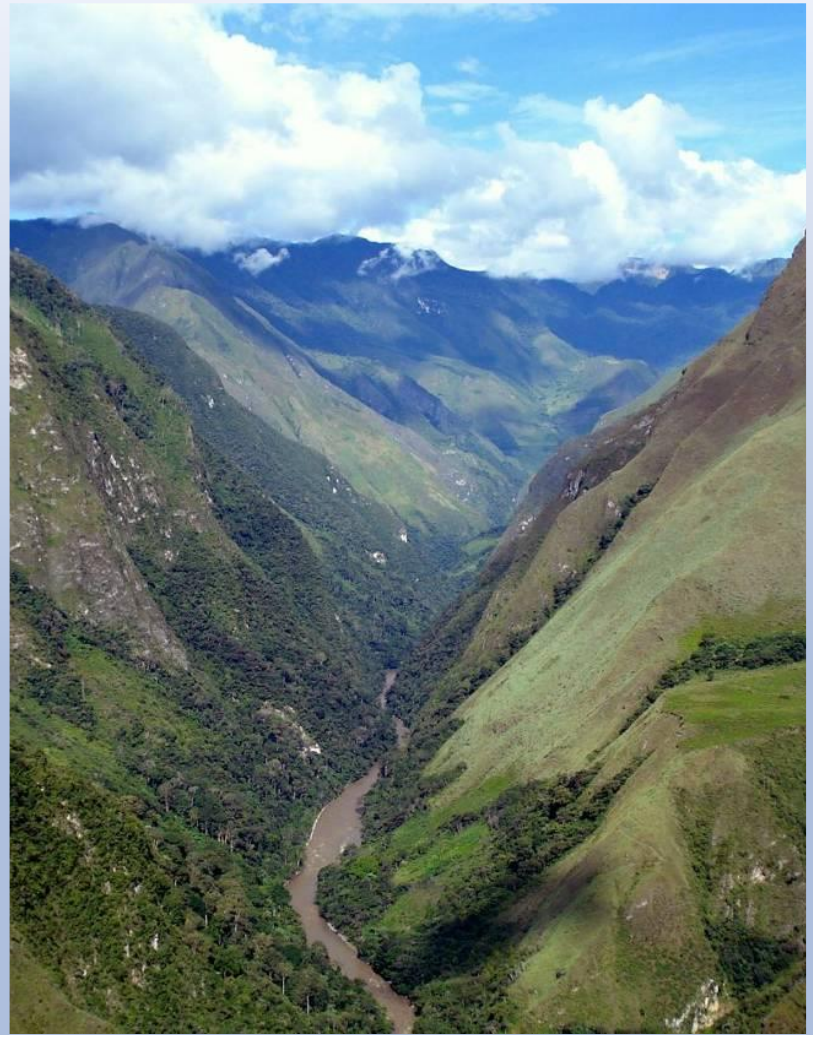
Nature of the Work

- Each Project is Different
  - Little replication
  - Individually planned
  - Virtually everything is bespoke
- High Value Contracts
  - Multi-million $ contracts present high risks (and rewards)
- Unpredictable Works
  - Civil works often encounter unexpected conditions
  - Working with unpredictable materials



Location

- Hydros often in remote and hilly locations
  - Difficult establishment – camps, site roads
  - Unskilled or imported labour
  - Transportation difficulties
  - Provision of utilities (electricity, water, communications etc)
- Need to produce materials on site
  - Quarries, crushers, batching plants for concrete
  - Fill for dams (earth, rock, filters etc)
- Remote from head office support
- Constraints on construction equipment



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Physical Environment

- Schemes often in harsh environments
  - Hot or cold weather challenges the workforce
  - Also can challenge construction (ice plants, moisture conditioning)
  - Expensive equipment maintenance
  - Difficult to keep clean conditions
  - Bad weather can disrupt work and create access problems
  - Bad weather affects productivity
  - Often high earthquake risks
  - Construction windows can be short (winter or monsoon)

Geology

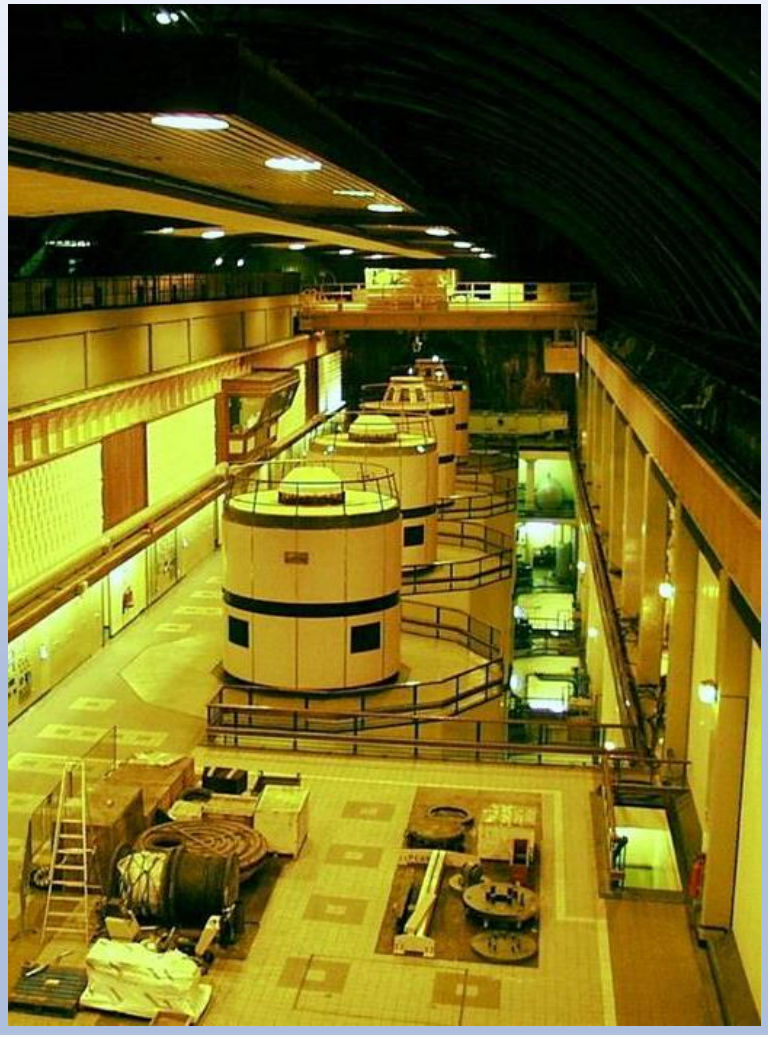
- Hydros often involve underground works
  - Unexpected and unpredictable conditions
  - Difficult to plan construction equipment
  - Difficult to predict progress and productivity
  - Contractor is typically responsible for primary support
- Major excavations and slope stabilisation
  - Dewatering, drainage, protection and rock bolts
  - Temporary excavations usually contractor's responsibility
- Often inadequate Site Investigation
  - Difficult to plan sub-surface works
  - Hard to plan quarrying and borrow operations

Programme, Interfaces and Seasonality

- Programme constrained and driven by external factors:
  - Seasonality of river flow for diversion
  - Weather windows for construction
  - Interfaces with other contractors
  - Access constraints due to other parties working
  - Availability of built-in parts
  - Seasonality of impoundment
  - Time limits for commissioning and commercial operation
  - Loss of revenue (hence high LDs and penalties)

Equipment Specifications

- Equipment specifications are increasingly challenging
  - Growing size and installed capacity of units
  - Rapid start / stop requirements
  - Large range of operating conditions (head, flow etc)
  - High efficiency specifications (with penalties for failure)
  - Design for runaway conditions
  - Requirement for resistance to sediment erosion
  - Conditions can promote cavitation



Performance and Productivity

- Unknown and Unskilled Labour
  - Intense training requirements
  - Unpredictable productivity
  - Need for additional supervision
  - Misuse or damage plant
- Conditions affect productivity of plant
  - Soil / rock hardness affects production of excavation equipment
  - Ground conditions affect tunnelling progress
  - Soil parameters affect compaction performance
  - Weather affected site roads affect haulage

Commercial Risks

- Contract conditions may not fully protect from:
  - Exchange rate movement
  - Cost escalation of labour, materials, fuel, transport and plant,
  - Taxation and duties
  - Industrial action
  - Force majeure events
  - Work permit and licence problems
- Standard contract forms are often highly modified
  - Risks transferred to contractors
  - Uncertainty of interpretation and lack of precedents.

Quality Control

- Nature of hydro schemes present QA/QC Challenges:
  - Geographically dispersed sites can make supervision difficult
  - Materials produced on site present specific quality challenges
  - One-off workforce requires intense training to achieve quality
  - Site conditions can make cleanliness difficult
- Widely dispersed suppliers can lead to quality problems
- Lack of industry experience causing quality issues
- Commercial pressures reducing supervision levels.

Health & Safety

- Increased owner requirements for H&S
- Shareholder pressure for H&S (Contractor's, other stakeholders)
- IFI conditions for H&S and good labour conditions (eg IFC)
- Hydro sites have all the major H&S risks and require careful management:
  - Heavy vehicle movements
  - Working at height
  - Falling objects
  - Cranage and hoisting
  - Underground works
  - Working close to water
  - High voltage electrical systems

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Environmental and Social

- Increasingly stringent environmental management plans
- Hydro schemes have many inherent environmental impacts
  - Visual impacts from major excavations
  - Large spoil disposal requirements
  - Siltation from excavations and clearance
  - High traffic movements
  - Noise and vibration affecting habitats
  - New access potentially affecting habitats
- Imported labour can have major social impacts

Country Risks

- International nature of hydro can present “country” challenges including;
  - Work permits and licences
  - Local regulations
  - Import difficulties
  - National contract conditions
  - Language challenges – contracts, documents and communication
  - National law and arbitration

EPC Issues

- Bidding Costs and Programme
  - Very expensive and time consuming to bid due to design requirements and need to firm up costs
- JV Issues
  - Parties do not understand each other's businesses and unhappy with risks
  - Typically led by civil contractor – often inexperienced in coordinating the other parties
  - Smaller parties unable to share JV risk
- Lack of warranted information
- Contracts often modified to load risk on EPC contractor

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