

contractor. FIDIC, however, recommends it to be used under certain conditions and not to be universally adopted for each and every project.

**a) Use of Turnkey/ EPC contracts for hydro projects-**

The Turnkey/ EPC contracts may be used considering the following aspects related to recommendations of the FIDIC, expectations of the various stakeholders, availability of sufficient EPC contractors, recommendations of the Government and past experience on the success of the EPC/ Turnkey contracts.

**i) Boundary Conditions for use as per FIDIC-**

The FIDIC Silver Book was produced in 1999, in response to a perceived need for a form of contract 'where certainty of final price, and often of completion date, are of extreme importance. Its publishers also recognized that turnkey projects are popular in project financed deals, where lenders require greater certainty about a project's final costs than is allowed for under contracts that reflect the traditional allocation of risks, such as FIDIC's Red and Yellow Books. Later on, FIDIC based on its experience brought out the second edition of the Silver Book during year 2017.

**ii) FIDIC has recommended that EPC/ Turnkey contracts should be used under the following circumstances for infrastructure/ hydro projects-**

- The Employer wishes the Contractor to take total responsibility for the design and construction of the infrastructure facility,
- Employer wishes a higher degree of certainty that the agreed contract price and time will not be exceeded, except that if underground works in uncertain or difficult ground conditions are likely then the risk of unforeseen ground conditions should be borne by the Employer (and the provisions of the Plant and Design-Build Conditions in this respect - Sub-Clause 4.12 - would be appropriate),
- The Employer wishes - or is used to - the Project being organized on a strictly two party approach, i.e. without an "Engineer" being

involved and the Employer does not wish to be involved in the day-to-day progress of the construction work, provided the end result meets the performance criteria he has specified, and

- The Employer is willing to pay more for the construction of his Project (than would be the case if the Conditions of Contract for Plant and Design-Build were used) in return for the Contractor bearing the extra risks associated with enhanced certainty of final price and time.

**iii) FIDIC states that the Silver Book is not suitable for use in the following circumstances-**

- If there is insufficient time or information for tenderers to scrutinize and check the Employer's Requirements or for them to carry out their designs, risk assessment studies and estimating;
- If construction will involve substantial work underground or work in other areas which tenderers cannot inspect, unless special provisions are provided to account for unforeseen conditions or
- If the Employer intends to supervise closely or control the Contractor's work, or to review most of the construction drawings.

**b) Expectations of the Stakeholders-**

The major stakeholders with regard to the contracting mechanism to be applied for hydro projects of CPSE's are owners (Government as equity holders), Debt infusers viz. Banks/ FI/ MBD and the Contractors. The expectations of the stakeholders are as under-

- i) Owners/ Management- The owners/ equity holders (including Government in case of CPSE's) will certainly look for least time and cost overrun. As per NITI Aayog OM dated 5th Sept,2016 regarding revival of the construction sector, it has been recommended to substitute Item Rate contracts by EPC/ Turnkey contracts, wherever appropriate. The Government is also now very serious in clearing RCE proposals and needs certainty in completion cost of the hydro projects.
- ii) Financiers- The financiers always look for certainty in the completion cost and EPC/ Turnkey contracts suits them the best. As per the recommendations of the World Bank vide their e-mail letter dated 6th

Jan,22, they have stated that “FIDIC Redbook (Item Rate Contracts) is not very popular for large power projects as it puts additional risks/responsibilities on Employer”.

iii) Contractors- Since the risk of the unforeseen ground conditions is being transferred to the contractor in case of EPC/ Turnkey projects, so most of the Contractors are not comfortable with EPC contracts. The other reason behind this is the poor financial health of most of the major civil contractors presently executing civil contractors. However, few contractors like L&T which are financially sound and use to EPC contracts welcome this mode of contracting. As per M/s L&T, EPC Contracts gives the Contractor's a better opportunity to optimize the design which in turn leads to cost optimization. However, projects which are confidential in nature, in sensitive zones and for the projects wherein the entire details cannot be shared; Item Rate Contracts may be operated.

**c) Availability of EPC contractors-**

At present most of the civil contractors viz. HCC, Patel, Gammon, JAL, Coastal, etc. executing hydro projects are experiencing poor financial health and so the risk capability is also reduced. Further, the working capital of these companies is not such to execute large hydro projects. Hence, most of the contractors are not comfortable with EPC projects.

**d) Past and present analysis of EPC/ Turnkey contracts-**

During the last 25 years, it has been observed that only about 10 hydro projects have been commissioned in time/ nearly on time. These projects had been executed under both Turnkey/ EPC mode and Item rate basis. Presently out of the 36 under construction hydro projects (above 25 MW), it has been observed that about 10 projects are being executed under EPC/ Turnkey mode and rest on Item rate basis. Based on the present and the past scenario, it cannot be specifically stated that the Turnkey/ EPC projects are best suited to contain time and cost overrun, however, the trend shows that more EPC/ Turnkey contracts are being executed at present than the past. The success of any contract does not depend on the contracting mechanism only and depends on many other factors, viz. use of correct contract mechanism under

the specific conditions, equitable and clear contract conditions, expeditious dispute resolution mechanism, timely payments, use of modern equipment, experienced manpower, timely decision making, etc.

It was observed that NEEPCO, THDC and SJVNL has no prior history of completion of hydro projects on turnkey basis, however, THDC and SJVNL are presently executing hydro projects under EPC/ Turnkey mode of contracting.

#### 6.1.2 NHPC views:

- **EPC Mode** of execution are feasible for projects located in smaller reach, compact in nature, less or no geological surprises (if quantum of underground works such as HRT, TRT, Diversion tunnels etc. are lesser in quantity and geological strata is favorable with limited variability), scope of work is not likely to vary and project cost is not too high so as to ensure availability of eligible and competent contractors. Law and Order conditions, availability of land for quarries / infrastructure should not hamper the progress of work in the future. This type of mode of executing is best suited for projects where the risk determined and perspective bidders can judge the local condition as well as the project profile appropriately.
- **Item Rate / Package mode** of contracts are suitable for large sized projects involving high cost and located in wider reaches, involving higher degree of geological surprises (high quantum of underground works) and scope of work could vary. It is suitable for works which can be split into various items, quantities under each item can be estimated with accuracy and where in-house capability for Design & Engineering and project management is available.
- **The success of contract** does not only depend on the adoption of type of contracting but also depends upon many other factors some of which are detailed hereunder:
  - (i) Choosing of correct mode of execution,
  - (ii) Contract administration in its true spirit,

- (iii) Timely approval of extension of time (EOT), deviations, rate revision, extra items and payment of monthly running account (RA) bills and other related payments,
- (iv) Timely dispute resolution and payment,
- (v) Deployment of right equipment and construction methodology,
- (vi) Deployment of sufficient experienced manpower,
- (vii) Timely decision making etc.

NHPC has also adopted EPC mode of contracting for HM and E&M Packages.

- **Availability of contractors-** Most of the Major civil contractors viz. HCC Ltd, Patel Engg. Ltd, Gammon, Jai Prakash Associates Limited, Coastal, etc. having experience of executing hydro projects are experiencing poor financial health some of them or their associate / subsidiary companies are going through insolvency proceedings, so the risk bearing capability of contractors has been substantially reduced. Further, the working capital of these companies is not such to execute large hydro projects on turnkey / EPC basis. Hence, most of the contractors are not comfortable with EPC projects.

As, availability of competent contractor(s) is a major issue in Hydro Sector, selection of Packages / Turn Key / EPC mode of contract should be considered on case to case basis considering the factors as brought out above (compactness, law and order, quantum of underground works associated unforeseen risk, local issues, investigation details available). As such, the option to choosing the mode of contracting should be left with the PSU to decide.

### 6.1.3 SJVN views:

All modes of contracting, item-rate as well as EPC/Turnkey contracts have their own advantages and limitations. Item-rate contracts offer better risk distribution, especially when uncertainties are higher with substantial underground works. But at the same time, item rate contracts are beset with time and cost overruns. EPC contracts though provide better time and cost certainty but the initial quotes are substantially higher. However, these higher quotes are offset by lower cost overruns during project executions.

Weighing-in all the pros and cons of item-rate and EPC contracts, SJVN has decided to adopt two-EPC mode where underground works are not substantial.

Based on the foregoing, EPC (Civil & HM works as one package and EM separate EPC contract) is most preferred in comparison to Item Rate. We are also not averse to the idea of having one package i.e. Turnkey contract. EPC/Turnkey mode of Contract should be avoided for projects which involve substantial underground works. However, if opted, suitable risk-sharing mechanism for underground works must be included in the Contract.

But it would depend on the features of the particular project as hydro projects are bespoke designed. As of now SJVN is executing two Dam-toe powerhouse projects in Two-EPC mode and is in the process of awarding works on another project also on this mode.

Therefore, the choice of the mode of contracting whether Turnkey, Two-EPC or Item-rate will depend on a no. of factors viz. the extent of underground works involved in the project, Value of the Contracts and availability of contracting parties.

Therefore, a one-size-fits-all approach may not be appropriate and the decision in this regard is best left to the developer of the Project.

#### **6.1.4 THDC views:**

Implementation of Civil Works of Hydro Projects, inherent uncertainty is involved in respect of topography, geology, hydro-geology etc. Due to this detailed design & construction methodology of contractors finalised during execution may widely vary as compared to their bidding stage design & methodology conceived in their bid leading to claims & disputes. Therefore, EPC Contract may not be a successful model for execution of such works unless an appropriate risk sharing mechanism is made a part of tender document. The risk of ground conditions in particular where substantial underground works are involved should rest with the Project Developer and should not be transferred to the Contractor. Further, EPC model does not provide adequate contractual window to the client to intervene in the event of non-performance of the contractor.

Contrary to above, in item rate tenders, contractors are required to quote rate for each individual items of work on the basis of Bill of quantities (BOQ) provided by the Procuring Entity in the Bid Documents. Reasonable variations in quantities are also allowed during the execution in terms of the contract.

Accordingly, Item rate contracts which can salvage the project from the uncertainties may be better to be followed for Civil Works Contract Packages. However, in case of Electro-mechanical and Hydro-mechanical works contract packages involving substantial off-site activities, EPC mode of Contract Condition may be followed.

Further, in Item Rates Contracts, it has been observed that contractors at times quote skewed rates comparison to estimated rates which cause problems in overall execution. Contractor is interested in executing high rated items and tries to increase the quantity of such items during execution. At the same time contractor avoids executing certain items which are low rated and tries to get substituted them by either rightly or highly priced items. In order to overcome such issues, the Bill of Quantity could be split in two parts. One those items, on which Developer is confident about productivity methodology and cost of input or those items for which rates are available in standard schedule of rates. Estimated rates of such items may be disclosed to the bidders and bidders may be asked to quote percentage above or below the estimated rates for the total group. Other items, whose productivity, construction methodology and cost of input are not certain, or which are not available in the standard schedule of rates, contractor may be allowed to quote their own rates of such individual items.

#### **6.1.5 NEEPCO views:**

In EPC Contract, reliance of the Client is concentrated on a single contractor. As a result, the success of executing the project largely depends on the performance of the EPC contractor.

Hydro Power Projects involve various complexities including sub-surface works and geological surprises in various work fronts. Further, the location of Hydro Power Project is mostly remote which lacks infrastructure, accessibility and other facilities. In consideration of these inadequacies, there could be a potential risk involved in relying upon a single EPC Contractor.

In Hydro Power Project executed under Package Contracts, the risks arising out of inadequacies are spread over different contractors which could be advantageous in risk mitigation.

In consideration of the above, while aligning with the view offered by Kanwar Singh Committee in its report Dated May, 2019, EPC contracts can be considered for works involving less uncertainties like Electro-Mechanical and Hydro-Mechanical works. Item Rate Contracts could be advantageous for the Civil works involving sub-surface activities.

### 6.1.6 World Bank Views:

Comparison of FIDIC Yellow Book with Silver Book:

Sl. No.	Yellow Book	Silver Book
1	This Contract model stipulates a single point responsibility on the Contractor to design and build a project fit for purpose stated in the Employer's requirement.	This Contract Model assigns a single point responsibility on Contractor to establish a turnkey project, capable of delivering the functional expectations and meet the performance criteria set out in the Employer's requirement.
2	When balanced risk sharing between Employer and Contractor is to be planned based on capacity to manage the respective risks by both the parties.	When Contractor is required to take wider range of risks including unexpected Site and Ground conditions at the project location and performance expectations.
3	When Employer is expecting lower price of Contract and is accepting further increase in costs only when the particular unforeseeable risks on his side actually eventuate.	When Employer is seeking certainty of final price and completion date but is willing to pay more for firm commitment of Contractor to deliver the expected performance.
4	Contractor is expected to quote competitive prices, since he need not evaluate those risk (taken by the Employer), which he cannot manage.	When Employer is willing to pay more since most of the risks are to be taken over by the Contractor.
5	The Contractor is expected to do detailed designing based on substantial guidance provided in Employer's requirement, about major features of the project.	Contractor is required to have competency to analyse Employer's requirement to convert it into the desired objective of expected project performance.
6	Contractor is required to face the Force Majeure events but is granted	Contractor is required to manage most of Force Majeure events,

Sl. No.	Yellow Book	Silver Book
	relief in time and cost to manage them properly.	adversely affecting the project except for risks of war, terrorism, and civil disturbance, which will be compensated by the Employer.
7	Employer's requirement is provided with major choices and parameters and Contractor is required to convert into proper design and detailed engineering to meet the performance expectations.	Employer's requirement provided here is supposed to describe the principles and basic design concepts of the Plant, only on functional basis and the Contractor is required to convert it into working design, meeting the performance expectations.
8	Tendering procedure with normal time to assess and prepare the offer based on Employer's major choices and general arrangement is sufficient for Contractor's offer.	Tendering procedure should allow sufficient time for investigation of site and initial design by the Contractor for proper pricing of the project.
9	Design engineering proposal in line with basic scheme suggested in the Employer's requirement.	Contractors would be allowed to offer design solution, best suited to his engineering capability and experience.
10	Tendering process will normally not require any interaction between Employer and Contractor since the basic design scheme is provided by the Employer.	Tendering process to permit discussion, if required between Employer and the Contractor about technology and commercial conditions.
11	The Contractor is expected to follow the time schedule mutually agreed by both the parties and to maintain it by corrective measures if it goes behind schedule during execution.	On award the Contractor should be allowed to plan and carryout the Work in his chosen manner, provided the end results meet the performance criteria set out by the Employer.
12	The Engineer appointed by the Employer can monitor the progress of Work regularly and seek revised schedule to completion, if the execution is behind schedule due to any reason.	Employer through its Representative should exercise limited control over the Contractor's work and should in general not interfere with the Contractor's work. Separate PMC Engineer shall not be appointed, and Employer's representative will look after the project.
13	The Employer's Engineer will have power to decide all matters referred to him by Contractor. The Engineer can	Employer can follow progress of the Work and be assured that the agreed time schedule is being followed and

Sl. No.	Yellow Book	Silver Book
	review the progress from time to time and seek compliance about the quality control test specified in the Contract along with test results.	the quality of construction is being maintained.
14	The Contractor is required to meet the various tests specified under “Test on Completion” and “Test after Completion” to the satisfaction of the Employer's Engineer.	The Contractor has to prove the reliability and performance of his plant and equipment to the Employer's satisfaction despite the intermediate tests being otherwise satisfactory.
15	<p>This model is suitable for following expectations of the Employer about the project:</p> <p>a) If Construction work involve substantial underground work or project areas which tenderer cannot inspect.</p> <p>b) If the Employer intends to closely supervise and control the Contractor's Work including review of most of the Construction drawings.</p> <p>c) If the Interim payments are to be released after the decision by an officer of the Employer on his assessment.</p>	<p>This model is not suitable for following expectations of the Employer about the project:</p> <p>a) If Construction work involve substantial underground work or project areas which tenderer cannot inspect.</p> <p>b) If the Employer intends to closely supervise and control the Contractor's Work including review of most of the Construction drawings.</p> <p>c) If the Interim payments are to be released after the decision by an officer of the Employer based on his assessment.</p>
16	If there are any Errors in the Employer's requirement, the Contractor is expected to check or correct them except for those errors, which he will not be able to locate easily. Price variation shall be allowed for serious errors in Employer's data.	If there are any errors in the Employer's data, the Contractor is expected to notice it and correct it without seeking any relief from the Employer since he is fully responsible for proper performance of the project.
17	Yellow book is silent about any pre-tender meeting between Employer and Contractor, probably because the Employer's Requirement are stated in good details (which does not require meeting for any clarification).	Silver Book encourages the meeting of Tenderer before he submits his proposal for mainly design and scope related queries and discussion to understand the Employer's expectations.
18	The Employer shall appoint PMC/ Engineer to monitor and control the project on his behalf, with the	The Employer shall not appoint PMC/ Engineer to monitor the project. However, the Employer's