

**Operational Guidelines For Development of Small Hydro  
Electric Power Projects upto Twenty Five (25) MW**



**Department Of Energy  
Government Of Odisha  
Bhubaneswar -751001**

# **OPERATIONAL GUIDELINES FOR DEVELOPMENT OF SMALL HYDRO ELECTRIC POWER PROJECTS UPTO 25 MW UNDER ODISHA RENEWABLE ENERGY POLICY, 2016**

[See Section-B, Clause-4 and Section-D, Clause-9 & 12 of Renewable Energy Policy, 2016 ]

- 1. Disclaimer** :These Operational Guidelines follow, the Odisha Renewable Energy Policy, 2016 to facilitate its implementation. These guidelines are subject to updating and modification periodically or as per necessity. Any shortcomings or suggestion may be brought to the notice of the issuing authority.
  
- 2. Preamble** :The Government of Odisha in the Department of Energy has notified the Odisha Renewable Energy Policy, 2016 vide Resolution No. 8646-OHPC-21/2016 dated 25.11.2016 with broad objectives of long-term energy security by creating an environment conducive to public private participation and investment in Renewable Energy projects including small hydro projects. The Policy also provides various incentives and support measures including, inter alia, provision for allotment of land, interconnection arrangements, methodology for allocation of projects, transmission and sale of power, concessions in taxes and duties exemptions from various charges etc. The policy itself has been prepared in a comprehensive manner, however with a view to fill-in the gaps and better understanding of the investors regarding the policy provisions, Operational Guidelines are hereby notified for implementation of Small Hydro Electric Power Projects upto 25 MW excluding Micro / Pico Hydro Projects under Odisha Renewable Energy Policy, 2016.
  
- 3. Short Title** :Operational Guidelines for Development of Small Hydro Electric Power Projects upto 25 MW excluding Micro/Pico category under provision of Section-B,

Clause-4 , Section-C, Clause 8.1.5 and Section-D, Clause-9 & 12 of Odisha Renewable Energy Policy, 2016.

- 4. Extent** : It shall extend to the whole of the State of Odisha.
- 5. Commencement** : It shall come into force from the "Effective Date" of Odisha Renewable Energy Policy, 2016 i.e. 25.11.2016.
- 6. Terms & Expressions** : Terms and expressions used in this Operational Guideline, but not specifically defined here, shall have the same meaning as in Odisha Renewable Energy Policy, 2016. [These Operational Guidelines will form an integral part of the Odisha Renewable Energy Policy, 2016.]
- 7. Policy Provisions** : Section-B, Clause-4 and Section-D, Clause-9 & 12 Of Odisha Renewable Energy Policy, 2016.
- 8. Nodal Agency** : Engineer-in-Chief(Electricity), Odisha shall act as the Nodal Agency for development of Small Hydro Electric Power Project upto 25 MW excluding Micro / Pico category.
- 9. STC** : State Technical Committee (STC) constituted concerning the renewable energy projects coming within the purview of E.I.C.(Electricity) as the Nodal Agency in pursuance to para 10.2.2(c) by the Department of Energy Resolution No. 8646-OHPC-21/2016 dated 25.11.2016.
- 10. OREEC** : Odisha Renewable Energy Empowered Committee (OREEC) constituted in pursuance to Para 10.1 by the Department of Energy Resolution No. 8646-OHPC-21/2016 dated 25.11.2016.

## **11. Implementation:**

### **a) Preparation of Pre-feasibility Report (PFR)**

- i) List of identified sites shall be prepared by the Nodal Agency. While preparing the list, preliminary checks shall be carried out to ensure that the projected / estimated potential shall be at least 2 MW. For each identified site, it shall have basic information like Head, discharge of water, sources of water i.e. river / rivulet / stream / canal, co-ordinates etc. vide format at **Annexure-A**.
- ii) The Nodal Agency will send the list with detailed information to Chief Engineer (Project, Planning, Formulation & Investigation) of Deptt. of Water Resources, Govt. of Odisha under intimation to EIC WR.
- iii) Office of the CE (PPF&I) will verify the sites with the available co-ordinates / head / discharges primarily on the following aspects:
  - a) Whether source of water involved in the site is authentic / known source of Water Resources Department.
  - b) Estimated required discharge of water & head available at the site.
  - c) Any other irrigation project whether proposed / existing / in the concept stage which may hamper the SHP development.
  - d) Any interstate related issues.
  - e) Dam safety related issues (if any)
  - f) Any other views which may help in deciding the site for future development.
- iv) Nodal Agency shall prepare the PFR of sites found suitable after consultation as above with CE (PPF&I), WR Deptt. by engaging suitable agencies

### **b) Preparation of Detailed Project Report (DPR)**

- i) Detailed Project Report for feasible sites will be prepared by the Nodal Agency through competent agencies / consultants / institutions along with detailed survey & investigation for the site.
- ii) Model format for detailed report containing key features of the project will be supplied by the Nodal Agency to the agency engaged for DPR preparation so that there will be no incompleteness with regard to

minimum features. Model format of DPR will be as per CEA / CWC standard recommendation (**Annexure-B**).

- iii) Nodal Agency will follow the usual prescribed procedure of Govt. for selection of agencies / consultants for preparation of DPR.
- iv) DPRs shall be vetted by WR Deptt. and thereafter considered for bidding depending on its techno-economic feasibility.

c) **Procedure for allotment of site to developer on the basis of competitive bidding**

- i) Nodal Agency will advertise feasible sites to invite intending eligible developers to participate in the competitive bidding for development of the SHP in accordance with Standard Bidding Documents to be prescribed.
- ii) Selection of the developer for each project will be decided by the State Technical Committee. STC shall examine the requisite qualification, experience, financial strength etc as per the criteria prescribed by the Standard Bidding Document and quoted best offer.
- iii) The recommendation of STC will be submitted to Govt. for necessary allotment of project to selected developer.
- iv) On receipt of allotment letter, developer will be asked to sign a MoU with the Nodal Agency. MoU shall contain terms & conditions of future course of action and necessary steps towards fulfilling the execution requirements i.e. milestones for obtaining Forest & Environment clearance, other clearances requisite, detailed engineering preparation etc.
- v) On satisfaction of the above clearance / approval, Nodal Agency shall sign implementation agreement with developer to facilitate him to go for execution by arranging finance.
- vi) Financial closure shall be completed within six months from the date of signing of Implementation Agreement. If execution of work does not commence within six months from the financial closure, the allotment will be automatically cancelled and security money will be forfeited.

**Basic Information**

- 1) Name of the Site.
- 2) District.
- 3) Sub-division.
- 4) Tahasil / Village.
- 5) River / Stream / Canal.
- 6) GEO Co-ordinates.
- 7) Access such as road, railway.
- 8) Any place of Importance near the site.
- 9) Power Evacuation System.
- 10) Catchment area.
- 11) Flow / discharge of river / stream details in brief.
- 12) Approximate Capacity of the Project in MW.
- 13) Topo Reference.
- 14) Hydrology.
- 15) Head.

**MODEL FORMAT FOR**  
**DETAILED REPORT**  
**FOR**  
**SMALL HYDRO PROJECTS**

**SECTION - I- GENERAL REPORT**

- 1.1 SCOPE OF THE PROJECT
- 1.2.0 INTRODUCTION
  - 1.2.1 Geographical disposition
  - 1.2.2 Topography and physiographic of the Basin / Sub-Basin
  - 1.2.3 Geology
  - 1.2.4 Hydrology
  - 1.2.5 River system / Canal system
  - 1.2.6 Location of Project area
  - 1.2.7 Communication facilities
  - 1.2.8 Climatic conditions
  - 1.2.9 Population
  - 1.2.10 Natural Resources
  - 1.2.11 Socio-Economic Aspects
  - 1.2.12 History
  - 1.2.13 Necessity- Needs and opportunities for development
  - 1.2.14 Choice of Scheme- Alternative Studies
  - 1.2.15 Scheme proposals
  - 1.2.16 Plan of Development

Note: - Only relevant information need be given in case of canal fall scheme.

**1.3.0 SURVEYS AND INVESTIGATIONS**

- 1.3.1 Topographical Surveys
  - Establishment of G.T.S bench marks
  - River Course/Canal
  - Head works /Diversion Site/ fall/ By-pass System
  - Water conduction System

- Penstock, Forebay
- Power House, Switchyard, Tailrace
- Camp / Buildings
- Communication and approach road

#### 1.3.2 Hydrological Surveys

##### a) For high head/ medium head scheme

- River/ stream across sections
- Gauge and Discharge Stations
- Tail Water curves

##### b) Canal fall schemes

- Canal discharge data

#### 1.3.3 Meteorological Surveys

- Rain gauge stations
- Meteorological observatories

### 1.4 WATER RESOURCES (HYDROLOGY)

#### 1.4.1 Surface water

- Catchments area
- Existing uses
- Rain fall data
- Climatological parameters like temperature humidity-wind, sunshine etc.
- Gauge and discharge data
- Sediment (suspended and bed-load) in flow and grain size composition
- Flood estimation

#### 1.4.2 Water Quality

- Dissolved and suspended materials
- Suitability of water

#### 1.4.3 Design Flood (Wherever applicable)

#### 1.5.0 GEOLOGY

##### a) For high / Medium head Schemes

- Regional Geology
- Geology of diversion site/ Power House site. Regional Geology
- Geological explorations



- Drill holes- pits etc.

- Seismicity

b) Canal fall schemes

- Soil bearing capacity under structures proposed

1.6.0 CONSTRUCTION MATERIALS

1.6.1 Sources and tests carried out

1.6.2 Requirements - quantities of principal construction materials

1.6.3 Concrete Materials

- Coarse aggregate

- Fine aggregate

1.6.4 Masonry Materials

- Stone

- Bricks

- Tiles

- Fine Aggregate

1.6.5 Cement pozzolona, lime and kankar

1.6.6 Steels

- Structural Steel

- Reinforcement steel

- Plate steel

- Special steel. etc.

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1.6.7 Scarce materials

- P.O.L.

- Explosives

- C.G.I. Sheets etc.

- Gas

1.7.0 PROJECT PURPOSES

1.7.1 Present development

- Existing power facilities

- Generating capacity

- Transmission system

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- System loads
- Load factors
- 1.7.2 Proposed Development
  - Existing markets
  - Growth trends
  - Load forecast
  - Firm power
  - Secondary power
  - Installed capacity
- 1.7.3 Transmission system
- 1.7.4 Rural Electrification
- 1.8 CONSTRUCTION PROGRAMME
- 1.8.1 Bar chart showing quantity-wise and item-wise target of construction
- 1.8.2 Material planning
- 1.8.3 Plant and Equipment Planning
- 1.8.4 Man power Planning
- 1.8.5 Dewatering
- 1.8.6 Workshop and transport equipment
- 1.8.7 Mode of Construction
  - Departmental
  - Contractor / Agencies
- 1.8.8 Organisational set-up
- 1.8.9 Services and utilities (wherever applicable)
  - Colony
  - Water supply
  - Power Supply / Construction Power
  - Sanitation
  - Telephones
- 1.8.10 Procurement of Materials
- 1.8.11 Work programme- Season wise
- 1.9 COSTS
- 1.9.1 Abstract of Cost

**1.9.2 Quarter – wise / Year-wise phasing of expenditure**

**1.10 BENEFITS AND FINANCIAL ASPECTS**

**1.10.1 Direct Benefits**

- Firm power
- Secondary power

**1.10.2 Financial Aspect**

- Expenditure
- Annual operating
- Maintenances
- Replacement costs

**1.10.3 Cost Benefit Ratio and Annual Returns**

**1.10.4 Financing (cash flow studies) and schedule of repayment of loans.**

**1.11 ENVIRONMENTAL AND ECOLOGICAL ASPECTS**

- Site selection
- Physical aspects
- Resource linkage aspects
- Public health aspects
- Preventive / corrective measures
- Estimation for measures

**SECTION – II DESIGN REPORT**

**2.1.0 WATER AND POWER STUDIES**

**2.1.1 Data available**

**2.1.2 Parameters of diversion structure**

**2.1.3 Capacity of water conductor system**

**2.1.4 Power Potential**

- Installed capacity
- Load factors
- Firm power
- Secondary power

**2.1.5 River Diversion during construction**

## 2.2 DESIGN CRITERIA OF MAJOR COMPONENTS OF SCHEME

### 2.2.1 Barrage / weir / intake

- Axis
- Section (sluices, over-flow section, head –regulator, road bridge)
- Design criteria (as applicable)
- Gates and operating bridge (as applicable)
- Spillway (as applicable)

### 2.2.2 a) High head / medium head schemes

- Water Conductor System
- Alignment
- L-Section
- Typical Cross- Section
- Hydraulic design
- Lining
- Sub-surface drainage
- Cross drainage works
- De-silting chamber

### b) Canal fall Schemes

- Automatic by –pass arrangement for canal power house

### 2.2.3 Fore bay with sill escape

- Design criteria
- Typical section
- Diurnal storage

### 2.2.4 Penstock

- Layout
- Hydraulic and structural design
- Economic diameter

### 2.2.5 Power Plant and Power House-

- Layout (installed capacity, stages of construction)
- Structural design criteria
- Generating equipment (Turbines, Generators, Governors, Switch panels)

- Mechanical equipment and auxiliaries

(Water supply, compressed air, Oil and dewatering system, Generator hall, draft tube and gantry crane, Pressure relief and butterfly valves, air- conditioning and ventilations systems, fire-fighting, equipment etc) (Whatever and wherever applicable).

2.2.6 Auxiliary Power Supply

2.2.7 Switchyard

2.2.8 Grounding System

2.2.9 Transmission lines

2.2.10 Power Circuits and lighting circuits

2.2.11 Telephone system

2.2.12 Tailrace Channel

- Draft tube gates
- Tailrace rating curve

**SECTION –III COSTS AND ESTIMATES REPORTS**

3.1.0 ESTIMATES OF COSTS

3.1.1 Major items of work and exploratory notes

- Outline of the Schemes
- Brief description of main component and structures

3.1.2 Abstract of Cost

- General abstract of cost
- Detailed Estimates costs
- Exploratory notes
- Detailed of provisions made under various sub-heads
- Brief explanation for the basis of provisions

3.1.3 Composition of Units

Unit-I Head works including diversion weir / barrage regulator etc.

Unit-II Water conductor system

Unit-III Hydro Electrical installations

- Power Plant and appurtenant works

i) Civil works

- ii) Power equipment
  - Transmission lines
  - Sub-stations

**3.1.4 Accounts Classification**

- Direct charges
  - I - Works
  - II - Establishment
  - III - Tools and Plants
  - IV - Suspense
  - V - Receipt and Recoveries on capital account
- Indirect charges
  - a) Capitalized value of abatement of land revenue
  - b) Audit and account charges

**3.1.5 Provision under I - Works**

- A- Preliminary
- B- Land
- C- Works
- D- Power Plant appurtenances (Civil Works)
- E- Buildings
- F- Plantations
- G- Miscellaneous
  - I- Maintenance
- J- Special T and P
- K- Communications
- Losses on stock
- Unforeseen items

**3.1.6 Analysis of rates for working of machinery**

**3.1.7 Analysis of rates for principal items of work.**

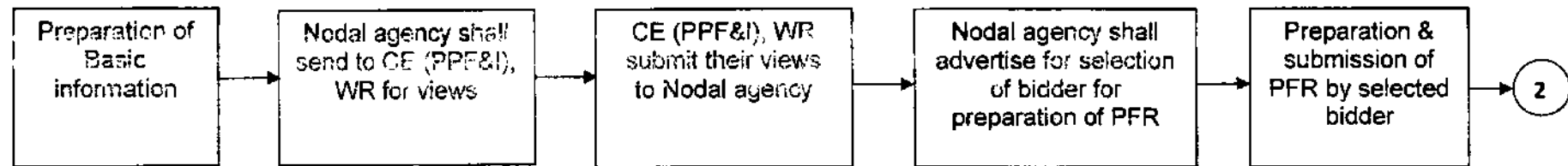
**SECTION –IV DRAWINGS**

- Index map of the scheme showing the location of major components
- Catchments area plan showing location of Hydro meteorological stations
- L-Section of the river/ canal showing maximum flood level, minimum water level etc.
- X-Section of the river at head works

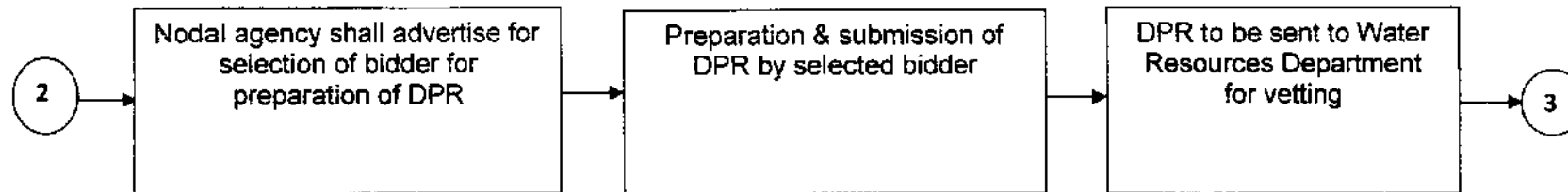
- Stage discharge curve of the site at Head works and Power House and Tail Water rating curve.
- Plan showing location of the bore holes drilled and pits excavated site geology and bed rock contours etc.
- Section along the axis of the head works showing MWL, FRL DWL, LWL, Log of bore holes drilled, pits excavated along the axis upstream and downstream.
- Cross- Section through spillway (if applicable)
- X-Section of the power house generating system from inlet to outlet.
- Layout plan of power house and appurtenant works with contours
- L-Section of the Power House
- Plan of the Power House at different elevations
- Map showing the general layout including the head works, water conductor system, power house, step-up substation .outgoing transmission lines etc.
- Penstock alignment showing the ground profile and position of anchor blocks
- Single line diagram showing switching scheme, instrumentation and Protection scheme.
- Switchyard layout plan with conductors
- Plan and section of anchor blocks
- Colony layout plan
- Typical plan and section for residential and non-residential buildings
- Master control network for construction programme of the scheme
- Bar Chart, showing the construction programme and programme of development of benefits
- Details of typical cross drainage work
- Layout plan, L-section and typical X-section of tailrace channel
- Layout plan and section of de-silting chamber with contours
- Layout plan section of forebay / balancing reservoir with contours
- Layout-plan pf head works and section with contours
- Layout, L-section and typical X-section of water conductor system with contours.

## Flow Chart for Operational process for development of SHP

### Preparation of PFR



### Preparation of DPR



### Selection of developer by competitive bidding and execution of the project

