

Online training of SAARC Professionals on Small, Mini and Micro Hydro Power Generation (Sept 13 - 17, 2021)

Policies and Regulations for SMMHP Development

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- Existing policies of SAARC member Countries
- Required features for policy
- Regulations for SHP

Learning Objectives

Policies and regulations prevailing for SHP Projects

Policy Development

The development of adequate enabling policies is a key element to boost the development of SHP projects.

- Formulation of appropriate legislative frameworks to encourage private investment in the development of SHP.
- Promote SHP development through technical cooperation among the countries of the region.
- Exchange information on SHP development and management through workshops, seminars, publications etc.
- Assist in the development of a regional market for SHP technologies and expertise.
- Elaboration of adequate policy frameworks to avoid conflicts on the national and international levels.

Possible Stakeholders Involved

(Source: Strategy formulation)

Governmental	Ministries responsible for regulation of the proposed policies and/or measures
	Energy regulators
	Sub-national governments (state and local governments)
Public sector	Public utilities (central/state/municipal)
	Public banks or investment promotion agencies
Private sector	Industry associations and chambers of commerce
	Key industrial companies
	Private utilities
	Private banks
	Other business with relevant interests in the NAMA measures
Non-Government Organizations and civil society	Non-Government Organizations from various areas
	Civil society representatives (<i>e.g.</i> indigenous or religious groups)
	Political parties
Supporting institutions	Domestic or multilateral development banks
	International development agencies
	Observers from regional institutions or partner countries
Research and academia	Universities and research institutions
	Think-tanks
	Technical experts and advisers

Engage at Multiple Levels With a Full Range of Stakeholders

- Private investors: they can help to boost the investments in SHP projects because Governments alone might not be able to manage power generation due to difficulty in obtaining and mobilizing funding.
- Existing or budding independent power producers
- Community: they play a large role in the development of SHP projects as they can be organized in a cooperative for electricity that could help in building stronger project ownership, reduce costs, have productive end use, and build local capacity.

Engage at Multiple Levels With a Full Range of Stakeholders

- Donor organizations: to whom SHP projects, can be offered/persuaded as an appropriate opportunity of people's development and poverty reduction.
- GEF-5 projects that will focus on promotion of private sector participation; and diversify the funding sources, including Public Private Partnerships (PPPs), Energy Services Companies (ESCOs) and Special Purpose Vehicle companies (SPVs).
- Local suppliers and manufacturers: establishing a network of local SHP equipment suppliers and manufactures could boost the community's economic growth and create expertise that could serve as a basis for the development of new projects.

Demonstrate Technology Use

- Building up SHP demonstration plants and electricity distribution systems will help to show the state of the art planning, designing and constructing SHP projects.
- These projects should also encourage capacity building with the government for the promotion of SHP, including the development and replication of successful business models .

Demonstrate Technology Use

- the project formulation should focus the technology transfer, replication, scale-up and integrated activities aimed at addressing barriers and reducing the risks to private sector investment in SHP projects.
- Monitoring, evaluation and reporting of each project for suggesting preventive and corrective measures be done.
- Lessons learnt from demonstration projects be disseminated may be useful for capacity building.

Licensing methods

- WHAT IS ALLOTMENT/licensing/concession/permission OF SHP ?
- METHOD OF ALLOTMENT
 - BIDDING PROCESS
 - MOU METHOD OF ALLOTMENT
 - SWISS MODEL OF DEFENSE
 - OWNERSHIP MODEL
 - JOINT VENTURE

Project Allocation

The respective state governments depending on the geographical constraints, commercial viability, innovation required allocates the Hydro potential sites for the development of Hydro schemes:

1. Through tariff based Competitive Bidding Process
2. Minimum VGF quoted
3. Maximum Upfront Premium (Tender Premium)
4. Unsolicited proposal
5. Based on Royalty (min. 12% free Power to state)

Existing Models

PPP (BOT) Model



- Build Operate Transfer: A Public Private Partnership model, where private party is encourage to undertake a cluster of small hydel projects in a river basin.

EPC Model



- The respective state governments implement the projects through EPC mode. The contractor is responsible for construction of the project.

Public Sector Model



- The center/state level government agencies or corporations undertake the project implementation. Example: NHPC –National Hydro Power Corporation

Community Model



- In the remote hilly areas, local communities are handed over the task of operating & maintaining the hydel power plant which is sufficient to meet their energy needs.

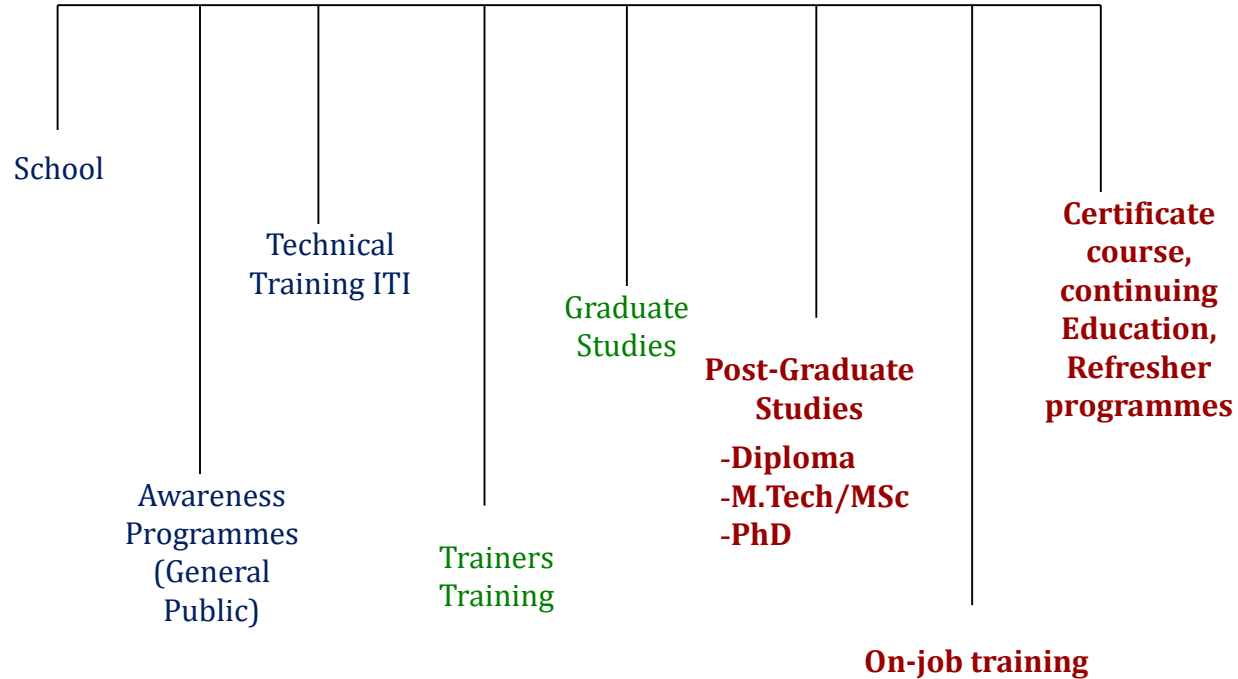
Ownership Model

The project may be:

- Built Own Operate and Transfer Mode (BOOT)
- Built Operate Transfer (BOT)
- Built Operate Lease Transfer (BOLT)
- Lease Rehabilitate Operate Transfer (LROT)

In all this model after specified period the entire project, including its related to water structures and power generation, shall be transferred to the state government free of cost.

Classification of Training and Education Levels



Manpower Requirement for SHP by HRED IIT Roorkee

In an optimistic estimate, a plant of 1 MW (an average size)

Stage	Education Level			Semi/ unskilled	Total
	Engineeri ng	Diploma in Engg.	Technicia n ITI		
Planning	1	1	2	--	5
Design	1	1	--	1	3
Execution	1½	2	1	14	17.5
O&M	¼	1	2	2	5.25
Sub Total	2.75	5	7	17	18.75
Grand Total	• During planning and construction : 15/MW • During O&M : 5.25/MW				

Process of allotment – Strategy

- Scope for Hydro Power development in region/country
- Participation & Prequalification
- Projects
- Process of allotment
- Facilitation to be provided by government
- Sale of power
- Wheeling charges
- Evacuation of power
- Banking
- Dispatch
- Royalty/Duty/Taxes
- Incentives if any by government
- Transfer of allotment
- Time limit for executing the project
- Role of state utility
- Role of Irrigation department
- Regulatory oversight
- Due diligence
- Power to resolve difficulties
- Renovation, modernization and management of existing power plants

FACILITATION TO BE PROVIDED BY GOVERNMENT

- For efficient interaction with other Government Departments, government should declare a nodal agency and constitute a technical body for clearing the project proposals in time bound manner.
- IPPs are required to obtain clearance from the Departments of Forests, Irrigation, Geology & Mining, Revenue, Environment, and District Administration. Police, Public Works Department (PWD), Aviation as the case may be.
- Allotment of Land: Optimum requirement of land for implementation of a particular project shall be allotted/sold at a premium / lease.

SALE OF POWER

- The IPP can contract to sell power to any HT consumer within Government to local rural grids which are not connected to main grid, to rural power distribution entities.
- In case of power supply to any rural interior areas, where SHP project may come up, can make suitable arrangements for sale of power to a group of rural consumers in a stand-alone generation and distribution system subject to fulfillment of requirements of regulatory commission.

WHEELING CHARGES

- The infrastructure and facilities of state utility, as may be available, will be made available to all IPP for wheeling the generated energy at a wheeling charge regulated by electricity regulator.

EVACUATION OF POWER:

- Should be provided free access.

BANKING

- IPPs may be provided the facility of banking of energy within fixed period spans of 6 months.

DESPATCH

- Priority will be accorded for dispatch into the grid by these IPPs ahead of merit order and any other source of supply, subject to any overall restrictions on the proportion of power that may be bought from such sources, which may be imposed by Regulator in the interest of keeping the overall cost of power purchase within reasonable limits.

ROYALTY/DUTY/TAXES

- A token royalty may or may not be charged per kWh generated basis.
- No further levies, taxes, charges be levied by the Government

INCENTIVES BY GOVERNMENT

- Taxes may be waived by the Government on power generation, transmission equipment and building material for projects.

TRANSFER OF ALLOTMENT

- Free transfer of shares will be permitted in the companies allotted projects.

TIME LIMIT FOR EXECUTING THE PROJECT

- IPP should sign a Memorandum of Understanding (MOU) with Nodal Agency for the development of the project with different milestone which may arrange from 2 – 5 years. Such implementation should improved surveys and investigations, report, financial closure, engineering designs, land acquisition etc.
- Failure to reach to milestone should result in a liability to pay penalty by the IPP to the government.

ROLE OF STATE UTILITY

- Should have facilitating role in time bound manner.

ROLE OF IRRIGATION DEPARTMENT

- The discharge available in the canals of Irrigation Schemes/projects will be let out by the Irrigation Department based on availability of water in irrigation canals/Rivers only. The release of water in canals will be under sole control of the Irrigation Department, Government and no claims for compensation on this account will be considered.
- IPPs be allowed to utilize acquired canal land (subject to availability) for setting up infrastructure for power generation on lease as per terms and conditions set forth by the Irrigation Department. Initial lease period will be of 35 years.
- IPPs may obtain consent from Irrigation Department for the design of works only connection, which shall have the bearings on safety, and operation of the canals.
- The cost of Remodeling/Improvement works of existing Irrigation Schemes/Projects due to the SHP project shall be borne by IPPs that may be necessary for setting up of SHP Projects (utilizing canal discharge).

REGULATORY ACTION

- Aspects of this policy that require Regulatory approvals from the concerned regulatory commission would be subject to such approvals being given and would apply in the manner approved by the Regulator.

DUE DILIGENCES

- IPPs be responsible for carrying out due diligence with regard to his compliance responsibilities under various applicable Central/State/other laws, rules and regulations, and ensure compliance with the same.

● **RENOVATIONS, MODERNISATION AND MANAGEMENT OF EXISTING POWER PLANTS**

Small hydropower stations which have outlived their original life span and some of them are working at sub optimum level or became defunct in the absence of due attention required to scheduled maintenance, renovation and modernization. This might have resulted in unplanned outages and frequent breakdowns. As a result, availability factor and the Plant Load Factor of plants may be below satisfactory level. To increase the operating efficiency of the existing plants introduction of professional management and renovation and modernization programme may be required. The process of renovation and modernization involves substantial investment. The government should proposed to throw open the renovation and modernization of some of the existing SHP plants to private sector (joint sector) or NGOs or cooperative participation which can help in bringing in more efficient management practices leading to greater availability of power.

Private Sector, or NGOs or cooperative be allowed to operate/manage the plants wherever necessary. Such participation by the private sector or NGOs or cooperative may follow the following routes:

- a) Lease, Rehabilitate, Operate and Transfer (LROT)
- b) Joint ventures with ASEB/Successor Company;
- c) Sale of existing plants to private sector or to any joint sector venture.

Afghanistan

- Specific objectives of the Afghanistan Rural Renewable Energy Policy (ARREP) of 2013 are to increase income generation of households by increasing energy access, provide affordable, clean and sustainable lighting, heating and cooking devices, reduce health and environmental impacts of energy use.
- The ARREP is limited to RE and rural electrification through RE off-grid systems to supply energy needs for rural population.
- In line with the Government's plan to meet 10 per cent of national demand with RE by 2032 (350-450 MW), the Afghanistan National Renewable Energy Policy and Strategy focus on stimulating privately-financed projects, both small- and large-scale.
- According to the Policy, projects up to 200 kW can be implemented under the auspices of the MRRD, while projects of less than 15 kW that are implemented by parties other than the Government do not require licensing.
- Environment Law of Afghanistan promulgated in 2007 requires planning for sustainable use, rehabilitation and conservation of biologic diversity. Environmental Impact Assessment (EIA), promulgated in 2008, established the process of conducting environmental assessments for development activities.

- The limited reach of regional grids means that smaller scale off-grid renewable energy (RE) technologies, such as small hydropower, solar PV, solar thermal and wind, can play a significant role in the provision of energy.
- Afghanistan has significant renewable resources, primarily in the form of hydropower. In mountainous areas, there is sufficient head to make even very low flow streams effective, and glacier-fed streams provide year-round minimum water flow.

Bangladesh

- Development of renewable energy is considered an important part of the Government's fuel diversification programme and a scheme to provide clean power to communities with no access to the grid.
- The Government has set targets to increase the share of renewable energy in the energy mix to 10 per cent (2,000 MW) in 2021 and maintain the share at 10 per cent (4,000 MW) until 2030.
- Favourable taxes and duties have been imposed on renewable energy equipment in Bangladesh

Legislation on Small Hydropower

- Environmental impact assessments (EIA) are mandatory for site selection and construction of any hydropower plant that requires the construction of a dam or any other type of obstacle

Bhutan

- The electricity tariffs in Bhutan is determined in the Tariff Determination Regulation 2016.
- Bhutan enjoys availability of enough low-cost medium and large projects and the small hydropower projects are not currently viewed as an attractive option due to their high cost of development.

India

The main points characterizing small hydropower and renewable energy policies (varying among states) of state Governments include:

- 24 States namely Arunachal Pradesh, Andhra Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Mizoram, Orissa, Punjab, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh and West Bengal announced policies for setting up commercial small hydropower projects through private sector participation.
- The facilities available in the states include wheeling of power produced, banking, buy-back of power and facilities for third party sale;
- Small hydropower sites with a combined capacity of over 7,000 MW have been allotted to the private sector for development;
- Many states permit power banking, i.e., supply to the grid of electricity surplus generated by an Independent Power Producer in the rainy season in exchange of the receipt of the same amount of electricity from the grid in the dry season, for a period of a few months to one year;

- Buy-back of small hydropower is generally based on the guidelines issued by the Central Electricity Regulatory Commission (CERC), with variations given by the respective State Electricity Regulatory Commissions (SERCs).
- Some states provide other concessions such as lease of land, exemption from electricity duty and entry tax on power generation equipment;
- Some states do not levy any water use charges, known as water cess, on the quantity of water or head used by the power plant, while some levy it as a percentage of electricity tariffs;
- Some states have prescribed the minimum quantum of power produced from renewable sources, renewable purchase obligation (RPO) to be purchased by State Distribution Licensee up to 10 per cent in incremental manners. Renewable energy certificate (REC) trading is not very successful;
- Some states have imposed minimum environmental flow during lean season, and monitoring is preformed using automatic devices with real-time data being published online. Some states have not implemented environmental flow regulations and thus are attracting protests of activist.

Legislation on Small Hydropower - Nepal

- Electricity Act (1992), Electricity Regulation (1993), Water Resources Act (1992) and its regulation are the key legal documents that pave the entry of the private sector in development of power projects.
- Licence is required even to proceed to investigation works for a project of 1 MW of capacity or more. There is a two-stage licensing system.
- The first stage is a survey licence issued for a maximum of five years to carry out a feasibility and environmental study.
- The second stage is a generation licence granted for a maximum period of 50 years for construction and operation of a power plant.
- At the end of the term of the construction licence, the licensee has to hand over the project in a good operating condition free of cost.
- The Hydropower Development Policy (2001) updated the duration of generation licences to 35 years for domestic projects and 30 years for export-oriented projects.
- The long-awaited National Electricity Regulatory Commission Act was promulgated in 2017 to regulate the electricity sector in Nepal.
- The Electricity Act (1992) waives the licensing requirement for hydropower projects of less than 1 MW of capacity, provided the project is registered with the District Water Resources Committee and forwarded to the Department of Electricity Development (DoED).

Nepal

Most of the small hydropower projects in Nepal are owned by the domestic private sector. Capacity and confidence levels of domestic developers, investors, contractors and consulting firms have been raised due to a number of factors:

- Local financial institutions have been providing loans to SHP projects;
- The Government's announcement of power purchase agreements on a take-or-pay basis;
- Tariff rates have been fixed for the base year at the time of commercial operation date of the power plant, and the escalation rate and escalation period were set;
- On-going reforms in the power sector;
- Commitment to provide 17 per cent return in equity;
- Assurance to provide VAT on civil works (approximately 5 million US\$/100 MW after the commercial operation date of the project);
- 100 per cent income tax exemption for 10 years from the commercial operation date and 50 per cent income tax exemption for five years; etc.

For rural communities, the development of small off-grid hydropower plants is a key priority

Pakistan

In 2006, AEDB introduced the Policy for Development of Renewable Energy for Power Generation, which became the first policy aiming to promote renewable energy projects in Pakistan. The policy set the goal to achieve a 10 per cent share of renewable energy in the country's energy mix by 2015.

The policy specifically focuses on solar, wind and small hydropower projects. The objectives of the policy are to:

- Increase the deployment of renewable energy technologies in order to diversify the energy supply mix and improve energy security;
- Promote private investment in the renewable energy sector via incentives and by developing renewable energy markets;
- Mobilize financing and facilitate the development of a domestic renewable energy manufacturing industry in order to lower costs, improve services, generate employment and improve local technical skills;
- Increase per capita energy consumption while promoting environmental protection and awareness, especially in remote and rural areas where poverty can be alleviated and the burden on women collecting biomass fuel can be reduced.

Legislation on Small Hydropower

- The National Electric Power Regulatory Authority (NEPRA) approved a maximum of PKR 8.32 (US\$ 0.068) per unit for the upfront tariff for small hydropower projects up to 25 MW under Section 31 (4) of the Regulation of Generation, Transmission and Distribution of Electric Power Act 1997.
- According to the NEPRA, comparatively small capital investment and short gestation periods are required to complete these projects. That is why it undertook measures to simplify the investment process for small investors, including the introduction of an upfront tariff.
- The tariff provides certainty to the potential investors, allows fast-tracking the development of commercially attractive small hydropower sites and material risk coverage to the investor.
- The economic attractiveness of the upfront tariff was further enhanced with the tariff being adjusted for each site depending upon the plant factor.

- In April 2015, the Power Generation Policy 2015 was published by the Private Power and Infrastructure Board (PPIB) after its approval by the Council of Common Interests.
- The main objectives of the policy are to
 - provide sufficient power generation capacity at the least cost;
 - encourage and ensure exploitation of indigenous resources;
 - ensure that the interests of all stakeholders are taken into account to create a win-win situation for all;
 - be attuned to safeguarding the environment.
- The policy deals with private sector projects, public sector power projects where required by the project sponsor, public-private partnership (PPP) power projects and power projects developed by the public sector and subsequently divested.

Sri Lanka

Primary legislation on small hydropower projects, the Sustainable Energy Authority (Act No. 35 of 2007, which has objectives of developing renewable energy resources, declaring energy development areas and promote energy security, reliability and cost effectiveness in energy delivery and information management) plays a role of a regulator who has control over the hydropower resources and the land requirement for the project.

Detailed information on project development process is contained in a publication titled “A Guide to the Project Approval Process for On-Grid Renewable Energy Project Development” and is cited in the subsidiary legislation as a binding acceptance, making the guide a part of the small hydropower legislation.

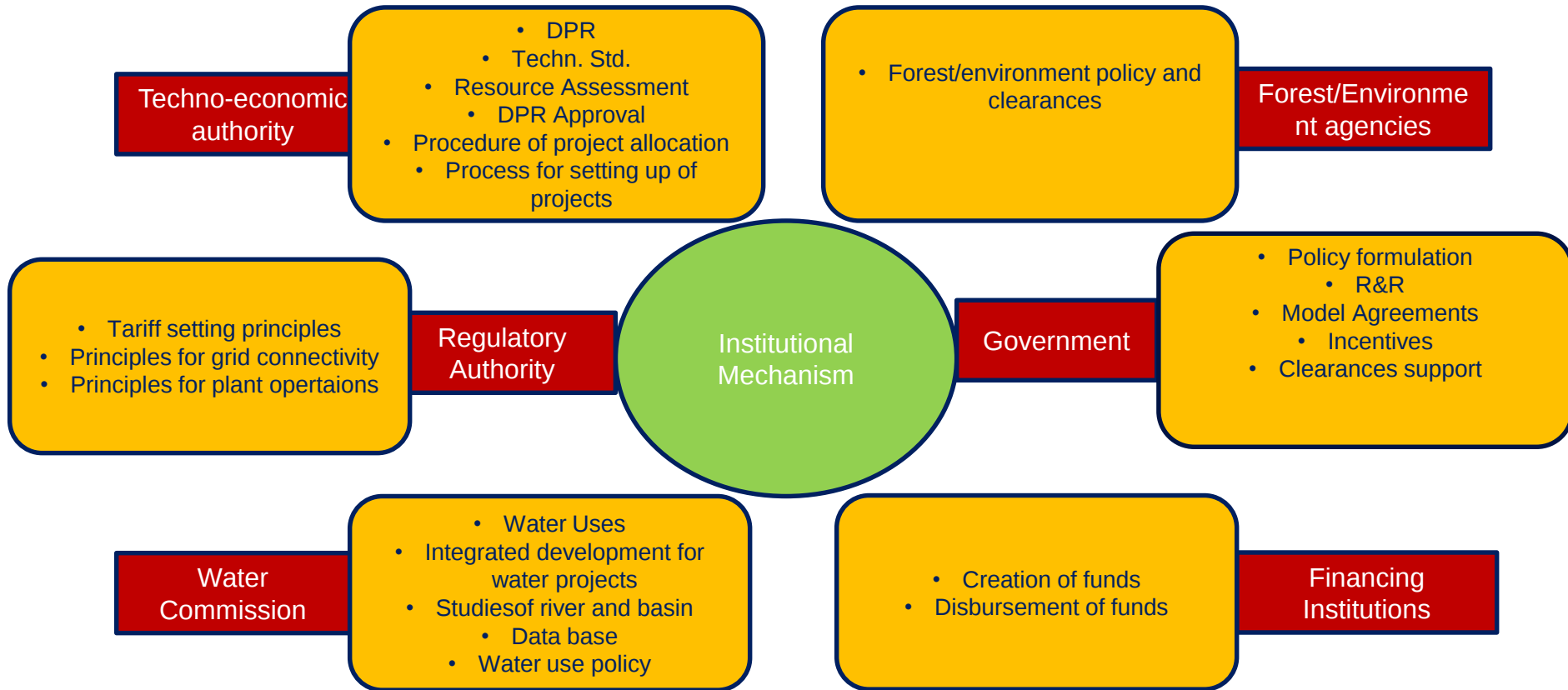
Salient features of the SPPA

- A complete avoidance of market risk: the Ceylon Electricity Board assures the purchase of all that is produced by a small hydropower project
- A floor price of 90 per cent of the tariff: ensuring a steady and predictable cash-flow
- A long-term commitment: the SPPA lasts 20 years and is based on sound legal provisions.

Key Policy Ingredients

Objective of Policy

- Should set target based on realistic potential assessment
- Create appropriate investment environment for private sector
- Fiscal and financial support for suitable projects
- Transparent project allocation process
- Institutional mechanism – clearance mechanism, roles and responsibilities, coordination and monitoring, disbursement of fund, R&R aspects, if applicable
- Business models
- Off take of power – transmission, tariff setting, model contracts etc.
- Support to manufacturing and R&D
- Capacity Building



Item	Himachal Pradesh(< 5MW)*	Arunachal Pradesh	Madhya Pradesh
Land Allotment	Permanent structures – Govt. Others – lease to developer	Land shall be acquired and leased to developer against payment of land revenue	water carrier system, substation and power house construction – Govt. land
Operative Period	40 Years, after transfer to govt. at free of cost	50 Years	BOOT basis – 35 years or life of project whichever is earlier
Sale of Power & Tariff	Rs. 4.59 per unit to HPSEB	To state govt. at 10p lower tariff as per SERC/CERC or for sale outside India.	Total or balance energy (left after third party sale / captive use), to be purchased under REC mechanism on APPC rate
Wheeling	For captive use at a fee of 2% (including losses), outside state. 1% of energy	SERC decides	Wheeling and Transmission charges as per decision of MPERC.
Banking	Allowed	permission of State Gov. required	Allowed on payment of 2% of banked energy.
Water Royalty	No royalty up to 5 MW for 12 years, 12% for next 18 years and beyond at 18% for sale within the state	-	Water rates not payable for water consumption when there is no consumptive use of water.
Power evacuation	Cost to be borne by developer	Cost to be borne by developer	Cost to be borne by developer
Incentives	Upfront premium exempted for projects -up to 2 MW. Above 2 MW and up to 5 MW - Rs.45,000/- per MW with ceiling of Rs.75,000/-	Tribal developer exempted from supplying free power to state govt.	Tax exemption on machinery/plant for 5 years, Electricity duty exemption Carbon credits etc.

BOOT – Build Operate Own Transfer

*Himachal Pradesh SHP Policy has separate provisions for capacity >5MW

HPSEB – Himachal Pradesh state electricity Board

SERC – State Electricity Regulatory Commission

CERC – Central electricity Regulatory commission

Off Take of Electricity

- Option to utilise generated power
 - Sale to distribution Utilities
 - Sale to third party
 - Captive use
- The Utilities to have the first right to purchase power/energy

Tariff Determination

- Regulator to determine tariffs for grid connected SHPs
- The tariff should be issued for the complete life span of the projects.
- Indexation formulae for capital cost - to incorporate the impact on future technological advancements
- Cost plus approach
 - to provide adequate return to the investor; a surety of return will lead to larger investment in renewable power.
 - Reduction in the cost of generation can be addressed
- Subsidy/grant to be factored into the tariff

Delivery Mechanism

Load Dispatch

- SHP generation can be intermittent in nature
- To encourage promotion of SHP is awarded a must dispatch/priority
 - Germany, Philippines, India
- To maintain better grid discipline SHP generators can be asked to give their schedule of generation – Sri Lanka
 - No penalty imposed if generators fail to match the schedule
- **Generators** should be encouraged to furnish an annual forecast that includes the following:
 - anticipated monthly generation availability, and
 - Scheduled Outages for each year; .

Institutional Mechanism in Bhutan

Method of allocation of projects



- They are allotted through competitive bidding process.
- All bids need to be provided with bid security.
- The process is based upon the Up-front Premium and Royalty power/energy as per the request for bids(RfB).
- Most of the projects are developed under BOOT Model with a concession period of 30 years.

Public-Public partnership



- The Royal Government of Bhutan (RGoB) awards projects through Public-public partnerships in which the RGoB and the participating governments have majority shareholding in the Public sector companies.
- RGoB has a 51% undertaking.

Public-Private partnership



- RGoB directly allocates projects to Royal Government undertaking.
- Private partner is selected through the project allotment process.

Strategic partnerships



- An investor can be selected without bidding as a strategic partner having maximum shareholding of 26%.

Project Ownership



- Investment in small hydropower projects will be addressed through the Renewable energy policy of Bhutan.



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Thank you

