IDENTIFYING POLICY INTER-LINKAGES FOR THE ULTRA-LOW-HEAD MICRO HYDROPOWER SECTOR DEVELOPMENT TOWARDS LOW CARBON ENERGY TECHNOLOGY DEPLOYMENT IN INDIA

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ABSTRACT

Current global development agenda becomes more complex and interdependent: for example, sustainable industry development needs to be focused on socio-economic and environmental aspects in its development pattern. If low carbon energy technology (LCET) is deployed for it, the policy will need to cover at least energy, climate change and development policies such as livelihood or industrial development, which are closely interrelated each other. These policies are often measured by the different units for the assessment – e.g. energy accessibility, greenhouse gas reduction potentials and or number of employment, etc. Ideally, the policy should achieve in multiple at the same time and compatible indicators. Several policy instruments are available in India (FIT, subsidy etc) to promote renewable energy in various policy contexts. The paper identifies current policy instruments on energy and climate change as an example. It also discusses opportunities in the LCET related policy framework based on a case study of ultra-low head micro hydropower technology (a net hydraulic head of 1.2 to 3.0 m) in India towards development perspective.

1. BACKGROUND

Across the globe, energy agenda is being shaped by two predominant factors of addressing energy security through reliable, affordable and sustainable forms of energy, and need to shift energy production and consumption towards cleaner, efficient and greener patterns for climate resilience. It is important that energy services are delivered to the deprived to attain adequate living conditions through access to food, water, shelter, health care, education, and employment (Reddy, 2014).

According to the International Energy Agency (IEA) estimates, the world energy-induced CO2 emissions will increase by 57% during 2005–30, and in this India will account for 14% of those emissions (IEA, 2012). It is also expected to be the second-largest contributor to the increase in global energy demand by 2035, accounting for 16 percent of the rise in global energy consumption.

To reduce the impact of climate change through greenhouse gas emissions, it is widely accepted that a variety of renewable and low-carbon electricity generation and energy efficient technologies must be deployed across the globe. The sustainable industrial development
actions should include the strategies those focus upon reducing the dependency of industries on fossil fuels and therefore climatic impact by decreasing the carbon emissions and applying the locally available renewable energy technologies. Such actions will not only help in socio-economic development through viable enterprise development but in sustainable environment development as well.

In India, about 0.4 billion population (45% rural and 8% urban households) do not have access to electricity (IEA, 2012; NSSO, 2011), and 90% in rural, 33% of urban households do not use clean cooking fuels. On a global scale, India is the world’s fourth-largest energy consumer with total primary energy consumption of 621 million tons oil equivalent in 2008.

The transition to a low carbon economy by adopting low-carbon low-emission technologies (LCETs), India could herald an economic and social transformation that will improve economic opportunities, living standards and lesser environmental threats. From the policy perspective and people’s discourse it appears that there is realization about low-carbon economy, therefore, there is focus upon enhancing technological innovation in renewable energy investments and promotion.

Since 2013, a pilot project on ultra-low head based micro hydro technology (ULH-MHP) has been on-going through transferring the first kind of LCET in India. This technological transfer focuses on fostering inclusive and sustainable industrial development through enhancing productivity, creating new job opportunities, boosting the use of clean and affordable energy, and providing training to the local communities through knowledge management and business model creation. It will also set up replicable technology transfer mechanisms and work upon building policy and institutional framework while fostering strategic partnerships among various interest groups.

This ultra-low head based technology is an inclusive project intervention that brings state-of-the-art technology and energy production connected to the rural industry sector such as agro-industry and energy supply services, while ensuring the national capacity for local manufacturing and investment opportunities as well as replication in a business model framework. A first pilot project of 10 kW in Uttarakhand (India) has been successfully
installed, while initial business partnerships have been established for local manufacturing, and a master plan and capacity development plans are under development with Indian counterparts.

The study identifies and reviews the current key policies related to such ULH-MHP deployment as a case example of providing sustainable decentralized energy generation while considering climate change agenda in India. The inter-linkages of existing policies and policy instruments are discussed.

2. IDENTIFICATION OF INTER-LINKAGES IN HYDRO POWER ENERGY AND CLIMATE CHANGE RELATED POLICIES IN INDIA

The total installed capacity of renewable energy systems in India is 211,766 MW as on January 2013. The potential of Small Hydro Power (<25 MW) has been estimated to be 20,000 MW, while installed capacity is 3,496 MW as on Dec 2012. Out of 29 Indian states, 24 states already have policy for private sector Small Hydro Power development Projects.

At federal level, the Ministry of New and Renewable Energy (MNRE) is mandated to promote; deployment of grid-interactive renewable power generation projects, renewable energy initiatives, supplementing energy needs in rural and urban areas, industries and commercial establishments. It promotes research, design and development activities on different aspects of new and renewable energy technologies, and helps in development of new product manufacturing in Renewable Energy Sector. It has also issued guidelines to the State Governments for developing policies on renewable energy development with special focus on small and micro hydropower.

In India, water is state subject, thus the State Governments are responsible for hydropower development and federal government provides them the advisory support. The policy framework is provided at the national level (Table 1). The implementation of policy instruments are available in various Indian states. The regulatory framework for renewable energy is also evolving in all major states, Central Electricity Regulatory Commission (CERC), Central Electricity Authority (CEA) etc, are declaring, revising, and modifying renewable power regulatory framework such as RE policy, RPOs, Feed in Tariffs (FITs), Renewable Energy Certificate (REC) mechanism, grid connectivity and forecasting provisions etc. on a regular basis.

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<th>Table 1: Chronological list of key national policies related to hydro energy and climate change</th>
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<tr>
<td>Name</td>
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<tr>
<td>Energy Conservation Act</td>
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<td>National Electricity Act</td>
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<td>(MoP Govt. of India-2003)</td>
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<td>National Electricity Policy (MoP Govt. of India-2005)</td>
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<td>National Rural Electrification Policy (MoP Govt. of India-2006)</td>
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<td>National Tariff Policy (2006)</td>
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<td>National Action Plan on Climate Change (MoEFCC)</td>
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<td>Hydro Policy (MoP Govt. of India-2008)</td>
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There are public, private entities and policy instruments in place, those specially focus and promote alternate green energy promotion (including micro hydro), and their easy accessibility to reduce the burden of greenhouse gas emission. The MNRE finds important contribution of renewable energy in the overall socio-economic and environment development in India. It promotes financial incentives for SHP & MHP through IREDA, tax holiday on grid interactive power generation projects and special subsidy for watermill development.

The MNRE that promotes small scale hydro (up to 25MW) has its focus on renewable energy initiatives to cater the needs in rural and urban setups including in industrial applications, while it is mandated to track renewable energy regulatory frameworks. During 2012-2017, MNRE targets that out of the total installed grid interactive power generation capacity, 2% should come from small hydropower (including micro hydro). It also focuses to lower the cost.
of equipment, to increase its reliability and to set up projects in areas which give the maximum advantage in terms of capacity utilization. Under Central Financial Assistance (CFA), the MNRE has provisions for financial incentives in micro-hydro projects (MHP up to 100 kW) to public and private agencies.

The Hydro policy 2008 to National Electricity policy 2005 talk about promotion of decentralized hydro-electric potential and provision of long term debt financing. The National Tariff Policy 2006 encourages state regulatory authorities to fix a minimum percentage renewable purchase obligation (RPO) by promoting such initiatives.

Central Financial Assistance (CFA) for Small Hydro (SHP) and Micro Hydro Power (MHP) is an instrument to promote specific size of hydropower systems. For example, the MNRE supports the development of Micro Hydro Projects (up 100 kW capacity) through Central Financial Assistance (Rs. 1,25,000 per kW) in the projects implemented by the State Government Departments, State Nodal Agency, Local bodies, Co-operatives and NGOs. National Clean Energy Fund (NCEF-2011) (MoF 2010) was created for supporting research and innovative projects in clean energy technologies. Any project or scheme relating to innovative methods to adopt to Clean Energy technology and Research & Development, shall be eligible for funding under the NCEF.

The MNRE has initiated an exercise to track the evolving renewable power regulatory framework and develop a repository of information (MNRE 2014). This exercise is expected to help understand the dynamic nature of the renewable energy regulations and related issues and also create a platform to share information on pertinent issues. The information comes in the form of monthly updates, consolidated renewable energy regulatory framework data and monthly renewable power generation report.

Indian Ministry for Environment, Forests & Climate Change (MoEFCC) is also of the view that the government and agencies working in India should focus upon appropriate climate adaptation and mitigation measures through deployment of energy efficient low carbon technologies (WWF India 2014). The low carbon technology agenda is linked to energy sectors. The Technology Development Board (TDB), Department of Science & Technology, Government of India has initiated the Facility for Low Carbon Technology Deployment (FLCTD), which aims to promote and adopt increasing use of new technologies which shall require lower consumption of Energy to Industrial applications (TDB-2014).

Figure 1 describes the chronological development of policies and inter-linkages among ongoing policies and instruments related to ULH-MHP sector development through public partner partnership mechanism in India. Energy and climate change policies and policy instruments have evolved since last 15 years in India. Some energy policies have wide focus and mandate. For example, National Electricity Policy (2005) is aimed to support lifeline to the targeted households in below the poverty line (BPL) category through the provision of subsidy. National Rural Electrification Policy (2006) focuses upon improved accessibility, availability, reliability and quality of electricity by considering the affordability of the customer to pay. The main scope of Hydro Policy (2008) is the deployment of hydroelectric potential at a faster rate to promote small & mini hydroelectric projects, whereas other
thematic area are incorporated in the small & mini hydro projects. National Action Plan on Climate Change (2008) has important indicators on renewable and green energy agenda. The cross-cutting policy suggests increasing the share of renewable energy in the total energy mix at-least up to 15 percent by 2020.

Fig. 1: Evolution of key energy and climate change policies and policy instruments with the scope of indicative thematic scope. The range of thematic scope is indicated based on the emphasis on the policy. An example of inter-linkages relate to hydro power policy are highlighted with arrows to show how various policies could overarch between energy policy and other related policies (red). The further linkage to policy instruments (e.g. funds, subsidy) are also indicated with arrow (green).

Those related policies could inter-link as prioritized policy framework, to synergize the outcomes to overarch multi thematic areas – development/livelihood, energy and climate change. With respect to the policy instruments, such as Central Financial Assistance for Small Hydro and Micro Hydro Power and National Clean Energy Fund could provide a holistic understanding of ULH-MHP sector development activities.

In addition to the policy side, the initiatives like ‘Climate Parliament’ has been pressurizing government to encourage private sector investment in renewable energy sector and provide additional central assistance to such states that constantly add renewable energy to the grid.
MNRE’s strategic plan for new and renewable energy sector for the period 2011-17 has a target of adding 21,000 MW by 2017, while NAPCC targets 15% share of renewable energy in the grid by 2020.

Based on the understandable but also pragmatic multiple policy framework, further designing of private sector involvement can be sought. Timely and predictable policy support will bring more incentives to private investors.

3. CONCLUDING REMARKS

This study aims to identify and review the current key policies related to the case of piloting a case of ‘Low Carbon Energy Technology (LCET)’ with the piloting of ultra-low head based micro hydro power technology (ULH-MHP) in the wake of available institutional and policy framework in India. Further, the potential inter-linkages among key policies were discussed for the possible private public partnership in the ULH-MHP sector development.

The study showed that several policies could inter-link as prioritized policy framework to synergize the outcomes to overarch multi thematic areas – development/livelihood, energy and climate change. With respect to the linkage to the policy instruments, a holistic understanding of ULH-MHP sector development activities could be provided. It can also remark that a close cooperation with federal and state level will be important to create smooth inter-linkage to ensure the multiple thematic scopes and utilize policy instruments in an overarching way.

There is also need of technology transfer through public-private partnership in developing countries like India towards overall socio-economic and environmental benefits. To this end the low-carbon low-emission technologies (LCETs) could be among the potential solutions that can address important key global challenges of socio-economic development through employment creation and energy security, and environmental impact through reduced climate impact. Therefore, the focus of country governments should be on the deployment of low carbon emission innovative technologies that will help in reducing greenhouse gas emission, climate change mitigation and linking sustainable energy with productive uses through development of small enterprises.

4. REFERENCES

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