Renewable Energy 61 (2014) 29–32

Contents lists available at SciVerse ScienceDirect

Renewable Energy

journal homepage: www.elsevier.com/locate/renene

Regulation for renewable energy development: Lessons from Sri Lanka experience

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ARTICLE INFO

Article history:
Received 14 December 2011
Accepted 16 April 2012
Available online 17 May 2012

Keywords:
Renewable energy
Regulation
Feed-in-tariff
Avoided cost
Net-metering

ABSTRACT

The paper examines the key features of the renewable energy development environment in Sri Lanka which led to sector's rapid expansion. The recent development framework of the renewable energy sector was based on the importance of using indigenous resources, recognizing the positive environmental impacts and the avoidance of high cost alternative thermal generation. This framework also recognized the pioneering effort of the developers in site identification by giving rights to develop on a first-come first-served basis. The policy framework was later extended with a renewable energy portfolio standard to achieve 10% of power generation through renewable energy. The standard power purchase arrangements reduced the transaction costs. The feeding tariffs originally based on avoided costs later shifted to cost based, technology specific tariffs encouraging diversification of the renewable energy portfolio. The introduction of net-metering for renewable energy based distributed generation and the limited interventions in the form of green-tariffs also assisted the renewable energy development. The paper concludes that the policy and regulatory frameworks and different approaches to implementing them have been mostly successful experiences in Sri Lanka and they would provide useful lessons for similar countries when formulating and implementing related polices, regulations and legal frameworks.

1. Introduction

Sri Lanka has a long history of using renewable energy for its power generation dating back to early 20th century when most of the tea plantation companies installed small hydropower plants to provide their electricity needs. Since then, the country's power generation system gradually developed into a large hydropower dominated system until early 1990s when almost 100% of its supplies came from hydropower. With the exponentially increasing demand for electricity and due to limited large hydro resources the country turned to oil based thermal power plants to supply its base-load requirements. The small hydropower development, though impeded until 1980s due to penetration of the national grid and large hydropower domination, became an attraction, with the increasing fuel costs for thermal power generation [1].

The paper examines the key features of the framework for grid-connected renewable energy and in particular small hydropower development in Sri Lanka and how the policy and regulatory interventions assisted the sector's rapid expansion.

2. Policy environment

2.1. Renewable energy development policy

In the mid 1990s there was a resurgence of the interest in small hydropower development, particularly on the grid-connected power plants. The policy environment was developed by the government with the assistance of the Ceylon Electricity Board (CEB) which was the sole purchaser of power generated by outside its own generation system. This process involved, assigning sites for development, licensing and power purchase agreement. Later with the rapid development of the small hydropower sector, the need to facilitate expansion into other renewable energy sources led the government to specifically address these aspects in the energy policy being drafted in 2006/07. From the beginning, the government policy has been to allow the private sector to develop all grid-connected plants up to 10 MW.

The Energy Policy and Strategies of Sri Lanka has given due emphasis to the development of both the conventional and non-conventional renewable energy based generation (NCRE) [2,3]. One of the key policy elements is the promotion of indigenous resources in energy supplies. The relevant strategies have been identified in order to achieve this objective. They are the following

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doi:10.1016/j.renene.2012.04.026

- The use of economically viable, environmentally friendly, non-conventional renewable energy sources to be promoted by providing a level playing field in generation sector development
- Concessionary financing to be sought to implement hydro-electric projects which are not viable under normal commercial terms
- Necessary incentives to be provided to other non-economic non-conventional renewable energy resources where appropriate to ensure their contribution to the energy supply
- A separate facilitation centre dedicated to the systematic planning and promotion of non-conventional renewable energy sources will be established.
- Appropriate steps to be taken to ensure the development and efficient use of non-commercial energy supplies such as biomass.
- Research and development on adopting new technologies and practices to be promoted

The policy has identified small hydropower, biomass power and wind energy as the three leading non-conventional forms of renewable energy sources to be promoted in Sri Lanka for grid-connected electricity generation. The Government would endeavor to reach a level of 10% of grid electricity generated to be produced using NCRE by 2015. Though this policy has not yet been formally translated into a renewable energy portfolio standard issued by the regulator, the government and the regulator are taking necessary measures to reach this target.

The government has recognized the principle that the natural resources are public goods and hence the associated benefits need to be passed on to all the citizens in the country. But in the interest of expanding the NCRE technology penetration no resource cost is charged for a period of 12 years from the date of commercial operation. The resource charges will be used to finance incentives for further NCRE development through the Energy Fund. Therefore this recent development framework for renewable energy sources within which the small hydropower sector operates was based on the importance of using indigenous resources while recognizing the positive environmental impacts and the avoidance of high cost alternative thermal generation.

2.2. Institutional framework

During the initial development phase of the small hydropower sector, CEB was the main institution involved as the sole purchaser of electricity generated by these plants. Central government agencies and provincial and local authorities have been involved in the areas such as land acquisition, environmental clearance and water rights. Once after commissioning the plant, apart from licensing and notifying the annual power purchase tariff determined by CEB, the central government's role in the sector was minimal.

With the expansion of the small hydropower sector and the interest of the private sector in developing other renewable energy sources, the government strongly felt the need to have a dedicated agency with adequate authority for NCRE resource development. Not only this agency needed to be able to facilitate the process of NCRE development but also it was to have the statutory powers to intervene and overcome barriers. Addressing this requirement the Government passed a new legislation to establish the Sustainable Energy Authority (SEA) in 2007 [3]. The board of directors of SEA has the representation from all important stakeholder state agencies and the private sector. This has enabled SEA to address many of the critical issues within their board meetings.

2.3. Site selection and development

The CEB developed the hydropower master plan in 1989 which identified many of the hydropower development sites greater than 1 MW capacity [4]. In addition, independent investigations by prospective developers and interested individuals and groups also have led to identification of many sites for small hydropower development including those below 1 MW capacity. The government policy has been to allow private sector to be the sole developer of all the sites below 10 MW capacity connected to the national grid. The right to develop each of the sites has been awarded on a first-come first-served basis through a letter-of-intent offered by the CEB, recognizing the pioneering effort of the developers in site identification. Later, in order to avoid excessive delays in developing sites for which the letters-of-intent have been issued, the government decided to impose a time limit for development activities to start and progress. If no progress is made within the timeframe provided the letter-of-intent for the relevant site is withdrawn.

During the development of the grid-connected small hydropower sites, the developers usually respond to the needs of the local population partly advocated by the local government bodies in order to ensure smooth implementation. Such interventions by the developers include those such as construction of paved access roads and bridges in the surrounding rural areas which improve transport facilities for the rural communities. In addition, local manpower and other resources are used to the maximum during construction and operation of the plants.

The off-grid micro-hydropower sites often identified by rural communities have been developed by the community organizations themselves, with the assistance of some non-governmental organizations. The community contributes both in-kind through manpower and material for construction and operation of the plants and in cash. These micro-hydro plants have varying capacities ranging from 5 kW to 25 kW each serving 25–200 village households depending on the capacity.

3. Regulatory environment

The regulatory environment for small hydropower involves licensing, power purchase agreements and feed-in tariffs. In the initial stages of development the institutions involved in this regard were the Ministry of Power and Energy and the CEB. With the establishment of the Public Utilities Commission of Sri Lanka (PUCSL) in 2003 and the enactment of the Sri Lanka Electricity Act of 2009, the regulatory authority over the small hydropower sector fell within the purview of the PUCSL.

3.1. Standardized power purchase agreement

In 1997 CEB introduced a standardized power purchase agreement (SPPA) for small grid-connected renewable energy based electricity generating plants less than 10 MW. SPPA binds the CEB to purchase power generated by these plants without a limitation at a tariff declared every year. Further, the generator was assured a minimum tariff of 90% of tariff in the first year of its commissioning, throughout the SPPA duration [5].

3.2. Feed-in tariffs

3.2.1. Avoided cost based

In 1997/98 the government declared that the SPPA tariff would be based on the "avoided cost" principle. The tariff calculated as the three year moving average was published at the beginning of each year. Initially the avoided cost was determined using the long