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CASE STUDY

Applicability of Energy Saving Obligations to Indian electricity efficiency efforts

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ABSTRACT

This paper investigates end-use electricity efficiency policies and DSM related aspects within the Indian electricity sector. This work also identifies lessons for India from White Certificate schemes and Energy Saving Obligations in the UK, France and Italy. These two analyses aim to identify lessons which are applicable for a utility based energy saving obligation scheme within India. Most relevant results and recommendations are that an obligation is suggested, that no elements should be simply copied and that standardization could offer benefits to the Indian context. However, a number of steps would be required prior to introduction of such obligation.

1. Introduction

The current pace of India's economic growth, together with governmental programmes such as the rural electrification policy and the Ministry of Power's "power for all"-mission suggest a strong growth in future power demand. A report by the Indian Planning Commission expects that electricity requirement will be increased by a factor three to four in 2031, compared to 2011 [1]. Fulfilling this demand will be quite a challenge. In January 2012, the reported deficit with respect to demanded power supply and demanded peak supply were −9.3% and −13.7%, respectively [2]. In order to meet future demand and reduce shortages there is a focus on issues such as, but not limited to, adding generation capacity, improving plant load factors and DSM (demand side management). Currently, there is no central legislation in place which obliges entities to participate in DSM schemes. However, studies have shown that there is substantial potential to reduce or change electricity consumption from Indian end-users in order to save additional generating capacity and primary energy consumption [3,4]. These savings can be cost-effective for both consumer and distribution utility, especially if the latter has to buy expensive peak power or has to sell this power at lower (tariff determined) prices.

The amount of literature published on DSM programmes in India is relatively limited, although a number of papers have investigated specific options for enhancing electricity efficiency through DSM in India. Parikh et al. [5] presented suggestions for efficient DSM programmes in India's energy intensive industry. Sant & Dixit [6] analyzed least cost power planning of Maharashtra State and the role of DSM in the potential financial savings. Kumar et al. [7] investigated the reasons for stagnation of the CFL (compact fluorescent light) market in India and suggested ways to popularize such technology. Reddy [8] identified efficient technologies for the household sector in India, and analyzed their benefits to the consumer as well as to society. McNeil et al. [9] provided detailed estimates for maximum cost-effective efficiency improvement potentials for key energy-consuming products in India. The appliances studies included household refrigerators, room air conditioners, industrial and agricultural motors, and distribution transformers. Bhargava et al. [10] observed for Punjab that electricity demand is unresponsive to price specifically in the short run asking for DSM programmes focussing on efficient appliances. Garg et al. [11] estimated the potential of DSM efficiency improvement targets for Gujarat state in India regarding 1) short-term efficiency improvement (agricultural pump rectification) and 2) long term efficiency improvement (standards for appliances such as air conditioners and refrigerators, and for new agricultural pump purchase and pump replacement).

To date, some DSM projects have been implemented in India. Barriers have prevented large scale uptake and related benefits of these schemes. A large scale, obligatory DSM scheme designed in order to overcome these barriers, could enhance end-

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use electricity efficiency and could achieve electricity savings. The implementation of an obligatory DSM scheme in India has been discussed by policy makers and researchers but, so far, has not been analyzed in a scientific paper.

Our literature review reveals that earlier work analyzed either limited options for energy efficiency (largely focussing on estimating their potentials) or analyzed a particular region of the country. Furthermore, given the federal structure of the Indian government, it is important to delineate an institutional structure wherein role and responsibilities of both central and state level institutions are clearly defined. Central level stakeholders should provide the overall framework for implementation of energy efficiency, whereas stakeholders at the state level have an important role in the final implementation of the scheme which may differ depending on local priorities.

An obligatory DSM scheme in India may include many mechanisms and measures: Increased electricity efficiency at end users, load shifting, market research and awareness creation can all be eligible measures under such scheme. Such flexibility, combined with the need of future end-use electricity savings and possible financial gains related to the avoiding of peak power purchases, can make an obligatory DSM scheme a valuable tool within India's electricity sector.

The untapped potential for end use electricity savings would offer benefits to India if harnessed efficiently. Although e.g. in Europe, White Certificate schemes and Energy Saving Obligations have proven to be quite successful in achieving cost-effective energy savings at the end use level [12], copying successful elements of these existing schemes to the Indian policy framework would not by definition be successful, as success is to a large degree determined by the existing (policy) context.

The aim of this paper is to analyze the applicability of an electricity savings obligation in India and discuss design recommendations for the short and long term. The approach we take for this is argument-based and relies on document review and semi-structured interviews. The set-up of the paper is as follows: firstly, we provide a brief overview of the relevant institutional and regulatory context in India (Section 2). Secondly, we investigate lessons learned from (previous) Indian policies on electricity efficiency and identify the barriers for electricity efficiency (Section 3). Section 4 investigates possible interactions between existing schemes and policies and the proposed obligatory DSM scheme. Then, Section 5 identifies considerations and lessons learned based on experiences from the Energy Saving Obligations and White Certificate Schemes of the UK, France and Italy which could be useful for India. Section 6 provides the results of a stakeholder consultation carried out. Section 7 wraps up. A number of recommendations, based on the performed research, are given. It also lists challenges that an obligatory DSM scheme would face.

2. Institutional and regulatory aspects of the Indian electricity sector

A number of acts, policies and institutions outline the (future) activity India undertakes in the area of electricity efficiency. This section provides a brief overview.

The Indian electricity distribution, transmission and generation companies were formerly bundled in State Electricity Boards. Most states have now unbundled these activities. Whereas generation facilities are owned at the state level, the central level or by private firms (44.6%, 30.8% and 24.6% of installed capacity respectively[1]), most transmission and distribution utilities are state, and thus publicly, owned. All states have an electricity regulator, though some are relatively new. These regulators had to be constituted within the states because of central regulations.

2.1. Institutions

The Ministry of Power has a number of representing regulatory and implementing bodies operating on certain tasks. For this work, the bodies mentioned in Table 1 are considered most relevant.

2.2. Legislation

The central act which regulates issues related to electricity efficiency at the end-user level is the Energy Conservation Act (2001). Some amendments within the Energy Conservation Act, stipulated by the National Mission on Enhanced Energy Efficiency, has initiated some additional policies related to electricity efficiency, see Table 2.

3. Indian policies for electricity efficiency and DSM: existing programmes and barriers

3.1. Review of programmes implemented by the Bureau of Energy Efficiency (BEE)

BEE is responsible for a variety of programmes related to energy efficiency. This subsection discusses standards and labelling and DSM projects.

[1] As on 31 January 2012 [13].

3.1.1. Standards and labelling

An energy efficiency standard prescribes minimum energy performance of an energy-using product. An energy efficiency label is an information label attached to a product indicating the product's energy efficiency rating and enabling consumers to make an informed decision for its purchase. Standards and labelling programmes are either implemented independently or together with other programmes to stimulate the market of more energy efficient products.

In India, the 2001 Energy Conservation Act mandates BEE to conduct product testing, establish minimum energy performance standards and implement energy labelling programmes. Subsequently as part of its mandate BEE launched the national energy labelling programme in 2006. The programme targets display of energy performance labels in form of stars wherein the number of stars represent the degree of energy efficiency. Five star labelled products are most efficient while one star being the least.

Initially, the energy star-rating scheme was launched on a voluntary basis for refrigerators, tubular fluorescent lamps, room air conditioners and distribution transformers. In January 2010, some of the appliances were brought under mandatory labelling compliance. This included household frost free refrigerators, room air conditioners, tubular fluorescent lamps and distribution transformers. Subsequently, some more appliances which include LPG stoves, general purpose motors, ceiling fans, pump sets, colour televisions, electric water boilers, washing machines and laptops were included in the voluntary labelling programme [15]. The verified energy savings as a result of this are shown in Table 3.

The impact of the Indian standard and labelling programme has been quite different for different appliances. For example, for refrigerators results of the standard and labelling programme have been encouraging while in case of air conditioners there has been slow adoption of most efficient product. The main reason for these differences is the price sensitivity in the appliance market. The market for air conditioners is currently dominated by 2–3 star labelled appliances. The price of an air conditioner increases significantly as one moves up the efficiency ladder which is not the case for refrigerators. The higher upfront costs of 4–5 star air conditioners limit their uptake in India. Other reasons for the lower uptake are the limited usage hours of air conditioners (used only in summer time) compared to refrigerators (used throughout the year), and the availability of substitutes for air conditioners (coolers, fans) whereas these lack for refrigerators.