

Power sector reforms in Brazil and its impacts on energy efficiency and research and development activities

Gilberto De Martino Jannuzzi*

Universidade Estadual de Campinas-UNICAMP, CP 6122 CEP 13083-970 Campinas, São Paulo, Brazil

Abstract

Since the mid-nineties Brazil has implemented significant changes in the country's power sector, including privatization, introduction of competition and the creation of regulatory agency. As reform started in Brazil traditional support to energy efficiency and energy research and development suffered a discontinuation, budget cuts and re-definition of roles of the public agents in charge. At the same time, new regulatory measures and the creation of a national public interest fund have helped to maintain and potentially enhance the country's effort to promote energy efficiency and investments in energy R&D. This paper analyses the impacts of these changes in the areas of energy efficiency and energy research and development and argues for an increased role of developing countries to provide solutions for a meeting energy demand requirements more suitable to their internal markets.

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1. Introduction

Radical change is required in the current energy system worldwide if sustainability is to be effectively pursued and incorporated in policy decisions and future technological choices. Developing countries, in particular, are facing additional and significant challenges with regards to continuing their economic development and the need to increase access and the level of energy services to their populations. More efficient and clean technologies, and economic strategies to commercialize them can help provide the solution to these challenges both to industrialized and developing countries (Williams, 2001; Patterson et al., 2002). At the same time, power sector reforms have posed new challenges and opportunities to enhance energy efficiency and R&D activities in some developing countries but may also have aggravated the capability to innovate and promote domestically conceived solutions.

Developing countries have little tradition in investing in R&D in general and in energy R&D in particular. Often R&D efforts are adaptive following externally developed technologies (see, for example, Intarakum-

nerd et al., 2002). Total national expenditures in R&D in developing countries hardly represent a significant share of their GDPs. In 1994 the average was about 0.65% in developing countries and 3% in industrialized countries (Hadjimanolis and Dickson, 2001). India and Brazil, for example, dedicate a little over 0.5% of their GDP to R&D activities,¹ much less than South Korea and several industrialized countries (Runci, 1999). In per capita terms total Brazilian R&D expenditure in year 2000 were US\$ 80.40, more than ten times smaller than the US per capita expenditure and five times less than South Korea (MCT, 2002).² Nevertheless, several developing countries have over the years created and supported research institutions with the purpose of providing technical (and in fewer cases, scientific) assistance to the existing electricity utilities.

During the last decade several countries started the introduction of structural reforms within their electricity industry. The international experience has demonstrated that these changes towards a more competitive and market oriented industry has strengthened the trend of falling investments in energy efficiency and research and

*Corresponding author. Tel.: +55-19-3249-0288; fax: +55-19-3289-2038.

E-mail address: jannuzzi@fem.unicamp.br (G.M. Jannuzzi).

¹In year 2000, Brazil's total R&D expenditure (public and private) represented 1.05% of GDP (MCT, 2002).

²Per capita figures are in 2000 US\$, corrected by local purchasing power parities (PPP).

development, at least in the early stages of reforms (Sioshansi, 1995; Surrey, 1996; Dooley, 1998; Dooley and Runci, 1998; Kammen and Margolis, 1999). Very few countries have included provisions to secure and enhance activities and resources in these areas (USAID, 1997; Dubash, 2002; IEI, 2003).

Introduction of power sector reforms had immediate implications on the support for R&D and energy efficiency. In several developing countries public agencies and public research institutions were the major and only supporters of energy research and activities related to energy efficiency. After reforms they had their roles and mandates revised.

The pursuit of greater competition, the creation of smaller and unbundled utilities and, in some cases, foreign private ownership, may cause developing countries to rely strongly on internationalized markets for R&D to provide solutions to their particular problems. Although most of the expected increase in energy demand will occur in developing countries, up to now very few industrialized countries concentrate about 95% of the world's investment in energy R&D (Dooley, 2002). The obvious implications of this usually high dependence on first world technologies, or solutions tailored for global markets, are that problems or opportunities specific to developing countries may not receive appropriate and adequate R&D attention.

Worldwide individual utility investments in R&D have decreased since the early 1990s, but have not disappeared. In the US, the 112 largest investor-owned utilities, which perform over 93% of non-federal R&D, reduced their R&D expenditures from \$778 million in 1993 to \$486 million in 1996. Investments in energy R&D in the US represent about 0.5% of total annual sales, which is far less than the values observed in other industries, such as Drugs and Medicine, Communications (over 10%), chemicals (4%) (Margolis and Kammen, 2001).

Deregulation encourages utilities to reduce overall investment in energy R&D because of the competitive pressure to cut costs and the risk that ratepayer-financed investments will become public rather than proprietary assets. Also in the US, utility spending on DSM has seen similar trends. Total utility DSM spending peaked in 1993 at about \$3 billion and declined to about half that amount by 1998.

For developing countries in particular, reforms have created new challenges to the public sector, which has to understand how markets operate, seek funding mechanisms and develop criteria for allocating funds (both public and private). This process meant a re-definition of the role of public agents and sometimes required the creation of new institutional structures. All this demands that energy policy makers understand how energy efficiency and R&D activities take place in the supply and demand side of the energy system, which has

now several operators, including private entrepreneurs. New energy policies need to take these changes into account and create regulatory incentives and other mechanisms to support activities related to energy efficiency and R&D.

The energy challenges facing Brazil call for a pivotal role for technologies and technology policies in finding, transforming and utilizing energy resources in an efficient, cost-effective and environmentally sound manner. This paper intends to analyse the Brazilian experience in implementing provisions in regulation and legislation to promote energy efficiency and R&D in a more competitive environment.

2. Energy efficiency and R&D investments after reforms

In some countries new mechanisms for collecting funds directly from energy consumers to sponsor energy efficiency and/or R&D programs have been implemented. These mechanisms have the purpose to replace the decreasing participation of federally and government sponsored programmes and have been increasingly been applied in several countries, specially industrialized countries.

In the US, many states have created these “public benefits funds”, during the process of reforms with the purpose of maintaining the prior level of spending in areas such as energy efficiency, renewable energy, R&D and some low-income services. In general, these funds do not create new charges to consumers and aim to be competitively neutral and non-bypassable to ensure that everyone contributes towards activities that benefit all. The mechanism used there is called Systems Benefits Charges (SBC) that are collected from utilities in amounts that varies from 0.5% to 3% of gross annual revenues, or fixed values as mills/kWh, or lump sums to be spend over a period of time (UCS, 2000).

Brazil started its power sector reform in the mid-nineties implementing changes in the management, organization, ownership and decision-making of its electricity sector. Privatization was one of the initial steps of the process which aimed to attract private investments and create competition within the industry. As these changes have taken place it was observed that public interest activities related to energy efficiency and R&D undertaken in the past by state-owned utilities also changed.

Traditionally, the country has shown support towards energy efficiency and energy R&D with the creation of research centre for the power sector CEPTEL in the seventies and a national electricity conservation programme PROCEL in the mid-eighties. These initiatives were mostly financed and managed within the structure of the large state-owned ELETROBRAS.

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