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Strategy For The Involvement Of Smes In Energy Efficiency Programs In México

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Abstract
Mexico's economic development is linked with energy consumption. Some programs exist in the context of the 2008 energy law reform aimed at improving the efficiency of energy use in the industrial sector, which is the second energy consumer in the country responsible for almost a third of total energy consumption. As it is frequent in many regions of the world, the industrial sector in Mexico is dominated by micro, small and medium enterprises (SME) that represent 99% of industrial establishments. Therefore, to improve levels of energy efficiency in SMEs potentially translates into substantial resource savings, reduces production costs and, therefore, enhances economic competitively.
This research analyzes government's programs promoting energy efficiency in Mexico, describes the challenges for SME to adopt their efficiency measures, and proposes a strategy for SME involvement and use of these programs.
We find that, despite the existence of energy efficiency programs in Mexico, SME participate weakly mainly due to the lack of interest, itself related to poor access to information, to lack of financial support and of management skills, regulatory pressure and lack of incentives.
This situation requires the implementation of strategies to achieve more active MSMEs within the existing energy efficiency programs, and monitor and record the results obtained from these programs to replicate success stories in similar businesses.
Keywords: Energy; Strategy; SME; Energy efficiency; Government programs

I. Introduction

In the past 20 years the concern about changes in the environment has been a subject of global interest, the different productive activities and consumption that makes humans deteriorate natural resources, especially non-renewable. As far as energy is concerned, the use of various energy sources is one of the main generators of greenhouse gases. "During the late seventies, humanity as a whole consumed renewable resources faster than they can regenerate ecosystems and released more CO2 than ecosystems could absorb" [1], generating a global climate change. For this phenomenon and because of the threat posed by these impacts is necessary to think about the way that we are using this resource in order to change consumer habits and lead towards a more efficient use. On the other hand in the specific case of Mexico, one of the most influential segments is formed by the micro, small and medium enterprises better known as SMEs. According to the Secretaría de Economía, SMEs "constitute an important segment for economic development, for up 99 percent of economic units and represent about 52 percent of gross domestic product, generating more than 70 per percent of formal jobs "[2], therefore an important part in the productive life of the country. That is why the use of different energy resources in this segment has a strong impact on the effects of greenhouse gases (GHGs) cause to the environment. Consequently SMEs need to actively participate in support programs and take action in order to make better use of energy. This study shows current government programs to promote efficient energy use, we identified the factors that inhibit the SME segment increased participation in programs and suggests a strategy for their involvement, all in support of efforts to integrate SME segment in a sustainable manner within supply chains to increase competitiveness.

II. Demand for energy services and SME segment

Global demand for energy services has grown 50% since 1980 and will grow to 50% by 2030 [3a]. If we continue with current demand levels, total energy consumption in the world will double in 2020 compared to what was consumed in 1990. The current level of per capita consumption in developing countries is between one tenth and one-twentieth per capita consumption in developed countries. In developing economies optimization potential in the use of energy is huge, however current inefficiencies in the production, distribution and consumption mean

that most of the energy generated is wasted and thus the price for obtaining service is high. Moreover, if we add consumption subsidy policies in countries like Mexico, there are conditions to create a culture that promotes consumption rather than efficiency, which translates into waste in resource utilization thereby exacerbating this problem. Therefore, we see the need to take actions such as developing policies, plans and programs to help reverse these trends to minimize their impact on the environment.

Garron [4] mentions that in recent years, the countries of Latin America and the Caribbean are in the process of revising the energy policies of the 90's derived from the last crisis, and considering the environmental and social impacts. These reviews are mainly characterized by migration to natural gas, investment in new hydropower, and the use of renewable energy and more.

According to the International Energy Agency (IEA), the speed at which new technologies are adopted and improved energy efficiency will be a key factor in reducing their environmental impact. Taking into account the uncertainties related to the potential for generation and storage of solar energy, advanced biofuels, and nuclear power [5a]. Energy efficiency is defined as the use of fewer resources to provide the same level of service, and can be achieved by improving the process of generation and consumption without changing the type of energy, or improving technology and opt for a more efficient source.

The agency proposes six categories of political action to achieve energy efficiency: strengthening the measurement and disclosure of energy efficiency improvements visible to consumers, regulations to prevent the sale of inefficient technologies and financing instruments and other, and notes that cross-sectorial policies in different countries are often the framework of energy efficiency measures in all individual sectors. They often include objectives, in terms of energy efficiency, improving energy intensity or energy saving.

Additionally, the IEA develops recommendations for energy efficiency in small businesses. Some of these suggest that governments consider the development and implementation of a set of policies and measures to promote energy efficiency in this segment including:

- A system to ensure that energy audits conducted by qualified engineers, are widely promoted and easily accessible to all small businesses.
- The provision of high quality and relevant information on energy efficiency best practices.
- The provision of information on energy efficiency standards that ideally should be structured to allow international comparisons.
- Adequate incentives to adopt the life cycle cost of capital acquisition and procurement procedures [6].

Mexico is a country rich in fossils and areas for renewable energy generation. However it is recognized that current growth rates, the supply will be insufficient to meet demand in 2020, as it is demand has shown an increasing trend in recent years that differs from sector development. Given this, it is necessary to incorporate energy efficiency measures that allow continued economic growth, reduce energy loss along the production chain and that it has a lower environmental impact.

In Mexico the energy consumption structure by segment is led by transport with 48.7%, followed by industry with 28.1%, 16.7% residential and public commercial and agriculture 3.3% 3.2% [7a]. Moreover the components of energy consumption in Mexico are oil and 29% diesel, 46% hydro 14% natural gas, 6% coal, nuclear 2%, 2% and 1% wind geothermal latter two considered clean energy [3b]. However, there are elements within the legislative and regulatory framework resulting in an inflexible structure in the energy market slowing their development. Limiting the participation of private initiative for clean energy generation, resulting in modest growth prospects in this industry in the coming years.

Meanwhile the SME segment is fundamental part of the Mexican economy because it represents an important source of employment. Currently there are registered more than 5.1 million small businesses. So the support programs to develop their skills and boost their growth is by far one of the key factors for the growth of the country. According to Moss [8] "energy efficiency can generate positive short-term results with the technologies and policies", and considering the trend in rising prices of energy resources, this should be a motivator for the creation of these instruments.

In México, according to data generated by the Instituto Nacional de Estadística y Geografía (INEGI) in the 2009 Economic Census, ranks companies according to the following criteria:

Micro industry. Companies employing up to 15 people and net sales value is up to 30 million pesos a year.

Small Industry. Companies employing up to 100 people and its net sales do not exceed the amount of 400 million pesos a year.

Medium Industry. Companies employing up to 250 people and the sales value does not exceed the sum of one thousand 100 million pesos per year [9].

With respect to agencies, the Comisión Reguladora de Energía was created in Mexico in the year 1993 by an act as a regulatory body for the electrical segment, reformed in 1995 as an autonomous body to act on issues of electricity and natural gas [10].

Being from 2008 energy reform when the energy segment Mexico began to have significant progress, the Mexican government has developed various plans and support programs to increase competitiveness in the industry, including the SME segment, some of these government efforts are:

Fideicomiso para el ahorro de energía (FIDE): Informative technical brochures

It consists of a series of technical documents that describe an educational way, the importance of determining what is to be measured and the factors to be considered for reliable power measurements considering the basic technical elements [11], through the description of the basic elements of an energy assessment.

A second contains practical suggestions on how to save energy and classified into three levels. Class actions include simple application measures with immediate effect and marginal investments like replacing incandescent lamps greater efficiency. The second level actions evaluated by comparing them with equipment and facilities adequate levels of energy efficiency internationally. Finally the third level actions include facilities and equipment replacements [12].

Moreover it has an additional document which presents additional recommendations for energy savings as firms know the electricity tariff which are subject, use heating based on natural gas, use of three-phase motors and installing capacitor banks to mention some examples. [13]

Since its inception in 1989 the FIDE has funded just over 4,300 projects, of which just over 1,800 were implemented in SMEs, with average savings of 32% of their electricity bills and payback of 2.5 years efficient equipment in promedio.21 potential energy saving projects carried out by FIDE electricity demand below 300 kW by technology type are shown in Table 1 [14].

Table 1. Savings projects developed by FIDE

Corrective Action	% Participation	Average Monthly Savings			
		Kw	Kwh	$	% Saving
Commercial refrigeration	48.03%	8.71	4,389.48	7,350.63	40
Air conditioning	29.13%	8.85	1,998.12	4,025.10	35
Air compressors	14.96%	15.34	4,368.01	10,044.35	30
Lighting	4.33%	7.72	2,120.00	4,505.44	35
Electrical motors	1.97%	16.05	5,471.76	7,415.78	12
Rate change	1.57%	0	0	10,293.09	40
Average	100.00%	9.44	3,057.89	7,272.40	

III. Environmental Leadership Program for Competitiveness (PLAC)

Created by the Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT) in coordination with the Procuraduría Federal de Protección al

Ambiente (PROFEPA) in 2005. Based on a pilot project called Competitive Supply Chains, developed by the Commission for Environmental Cooperation of North America (CEC) with the aim of improving capacity within the supply chain. The program is free and involves the direct participation of company personnel interested in two training workshops for 8 hours each. Additionally you have to attend seven meetings with duration of 3 hours each. The training is complemented by an online course.

During the development of the training, participants detected energy saving opportunities, water and waste and propose an action plan to be developed during the same training period. After the company gets some recognition. The 1932 program has generated projects from start until April 2011.

The program has included companies from 22 states of the republic. It emphasizes the participation of 56 micro enterprises with less than 10 employees, 271 small businesses with a range between 11 and 50 employees and 360 medium-sized companies employing between 51 and 250 employees. Worth mentioning that of all the projects, 874 projects are energy efficiency [15].

Despite the success of the above programs, the SME segment in the country has to overcome various barriers to adopting energy efficiency programs, such as: lack of information, this translates into segment ignorance about existing programs and procedures to join. Lack in energy efficiency issues by part of decision makers of SMEs. Another aspect has to do with the market, since the supply of energy services in Mexico is limited to public companies, in the case of electricity as a provider only has the Comisión Federal de Electricidad and in the case of fuel Petroleos Mexicanos to name one example, limiting the possibilities of having references for comparison. On the technical side, the SME segment is not the first to get the benefits of the latest advances mainly to its cost.

On the other hand, access to products and services they fund their activities is limited to those companies that meet the requirements to be eligible for credit by financial institutions. The initial costs of implementing energy efficiency practices are still high compared to the income of the segment. Besides that there is a perception that energy efficiency projects are associated with high levels of risk. Public policies represent another obstacle to the MSME segment onto energy-efficient practices. To date, it has not even submitted the initiative to energy reform that creates more opportunities for the sector and promote more efficiency rather than consumption.

All this results in a lack of interest in the segment for the adoption of practices and energy efficiency measures. To achieve involvement more participatory, and that SMEs take actions even better use of energy resources, it is necessary to have an approach and provide initially diagnosed as consulting, without the company bears the cost that this represents. This requires the coordinated participation of public and educational sectors as well as the generation of government programs that support the segment so that the cost of adoption is minimal.

Strategy

The proposed strategy relies on a series of actions that will provide on the one hand, bring to SME to adopt energy efficient practices and on the other hand, focus efforts on the areas and processes that have the greatest impact in production processes companies besides resulting in energy efficiency and operational efficiency.

Process

Step 1: Approach and analysis processes. In order to know what are the opportunities for efficiency in the development of its main product or service. It should be mentioned that this activity is central to the achievement of the objectives; it will depend largely on the energy savings generated by the process to key activities to inform decision makers of SMEs to the direct benefits of the adoption of best practices and achieve a higher degree of interest.

Step 2. Identifying potential energy savings. Making an inventory of types of energy consumption, required equipment models and capacities, determining optimal operating consumption and associating these consumptions with basic units such as production volume, costs, etc. This will serve as a starting point for setting goals and for future comparisons when implemented energy efficiency actions.

Step 3. Implement energy efficiency actions. Among the key processes, apply a series of measures starting from simple recommendations as appropriate scheduling of production in terms of energy, day lighting, compared to best practices, up to equipment replacement programs, mainly in processes that generate business value. This will trigger the production activities of the company, expanding the capacity to produce your products or services thus obtaining operating cost savings and increased competitiveness.

Step 4. Evaluate. Once implemented the actions, knowledge of which is the result of applying them in numbers, comparing against measurements taken initially to determine whether the objectives have been achieved initially, and to quantify the direct impact financially or productively and perform observations necessary to make adjustments in the areas of opportunity identified.

Step 5. Document. Is worth mentioning that throughout the process generates valuable information, so the documentation should begin from

the first step. However it is until now when you can get conclusions to determine whether energy efficiency measures taken were effective, as well as the obstacles that had to be overcome during the process. This documentation proves useful for future projects or companies with similar characteristics.

Step 6. Spread. This step is related not only to publicize the results of the adoption of energy efficiency measures. It is also important part in the generation of knowledge for companies in the same industry. To present the experience gained during the implementation of energy efficiency measures, will serve as a driver for other SMEs take the initiative to find similar programs knowing in advance what the potential risks and expected benefits.

By applying the proposed steps, it is possible to achieve a more active participation of SME in energy efficiency programs in Mexico. Using this methodology, we minimize the effect of the barriers that exist today, mainly because of the lack of such resources human, technical or financial segment faces and mitigate the ignorance of direct and indirect benefits and reduce lack of skills in the subject.

IV. Conclusions

Among the strategies for sustained growth of Mexico, energy efficiency is one of the relevant issues, speaking involves power generation, distribution and consumption of different resources either fossil or non-fossil also represents the generation of CO2 which is an impact factor to global warming. Meetings of cooperation between different groups of countries that includes both developed and emerging economies, agreed on the urgency of action to reduce emissions of greenhouse gases. Adding this to the trend of an increasing demand in energy consumption, looming two alternatives: The first is the generation of a greater amount of energy and consumption, which have a direct impact on the effects and consequences mentioned, being the least convenient. The second is to create a culture that we take responsibility to make more efficient use of the resource, thus not only prevents the demand to increase additionally the above mentioned effects diminish in number and impact. If we add the component of power generation through cleaner technologies, the results will be better. Noting that the developed in conjunction with major emerging economies consume about 70% of the global total, the industrial sector is one of the largest consumers and SMEs account for a greater than 90% of the production units, the actions be taken for efficient use of energy in this segment, will be important to achieve a considerable reduction.

In this paper we presented government's efforts to support SME in Mexico in relation to energy efficiency. When looking into the different clusters were found linkage programs between SMEs and industry segment, and quality improvement programs, however it is noted that there are factors that inhibit the active participation of the SME segment.

Identifying these factors was relevant to the development of the proposed strategy, which serve to make the offer more attractive programs that promote the implementation of effective practices and support the participation of companies.

That is why the regulations, public policies and participation of government institutions play a key role in achieving efficient use of energy, by creating the conditions that allow public or private segments implement schemes and supports technologies lead to the SME segment to adopt better practices and be more efficient. All this to generate new knowledge, can expand beyond the organizations themselves, thereby motivating to join other companies to programs.

There remains the application of the methodology proposed here. Achieving efficiency targets along the entire production chain will result oriented culture organizations to use resources with the benefits already mentioned.

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