

## ENERGY EFFICIENCY IN BUILDINGS

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# Sonora State, Mexico

*Photo by Brianda Maldonado on Unsplash*

### STATUS AND TRENDS

The Estado Libre y Soberano de Sonora (Sonora State, hereafter) is one of the 32 federal entities of Mexico. Located in the north-west of the country, Sonora borders with other Mexican states of Baja California, Chihuahua, and Sinaloa, as well as with the United States. It is composed of 72 municipalities, whose capital and the largest city is Hermosillo. The main climate is classified as dry desert, according to the Köppen climate classification. The population of Sonora is 2.58 million inhabitants, with 86% of them living in urban areas and 14% – in rural ones. Sonora has a surface of 184,934 km<sup>2</sup> and is the second largest state of Mexico, as it represents 9.2% of the whole Mexican territory (Gobierno de México, 2019).

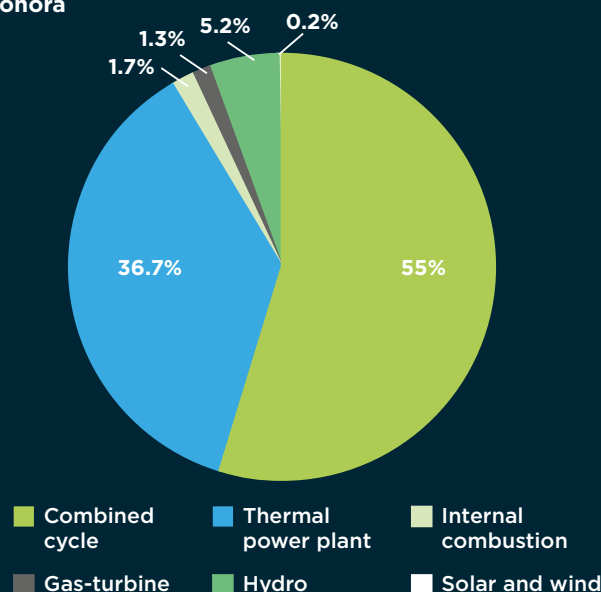
The state has a notable abundance of mineral resources and the local economy accounted for 3.5% of Mexico's national GDP in 2016, with manufacturing activities accounting for the largest share. Overall, the main economic sectors are represented by mining, quarrying, oil and gas extraction, manufacturing, wholesale and retail trade, and real estate (Pro México, 2017a). The state received USD 253 million in Foreign Direct Investment (FDI) in 2017, principally for the manufacturing industries (ibid.).

Sonora is considered as one of the largest consumers of oil products in Mexico. The local demand for oil shows that petroleum coke was the most demanded oil product, especially for the industrial sector. In fact, in 2016 the demand for petroleum coke was 290.4 tonnes and the demand of other oil products was 56.8 Mbbl/d. The local demand, however, has been diminishing since 2011 (Pro

México, 2017b). Natural gas is another popular energy source in Sonora, as 278.4 million standard cubic feet per day (MMSCFD) were consumed in 2016 only (ibid.).

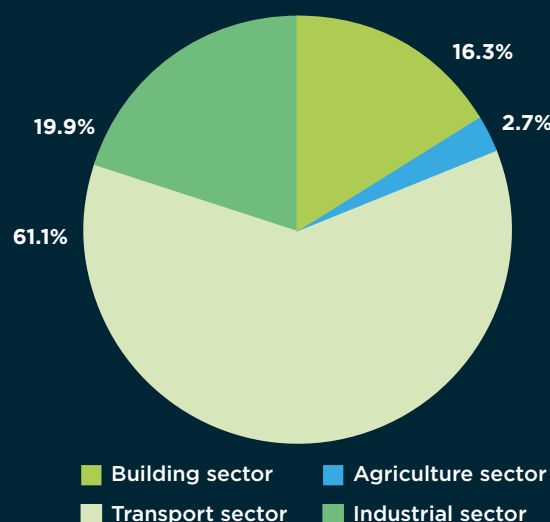
In 2016, Sonora accounted for 4.4% of Mexico's national electricity generation with the local installed electricity generation capacity being at the level of 3,140 MW. As per Figure 1, clean energy sources have only a small share (ca. 5%) in the local electricity mix (ibid.).

**Figure 1. Distribution of sources for electricity in Sonora**



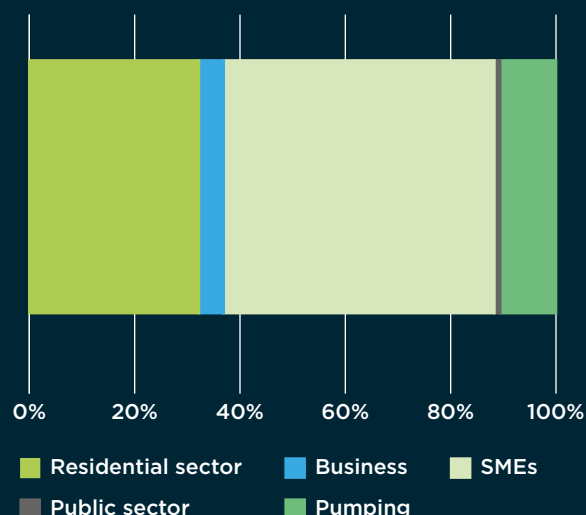
Source: Pro México (2017a)

**Figure 2. Percentage of energy consumption by sector in Sonora in 2010**



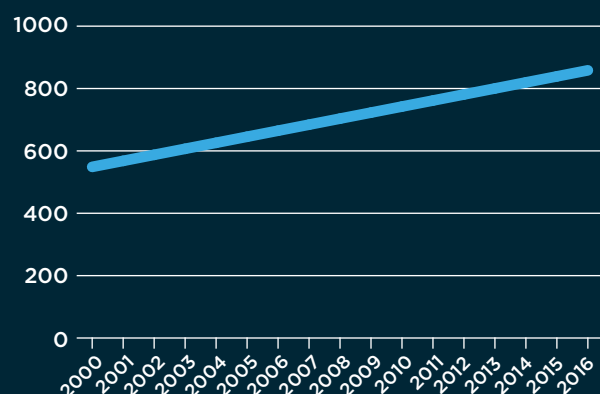
Source: Gobierno del Estado de Sonora; Comisión de Energía del Estado de Sonora (2011)

**Figure 3. Electricity demand by sector in Sonora State in 2015**



Source: Pro México (2017b)

**Figure 4. Number of residential buildings in Sonora (from 2000 to 2016)**



Source: CONUEE (2019)

The latest energy report (*Balance de Energía del Estado de Sonora*) dates back to 2010 and presents the data on local energy consumption, energy sources, and distribution of energy demand amongst sectors. Due to the absence of more recent statistics, the data from that report is used in this paper despite being outdated, in order to show the building sector is the third most energy-consuming sector, after transport and industry (Figure 2) (Gobierno del Estado de Sonora; Comisión de Energía del Estado de Sonora, 2011).

As for electricity consumption, Small and Medium Enterprises (SMEs) followed by the residential sector have the largest shares in the State of Sonora. In fact, the data from 2015 show that these two sub-sectors combined cover more than the 80% of the local electricity demand (Figure 3) (Pro México, 2017b).

In 2016, the electricity consumption of residential units was 4488 kWh. The fact that residential buildings account for more than one third of electricity demand in the State (Figure 3) and the residential floor area has been growing rapidly (Figure 4), indicates that without energy efficiency measures residential sector will continue to contribute significantly to increasing demand for fossil fuels, which already represent more than 90% of the electricity generation (Figure 1). Targeting energy efficiency for residential sub-sector is a crucial measure to mitigate local fossil fuels consumption (CONUEE, 2019).

The uptake of green or energy efficient buildings in Sonora is limited. For example, there are two buildings registered under the LEED certification, namely the Willis Towers Watson and the TE Tangerine in Hermosillo. Another one, the BD Medical Nogales building, achieved the Energy Star Challenge for Industry in 2012. In addition, in 2015, two commercial buildings received a gold and a silver certification from TripAdvisor GreenLeaders (The Green Building Information Gateway, 2019). Therefore, development of green buildings in Sonora has started, though at a very small scale and only in the capital city.

## INSTITUTIONAL FRAMEWORK

As Mexico is a federal country, the State of Sonora enjoys its own constitution, congress, and judiciary, similarly to other States of Mexico. With regards to the local institutions working on energy efficiency for the building sector, the following are the most relevant ones in Sonora State:

- The *Comisión de Energía del Estado de Sonora* (Energy Commission of the State of Sonora) is the principal institution working on energy efficiency in Sonora established in 2009. Their goal is to research, innovate, and develop sustainable energy systems, as well as to foster energy efficiency improvements (Gobierno del Estado de Sonora, 2019).
- The Energy Commission is part of the *Foro Consultivo CENAGAS región Noroeste* (CENAGAS Consultative Forum for the Northwest region), which works on identifying the actual and potential demand of natural gas. CENAGAS is composed of authorities from Sonora, Baja California, Baja California Sur, Chihuahua,

Durango, and Sinaloa (Centro Nacional de Control del Gas Natural, 2019). Through this Forum, Mexican states can present to the national institutions data on their local energy demand and supply, as well as to identify opportunities and challenges for distribution of natural gas at the national level.

- The *Comisión Sonora – Arizona* (Commission Sonora – Arizona) and the Arizona – Sonora Commission are two public institutions, which were established in 1959 with the objective of fostering collaboration between the two regions and within the megaregion of Sonora (Mexico) and Arizona (the United States). Amongst 14 committees, which constitute the Commission Sonora – Arizona, the most relevant ones in relation to energy efficiency are the following: agriculture and wild life; economic development; ecology, environment and water; energy. The goal of these organisations is to foster the relations between the two regions, with a particular focus on sustainability issues (Gobierno del Estado de Sonora, 2017).
- Other institutional actors in Sonora working on energy efficiency in the building sector include the *Secretaría de Economía* (Secretary of Economy) and the *Secretaría de Infraestructura y Desarrollo Urbano* (Secretary of Urban Infrastructure and Ecology) (INAFED, 2019). In 2016, they signed a memorandum of understanding with the *Instituto Tecnológico de Hermosillo* (Technical Institute of Hermosillo) and the Energy Commission, in order to manage and plan sustainable energy transition in Sonora, considering energy efficiency measures important for this process (Secretaría de Infraestructura y Desarrollo Urbano, 2016).

## POLICY FRAMEWORK

The policy framework of Sonora on energy efficiency in the building sector is largely built upon the *Ley de fomento de energías renovables y eficiencia energética del Estado de Sonora* (Law for the promotion of renewable energies and energy efficiency in the State of Sonora). The Law was adopted in 2009 and its last amendment took place in 2009. To promote energy savings and increase energy efficiency, the Law established the institution of the Energy Commission of the State of Sonora. With regards to energy efficiency in the building sector, the Law states that municipalities have the authority to implement the necessary regulations to improve energy efficiency of local buildings. It also establishes that the Energy Commission shall apply a procurement process for municipal and state buildings that aligns with energy efficiency criteria. These are yet to be defined in the Law. On the downside, the Law neither sets quantitative targets for energy savings, nor provides requirements for energy efficiency measures to be implemented (Boletín Oficial del Estado de Sonora, 2018).

In 2017, Sonora established a *Mapa de Ruta de Energía de Sonora* (Energy Roadmap of Sonora) that included energy efficiency as one of the means to achieve sustainable energy transition in the state. The roadmap presents a series of actions to be implemented between 2018 and 2026, which include the following goals: to establish data collection framework on energy consumption in order

to support development of energy efficiency projects, to create a regulatory and coordination authority on energy efficiency, and to incorporate smart and energy efficient solutions into existing projects (e.g. installation of smart metres and intelligent energy management data systems, improvement of building insulation, etc.). It also promotes good practices and the research into the Water-Energy-Food Nexus (Pro México, 2017b).

In line with the goals for the Commission Sonora – Arizona, a roadmap for energy development of the megaregion Sonora – Arizona was published in 2017. It focuses on education and training on energy efficiency practices, regulatory frameworks, and energy demand as means to increase energy savings (Comisión Arizona-México, Comisión Sonora-Arizona, 2017). This roadmap, however, lacks the formulation of specific actions, as well as a timeline for implementation.

## INTERNATIONAL SUPPORT

In the state of Sonora, the municipality of Hermosillo, which is considered to be one of the most active when it comes to design and implementation of projects, the Tool for Rapid Assessment of City Energy (TRACE) of ESMAP's Energy Efficiency Cities Program was used for data collection in 2014-2015. The information supported Hermosillo in understanding local priorities for energy efficiency improvements and developing a local energy plan (ESMAP, 2018; ESMAP, 2019). The city developed a series of actions targeting efficiency in public buildings, focussing on lighting, air conditioning, and elevators (SENER, 2016).

Additionally, Hermosillo was included into the Nationally Appropriate Mitigation Action (NAMA) project developed by the Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ), namely the Supported NAMA for Sustainable Housing in Mexico – Mitigation Actions and Financing Packages. The analysis proposes a series of measures to improve energy efficiency in buildings in four Mexican cities. The final document presents, with regards to Hermosillo, installation of triple glazing windows with sun protection, energy recovery systems for ventilation, recirculation cooling, reflective paint, energy efficient appliances, and insulation of exterior walls, as well as floors, and roofs (CONAVI, 2012).

In December 2018, the Global Green Growth Institute (GGGI) and the State of Sonora hosted a workshop in Hermosillo to launch Sonora's Green Bond Framework.

Through issuing green bonds by the State, this Framework will support development of green projects, including urban mobility projects such as the State's Integrated Transport System (ITS) system. There is also a potential to include energy efficiency projects under this Framework, however, at the time of preparing this publication no data on whether such projects are being developed were found. The collaboration between GGGI and Sonora continues in supporting green growth projects and issuance of a green bond in 2019 (GGGI, 2018).



The North American Development Bank (NADB) created a fund for Mexico's states on the border with the United States of America in support of and providing technical assistance for environmental infrastructure projects. The fund is contracted through projects, which the NADB tenders through a programme, named *Programa Financiamiento Ambiental Infraestructura Fronteriza* (Financing Programme for the Environmental Infrastructures at the Border). It served several projects related to energy efficiency, from water supply to air quality to educational materials. As of December 31, 2018, 29 projects were financed through this fund in different municipalities in the state of Sonora, corresponding to USD 281.89 millions in investments (NADB, 2019b). The Fund has not yet provided the finance for projects focused specifically on energy efficiency in the building sector, but could potentially be used as a vehicle for accessing project finance in this area as well (NADB, 2019c; OLADE, ONUDI, 2011).

Since December 2018, Sonora State started a collaboration with the Building Efficiency Accelerator (BEA) led by the World Resources Institute (WRI). This collaboration aims to enhance the energy efficiency efforts of the State on building efficiency policies and programs. This work has the objective to align the local and sub-national energy efficiency initiatives in the building sector with the national level efforts in order to meet the commitments of Mexico on reducing energy-related emissions (WRI, 2018).

## RECOMMENDATIONS

- Develop a state-level strategy on energy efficiency, with buildings being one of the priority sectors;
- As part of the Strategy set quantitative energy efficiency and energy savings targets for each of the priority sectors, accompanied by potential actions to achieve those targets, as well as monitoring and verification framework for tracking progress towards achieving those targets, based on the adopted set of indicators;
- Prepare implementation plan for identified actions with a view to develop them into bankable energy efficiency projects at the sub-national and municipal levels;
- Establish data collection framework in order to collect and analyse data on energy use, including the data on energy use in buildings;
- Establish coordination mechanism between the Energy Commission and other institutional actors, involved into energy efficiency implementation at the sub-national and municipal levels, especially with local sectorial authorities, such as the Secretary of Urban Infrastructure and Ecology;
- Develop programs to support SMEs in reducing energy consumption and improving energy efficiency, e.g. through offering incentives to establish energy management practices and/or conduct energy audits and implement recommended measures;
- Encourage the municipalities that are part of Sonora, to develop local energy agendas, which include energy efficiency actions in line with Sonora's Strategy;

- Establish sub-national guidelines for implementation of the national Building Energy Code, applicable to residential and non-residential buildings;
- Utilise the available funds to implement energy efficiency projects (e.g. the programme Border 2020), for example to improve energy efficiency in public buildings to lead by example and demonstrate benefits of higher building energy performance;
- Create incentives for the private sector to invest into energy efficient projects in the building sectors, for example through green mortgage schemes and public private partnerships.

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