



# PALMAS SOLAR PROGRAM

## Decentralized Energy for the Ecological Capital

Located in the northern region of Brazil, Palmas is the state capital of Tocantins and the youngest planned city in the country. In the late 1980s, urban planners intended for Palmas to be known as the **ecological capital**. However, the city expanded more quickly and widely than foreseen. Despite having seven hydroelectric plants along the Tocantins River, Palmas' electricity costs were amongst the highest in Brazil. However, the city benefits from **exceptional solar resource potential**.<sup>i</sup>

With the ambition of becoming an ecological capital and contributing to the success of the Paris Agreement, the city adopted a strategy to develop its solar capacity, and in 2015, started working on the **Palmas Solar Project**. The city now aims at shifting the entire electricity mix to solar power, attempting to achieve the largest share of renewable energy in Brazil. To encourage private electricity consumers to **produce their own solar energy**, the city offers a tax incentive for residents and businesses to install photovoltaic panels in their houses or places of businesses. Those who do install solar receive a discount of up to 80 percent in municipal taxes for a period of five years.

The technology consists of decentralized solar photovoltaic systems connected to the state electricity grid. These provide energy to the final consumer, who can replace the expensive electricity from the grid with the electricity from the solar PV systems. Moreover, the surplus electricity generated from solar is funneled back into the electricity grid. This creates further incentive for users because in addition to the tax discount, private users also pay drastically reduced service fees, as the **electricity they generate is discounted from their final bill**. The dynamic is mediated by a *net metering* tariff system, which calculates the electricity flow in both directions and the difference between generation and consumption.

Results of the program came swiftly to the city. Several studies have revealed that panels generate almost the **total electricity consumed in an average household** –allowing the private consumers a return of investment on the panels in two years,<sup>ii</sup> and highlighting the use of tax incentives is a key accelerator for decentralized energy generation.<sup>iii</sup>



The program also resulted in an **economic stimulus** through the creation of local enterprises in the PV sector, contributing to the city's tax collection. In terms of climate benefits, a **GHG emission reduction** of 16.999 tCO<sup>2</sup> is expected.

Some of the lessons learned include the fact that decentralized energy generation leads to a **win-win situation**, in which consumers do not only generate saving in their private economies, but they also gain stable energy supply. However, reaching the most vulnerable population remains a challenge. In this sense, it is still necessary to develop payment schemes to invest in PV panels, in order to ensure that all families can take part in the energy transition.

The results achieved were supported by various **success factors**, such as the coordination of energy strategies and management of municipal income (e.g. tax system adaptation, law modifications), consideration and analysis of the local energy capacity and energy consumption through feasibility studies (to ensure household's energy generation, post-implementation evaluations, etc.), and the flexibility of city officials and project leaders regarding emerging needs, along with a willingness to improve the concept further.

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<sup>i</sup> Piccini, A. R. (2014). *Análise da viabilidade da conexão de geração solar fotovoltaica na rede de distribuição de Palmas-TO via MATLAB/PSAT*. Master's Thesis. Universidade Federal de Uberlândia, Uberlândia, Minas Gerais.

<sup>ii</sup> Carneiro-Guimarães, K., Kesler-Sousa Carvalho, E., Teixeira-Barbosa, L., Araújo-Santos, G. F. (2019). Uso da energia solar fotovoltaica como alternativa de economia e sustentabilidade: Estudo de caso em residência em Palmas-TO. *Anais do Contec 2019*, 1(6), ISSN: 2358117-4.

<sup>iii</sup> Silva, A. C. N., Brito, B. H. (2019). Impactos dos incentivos dos governos do estado e do município na microgeração solar fotovoltaica em Palmas-TO. In Antena Editora (Ed.), *Energia solar e eólica 2* (pp. 91–103). Belo Horizonte. <https://doi.org/10.22533/at.ed.674192201>.