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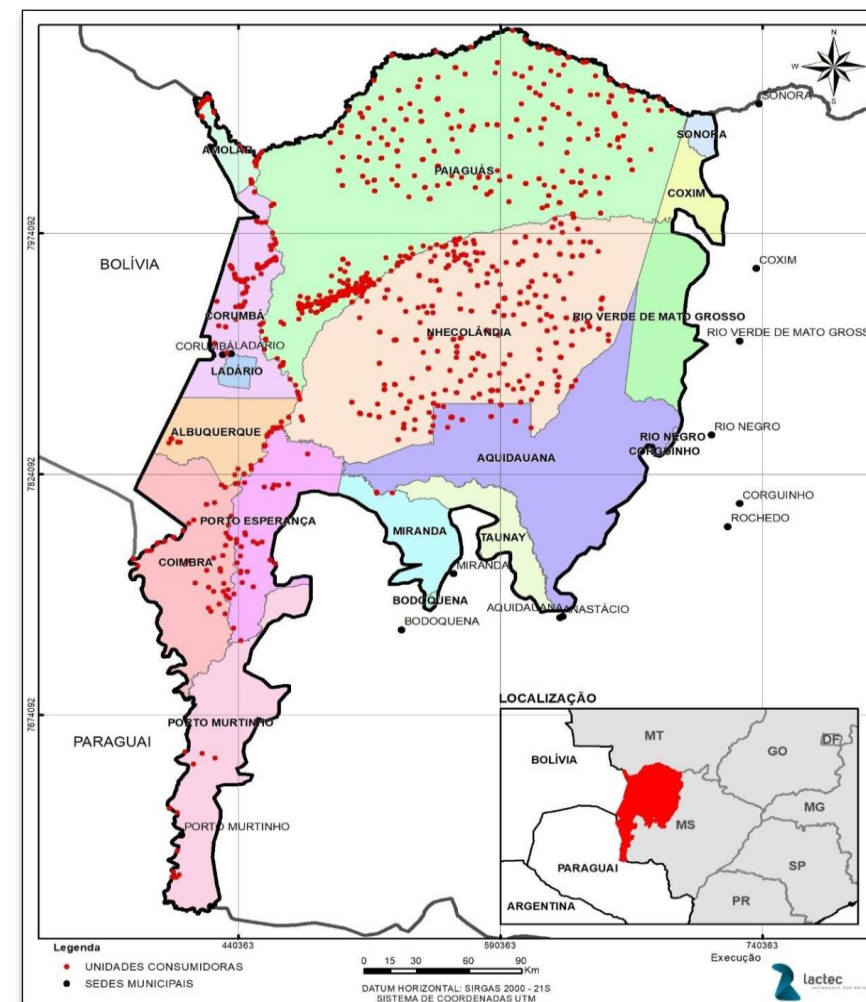
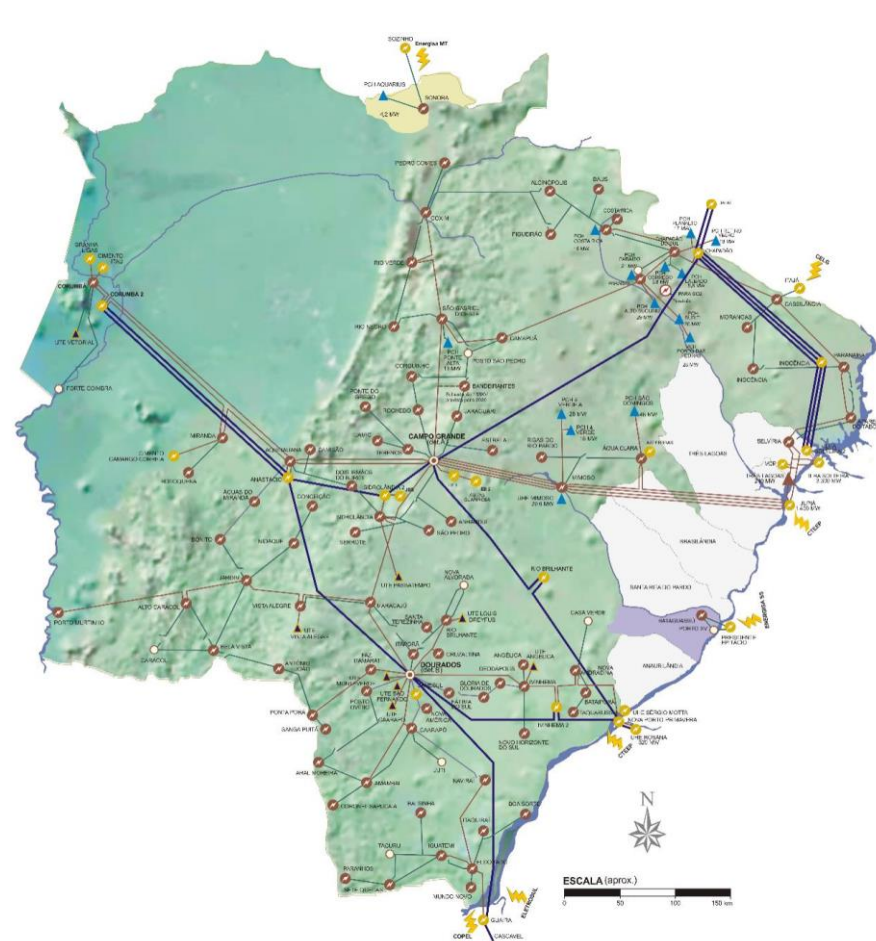
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INTRODUCTION

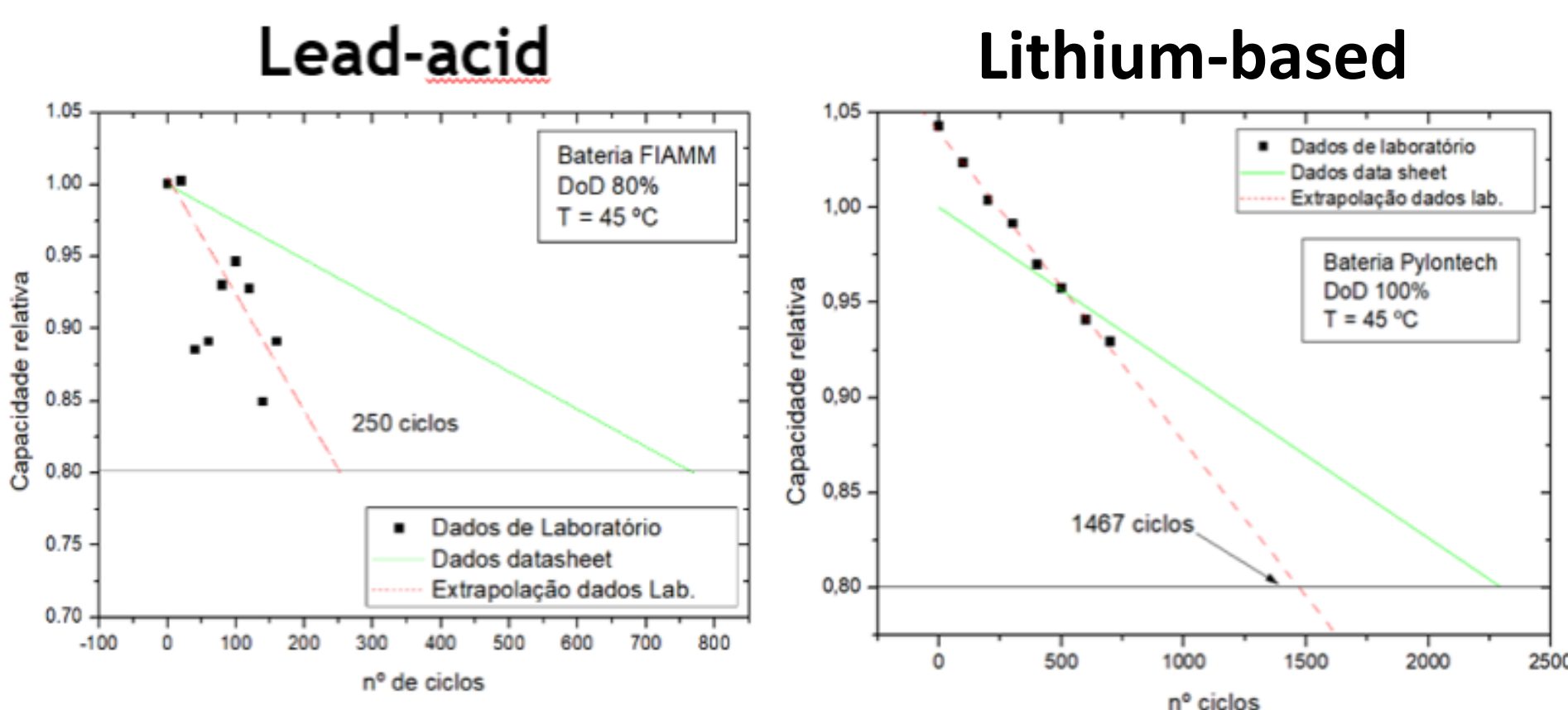
- Ilumina Pantanal (Lighting up the Pantanal) is an off-grid project applied to an swampy area of 35,000 miles² in Brazil that is recognized by the UNESCO as a Biosphere Reserve and as a World Heritage Site,
- Unfeasibility of supplying electricity through conventional distribution grid lines due to infrastructure investment and environmental specificities: large areas of preservation and seasonal flooding,
- Different approaches and technologies were studied on the way to find the best energy supply solution.

BACKGROUND AND DEVELOPMENT

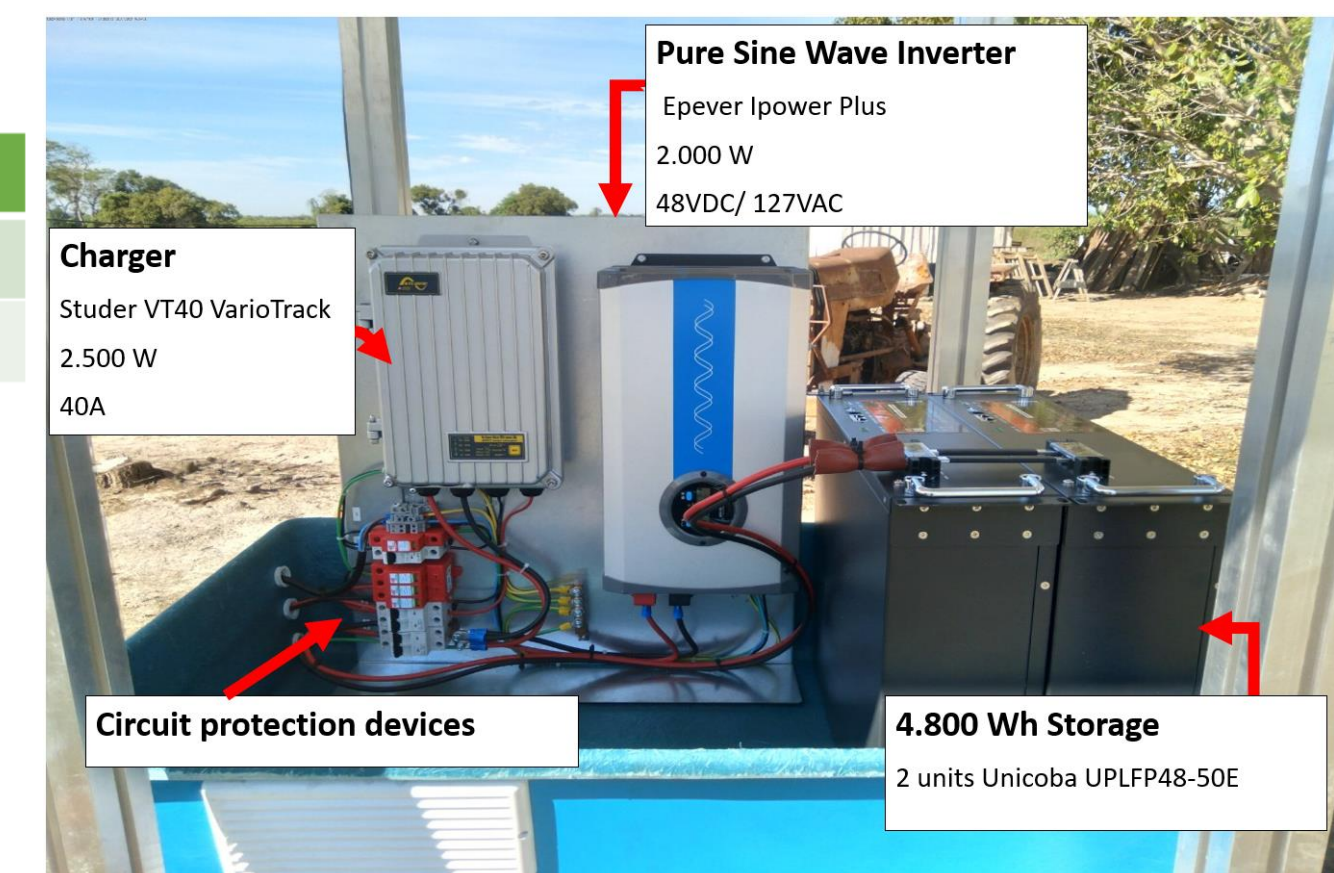
The project started in 2015 and, as a first step, a cartographic base was drawn up from the use of orbital images from SPOT6&7 satellites. In the cartographic mapping, the road system and buildings of the study area were vectored together with spatial data from the distribution network, which borders the Pantanal region. The data allowed drawing up a navigation system, implemented in the Locus Map-Pro application, which assisted the displacement of the registration teams to the properties, where interviews were conducted for a statistical study of electrical, social, environmental, logistical, and economic consumption. With this data, a methodology was developed to assess the electrification alternatives for the region, among these, solar, wind, and biomass resources were considered. The alternatives of hybrid systems with diesel oil or extension of conventional distribution networks that border the region were also studied. In December 2016, a multi-criteria analysis of the alternatives, still considering aspects of environmental impact, socio-environmental and operational cost constraints, determined that a total of 2090 consumers should be served exclusively by individual systems consisting of photovoltaic panels and batteries.



For these properties an electrification model was developed by an individual intermittent source generation system (ISGS), with photovoltaic source and battery, with which several battery technologies were tested (Li-ion, tubular lead acid and carbon lead) in various climates and geographies of the Pantanal, in order to gather experiences and knowledge for each solution. Initially 23 prototypes were installed as a first pilot, in the context of a research and development (R&D) project. In P&D, LiFePO₄ battery life prediction and O&M optimization models were also developed, both aimed at increasing the reliability of the system and mitigating the high maintenance costs over the lifespan of the ISGS.



LCOE (US\$/kWh)	Lead-acid	Lithium
Optimal Regime	US\$ 3,93	US\$ 1,73
Agressive Regime	US\$ 19,94	US\$ 4,38



CONCLUSION

- Photovoltaic ISGS with lithium-based storage proved to be the best LCOE alternative for the case,
- The implementation of 2,090 ISGS took time from June 2021 to February 2022,
- Total investment of US\$ 27 million,
- Nowadays the developed solution is serving more than 3,000 consumers,
- Also, the project is avoiding more than 180 tons of CO₂ each year.

