D 3.1: Updated techno-economic model

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CITIZENS4PED

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1. Introduction

This research focuses on refining the techno-economic model of Arteria to incorporate varied inputs related to socio-economic, spatial strategy, and regulatory/policy domains. Through an integrated collaborative effort, several new features have been incorporated into the model to align with the objectives of the Positive Energy Districts.

Positive Energy Districts (PEDs) are at the vanguard of the sustainable urban transition, aiming to produce more energy than they consume. To optimize energy management and infrastructure planning within these districts, the Arteria techno-economic model has been crucial. The current project aims to expand and refine this model by integrating broader socio-economic and spatial strategies, as well as policy regulations.

1.1. Methodology

In collaboration with our partners, we have assessed the current model's capabilities and identified areas for enhancement. The current model looks like the following picture:

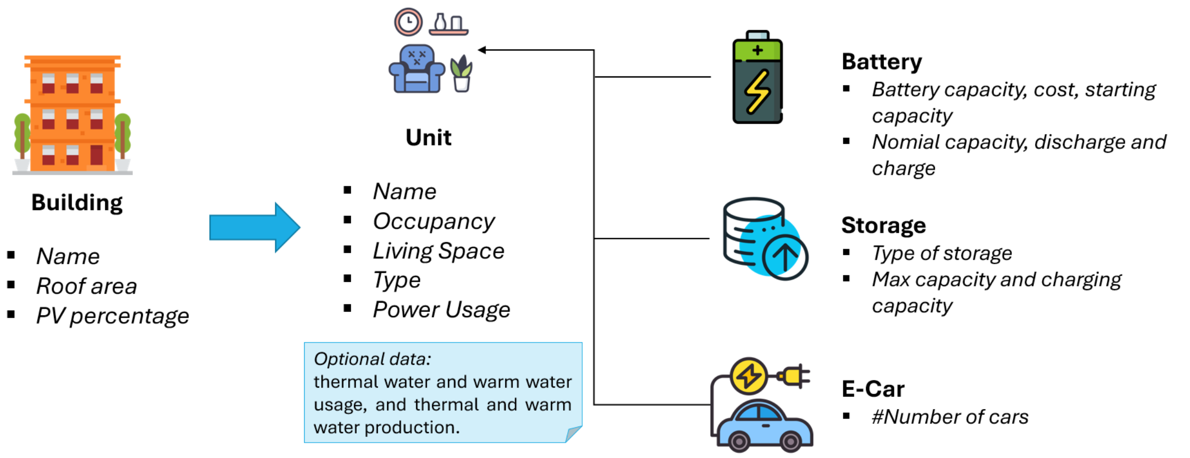

Figure 1: Current model setup

Additional areas were mapped to specific new features, with design and implementation taking into account both technical specifications and the broader objectives of PEDs. This was discussed with the project members during one of the meetings, in order to adapt the model to the needs of the demos.

2. Key Features Added

Based on the discussion, the following feature list was created which is the list of updated technical parameters for the model:

2.1.1. Automated Potential Calculation:

This allows for the dynamic assessment of energy production and consumption potentials within a district, thereby providing actionable data for infrastructure planning and resource allocation. The outcome is a fast analysis on renewable energy calculation.

2.1.2. Building Topologies:

By incorporating various building structures and their associated energy dynamics, the model can now generate more nuanced and accurate energy demand and supply predictions for various buildings.

2.1.3. Power Demand of Typical Structures:

This feature uses an individual energy demand curve for common structures compared to standard load profiles used now. This is offering a generalized yet accurate metric for urban planning.

2.1.4. Component Selection for Heat Supply with Typical Load Profiles:

Enables users to strategically select heating systems based on varied load requirements, ensuring optimal energy efficiency and resource utilization.

2.1.5. Efficiency Enhancement for PV Modules:

Allows to set an efficiency factor for PV plants to consider shadow or alteration of modules.

2.1.6. Community Level Batteries:

A game-changer for grid stability and energy storage solutions, this feature focuses on integrating community-scale battery storage systems, allowing districts to store excess energy and draw from it during periods of high demand.

2.1.7. Energy Demand of Streetlights:

A crucial but often overlooked energy demand element, this feature integrates the energy dynamics of urban lighting into the model.

2.1.8. Randomization of Structures Connected to the Grid:

This feature introduces variability in grid-connected building, simulating real-world scenarios where not every building might be connected or might have varying levels of connectivity.

Indicators	1st criteria	2nd criteria
First indicator		
Second indicator		
Third indicator		

3. Conclusion and recommendation

The enhanced techno-economic model of Arteria stands as a comprehensive tool for Positive Energy District planning and management. The additions made will significantly benefit stakeholders in the various demos in optimizing energy production, consumption, and overall sustainability within urban environments. This project not only represents a leap in software development but also showcases the power of collaborative interdisciplinary efforts in pushing the boundaries of sustainable urban planning.

To ensure the model's viability and relevance, inputs were sought from various stakeholders, including socio-economic experts, urban planners, policy makers, and technology specialists in the project. This interdisciplinary approach has enriched the model, making it robust and versatile.

4. References

Byrne, J.,Taminiau J., Kurdgelashvili L. and Kim N. K. A review of the solar city concept and methods to assess rooftop solar electric potential, with an illustrative application to the city of Seoul. Renewable and Sustainable Energy Reviews, 2015. https://doi.org/10.1016/j.rser.2014.08.023

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