



Sustainable Energy Systems

U.S. Microgrids Adoption Trends to 2035

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Introduction

One outstanding topic which remains open in microgrids research is the comparative long-term project value offered by different types of microgrid systems in the near-term future. A clear understanding of such aspects may dictate not only policy decisions by key stakeholders in the microgrid arena but also accelerate the actual deployment of systems at the urban planning level. The present poster provides a comparative outlook to the NPV over a period of 20 years of different types of microgrid projects in the U.S. territory. The modeling is done for multiple climates so to provide an idea of a potential range of financial added-value offered by microgrids.

Methodology

Several microgrid models resembling single building (OFF, HSP) and community-scale (OFF-APT, OFF-HSP) systems were run under evolving DER, demand and market specific conditions for 2015, 2025 and 2035. The runs were performed in three U.S. climate-representative locations: z1A - Miami (hot climate), z4A - Albuquerque (moderate climate), and z8 - Fairbanks (cold climate). An expanded version of the optimization tool DER-CAM is used to solve each microgrid's DER optimal selection and sizing problem.

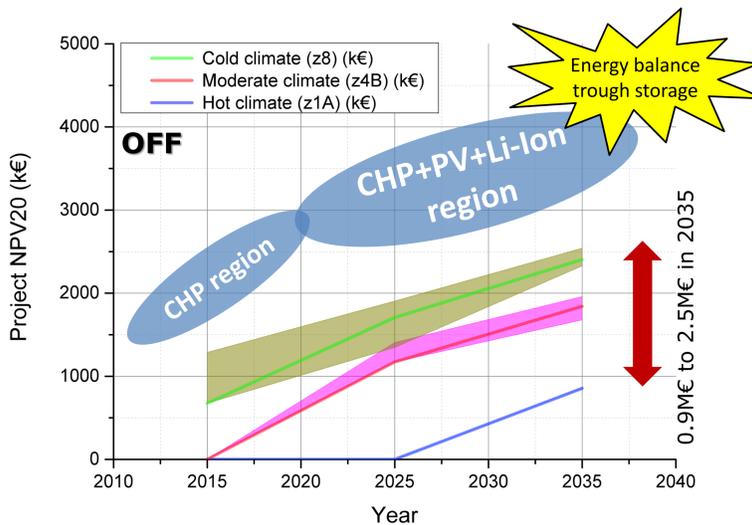


FIGURE 2: PROJECTION OF OFFICE BUILDING MICROGRIDS PROJECTS RANGE OF ATTRACTIVENESS TO 2035 IN U.S. TERRITORY.

Office buildings are in 2015 problematic microgrid customers in hot to moderate climates, due to low HPR/H:EC and prohibitive prices of PV and storage. In cold climates CHP can be triggered, making projects feasible. In 2025-2035 investments in PV and Li-ion become finally feasible for moderate climates. Hospitals are potentially very valuable CHP customers already in 2015 if climate is moderate to cold. Investments in hot climates will remain discouraging.

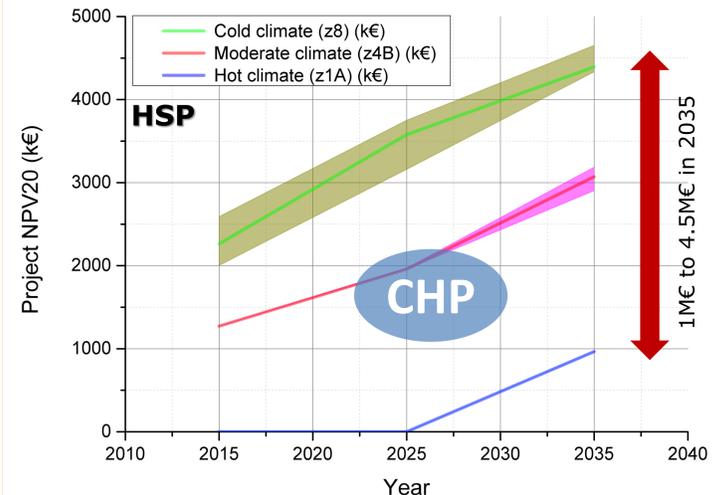


FIGURE 1: PROJECTION OF HOSPITAL BUILDING MICROGRIDS PROJECTS RANGE OF ATTRACTIVENESS TO 2035 IN U.S. TERRITORY.

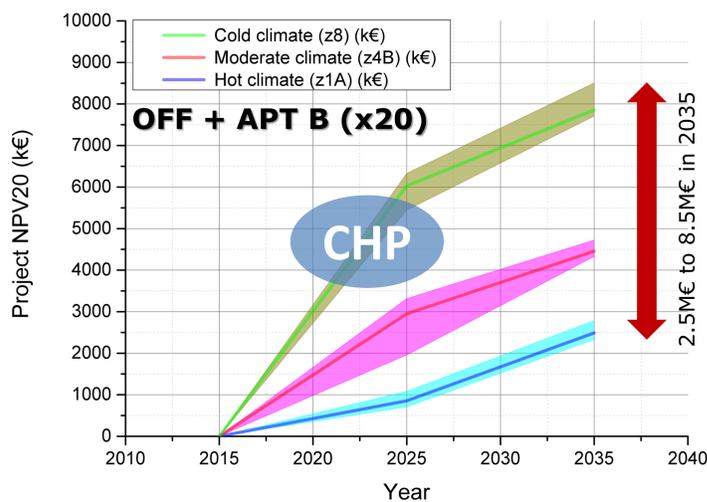


FIGURE 3: PROJECTION OF [OFFICE + RESIDENTIAL] COMMUNITY MICROGRID PROJECTS RANGE OF ATTRACTIVENESS TO 2035 IN U.S. TERRITORY.

Microgrids composed of Office and Residential loads have higher load factors and favorable heat-electric dynamics. Here, PV is not key. The high heat load of residential triggers CHP and absorption cooling for offices. These projects will become very attractive from 2025 on. Massive reliability-intensive complexes made up of office and hospital loads also form attractive community microgrid customers, if primarily heat-driven. Both CHP and PV will thrive in this environment.

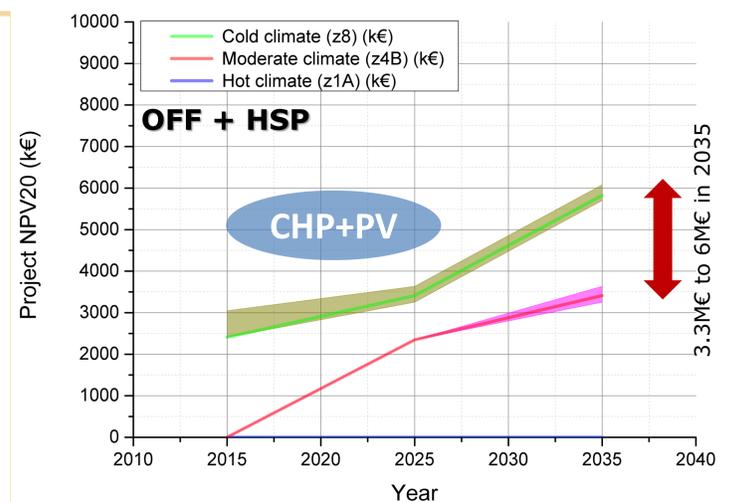


FIGURE 4: PROJECTION OF [OFFICE + HOSPITAL] COMMUNITY MICROGRIDS PROJECTS RANGE OF ATTRACTIVENESS TO 2035 IN U.S. TERRITORY.

Some Remarks

The financial attractiveness of microgrids is not, and won't become in the near-term, trivial, even when favorable DER and market conditions are at place. While the climate reference location where investments take place has significant impact, advances in PV and Li-Ion technologies will become key for customers such as offices, in forming financially-viable microgrid projects. CHP DGs such as ICEs and MTs will remain a core energy-efficiency driver for many types of microgrids, as the modeled examples in this poster show. Both single and community systems show promising evolution to 2035. For most cases, the economics for 2015 is still challenging.

The showcased analysis is heavily modeling and data-intensive, and thus only partially reflected in this poster. Please contact the author for more details.