

Local alternative for energy supply: performance assessment of integrated community energy systems

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Abstract-

Integrated community energy systems (ICESs) are emerging as a modern development to re-organize local energy systems allowing simultaneous integration of distributed energy resources (DERs) and engagement of local communities. Although local energy initiatives, such as ICESs are rapidly emerging due to community objectives, such as cost and emission reductions as well as resiliency, assessment and evaluation are still lacking on the value that these systems can provide both to the local communities as well as to the whole energy system. In this paper, we present a model-based framework to assess the value of ICESs for the local communities. The distributed energy resources-consumer adoption model (DER-CAM) based ICES model is used to assess the value of an ICES in the Netherlands. For the considered community size and local conditions, grid-connected ICESs are already beneficial to the alternative of solely being supplied from the grid both in terms of total energy costs and CO₂ emissions, whereas grid-defected systems, although performing very well in terms of CO₂ emission reduction, are still rather expensive.

Index Terms- distributed energy resources (DERs); energy communities; smart grids; multi-carrier energy systems; optimization

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