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Network cost estimation for mini-grids in large-scale rural electrification planning

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Abstract-

**Universal access to electricity is a crucial challenge in many developing countries. Establishing the electrification agenda of an underserved region is a complicated task where computer models play a critical role in calculating geospatial plans that efficiently allocate resources. Such plans should include—among other things—reasonable estimations of the designs and economic costs of standalone systems, mini-grids, and grid extensions. This implies that computer models need to estimate the network cost for many potential mini-grids. To that end, most planning tools apply quick rules of thumb or geometric methods that ignore power flows and electric constraints, which play a significant role in network designs. This paper presents a methodology that rapidly estimates any low-voltage mini-grid network cost without neglecting the impact of electrical feasibility in such cost. We present a case study where we evaluate our method in terms of accuracy and computation time. We also compare our method with a quick estimation similar to the ones most regional planning tools apply, showing the effectiveness of our method. **

Index Terms- energy access; rural electrification; geospatial planning; mini-grid; network design; linear regression; hierarchical regression

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