GEOSPATIAL PORTFOLIO PLANNING

MINI GRIDS FOR HALF A BILLION PEOPLE

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10 building blocks to deploy mini grids at scale

Where We Are Today

47 million people connected to **19,000 mini grids,** mostly hydro and diesel-powered, at an investment cost of **$28 billion**. *Plus: 7,500 mini grids planned, mostly in Africa, mostly solar-hybrid, connecting more than 27 million people at an investment cost of $12 billion.*

Where We Want to Be to Reach Universal Access by 2030

490 million people served at least cost by **210,000 mini grids,** mostly solar-hybrids, requiring an investment of **$220 billion.**

10 Building Blocks need to be addressed in countries to deploy mini grids at scale: (i) solar-hybrid technology and costing, (ii) geospatial portfolio planning, (iii) income-generating uses of electricity, (iv) community engagement, (v) local and international industry, (vi) access to finance, (vii) training and skills-building, (viii) institutional framework, (ix) workable regulations, and (x) enabling business environments.

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Why geospatial planning, why now?

- Technological advances and cost reductions in satellite imaging and machine learning
- Increased sophistication of algorithms and analytical software
- Proliferation of global positioning system (GPS) devices and Web-based and mobile technologies
- Availability of high-quality open-source software
- Accessibility of big data and cloud-based computing

National Least-Cost Electrification Planning

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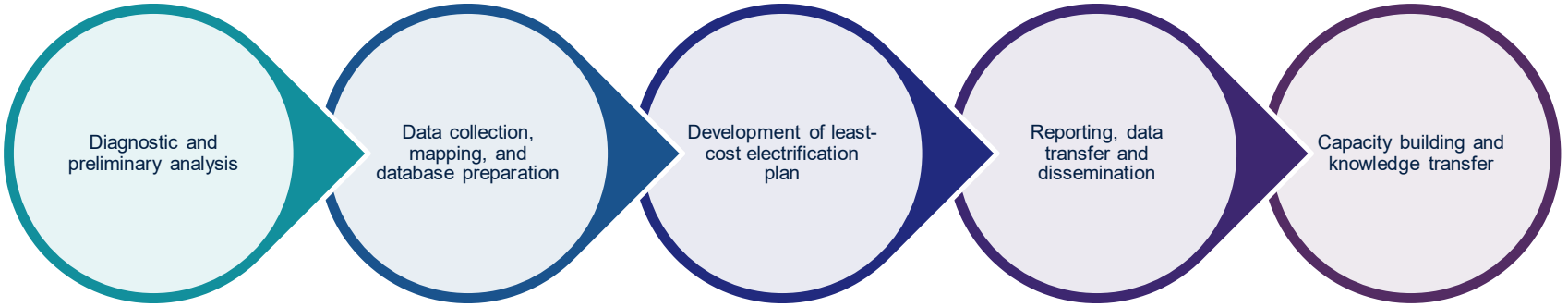
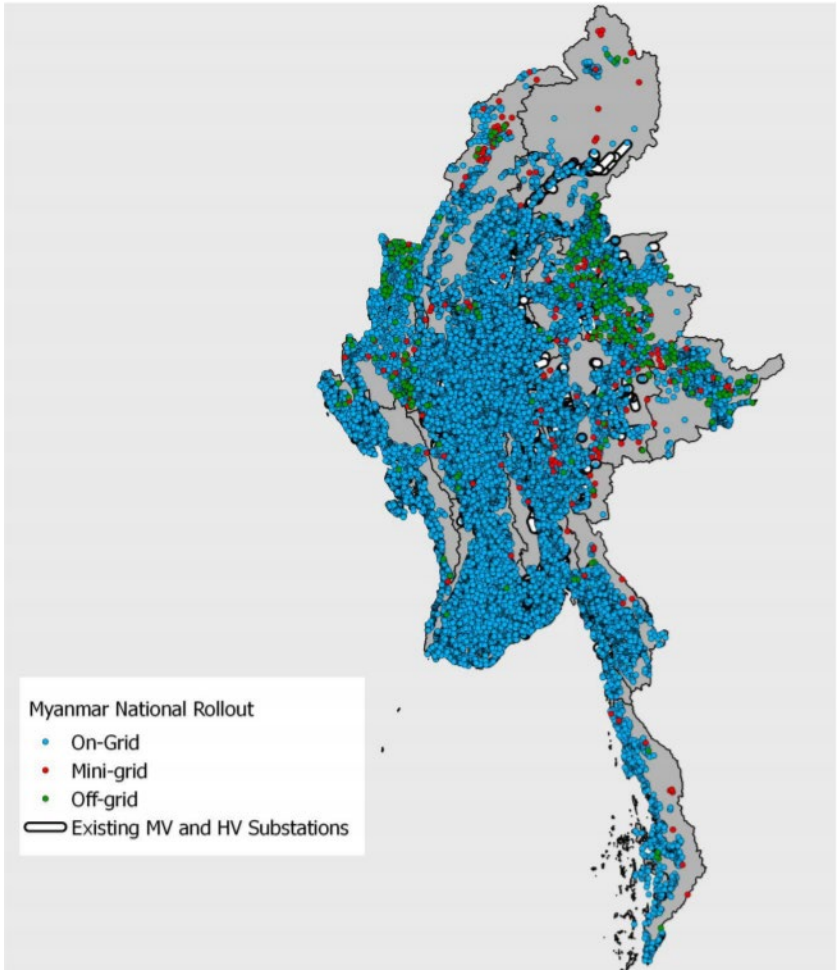
Typical Least-Cost Electrification Planning Sequence

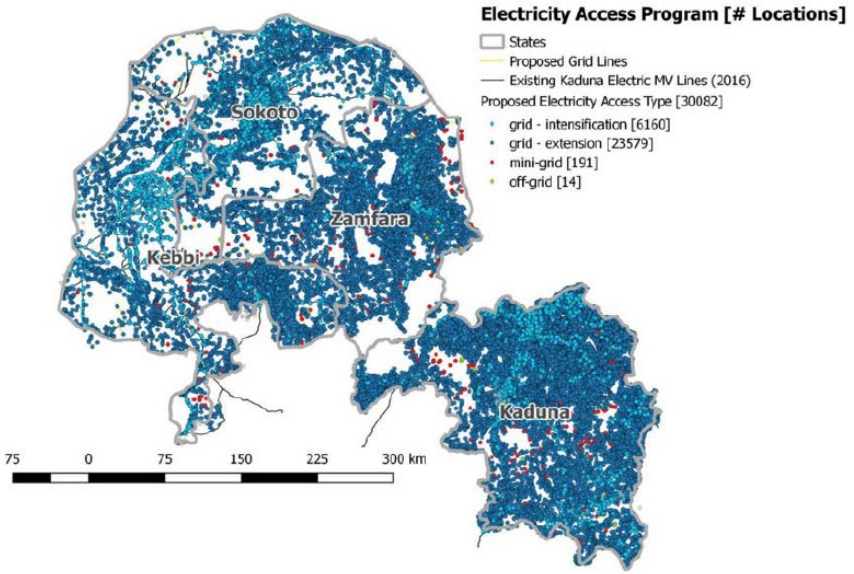


National Least-Cost Electrification Planning Outputs

Myanmar



Nigeria (4 states)



Source: Myanmar National Electrification Program (NEP) Roadmap and Investment Prospectus, Castalia, 2014; Achieving Universal Access in the Kaduna Electric service area, World Bank, 2015

National Least-Cost Electrification Planning in Africa

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Mini Grid Portfolio Planning

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Mini Grid Portfolio Planning

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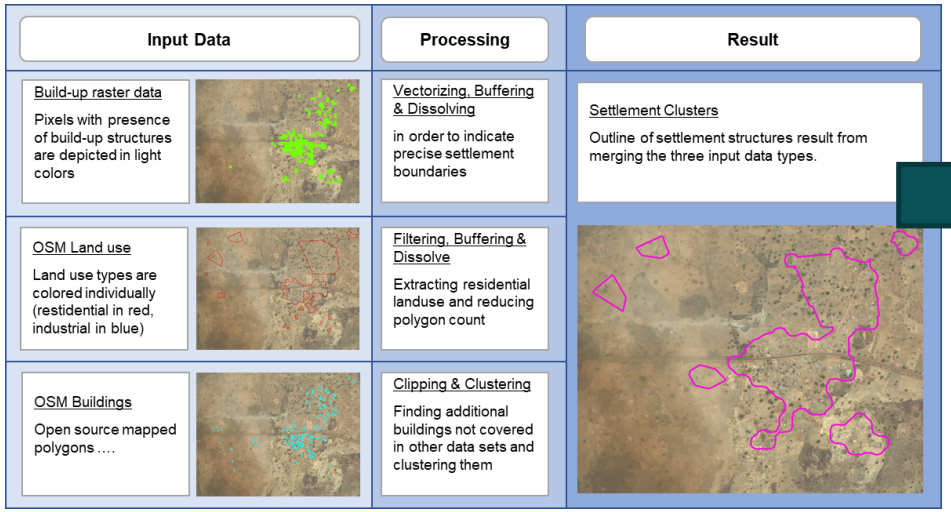
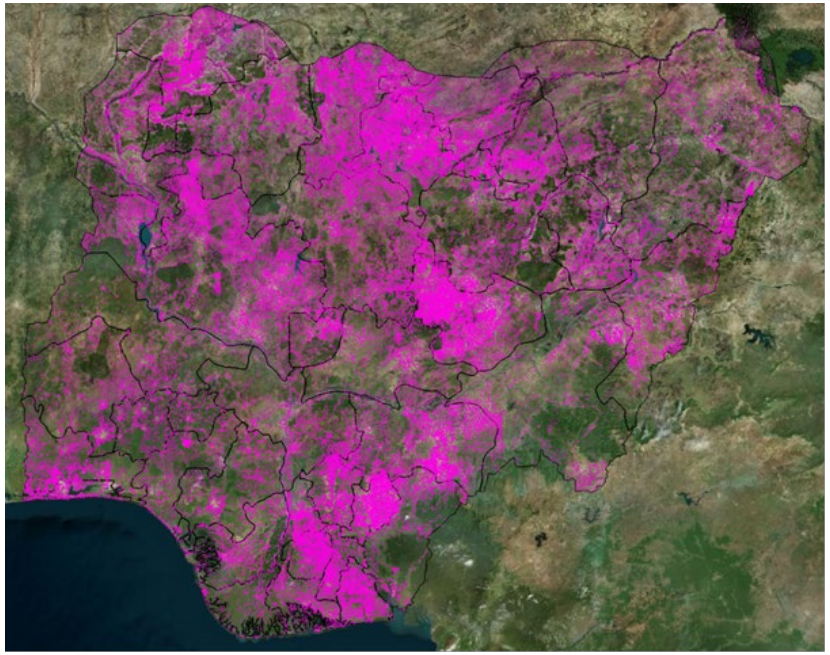
Site Identification and Prioritization

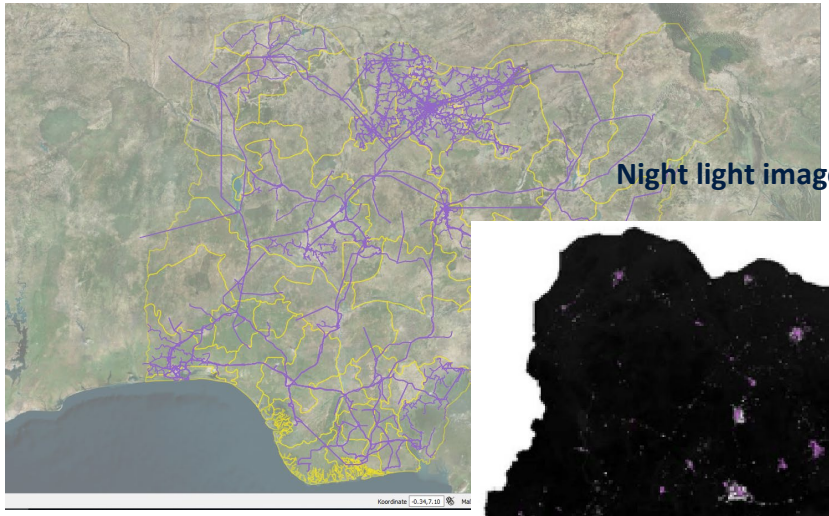


Source: RLI and Integration



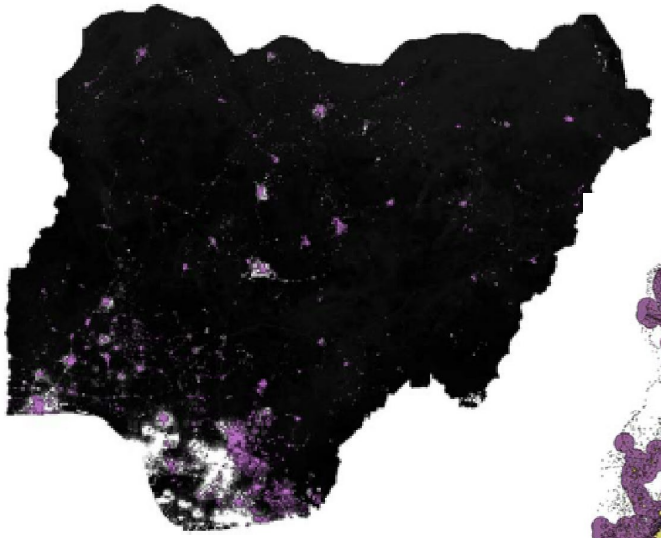
Site Identification and Prioritization

Map of available geospatial grid data coverage in Nigeria

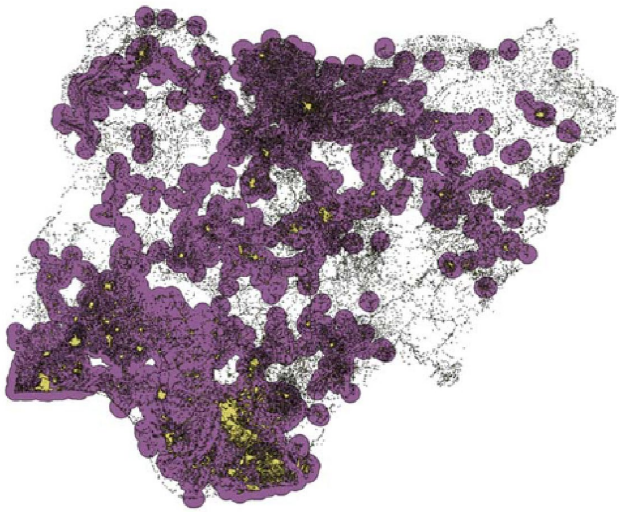


Source: https://energydata.info

Night light imagery of Nigeria



20-kilometer buffer zones



Site Identification and Prioritization

Additional socio-economic data available for entire Nigeria are number of schools, health facilities and telecom towers currently relying on diesel generators.

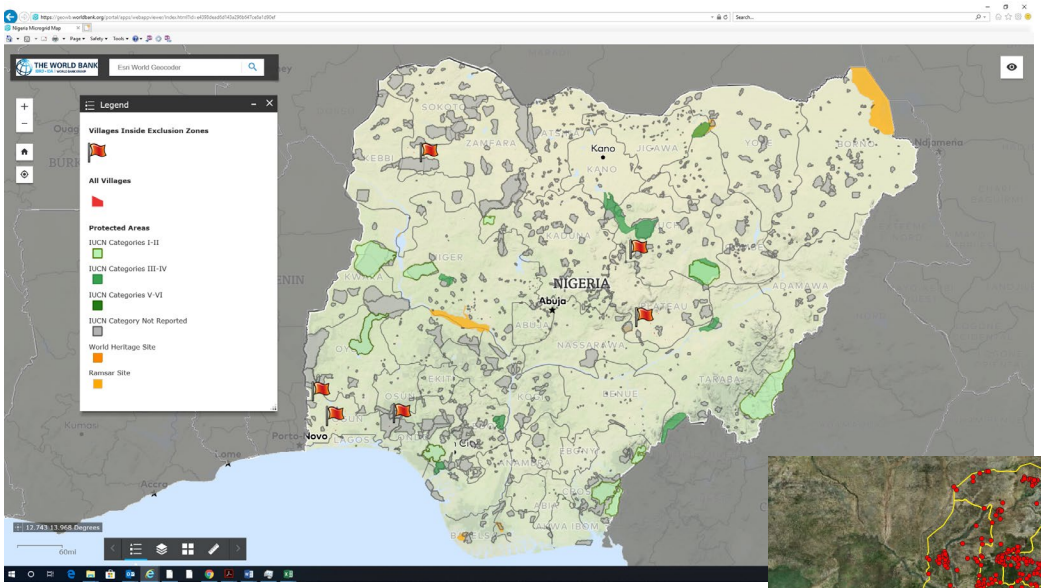
Exclusion Criteria:

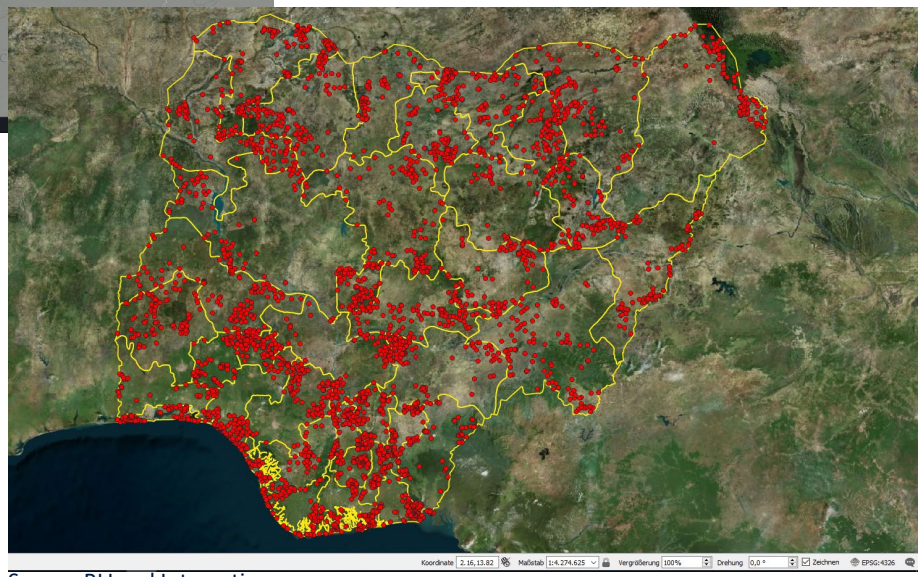
- Exclusion of sites with distance to grid <5km
- Exclusion of sites with population < 1,000
- Exclusion of sites that fall within protected areas, national parks and other ecologically sensitive zones

Prioritization Criteria:

- Ranking of sites based on population, density, schools, health facilities, distance to grid, anchor customers.

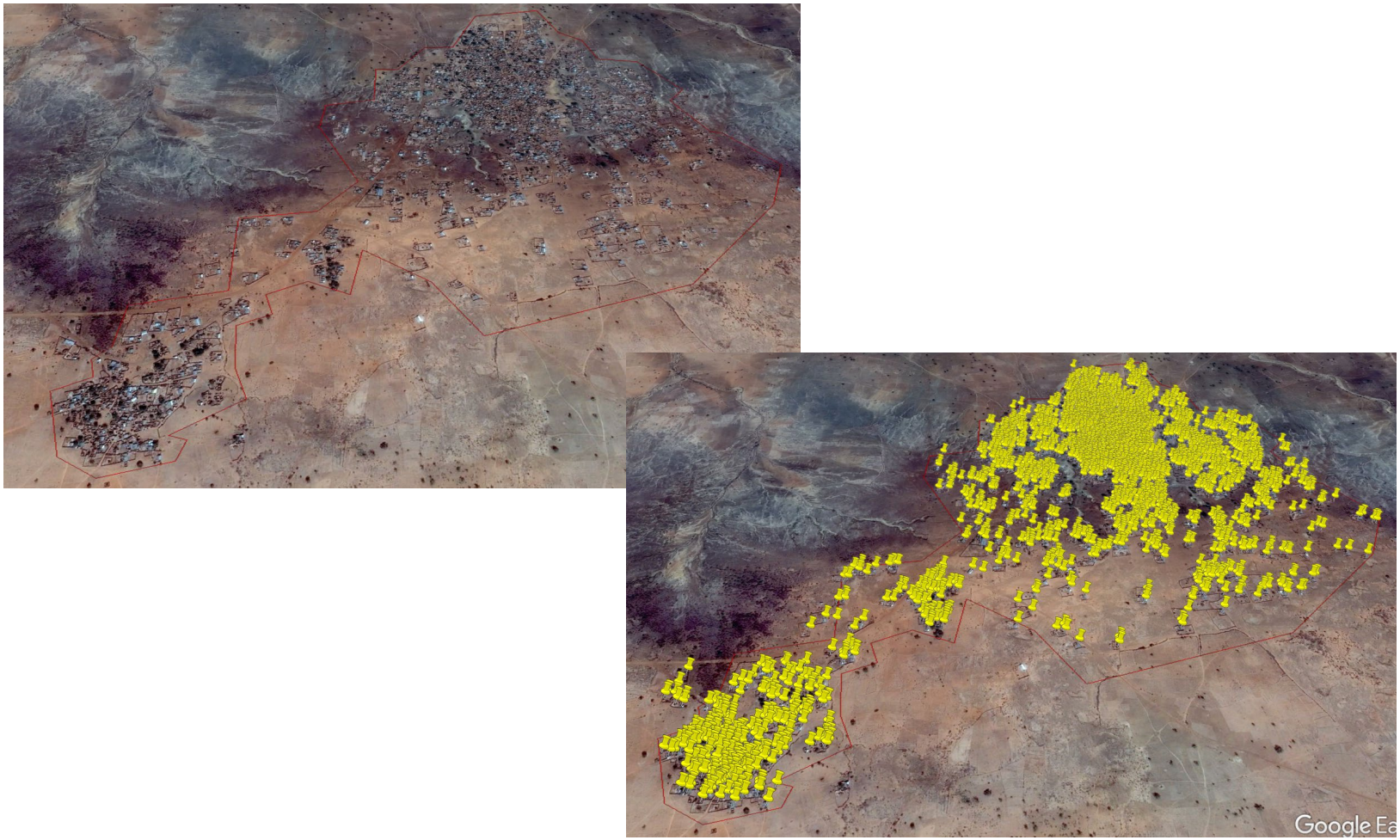
Site Identification and Prioritization



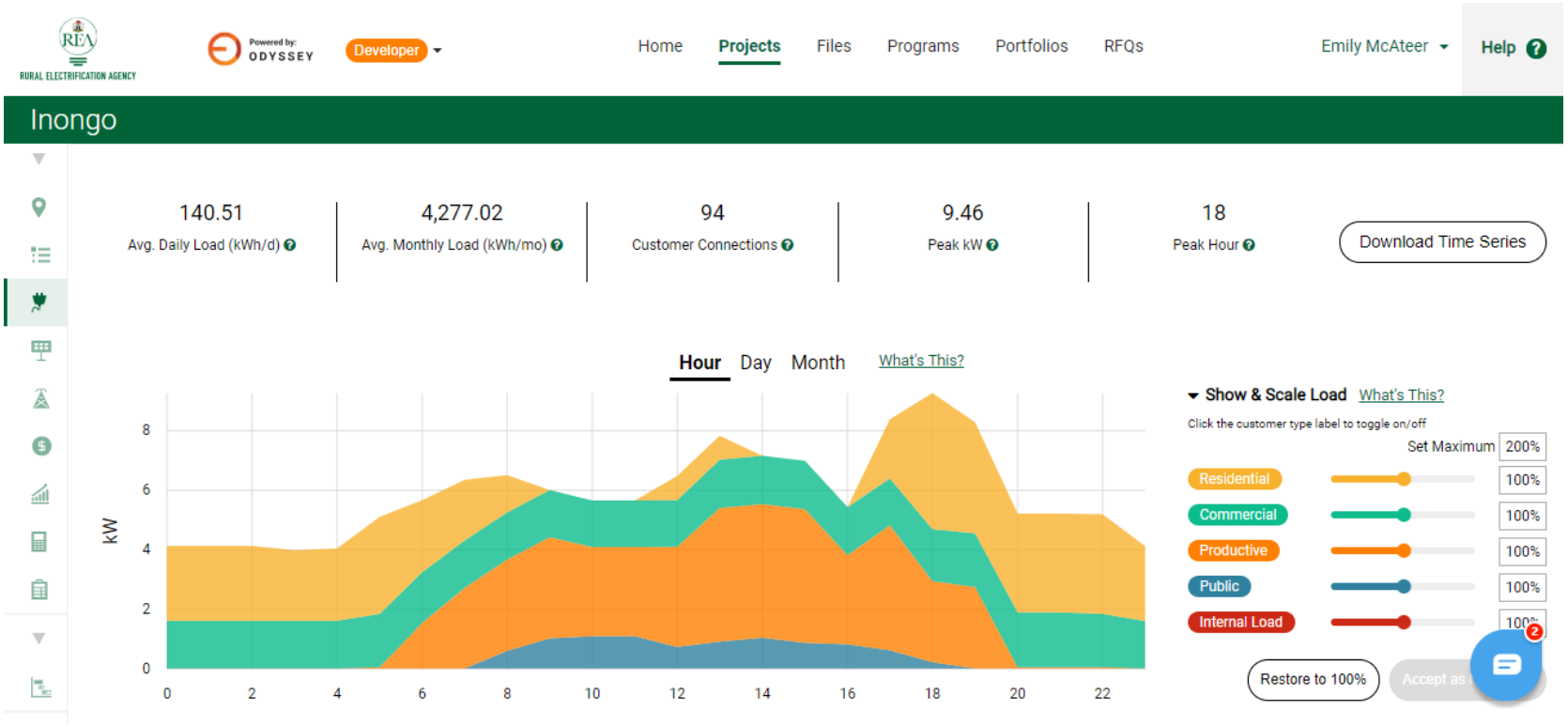


Source: RLI and Integration

Customer Mapping



Survey Data Collection and Load Modeling



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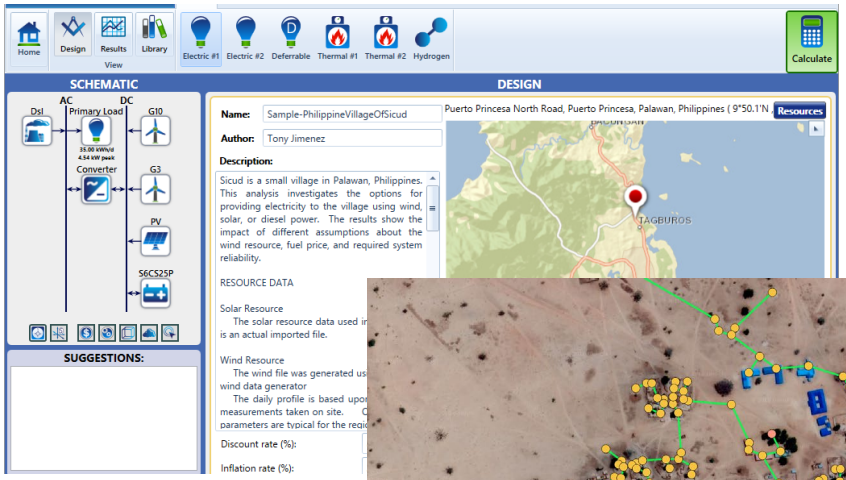
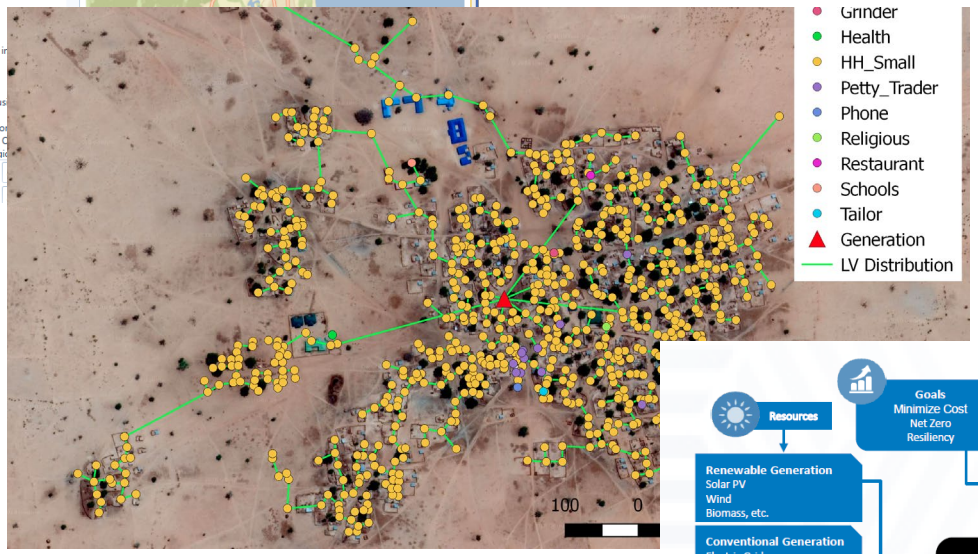
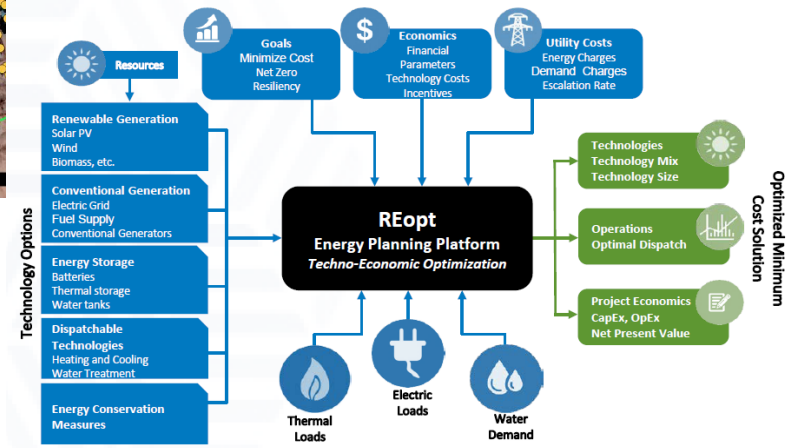
System Optimization







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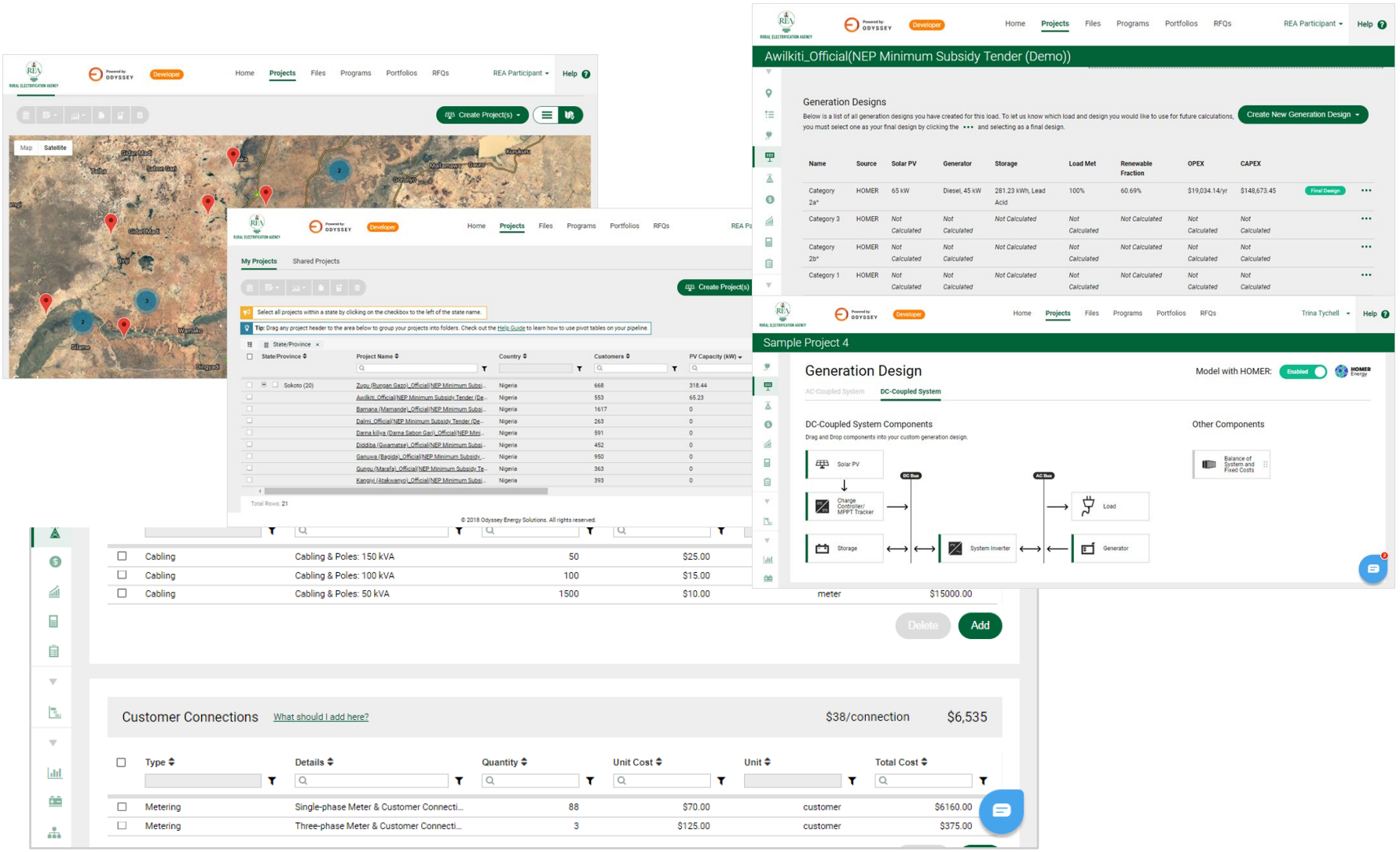
Online Platform



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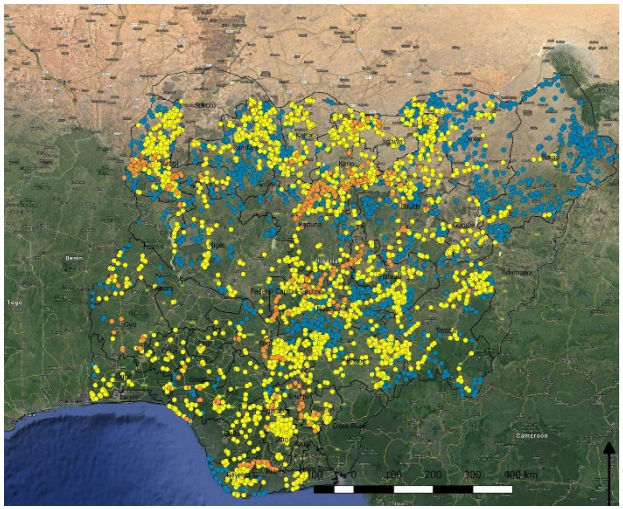
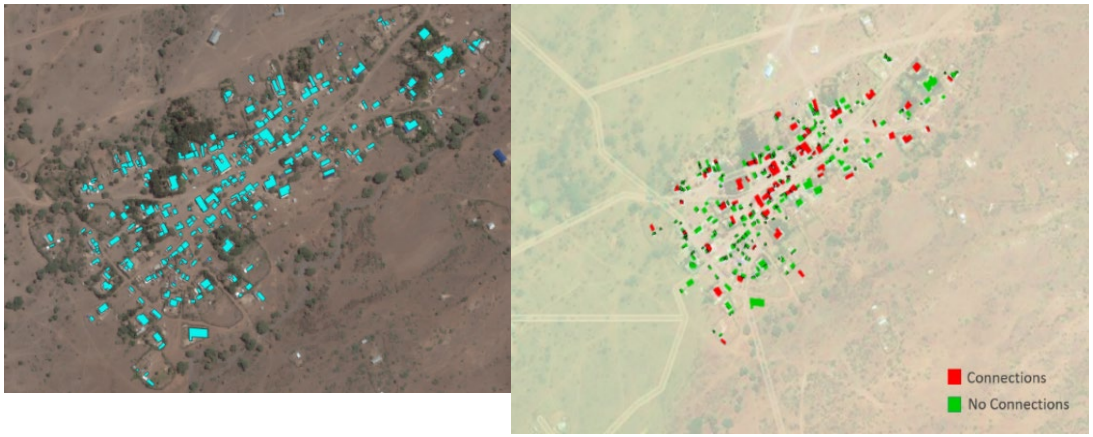
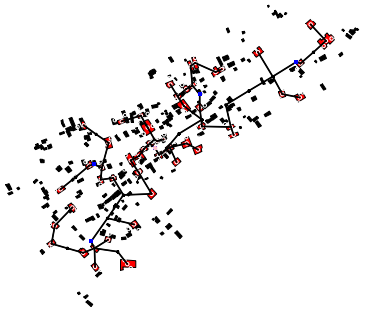
Private Developer Initiatives



Powerhive

Engie





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Conclusions

Impact of Geospatial and Digital Tools

- Significant **reduction in pre-investment costs** associated with mini grid development
- **Unprecedented scale** possible because of the low costs involved
- **Swifter speed** compared to traditional approaches that require the deployment of multi-disciplinary teams at considerable expense
- Experience from Nigeria suggests mini grid portfolio planning already feasible at a cost of approximately $2300 per site, with scope for further cost reduction

Thank You

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