

The Reference Electrification Model

A decision support tool to enable smart electricity access planning

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Energy Access Planning

Providing universal access to electricity will be a huge and complex task.

- Decision making between various on-grid and off-grid solutions must incorporate many factors, including current and future demand, available resources, reliability, economics, and social acceptance

REM as a Solution

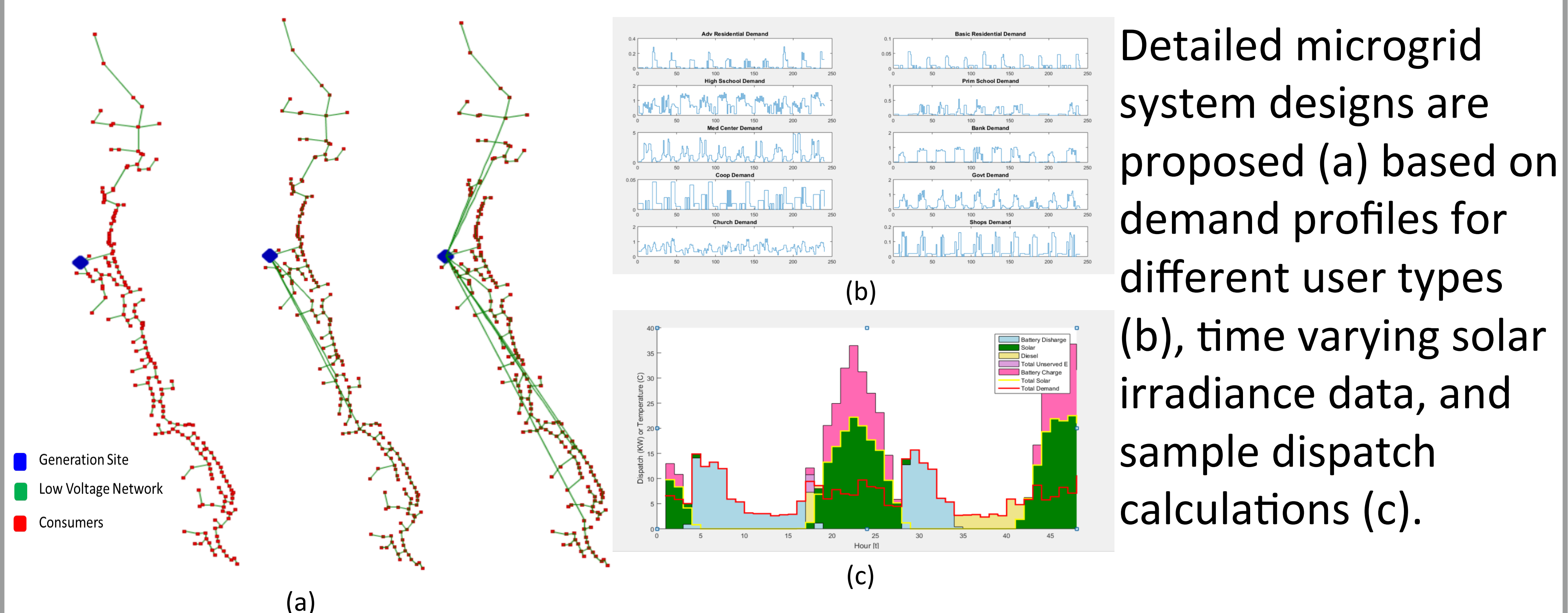
REM supports (1) large-scale electrification planning and (2) local electrification projects by producing optimal system designs.

- Locates buildings, characterizes load from satellite imagery, and infers electrification status
- Selects the best electrification mode for each individual customer (grid, microgrid, isolated)
- Selects technologies and sizes components for generation and distribution
- Produces system cost and performance estimates
- Produces detailed generation and network designs

Applications

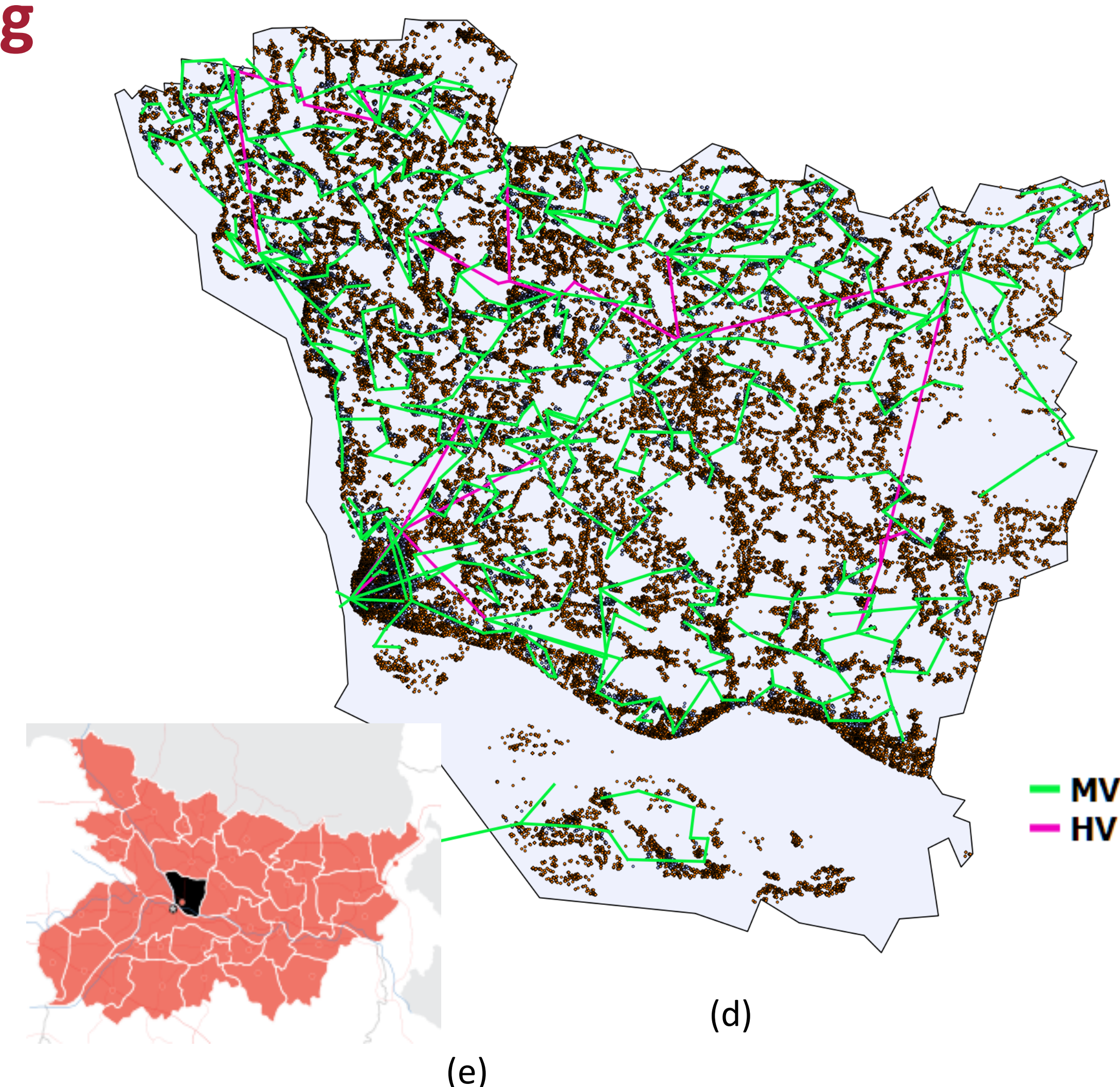
- Current case studies in India, Uganda, Rwanda, and Peru
- Policy makers can use the model to answer “what if questions” (e.g. impact of improved reliability, demand growth, generation without fossil fuels)
- Entrepreneurs can use the model to plan their businesses (e.g. identify locations where technology is most cost-effective, assess financial viability of designs, design microgrid layout and generation)

Individual System Design



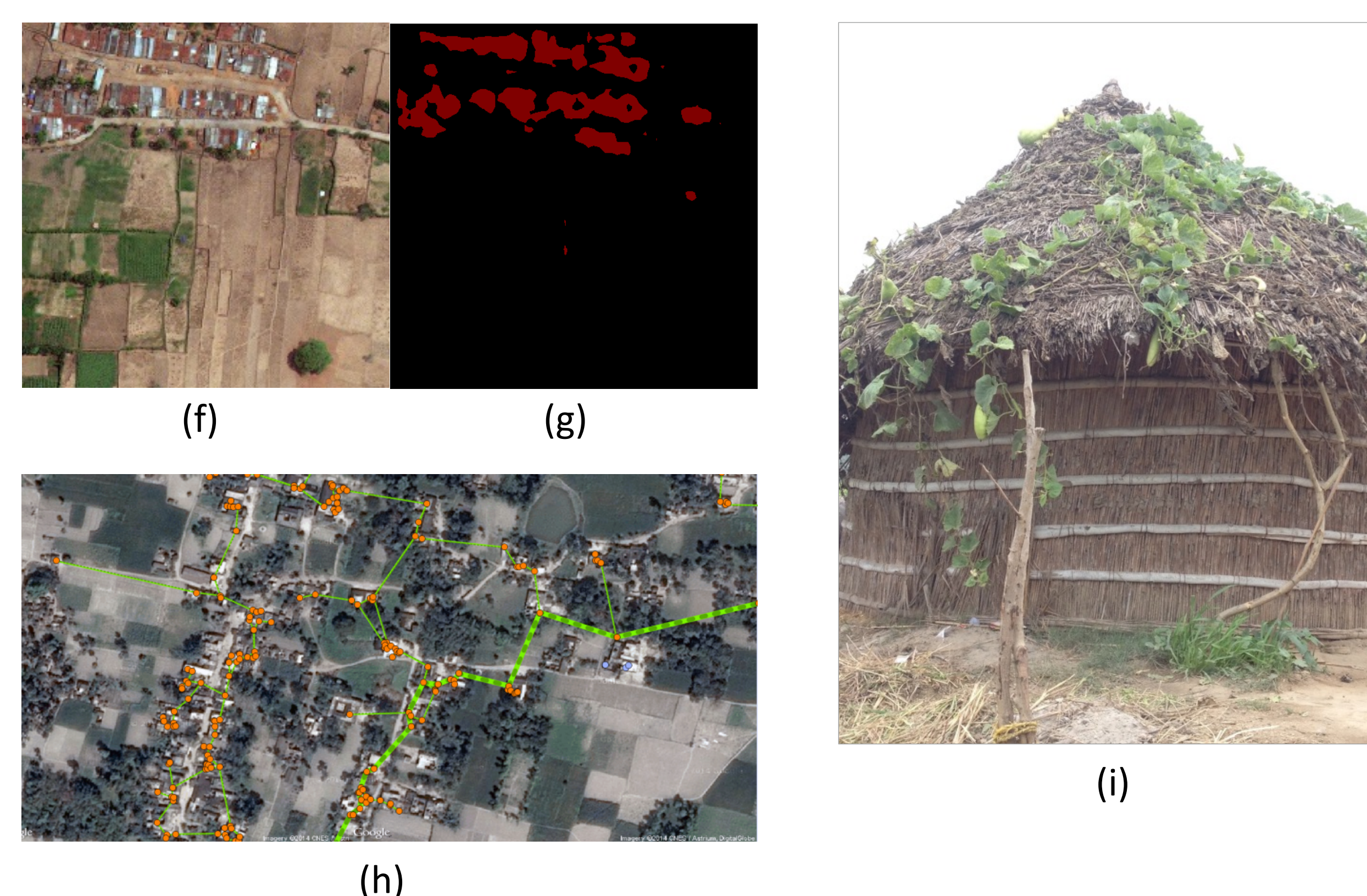
Large Scale Regional Planning

Given information about the existing and planned network, REM can be greatly scaled to design networks for large regions. Our initial case study in India concerns the Vaishali district (d) in the state of Bihar (e), which has over 600,000 buildings. Metrics regarding cost, reliability, and technology mix can help to inform electrification planning and policy decisions.



Building Extraction from Satellite Imagery

Building rooftop probability maps (g) are produced from satellite imagery (f) to inform REM designs (h) using machine learning techniques. Rural India presents special challenges for building extraction (i).



Implementation Partners

Tata Power Delhi Distribution Ltd., Prayas, TARAurja

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