Modeling Framework for Network Planning
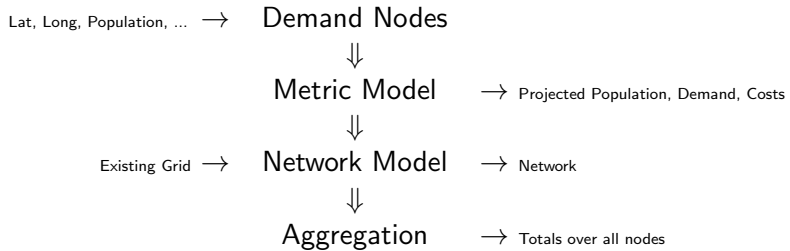
(Demand Nodes, Parameters)
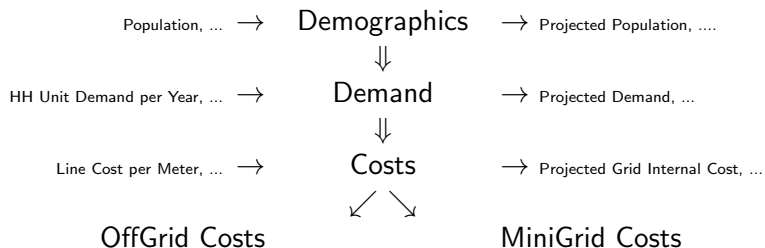
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NP

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(Network, Model Outputs)

Lat, Long, Population, ... $\longrightarrow$ Demand Nodes

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Metric Model $\longrightarrow$ Projected Population, Demand, Costs

$\Downarrow$

Existing Grid $\longrightarrow$ Network Model $\longrightarrow$ Network

$\Downarrow$

Aggregation $\longrightarrow$ Totals over all nodes

Metric Model

Population, ... $\rightarrow$ **Demographics** $\rightarrow$ Projected Population, ...

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HH Unit Demand per Year, ... $\rightarrow$ **Demand** $\rightarrow$ Projected Demand, ...

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Line Cost per Meter, ... $\rightarrow$ **Costs** $\rightarrow$ Projected Grid Internal Cost, ...

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OffGrid Costs   **MiniGrid Costs**

$$mvMax = \frac{min(OffGridCost, MiniGridCost) - GridInternalCost}{mvCostPerMeter}$$

Network Model

Kruskal's MST Algorithm
Iterate over all candidate segments (node pairs) in ascending length order adding to the network IF they do not create a cycle.

Modifications:

1. Add the condition $node1.mvMax \geq segment.length \land node2.mvMax \geq segment.length$
2. Use "intersects subnet in more than 1 place" for cycle detection
3. For segments added and all nodes in their subnet, set
   $mvMax = node1.mvMax + node2.mvMax - segment.length$

That last modification "distributes" demand over the network, increasing it's reach