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Integrated Resource and Resilience Planning (IRRP) in Lao PDR *Modeling Overview*

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What is IRRP?

An approach to power planning that...

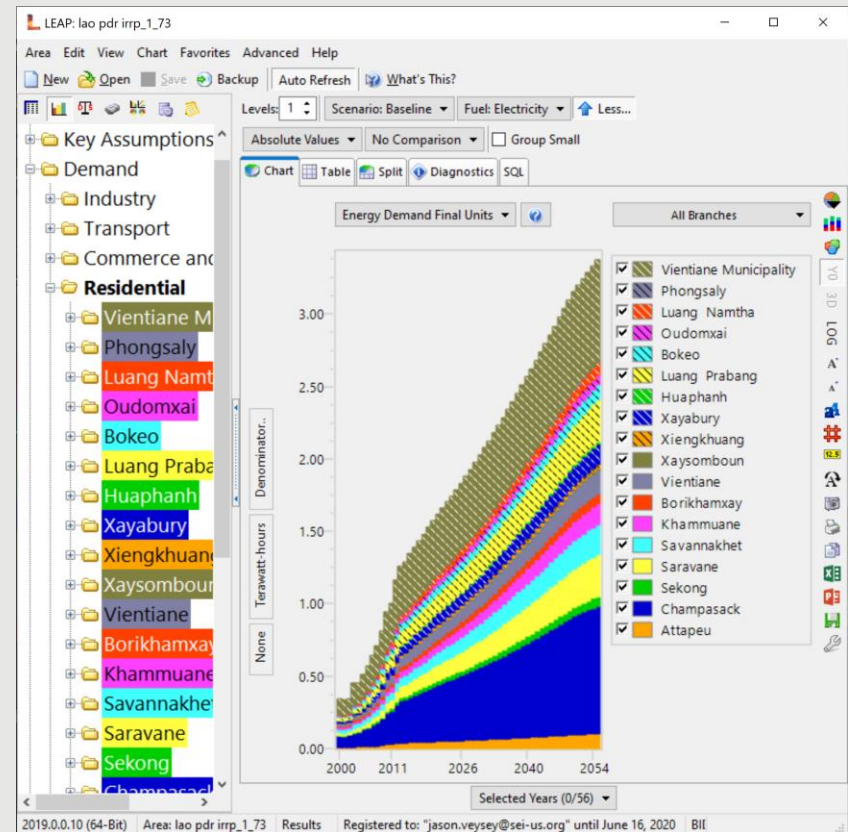
- Considers both supply-side and demand-side options
- Accounts for a broad range of uncertainties and risks
- Considers multiple social objectives, and evaluates planning options using corresponding metrics



IRRP program modeling



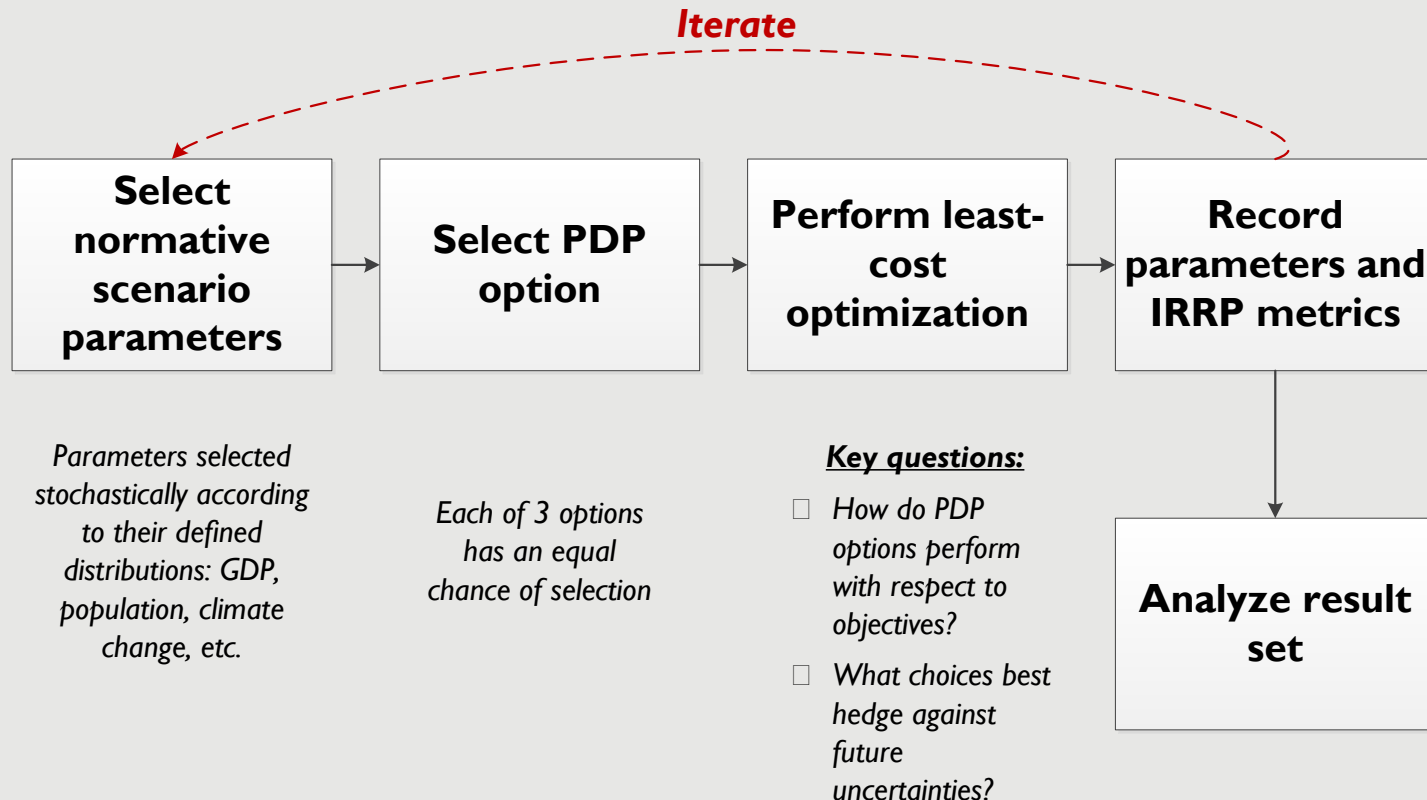
- Integrated energy system modeling (all sectors, all fuels)
- Multiple scenarios
 - Baseline
 - Normative – factors outside planners' control => major uncertainties
 - PDP options (3, 4, 6)
- Metrics



Large scenario ensemble analysis

Systematically explore uncertainties and planning decisions

(investments in generation and transmission, energy efficiency, and climate change resilience)



Project status



Large scenario ensemble analysis taking place this quarter

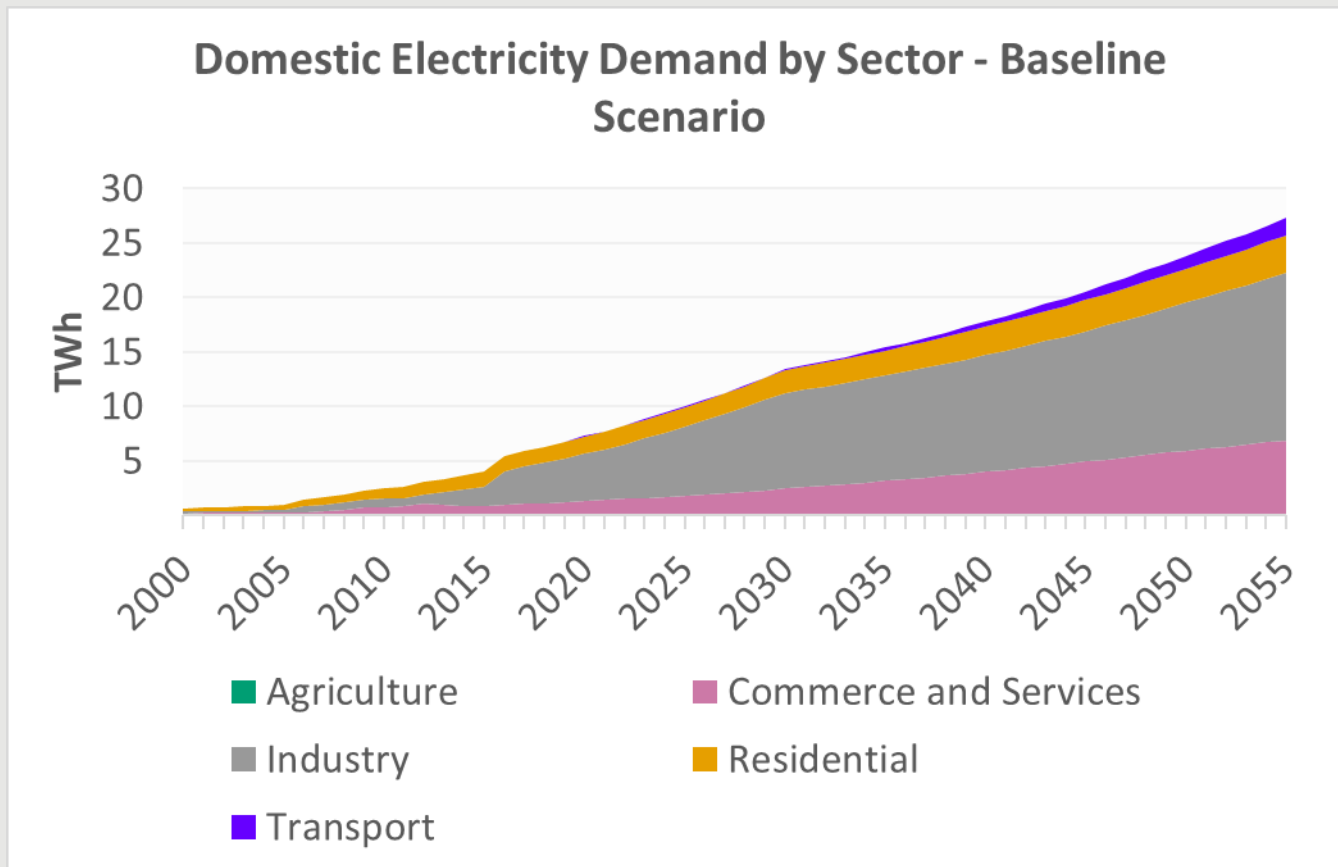
Demand modeling approach

- Bottom-up analysis of demand using Lao PDR data
- Disaggregation by electricity supply region, sector, subsector, energy use, technology, and fuel
- Evolution of major demand drivers explored through normative scenarios, or based on official forecasts and MEM/EDL judgement



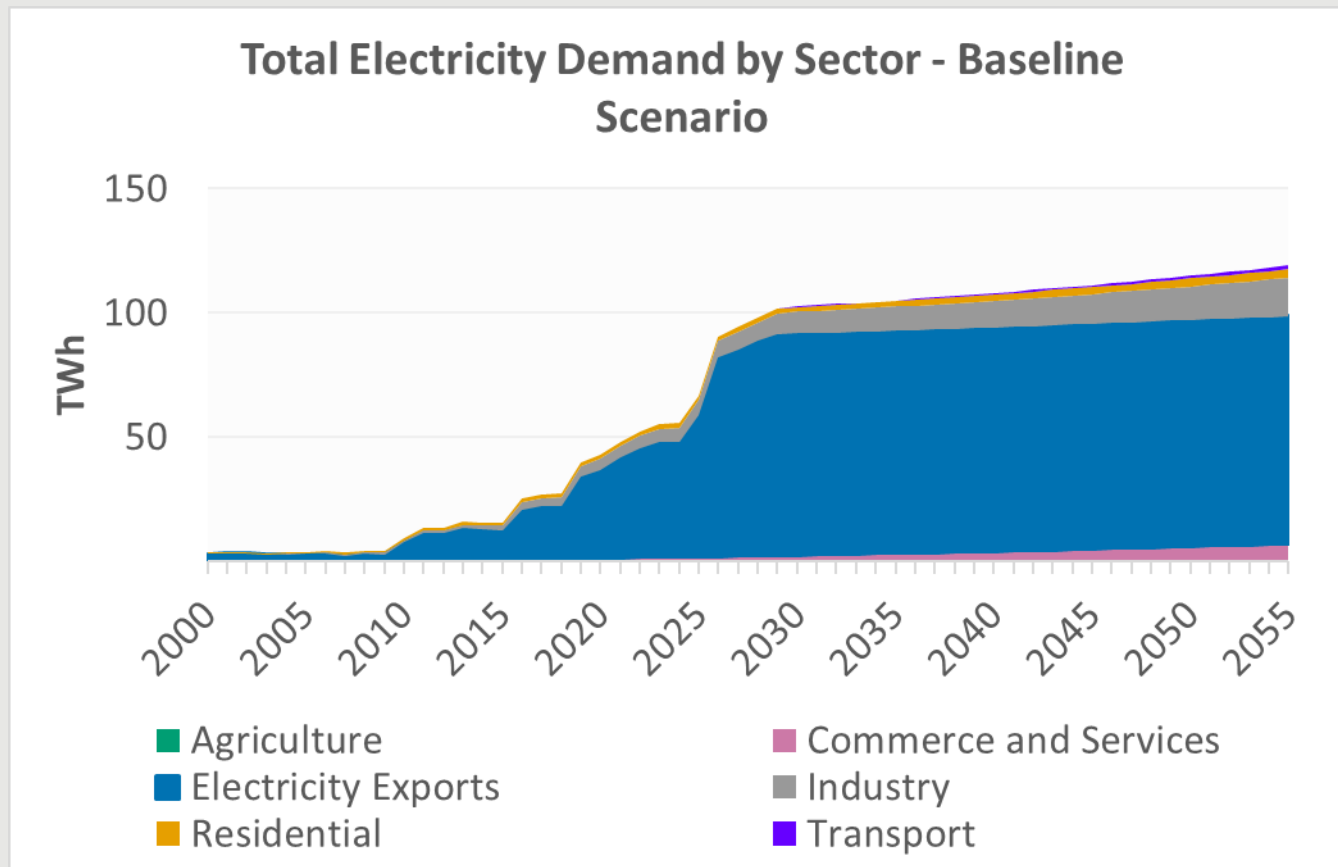
Preliminary demand results

Significant long-term growth in domestic demand...



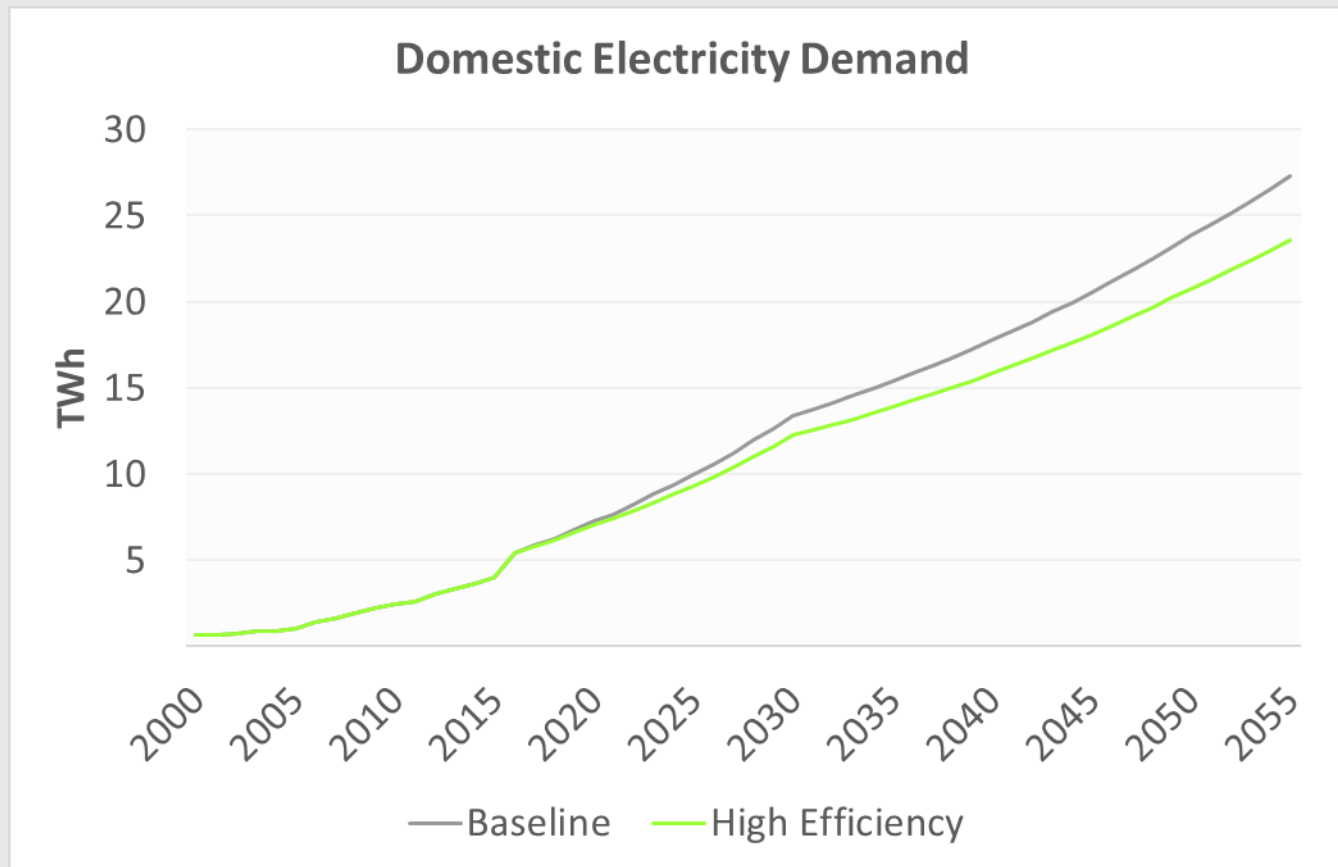
Preliminary demand results

...but demand for exports dominates



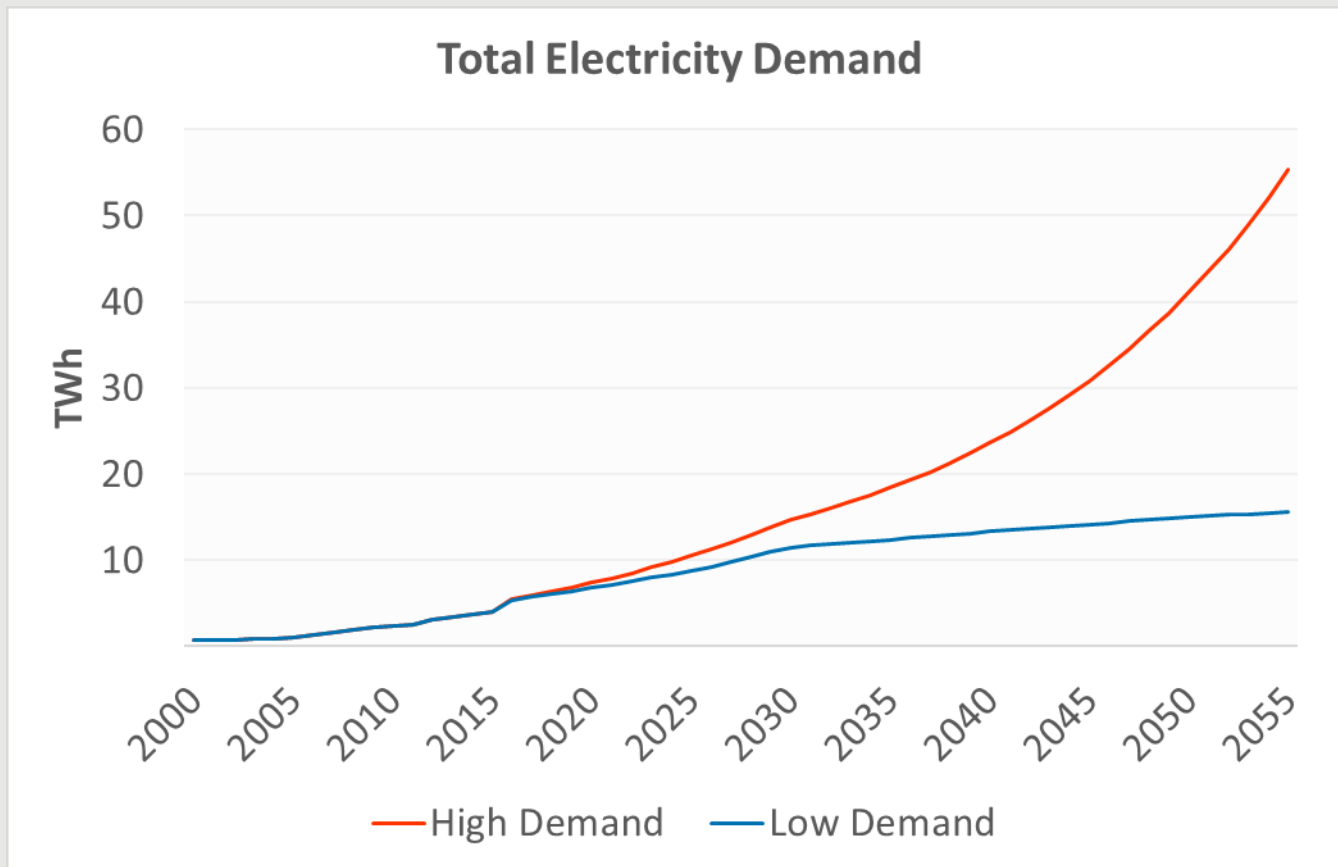
Preliminary demand results

Substantial low/no-cost energy efficiency potential



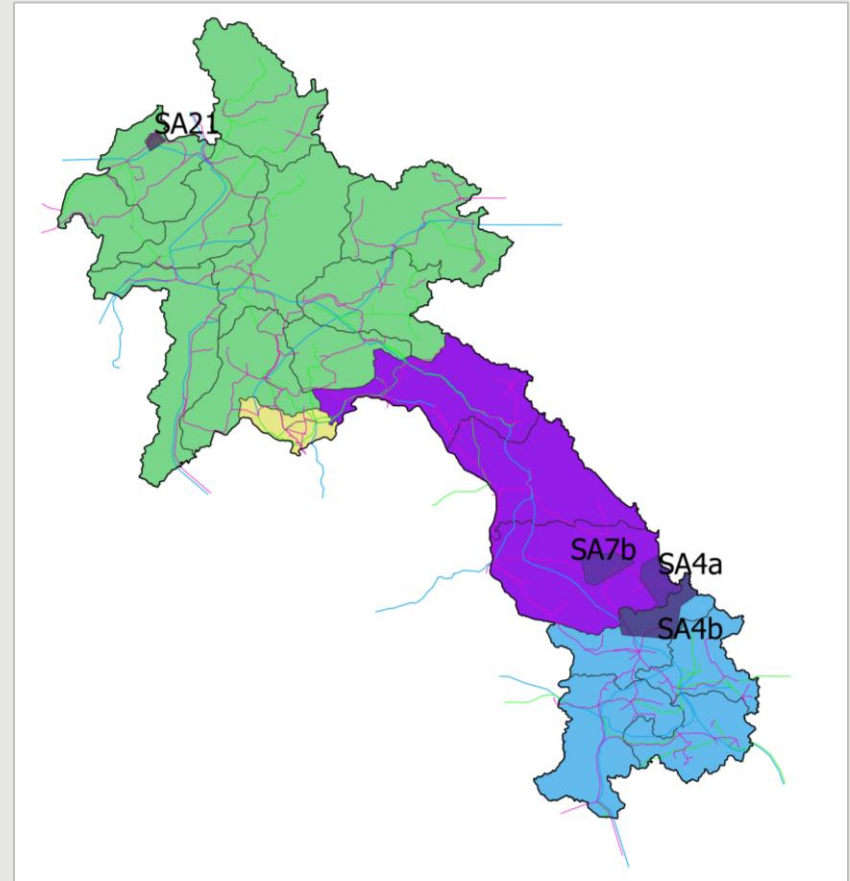
Preliminary demand results

Even larger variation when considering uncertainties



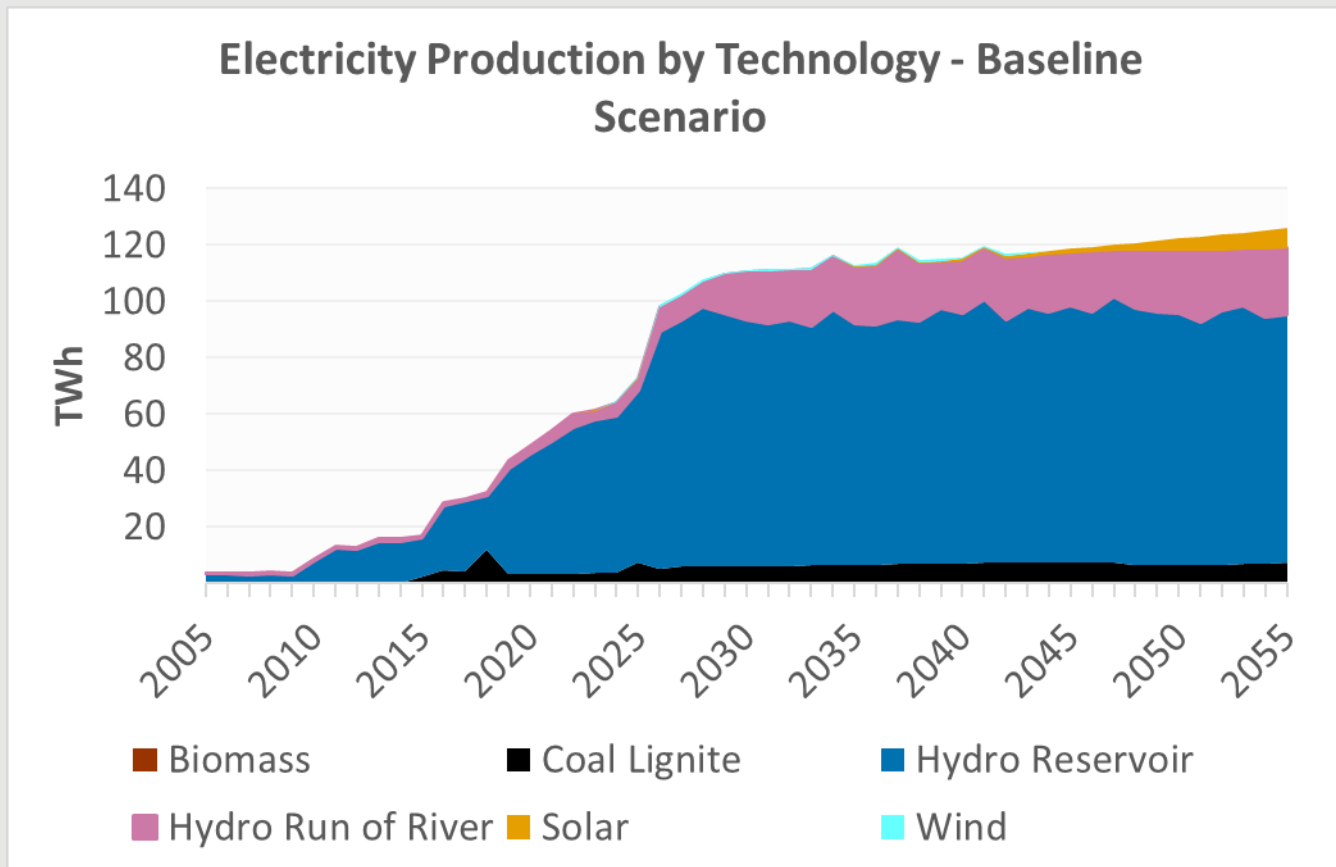
Supply modeling approach

- Aggregate representation of transmission grid (8 major nodes)
- Existing, under construction, and planned generation plants and transmission lines
- Candidate REZs/generation clusters and transmission lines
- Other candidate technologies (hydro, coal)
- 96 time slices (wet/dry x weekday/weekend x 24 hours)
- Least-cost optimization, direct current optimized power flow



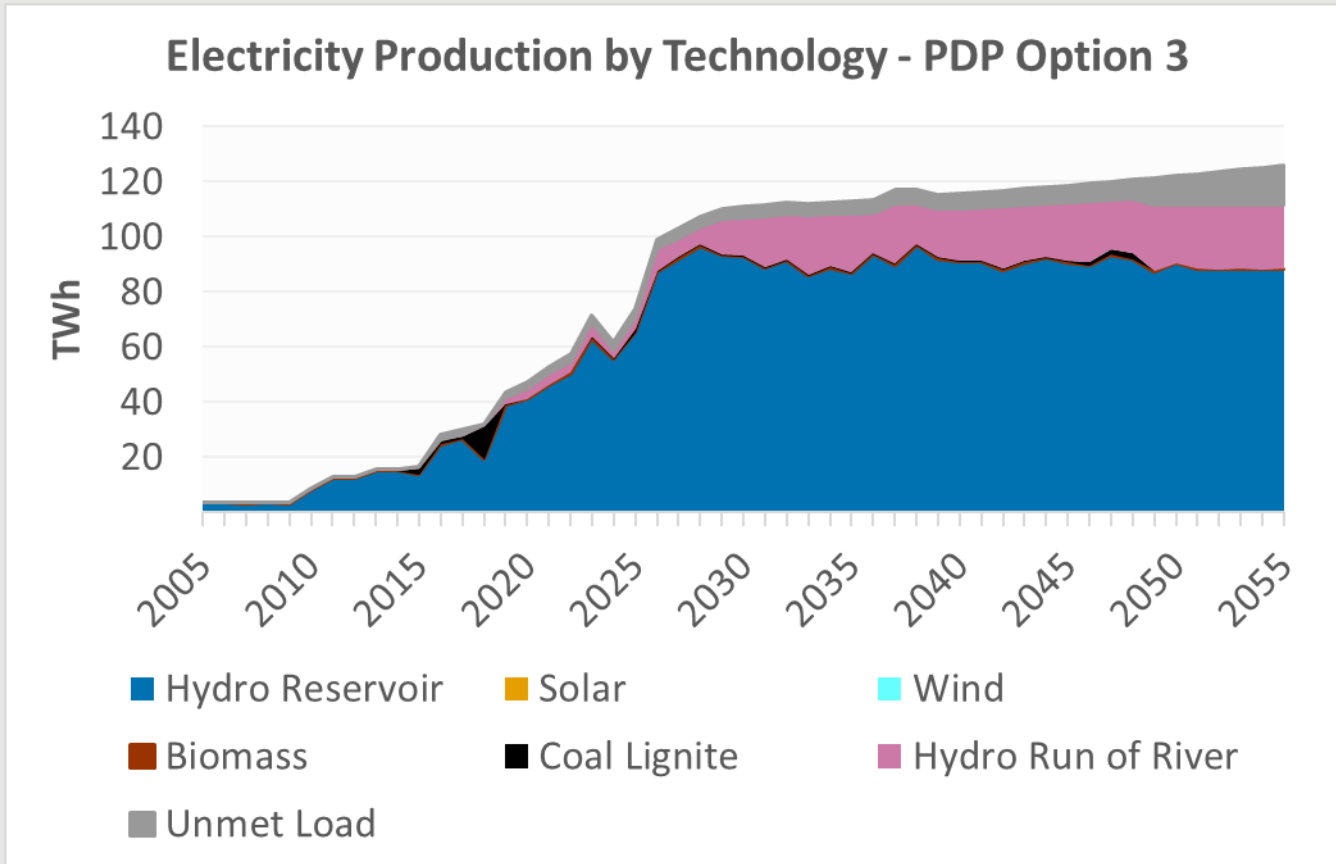
Preliminary supply results

Solar and coal both play a role in PDP Option 6



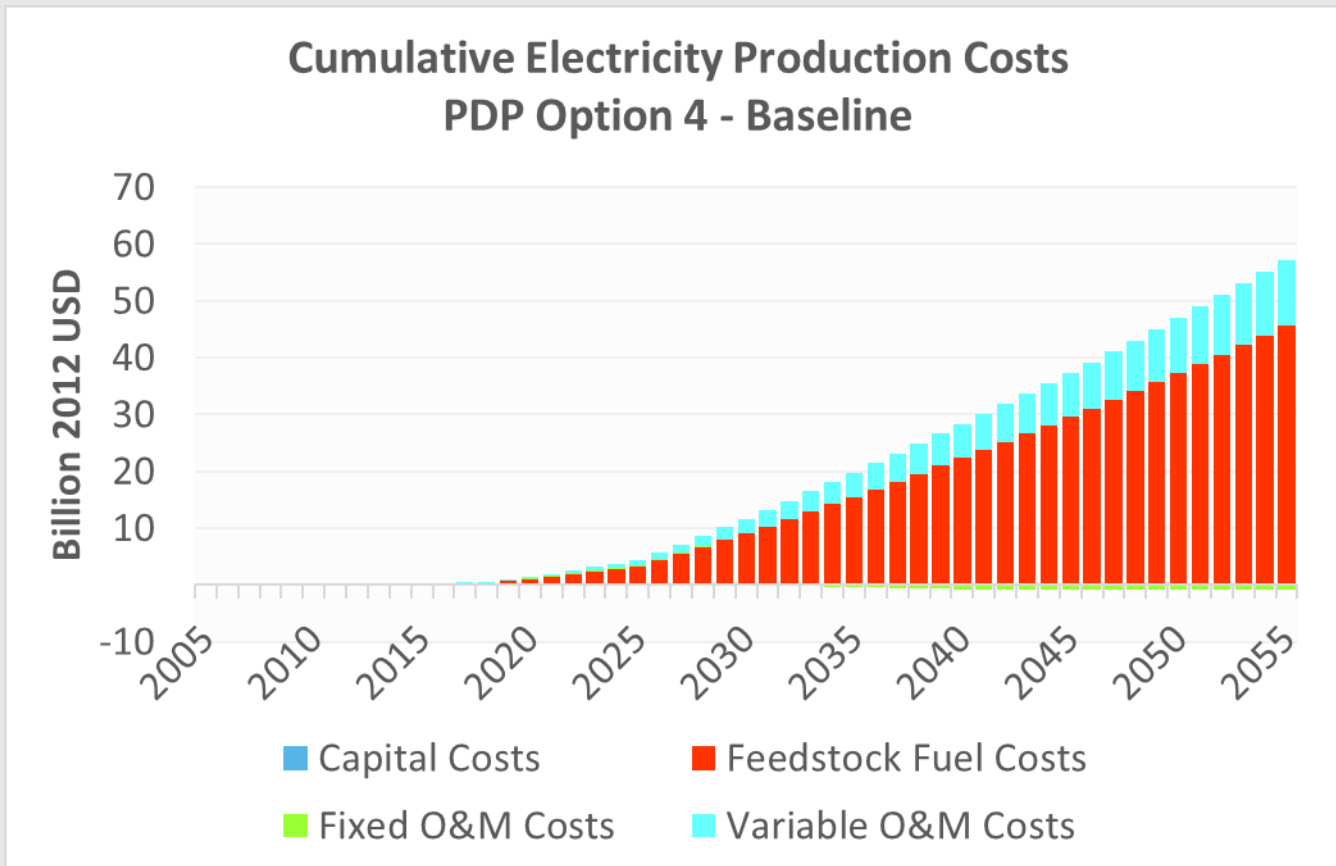
Preliminary supply results

Unmet requirements in PDP Option 3 (hydro only) due to transmission constraints



Preliminary supply results

Resource diversity lowers electricity production costs



Preliminary supply results

Solar and coal fill gap in high demand scenario

