DOCKETED	
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Los Angeles Department of Water & Power

CUSTOMERS FIRST

SB 100 TECHNICAL WORKSHOP

L.A. 100% Renewable Energy Study (LA100)

November 18, 2019

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Outline

- Background
- Assumptions and Scenarios
- Study Modeling
- Challenges
- Preliminary Results
- Timeline

LA100 Study Goals

- L.A. City Council motions directed LADWP to:
  - Determine investments needed to reach 100% renewable energy
  - Examine the impacts on local jobs and economic development
  - Understand the health, air-quality, and electricity-rate impacts of achieving a 100%-renewable system; identify environmental-justice neighborhoods as first beneficiaries

UNIQUE ASPECTS OF STUDY

- LADWP must supply all energy for sales plus losses
- Includes 100%-renewable scenarios without the use of renewable-energy credits (RECs)
- Study's scope is unprecedented — using state-of-the-art modeling

National Renewable Energy Laboratory (NREL)

- DOE-funded lab in Golden, CO
- Only DOE lab focusing on renewables
- NREL has unique modeling capabilities
  - LA100 is one of the largest renewable-energy studies
  - LA100 requires high-performance computing
  - Some analyses would take 20 years to run on a laptop

NREL supercomputer: Eagle

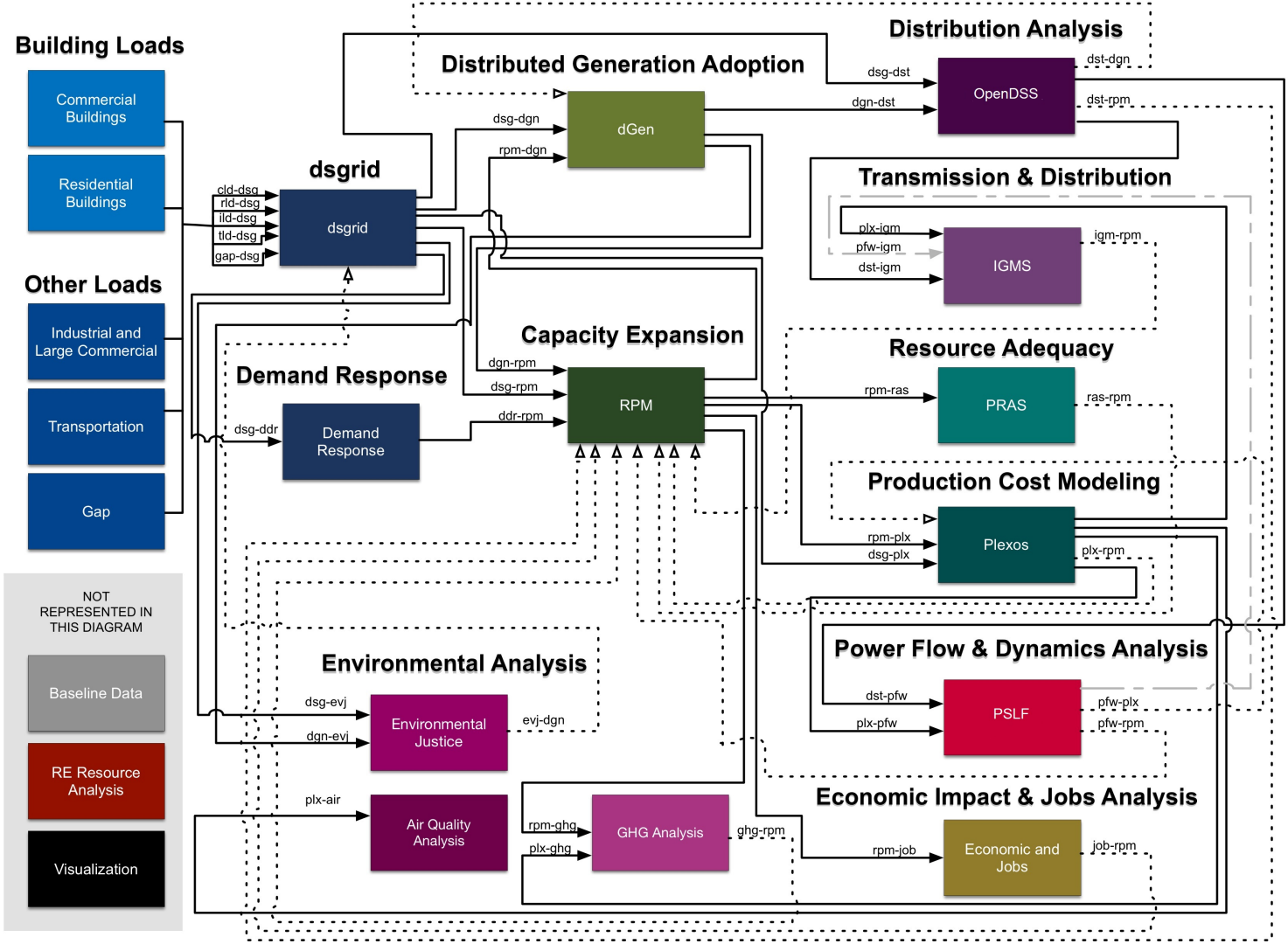
Advisory Group (AG)

LA100 Scenarios

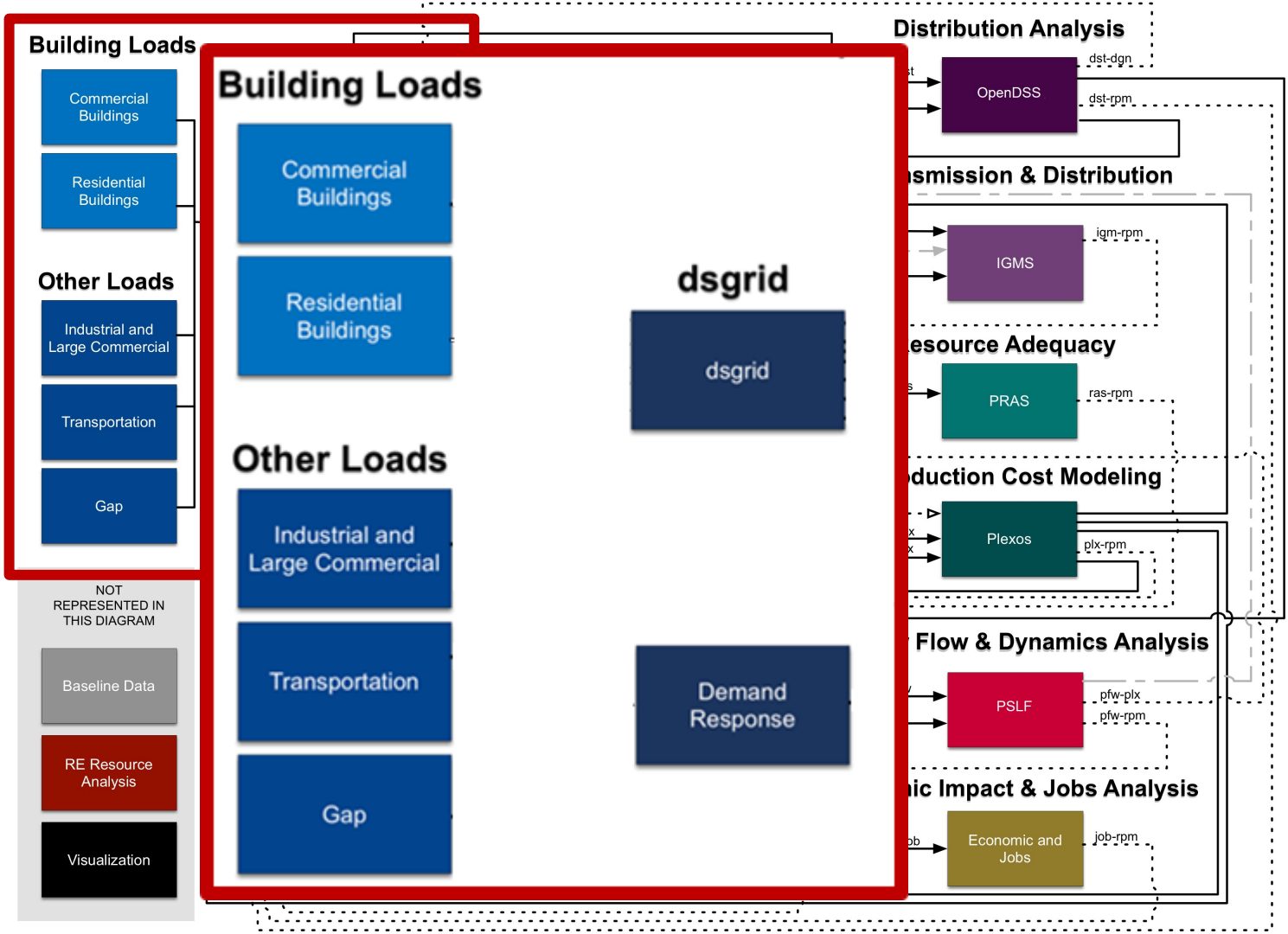
		LA100 Scenarios								
		Moderate Load Electrification				High Load Electrification (Load Modernization)				High Load
		SB100	LA-Leads, Emissions Free (No Biomass)	Transmission Renaissance	High Distributed Energy Future	SB100	LA-Leads, Emissions Free (No Biomass)	Transmission Renaissance	High Distributed Energy Future	High Load Stress (SB100)
	2030 RE Target	60%	100% Net RE	100% Net RE	100% Net RE	60%	100% Net RE	100% Net RE	100% Net RE	60%
	Compliance Year for 100%	2045	2035/2040	2045	2045	2045	2035/2040	2045	2045	2045
Technologies Eligible in the Compliance Year	Biomass	Y	No	Y	Y	Y	No	Y	Y	Y
	Biogas	Y	No	Y	Y	Y	No	Y	Y	Y
	Electricity to Fuel (e.g. H2)	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Fuel Cells	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Hydro - Existing	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Hydro - New	N	N	N	N	N	N	N	N	N
	Hydro - Upgrades	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Natural Gas	Yes	N	N	N	Yes	N	N	N	Yes
	Nuclear - Existing	Y	Y	No	No	Y	Y	No	No	Y
	Nuclear - New	N	N	N	N	N	N	N	N	N
	Wind, Solar, Geo	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Storage	Y	Y	Y	Y	Y	Y	Y	Y	Y
Repowering OTC	Haynes, Scattergood, Harbor	N	N	N	N	N	N	N	N	N
DG	Distributed Adoption	Moderate	High	Moderate	High	Moderate	High	Moderate	High	Moderate
RECS	Financial Mechanisms (RECS/Allowances)	Yes	N	N	N	Yes	N	N	N	Yes
Load	Energy Efficiency	Moderate	Moderate	Moderate	Moderate	High	High	High	High	Reference
	Demand Response	Moderate	Moderate	Moderate	Moderate	High	High	High	High	Reference
	Electrification	Moderate	Moderate	Moderate	Moderate	High	High	High	High	High
Transmission	New or Upgraded Transmission Allowed?	Only Along Existing or Planned Corridors	Only Along Existing or Planned Corridors	New Corridors Allowed	No New Transmission	Only Along Existing or Planned Corridors	Only Along Existing or Planned Corridors	New Corridors Allowed	No New Transmission	Only Along Existing or Planned Corridors
WECC	WECC VRE Penetration	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate

Note: The study also includes a reference case (2017 SLTRP with minor updates). This case extends through 2036.

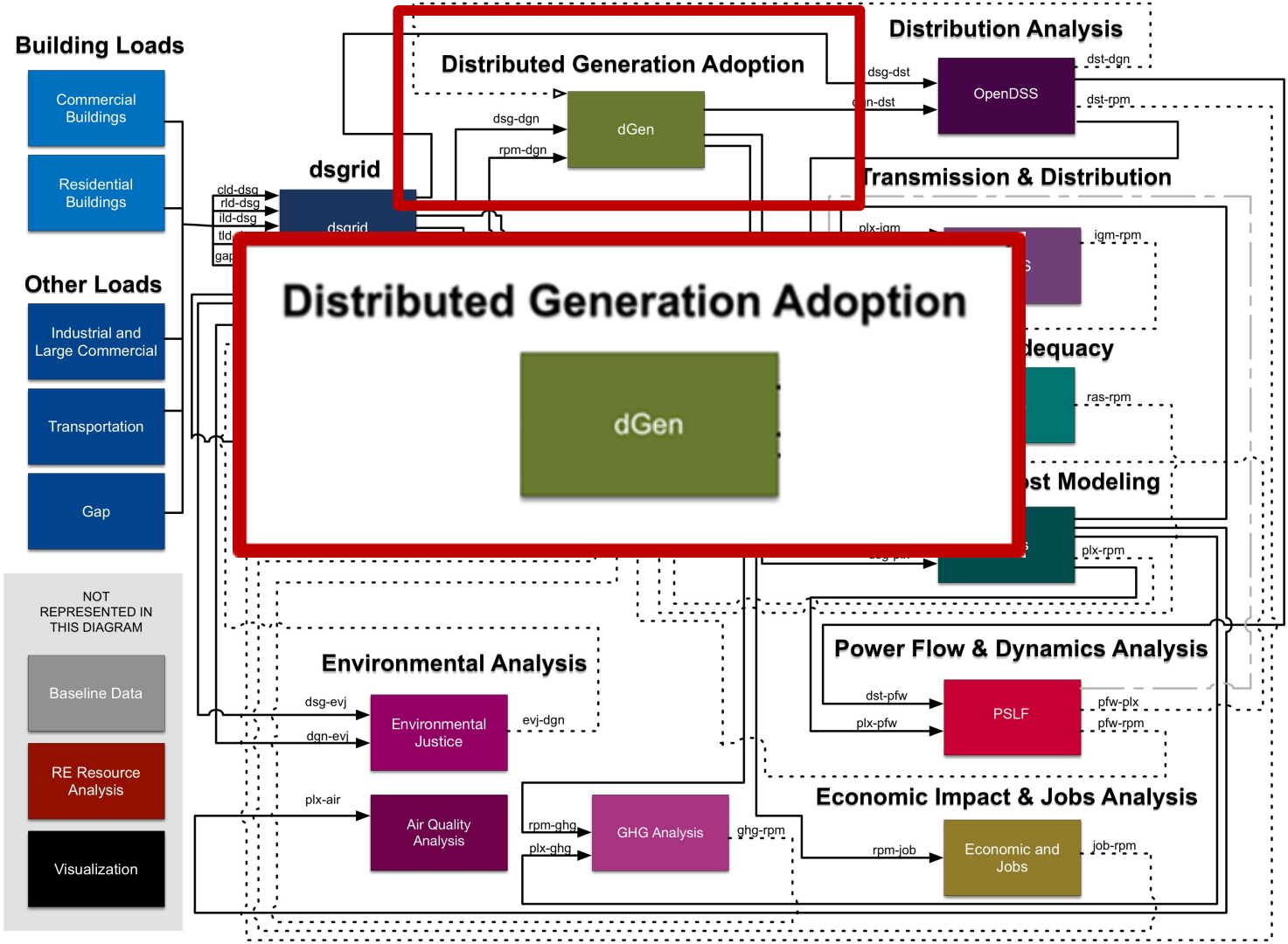
LA100 Modeling



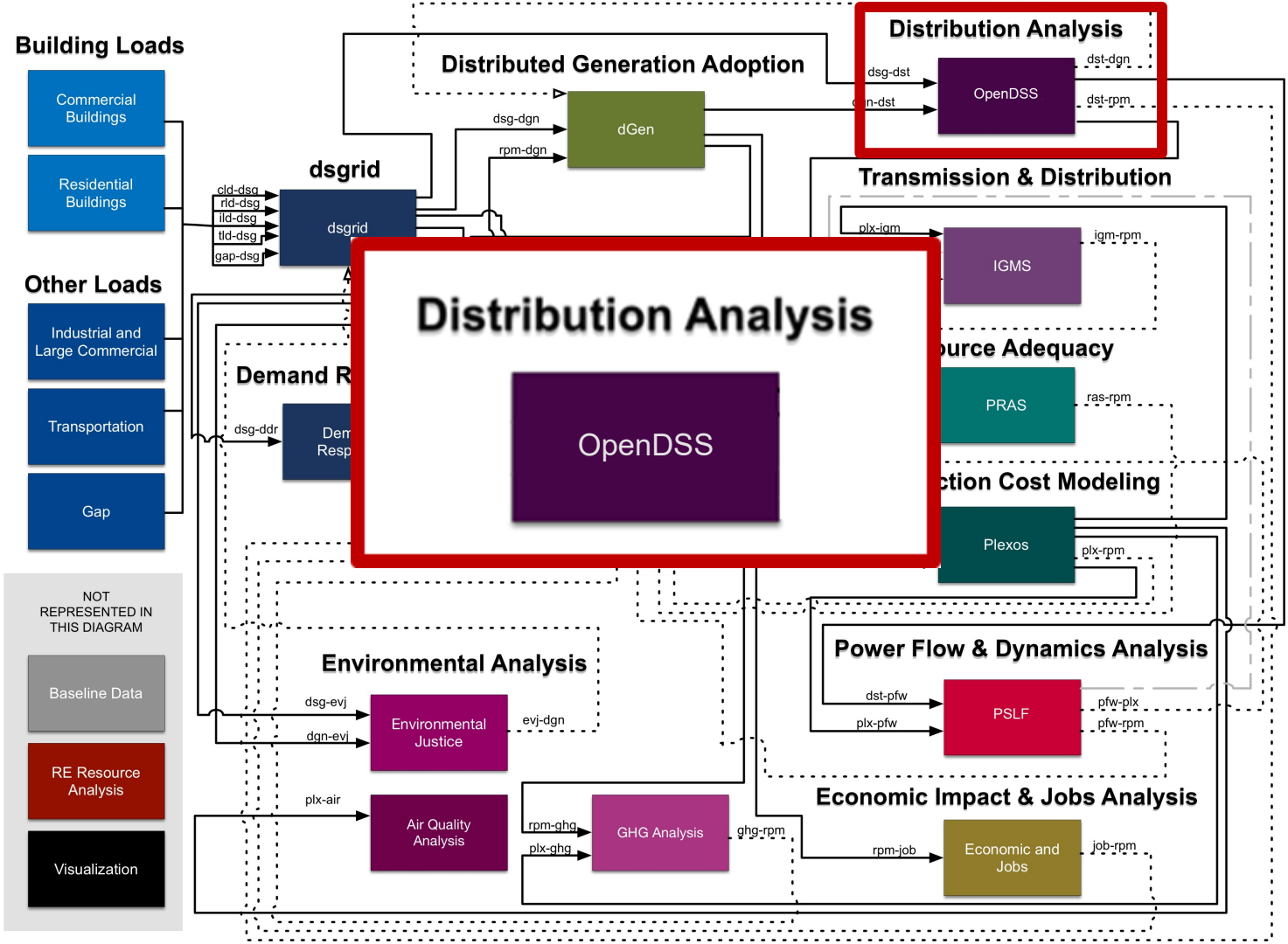
Load Modeling



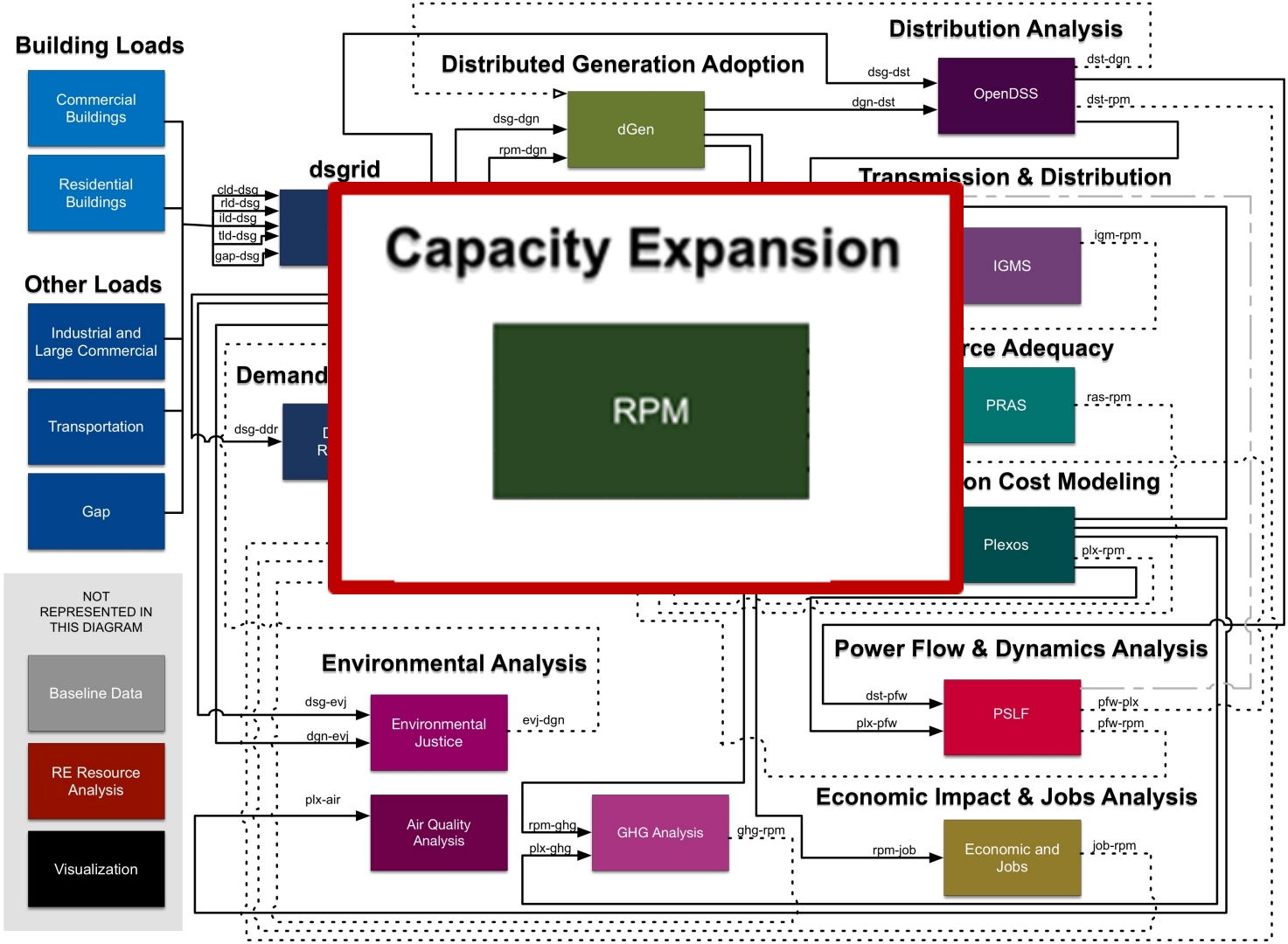
DER Modeling



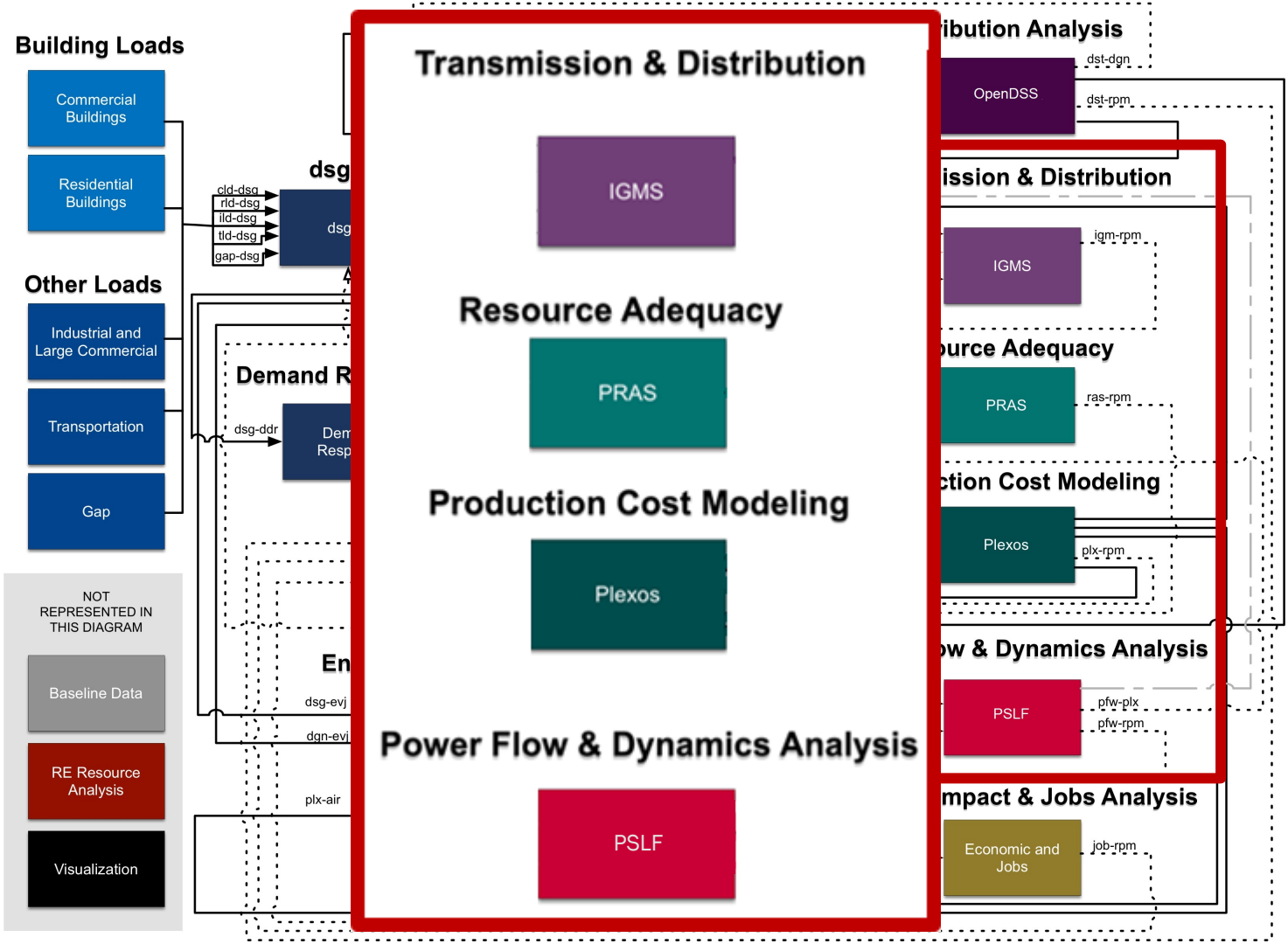
Distribution System Modeling



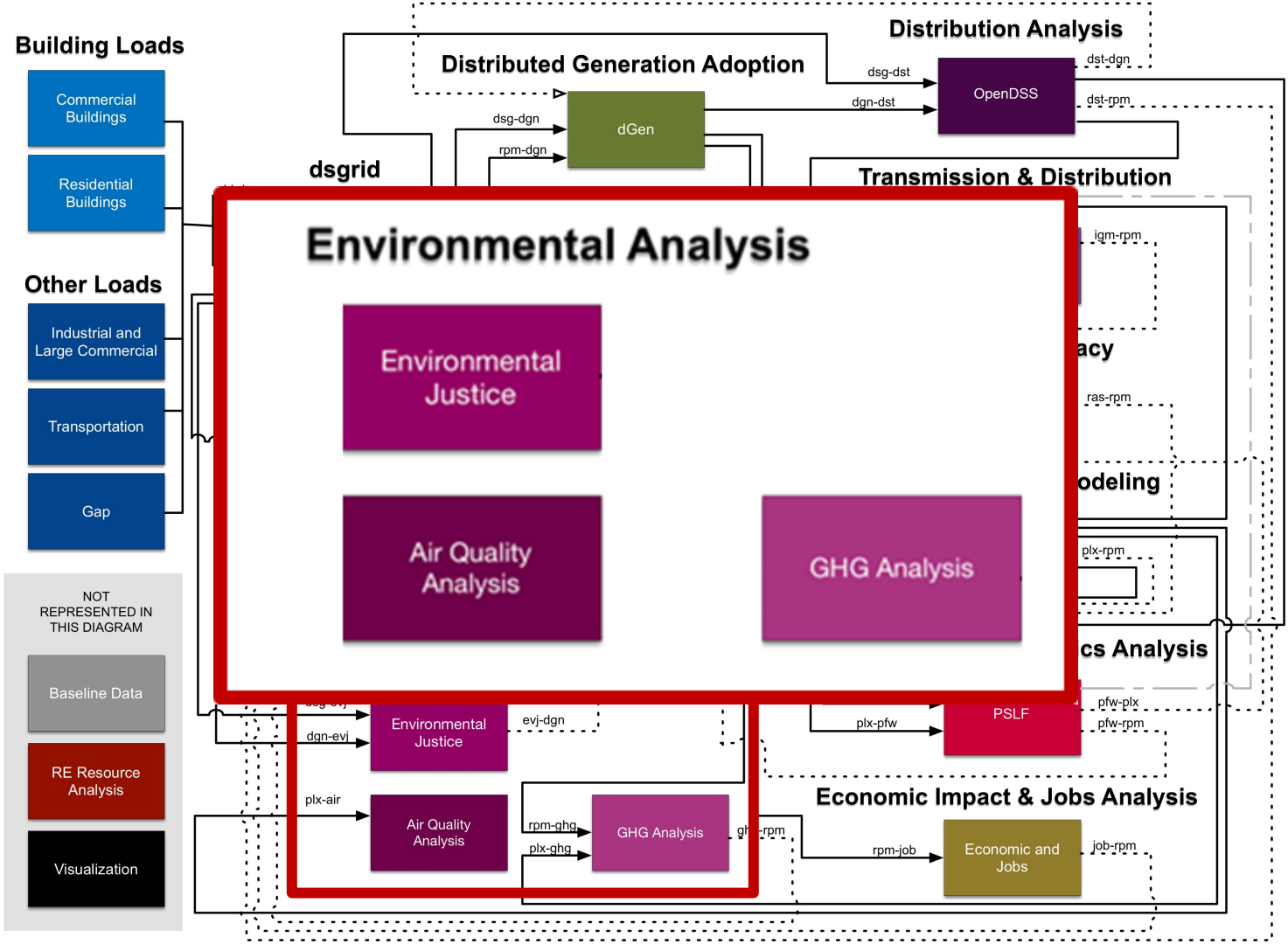
Capacity Expansion Modeling



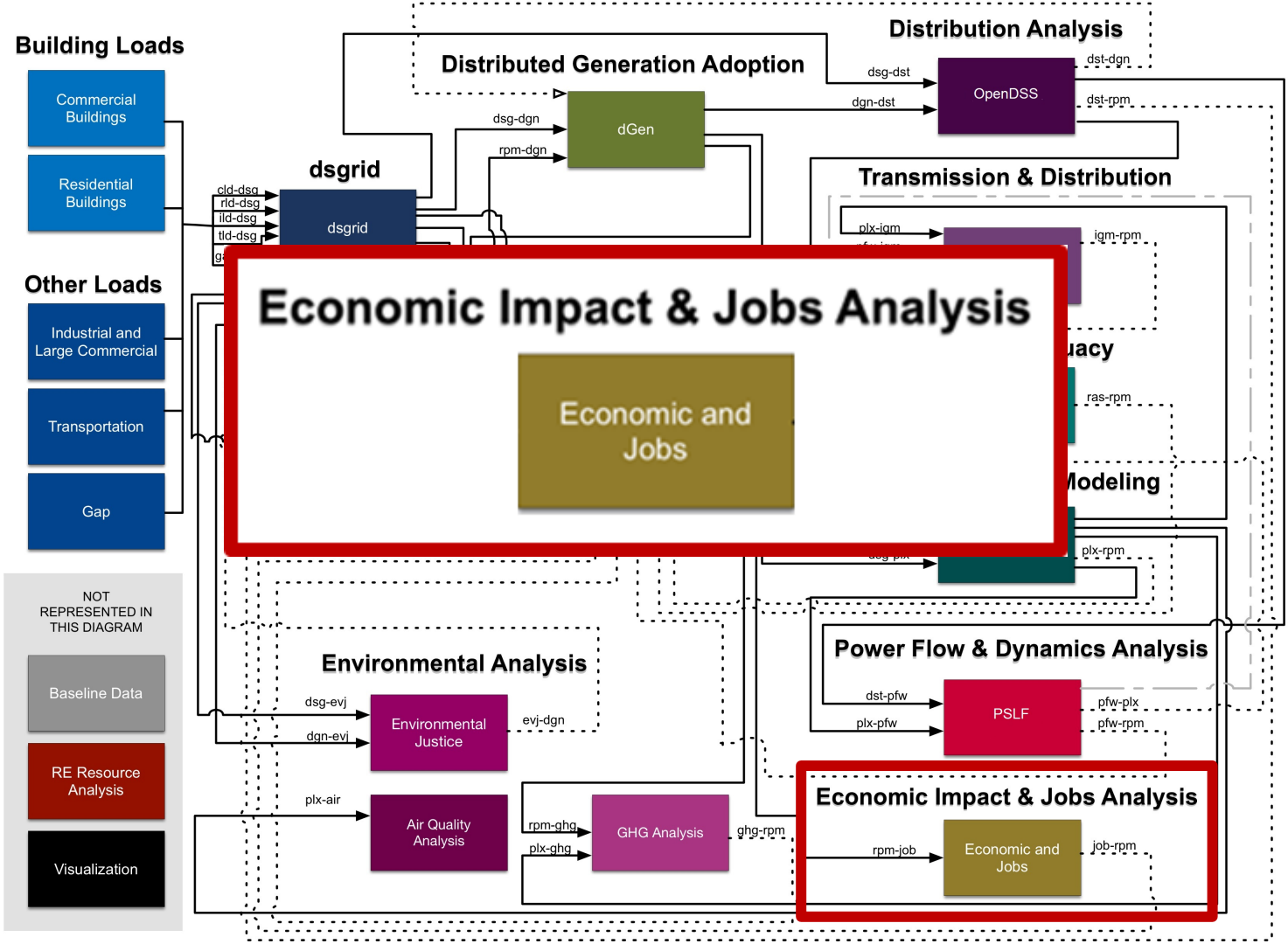
RA, PCM, and Power Flow Modeling



GHG and Environmental Modeling

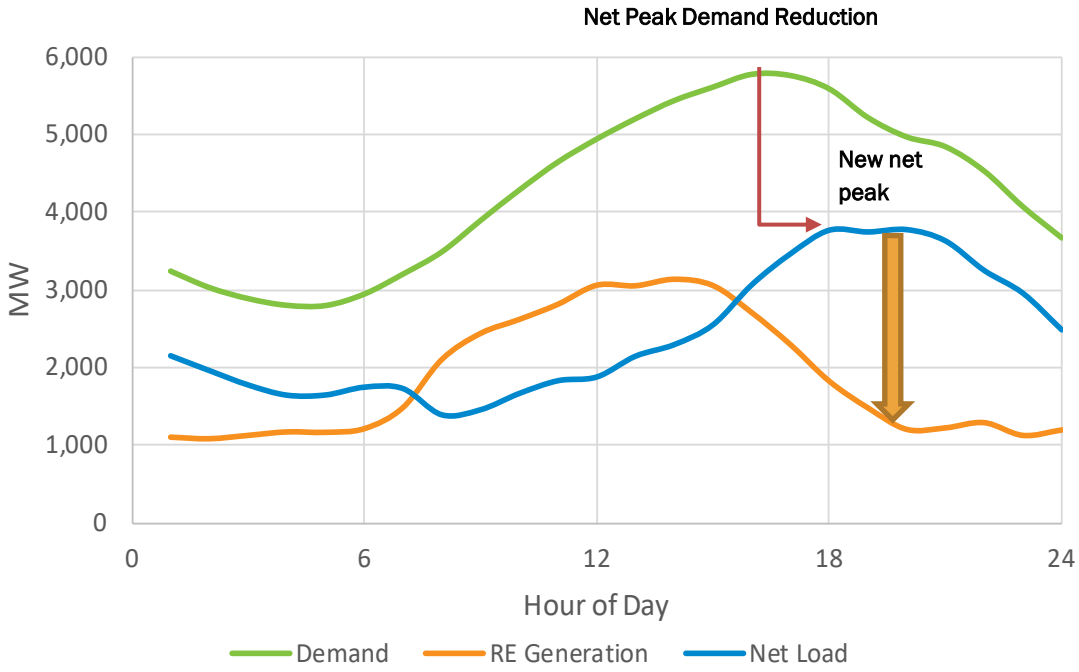


Economic and Job Modeling



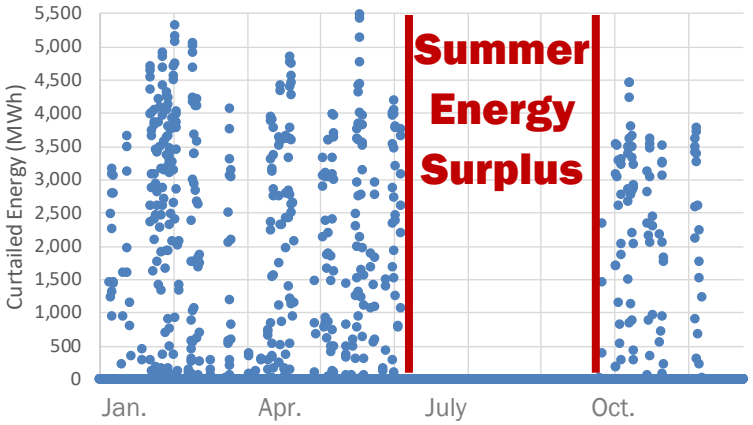
Diurnal Mismatch

Example figure for demonstration purposes only

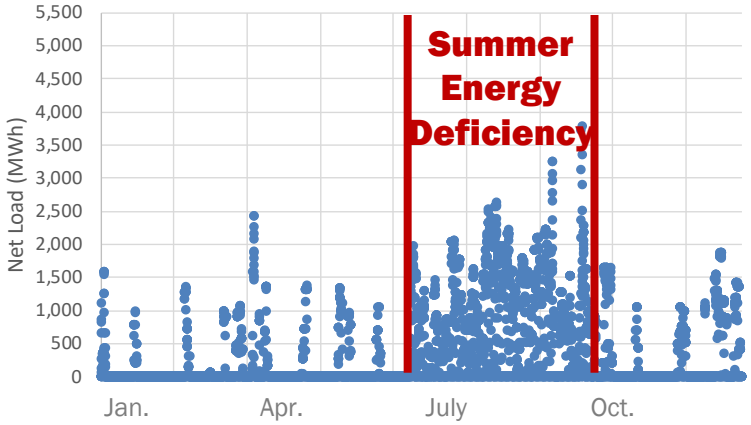


Seasonal Mismatch

Example figure for demonstration purposes only



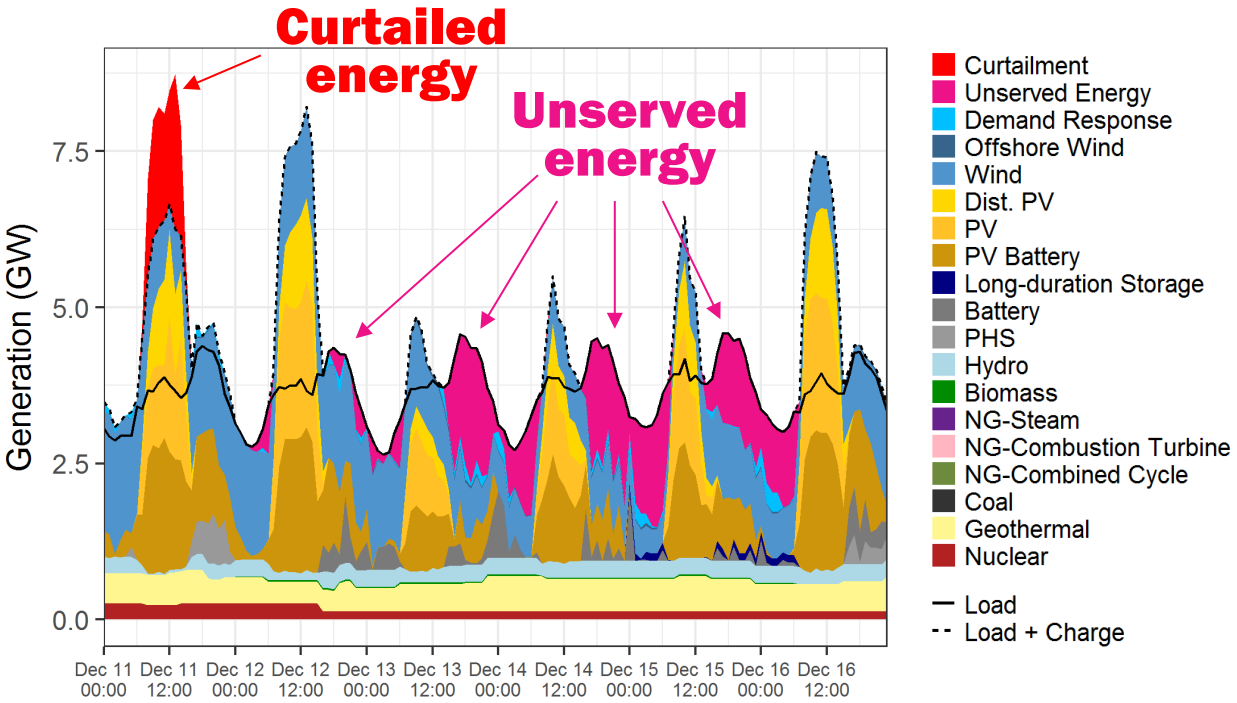
Energy Surplus



Energy Deficiency

Curtailed and Unserved Energy

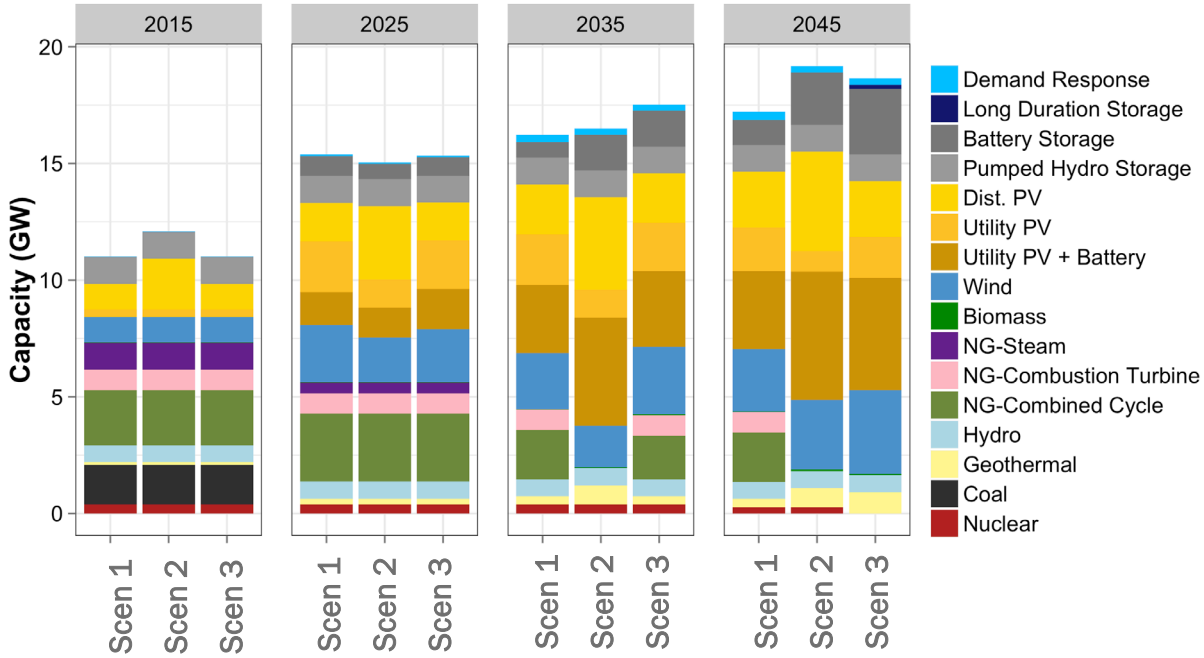
Example figure for demonstration purposes only



December 11–16, 2045

Rapid Expansion of Resources

Example figure for demonstration purposes only



Heavy Reliance on Transmission

- Grid resiliency (fire, earthquake, etc.)
- Charging the in-basin energy storage while serving load
- Limitation on transmission imports
- Coordinating transmission outages (scheduled and emergency)

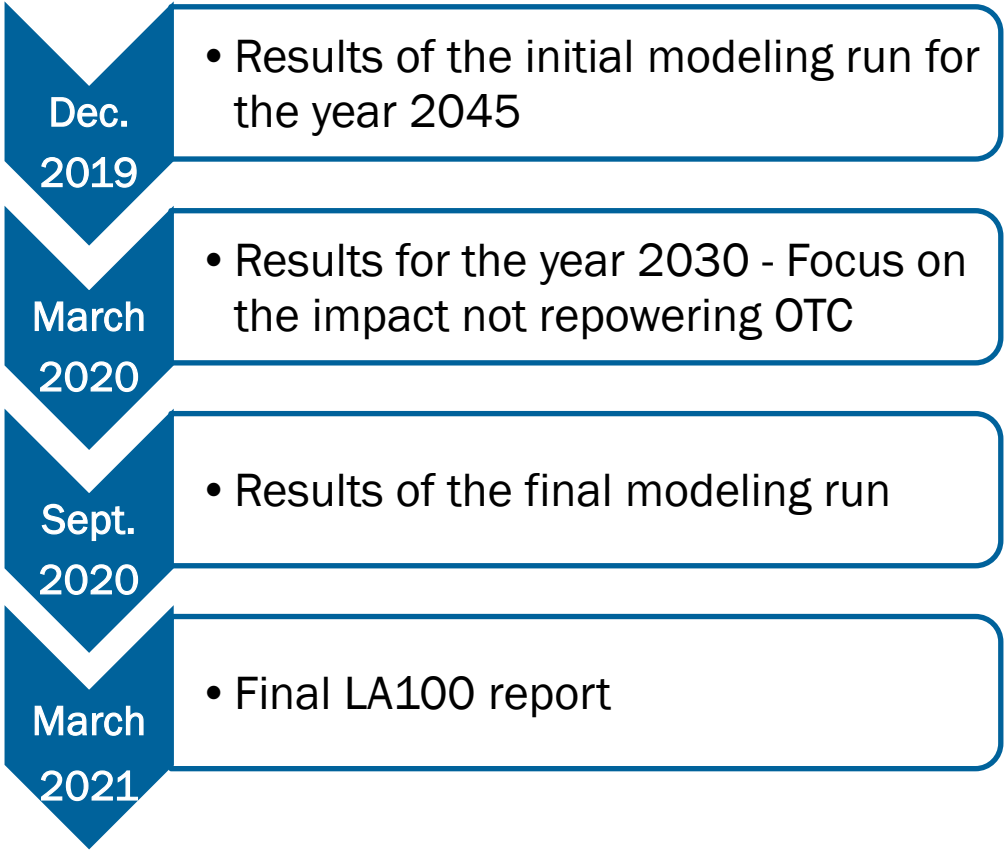
Low Electricity Rates to Encourage E.V. Adoption and Building Electrification

Source: https://www.theverge.com/2017/11/16/16665504/tesla-supercharger-largest-us-kettlemen-truck

Preliminary Results

- Diverse mix of wind and solar capacity is crucial
- Short- and long-duration storage is needed to manage diurnal and seasonal variability
- Allowing RECs significantly reduces the need for long-duration storage
- Higher penetrations of variable resources results in exponentially increased level of curtailment

LA100 Study Timeline



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Find LA100 Homepage on:
https://www.ladwp.com/cleanenergyfuture