The Need for Cross-Cutting Renewable Energy Research

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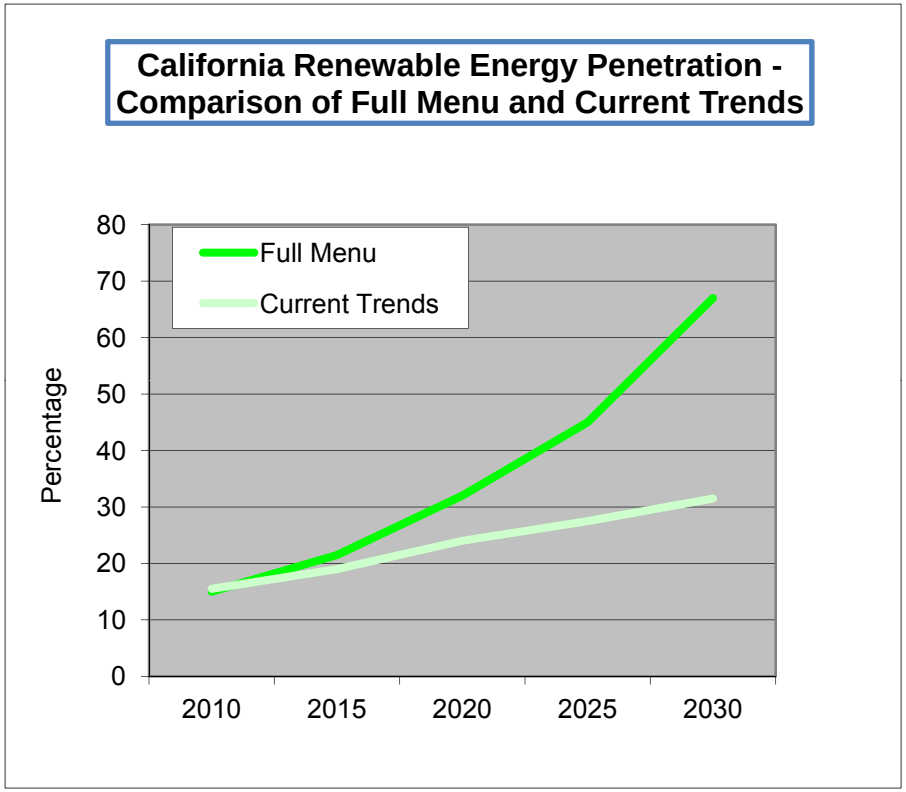
Outline

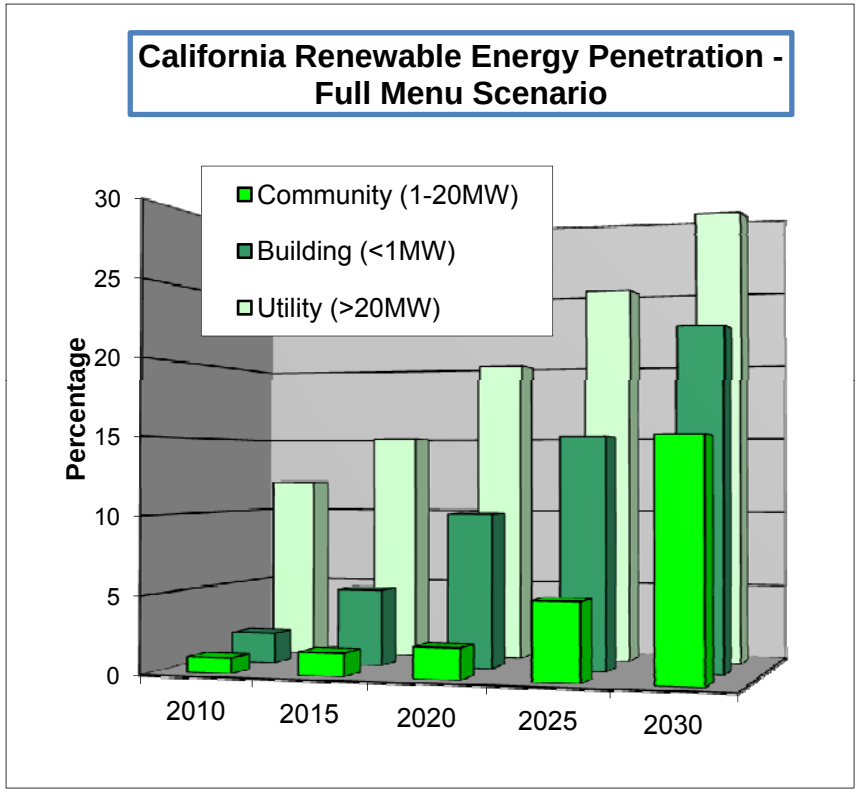
- Diverse and evolving renewable energy solutions and industries
- New dimensions for integration with existing infrastructure
- California's special or unique integration opportunities and challenges

Renewable Energy Technology Menu

√ = primary application	Deployment Venues		
√ = secondary application	Utility-Scale Renewables	RE Secure Communities	RE Secure Buildings
Technology/ Resource	Utility-scale power plants and bio-refineries	Smaller energy plants exploiting high-quality local resources	Modular systems for building and industrial power, heat, cooling and lighting
Wind Power Plants	√	√	
Geothermal Power	√	√	
Hi Temp Solar Thermal	√	√	√
Biomass Power	√	√	√
Water	√	√	
Solar PV	√	√	√
DG Wind		√	√
RE Space/Water Heating		√	√
Direct Geothermal		√	√
Geothermal Heat Pumps		√	√
Biofuels	√	√	√
Energy Storage		√	√

21st Century Energy Supply





The left chart shows the difference between reliance on historical renewable energy deployment pathways and the acceleration potentially achievable through balanced and integrated deployment of utility, community and building scale solutions (right chart).

Cal-IRES Integrated Renewable Energy Systems for a Renewable Energy Secure California

California/US Comparison: Renewable Energy Deployment Factors

	Wind		Solar			Geothermal		Biomass	
	Onshore	Offshore	PV	Heat/Cool	CSP	Utility	Heat/Cool	Forestry	Agriculture
Supply Curve									
Resource Availability									
Cost and Performance									
Preferred Techology Mix									
Output Characteristics									
Large Scale Production									
Grid Integration and Environment									

Legend:
Unique
Different
Similar

The comparison identifies the metrics and attributes of renewable energy options where reliance on generalized assessments may fail to identify opportunities and barriers to renewable energy deployment in California

Source: Cal-IRES

Recommendations

- California can lead the US regarding transformative high penetration renewable energy. So,
  - Model the future mix and inter-operation of real and virtual renewable power plants.
  - Measure the performance and grid impacts of net zero communities.
  - Develop hybrid retrofit solutions with present and future building occupants in mind.
- Adapt research results from Federal programs to California where possible, while focusing research on topics where California is unique or different.