

DRAFT

# Emerging Technology Conservation for Low Carbon Futures

Charlie Grist  
Kevin Smit  
Tina Jayaweera

Conservation Resources Advisory Committee  
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## Background

- **Purpose: Very low or no carbon resource scenario**
- **Consider emerging generation & EE technologies**
- **For conservation, include technologies that are:**
  - Beyond our existing supply curve
  - Available within next 10 years
  - Significant steps in efficiency/cost
- **Ask: Input from the CRAC on what would be reasonable to include in this scenario**
  - Collecting inputs by end of April
  - Need data and professional judgment

## Conservation Emerging Tech: Two Levels

- ET Level 1: Available now, in Supply Curves
- ET Level 2: Potentially available after 5 years
  - Technologies on the horizon which could have major impacts if advancements occur
  - Not “reliable and available” now, but may warrant near-term actions to develop into “reliable” future resources



## Approach



- Broad-brush estimate of impacts of ETs
- Incorporate stock turnover constraints
- Use best available data (which may be sparse)
- No cost-effectiveness constraints
- Used for narrative purposes only (will not do full-RPM test)

## ET Level 2 Measures

- Solid State Lighting
  - Quantum dots
  - Could cut lighting power in half
- CO2 Heat Pumps Space Heating
  - Could double heating efficiency
- CO2 Heat Pump Water Heaters
  - Could double efficiency
- Next advance in silicon wafer technology
  - Photonics
- Highly Insulated Dynamic Windows
- Optimized HVAC Controls
- Ultra-low Energy Buildings

## What about Distributed Generation?

- Already includes distributed solar PV
  - 10-year forecast of cost and efficiency
  - Approximately 3500 aMW by 2035
  - Cost: \$110 - \$200/MWh
  - Note: **not** part of EE supply curves
- Will also consider:
  - Fuel cells
  - Combined heat & power

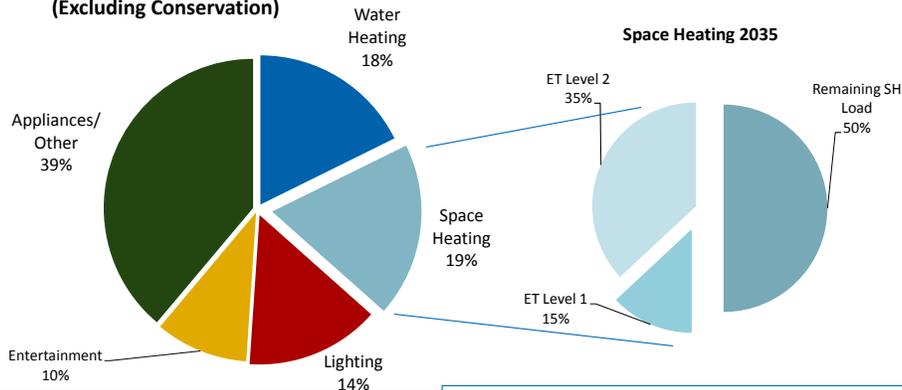


## ET Sources

- Bonneville E3T & EE Technology Roadmap
- Energy Trust conservation potential study (2014)
- National labs
- NEEA
- Portland General Electric E3 Study (2013)
- Lazard's Levelized Cost of Energy Analysis – Version 8.0
- Brattle: Advanced Energy Technologies for GHG Reduction
- CA Statewide ET Program
- IDDRI: Deep decarbonization US 2050 Report (2014)
- New Buildings Institute ZNE Database
- LBL-High DSM/DG Study Case Inputs for SPSC

## Illustration of Impacts

**Residential End-Use Forecast (2035)  
(Excluding Conservation)**



The End-Use Forecast Shares are from current load forecast  
The Space Heating Shares are broad-brush preliminary estimates for illustration purposes only

## Questions

- Do we have the right Emerging Tech measure list?
  - Are we missing anything?
  - Should we exclude any?
- Do you have data sources for savings and cost?
- What is the max pace of each measure category?
  - What is a reasonable introduction date?
  - How fast could it be implemented?

## ET Level 2 Measure Table

Emerging Tech Level 2 Measure	Savings Estimates	Cost Estimates	Life	Possible start Year	Pace
CO2 Heat Pump Water Heater	100% better than current HPWH (to 4.2 cop)	High	15	2018	Moderate
CO2 Heat Pump	50% savings in heating load	High	18	2020	Moderate
Solid State Lighting (Quantum Dots)	50% savings	Low	?	?	?
Silicon Wafer Technology (Photonics)	Unknown	If feasible, will likely become std practice	?	?	If realized, fast
Highly Insulated Dynamic Windows	Moderate improvement	High	40	2025	Slow
HVAC Controls - Optimized Controls on all systems	15% additional savings of HVAC loads	Low	10	2020	Moderate
Ultra-Low Energy Buildings	2-5 kWh/sqft savings	Low	30	2016	Very slow

## Next Steps

- **Further develop ET Level 2 estimates**
  - **Cost and savings estimates – will likely be at the high end of the supply curve costs.**
  - **Availability estimates –cost declines and performance increases based on secondary research**
  - **Pace – most based on equipment turnover rates - Not available instantly, but accumulates over time**