

# CEE Presentation

September 17<sup>th</sup>, 2010

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# Agenda

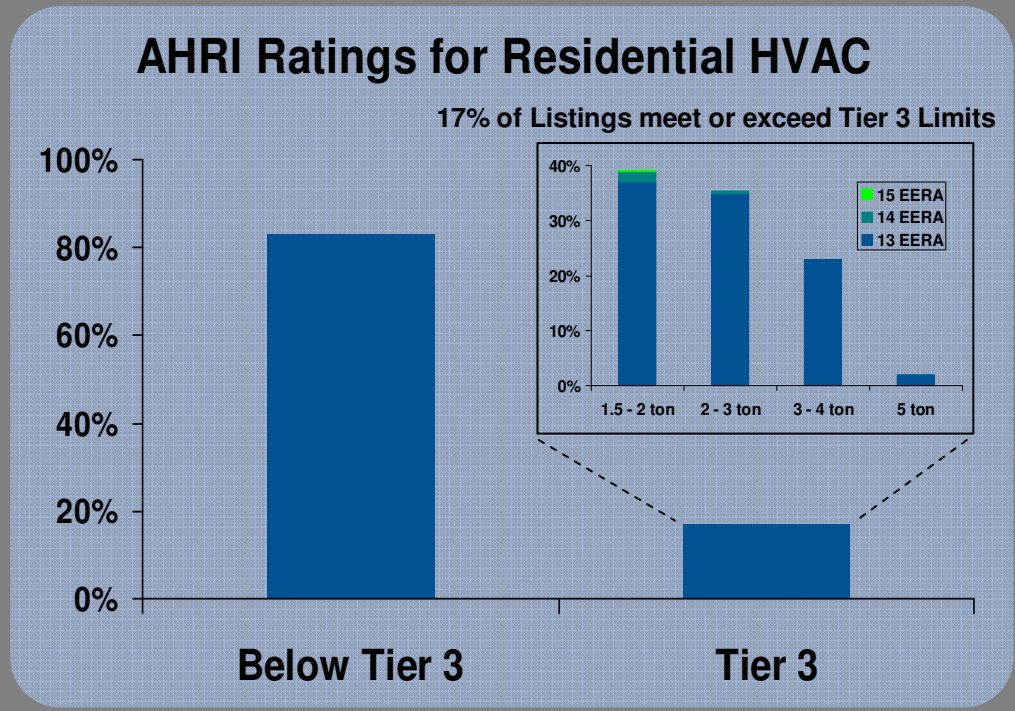


- Residential HVAC EER
- Regulatory Trends and New Refrigerants – Pro's and Con's
- Demand Response and Impact on Consumer Comfort

# Residential HVAC EER

- Equipment Implications of going beyond Tier 3 EER's

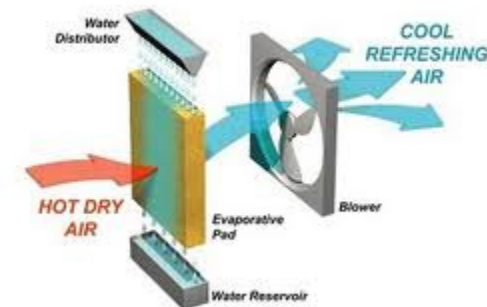
- Sizing
- Cost
- Materials / Refrigerant



5 Ton 15 EERA – Might Need Approx 7' High Outdoor Unit

# Residential HVAC Alternative Systems

- **Ground Source Heat Pumps**
  - **Pro's**
    - High EER's (14 to 16)<sup>1</sup>
    - Robust through Seasons
  - **Con's**
    - Installation Design and Cost
    - Ground Temp Considerations
- **Water Assisted Cooling**
  - **Pro's**
    - High Applied EER Potential (8-24)<sup>2</sup>
  - **Con's**
    - Regionality – for the “West”
    - Water Use Considerations
    - Evaporative Systems May Have Comfort Limitations<sup>3</sup>



<sup>1</sup> [http://www1.eere.energy.gov/femp/pdfs/groundsource\\_heatpumps.pdf](http://www1.eere.energy.gov/femp/pdfs/groundsource_heatpumps.pdf)

<sup>2</sup> <http://www.nrel.gov/docs/fy07osti/40041.pdf>

<sup>3</sup> [http://www.etcc-ca.com/images/stories/pdf/ETCC\\_Report\\_304.pdf](http://www.etcc-ca.com/images/stories/pdf/ETCC_Report_304.pdf)

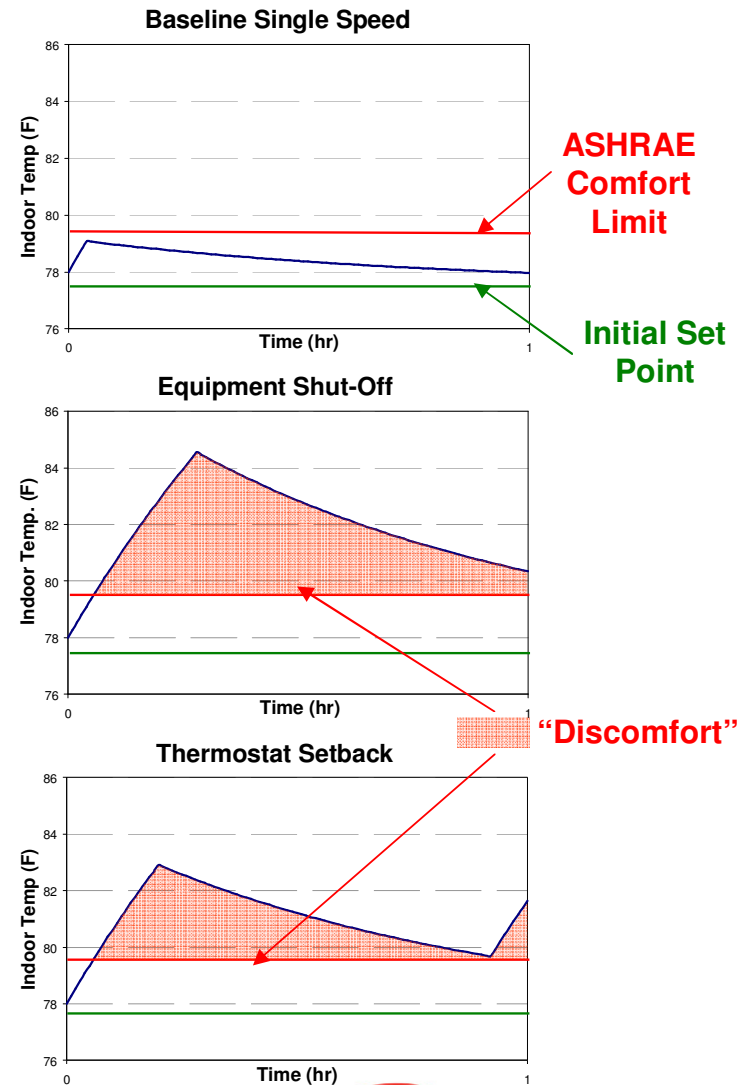
# Refrigerant Trends and Implications

	GWP	Cycle Efficiency	System Cost	Flammability / Toxicity
R410A	2100	Baseline	Baseline	Baseline
Ammonia	1	+	-	--
Propane	4	Similar	-	--
CO <sub>2</sub>	1	--	--	+
R1234yf	4	Similar	-	Similar
R32	675	Similar	Similar	-

**Low global warming potential alternatives full of trade-offs**

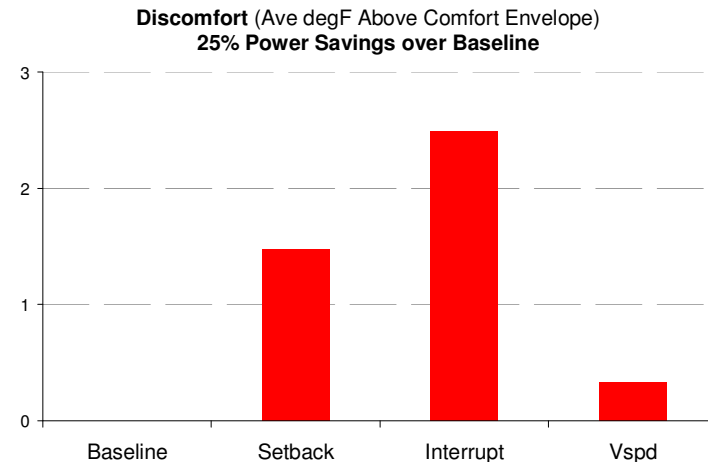
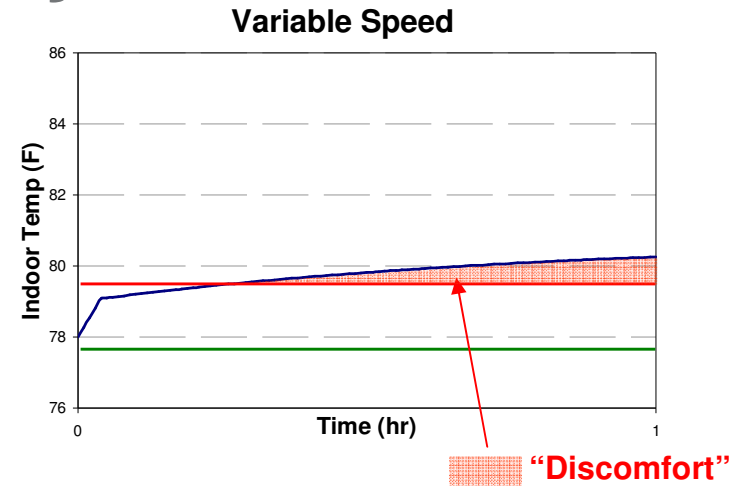
# Smart Grid/ Demand Response

- **Modeling a DR Event**
  - Set Baseline Conditions
    - 13 EERA Equipment
    - Single Stage A/C
    - 100 deg F Day
  - Target 25% Energy Savings
  - Today's Technology
    - Equipment Shut-Off
    - T-Stat Set Back



# Future System Opportunity

- **Variable Speed Systems**
  - 13 EERA Equipment
  - 100 deg F Day
  - Same Sizing As Baseline
- Same 25% Energy Savings
- Significantly less “Discomfort” for the Consumer



# Technology Summary

	Seasonal Energy Use	Homeowner Comfort	Ease of Installation	Utility DR Advantage	Regional Applicability
Traditional Splits	Baseline	Baseline	Baseline	Baseline	Baseline
Ground Source Heat Pumps	+	Same	-	Same	"Middle" of Country
Water Assisted Cooling	+	-	Same	Limited	"West" (Assuming Water Access)
Tier 3 Variable Speed Systems	+	+	Same	+	Broad Applicability