

Holistic approaches for Achieving Local Climate Action

Max Wei

Lawrence Berkeley National Laboratory

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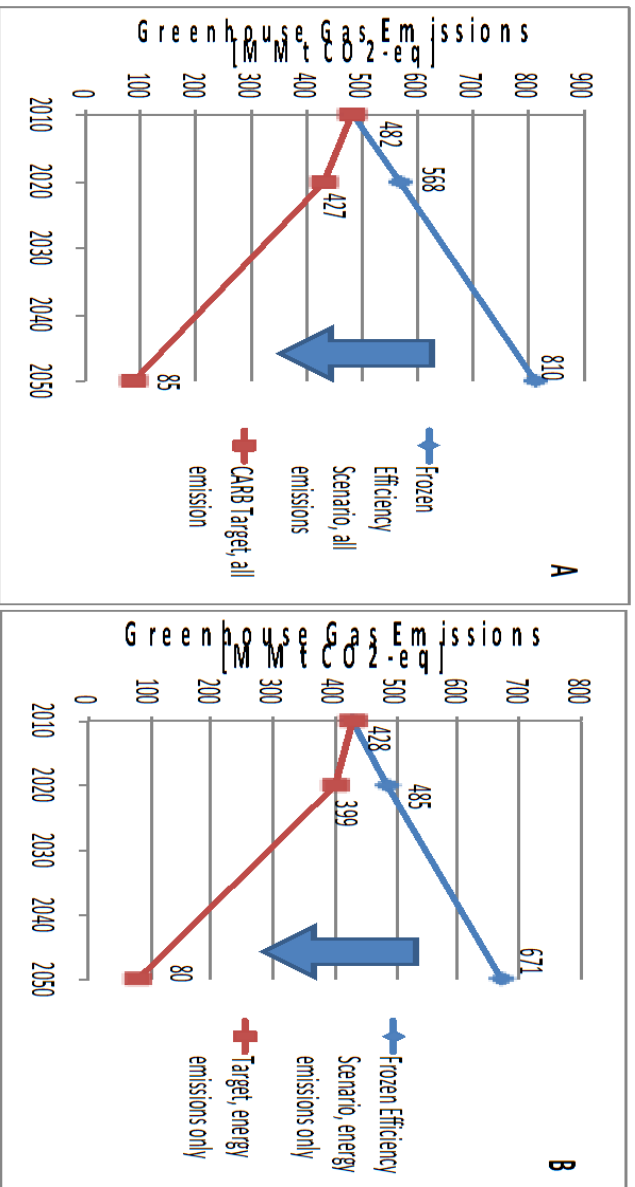
- **Problem**
 - How to mobilize climate change action at the local level
- **Opportunity**
 - Residential sector as catalyst for overall system
- **Challenges**
 - *How can Cities engage citizens in behavior change; cost/resources*
- **System Framework/ Examples**
- **Key Research Questions**

Global climate change

- How to get to 80% reduction to carbon neutrality?

California Global Warming Solutions Act AB32: An International Test Bed

- 2020 target: meet 1990 level of emissions (AB32)
- 2050 target: 80% below 1990 level



Why Cities

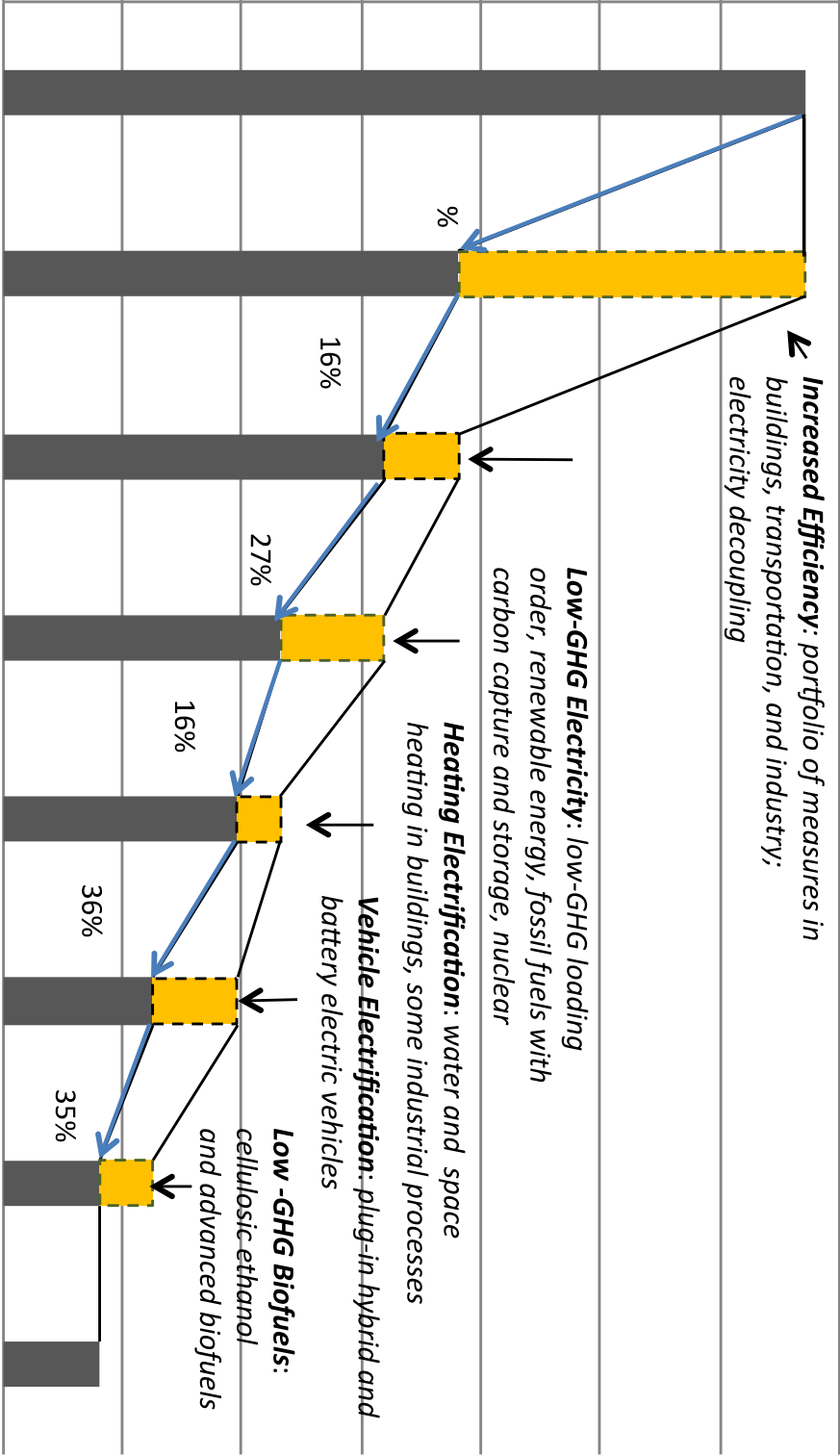
- Local policies easier to implement
- Pilot program opportunities
- Cities can demonstrate and lead other cities and their state (e.g. Davis, Boulder)
- Staff learning and training ground for other cities

Cities can be demonstration sites for innovative approaches to deep Carbon reduction

Cities, California

- Cities at forefront – 100 Climate Action Plans in CA.
 - Often lack implementation strategies
 - Stiff headwinds in community awareness and acceptance.
 - Lack financing
 - May focus on high-level carbon reduction targets with no methodology for structured implementation, measurement or verification.

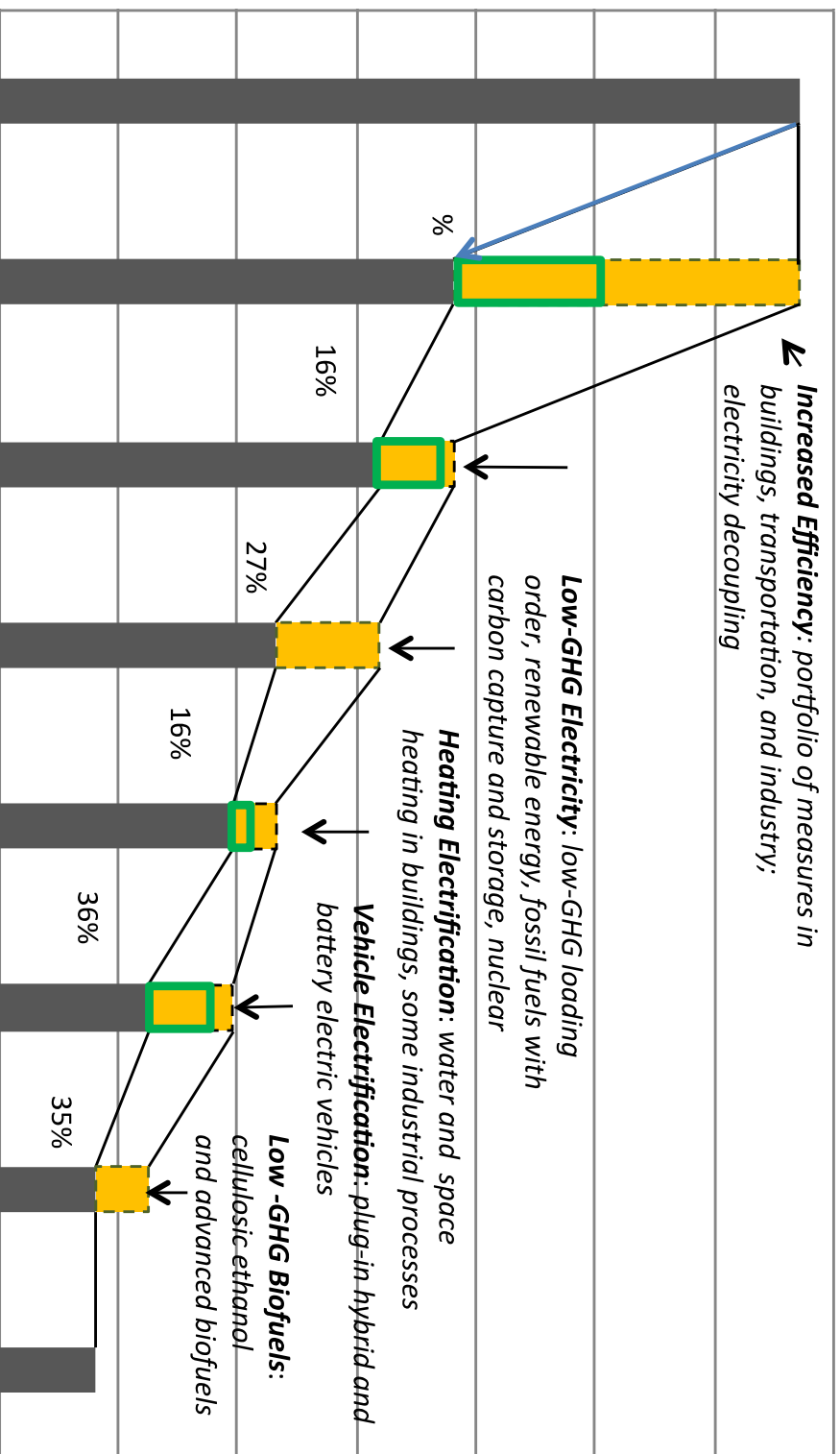
The Carbon Challenge (California example)



Wei, M. et al, Environmental Research Letters, March 2013

Wei, M. 2011 BECC, "Carbon Reduction Potential from Behavior Change in Future Energy Systems"

The Opportunity



Over 40% of Potential reduction in the Residential Sector (transportation, buildings)

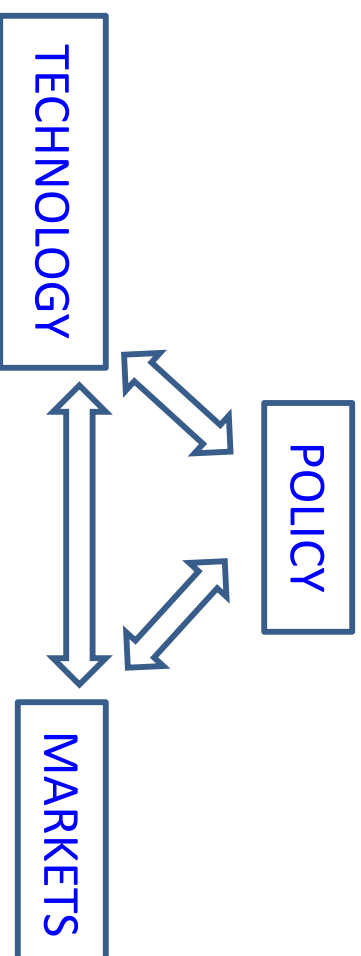
California Carbon Policies

DEMAND

SUPPLY

OVERALL EMISSIONS REDUCTION	Conservation	Energy Efficiency	Clean Energy	Fuel Switching
Cap and Trade; AB32	Related: Land use and Transportation planning SB375	Building codes ; Appliance Standards	Renewable Portfolio Standards; Million Solar Roofs	Solar Water Heating
		MPG standards (Vehicle Emission standards)	Low Carbon Fuel Standard	Zero Emission Vehicle Targets (PEV, FCV)
		Zero Net Energy Buildings	Cogeneration Targets	

Techno-Economic Policy Framework

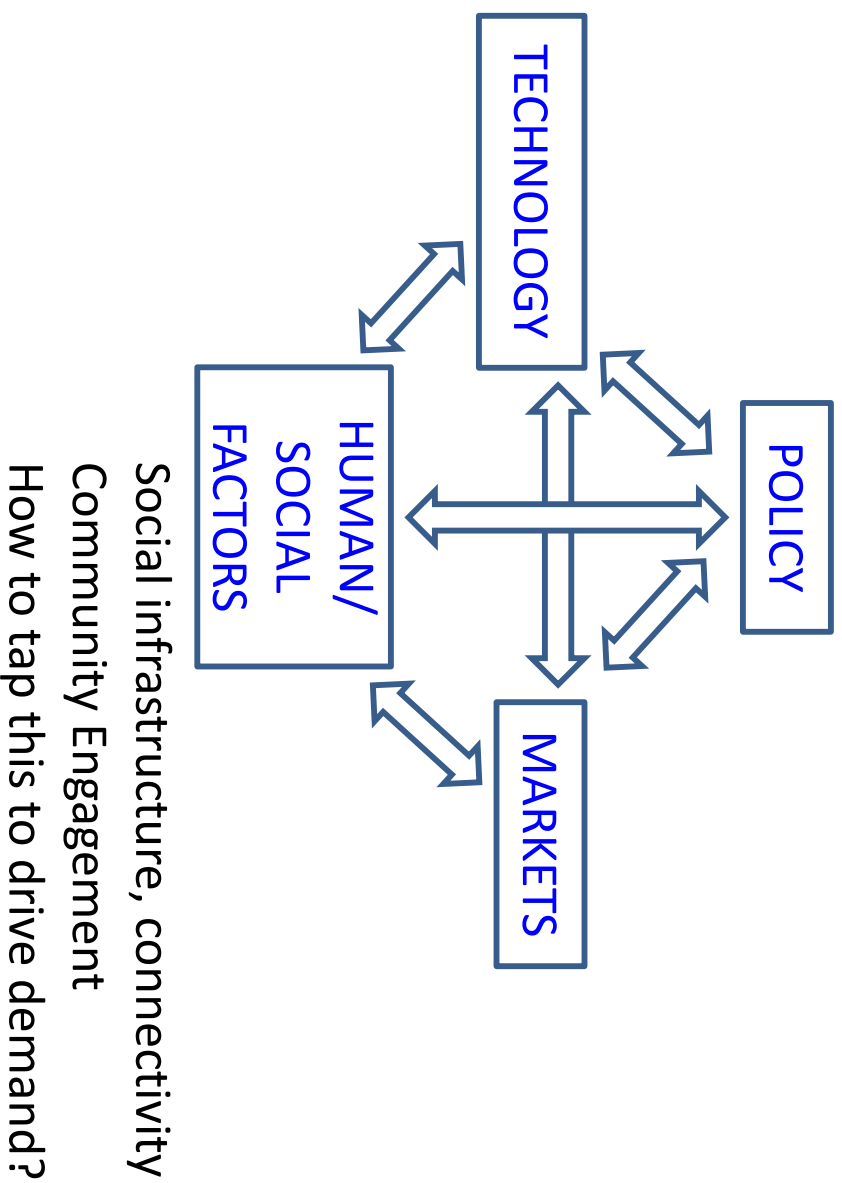


Limitations of this model?

- “among the causes for US reluctance to move more aggressively on energy policy and climate, are **economic modeling exercises which have preempted the assessment of a more robust set policy initiatives**. Among the missing or miss-specified elements within economic models are critical elements in the disciplines of physics and **behavioral and social psychology.**”

- John “Skip” Laitner, March 11, 2013

System Framework Including Human/Social Factors

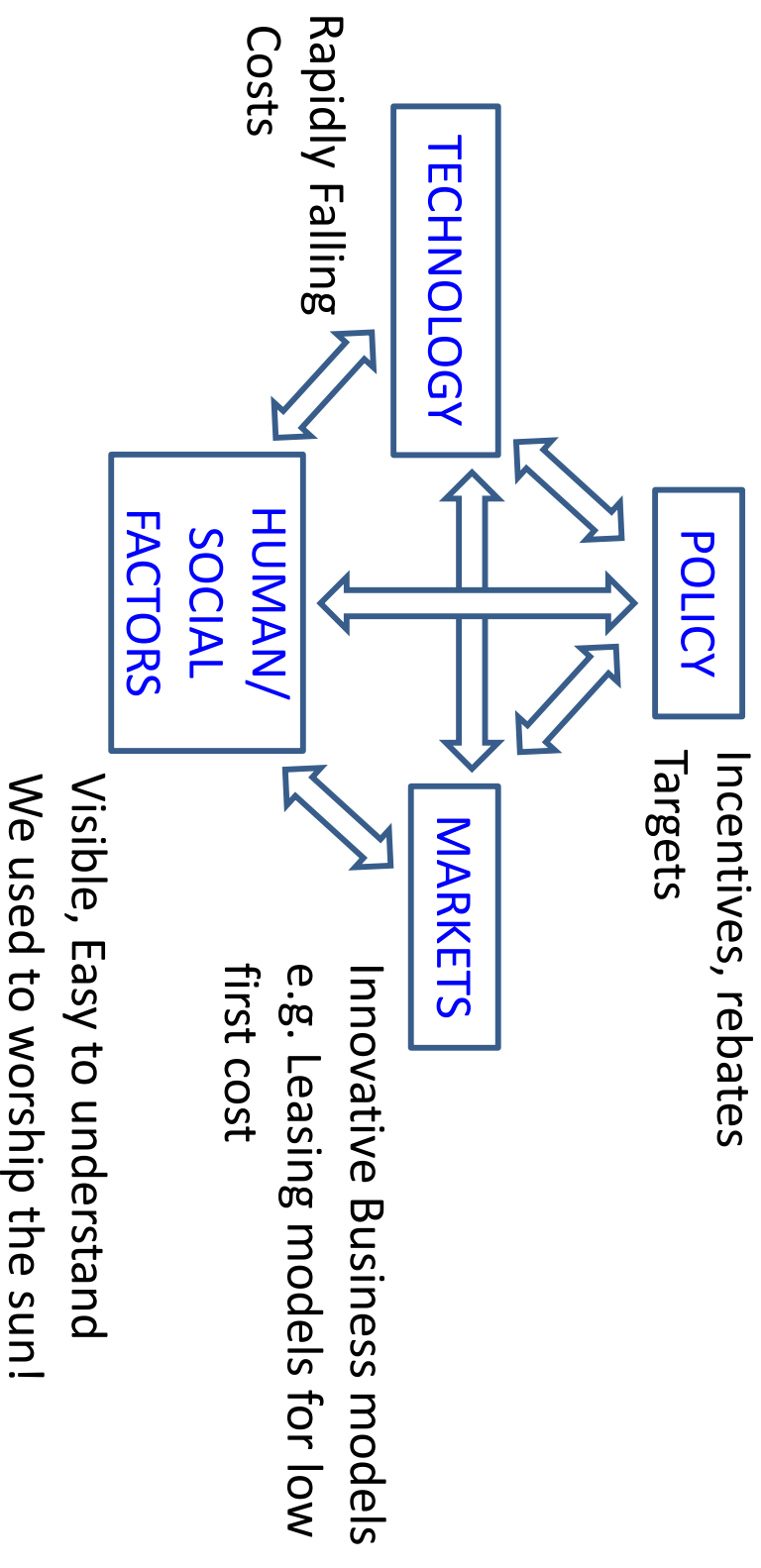


Both bottom up and top down approaches are needed.

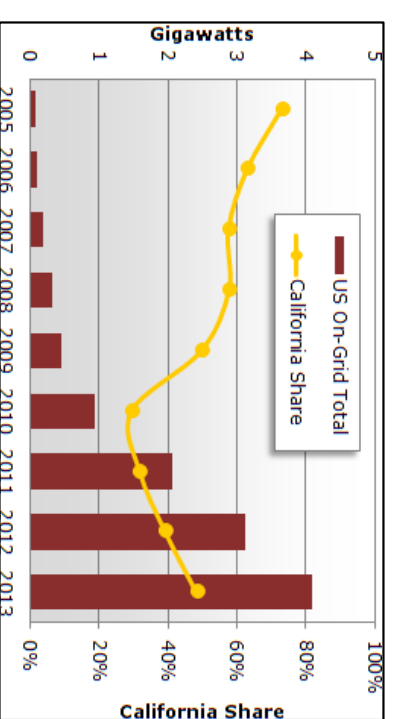
Why Community Engagement?

- Tap Conservation potential
- Hard to see substantive action happening top-down (w/ some exceptions)
- Local gov'ts and communities can drive bottom up movements
- Communities provide the setting for cross platform outreach (neighborhood safety, disaster preparedness).
- Opportunity for innovation: technology + social engagement (e.g. big data, apps)

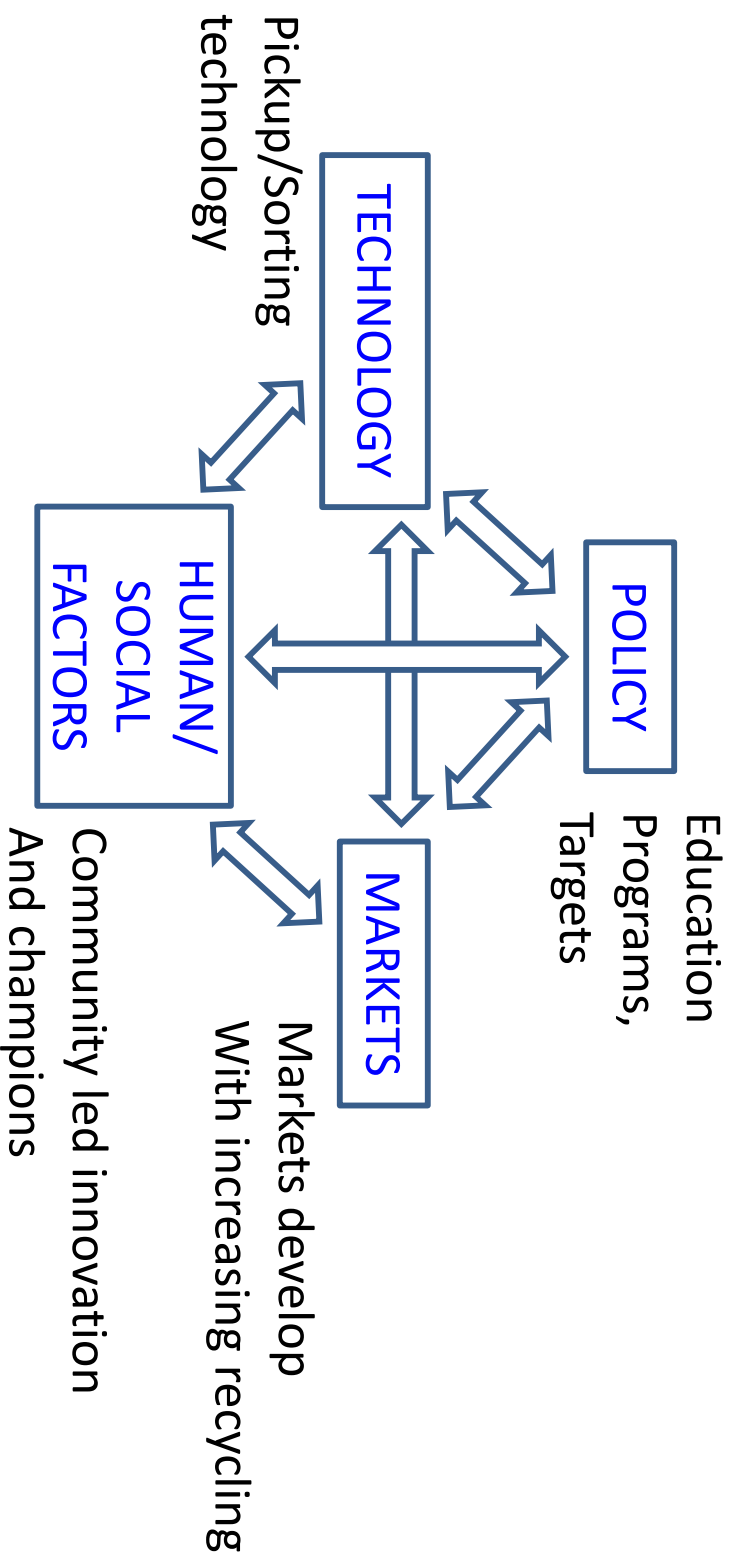
Solar PV



**Alignment of technology, policy,
markets and human factors have
ignited the solar PV industry.**



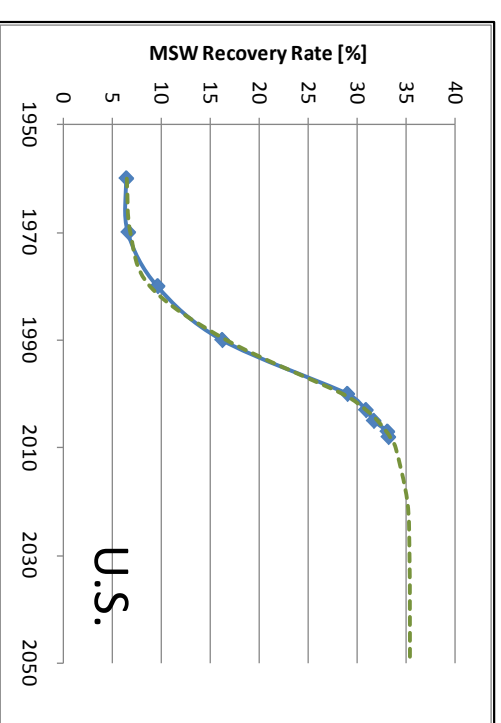
Recycling



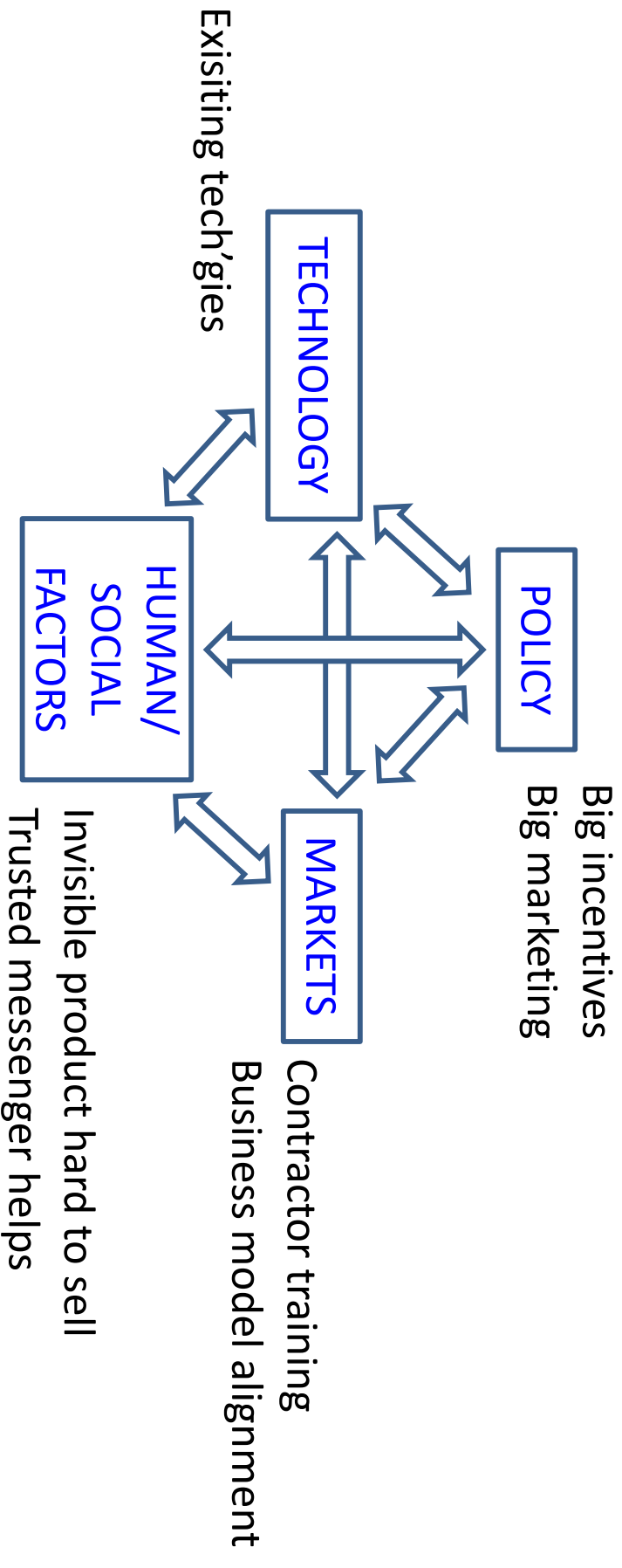
AB939 (1989) in CA, landfill

diversion law, inspired by cities –

But took 40 yrs; and MSW up 3X!



Residential EE retrofits



- Market factor blockages
- Human/social factor blockages

MIXED RESULTS
COST/BENEFIT?

EE Retro-fitting Case Studies

Messaging/ city competition (Kansas)

Make it easy, or easier (On-bill Financing, Portland)

Training of key agents (Contractor training, Maine)

Detailed reports available on Department of Energy

Better Building Neighborhood program

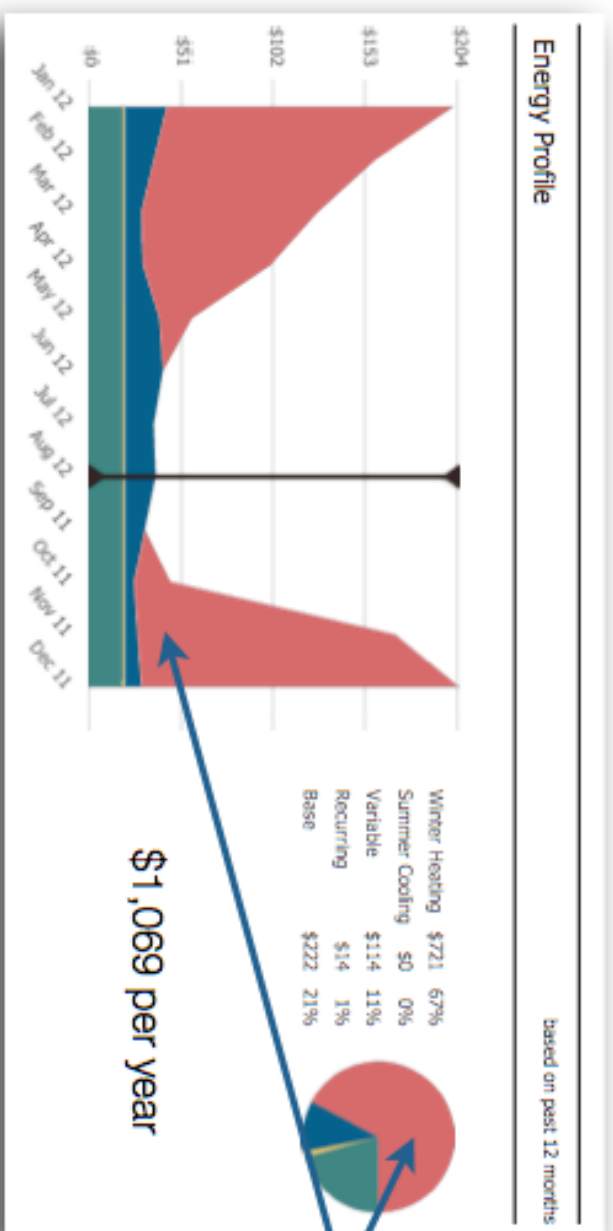
Mitigation of EE retro-fit Barriers?

EE Retrofit Barrier (>15% Savings)	STRATEGIC PROGRAM	OUTREACH PROGRAM
Not a priority	NO	YES
Need trusted messenger	NO	YES
Trust barrier - contractor	YES	MAYBE
Long transaction chain	YES	MAYBE
Split incentives - Contractor	MAYBE	NO
High first cost	YES	NO
Financing Barrier	YES	NO
Poor ROI	NO	NO

Need integration of upstream system readiness with downstream community engagement and behavior change expertise

Technology abetting Behavior change

- Green Energy Match, San Jose
- High Energy Audits, 7 Silicon Valley towns, CA



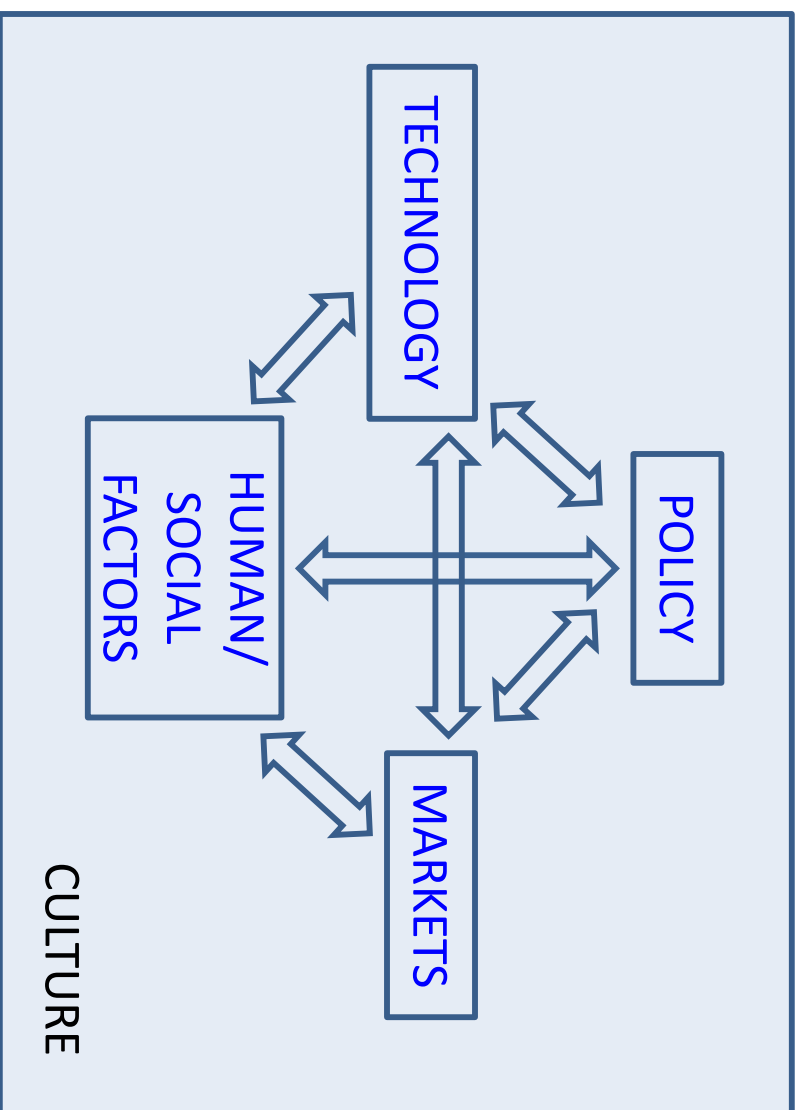
Home #1	
Energy costs	Low
Problem area	High heating loads
Corrective action	<ul style="list-style-type: none"> • weatherization • HERS audit • retrofit

HEA

Automated utility bill data collection +
 recommendations for Behavior change

Some key research questions for community engagement programs

- Cost/benefit evaluation in comparison to other investment paths
- Technology/ behavior interaction and impacts to other system elements?
- How to collect data robustly and automate?
- Scalability – are there conditions for self-sustaining programs?



When and where do we address Consumer culture?

M.Weij, 2012 BECC, “Confucius, Keynes, and Christ: Is there a larger role for ethics in driving climate-friendly behavior change”

Summary

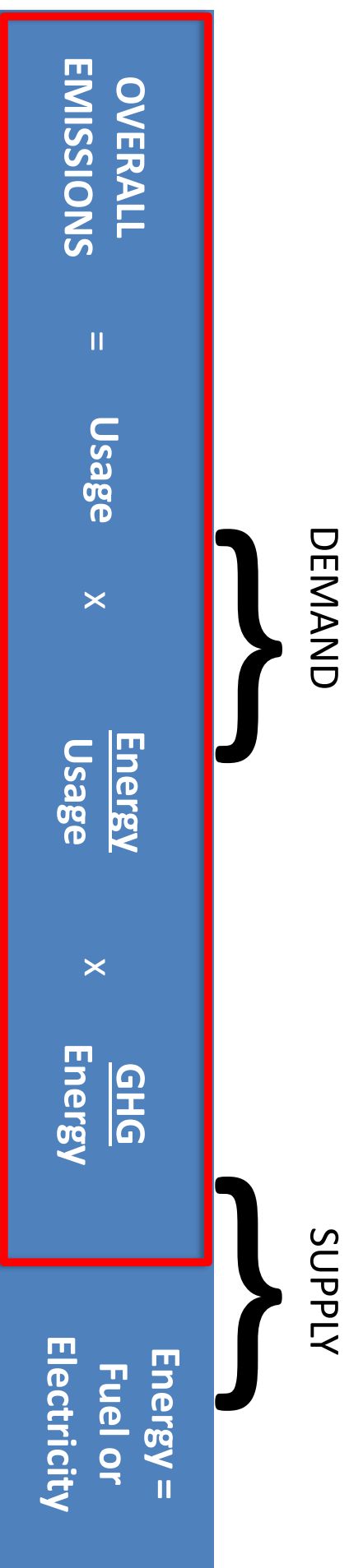
- Over 40% of the carbon reduction potential is in the residential sector.
- A system approach including human and social factors may provide the best chance to address the climate challenge.
- Many research questions and cost benefit analysis vs other pathways are needed.

Acknowledgements

- Martha Amram, Wattz On
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- Lisa Schmidt, High Energy Audits
- Mitch Sears, City of Davis

Backup

GHG components



**OVERALL
EMISSIONS
REDUCTION**

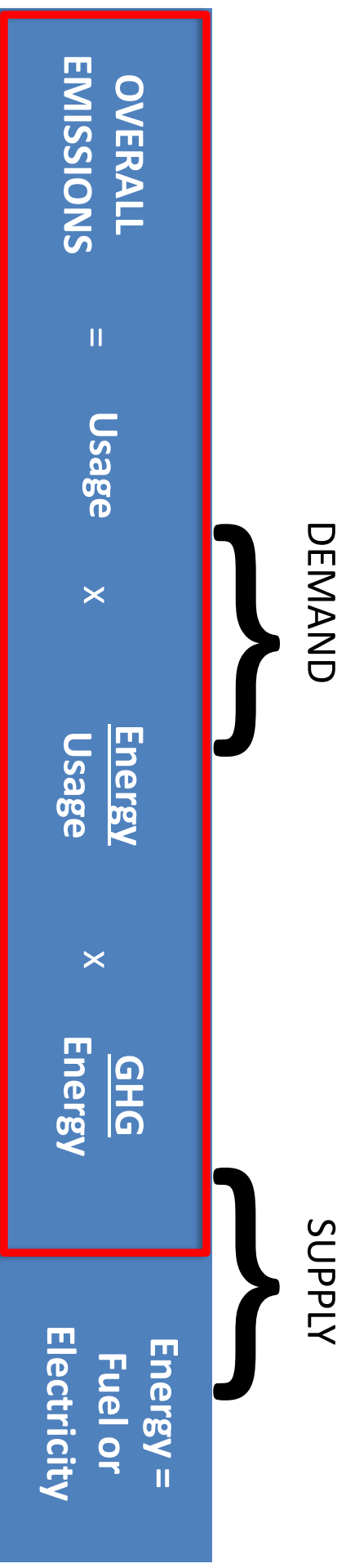
Conservation

**Energy
Efficiency**

Clean Energy

**Fuel
Switching**

End Use Examples



Driving	Vehicle miles travelled	Gallons mile	CO ₂ gallon of gasoline
Consumption	Amount of X	Amount of <u>Energy</u> X	<u>CO₂</u> Energy