



**SOLAR THERMAL**  
ALLIANCE OF COLORADO

Colorado's *Solar Thermal Roadmap* to Growth

# Big Economic Opportunities Ahead

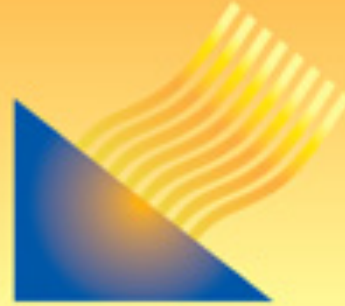
2/9/2012

STAC's  
*Colorado Solar  
Thermal Roadmap*  
was unveiled in  
Denver on January 24,  
2012

Available online:


[www.coseia.org/  
insights/thermal.html](http://www.coseia.org/insights/thermal.html)

[www.cres-energy.org/  
pubs/  
solarthermalroadmap.  
pdf](http://www.cres-energy.org/pubs/solarthermalroadmap.pdf)



**SOLAR THERMAL**  
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# Colorado Solar Thermal Roadmap



Our vision is to make Colorado a global leader in solar thermal adoption, installation, manufacturing, and R&D to boost Colorado's economy, generate jobs, and help build a sustainable energy future.

# The STAC Vision

Our vision is to make Colorado a global leader in solar thermal adoption, installation, manufacturing, and R&D, to boost Colorado's economy, generate jobs, and help build a sustainable energy future.

# What is STAC?



- Founders (pg. ii of Roadmap)
  - RJ Harrington, Policy Director, COSEIA
  - Ron Horstman, President, RWH Ventures, Inc
  - Neal Lurie, Executive Director, COSEIA
  - Laurent Meillon, Director, Capitol Solar Energy, LLC
  - Leslie Martel Baer, Energy Intersections
  - Becky English, Principal, Rebecca English and Associates
  - Leslie Glustrom, Director of Research and Policy, Clean Energy Action
  - Tony Frank, Executive Director, CRES
  - Ron Larson, Founder, CRES
  - Charlie Montgomery, Energy Organizer, Colorado Environmental Coalition
  - Mike Wilson, Energy Consultant, Earth Energy Solutions
  
- Stakeholders (pg. 22)
  
- Process

# Today's Panel

- Tony Frank, Moderator
- Ron Larson
- Leslie Martel Baer
- Charlie Montgomery
- Laurent Meillon

# Solar Thermal Technology

Ron Larson

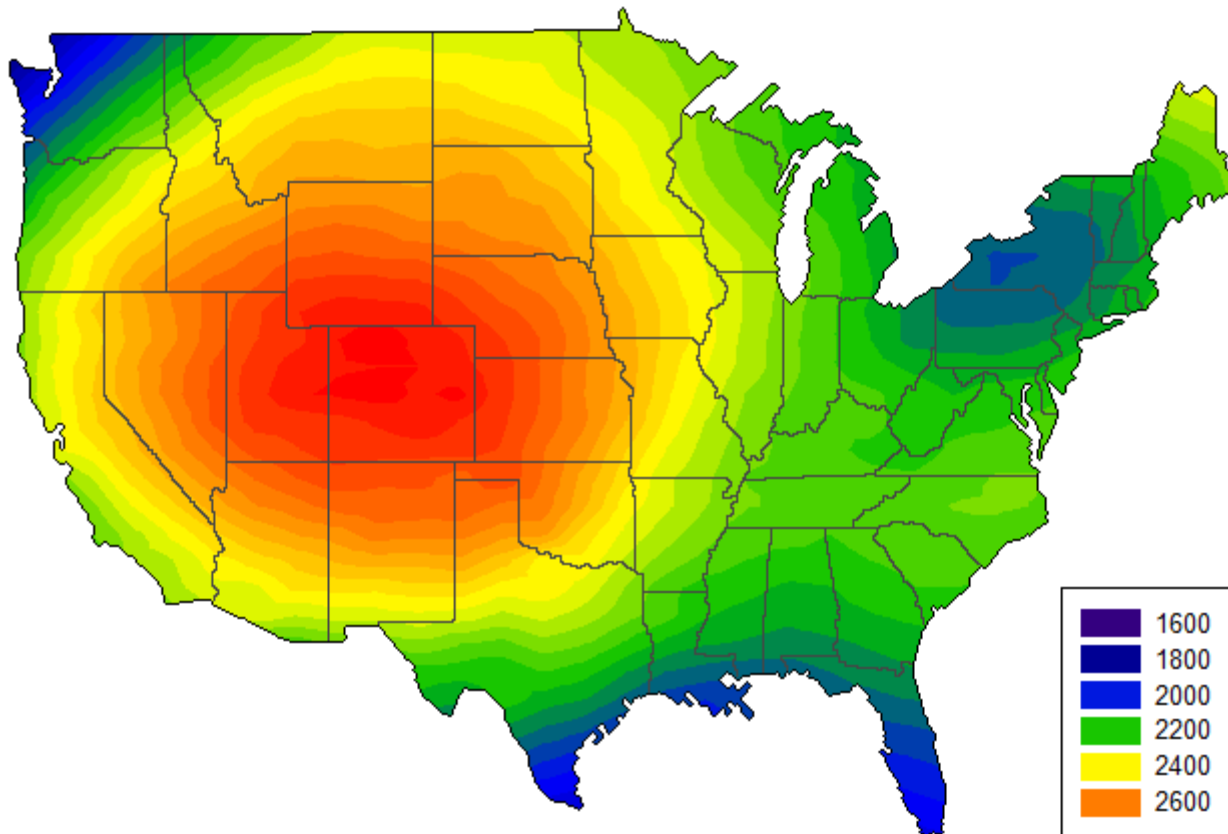
# Establishing the Metric

- Colorado Governor's Energy Office applied for an NREL Technology Assistance Program (TAP) Grant to STAC
- Validated the conversion (pg. 9):
  - 0.7 kW<sub>th</sub> capacity per square meter of solar thermal panel in Colorado
  - 1,298 kWh<sub>th</sub> annual energy consumption offset per 1 kW<sub>th</sub> capacity of solar thermal

# Identifying the Opportunity

U.S. Solar water heating performance in kWh/year (energy saved using a glycol solar system with a selective surface collector; pg 1).

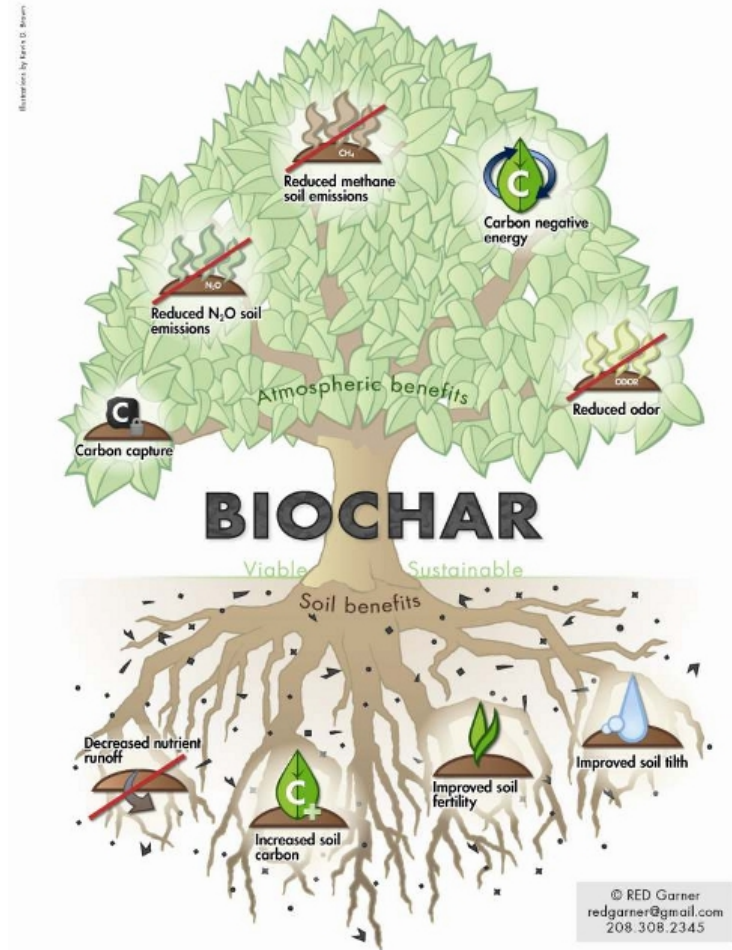
*Source: Danny Parker, Florida Solar Energy Center*



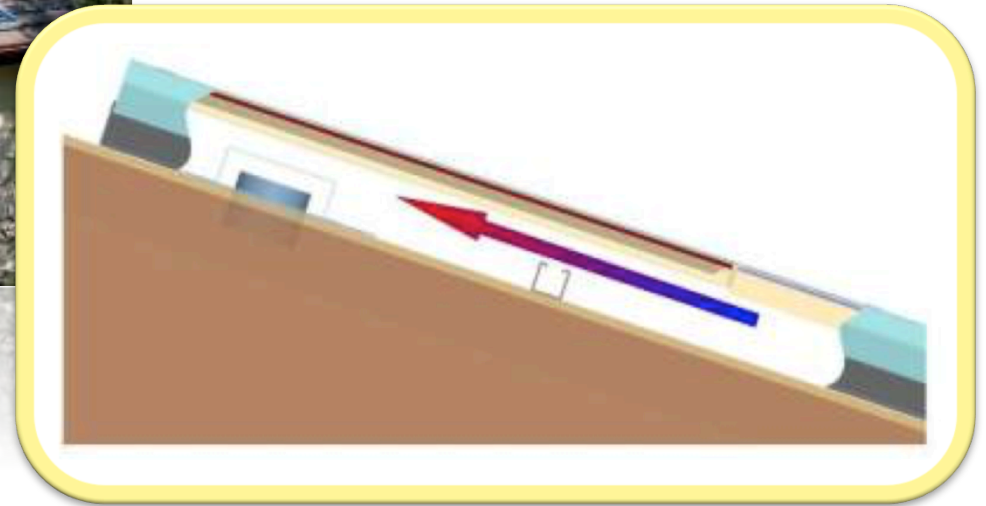


# Diverse Technologies

- Thermally Driven Cooling and other cooling methods (pg. 3, 18)
- Biochar: a complementary technology (pg. 3)
- Opportunities for economies of scale, equipment cost reductions (pg. 17)



# Combined PV/Thermal Systems



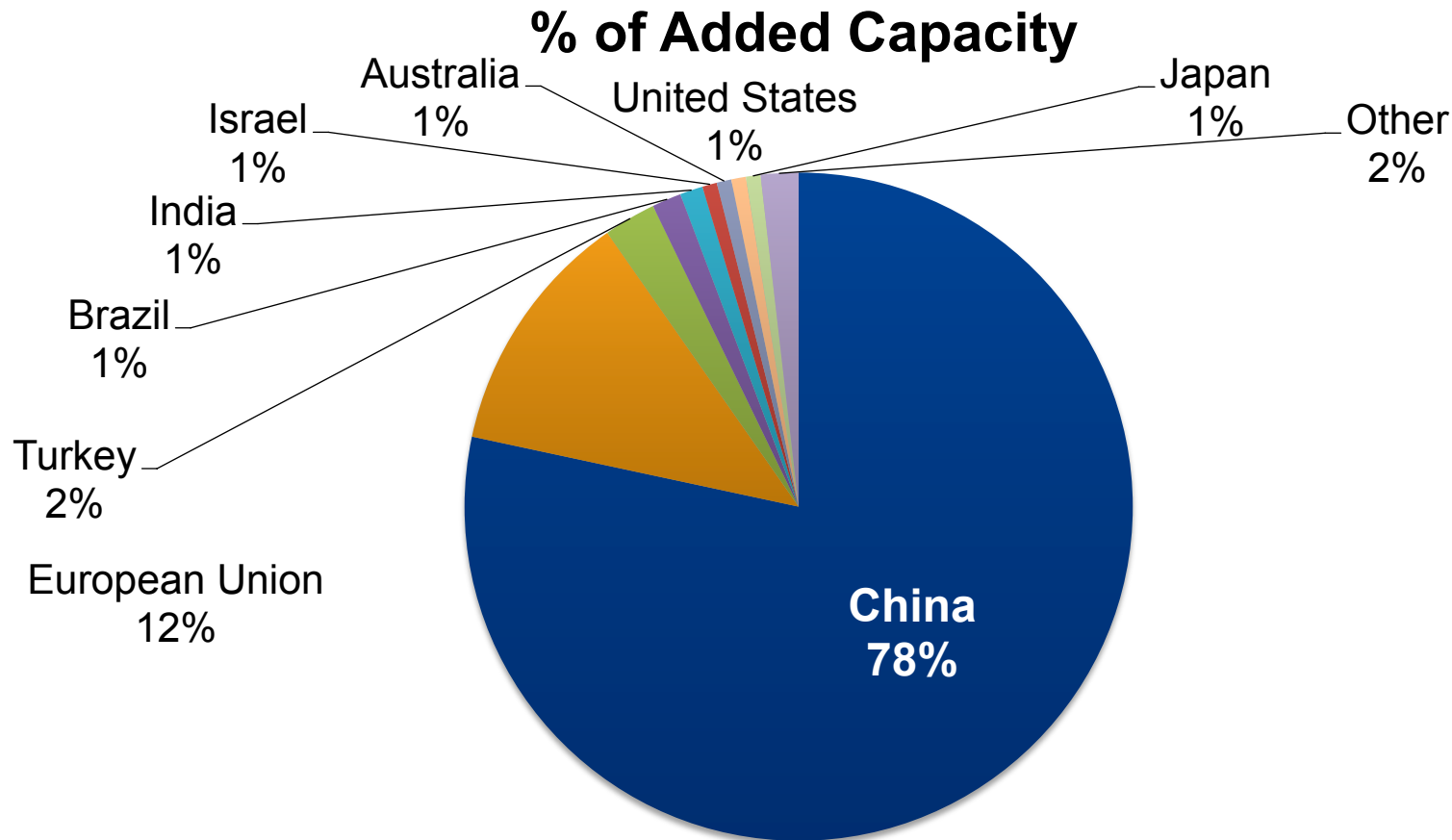
# Summary Thoughts

- The map and computations are conservative and NREL blessed, but the geographic bull's-eye is model is accurate
- The need for more ST is great and overdue—  
—from climate preservation views
- There is plenty of room for ST growth:
  - DOE has not funded ST adequately
  - Costs will come down
  - Incentives are justified

# The Economic Opportunity

Leslie Martel Baer

# The International Scene



2008 total solar hot water/heating capacity added by the top 10 countries: 28 GW<sub>th</sub> (pg. 4). Source: REN21

# Revenues and Jobs

<b>Year</b>	<b>Annual Installed Capacity (MW<sub>th</sub>)</b>	<b>Total Solar Thermal Installed Capacity (MW<sub>th</sub>)</b>	<b>Annual Revenue</b>	<b>Total Jobs</b>
<b>2010</b>	5	150	\$16,000,000	626
<b>2020</b>	35	289	\$57,000,000	1,500
<b>2030</b>	500	2,474	\$677,000,000	15,600
<b>2040</b>	700	9,140	\$944,000,000	21,700
<b>2050</b>	780	16,595	\$1,060,000,000	24,300

# Jobs Across the Value Chain

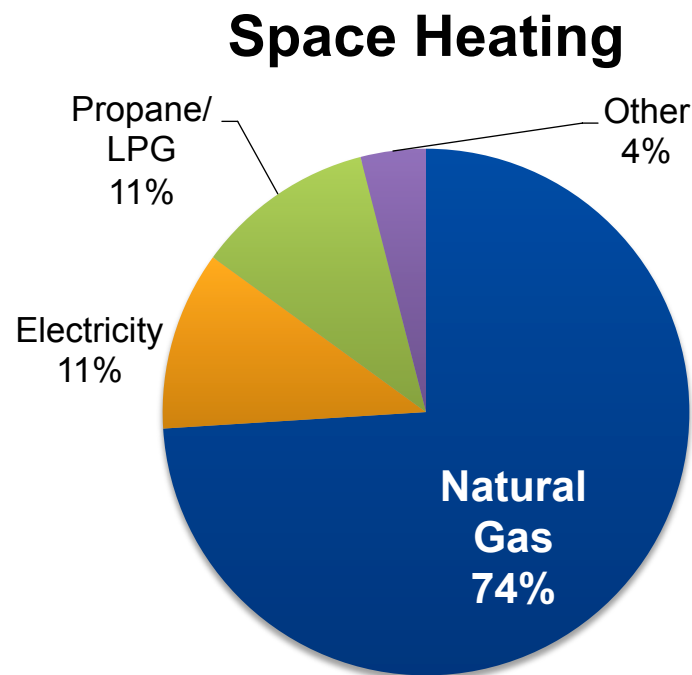
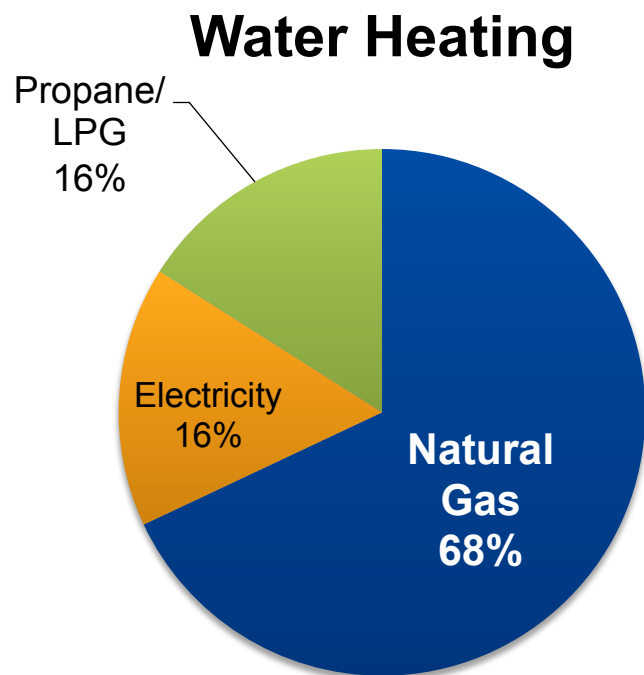
- Research & Development
- Engineering
- Manufacturing
- System Design
- Installation
- Business Management & Executives
- Indirect Jobs

# Industry Veterans on ST Training

- We need more rigorous training and certification
- Mathematics and physics really do matter
- The industry must figure out how to *fund* this training and education
- We need to transfer knowledge
- State could alter insurance rules to support more on-site training



# More Than Gas: Energy Sources for Heat



Fuels used in Colorado to heat water and building space in 2009. *Source: EIA*

# Policy Options and Political Challenges

Charlie Montgomery

# Working with Existing Programs

- Renewable Energy Standard: Sect. 124
- Public Utilities Commission: Sect. 123
- Energy Efficiency Programs

# Innovative Policies

- Stand-alone thermal standard
- Building codes, net-zero homes
- State target with tax credits, rebates

# Competition with Natural Gas?

- Solar thermal has limited impact on natural gas market
- Advantages of gas today:
  - “Clean” or “cleaner”: President Obama
  - Low price, predicted to last for awhile
  - A mini stimulus package ... billions of dollars into national economy

# What's Ahead: Carbon Pricing

- Clean energy standard vs. carbon cap or price
- Is a price on carbon a distant dream?
  - Public's concern with global warming, love of clean energy
  - Dismal climate projections
  - Significant GHG liability with both coal and natural gas

# The Business Development Perspective

Laurent Meillon

# We need a stable business environment!

I build power plants that last 40 years. I need as much clarity as possible about what the rules are going to be. The clearer the roadmap, the better able I am to make good decisions that will still be good a decade from now, or three decades from now.

—*CEO, Duke Energy*

One of the defining challenges of the next century will be how nations and businesses change the ways they produce and consume energy.

—*President Bill Clinton*



# The Colorado Solar Thermal Economic Opportunity

## The Advantages

- <50% of buildings' energy
- Easy retrofit
- 5–30 yr payoff (coal = 60 yr)
- Stores energy on-site
- New apps: cooling, electricity
- Cost reduction innovations
- CSP power plants
- Free, very long-term fuel
- Clean fuel, no external costs
- Local; improves import-export
- 2/3rd local labor content

## The Obstacles

- Lack of consumer awareness
- Lack of financing mechanism
- Glaring state policy gap
- Zoning & permitting red-tape
- Newly-accessible cheap natural gas

**11 advantages clearly outweigh 5 obstacles!**

# Green Energy: Job Creator

For those of us invested in preserving the planet for our children and grandchildren, the mission is clear: We must continue to prove that green energy is America's greatest job creator of the 21st century. Since 2003, this sector has added jobs twice as quickly - and at a higher median wage - than other fields. And the private and public sector have the opportunity to bolster this growth further by collaborating to drive down costs, eliminate barriers to innovation, and provide creative financing structures to expand solar market.



—*President Bill Clinton*  
*Letter to COSEIA*  
*February 7, 2012*

# Questions & Answers

Tony Frank

# Wrap Up & Follow Up

Tony Frank

Find the *Roadmap* online:

[www.coseia.org/insights/thermal.html](http://www.coseia.org/insights/thermal.html)

[www.cres-energy.org/pubs/solarthermalroadmap.pdf](http://www.cres-energy.org/pubs/solarthermalroadmap.pdf)

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