ALLIANCE FOR GREEN HEAT
low carbon, renewable and local

BTEC
Biomass Thermal Energy Council

Thermoelectric Wood Stoves

Thursday, May 18, 2017
11:00 AM ET

In support of the Alliance for Green Heat's 4th Wood Stove Competition in November 2018

NEXT GENERATION WoodStove DesignChallenge

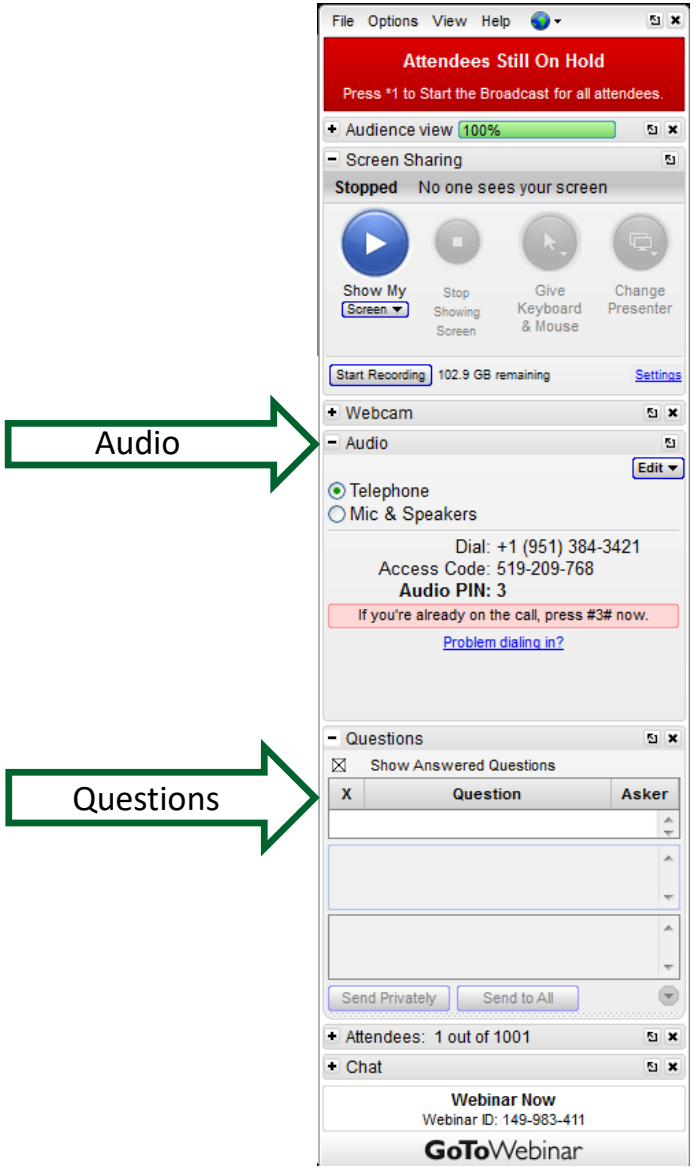
Quick Notes

- Two Audio Options: Streaming Audio and Dial-In.
  1. Streaming Audio/Computer Speakers (Default)
  2. Dial-In: Use the **Audio Panel** (right side of screen) to see dial-in instructions.

     Call-in separately from your telephone.

- Ask questions using the **Questions Panel** on the right side of your screen.

- The recording of the webinar and the slides will be available after the event. Registrants will be notified by email.



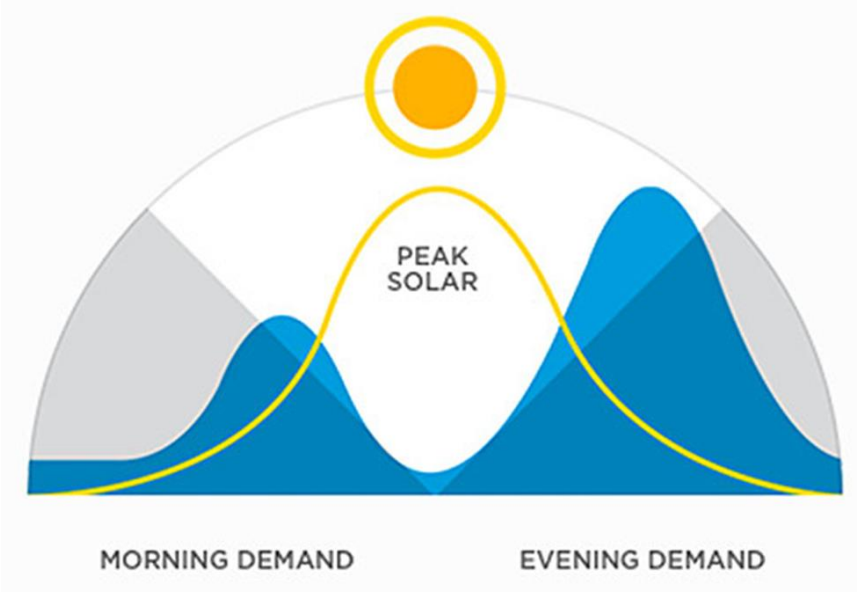
- ✓501c3 nonprofit
- ✓Promotes clean & efficient biomass heaters
- ✓National voice for wood heat consumers
- ✓Hosts design competitions
- ✓Encourages transparency from manufacturers and regulators

NEXT GENERATION
WoodStove DesignChallenge

- 4th Wood Stove Design Challenge
  - 3rd Week of November 2018
  - National Mall in Washington DC
- Two Competition Categories:
  - Automated stoves
  - Thermoelectric stoves

2018 Thermoelectric Stove Challenge

- Huge potential for thermoelectric power to supplement winter time solar energy production.
- Homes in Northern hemisphere produce large amounts of wood heat exactly when homes and the grid need electricity.
- NREL estimates typical solar panels in VT make 571 kWh in summer and 191 kWh in winter.
- Efficient thermoelectric generation is still in early stages. Raising efficiency and lowering cost – just like solar PV did – is the challenge.



Thank you!

John Ackerly – jackerly@forgreenheat.org

Ken Adler – kadler@forgreenheat.org
(for thermoelectric issues)

Alliance for Green Heat
Takoma Park, MD
www.forgreenheat.org
301-204-9562

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About BTEC

The national trade association for the modern wood heating industry.

Engage in technical codes and standards development, public advocacy, and education.

100+ members and associates across the US and Canada:

- Fuel Producers
- Manufacturers
- Sellers
- Installers
- Service Providers
- Universities
- Non-profits & NGOs
- Government agencies

Bear Mountain Forest Products SINCE 1988

CENTRAL BOILER

Forest Energy Corporation

NEW ENGLAND WOOD PELLET, LLC

BTEC
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For More Information:

http://www.biomassthermal.org
202-596-3974

Jeff Serfass – jeff.serfass@biomassthermal.org
Executive Director

David Bancroft – david.Bancroft@biomassthermal.org
Technical Engagement Manager

Aaron Aber – aaron.aber@biomassthermal.org
Outreach, Policy, & Membership

THERMAL ELECTRONICS CORP.

What we provide

- 25 years of Thermoelectric experience
- Library of custom components
- Application specific DC to DC Charge Controllers
- Largest inventory of Semi-conductor material modules

Discussion of Thermoelectric Power Generation

Managing Thermal Resistance

When designing a system it breaks down into 3 thermal resistances

R1 =Hot Side

R2 =Module

R3 =Cold Side

Optimal design is when

R1 = R2 = R3

Management of Thermal Resistances

Optimum Design Parameters

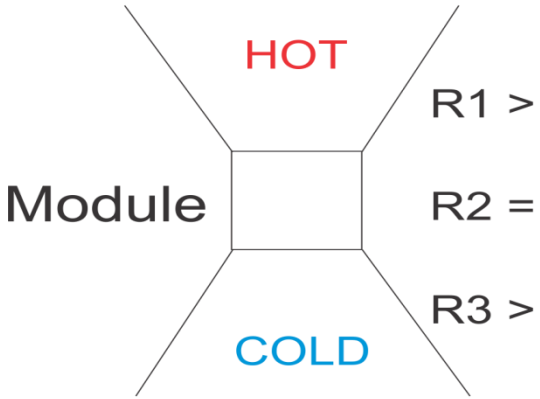


Fig 1

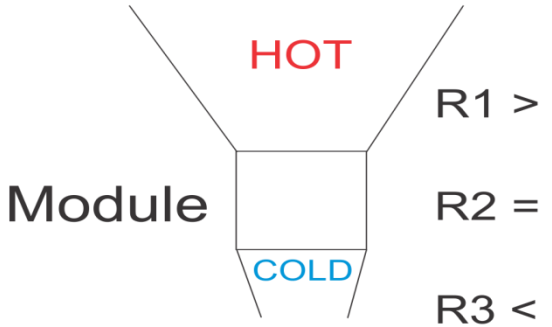


Fig 2

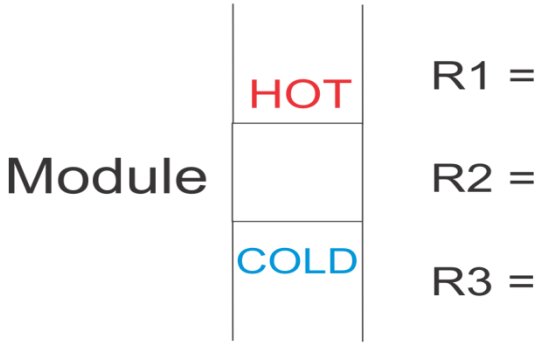


Fig 3

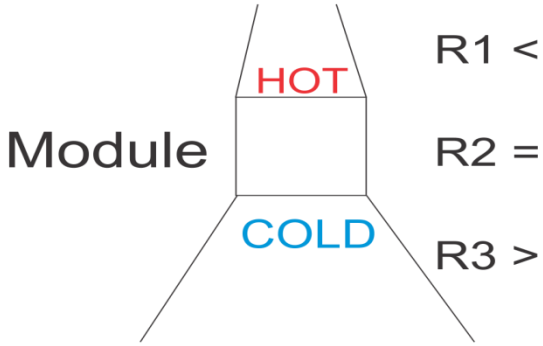


Fig 4

TEG Thermal Ranges and Efficiency

Material	Temp Range	Efficiency
BiTe TEG 1 Series	50C to 300C, sweet spot 200C to 280C	3% best
BiTe PbTe TEG1 Hybrid	200C to 310C, sweet spot 260C to 290C	4% best
PbTe/PbTe TEG1 sealed	400C to 575C, sweet spot 350C to 575C	6% best
PbTe/TAGS Series	400C to 600C, sweet spot 400C to 600C	12% best
CMO Oxide Series	650C to 900C, sweet spot 650C to 875C	3% best

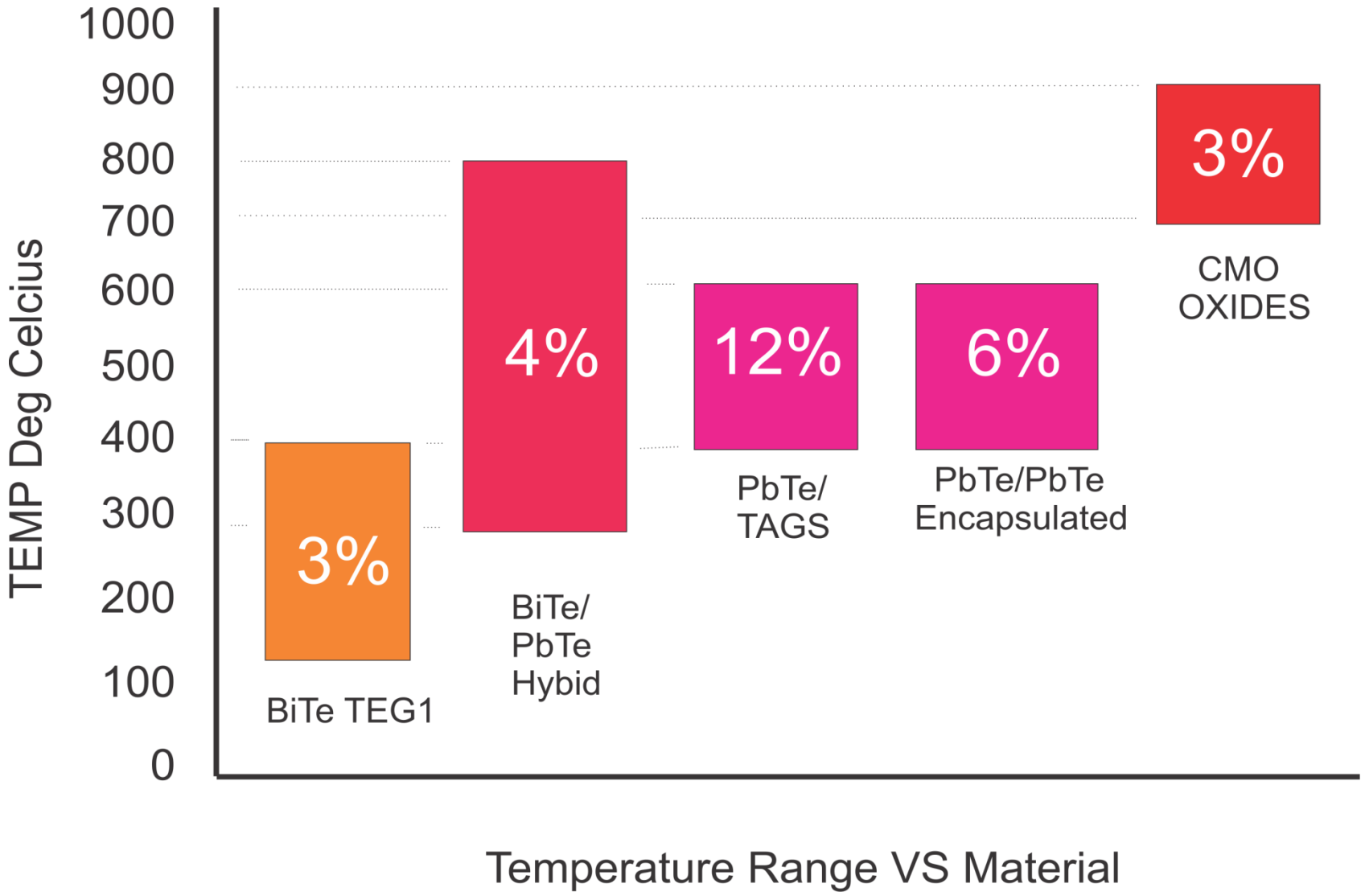
Key Parameters for design!

- Heat source & temperature?
- Space considerations?
- Available cooling processes?
- Heat flow rate?
- Power requirements?
- Cost consideration?

Absorbing & Moving Heat Flux Rapidly

Hot side Best to Worst	Type
	Hot Liquid Parallel Flow
	Heat Sink
	Heat Pipe
	Plate
Modules	**Type**
	Depends upon Design ?
	Available amount of Heat?
Cold side	**Type**
	Liquid Flow Parallel Flow
	Reservoir Thermosiphon
	Heat Pipe w/fan
	Heat Sink w/fan
	Heat sink natural convection
	Flat plate

TEG Temperature Ranges



Thank You

Project Light Up!

Questions? Contact: Gerard Campeau, Thermal Electronics Corp.
tecteg@rogers.com
(905) 751 – 1362 or 1 (800) 769 – 2395 Toll Free