



**TransPacific Energy, Inc.**  
Innovative Energy Systems for A Cleaner World

*TransPacific Technology with Refrigerant Mixtures  
Transforming the Heat Recovery Industry:  
Challenge of Today and Tomorrow*



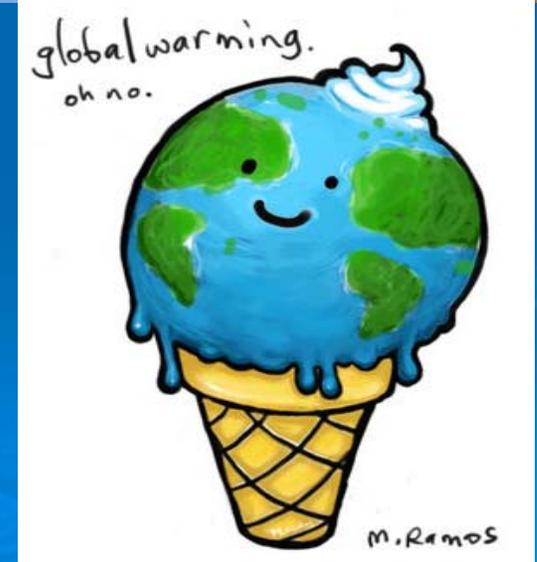
[www.transpacenergy.com](http://www.transpacenergy.com)

## International Energy Agency, May 11, 2009:

- *Electricity demand to double by 2030*
- *\$11 TRILLION will be spent by then on energy infrastructure*

## Other Drivers:

- *Competitive need to reduce the increasing cost of generated electricity*
- *Imperative to eliminate destructive emissions and*
- *Global warming issues*
- *Green and renewable energy appeal*



**Market... over \$500 Billion**

**TPE**

**TPE Heat Recovery Technology  
Solutions:**

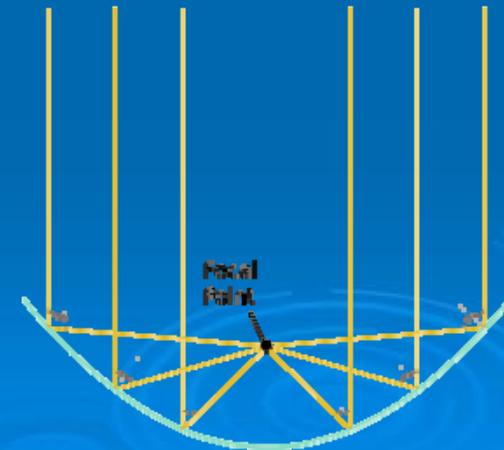
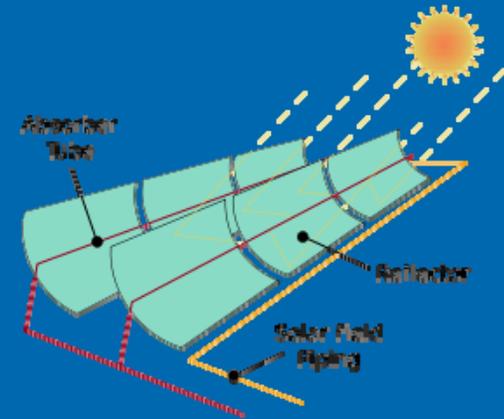
**Make no or marginal return projects  
Profitable;**

- **Solar, Geothermal, Wind-ORC**
- **Warm sea water OTEC, Thermal Storage**
- **Biomass/Landfill,**
- **Other high medium and low  
temperature heat sources**



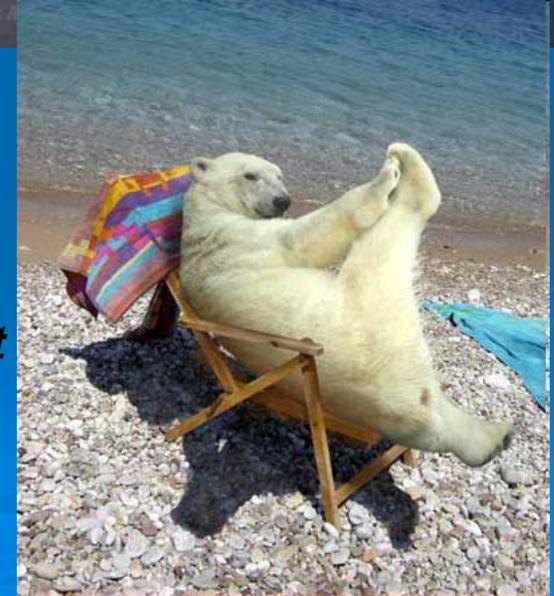
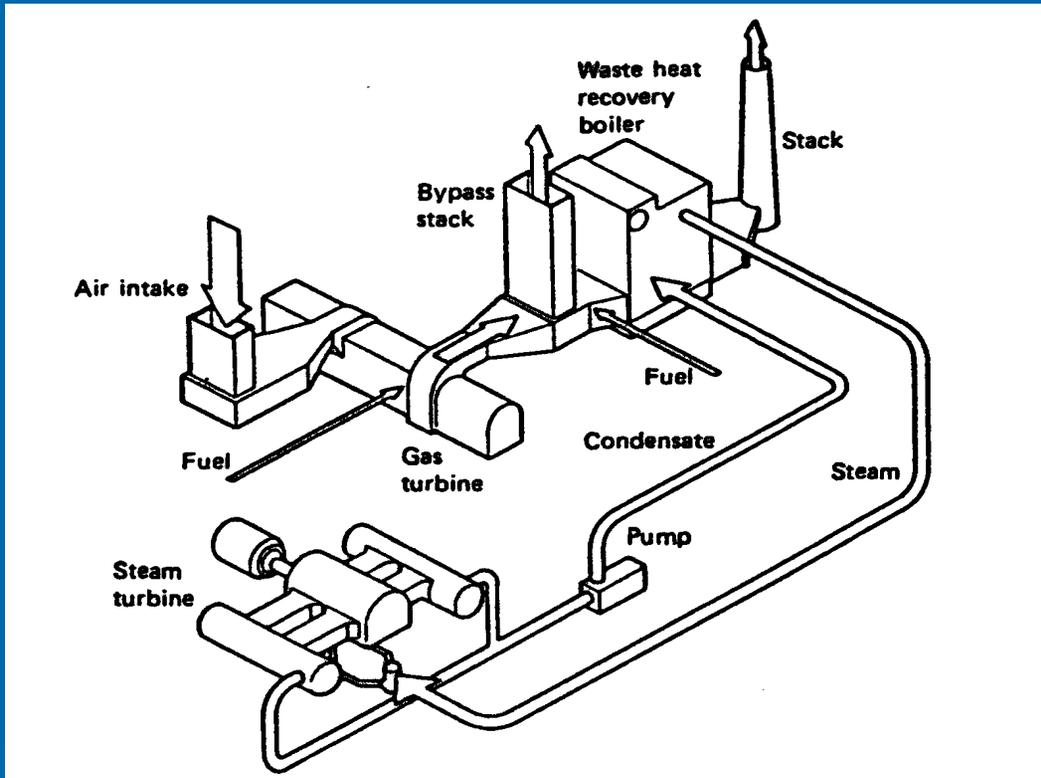
## Advantages of thermal solar:

- *High temperature for power generation*
- *High efficiency*
- *Inexpensive compared to PV*
- *Produces thermal Heat*
- *Thermal heat storage*
- *Green and renewable energy appeal*



## ***Background: waste heat recovery***

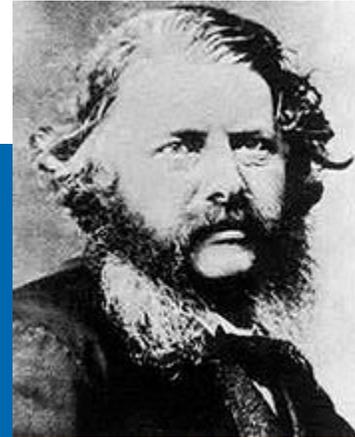
***TPE***



***There are many predicted effects for the environment and for human life and our energy supply due to global warming.***

## ***Proven Base Technology....***

***TPE***



### ***The Rankine Cycle***

- ***Developed in 1859 by William John Macquorn Rankine, a Scott***
- ***Generates about 80% of all electric power used throughout the world***

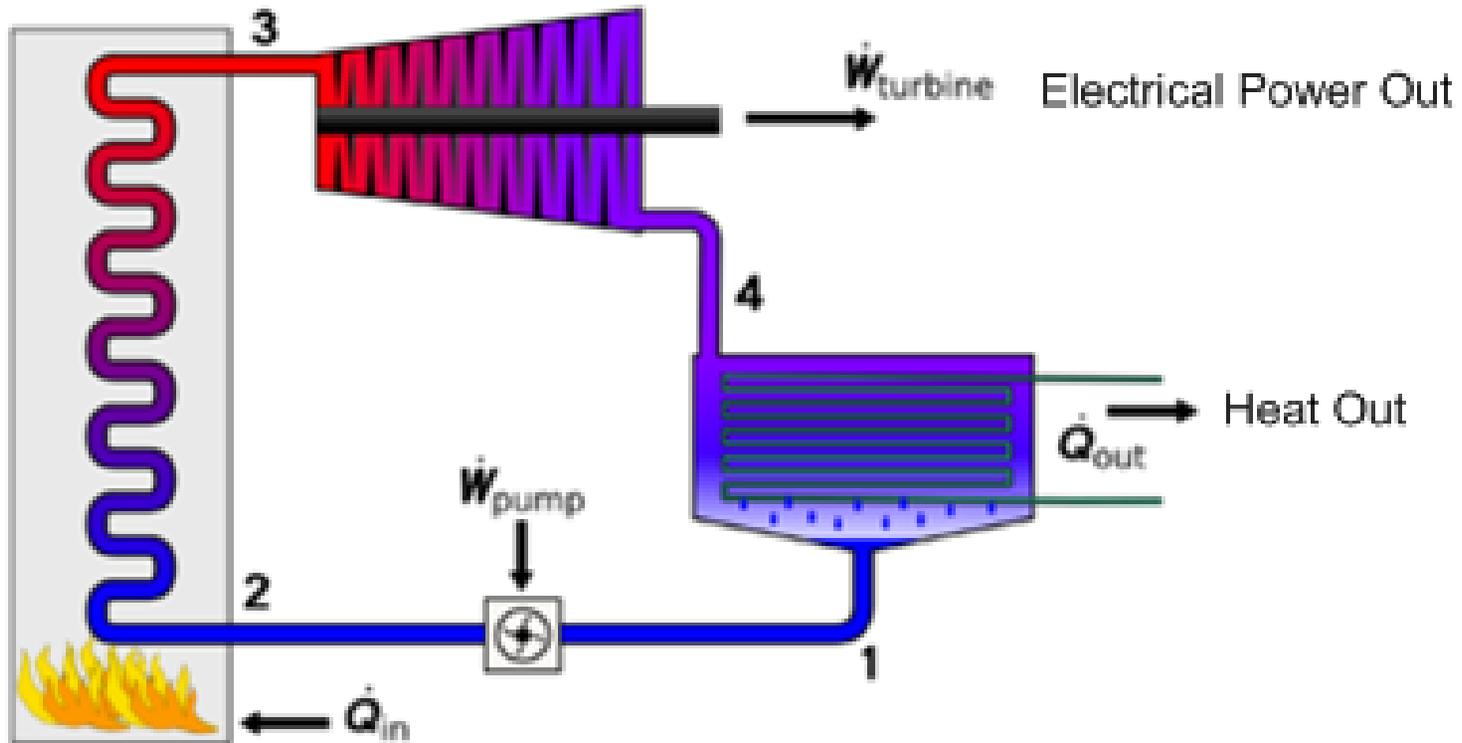


### ***The Organic Rankine Cycle (ORC)***

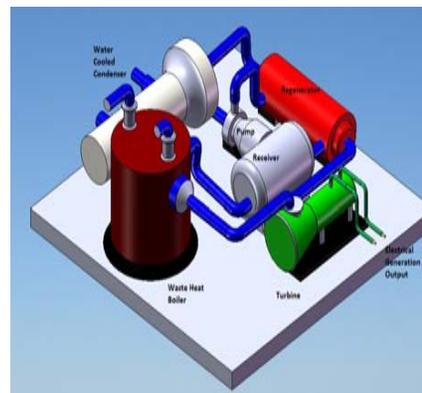
- ***First developed and exhibited in 1961***
  - ***by Israeli solar engineers Harry Zvi Tabor and Lucien Bronicki (Ormat)***
- ***Use of an organic, high molecular mass fluid with a liquid-vapor phase change***

# ORC: Base Technology...

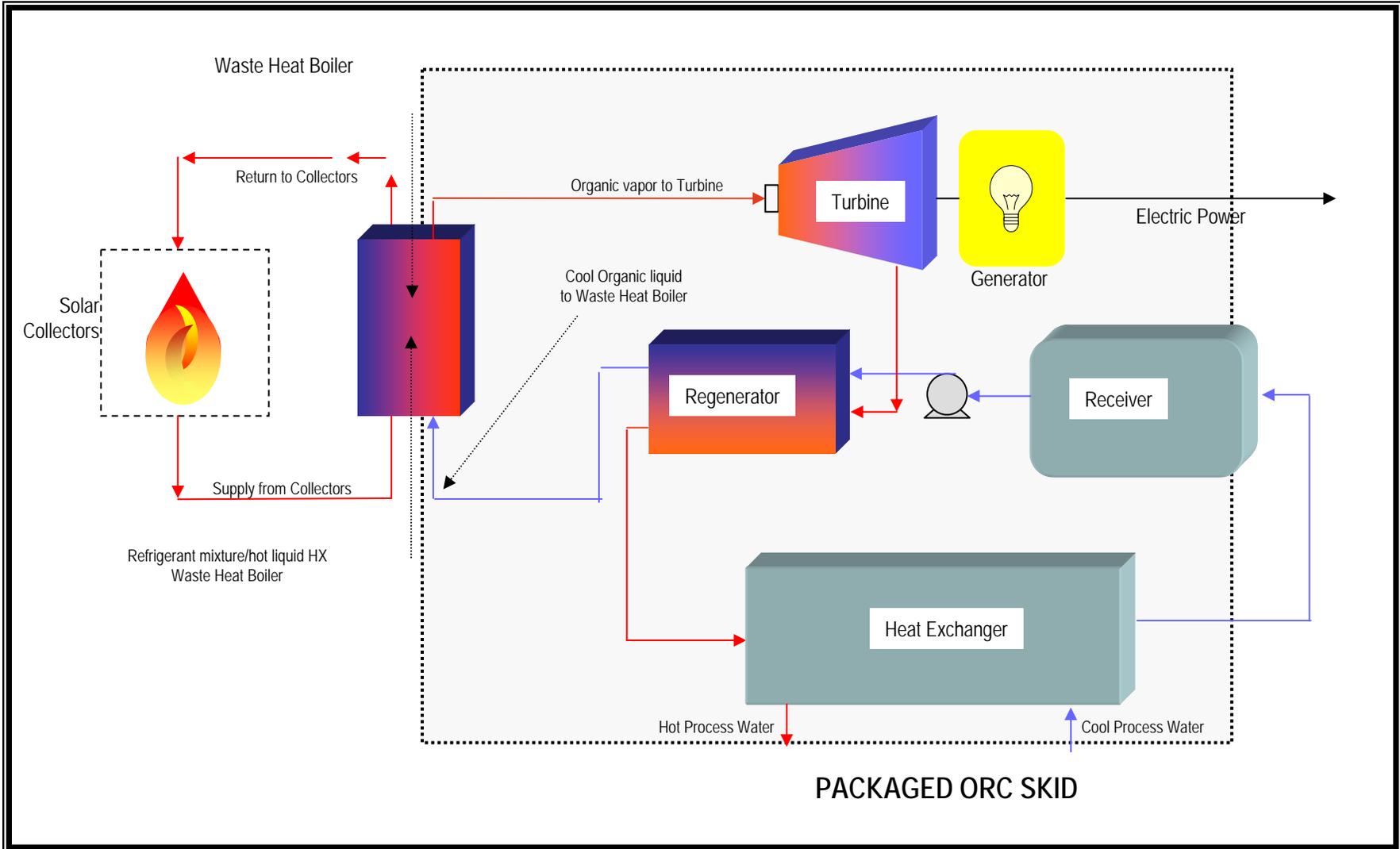
TPE



- 1. Low Pressure Cool Liquid
- 2. High Pressure Liquid/Vapor
- 3. High Pressure Hot Gas
- 4. Low Pressure Hot Gas



# Thermal Solar Heat Recovery Organic Rankine Cycle

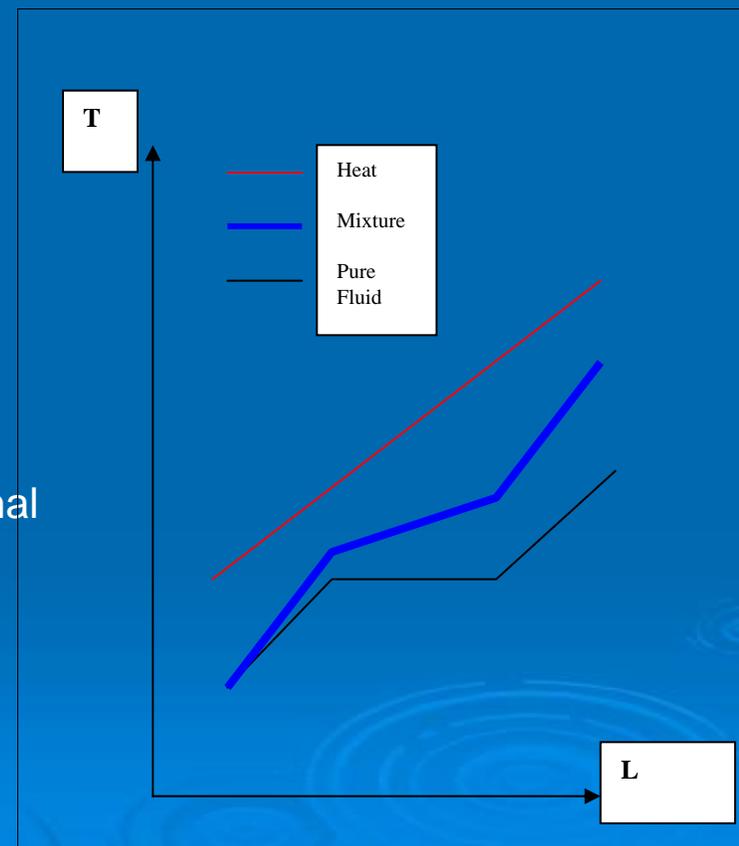


## Value proposition: Why Refrigerant Mixtures?!!

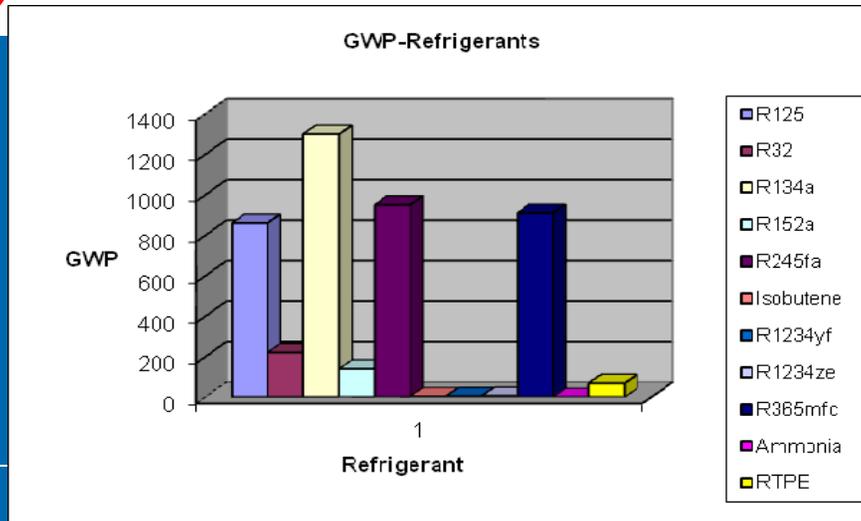
- Pure Refrigerants boil at constant but **blends** boil at **variable** saturation temperatures.

### •Benefits of TPE refrigerant Mixtures:

- Unique ability to customize refrigerant mixture for maximum heat recovery, less heat losses and power production.
- Efficient **Heat Recovery: (80-1000F)**
- **Wide applications:**
  - Hot fluids:** Gray water, Solar, Geothermal
  - Hot gases:** Flue gases, Hot air
- Economically viable
- Environmentally sound
- Certified use: Residential, Commercial/Industrial



# The Technology...



## TPE

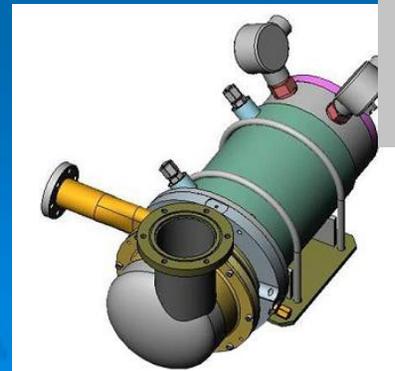
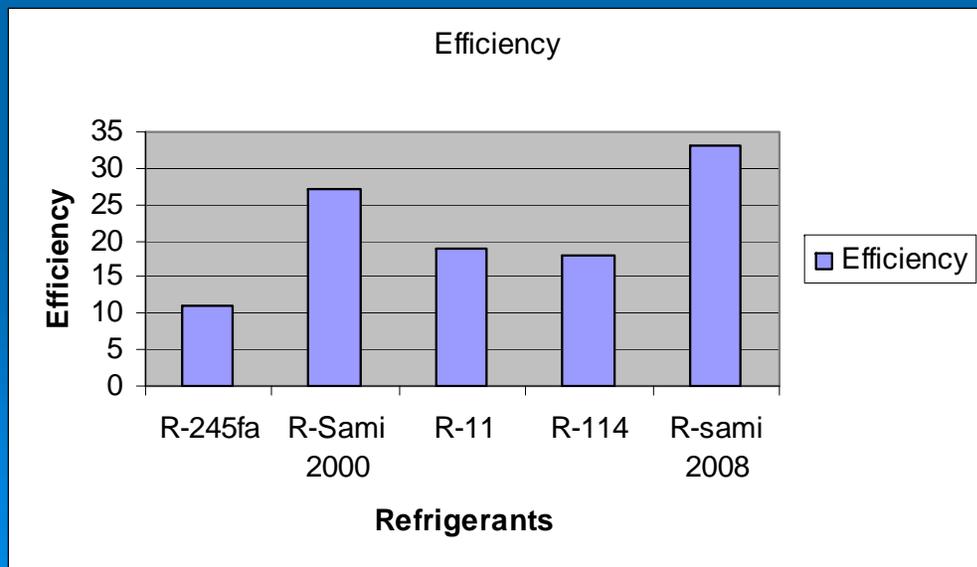
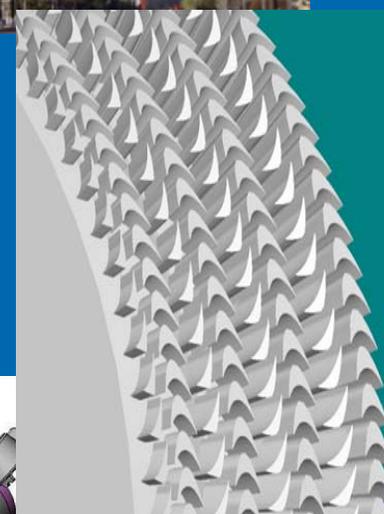
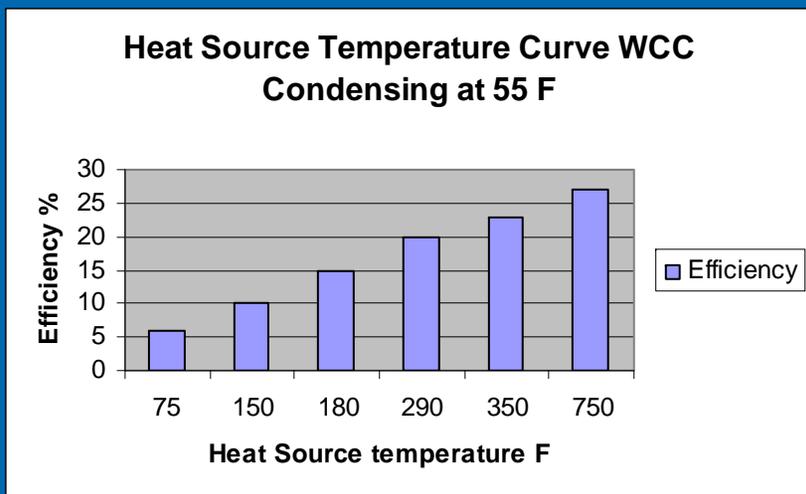
### • Proprietary Mixtures

- Low pressures
- Non toxic
- Non flammable
- Hi thermal efficiency
- Broad temp applications
- Certified EPA ARI

## Current Industry

- HCFC's, Ammonia, Pentane, Propane, Isobutene, Butane
- Very high pressures
- Highly toxic
- Explosively flammable
- Low thermal efficiency (including R245fa)
- Narrow temp applications

# Substantial Advantage...



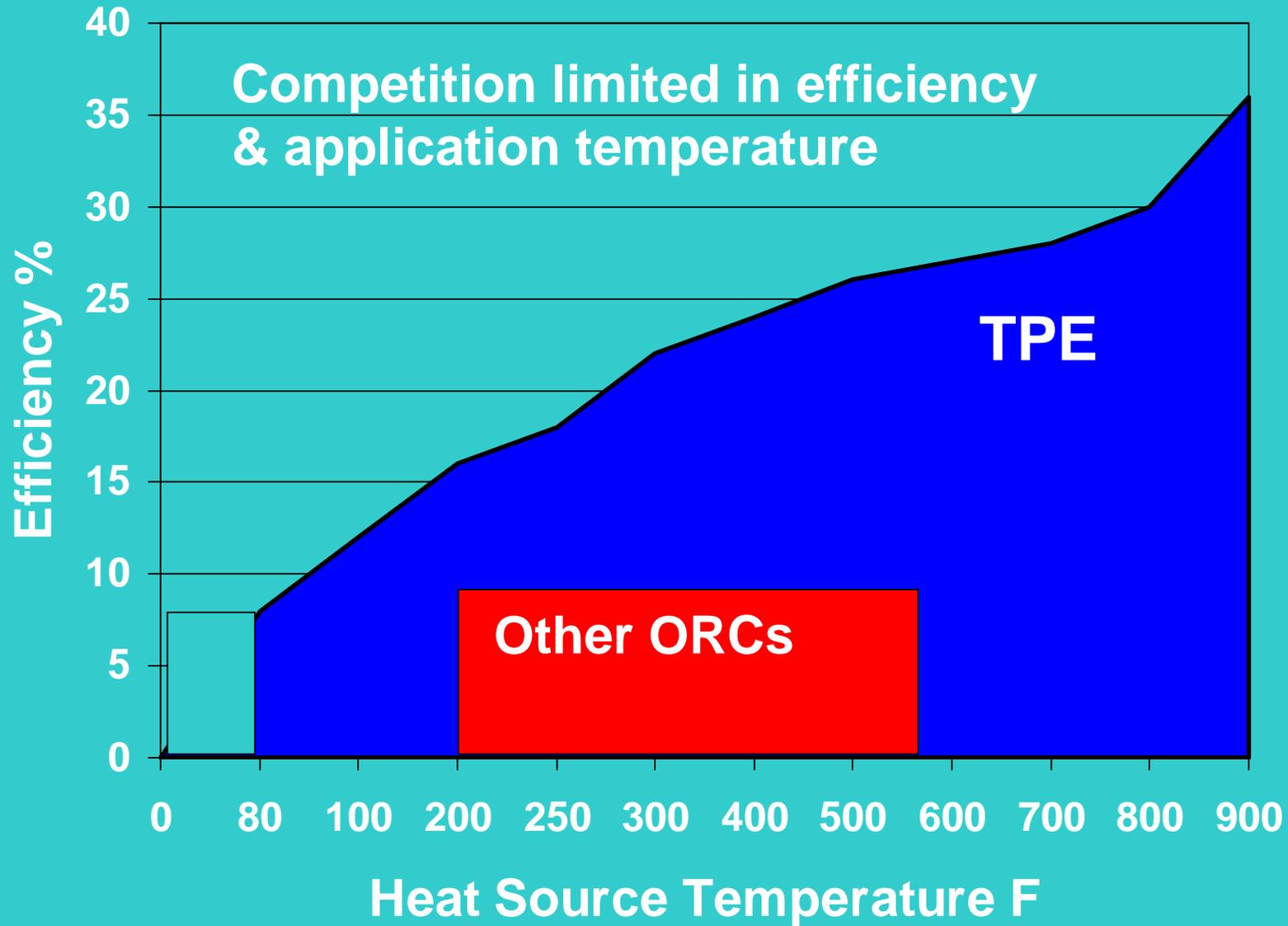
## ..... TPE Technological Advantages

- Increased efficiency 20%-35% vs. 8%-10% with MHD
- Innovative certified refrigerant mixtures
- Variable boiling temperatures maximize heat recovery
- Multistage direct drive turbine/generator
- Magnetic/ foil bearings & MHD
- Fully hermetically sealed system
- Air-cooled condenser
- Reduced cost of production and maintenance
- Custom-made units tailored to client heat source
- **Capture low and medium sources of heat;**
  - **Flue Gases**
  - **Solar Energy**
  - **Geothermal Energy**
  - **Gray water**



**Substantial Advantage....**

**TPE**

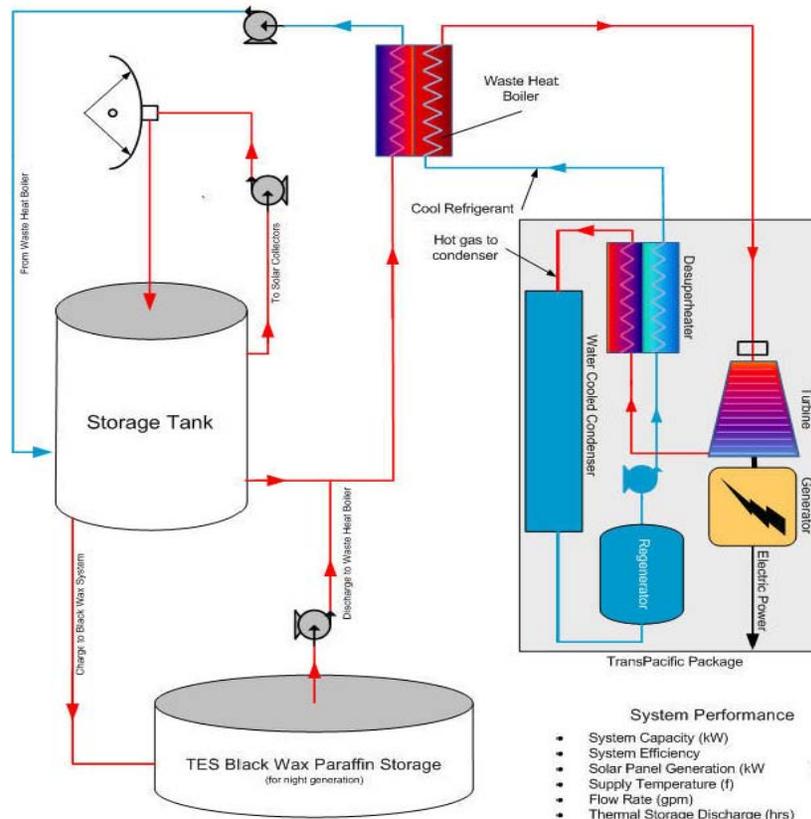


## ..... Thermal Storage.... Black Wax Paraffin

- Innovative Technology
- Provides 24/7 continuous supply of power
- Ensures 24/7 continuous supply of heat or cooling
- Enables change of state at predetermined temperatures
- Can be used with forced air or liquid coolant flow
- Environmentally sound, meets codes and flame spread standards
- ***Applications: Solar, Geothermal and load shifting***



## TransPacific Energy Solar Thermal



**System Performance**

- System Capacity (kW) 1,170
- System Efficiency 14%
- Solar Panel Generation (kW) 13,485
- Supply Temperature (f) 200
- Flow Rate (gpm) 3,488
- Thermal Storage Discharge (hrs) 10.09
- Operation 24/7

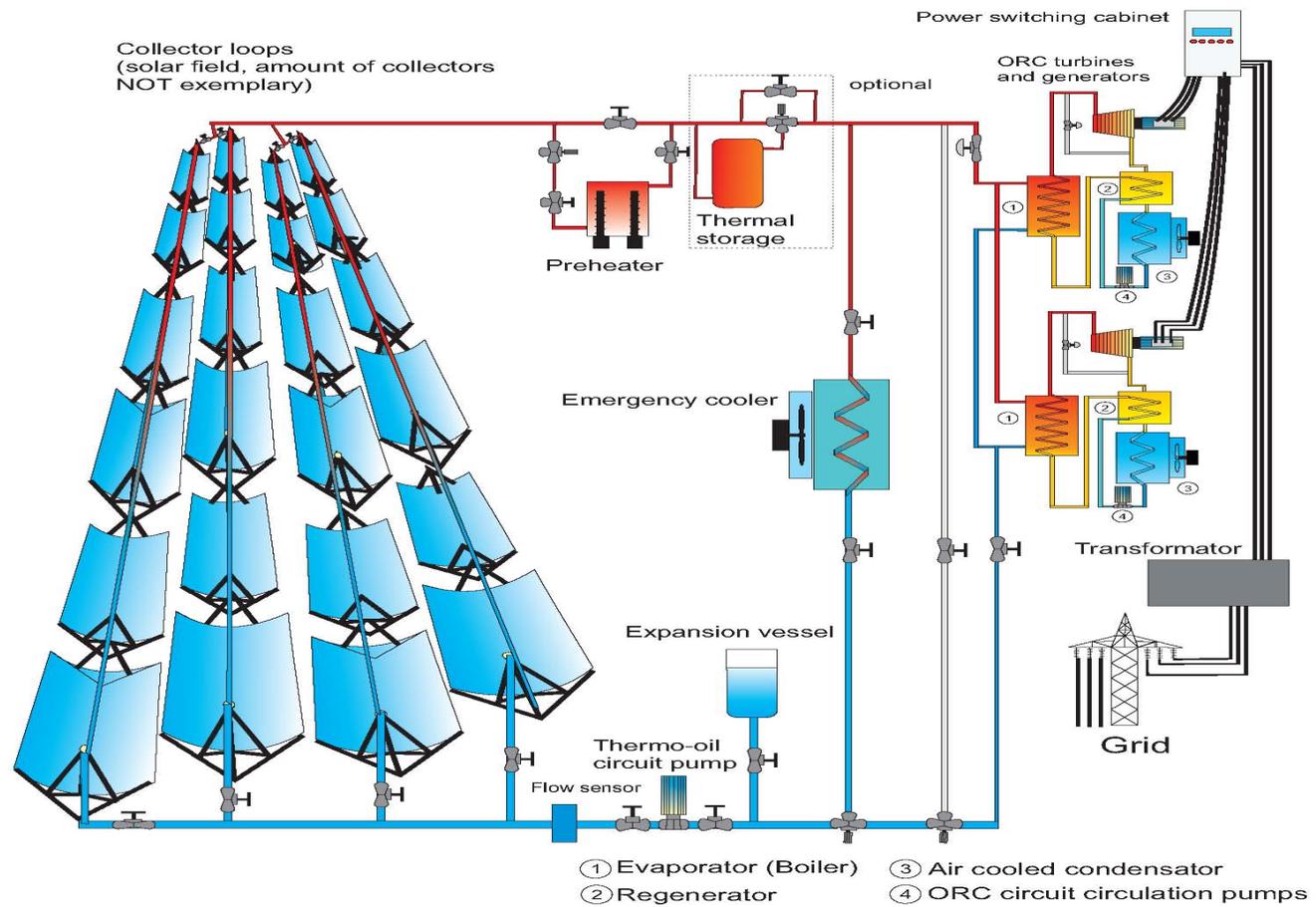


# Thermal Solar CSP -ORC .....

TPE

MITHRAS

Thermo-oil circuit with thermally coupled twin TPE ORC turbine circuit



- Thermal Solar Plant
- 1 MW

# .... Thermal Storage & Solar Energy

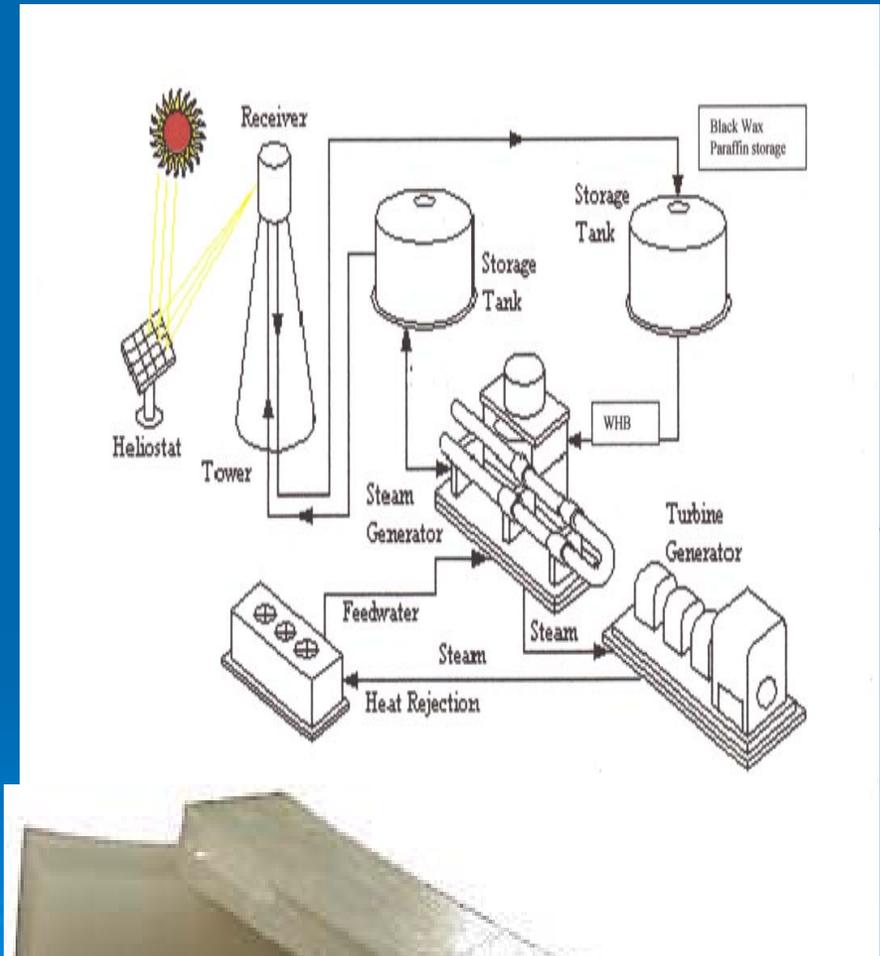
TPE

**\*\*\* Black Wax Paraffin:**  
**More efficiently producing power 24/7;**

- Waste heat and untapped heat
- Geothermal, Solar and others

•Consuming no fuel and saves on fuel consumption

•Producing zero pollutants and reduce Global warming



## ..... Environmental Impact



### •No Fuel Consumption

- ZERO Pollutants particulates such as carbon monoxide, nitrogen oxides and sulfur oxides.
- ZERO CO<sub>2</sub> discharge
- ZERO Acid Rain

**Market...**

**TPE**

**Customers Worldwide...  
Hot gas or Hot fluid applications;**

- **PPP using fossil fuel**
- **Solar and Geothermal power plants**
- **Food processing facilities**
- **Petrochemical refinery installations**
- **Abundant/Live oil wells**
- **Desalination process**
- **Biomass applications**
- **MWD sites**
- **Marine transport**
- **Ocean warm waters (OTEC)**
- **Cooling Tower replacements and substitutes**
- **Condenser Alternatives**
- **Various DOD applications**



## ***Business Model....***

***TPE***

### ***TransPacific Energy (TPE )***

- ***Sells systems directly to customers for their installation and operation***



***and***

- ***TPE owns, installs and operates, selling electricity, PPA***

***and***

- ***Licenses TPE technology for specific applications and markets***



***and***

***Research and Development....new ORC applications & Renewable Energy***

# Market... Current and Future

TPE



Power Plants Around The World



Power Plants Around The World

Question & Answer Slides