

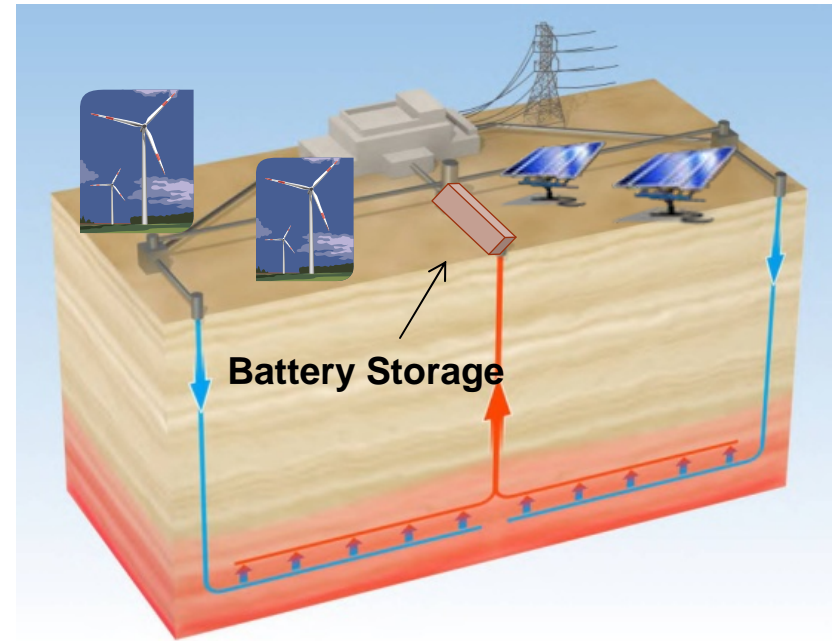
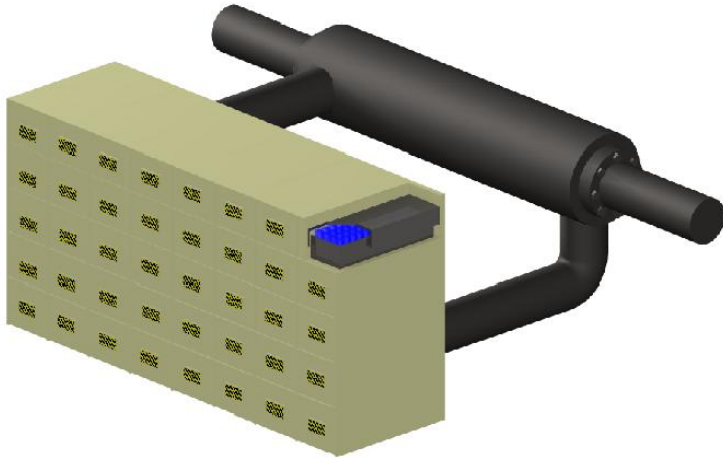
# Lava Energy Systems Inc.

SMU Geothermal Conference  
November 3, 2009

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CEO

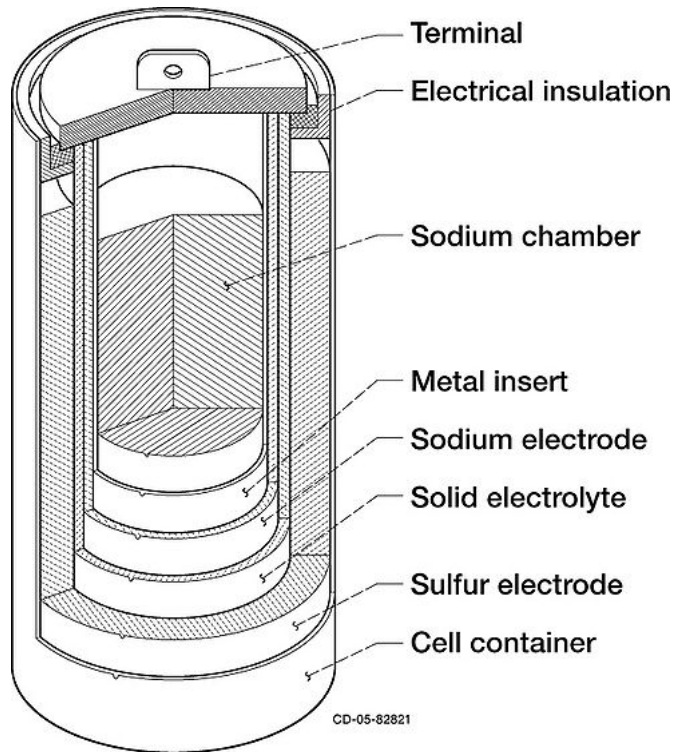
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# Concept



*‘Utilize geothermal fluids for thermal management and waste energy harvesting of molten salt batteries and power conversion electronics.’*

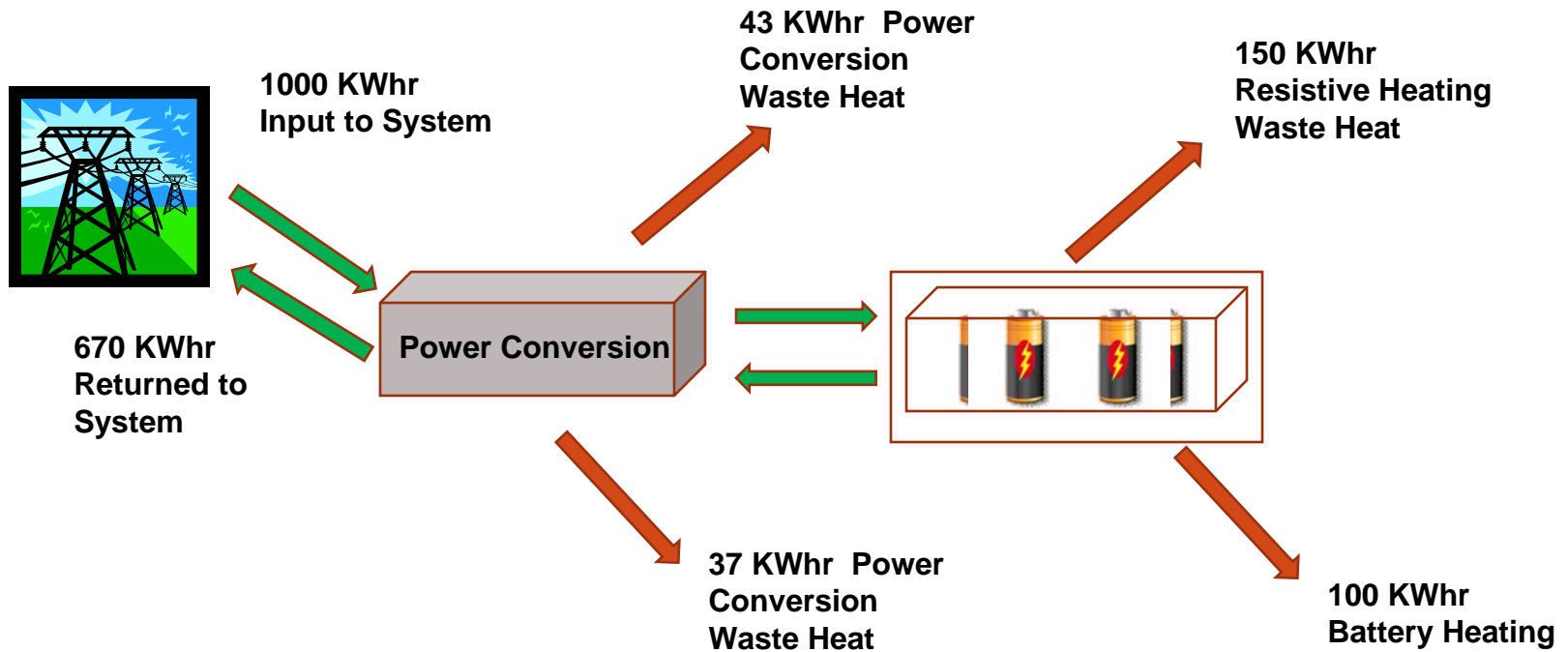
# Molten Salt Batteries



Sodium sulfur battery schematic

- Current Technologies, mainly Sodium Sulfur or Nickel Chloride (Zebra) are highly efficient and low cost storage media.
- They do have inefficiencies due to internal resistance during charge/discharge, generally 10% - 15% of stored energy is lost to heat.
- Need to be kept at elevated temperatures  $> 150^{\circ}\text{C}$  normally for salt to be molten and efficient ion transfer.

# Current Storage Efficiencies



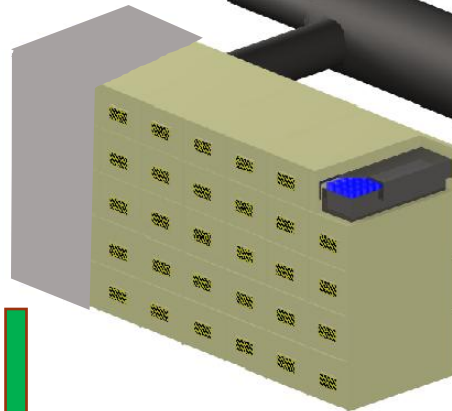
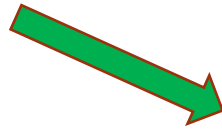
1000 KWhrs Input to System  
670 KWhrs Returned to System

**330 KWhrs Lost as Waste Heat**

# Lava Energy Efficiency



**5 MW Intermittent  
Wind Input to  
System**



**3.7 MW Base load  
Wind Input to  
System**



3.7 MW vs.  
3.35 MW using  
traditional battery  
storage + 10%



**100 KW Geothermal Plant  
Working Fluid +110 C**



**1.3 MW Incremental  
Geothermal Fluid  
Temperature (+120C)**



**100 KW Plant now  
adds >130 KW  
Incremental Output**

**230 KW Power**



# Benefits

- **Redefine Geothermal as Reliable Load Following Energy:**
  - 'Top Off' Air Cooled Power Losses
  - Power Shifting to Load Following
  - Improve Power/Demand Quality
- **'Black to Green' Conversion of High Temp Oil/Gas Wells**
  - Storage Services for Co-Located Wind/Solar Resources
  - Energy Harvesting of Battery Waste Heat
    - 200KW Geothermal Plant supporting 5MW wind
      - Geothermal Plant Harvests 500KW Waste Heat
  - Capacity Firming and Time Shifting of Wind/Solar Resources
- **Thermal Management Streams**
  - Geothermal Resources
  - High Temperature Oil & Gas Wells
  - Metro – Commercial Steam Plants

# Status

- **Confirming Strategic Relationships**
  - Cell Manufacturing and Development
    - Utilize 'Off the Shelf' Technology
      - GE and MES-DEA Ramping Up Zebra Cell Technology
      - Autoliv – Tier 1 Automotive Supplier
  - Power Conversion Electronics
    - S&C Electric Company – Leader in Battery Storage Systems
- **Market Development**
  - Identification of Customer Partner for Demonstration Project
- **Capital Requirements**
  - \$400K needed for lab scale demonstration project
  - Strategic Partners/Investors