

# *Thermal Energy Storage Research- Phase Change Material Latent Storage.*

**Dr. Mick Mc Keever**

**DIT**

**Grangegorman**

**20<sup>th</sup> May, 2015**



SCHOOL OF  
ELECTRICAL AND  
ELECTRONIC  
ENGINEERING



## Challenges : Improve the Customer Knowledge

- Phase Change Material Energy Storage Market Survey feedback
- Why is a PCM Storage Tank better than a Water Buffer Tank?
- The PCM tank holds 6.5 times the energy of a same size water tank.
- Can you show me it running in a real building?
- Demonstration site required to show it works.
- How much does it cost and what is the payback?
- Demonstrator data required for Nett Present Value and Simple Payback Periods.
- What are the drawbacks of the PCM storage tank?
- Thermal response times are slower for PCM.

# Size Matters



# How PCM Works

- How does PCM work?
- 500 Litres of water heated by  $10^{\circ}\text{C}$  (e.g.  $75^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ ) stores only Sensible Heat
  - Sensible Heat:  $500 \times 4.1 \times 10 / 3600 = 5.7 \text{ kWh}$
- 500 litres of PCM heated by  $10^{\circ}\text{C}$  stores Sensible Heat and Latent Heat when melted.
  - Sensible Heat:  $500 \times 2.1 \times 10 / 3600 = 2.9 \text{ kWh}$
  - Latent Heat:  $500 \times 300 / 3600 = 41.6 \text{ kWh}$

Theoretical Storage Ratio of 7.8 for a  $10^{\circ}\text{C}$   $\Delta T$

## Spiral PCM Tank Features



- **Dual Coil**
- **Pressure carried by coils**
- **Can use any PCM**
- **Heating and Cooling**
- **PCM at atmospheric Pressure**
- **Stainless Steel Construction**
- **500 Litre (1.3 OD x 0.5 H)**
- **Modular**
- **Ideal for retrofitting old and existing buildings**



# CHP Plant Room During Commissioning

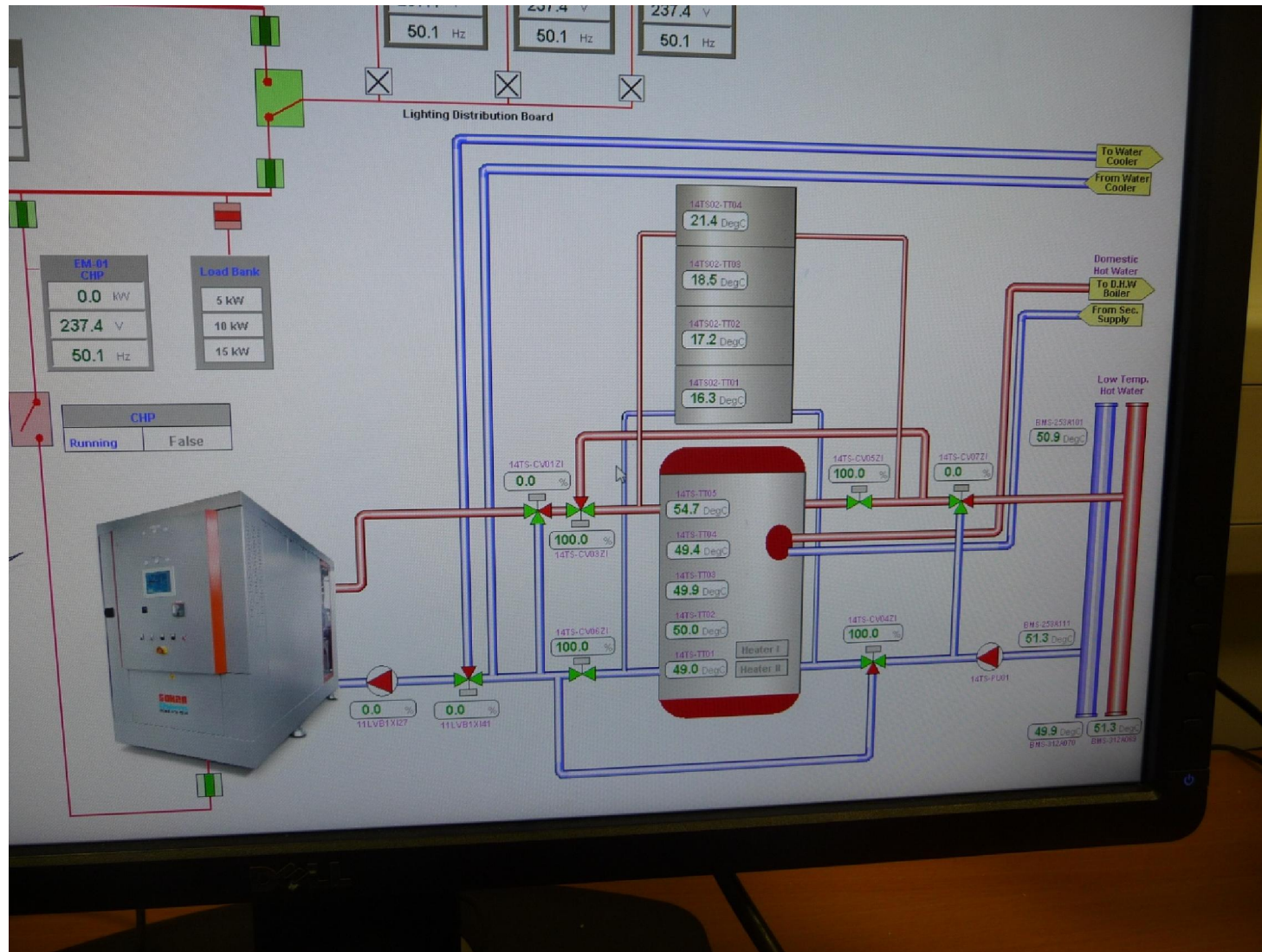


# CHP Plant Room During Commissioning



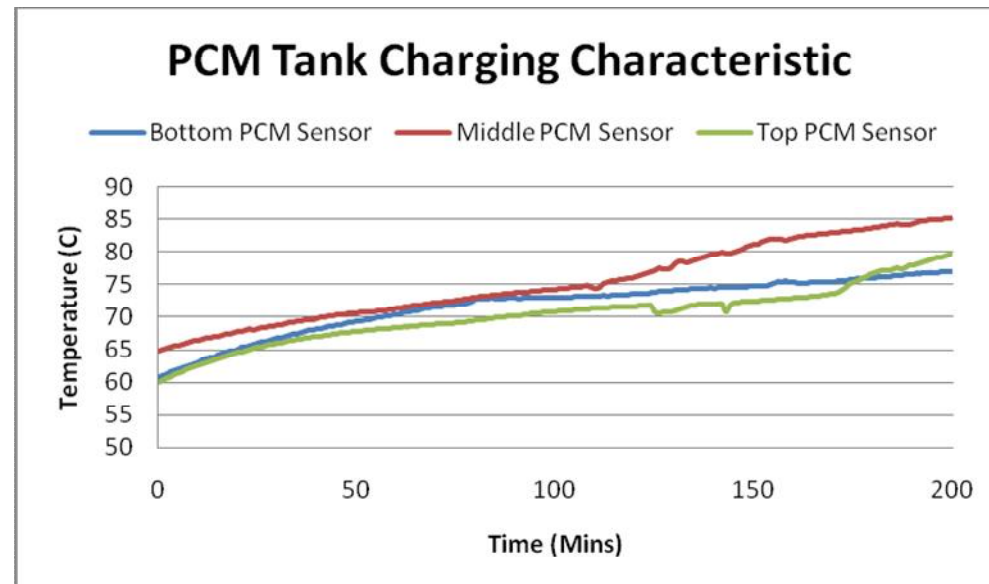
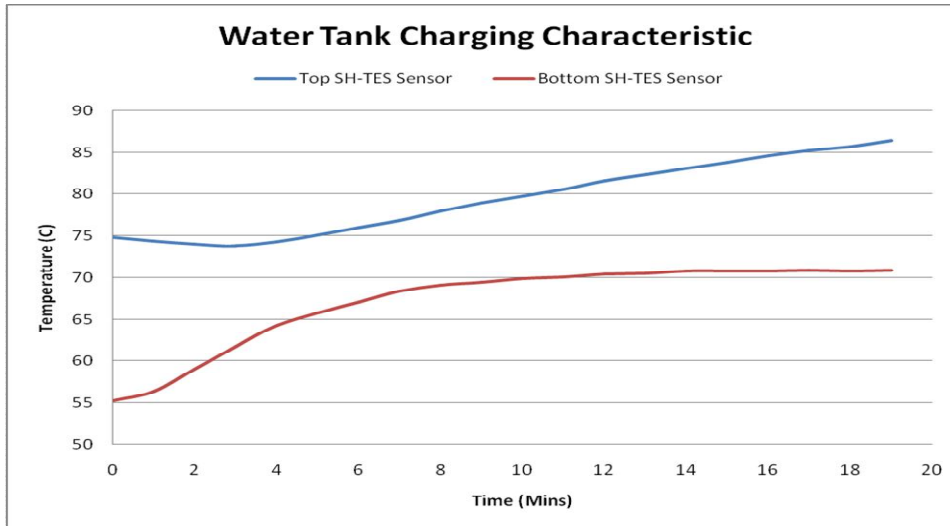


# CHP Plant Room During Commissioning

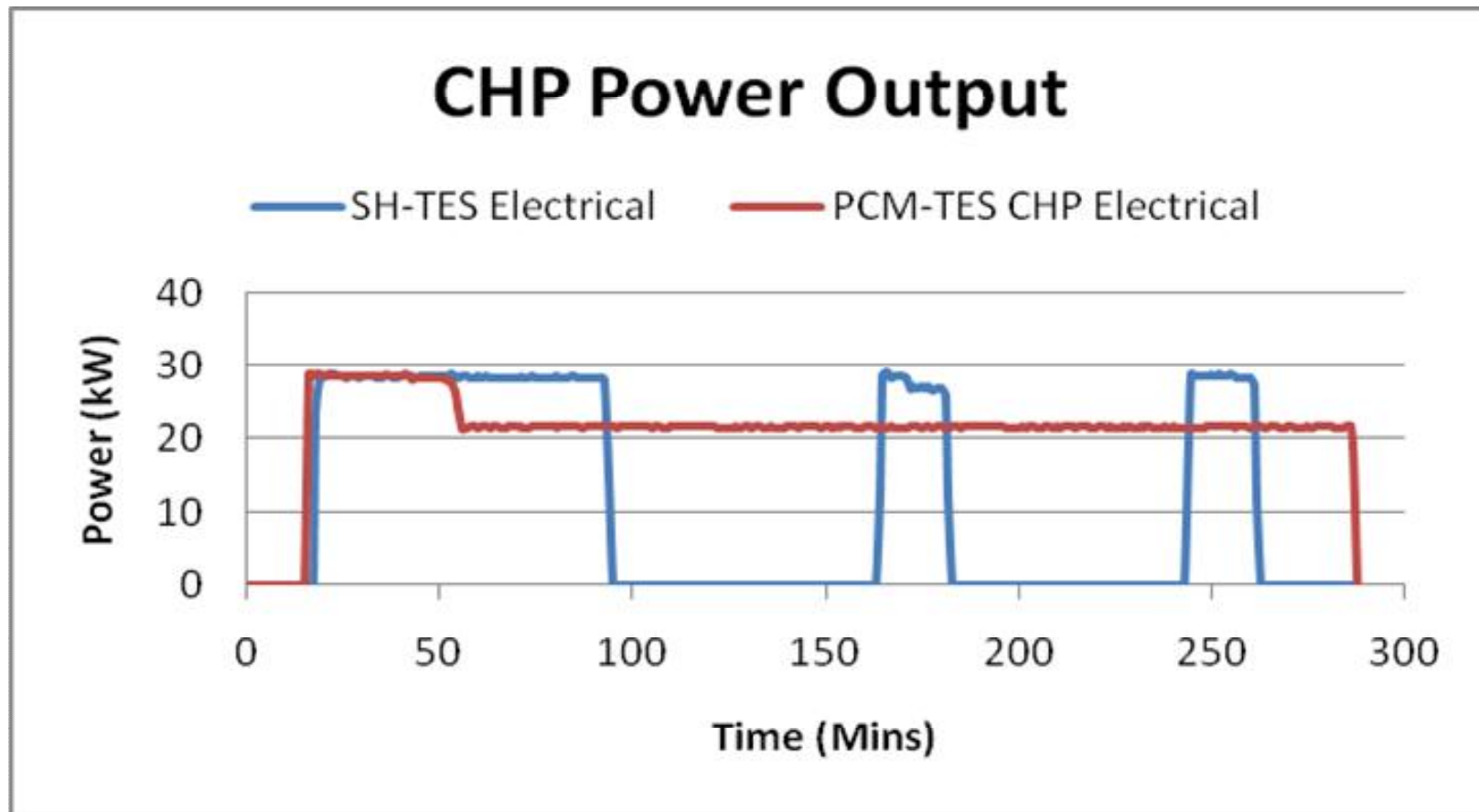




# Charging Times of Sensible Tank and PCM Tank in Demonstrator Building



## Comparison of PCM Tank and Sensible Water Tank during CHP Charging Cycle





## Meeting Potential Customers at the Demonstrator Site





The background of the slide is a dark, textured image of a circuit board with various electronic components and traces.

# Thank you



