# Flexible Power Generation – ETN Webinar Series – 4<sup>th</sup> episode

# **PUMP-HEAT**

# Innovative concept to increase flexibility of combined cycle power plants and gas turbines

Tuesday, January 12, 2020 • 12:00am – 01:00 pm

# **Development of Thermal Storage Materials for CCGT**

Speaker: Assist. Prof. Dr. Justin NW Chiu *KTH Royal Institute of Technology* H2020 Pump Heat WP3 Leader



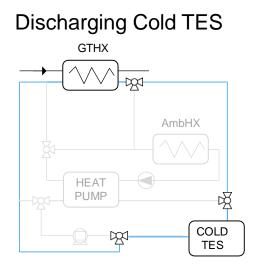
This Project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement N. 764706

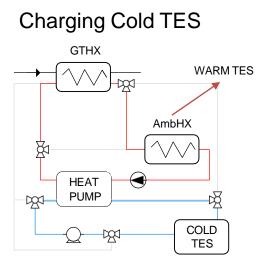


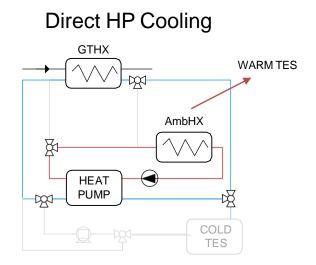




### Added Flexibility for Thermal Energy Integrated CCGT-HP







Flexibility in energy-only markets to increase profitability by:

- Pre-cooling the air during peak-price hours
- Storing cold energy during off-peak periods

off-peak periods

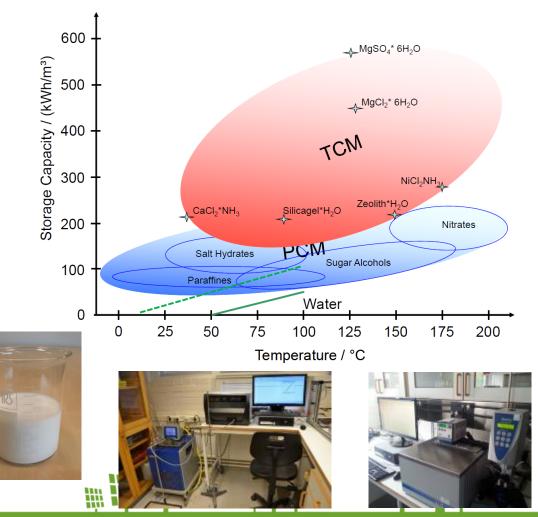
Alternatively: storage of flue gas waste heat recovery for district heating

HTT



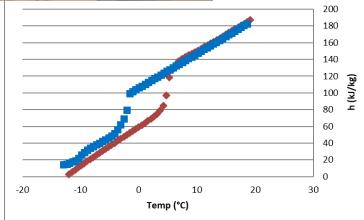


#### **Choosing the Right Storage Materials**







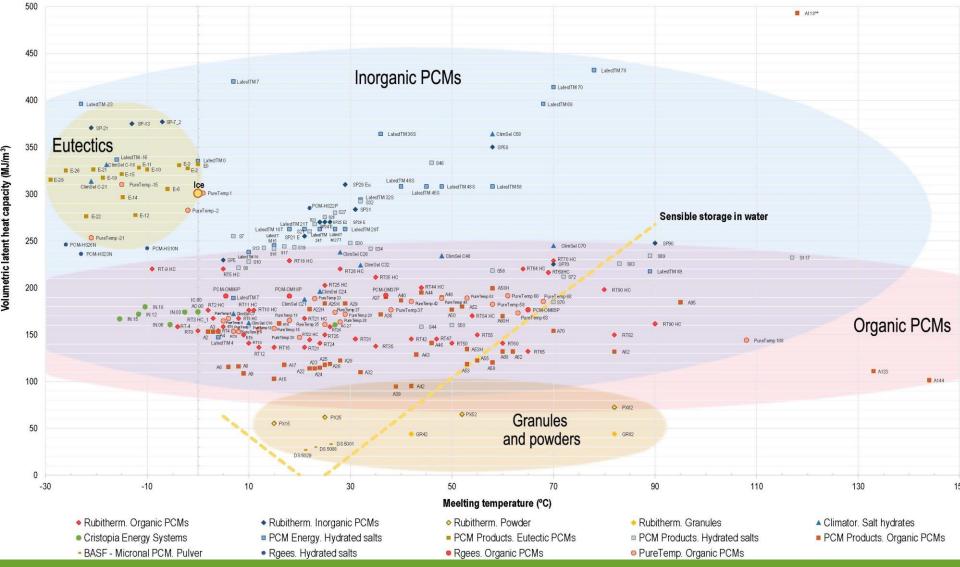


Hauer, A. 2012; Chiu et al. 2019.





#### Available Phase Change Materials for building applications



Lizana et al. 2017

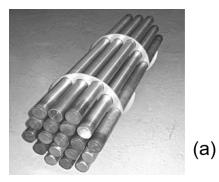
4

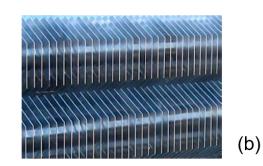




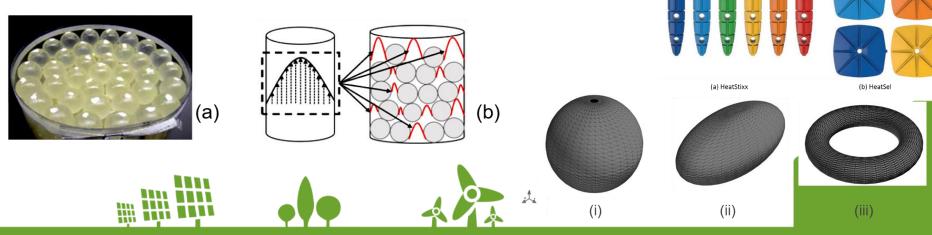
### Thermal Energy Storage Heat Exchanger Design

• Submerged





• Encapsulated

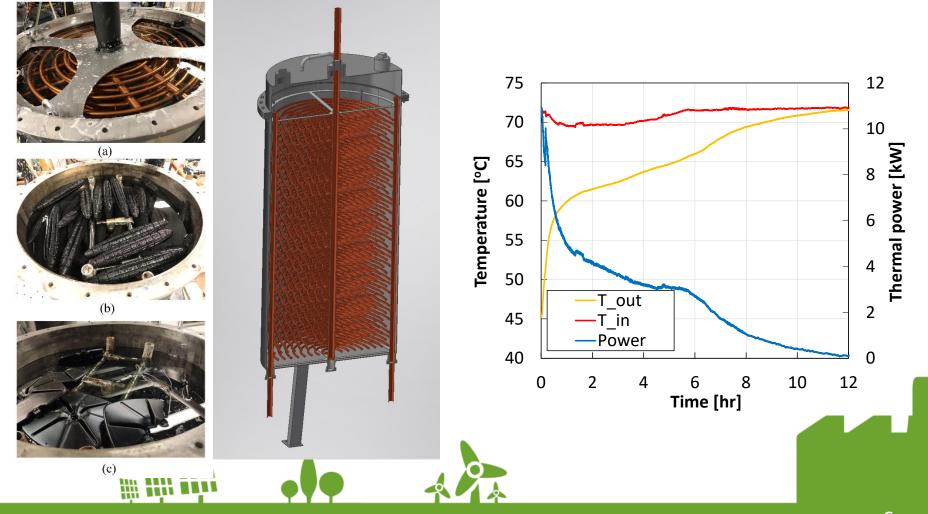


Pincemin S. et al. 2008; Farkas D. et al. 1985; Arkar, C. et al. 2007; Perera, D. 2017; Chiu et al. 2019; I-TES, 2020; Axiotherm 2020. 5





#### **Storage Unit Performance Testing**



# Flexible Power Generation – ETN Webinar Series – 4<sup>th</sup> episode

# **PUMP-HEAT**

# Innovative concept to increase flexibility of combined cycle power plants and gas turbines

Tuesday, January 12, 2020 • 12:00am – 01:00 pm

# **Development of Thermal Storage Materials for CCGT**

Thank you for your attention Contact: Justin NW Chiu <u>Justin.chiu@energy.kth.se</u>



This Project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement N. 764706

