

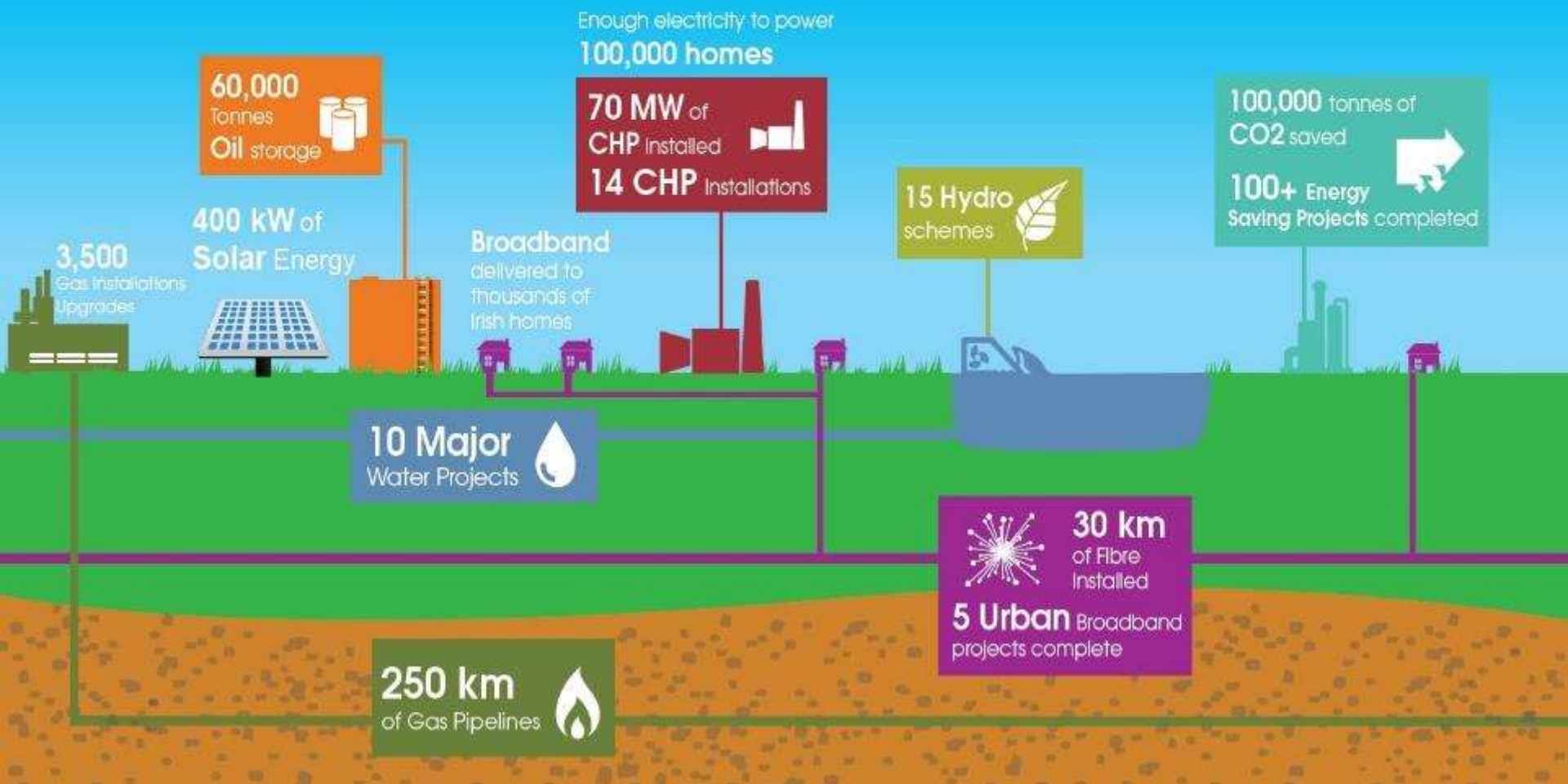


# COMBINED HEAT AND POWER



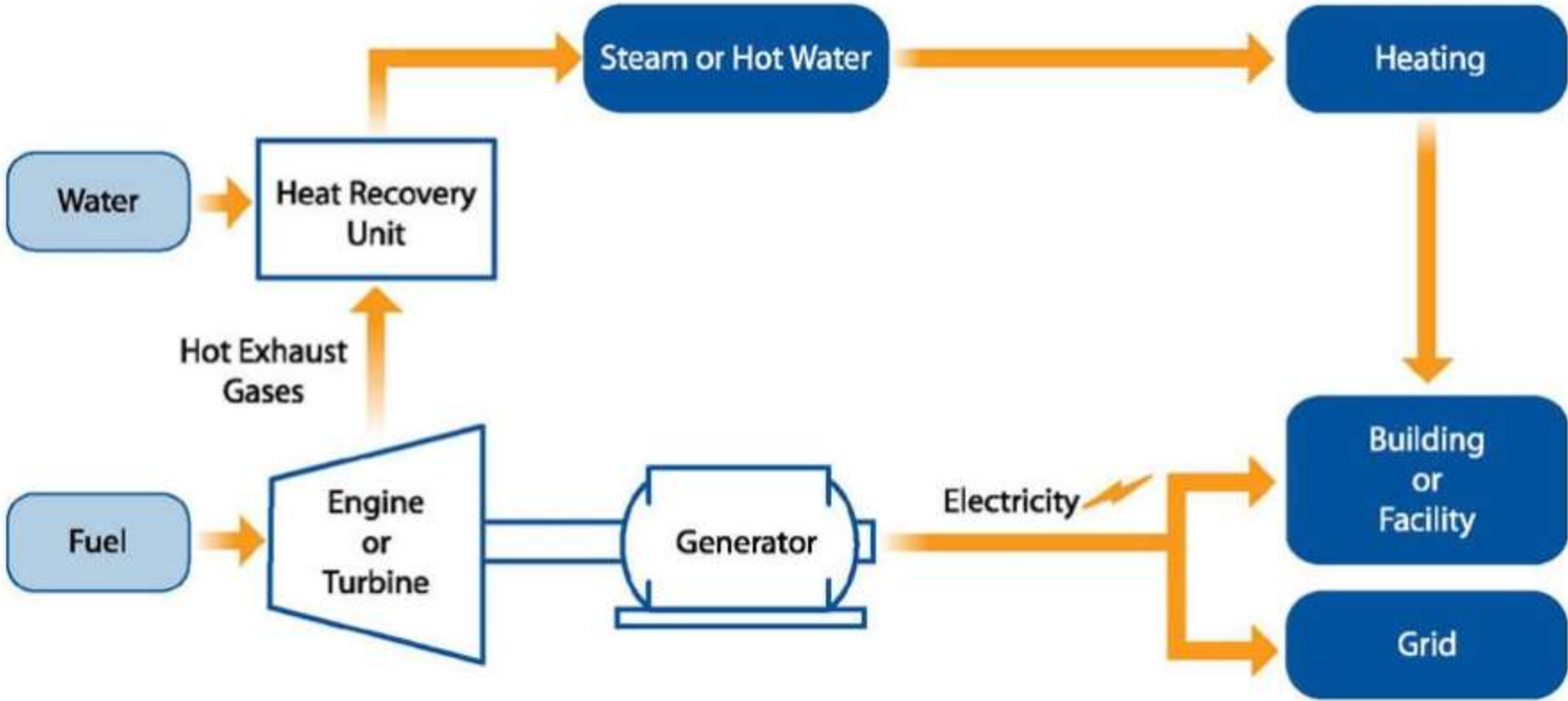
**€1,000m**  
Capital Projects  
Completed

**€80m**  
Current Projects  
Capital Value

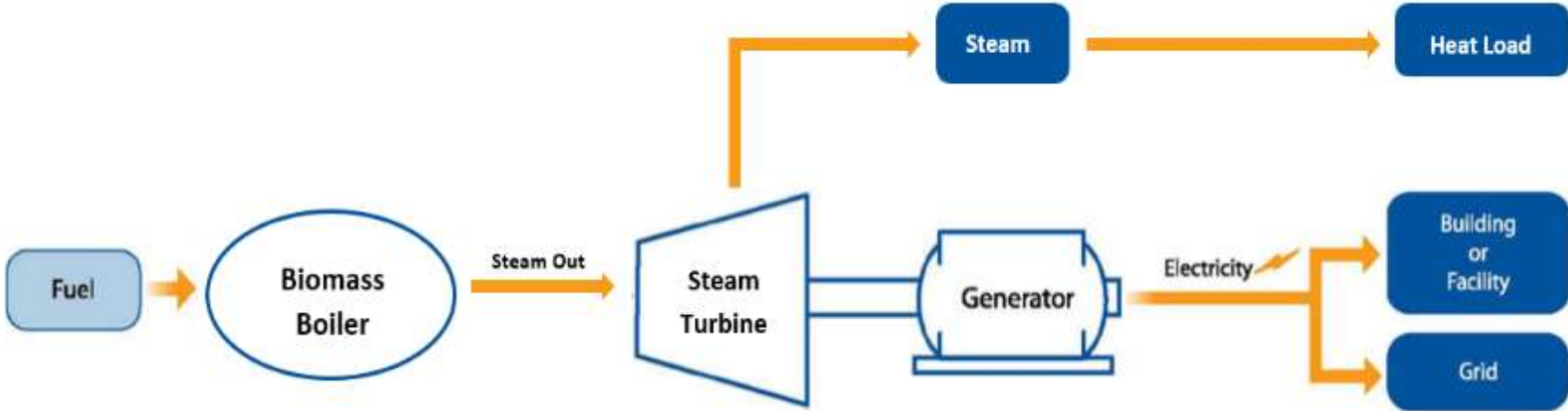




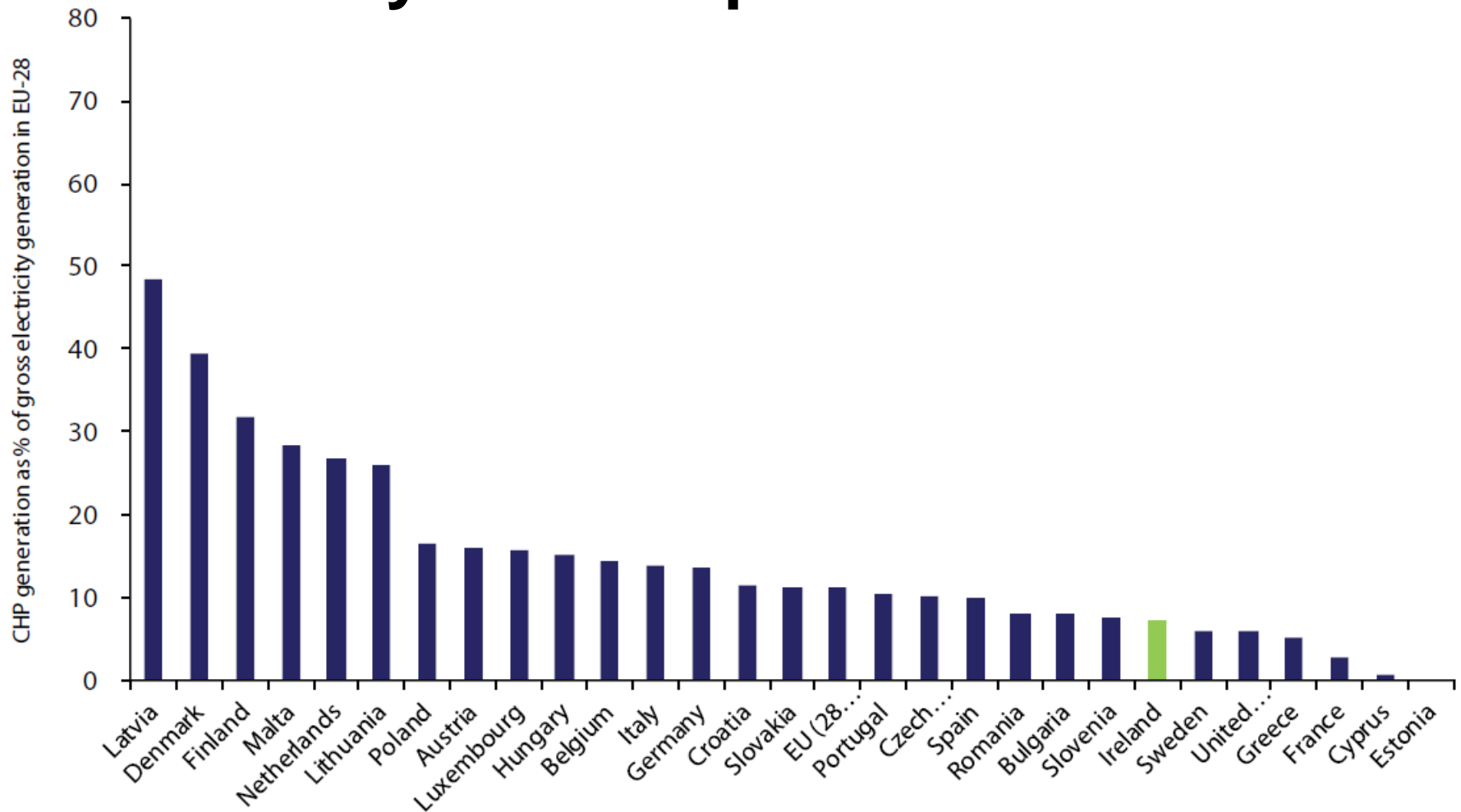
# Gas CHP



# Biomass CHP



# CHP Electricity as a Percentage of Gross Electricity Consumption in EU-28 2016



Source SEAI

# Energy Savings

# Conventional Generation



Input = 133  
Losses = 53  
Output = 80

Overall efficiency

60%

# CHP

## Combined Heat and Power



Input = 100  
Losses = 20  
Output = 80

Overall efficiency

80%



# High Efficiency CHP

$$PES = 100\% \times \left[ 1 - \frac{1}{\frac{CHP H_{\eta}}{Ref H_{\eta}} - \frac{CHP E_{\eta}}{Ref E_{\eta}}} \right]$$

- > 10% for 1 MW or more
- > 0% for less than 1 MW

# Energy Saving Calculation – Sample

<b>Description</b>	
Type	Gas Turbine with Heat Recovery
Primary Fuel	Natural Gas
Electrical Rating (MW)	5 MWe
Thermal Rating (MW)	8 MWth
Year of construction	2004
Grid Connection	0.4-50kV
Useful heat demand type	Steam/ Hot Water
On-site electricity use	88.9%

<b>Overall Efficiency</b>	
Electricity Generation	36,699 MWh
Useful Heat Output	67,653 MWh
Fuel Input	128,713 MWh
Electric Efficiency	28.5%
Thermal Efficiency	52.6%
Overall Efficiency	81.1%
Threshold Efficiency	75.0%
Meets Annex II Criterion	<b>Yes</b>

# Energy Saving Calculation – Sample

<b>Primary Energy Savings</b>	
Efficiency for Electricity Production	
non-CHP Fuel	- MWh
CHP Fuel	128,713 MWh
CHP Hn	52.6%
CHP En	28.5%
Ref Hn	85.0%
<hr style="border-top: 1px dashed black;"/>	
Ref En	52.5%
Grid loss correction - onsite	0.851
Grid loss correction - exported	0.888
Climate Adjustment	0.6%
Ref En (Adjusted)	45.4%
<b>PES</b>	<b>19.8%</b>
Meets Annex III Criterion	<b>Yes</b>

# Energy Saving Calculation – Result

**19.8% PES**

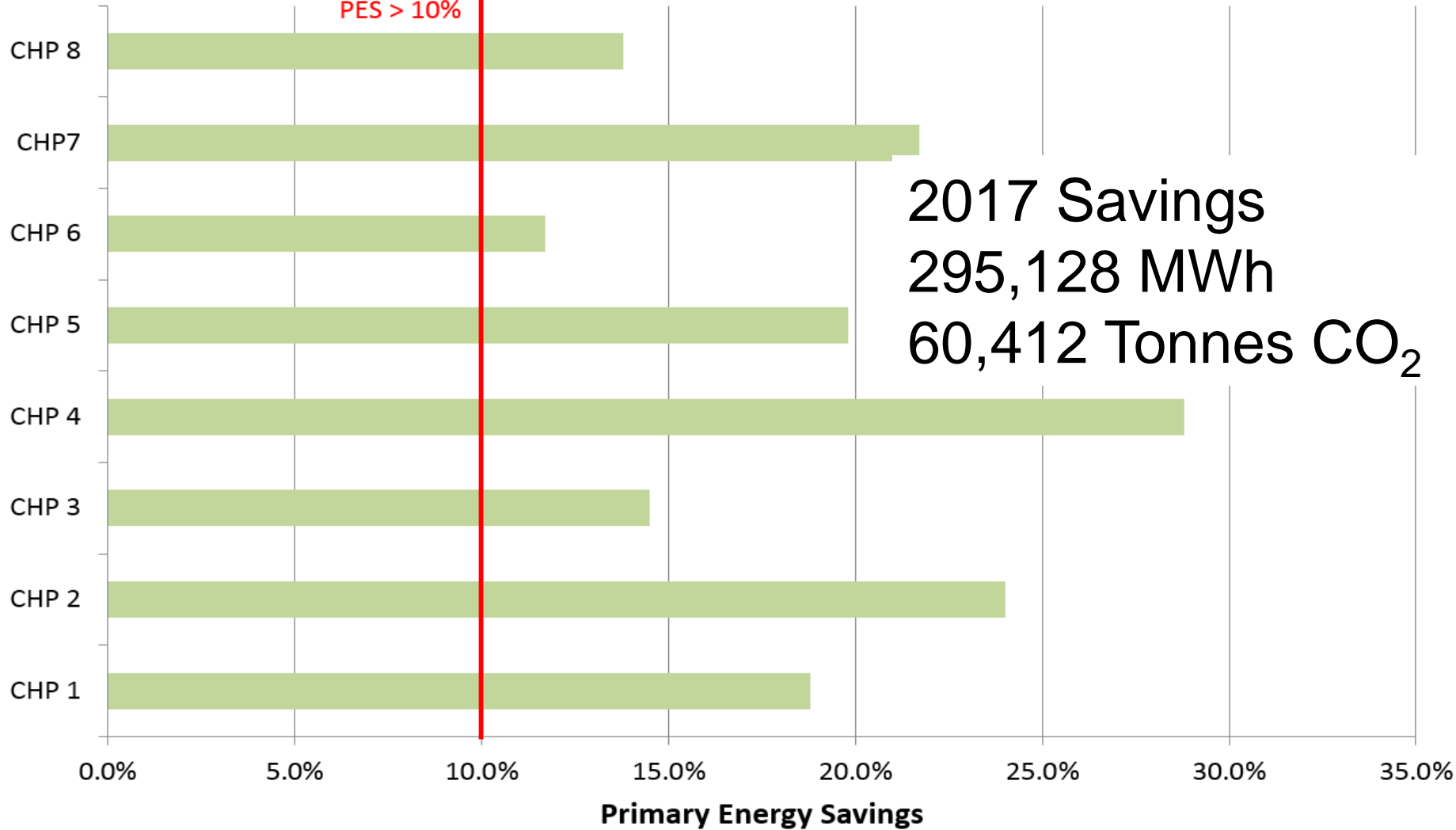
**31,702 MWh Saved**

**6,374 tonnes CO<sub>2</sub> avoided**

# PES as per CRU 2017

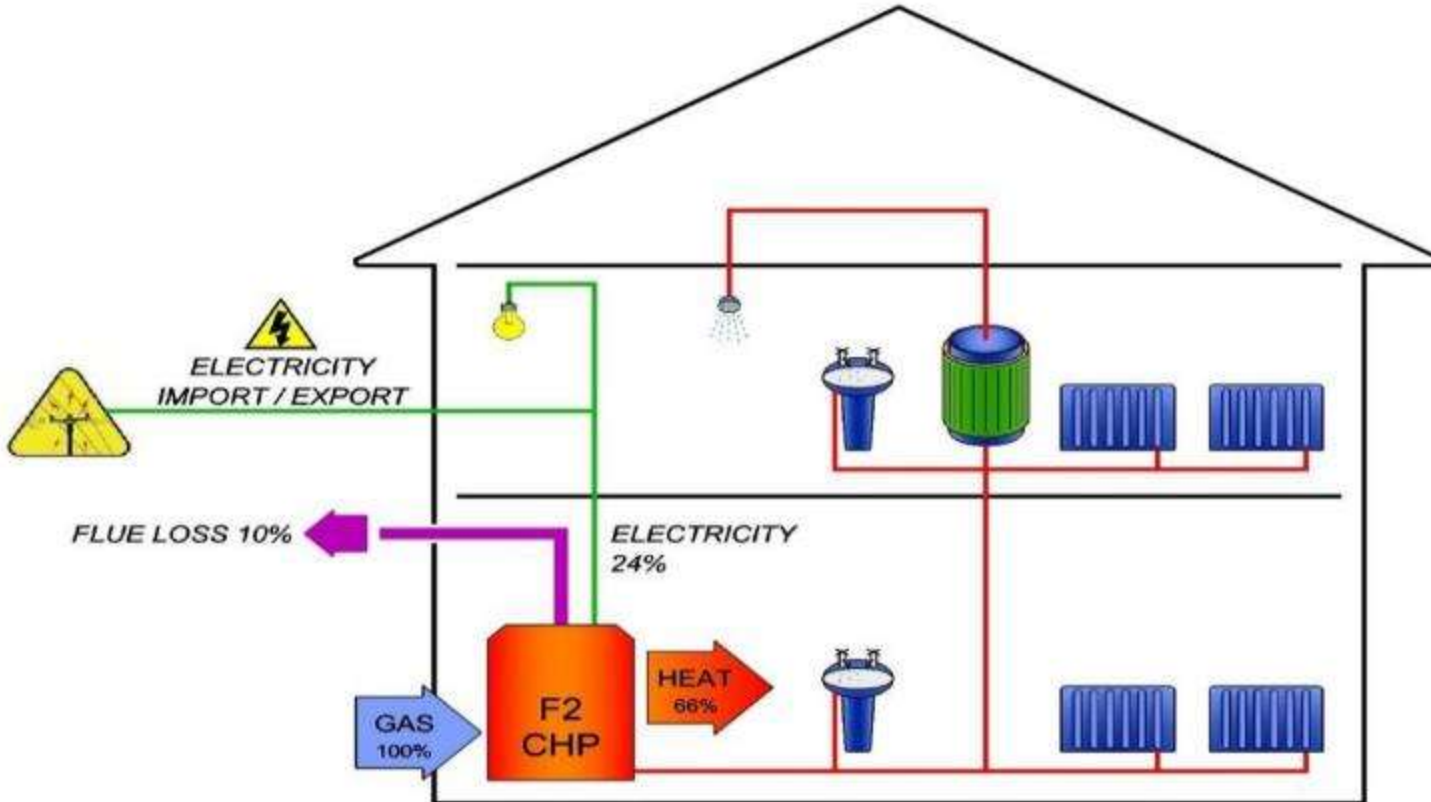
HE CHP  
PES > 10%

CHPs operated by Fingleton White

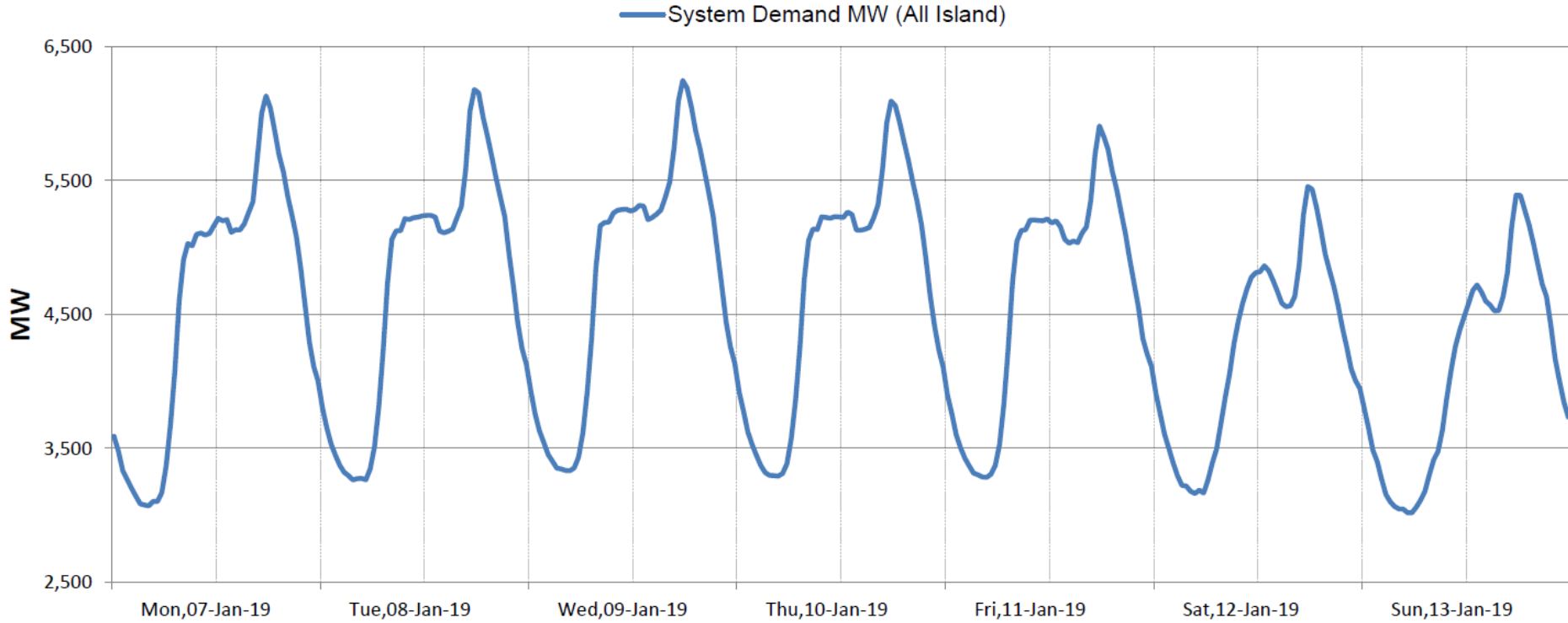


# Benefits of CHP

# Domestic CHP



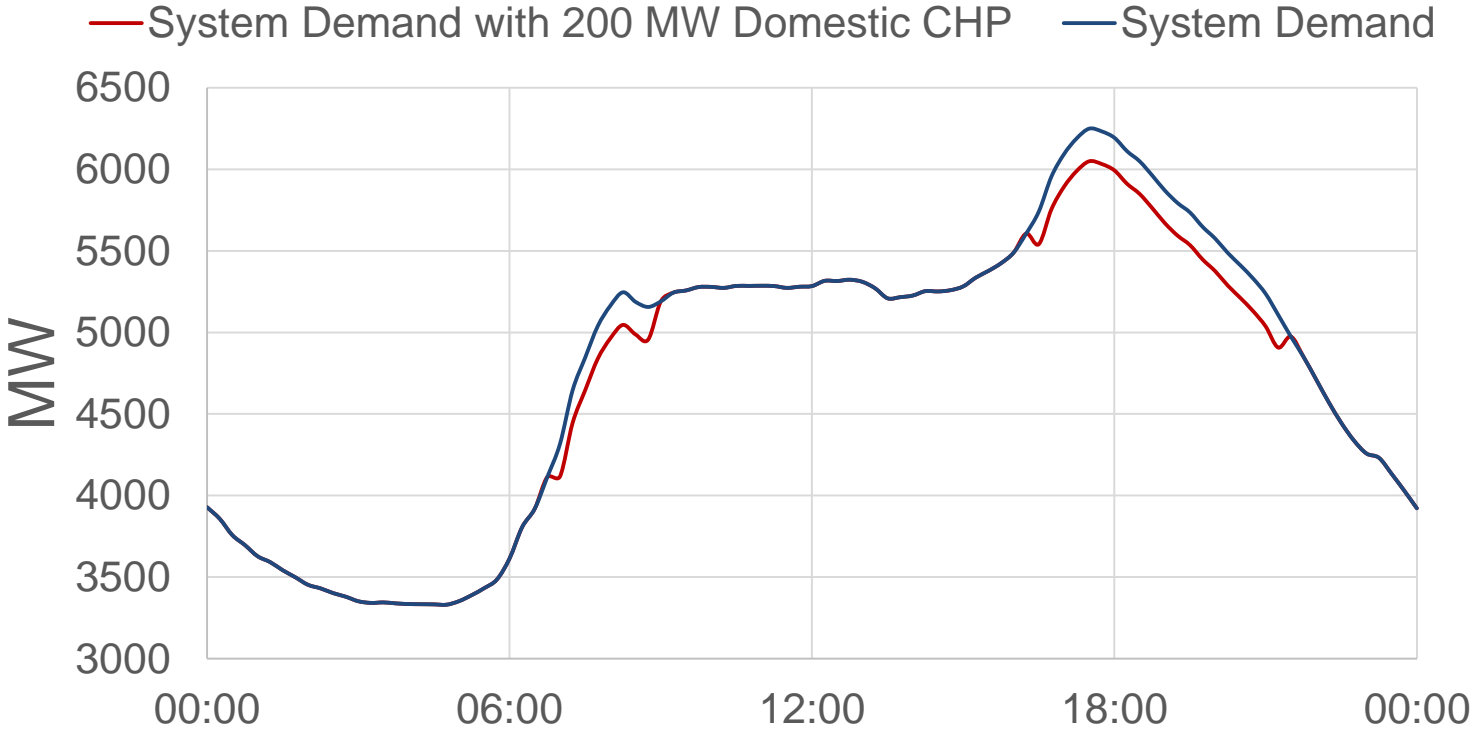
# Electricity Demand in Ireland





# 200 MW of Domestic CHP in Ireland

## System Demand (MW)



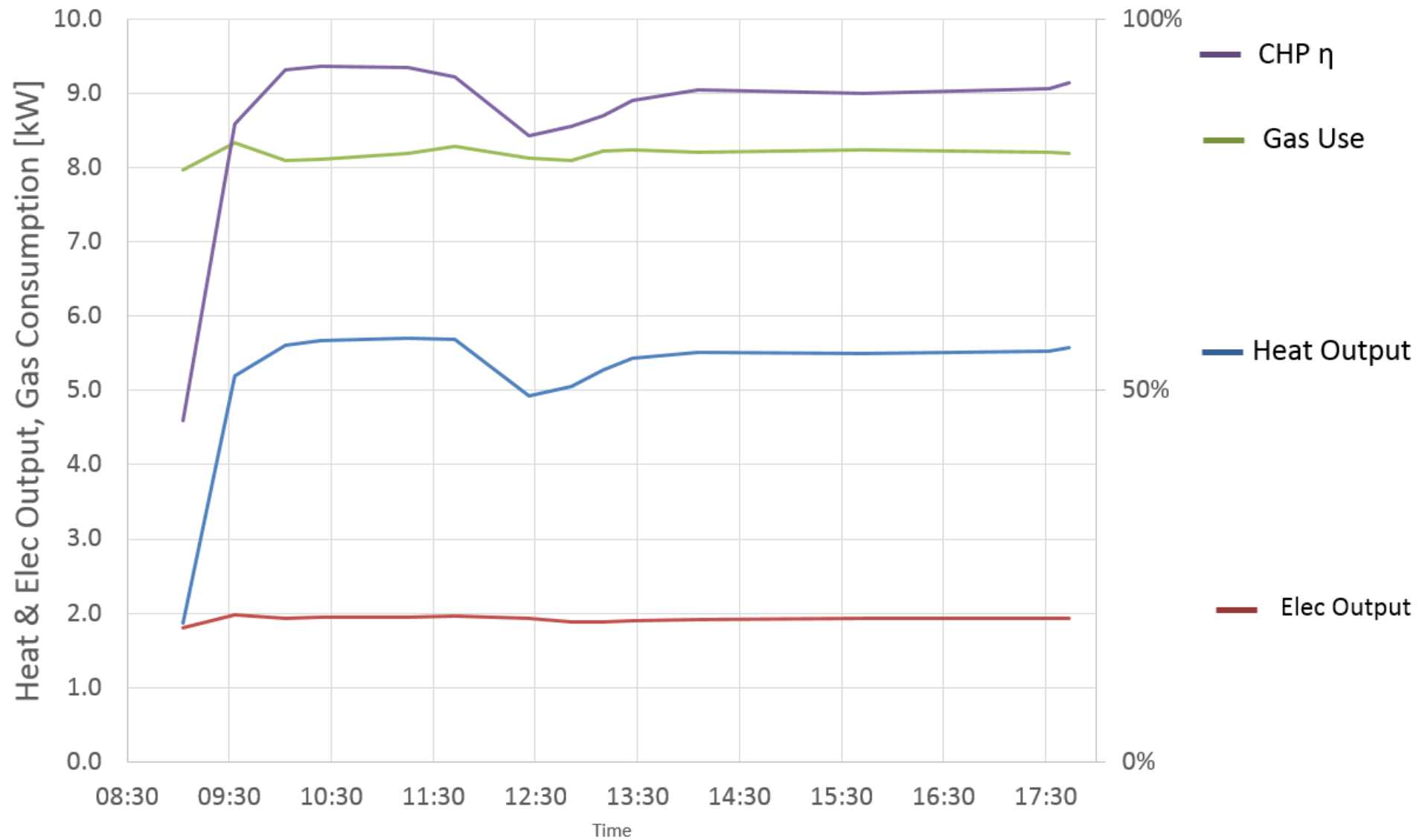
# Domestic CHP – Test Lab



# CHP Noise & Maintenance Interval



# Typical Day Domestic CHP Performance - Lab Trial



# Domestic CHP – Test Lab



# Domestic CHP – Test Lab











# Summary

- 22% Energy Savings
- Reduce Costs
- Avoid Transmission and Distribution Losses
- Back up Intermittent Renewables
- Maximise potential of Renewable Gas & Biomass
- Reduce GHG emissions