2nd International Conference on Smart Energy Systems and 4th Generation District Heating
Aalborg, 27-28 September 2016

David Connolly

Heat Roadmap Europe Coordinator

www.heatroadmap.eu

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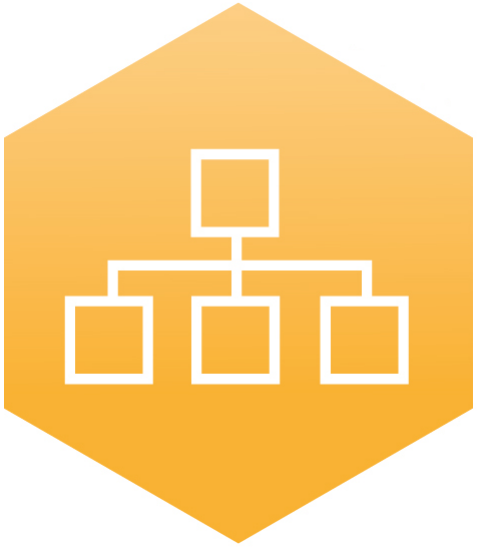

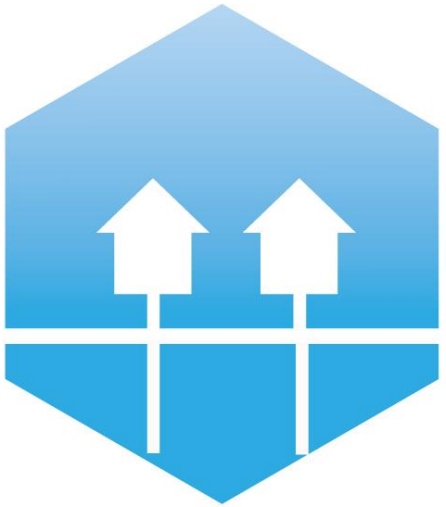

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4DH
4th Generation District Heating
Technologies and Systems

Heat Roadmap Europe 4
Overall Aim

To identify how the EU can cost-effectively decarbonise its heating and cooling sectors…

…by quantifying the impact of various alternatives

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 695989.

Heat Roadmap Europe
1, 2, 3, and 4

- Study 1 (2012): will district heating play a role in the decarbonisation of the European energy system?
- Study 2 (2013): what is the balance between heat savings and heat supply at an EU level?
- Study 3 (2015, STRATEGO WP2): low-carbon heating and cooling strategies for 5 member states
- Study 4 (2016-2019): low-carbon heating and cooling strategies for 14 member states

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HRE Team


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I·C·L·E·I
Local Governments for Sustainability
TEP
EUROHEAT & POWER
ehpa
european heat pump association
BPIE
Danfoss
EnR
EUREC
The Association of European Renewable Energy Research Centres
ECOFYS
sustainable energy for everyone
european council for an energy efficient economy
City of Gothenburg
Lantmännen Agrovärme
EGEC
GEOTHERMAL

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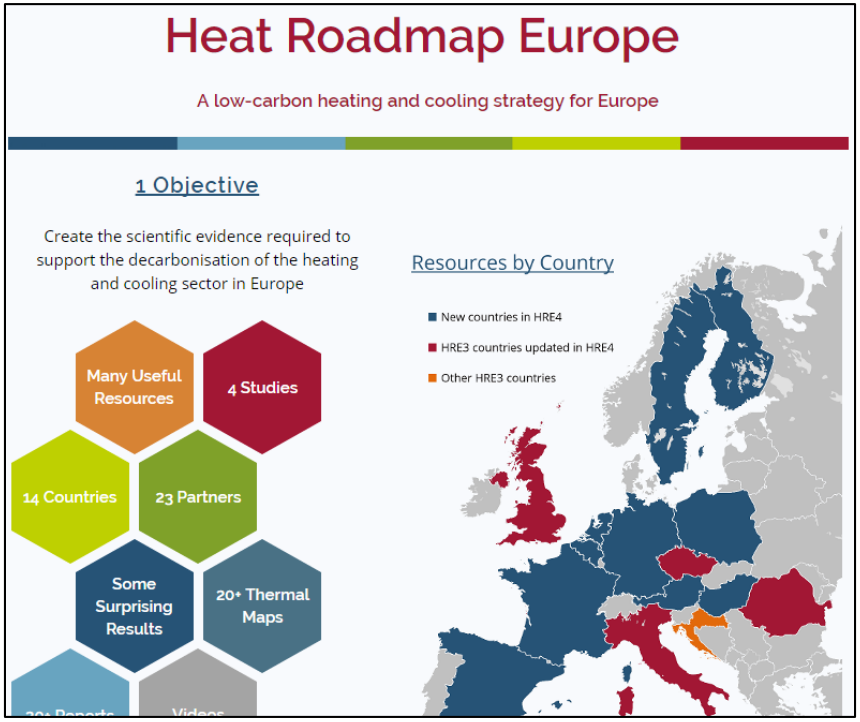

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  - Peta4 Version 1 Out Now!
- Download Our Models, Factsheets, Scientific Reports & More
- Read about the HRE Team

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Today: 10 Points in 30 Minutes!

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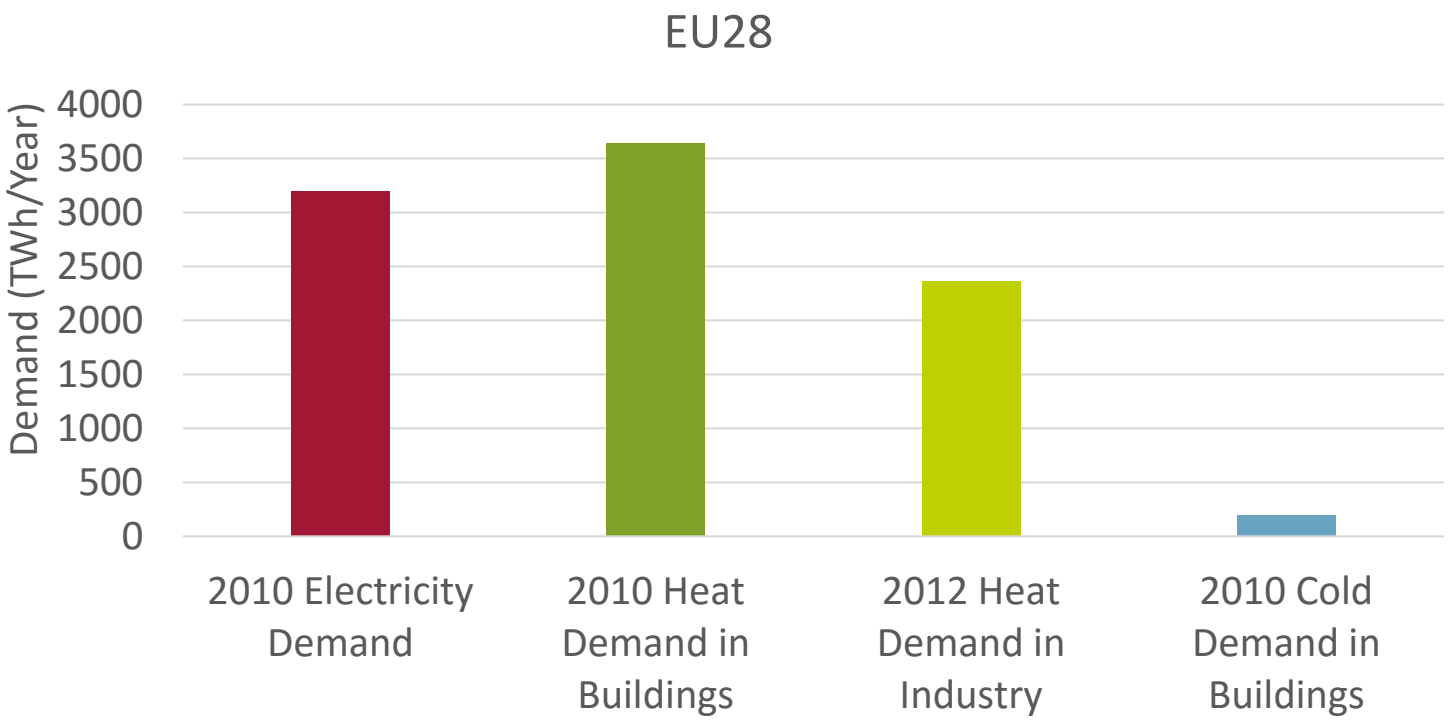
Cooling a Major Part of HRE3



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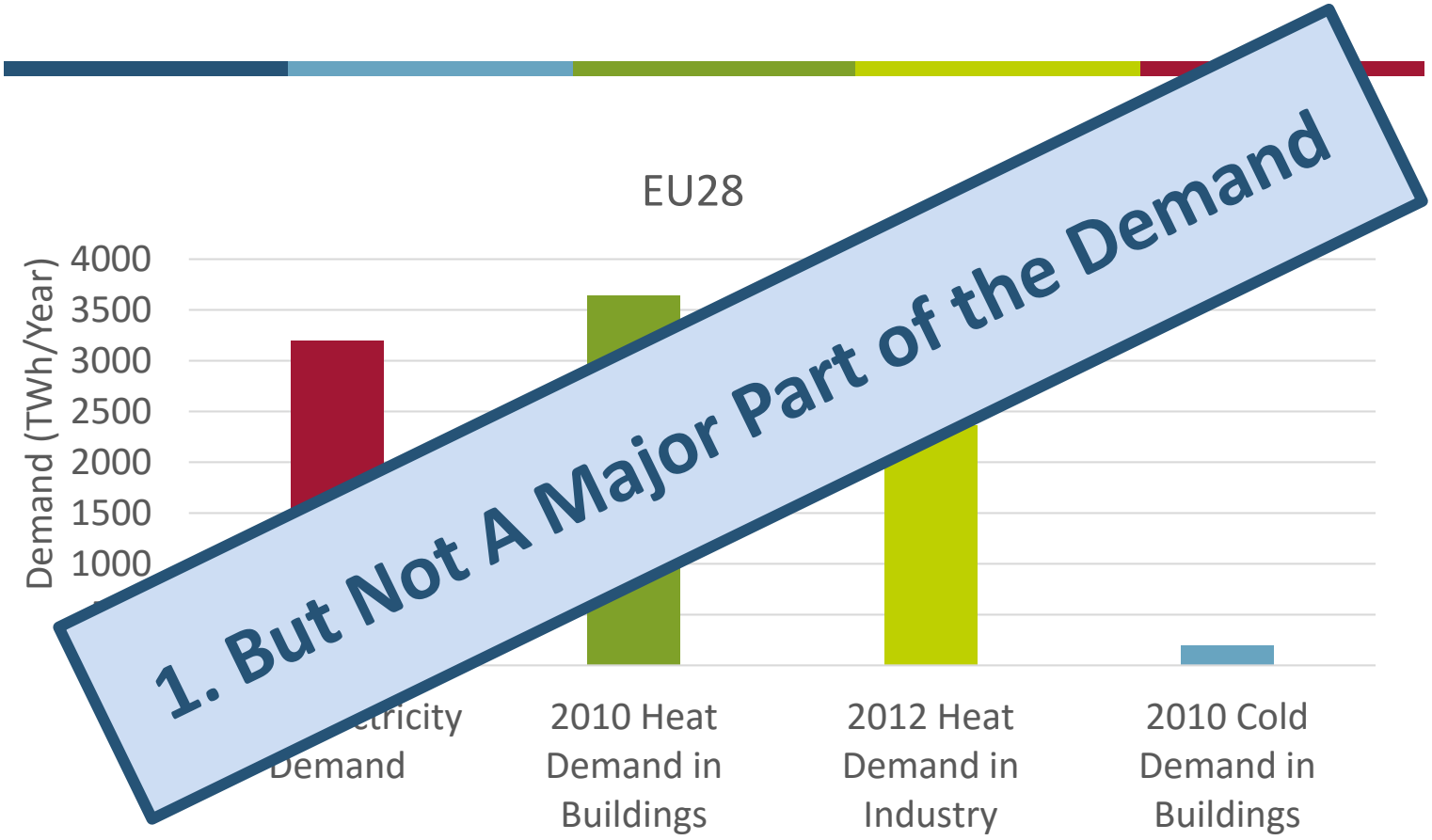
Cooling a Major Part of HRE3



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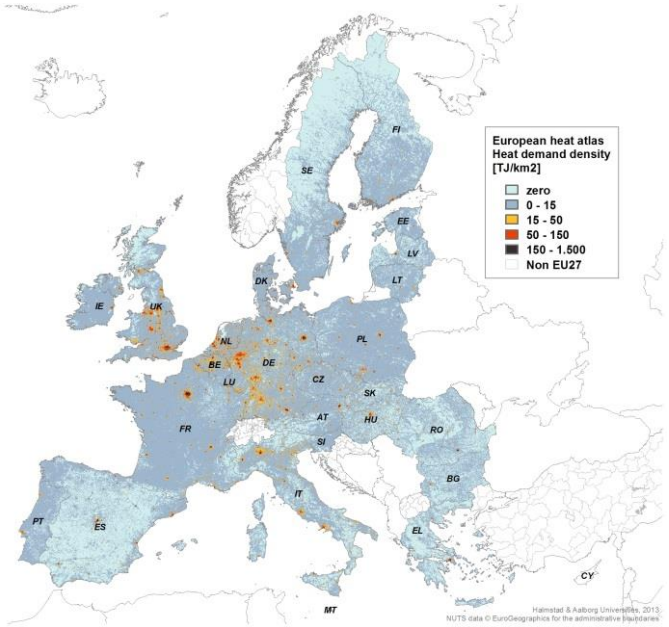
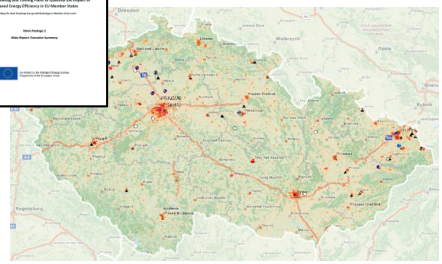
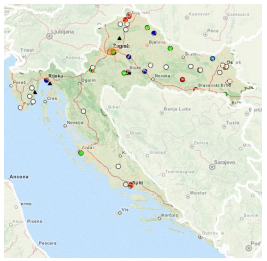
Stratego | ENHANCED HEATING & COOLING PLANS

2. From EU to National Level

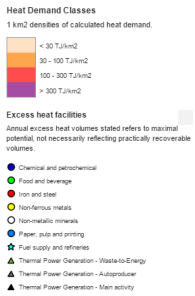




Czech Republic

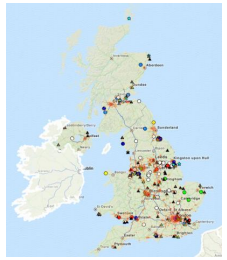


Croatia



Italy

Romania



United Kingdom

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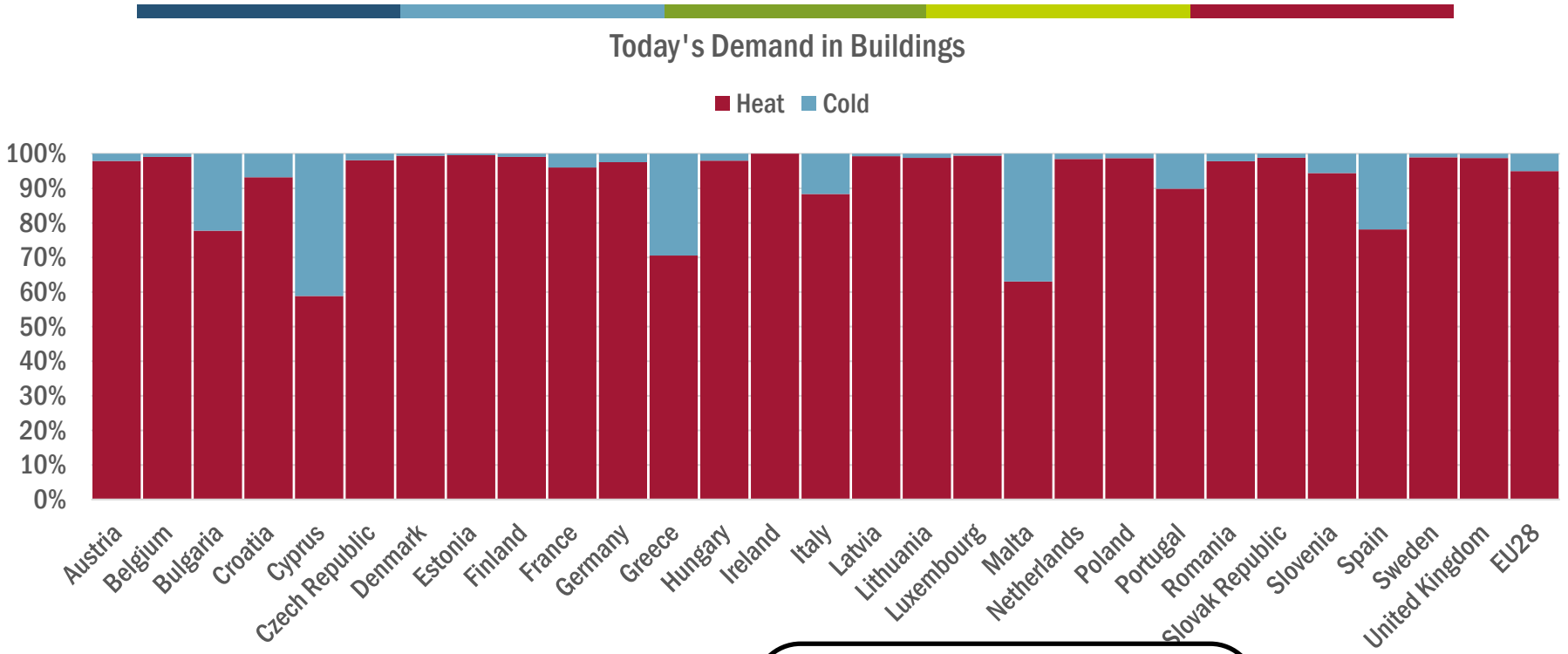
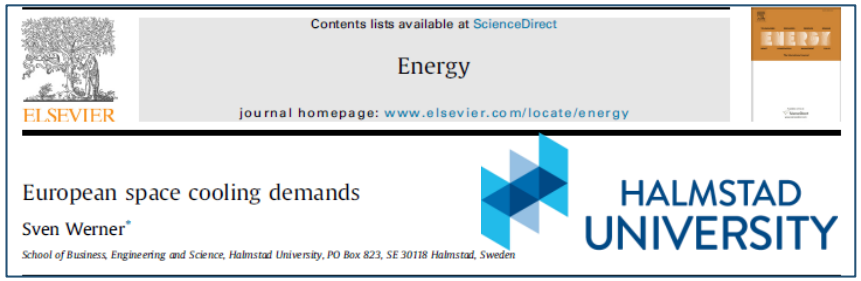
Heat Demand is Much Bigger than Cooling Demand in Buildings… Today




Contents lists available at ScienceDirect

Energy

journal homepage: www.elsevier.com/locate/energy

ELSEVIER

European space cooling demands

Sven Werner*

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HALMSTAD UNIVERSITY

HRE4

Fraunhofer ISI

Universiteit Utrecht

TEP

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3. Same Key Recommendations for EU & National Level, BUT Different Amounts

Everywhere

- Heat Savings
- Balance Savings vs. Supply
- 30-50% of Total Heat Demand

Urban Areas

- District Heating Networks
- High Heat Density Areas
- 40-70% of Total Heat Demand

Rural Areas

- Primarily Electric Heat Pumps
- Smaller Shares of Solar Thermal & Biomass Boilers
- 30-60% of Total Heat Demand

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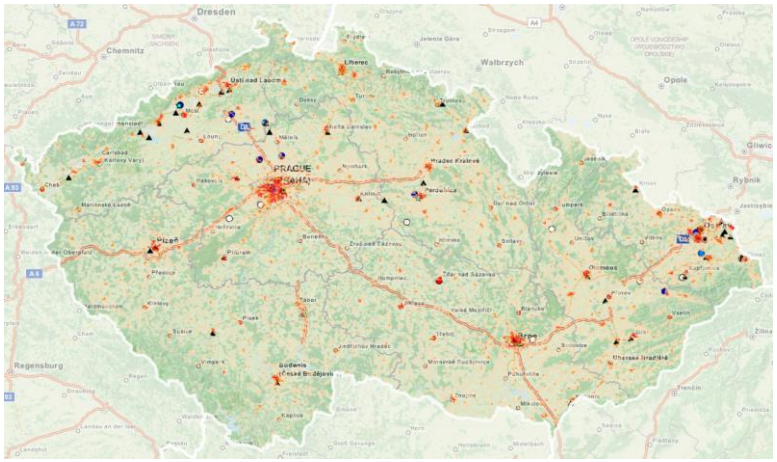
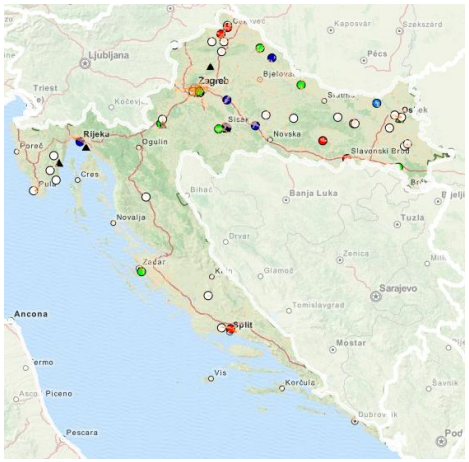
4. ‘Unexpected’ District Heating Potential (vs. Today)



Czech Republic 40% (15%)



Croatia 40% (25%)

Heat Demand Classes

1 km2 densities of calculated heat demand.

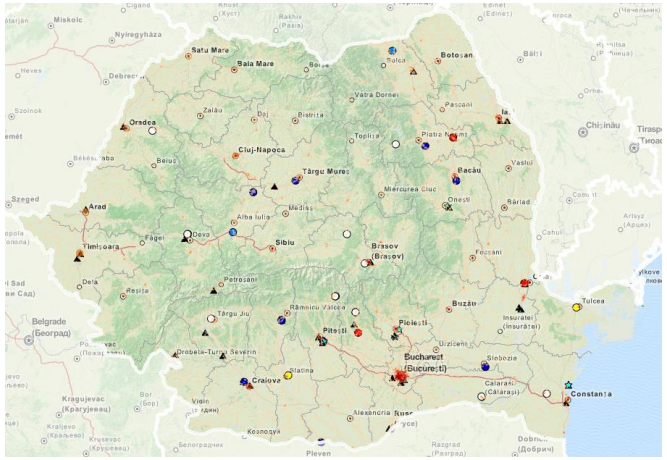
- < 30 TJ/km2
- 30 - 100 TJ/km2
- 100 - 300 TJ/km2
- > 300 TJ/km2

Excess heat facilities

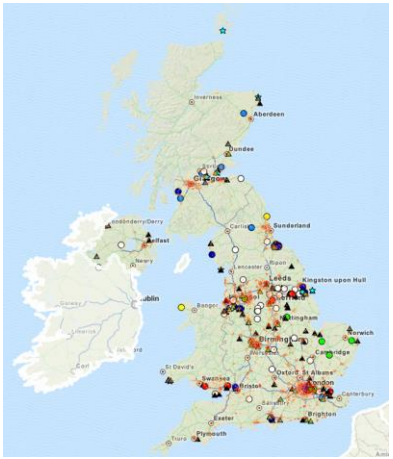
Annual excess heat volumes stated refers to maximal potential, not necessarily reflecting practically recoverable volumes.

- Chemical and petrochemical
- Food and beverage
- Iron and steel
- Non-ferrous metals
- Non-metallic minerals
- Paper, pulp and printing
- Fuel supply and refineries
- Thermal Power Generation - Waste-to-Energy
- Thermal Power Generation - Autoproducer
- Thermal Power Generation - Main activity

Italy 60% (<5%)



Romania 40% (20%)



United Kingdom 70% (<5%)

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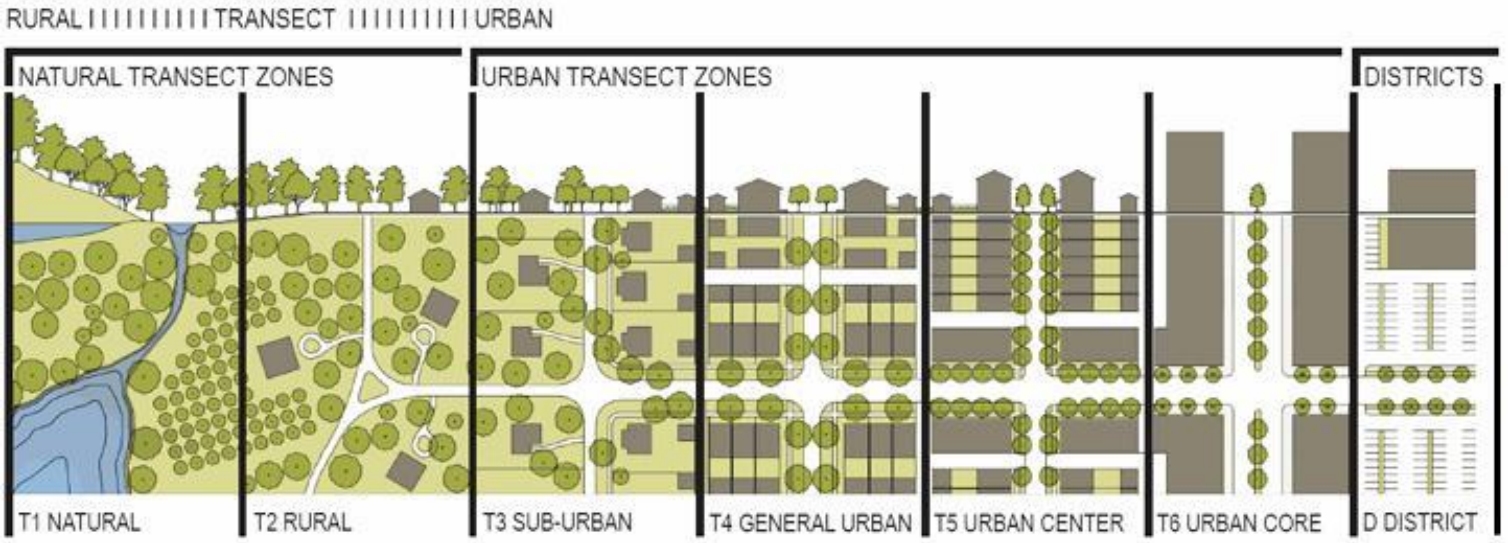
‘Urban’ Heating Connected to City Structure



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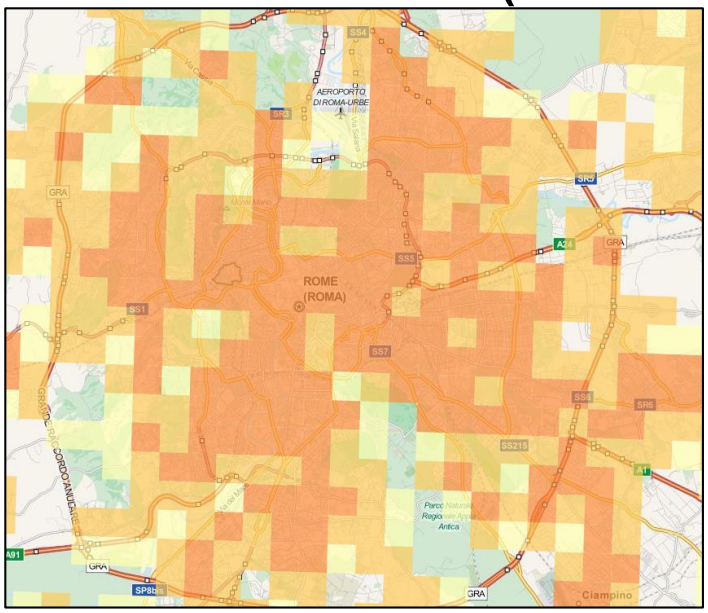
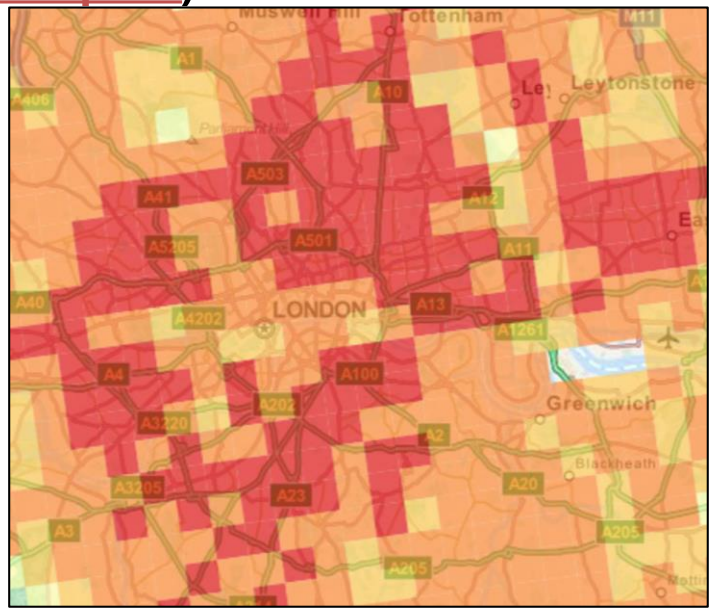
HRE3 City Maps from Peta3

(Video Online: www.heatroadmap.eu)



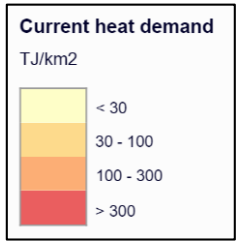
Rome (IT=60%)

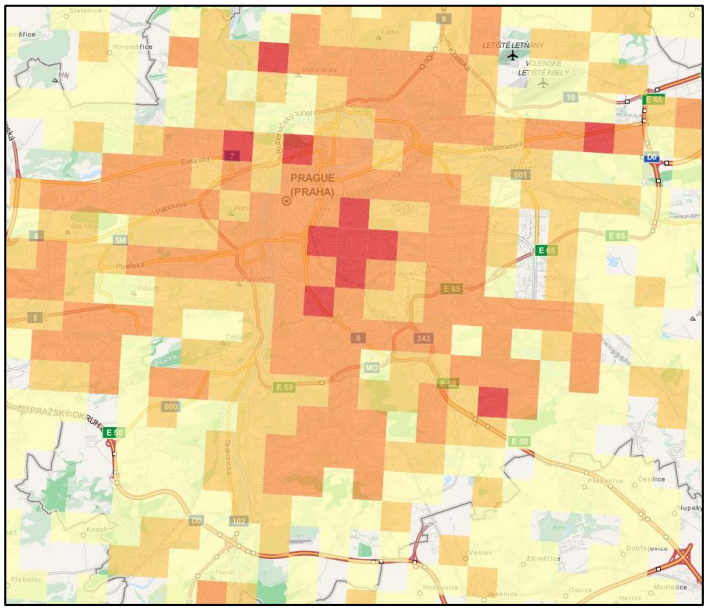
←<5% DH



London (UK=70%)

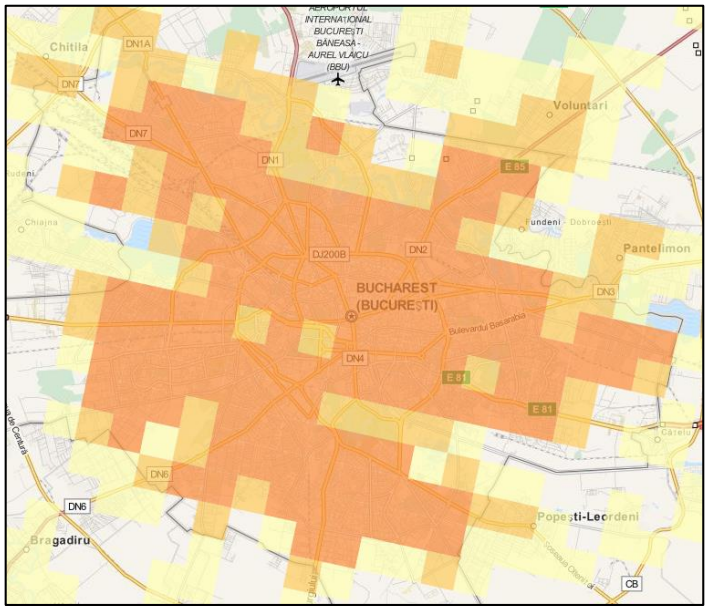
<5% DH →





Prague (CZ=40%)

←~45% DH



Bucharest (RO=40%)

~75% DH →

First Version of HRE4 Maps Now Online!

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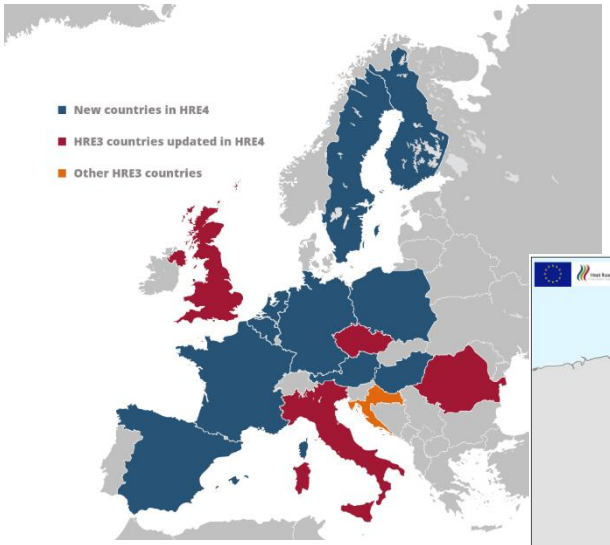
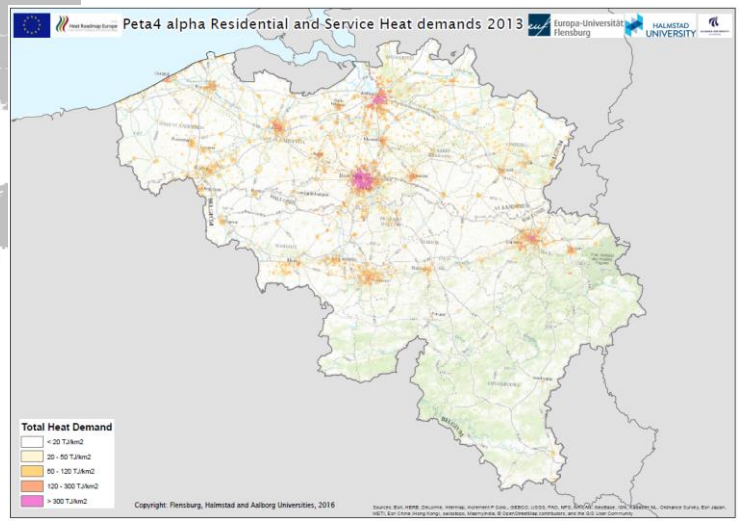
14 Largest Countries by Heat Demand = 90% of EU Heat

- Belgium (BE)
- Czech Republic (CZ)
- Germany (DE)
- Spain (ES)
- France (FR)
- Italy (IT)
- Hungary (HU)
- Netherlands (NL)
- Austria (AT)
- Poland (PL)
- Romania (RO)
- Finland (FI)
- Sweden (SE)
- United Kingdom (UK)





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5. Energy Efficiency…

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Current Situation for Many EU Power Plants

Electricity Market
€40/MWh

Fish Market
€0/MWh

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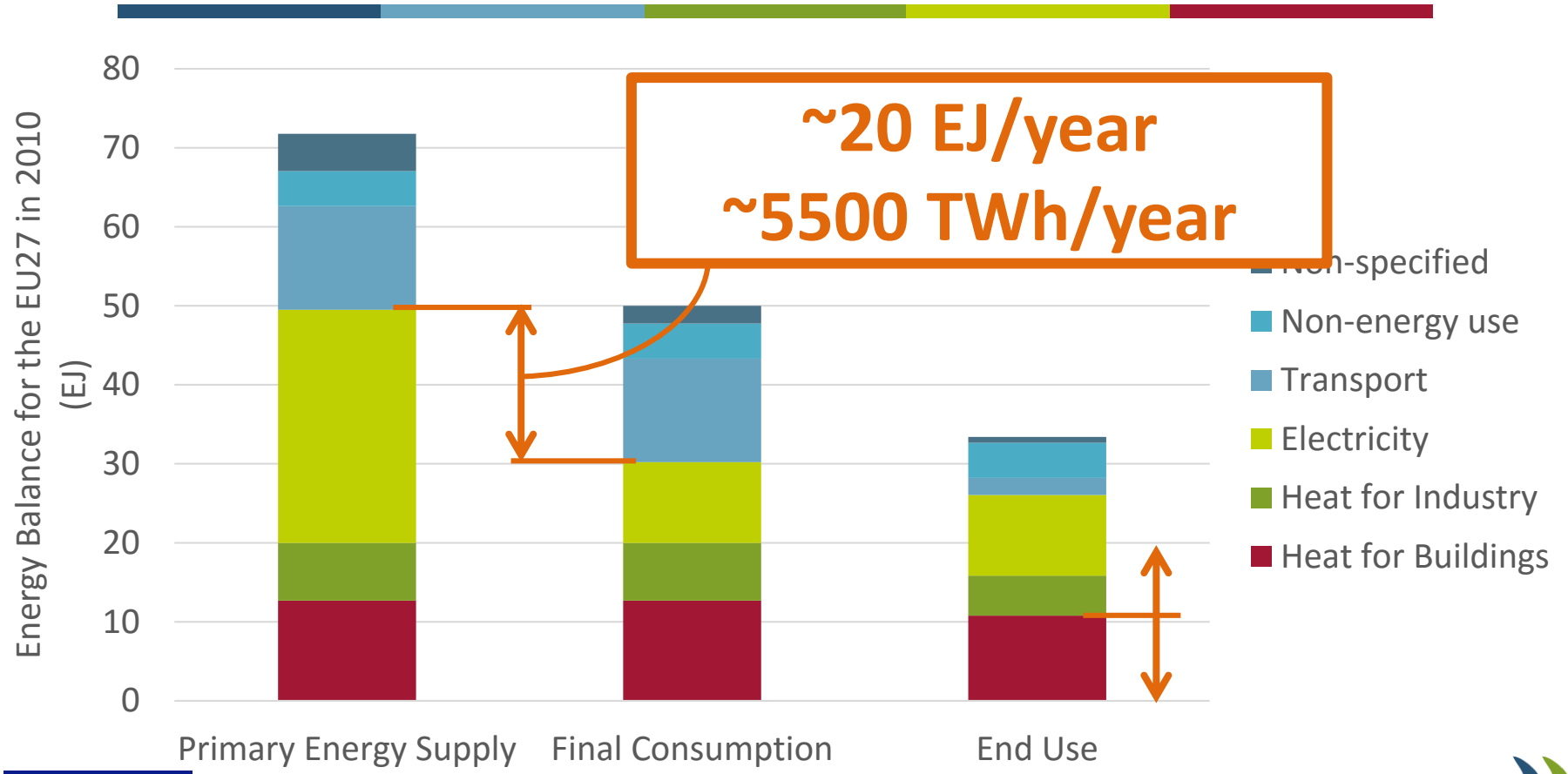
Current Situation: More Excess from Electricity Generation in Europe than Required to Heat All Buildings



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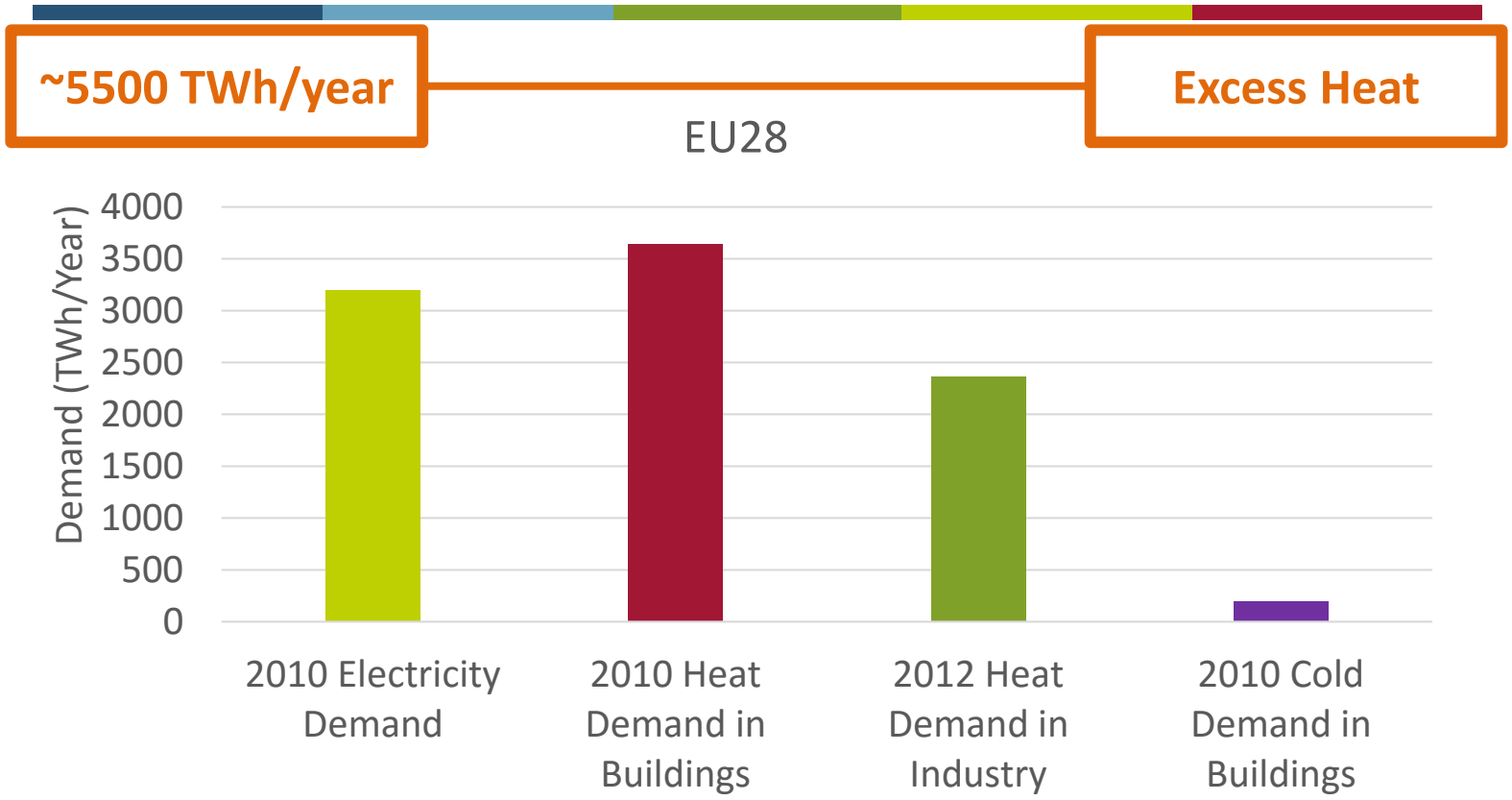
EU28 Demands: Totals

~5500 TWh/year

Excess Heat



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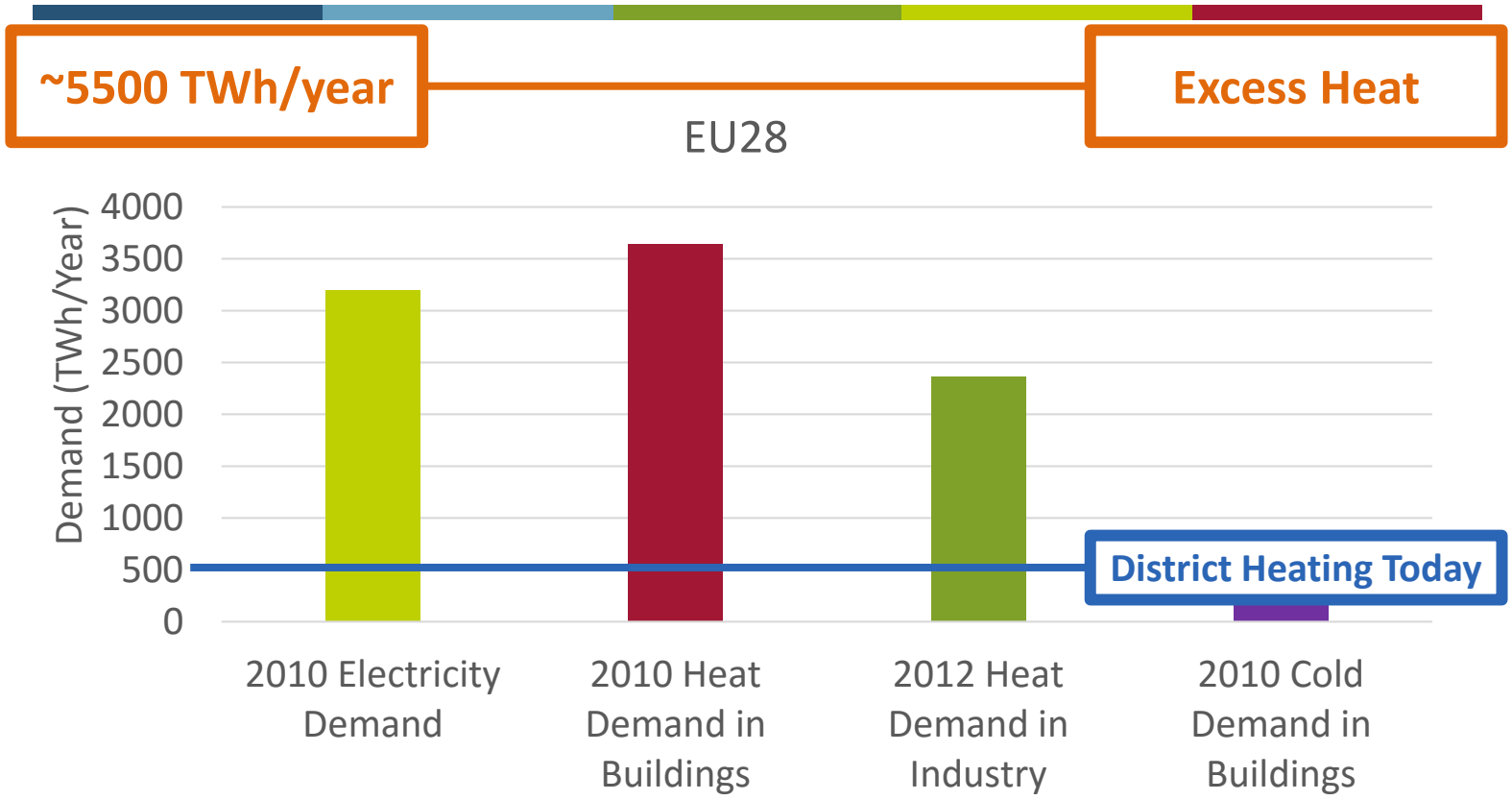
EU28 Demands: Totals



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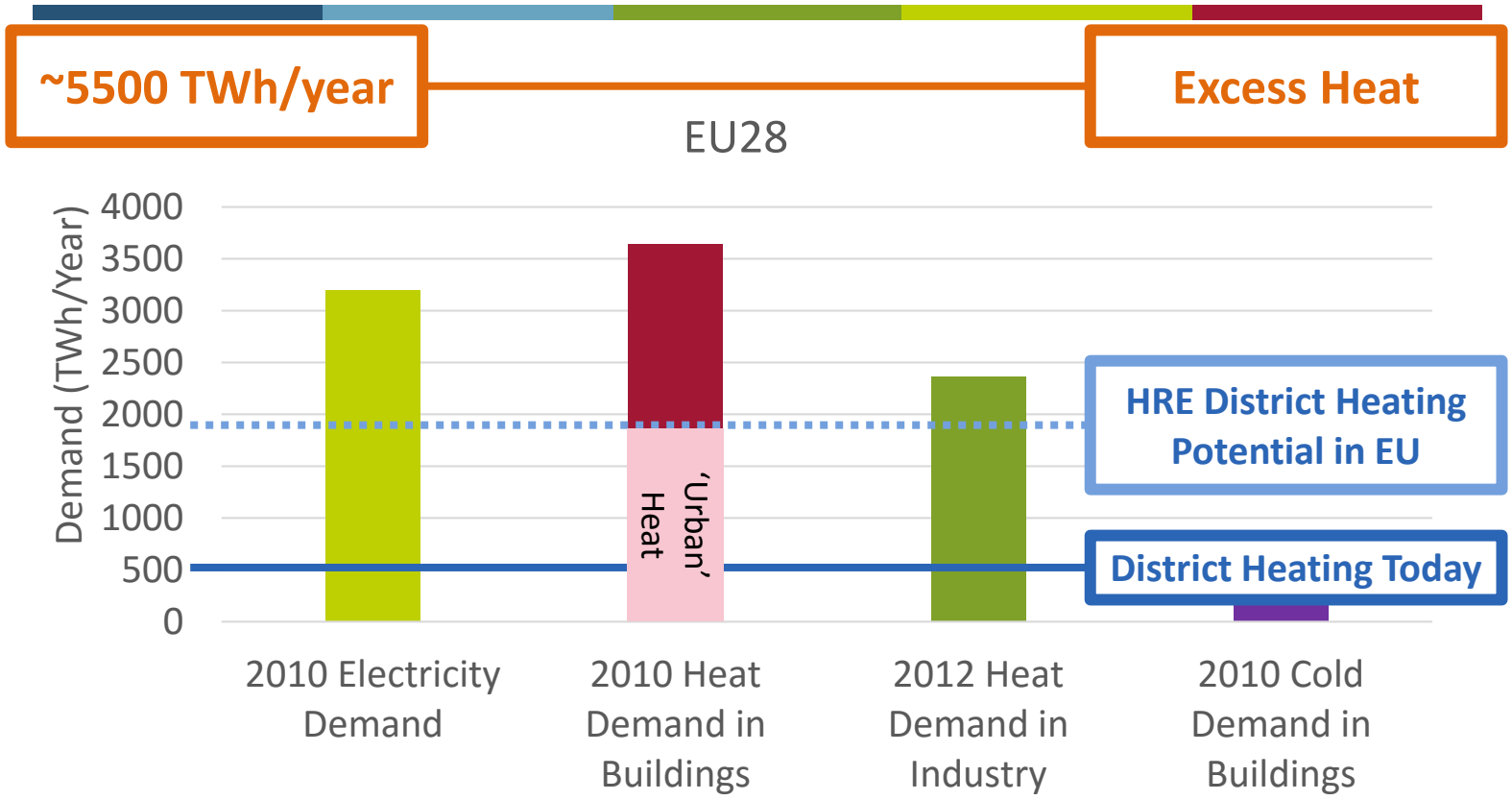
EU28 Demands: Totals



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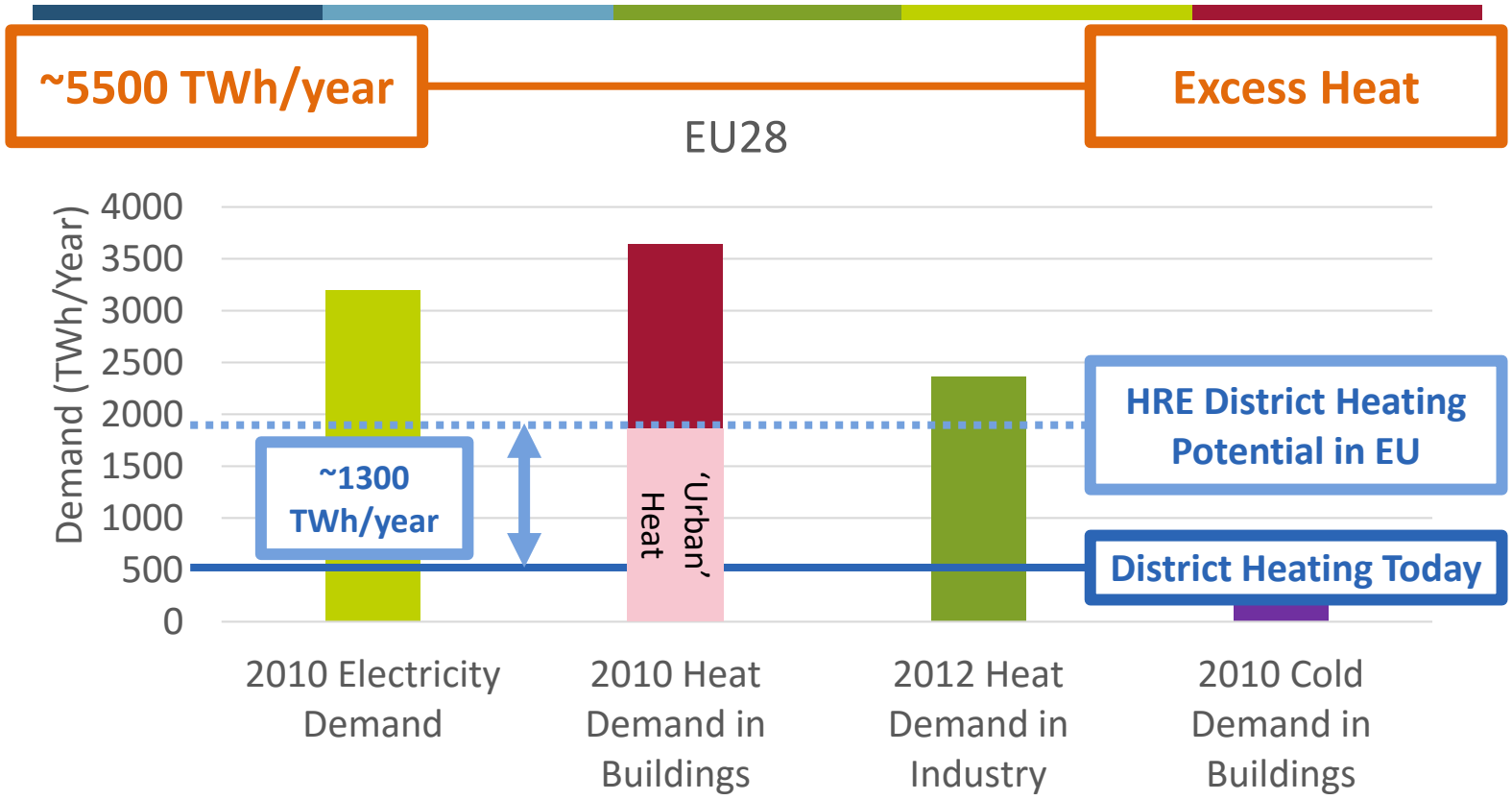

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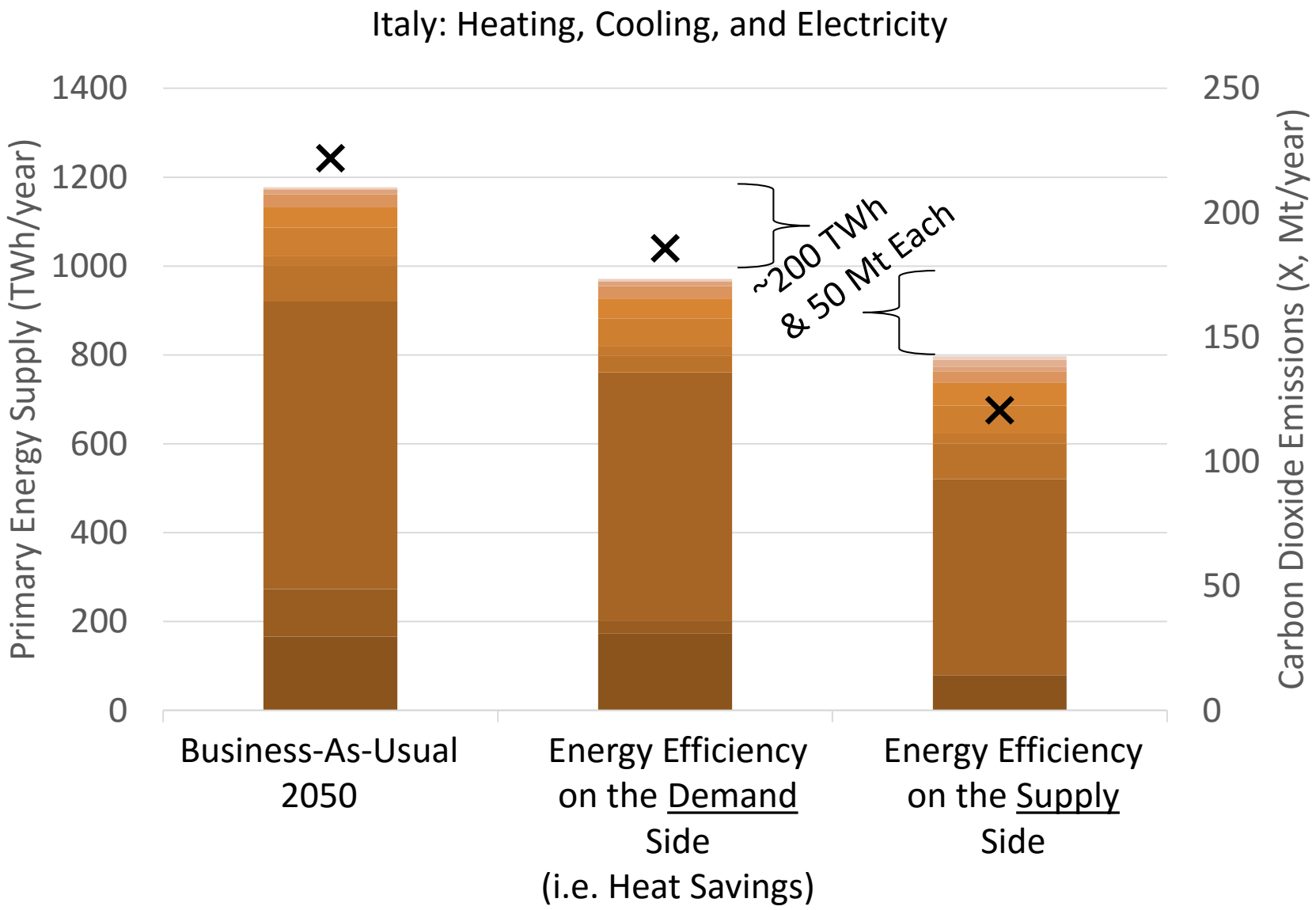
5. Energy Efficiency on Both Sides Can Save Similar Levels of Energy & CO2



HRE's 10 Pointer

1. Cooling Demand is Relatively Small
2. HRE is moving from an EU to National Level
3. Same Key Recommendations at National Level:
   - Heat Savings
   - District Heating
   - Heat Pumps (with biomass and solar thermal)
4. District heating potential is higher in countries with less district heating today
5. Energy efficiency is essential on the demand & supply side
6.
7.
8.
9.
10.

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WHAT WILL THIS COST?

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Heat is Valuable!

Electricity: Coal Power Plant

Vs.

Heat: Gas Boiler

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6. Only ONE Scenario, But Proves Heat is Valuable

Electricity: Coal Power Plant **Vs.** **Heat: Gas Boiler**

~€40/MWh

~€60/MWh

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Current Situation for Many EU Power Plants

Electricity Market
€40/MWh

Fish Market
€0/MWh

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Future: Sell the Heat @ €30/MWh

Electricity Market
€40/MWh

Heat Market
€30/MWh

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Value of Heat Supply @ €30/MWh
From ~15% to 50% District Heating

Electricity Market
€40/MWh

Heat Market
15% to 50% DH
Extra 1300 TWh
@€30/MWh
is €40 Billion/Year

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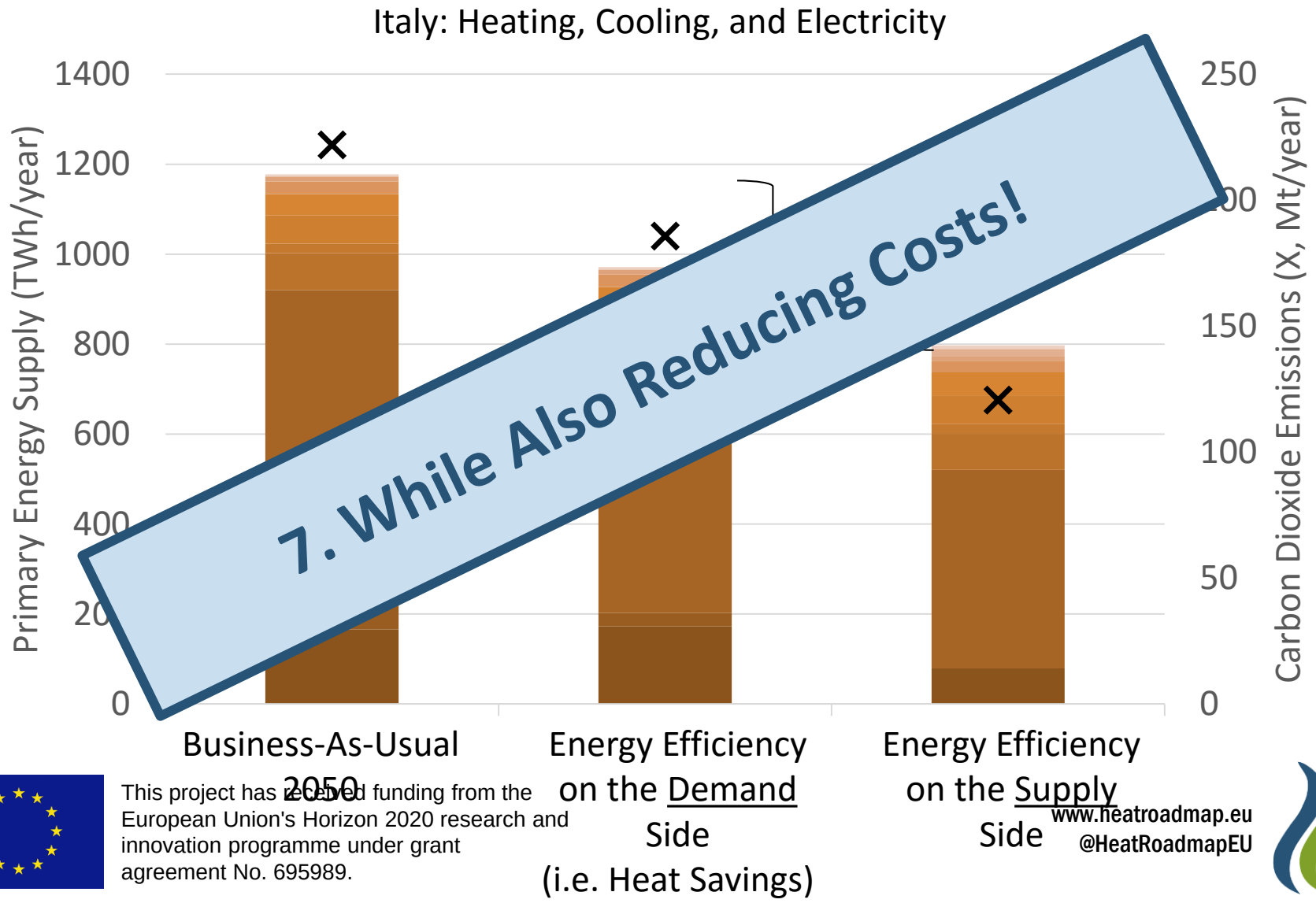
Similar Energy Efficiency Potential on Both Sides of Heat Supply



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4. District heating potential is higher in countries with less district heating today
5. Energy efficiency is essential on the demand (savings) & supply side (DH & HPs)
6. Heat is valuable (i.e. compared to electricity here)
7. So energy efficiency saves money
8.
9.
10.

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8. Heat Can Help Decarbonise Electricity

Urban Areas

- District Heating Networks
- High Heat Density Areas
- 40-70% of Total Heat Demand

Rural Areas

- Primarily Electric Heat Pumps
- Smaller Shares of Solar Thermal & Biomass Boilers
- 30-60% of Total Heat Demand

=

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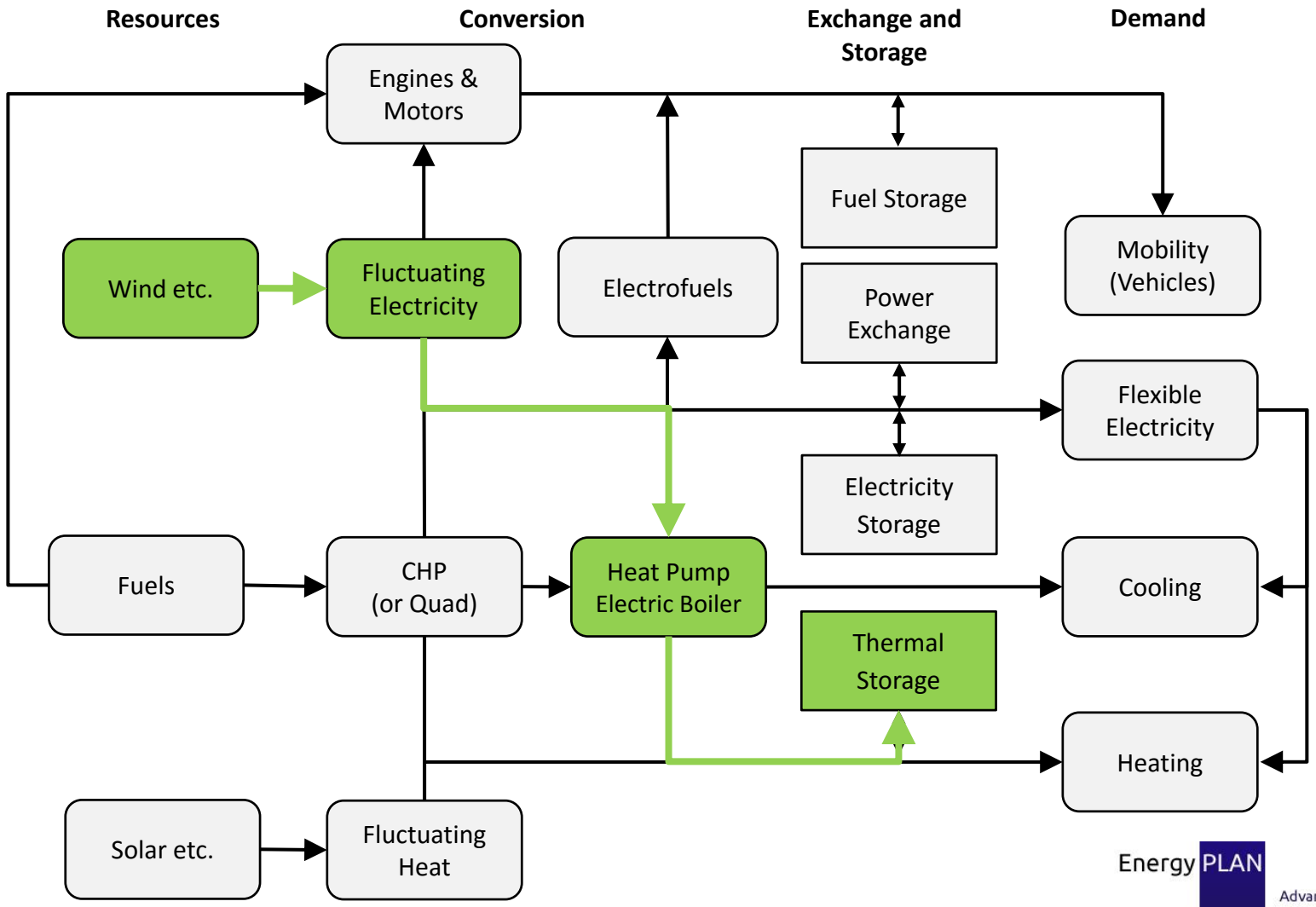
Thermal Storage (~€0.5-3/kWh) is much cheaper for wind/solar than Electricity Storage (~€125/kWh)



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Energy PLAN
Advanced energy system analysis computer model

Energy Storage Comparison
Unit Investment Costs

Electricity

Thermal

Central

Decentral

Energy Storage Comparison

1. Thermal Cheaper at All Scales

Electricity → **Thermal**

Central

Decentral

Energy Storage Comparison

1. Thermal Cheaper at All Scales

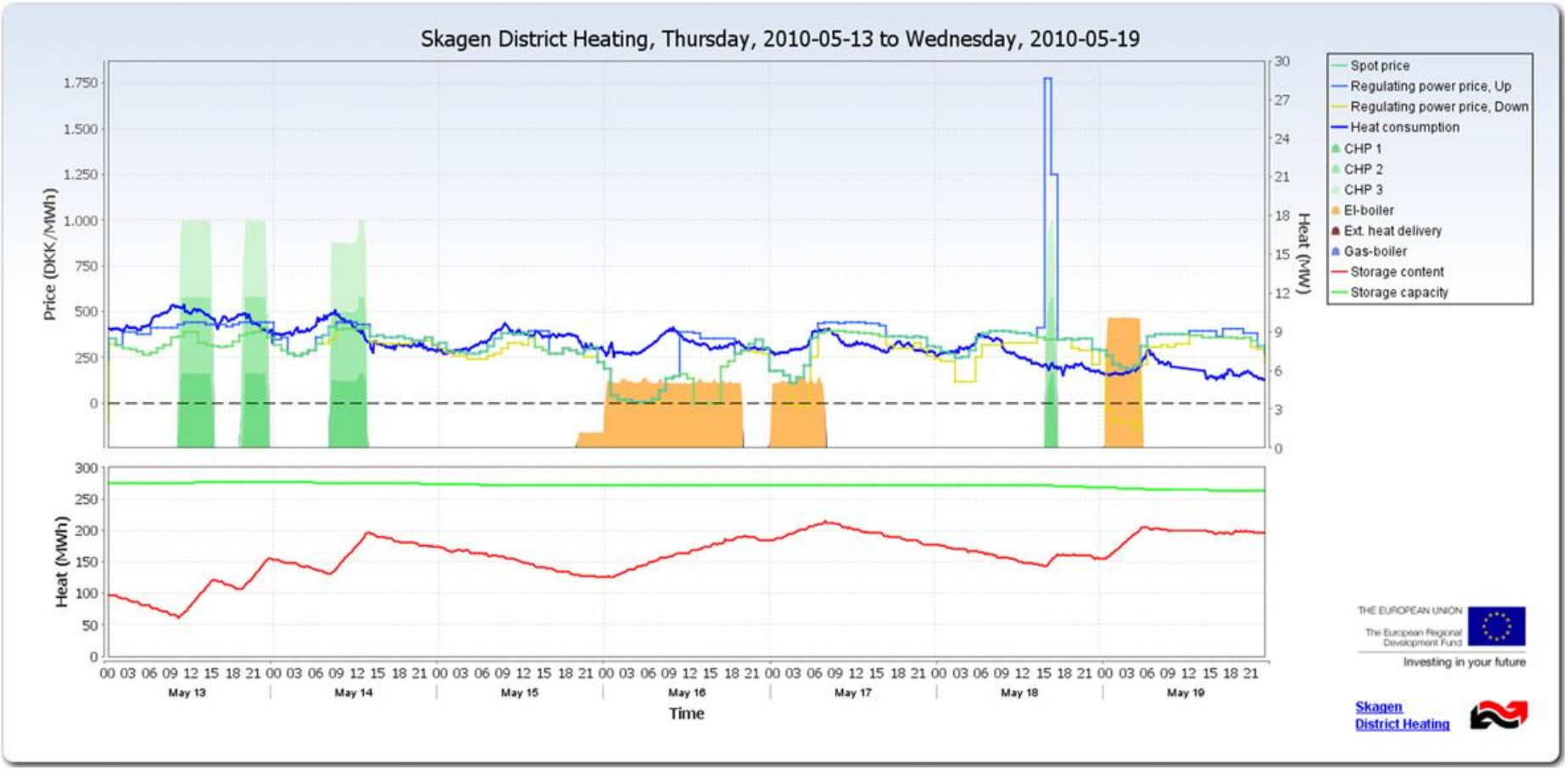
Electricity → **Thermal**

Central

2. Bigger is Better i.e. Cheaper

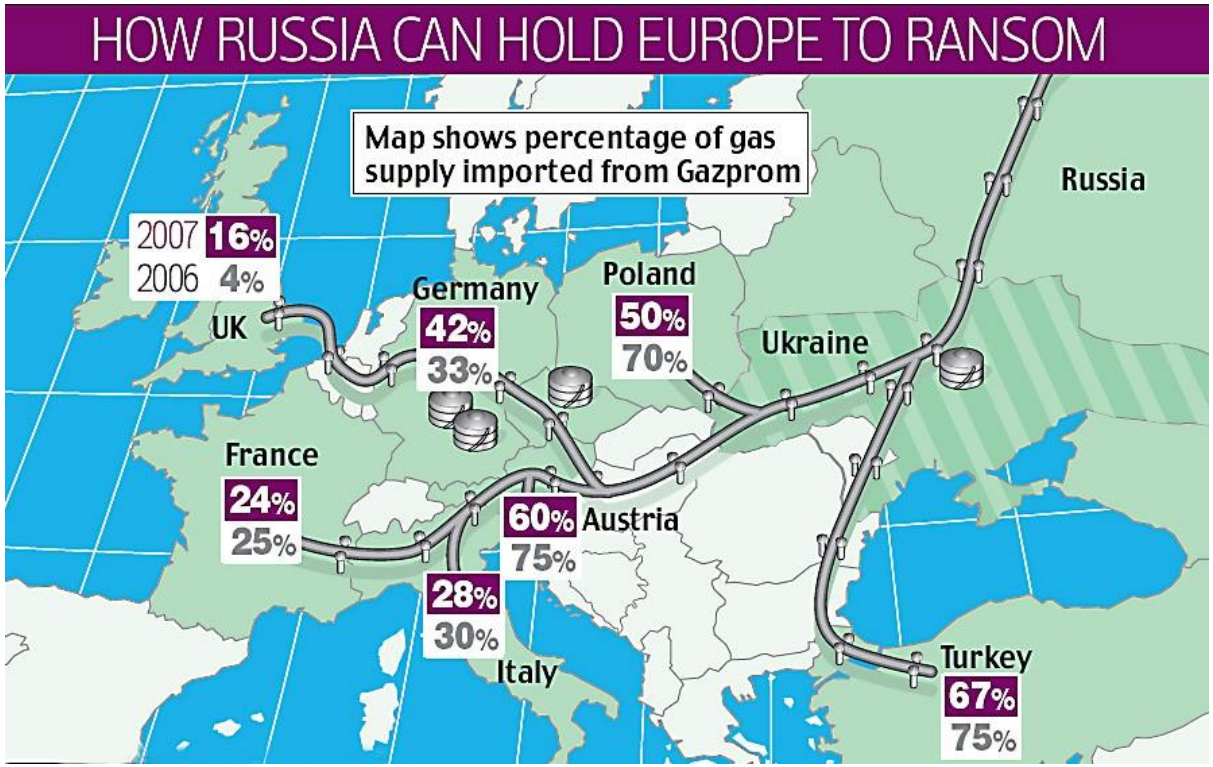
Decentral

9. It is Proven Already!



EMD International A/S
www.emd.dk

10. Money is Only One Metric!



Source: http://www.dailymail.co.uk/news/article-1103790/Russia-accuses-Ukraine-stealing-gas-raising-fears-UK-Europe-left-cold.html

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4. District heating potential is higher in countries with less district heating today
5. Energy efficiency is essential on the demand (savings) & supply side (DH & HPs)
6. Heat is valuable (i.e. compared to electricity here)
7. So energy efficiency saves money
8. Heat can also help decarbonise electricity
9. Using Existing Technologies
10. Along with Other Benefits such as energy security, environmental impact, jobs

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Closing Message

Big Change Requires Big Benefits

HRE: DH Can Deliver Big Benefits!

- The Potential Exists
- The Technology Exists
- The Benefits Exist
- Let's Do It!

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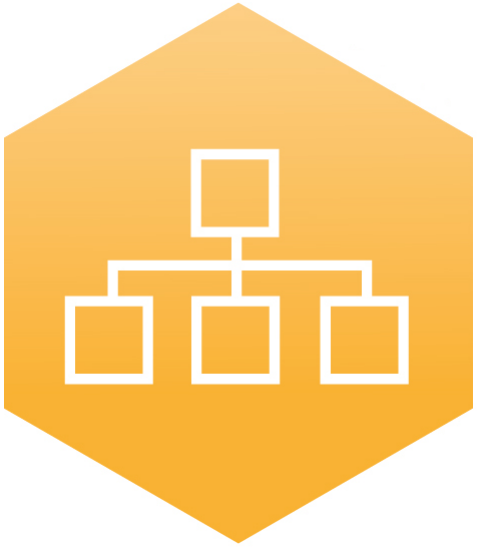
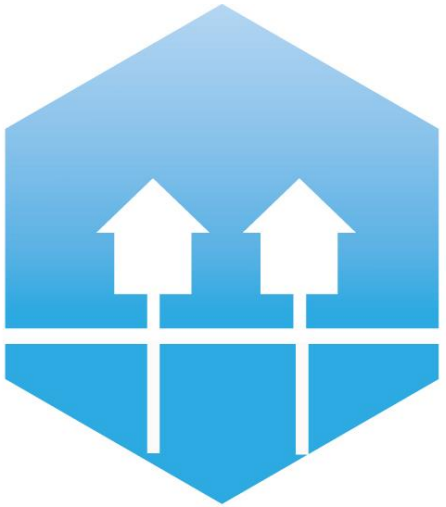
@HeatRoadmapEU





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