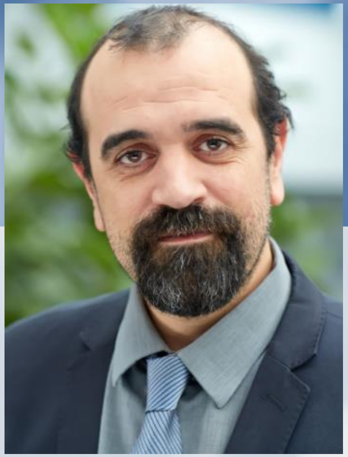
CELSIUS Talk: Business models for district energy

2017.05.02

celsius smart cities

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 314441.

Urban economic development through district energy



Sergio Saiz Bombin
Energy Efficiency and Industrial Sustainability Director
Tecnalia, representing PITAGORAS project

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PITAGORAS, EU funded FP7-Smart Cities project

Successful experience in the city of Brescia with an innovative and replicable real scale pilot plant

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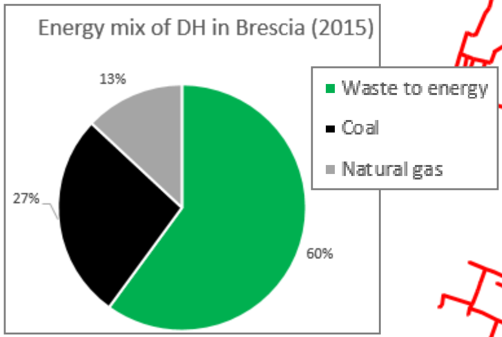
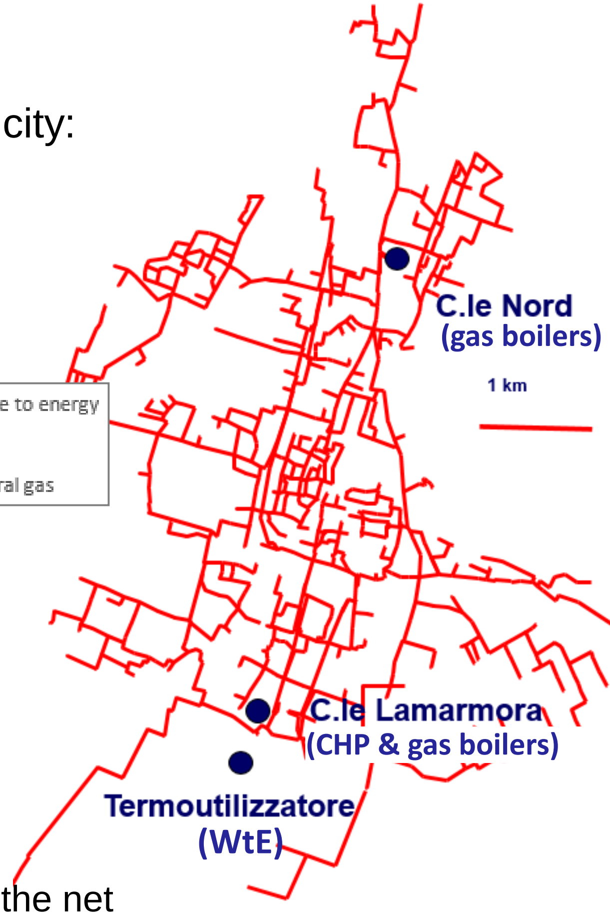
District Heating network of Brescia – key figures

- The first Italian city developing a DH system (in the 1970's), driven by the will of the municipality

- Heat supply to 21.000 buildings, 70% of the heat demand of the city:
    - Installed capacity$_{2015}$: 710 MW
    - Heat consumption$_{2015}$: 1.266 GWh/y
    - Total lengh: 663 km

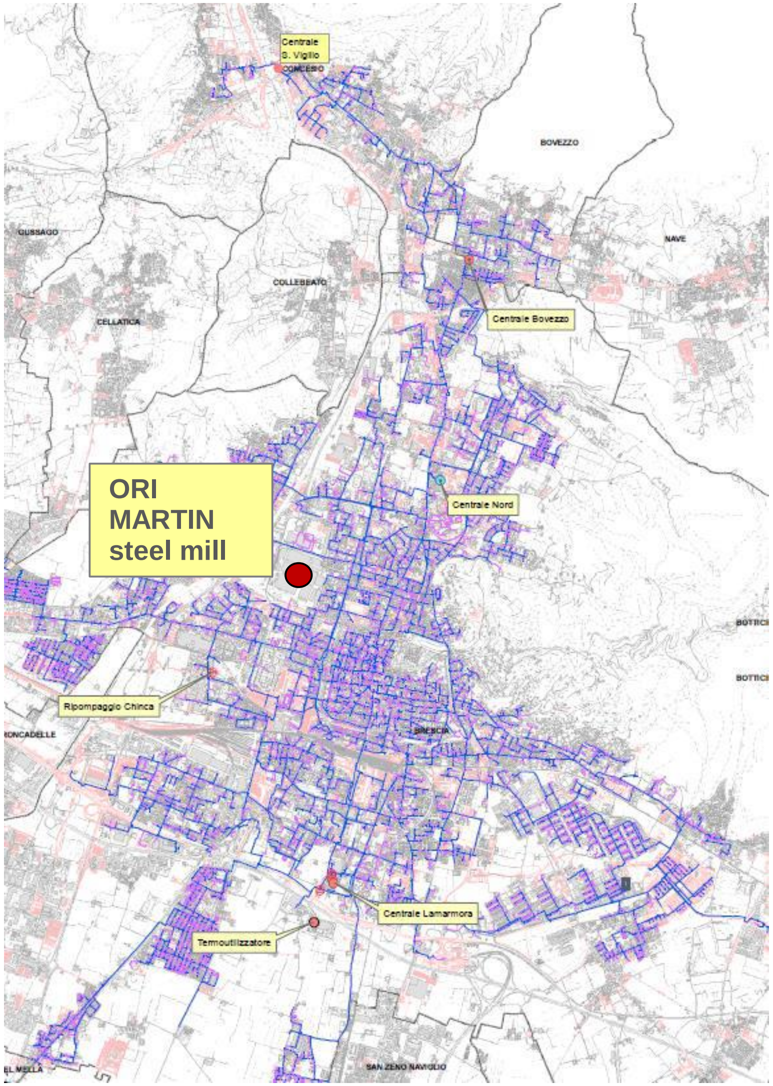
- Energy sources of the net (2015):
    - 180 MW waste-to-energy
    - 110 MW multi-fuel CHP (coal and gas)
    - 420 MW natural gas boilers





- Evolution of the energy mix of the city of Brescia:
    - From 100% fossil fuels in the 1950's to 40% WtE
    - DH deployment played a key role on achieving it
    - Still potential (and willingness) to reduce the carbon footprint of the net

District Heating network of Brescia – key figures



Within the PITAGORAS Project (FP7-Smart Cities programme) a new plant has been built for district heat supply based on **waste heat recovery from a local steel mill:**

- Implemented at ORI MARTIN steel mill, located close to the urban areas
- 10MW of industrial waste heat revalorisation
- Started-up on January 2016, now on extensive monitoring campaign

Key success factors – financial and business model:

- **Public-Private Partnership (PPP):** the DH system in Brescia is managed through a long-term concesion (>30 years) between the Municipality and A2A

- **Support from the municipality**: since the DH grid commissioning in 1972, the Municipality of Brescia has strongly supported its deployment, following the best available practices towards an efficient and low carbon footprint network

- **Integrated approach, including long-term heat planning** and following the best available practices and the use of **local resources** (waste-to-energy, industrial waste heat…)

- Implemented solutions allow **competitive prices and a profitable business**:
    - The payback of Brescia's DHC investments was ≈15 years, already achieved
    - Average price of DH is ≈70 €/MWh (excluding VAT), similar or lower than natural gas (most common alternative)

Key success factors – financial and business model

- In particular, **success factors** to be highlighted regarding the new **waste heat recovery plant implemented**:
  - **Continuous willingness by the municipality and DH operator** to improve the energy mix of the net and reduce the carbon footprint of the city
  - **Awareness and willingness of the involved industry** to invest on energy efficiency and sustainable solutions
- Main barrier identified → economic:
  - **Investment payback times for the implementation of waste heat revalorisation technologies are longer than 3-4 years (usual time frame acceptable by industrial players).**
  - The most recent regulatory decisions taken in Italy reduce the incentives to ORC applications for waste heat recovery and some DH support has been significantly reduced
  - Incentives mechanism necessary to overcome this barrier. The new plant (total investment of 12 M€) has been partialy funded by the European Commission, which has enabled to reach a more acceptable payback period (around 6 years). The rest has been internal company investment
  - ESCO model could be an interesting alternative financial model (acceptance of projects with larger time for ROI than industrials)

Conclusions

- This project has been a demonstration of how the **energy efficiency interventions in the industrial sector** can contribute to the **smart cities** development and achievement of energy objectives at city level
- The new plant will reduce the part supplied by fossil fuels increasing the fraction covered by waste energy. In 2015 the fossil fuels (natural gas and coil) represented 40% of the total heat supply. It is estimated that the heat supply from the new plant will be around **3%**
- **Highly replicable solution** specially in similar cities than Brescia, important centers of high energy intensive industry
- This kind of projects strengthen the **positive link between the cities and its industries**, relevant in this period of crisis and delocalization

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Conclusions

Relevance of the Business Model in Smart Cities

- QUESTION that WE ALWAYS NEED TO ANSWER

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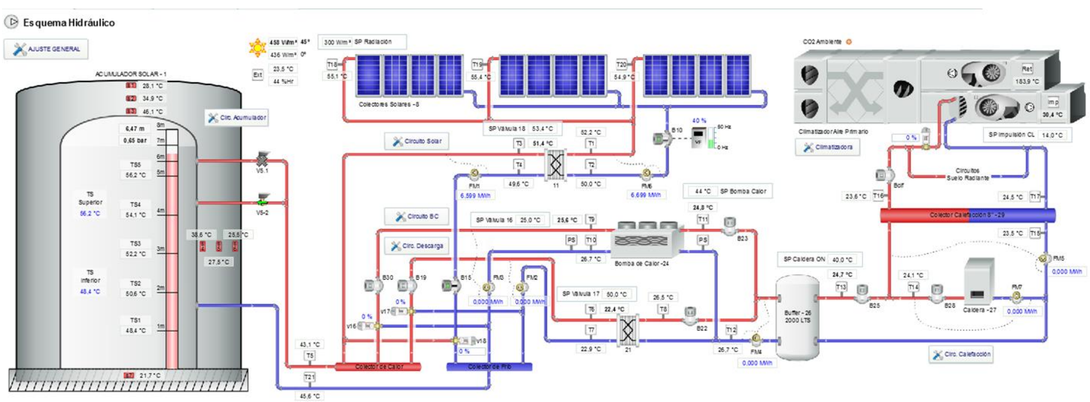

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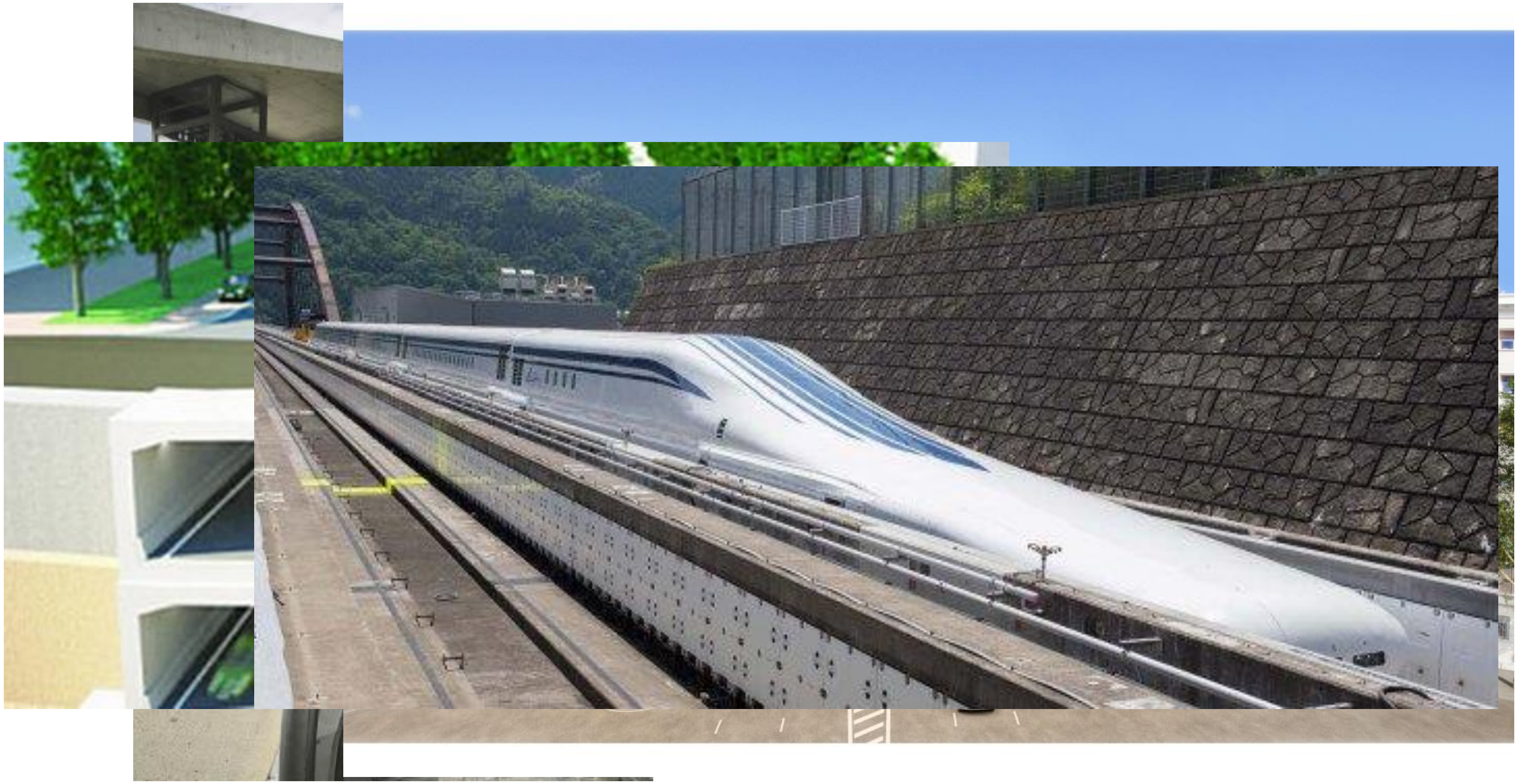

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Conclusions

Relevance of the Business Model in Smart Cities

.- The ROLE of the PUBLIC AUTHORITIES is key

.- The public-private partnership is an interesting approach:

Public authorities should offer 'credibility and transparency' for final users

Public authorities should consider the ENERGY INFRASTRUCTURES (District Network, Thermal Storage, etc.) in the same way they do with other infrastructures. Not a 'short term' profitable investment (*is not a 'new' concept… as we have seen*)

Private partner should operate & maintain the INFRASTRUCTURE

.- The Payback Period could be different for public and private entities, trying to ensure the feasibility of the project

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Conclusions

.- An Existing Infrastructure can ‘enable’ other actions:

.- WASTE HEAT RECOVERY from Industrial processes

.- Solar Thermal Energy (in an highly efficient way)

.- Seasonal Storage Systems

.- Others…

This ‘indirect & induced’ impacts are not easily foreseen… and so, not properly considered, Existence of Networks could have other ‘induced’ impacts that could increase the added value of them

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Conclusions

But…. What is the best energy plan for my city?

This question has NOT an easy answer

It depends on the Local Impacts generated by the plan..

..and is not easy to evaluate them ex-ante..

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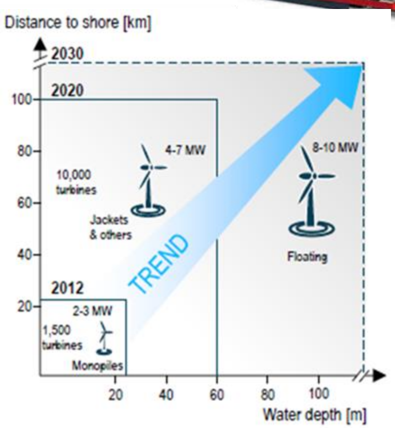
The (Local) Impact Approach *(EERA JP-E3S – leaded by Tecnalia)*



ESCENARIOS	tecnología	Acumulado para el periodo 2016-2050							
		Producción (Millones de Euros)		Empleos		PIB		Renta Disponible	
		Efectos INDIRECTOS	Efectos INDUCIDOS	Efectos INDIRECTOS	Efectos INDUCIDOS	Efectos INDIRECTOS	Efectos INDUCIDOS	Efectos INDIRECTOS	Efectos INDUCIDOS
ESC 1 (446 GW)	Floating	66.545	85.368	279.340	427.222	26.128	36.993	13.634	18.756
	Bottom fixed	50.270	63.159	246.445	352.315	16.520	23.928	9.292	12.785
ESC 2 (116 GW)	Floating	18.393	23.575	82.496	125.304	7.159	10.146	3.748	5.156
	Bottom fixed	12.891	16.193	68.202	96.965	4.230	6.128	2.382	3.277
ESC 3 (87GW)	Floating	13.380	17.151	59.526	90.497	5.214	7.388	2.729	3.754
	Bottom fixed	9.691	12.174	50.475	71.847	3.181	4.609	1.791	2.464

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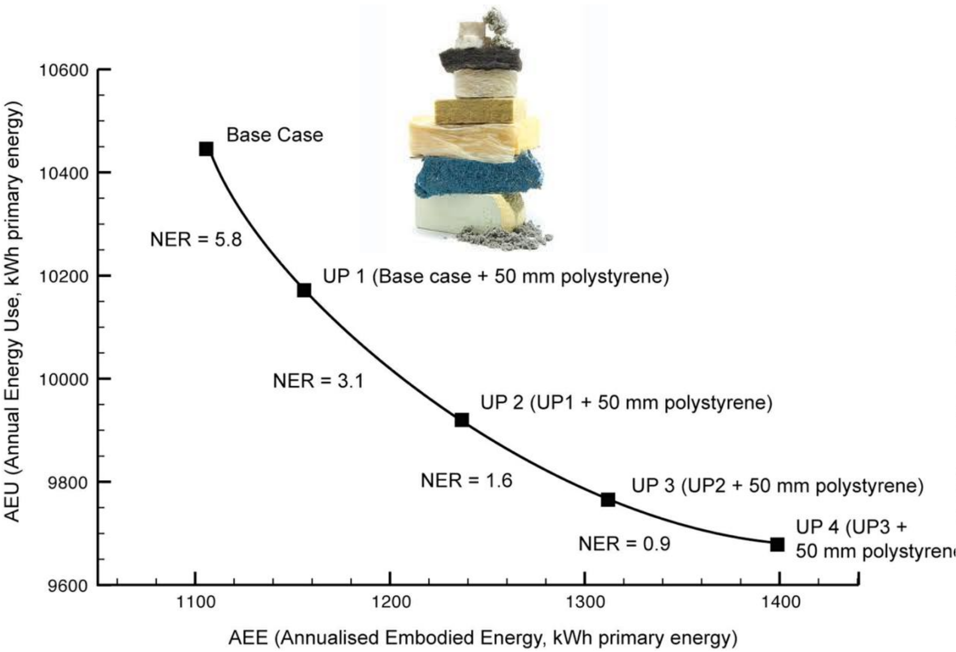
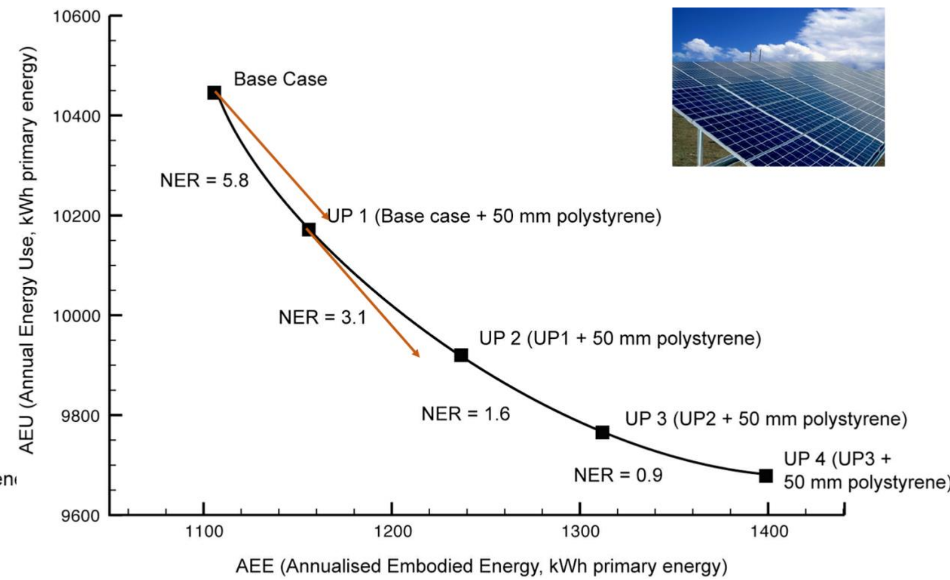
Conclusions

¿Which is the compromise between 'Passive' and 'Renewable Active' contribution?

(Net Energy Ratio Approach, LCA perspective = supply chain - by Tecnalia)





Moreover, each technology will have different *business potential* and different *local impact*

Questions?

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MANY THANKS FOR YOUR ATTENTION

Sergio Saiz – Manager of Energy Efficiency Area - Tecnalia

sergio.saiz@tecnalia.com + 34 637 587 813

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maider.epelde@tecnalia.com