Smart Grids for Smart Cities

The Electrification of the Economy

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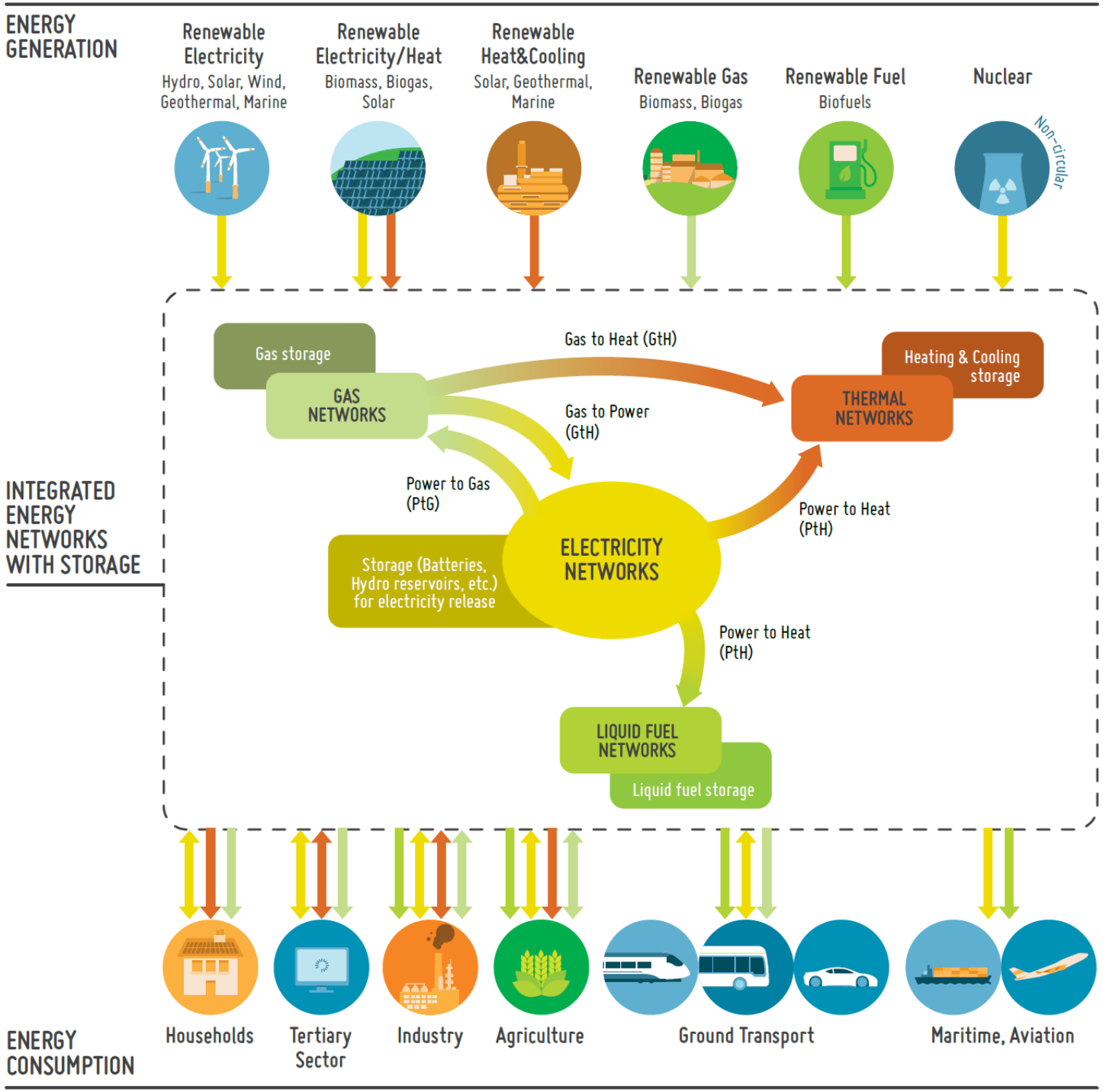
The Role of Smart Grids…

- Electricity Grid is an Existing high value infrastructure-.
- The combustion has disadvantages in the cities.
- The Electrification of mobility is an ‘already taken decision’

- And… ¿what about the Electrification of Heating…?

All Electric scenario



¿Why 4 networks are considered?

If we can give the same service with only one,

¿WHY NOT?

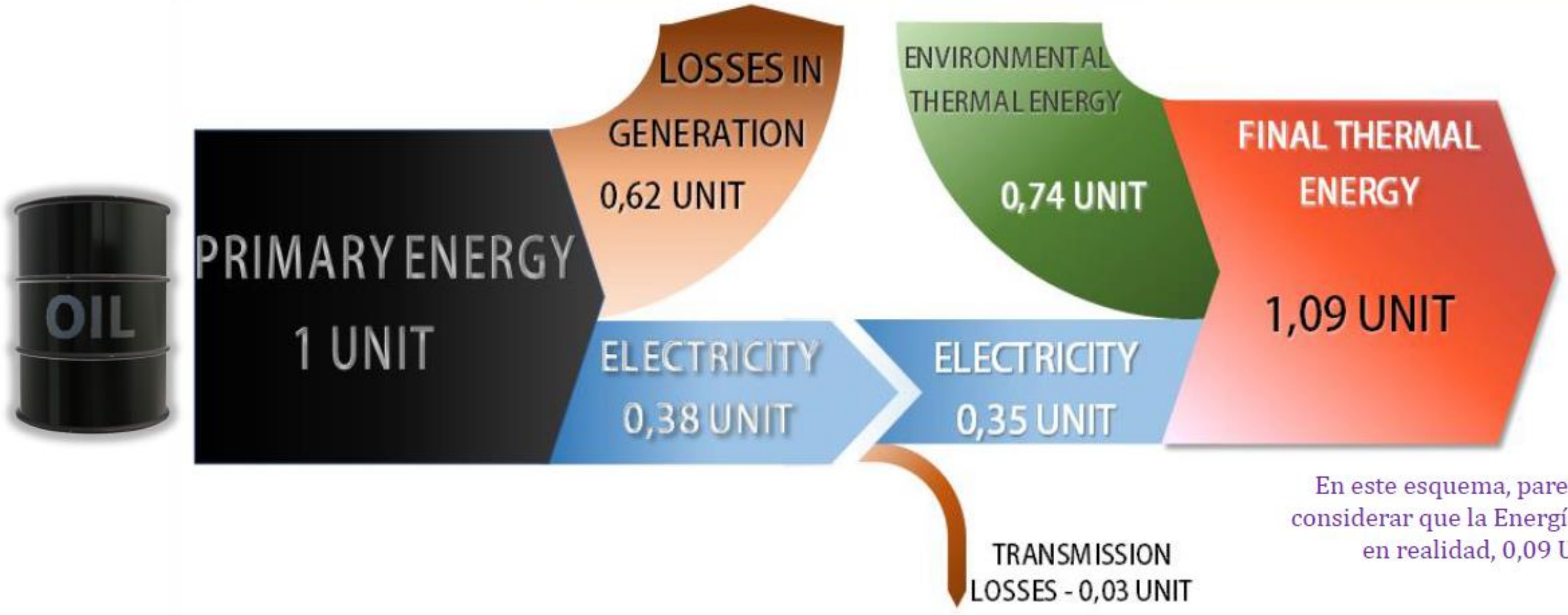
The energy exchanges between sectors…

Too many early decisions seems to be already taken

Heat Pump Technology

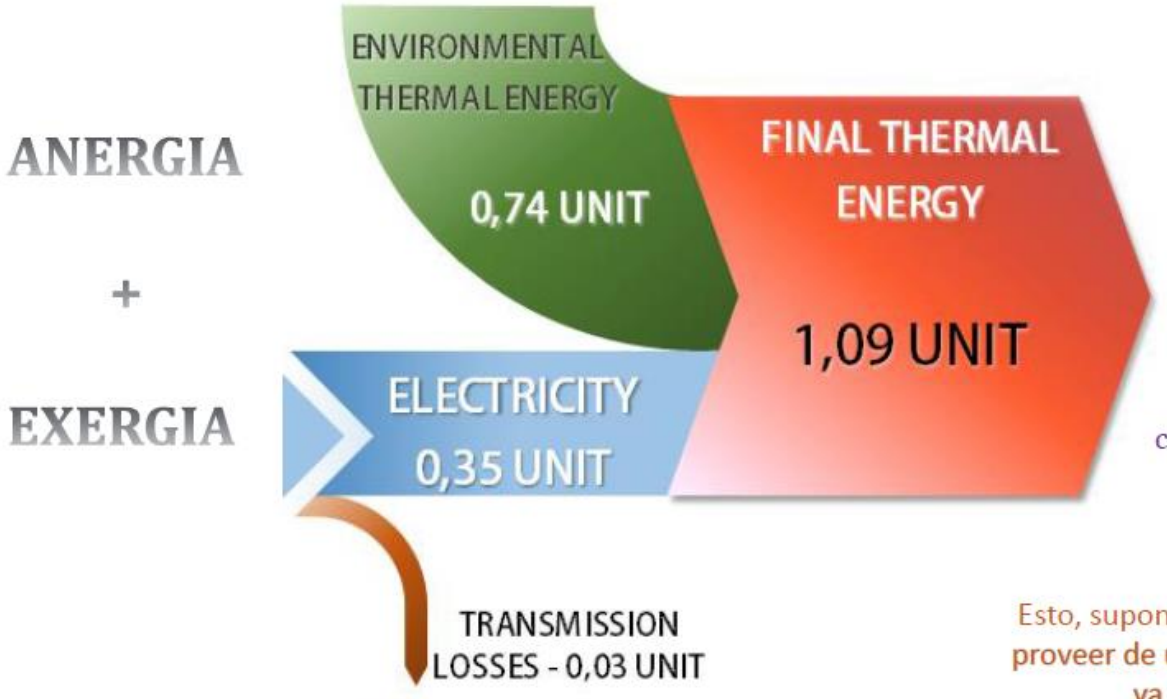
- The heat pump technology is a mature solution, with more than 100 years.
- The Air Conditioning, Refrigerators, chillers… are based in this technology
- The Performance has some trascendent properties, which gives the technology a high competitiveness in the future scenarios

Key aspects of heat pumps



En este esquema, parece razonable considerar que la Energía Renovable es en realidad, 0,09 Unidades

Key aspects of heat pumps

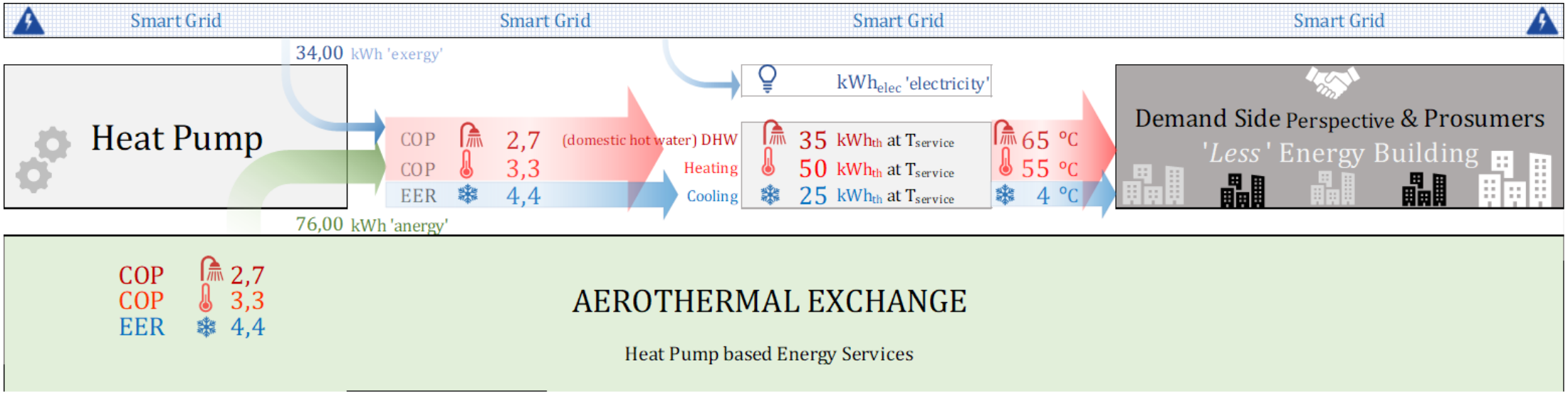


ENERGIA

En este esquema, parece razonable considerar que la Energía Renovable es en realidad, 0,74 Unidades (68%)
(considerando electricidad no renovable)

Esto, supone trasladar al sector eléctrico la responsabilidad de proveer de una electricidad renovable a los consumidores, que ya estarían en condiciones de ser renovables al 100%.

Key aspects of heat pumps

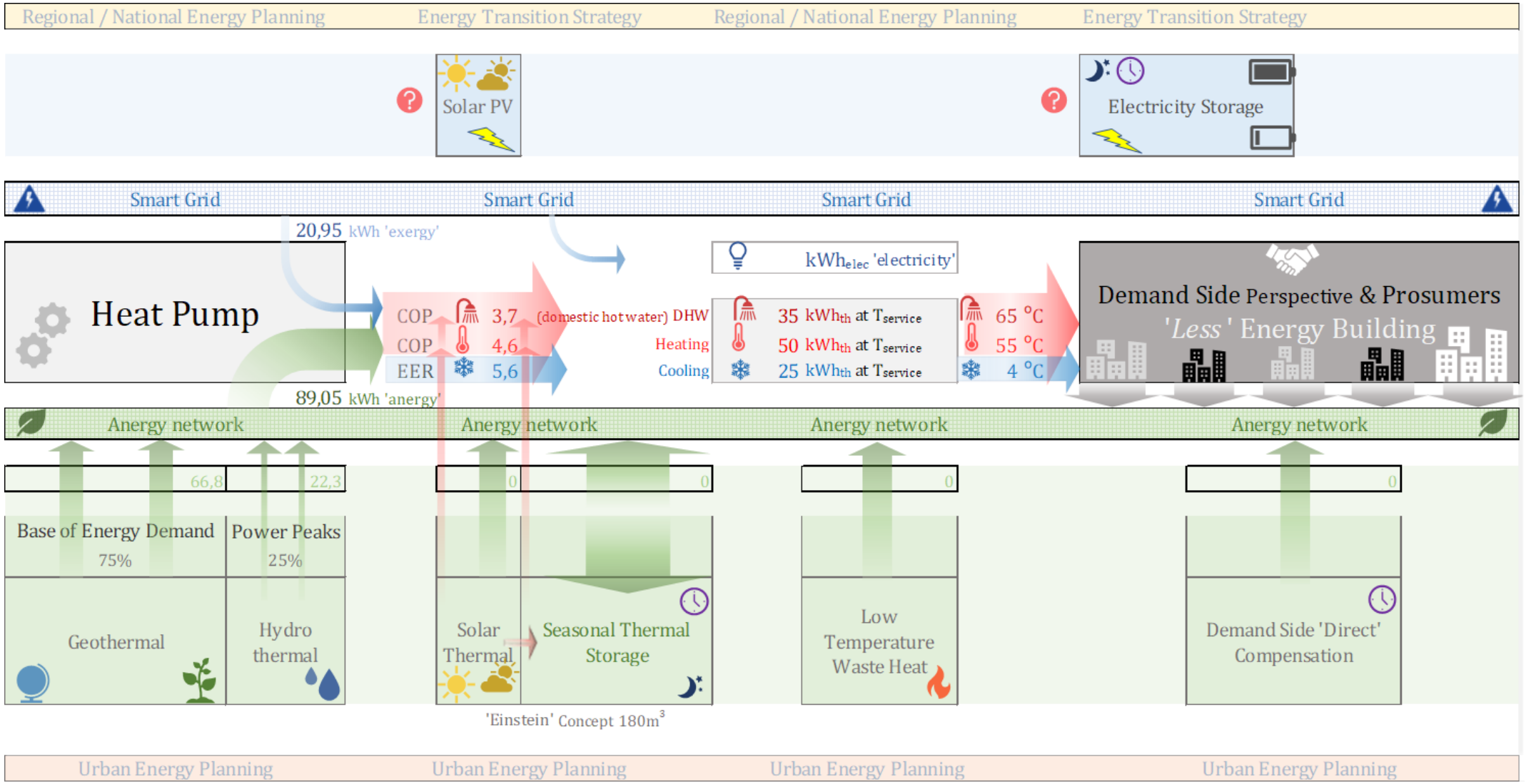


34,00 kWh	
30,9% electricity	
110,0 kWh$_{th}$ final energy	
69,1% local renewable	
76,00 kWh	

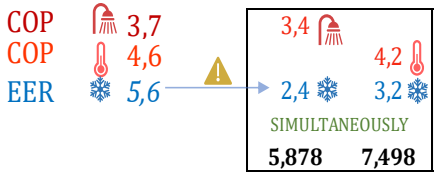
Reference configuration

0,140 €/kWh - electricity cost (€)	4,76
total 'marginal cost' (€)/(m2·year)	4,76
*Energy cost savings Vs NGas	-4%
(only heat+dhw) NGas cost(€)	3,83
(only heat+dhw) Aerothermal(€)	3,96

Reference Scenario – SCC1 Atelier (AMS/BIO)



Key aspects of heat pumps



Thermal Storage:

The best performance of heat pumps is when run directly against the Anergy network

DHW + Cooling: 9,3 vs 5,878 (SCDHW). Storage 'oportunity' is in this GAP

Heating & Cooling 10,24 vs 7,50 (SCHT). Storage 'opportunity' is in this GAP

Heat &/or Cold Storage offers several approaches, depending on the balance of the energy demands. The Overall COP should be higher than the ones operating simultaneously.

20,95 kWh	
19,0% electricity	
110,0 kWh_{th} final energy	
81,0% local renewable	
89,05 kWh	

0,140 €/kWh - electricity cost (€)	2,72
0,014 €/kWh - anergy cost (€)	1,25
total cost (€)/(m2·year)	3,97
Energy cost savings Vs Aerotherm	17%
*Energy cost savings Vs NGas	26%
(only heat+dhw) NGas cost(€)	3,83
(only heat+dhw) GeoAnergy(€)	2,84

For discussion…

Main Barrier identified in our experience in the market

CULTURAL BARRIERS

That perhaps seem to be economic or technological ones. But we bet for cultural ones.

The most relevant cultural barriers are those of oneself.

We all see more or less clearly which should be done by the others.
It’s more difficult to see what should be done by ourselves.

BUSINESS MODELS.

There is needed, nowadays, public contribution in each Project to make it feasible.

For discussion…

ZERO ENERGY BUILDINGS…
POSITIVE ENERGY DISTRICTS…

¿Which BUSINESS MODEL is suitable for private companies in that context?

No company is able to invest where does not make business at all.

So… Why EC is asking for these? And what kind of replicability are considering

The PROSUMERs are going to be…

For discussion…

PROSUMERS…

¿What are we expecting from the Prosumers?

The citizen, when finishes his work, goes home and manages the PV installation, offers some flexibility services to the Grid, uses the big data and blockchain to optimize his own installation, and… follows with his life?

We think that there is space here to profesionalize the ‘energy services’, through local ESCOs.

For discussion…

Electric mobility…

¿What happens with the Distribution Network, and Charging Infrastructure?

Is powerful enough to support the electrification of the cities as referred scenario?

What about the POWER LIMITATION?

Power Rationalizers, Power Buffers, High power charging systems… TIME!

We believe that ‘TIME’ will be the added value of the ‘power services’, which is probably more valuable approach for this scenario

Thanks!...

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