Consumers, tariffs and markets roundtable

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ENGIE

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ENGIE A GLOBAL AND DIVERSIFIED FOOTPRINT*

** Figures as of 31 December 2016
** Installed capacity at 100%
*** Including Turkey
**** Including Mexico

ACTIVITIES IN 70 COUNTRIES

153,090 EMPLOYEES ACROSS THE WORLD

112.7 GW OF INSTALLED POWER PRODUCTION CAPACITY

€66.6 billion OF REVENUES IN 2016

43,50 emp.
2016 rev.: €4.7 billion
11.7 GW installed**

North America

6,235 emp.
2016 rev.: €3.9 billion
17.2 GW installed**

Latin America

133,770 emp.
2016 rev.: €52.7 billion
44.7 GW installed**

Europe***

1,380 emp.
2016 rev.: €0.5 billion
26.3 GW installed**

Asia

400 emp.
2016 rev.: €0.3 billion
1.4 GW installed**

Middle East

3,825 emp.
2016 rev.: €1.6 billion
3.9 GW installed**

Africa

3,130 emp.
2016 rev.: €2.9 billion
7.5 GW installed**

Oceania

400 emp.
2016 rev.: €0.3 billion
1.4 GW installed**

Africa

3,825 emp.
2016 rev.: €1.6 billion
3.9 GW installed**

Oceania

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#IDCHC
The new energy world is characterized by **Decarbonization**, **Decentralization** and **Digitalization** (the 3 “D”).

**DECARBONIZATION**
Worldwide renewable energies: annual additional capacity to grow by +70% in 2030 vs 2015

**DECENTRALIZATION**
Decentralized solutions to more than double by 2030

**DIGITALIZATION**
Digital disrupts energy systems and improves customer offers
The combination of (A) ENGIE’s traditional businesses in infrastructures and services combined with (B) new solutions and (C) a strong knowledge of local authorities provides a unique competitive position
MARKETS
Comparison of performance with stand-alone systems:

- **50%** Improvement in energy efficiency
- **50%** Less CO₂ emissions
- **65%** Less water consumption
- **35%** Less electricity consumption
- **80%** Less usage of chemicals
HEATING AND COOLING IS 50% OF EU'S FINAL ENERGY CONSUMPTION

EU total energy consumption

- Heating and cooling: 50%
- Rest: 50%

Buildings consume 60% of heating and cooling. Industry consumes most of the rest.

Source: European Commission DG Energy, Renewable Energy
PERCENTAGE OF THE POPULATION SERVED BY DISTRICT HEATING (2013)

DH, A HUGE GROWTH POTENTIAL EVEN IN « OLD » EUROPE

Source: Commission services using data supplied by Euroheat and Power
District Cooling

“The” solution to answer cooling needs while respecting major energy and environmental issues

Cooling is set to expand 625% by 2050 in selected regions of Asia & Latin America

World final energy use for cooling in the IEA’s 2°C scenario, 2010–2050

World total emissions of cooling sector

1 Source : IEA (2014b) 2 Source : Green cooling initiative
Integrating smart thermal grids into future sustainable energy systems (4th generation DHC)

1st Generation: 1880 – 1930
- Steam (~200°C)
- Steam pipes in concrete ducts
- Powered by coal plants
- Appeared in US and Europe

2nd Generation: 1930 – 1980
- Pressurized hot-water (> 100°C)
- Water pipes in concrete ducts
- Fuel savings through CHP
- Widespread in USSR

3rd Generation: 1980 – 2020
- The scandinavian model
- Pressurized hot-water but with T° < 100°C
- Use of local fuels (biomass, industry waste, solar) in response to the oil crisis
- US, Europe, China, Canada...

4th Generation: 2020 – 2050
- Low-temperature (40-60°C) district heating, low grid losses
- Integrated to smart energy systems: gas, electricity (RES), renewable heat and recycled heat
- Intelligent control and metering
- Linked to a district cooling systems

Source: Aalborg University and Danfoss District Energy, 2014
The new energy world is characterized by decarbonization, decentralization and digitalization with modern DHC at the heart of the energy revolution.

3rd and 4th generation DHC Systems are the most efficient way to decarbonize dense areas like City Centers, or tertiary or industrial parks, and will be the backbone of the sustainable City of Today and of Tomorrow.

Engie together with its partners in different parts of the world, like Mubadala and Tabreed for the GCC region, believes that DHC will create tremendous value for customers and stakeholders and has identified it as a privileged growth vector.
BUSINESS MODELS
DHC BUSINESS MODELS

Conception Engineering Infrastructure & Network

Construction Implementation Infrastructure & Network

O&M Infrastructure & Network

Services’ commercial operations

WHOLLY PUBLIC

PUBLIC SECTOR

PUBLIC SECTOR

PUBLIC SECTOR

PUBLIC SECTOR

PUBLIC SECTOR

PUBLIC SECTOR

PUBLIC SECTOR

PRIVATE COMPANY

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DHC BUSINESS MODELS: WHAT ARE THE PUBLIC-PRIVATE PARTNERSHIP ISSUES FOR PUBLIC SERVICES?

- Best value for money
- To avoid uncontrolled growth of public charges
- To transfer the operating risk in the most optimal way to the party best suited to carry it
- To increase the quality of public services / To enhance usability and functionality of public bodies
- To increase the competence of public employees
- To incorporate innovation and modern processes in public services
- To make effective the investments in necessary infrastructures through private resources mobilization in addition to the public ones
- Facilitate empowering public authorities on sustainable management
## DHC BUSINESS MODELS: PUBLIC OR PRIVATE? BENEFITS AND DISADVANTAGES

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<thead>
<tr>
<th>Type</th>
<th>Benefits</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td><strong>Public procurement:</strong></td>
<td>Individual market lot/short-term contract</td>
<td>Immediate payment/heavy investment at first</td>
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<td>Well-known process/usual procedures/ less political discussions</td>
<td>Slow administrative procedures/delayed projects /less access to private innovation</td>
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<tr>
<td><strong>Delegated Public Services:</strong></td>
<td>Well-known process/usual and traditional procedure/long-term contract</td>
<td>Risk of information assymmetry</td>
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<tr>
<td>« Affermage » Contract &amp; concession</td>
<td>Private initiative/efficiency/Innovation/ less public expenditure at first</td>
<td>Misunderstanding between delegation and privatization? need for expertise and capacity to control on the public side</td>
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<td><strong>Private Partnership Contracts:</strong></td>
<td>Best value for money/public payment smoothed over time/long-term contracts</td>
<td>Higher transaction cost</td>
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<td>Global contract/coordination of works/quick delivery of infrastructure</td>
<td>Higher legal risk?</td>
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DHC BUSINESS MODELS: WHAT ARE THE KEY QUESTIONS FOR THE PUBLIC AUTHORITIES

- Nature and complexity of the public service?
- Sufficient internal skills? or external experts needed?
- Own financial resource or external financing?
- Risk allocation: Public/Private? Who is best placed?
- Global contract or with allotment?
- Guaranteed compensation by the public sector or by the user fees? Or a combination?
- Duration of the contract and its impacts?
- The property of the infrastructure before and after the end of the contract?
EXAMPLES OF END-USER EXPECTATIONS
(DC network of Paris: Climespace)
CUSTOMER EXPECTATIONS:

Example of DC network in Paris (1)

1. PUBLIC CUSTOMER

Main expectations:
- Initial investment costs known
- CAPEX optimization
- Supply reliability
- Specific needs: ex Museums

Value proposition CLIMESPACE:
- Fixed CLIMESPACE costs
- Adaptation to energy needs and optimization of subscribed power
- Equipment redundancy and inter-connected networks
- Continuity of Supply, guaranteed stable low temperature (humidity)

2. PRIVATE CUSTOMER

Main expectations:
- Overall cost profitability
- Strong environmental communication
- High occupant well-being

Value proposition CLIMESPACE:
- Over installation lifetime, long-term & global profitability approach
- Network’s environmental performance, environmental certification
- Optimal use of customer space, stable very low temperature provided
3. OWNER OF TERTIARY BUILDINGS & REAL ESTATE COMPANIES

Main expectations:

▪ Enhance the property asset
▪ Supply reliability
▪ High occupant well-being

Value proposition CLIMESPACE:

▪ Contributing to qualifying for certifications
▪ Equipment redundancy and inter-connected networks
▪ Optimal use of customer space (free basement, rooftops) and stable very low temperature provided
### CUSTOMER EXPECTATIONS:

*example of DC network in Paris (3)*

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<tr>
<th>4. DEVELOPER</th>
<th>Value proposition CLIMESPACE:</th>
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<tr>
<td><strong>Main expectations:</strong></td>
<td><strong>CAPEX optimization</strong></td>
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<td><strong>Short-term asset valuation</strong></td>
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<td><strong>Facility for obtaining work permit</strong></td>
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<th>5. MANAGER</th>
<th>Value proposition CLIMESPACE:</th>
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<tr>
<td><strong>Main expectations:</strong></td>
<td><strong>Simplicity and ease of operations</strong></td>
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<td><strong>Supply reliability</strong></td>
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<td><strong>Clear and regular reporting</strong></td>
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<td><strong>Technical, financial, optimization consulting</strong></td>
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