Innovative business model for the energy renewal of Torrelago district

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Agenda

- Introduction.
- Torrelago district description.
- Torrelago retrofitting strategy.
- Torrelago business case.
- Discussion.
Introduction
Greenhouse gas emissions to be reduced by 20% compared to 1990.

Share of renewable energy sources in final energy consumption to be increased to 20%.

Energy efficiency to be improved by 20%.
CITYFiED Project: Five main pillars

01 Methodology for urban renovation at district scale

02 Better business models

03 Energy-efficient renovations at district scale

04 Reduction of the energy demand and CO₂ emissions in districts

05 Replicability and citizen engagement
Torrelago district description
Torrelago district description: Case study

Torrelago district:
- 31 residential buildings
- 1,488 dwellings
- 140,000 m² conditioned
- Two heating networks
- Fossil fuels (natural gas)
- Consumption: 14 GWh/yr
- Power installed: 15 MW
Torrelago district description: Residents needs

- **Low comfort** level at home and **regular damps** in the walls
- **Old equipment** and bad performance of the energy facilities
- **Inefficient** management of the district **heating** system
- Expensive **energy bill** and operation costs
- Instability of the **energy price** due to external conditions
Torrelago retrofitting strategy
Torrelago retrofitting strategy: Objectives

- Reduction of the **buildings’ energy demand** by a 40%
- Improvement of the **comfort level** inside the dwellings
- Operation **costs savings**
- Enhancement of the overall **energy performance**
- Reduction of the **CO₂ emissions**
- Increase the share of **renewables to a 80%**
- **Citizens decision-making** at district, building and home level

Innovative business model for the energy renewal of Torrelago district
1. Buildings insulation
2. District heating renovation
3. Overall energy management
4. 3 high-efficiency biomass boilers
5. 1 high-performance CHP unit
6. Variable flow pumping system
7. Optimized control strategies
8. Smart energy metering
9. Simulation and monitoring
10. Home temperature control
Torrelago business case
## CITyFiED partners in Torrelago demo site

<table>
<thead>
<tr>
<th>Partner</th>
<th>Type</th>
<th>CITyFiED role</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Image]</td>
<td>Energy Services Company</td>
<td><strong>District Heating Network</strong>&lt;br&gt;• Design, installation and commissioning&lt;br&gt;• Energy management&lt;br&gt;• Operation and Maintenance&lt;br&gt;• Full guarantee&lt;br&gt;• Financing of the DH interventions</td>
</tr>
<tr>
<td>[Image]</td>
<td>Building Company</td>
<td><strong>Buildings Envelopes (Façades)</strong>&lt;br&gt;• ETICS design, installation and commissioning&lt;br&gt;• ETICS guarantee&lt;br&gt;• Financing of the ETICS interventions</td>
</tr>
<tr>
<td>[Image]</td>
<td>University &amp; Research</td>
<td>• ICT platform design and commissioning&lt;br&gt;• HEMS installation and commissioning&lt;br&gt;• Recommendations for a better energy use</td>
</tr>
<tr>
<td>[Image]</td>
<td>Research Centre</td>
<td>• Dynamic simulation on energy performance (DH)</td>
</tr>
<tr>
<td>[Image]</td>
<td>Infrastructures Company</td>
<td>• Static simulation on energy demand (buildings)</td>
</tr>
<tr>
<td>[Image]</td>
<td>Research Centre</td>
<td>• Project coordination&lt;br&gt;• Verification of results</td>
</tr>
<tr>
<td>[Image]</td>
<td>City Council</td>
<td>• Licensing</td>
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</table>
Veolia designs and deploys solutions for **water**, **waste** and **energy** management, participating in the sustainable development of cities and industries.

**WATER**
Management of the global water cycle, from production and distribution of drinking water to the collection, treatment and recycling of wastewater.

**WASTE**
Liquid and solid non-hazardous and hazardous waste management
Our expertise covers the entire waste life cycle from collection to recycling, leading to the final recovery of waste as materials or energy.

**ENERGY**
Energy efficiency, efficient management of heating and cooling networks, green energy production.

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3ia Ingeniería y Construction Técnica

Energy improvement studies. Indoor and outdoor construction. Thermography

Project documentation. Project execution. Acoustic laboratory for buildings and industry

Civil works projects. Technical and traditional construction. Maintenance of Communities Dry partitioning specialists

Innovative business model for the energy renewal of Torrelago district
Business model approach: CANVAS method

Business model CANVAS

Torrelago business blocks

Value Propositions

Offer/Service

Key Partners
Key Activities
Key Resources

Infrastructure

Customer Segments
Customer Relationships
Channels

Customers

Cost Structure
Revenues Streams

Finances

Innovative business model for the energy renewal of Torrelago district
Offer / Service

Innovative business model for the energy renewal of Torrelago district

1. Façades insulation
2. Full guarantee
3. Financing

Energy management and supply
Full Guarantee
Operation & Maintenance
Financing
Innovative business model for the energy renewal of Torrelago district
Innovative business model for the energy renewal of Torrelago district
Finances: Financial scheme

- **Private** model of **shared risks**
- Partnership between an **ESCO** and a **building** company
- Partly granted by the **European Commission** (FP7)
- The **investment** is covered by the companies (**equity** and **bank loan**)
- The payment is returned by the Communities of Owners through **2 monthly bills** (façades and energy) along a **long-term contract**.
- The dwellings’ owners keep the same monthly **Community fee**.
Finances: Share of revenues

- Energy management
- O&M
- Full guarantee
- Financing

Innovative business model for the energy renewal of Torrelago district
## Finances: Long-term contracts

<table>
<thead>
<tr>
<th>Community of Owners</th>
<th>Façades contract</th>
<th>Energy contract</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase I (576 owners)</td>
<td>25 years</td>
<td>20 years</td>
</tr>
<tr>
<td>Phase II (912 owners)</td>
<td>20 years</td>
<td>15 years</td>
</tr>
</tbody>
</table>
## Finances: Economic figures

### Intervention vs Total investment

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Total investment</th>
<th>EC grant</th>
<th>Private investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building retrofitting</td>
<td>14.0 M€</td>
<td>7.0 M€ (50%)</td>
<td>7.0 M€ (50%)</td>
</tr>
<tr>
<td>District heating</td>
<td>2.5 M€</td>
<td>1.0 M€ (40%)</td>
<td>1.5 M€ (60%)</td>
</tr>
</tbody>
</table>

### Financial revenues
- Veolia: 29%
- 3IA: 71%

### Investments
- EC: 9%
- 3IA: 42%
- Veolia: 49%

### Upfront costs
- Building retrofitting: 15%
- District Heating: 85%

### Energy Savings impact
- Building retrofitting: 20%
- District Heating: 80%
Discussion
Key figures in Torrelago business case

- Total share of **energy savings**: 50%
- **CO₂** emissions avoided: 3,000 ton/yr
- **Thermal power** installed: 3.5 MW (biomass) + 73.4 kW (CHP) + 9.0 (gas)
- **Electric power** installed: 33 kW (CHP)
- Contract: Long-term (25 yr)
- Total **investment** for district retrofitting: 16.5 M€ (EC + ESCO + Building)
- Total **investment per conditioned area**: 118 €/m²
- Total **revenues**: 1.1 M€/yr
- Internal Rate of Return (**IRR**¹): 10%

¹ IRR was calculated using an average of the contract duration
Barriers in Torrelago business case

Political

Spanish legislation against electrical self-consumption

Economic

High upfront costs for district energy retrofitting
Need of a long-term contract > 15 yr to be feasible (investment risk)

Social

Private multi-property ownership (agreements, decision-making...)
Citizens’ distrust companies (energy and building)

Technical

General lack of knowledge about energy and environmental projects
Success factors in Torrelago business case

**Political**
The use of both regional and international fuels enables a more stable energy price and security of supply in the long term.

**Economic**
European Commission support made the renovation possible without raising the energy bills to the Communities of Owners.

**Social**
Communication strategies with the owners can foster their confidence in this kind of projects.

**Technical**
Companies’ expertise to improve the owners’ confidence. M&V to assure the energy savings increase transparency and trust.

Innovative business model for the energy renewal of Torrelago district
Lessons learnt in Torrelago business case

- **Innovative financing** scheme: public **institutions** (EC), private **companies** (construction and energy), **banking** entities (private green bank) and private building **owners** (1,488 dwellings).

- **Classical financial entities** do not see the energy savings as a guarantee to endorse retrofitting projects → Need of green banks.

- Company´s **business models** must be **flexible**, taking into account the customers’ needs.

- Large-scale renovation projects towards ambitious energy targets are only possible under **long-term financing schemes**.

- **Close partnership** between different entities.

- **Users knowledge** and **citizen engagement** are a key factor in accomplishing energy savings.
Thank you very much for your attention

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