Workshop

Upscaling energy renovation to the district level

TU Delft, 25 September 2019
Upscaling energy renovation to the district level

Workshop goals
Moderator: Zeno Winkels, Climate-KIC/ TU Delft, The Netherlands

12:45 The IEA EBC Programme: supporting policy and business development
Daniel Van Rijn, The Netherlands Enterprise Agency (RVO), The Netherlands

13:00 The Annex 75 project: objectives on policy and business development
Manuela Almeida, University of Minho, Portugal

Experiences regarding building renovation at district scale
Moderator: Zeno Winkels, Climate-KIC/ TU Delft, The Netherlands

13:15 Local policy action for neighbourhood renovation
How to operate Amsterdam on clean energy?, Tess Blom, TU Delft, The Netherlands
Experiences from the development of sustainable neighbourhoods in Rotterdam
Andre De Groot, City of Rotterdam, The Netherlands
Group renovation of owner-occupant’s houses in Mechelen, Ighor Van de Vyver, City of Mechelen, Belgium

14:00 Frontrunner market approaches for neighbourhood renovation
The role of ESCO’s in large scale renovation, Johan Coolen, Factor4, Belgium
Climate Mission initiative, Rene Pie, Klimaatmissie, The Netherlands
Challenges of revolving funds, Patrick Lüftenegger, City of Salzburg

14:45 Q&A

15:00 Coffee break
Upscaling energy renovation to the district level

Go to www.menti.com and use the code 44 76 91

What do you think is the most effective way to move an unwilling donkey?

A. hitting the donkey with a whip  B. holding a carrot in front of the donkey  C. a dog barking at the donkey  D. turn the donkey’s head to make it see other donkeys are moving
Upscaling energy renovation to the district level

Go to www.menti.com and use the code 66 67 71

What do you think are the most important stakeholders we need to activate to achieve district energy renovation?

Policy actors  Suppliers  Residents
Upscaling energy renovation to the district level

15:30 Break-out Sessions: Policy instruments & Business Models

17:00 Conclusions

Findings Policy Instruments, Jens Freudenberg, TU Delft, The Netherlands

Findings Business Models, Thaleia Konstantinou, TU Delft, The Netherlands

Lessons for the IEA EBC Annex 75, Zeno Winkels, Climate-KIC/ TU Delft, The Netherlands

Lessons for the Netherlands Enterprise Agency, Daniel Van Rijn, RVO, The Netherlands

17:30 Closure
More information?
http://www.triple-a-interreg.eu/

+31 628 616 419
E.mlecnik(at)tudelft.nl
TU Delft, P.O. Box 5043, 2600 GA Delft, Nederland

Triple-A is funded by the European Interreg 2 Seas programme and co-financed by the European Regional Development Fund (ERFD) under grant agreement No 2S02-029 (for the period December 2016 – December 2020). Also the Province of South-Holland and the Belgian Province of West Flanders are offering financial support. The sole responsibility for the content of this presentation lies with the authors. It does not necessarily reflect the opinion of the European Union. Neither the Interreg 2 Seas Programme nor the European Commission are responsible for any use that may be made of the information contained therein.
The IEA-EBC programma

Importance for the Netherlands

Daniël van Rijn
Netherlands Enterprise Agency
International Energy Agency

Founded in 1974

Originally
To help countries co-ordinate a collective response to major disruptions in the supply of oil.

Nowadays
• Environmental Awareness
• Energy Security
• Economic Development
• Engagement Worldwide
IEA Technological Collaboration Programmes (TCP’s)

Independed bodies within the framework of the IEA

TCP’s relevant for the Build environment:

• Energy Buildings and Communities (EBC)
• Solar Heating and Cooling (SHC)
• Heat Pump Technology (HPT)
• Demand Site Management (DSM)
• Smart Energy systems (ISGAN)
• Photovoltaic power systems
• Energy Storage (ECES)
• ....
Energy Buildings and communities (EBC)

- Founded in 1977
- 24 member countries
- 16 ongoing annexes
- 2 working groups
- Last meeting: annex nr. 80!
EBC Strategic plan

High Priority Research Themes

• Integrated planning and building design
• Building energy systems
• Building envelope
• Community scale methods
• Real building energy use

www.iea-ebc.org
Dutch Built environment
Building stock

- 570 million m2 utility buildings
- 7.7 million houses
- 40% rowhouses
- 32% multi storage buildings
- 60% build between 1946 - 1992
- 30% social housing

93% of Dutch households have an individual heating system (gas boilers)
Dutch Climate agreement

• Over 100 organizations involved to set agenda for policies to reduce CO2 emissions by 49% in 2030

• Heat in built environment:
  - Reduce use of natural gas
  - Energy efficiency
  - Heat pumps
  - District heating (geothermal, biomass, surface water etc.)

• 2030: 1,5 million houses free of natural gas
• 2050: build environment is CO2-neutral
Stimulation knowledge, innovation and market conditions

- Cheaper
- More quality
- Much higher labour productivity

*Integrated approach on building and neighbourhood level (technical and proces)*

*Industrialisation and use of ICT*

*It’s about people in their homes*
Programmes

• Mission Oriented Knowledge and Innovation agenda
• Pilots and demonstrations
• Programme for neighbourhoods ‘free of natural gas’
• Activities to create better market conditions
Thank you

Greatings from Holland

Ir. Daniël van Rijn
Netherlands Enterprise Agency
daniel.vanrijn@rvo.nl
IEA EBC Annex 75
Cost-Effective Building Renovation at District Level Combining Energy Efficiency & Renewables

13 countries are involved in the project:
AT, BE, CH, CN, CZ, DK, ES, GE, IT, NL, NO, PT, SE

January 2018 – June 2022

Manuela Almeida (Operating Agent)
University of Minho
Portugal

Workshop on Upscaling energy renovation to the district level
Delft, The Netherlands
25th September 2019
In existing buildings, the most cost-effective renovation solution is often a combination of energy efficiency measures and carbon emissions reduction measures.

So, it is relevant to investigate where is the balance point between these two types of measures in a cost/benefit perspective.

Questions?

• How to achieve the best performance with minimal effort?
• How far is possible to go with energy efficiency measures (initially often less expensive measures)
• From which point the carbon emissions reduction measures become more economical
2. Project Idea

Key question: Where is the balance point between energy efficiency measures and measures that promote the use of renewable energy?

Annex 56: At the building level

Annex 75: At the level of groups of buildings / urban districts
2. Project Idea

- At **district level** there are **specific opportunities** as well as **specific challenges** when compared to building level.

- **Finding the balance** between renewable energy supplies and energy efficiency measures for the renovation of the existing stock is **more complex at district level** than for individual buildings, but **may also bring larger benefits**.
There are several options available that need to be explored:

**Exemples:**

- We can benefit from significant **economies of scale for energy efficiency measures due to aggregated demands and synergies** in construction procurement, processes and planning;
  The provision of low-temperature district heating systems to groups of buildings may benefit from synergies when combined with energy efficiency measures applied to the buildings envelopes.

- There is also an opportunity to **benefit from centralized renewable energy approaches**;
  The availability of heat storage facilities that in a single building intervention is limited to the building floor space, at district level the options are wider.
However, there are also some challenges:

- At the level of individual buildings, synergies between energy efficiency measures and installation of renewable energy systems can be easily achieved but, at district level such synergies are not necessarily available as they depend on the existing heating systems and on the synchronization of the buildings’ renovation cycles.

In this context, it is important to explore the potential of cost-effective renovation interventions at district level to accelerate the necessary transition towards low-emissions and low-energy districts.
In Annex 75:

• A flexible methodology will be created, supported by efficient tools, to identify cost-effective strategies for renovating urban districts to significantly reduce carbon emissions and energy use.

• The methodology is being supplemented by the identification and documentation of good practice examples showing strategies for transforming existing urban districts into low-energy and low-emissions districts.

• Guidelines for policy makers and energy-related companies on how to encourage the market uptake of cost-effective strategies combining energy efficiency measures and renewable energy measures will be produced.

• Guidelines for building owners and investors about cost-effective district-level solutions are also going to be produced.

http://annex75.iea-ebc.org/
4. Annex 75 Scope

Annex 75 Scope:

- Residential buildings
  Single-family houses and multi-family buildings

- Non residential buildings
  without complex technical systems
5. Target Audience

• **Policy makers and staff from city administrations** (energy, urban planning, utilities)

• **Local and regional energy companies, utilities, construction and installing companies** and contractors, architects, engineers, multipliers and promoters

• **Building owners**, in particular **building owner associations** and professional building owners
6. Research Structure

Annex 75 Structure:

The project is organized in four Subtasks as follows:

- **Subtask A:** Technology Overview
- **Subtask B:** Optimization Methodology and Strategy Development
- **Subtask C:** Case Studies
- **Subtask D:** Policy Instruments, Business Models, Stakeholder Dialogue, and Dissemination
7. Annex 75 Reports

- **Report on Technology Overview**
- **Methodology Report** on cost-efficient building renovation at district level
- **Assessment tools**
- Report on the application of the methodology in generic districts
- Report on strategy development
- Report on parametric assessments of case studies
- Online documentation of **good practice examples**
- Report on **enabling factors and obstacles to replicate successful case studies**
- Good practice guidance: Guidance for transforming existing districts into low-energy and low-emission districts
- Report on **policy instruments, including recommendations for subsidy programmes and for encouraging market take-up**
- Report on **business models and models for stakeholder dialogue**
- **Guidelines** for policy makers and energy related companies on how to encourage the market take-up of cost-effective strategies combining energy efficiency measures and renewable energy measures
- **Guidelines** for building owners/investors about cost-effective renovation strategies, including district-based solutions
8. Work Developed

Technology Overview

<table>
<thead>
<tr>
<th>Identification of Technologies</th>
<th>Characterization of Technologies</th>
<th>Identification of obstacles, interdependencies and success factors</th>
<th>Future Developments</th>
</tr>
</thead>
</table>

IEA EBC ANNEX 75

WORK IN PROGRESS: November 2016

Technology Overview

Subtask A - Work Package A1

Summary

The objective of Work Package A1 is the identification of existing and emerging technology options in both end-use and systems use at both a building and urban scale. This document reports on work developed through collection of technologies with the potential to be included in the methodology for the participants of the research project.

Work in Progress consists of a series of documents presenting on-going work being developed in the context of the Annex 75 research project.

Prepared by: [Names]

Figure 16: Tulliallan District Heating, 27,000 m² solar panels and 10,000 m³ water. The facility will satisfy approximately 46% of the total heating needs of the 3,300 individual householders.

Main characteristics:
- Solar collectors combined with a large water storage, boiler.
- Heat storage.
- If solar heat is used in combination with combined heat and power production (CHP), the flexibility of the storage for electricity production in a system dominated by wind power could be installed.
- The solution is resilient in climates dominated by heating with a seasonal variation in sunshine levels and temperatures.

Advantages and disadvantages:
- The solution is resilient in climates dominated by heating with a seasonal variation in sunshine levels and temperatures.
- The flexibility of the storage for electricity production in a system dominated by wind power could be installed.

Reference:
- “Solar Water Heating Project Analysis”, [Source].

Future Developments

- [Details on future developments.]

Energy system - Storage

Solar district heating

Järjestö Nimi, [Location], Germany

Description:
Large-scale solar panels arranged connected to a solar hot water basin. During summer, the solar panels heat the water in the basin to approximately 90°C and during winter, the stored energy supplies the district heating. Systems with additional heat generating capacity to ensure that all of the consumers heating needs are met, even when there is insufficient sunshine.
8. Work Developed

Methodology

Methodological guidelines and framework conditions
8. Work Developed

Cases Studies and Success Stories

Case Study - Santa Tecla neighbourhood, Braga

- building typology:

- year:

- no. of buildings: 8
- total heated floor area: 3925 m²
- reno impl

Furuset, Oslo

- building typology:

- no. of buildings:
- total heated floor area: 260 0

Kildeparken, Aalborg

- building typology (no. of dwellings):

- number of dwellings (after renovation):

<table>
<thead>
<tr>
<th>Before</th>
<th>After</th>
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</thead>
<tbody>
<tr>
<td>- no. of dwellings [-]</td>
<td>942</td>
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<tr>
<td>- total heated floor area [m²]</td>
<td>96,000</td>
</tr>
</tbody>
</table>

- renovation measures already carried out
- renovation in progress
- implementation period: 2014 - 2020
8. Work Developed

Dissemination

- Published articles

http://annex75.iea-ebc.org/

Workshops

Periodical

Annex 75 Newsletters
8. Work Developed

Dissemination

http://annex75.iea-ebc.org/

linkedin.com/company/ebc-annex-75-project/

facebook.com/ebcannex75

twitter.com/iea_abc_annex75
Thank you for your attention!

Manuela Almeida
malmeida@civil.uminho.pt
University of Minho, Civil Engineering Department, Portugal
HOW TO OPERATE AMSTERDAM ON CLEAN ENERGY?

Tess Blom - 25.09.19
THE CITY-ZEN APPROACH for urban energy transitions

Step 1: Energy Analysis (mapping the technical geographical present)

Step 2: Present planning and trend (mapping the near future for energy plans)

Step 3: Society & stakeholder analysis (mapping the political-legal-social-economic climate)

Step 4: Scenarios for the future (defining external influencing variables)

Step 5: Energy vision with targets and guiding principles (from book of inspiration & catalogue of measures)

Step 6: Roadmap with energy strategies and actions (by means of the Catalogue of Measures)
ENERGY TRANSITION ROADMAP AMSTERDAM

Gemeente Amsterdam + 2 voorbeeld wijken

Slotermeer

Brouwerskruis (city Centre)
CURRENT DHN

[City of Amsterdam, 2017]
ENERGY DEMAND AND ENERGY USE

Energy use

- Electricity: 13.3 PJ
- Gas: 15.6 PJ
- Heat: 2.9 PJ

Business use: 10.5 PJ
Private: 2.9 PJ

Energy demand total

- Electricity: 16.2 PJ
- Heat: 25 PJ
ENERGY DEMAND AND ENERGY USE

[City of Amsterdam, 2017]

[www.pico.geodan.nl]
ENERGY POTENTIAL MAPPING

electricity potential ROOFS (PV)

[Boogert, et al., 2014]
ENERGY POTENTIAL MAPPING
waste heat from buildings: datacenters, hospitals etc.

[City of Amsterdam, 2018]
ENERGY POTENTIAL MAPPING
sustainable electricity

Current demand

Electricity potentials scenario
- waste incineration
- wind turbines (large)
- solar PV on roofs

Current demand vs. Electricity potentials scenario
ENERGY POTENTIAL MAPPING
sustainable high temperature heat (>70°C)

current demand & sustainable production

HT potential scenario

- woody biomass (trimmings)
- Diemer PP waste heat
- AEB waste heat
- deep geothermal
- solar thermal HT/MT
ENERGY POTENTIAL MAPPING
sustainable low temperature heat (<40°C)

current demand & sustainable production

Low & mid-temperature potentials

- Drinking water mains
- Sewage mains
- Surface water
- Road collector
- Waste heat (mixed functions)
- Solar thermal LT or pvT
LIMITATIONS & CONCLUSIONS

• Not enough potential for sustainable electricity → reduce demands

• Waste combustion not sustainable, circular economy → limited potential

• Deep geothermal can only replace natural gas and waste partially

• There is too little biogas potential to replace natural gas completely

→ Only use high temperature sources, where low temperature is no option

→ All new buildings energy neutral
ELECTRICITY DEMAND-SCENARIO AMSTERDAM

Electricity demand scenario Amsterdam

- 23 PJ
- 6250 GWh

- Current non-residential buildings
- New non-residential buildings
- Current residential buildings (user related)
- New residential buildings
- Electric vehicles
- Electric heat pumps

+/− 16 PJ / 4500 GWh
% HEATING TEMPERATURE LEVELS

- Low-temperature
- Mid-temperature
- High-temperature

A: 2%
B: 12%
C: 30%
D: 24%
E: 22%
F: 8%
G: 2%
SHIFT IN ENERGY LABELS AND TEMPERATURE LEVELS

Now

2040

Low-temperature

10 %

+ 28 %

38 %

Mid-temperature

55 %

38 %

High-temperature

35 %

24 %

300,000 Residential equivalents over a period of 22 years (13,500 Res. eq. / year)

110,000 Residential equivalents over a period of 22 years (5,000 Res. eq. / year)
TYPOLOGIES NEIGHBOURHOODS
TYPOLOGIES NEIGHBOURHOODS
TYPOLOGIES NEIGHBOURHOODS
TYPOLOGIES NEIGHBOURHOODS
TRANSFORMATION DHN
TRANSFORMATION DHN

AMSTERDAM DISTRICT HEAT NETWORK TRANSFORMATION

EXPAND DHN TO EXISTING BUILDINGS & (TEST) CONNECTION OF LOCAL SOURCES; 2 - (4)
TRANSFORMATION DHN
ENERGY TRANSITION ROADMAP AMSTERDAM

Centrum

Brouwerskruis (City Centre)
ENERGY TRANSITION CITY CENTRE

3 strategies:
1. Radical renovation to LT
2. HT/MT heat network
3. Green gas
ENERGY TRANSITION CITY CENTRE
warmtenet (HT) + E-neutral house boats

- Small renovations
- PV panels + PV tiles where possible
- HT DHN geothermal/residual heat
- Houseboats all-electric HP canal water
### Roadmap for Sustainable Heating of Amsterdam’s Existing Built Environment

<table>
<thead>
<tr>
<th>Year</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
<th>2035</th>
<th>2040</th>
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<tbody>
<tr>
<td><strong>Expand HT &amp; MT district heat network (DHW)</strong> with 26,000 res. eq. /year</td>
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<tr>
<td>From current 85,000 res. eq. now up to 400,000 HT DHW connections in 2030</td>
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<td><strong>Increase HT waste heat - 0.5 to 4.7%/year</strong></td>
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<td>High temperature waste heat from incineration</td>
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<td><strong>Reduce to 1.5%/year</strong></td>
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<tr>
<td>Only non-renewable waste is incinerated, from 2030 no more waste from fossil-based electricity production</td>
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<td><strong>1 - 1.5 Pj</strong></td>
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<td>(Optional Carbon Capture Storage - CCS)</td>
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<td><strong>Current use</strong></td>
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<td>Only in case the acceleration of the transition is not up to speed</td>
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<td><strong>No heat of Co-generation</strong></td>
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<td>Stop the fossil-based electricity production (GROW@AM)</td>
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<td><strong>Test</strong></td>
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<tr>
<td>Build 2 doubles / year up to 3.5 Pj / year (total)</td>
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<tr>
<td>Arrange permits</td>
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<tr>
<td>High-temperature deep geothermal heat to replace industrial waste heat (from co-generation)</td>
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<td><strong>Test</strong></td>
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<tr>
<td>Facilitate 0.25 Pj/yr MT storage up to 2 Pj/yr</td>
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<tr>
<td>Underground</td>
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<tr>
<td>Underground high-temperature storage in deep aquifers</td>
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</table>

### Roadmap for Sustainable Electricity of Amsterdam’s Existing Built Environment

<table>
<thead>
<tr>
<th>Year</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
<th>2035</th>
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<tbody>
<tr>
<td><strong>Install 14 ha. of PV panels on roofs per year</strong></td>
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<tr>
<td>In total 290,000 PV panels installed per year</td>
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<td>Planning</td>
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<tr>
<td>Install 14 ha. of non-roof PV projects per year</td>
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<tr>
<td><strong>Arrange permits</strong></td>
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<tr>
<td>Install 5 - 15 MW-wind turbines per year</td>
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<td>up to 450 MW</td>
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<td>Including replacement of existing smaller turbines</td>
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<td><strong>1100 GWh/year</strong></td>
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<td>Reduce to 300 GWh/year</td>
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<td>Due to increase of circular waste treatment</td>
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<td><strong>Increase regional sustainable electricity import with 100 GWh/year</strong></td>
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<tr>
<td>Up to 200 GWh by 2030</td>
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</table>
IEA / Triple-A: District heat roll out and neighbourhood approach pilot Prinsenland / Het Lage Land

André de Groot, City of Rotterdam, Projectmanager City Development
aj.degroot@rotterdam.nl
+31(0)653331432
But first the context: Positioning the energy transition of Rotterdam for the built environment
1. Sustainability Compass: guidance and cross overs

By making smarter choices for measures to improve air quality the CO2 emissions will diminish.

The more we prevent Climate change the less cost we need to make for adaptation measures on the long run.

The energy transition is an important issue that also aims at more efficient use of natural resources.

Preventing heat stress diminishes the use of electricity for airco’s in summer.

Healthy living environment

Energy transition

Circular

Climate proof
2. Goal regarding future energy supply system

Clean, safe, reliable and affordable energy supply for everyone
3. District heating the promising source for the region

Regional transport to connect supply & demand

Local distribution to connect end-users
4. Cost efficiency map: district heat vs all electric
5. Heat transition: impact on housing stock

LESS ENERGY USE

CHANGE ENERGY USE to potential CO₂-free alternatives

CO₂ FREE ENERGY SUPPLY by replacing fossil based energy sources to CO₂-free alternatives
6. Rotterdam: from 263,000 gas connections to 0 (2050)

Different groups:
- Housing corporations
- Housing associations
- Privately rented houses
- Private homeowners

Also:
- Shops / business units
- Schools
- Municipal en societal buildings
- Monuments
- Etc.
7. Start 2018: 5 pilot neighbourhoods “to free of gas”

Neighbourhoods:
Reyerdijk/Reyeroord
Rozenburg
Pendrecht
Bospolder-Tussendijken
Prinsenland - Het Lage Land

Investigation:
Overschie
Schiebroek

Plan for / to 2030
7a How to transform to district heating?

Technique
What is possible? And needed?

Financial
What are the total costs of the scenarios?

Social
What do people think? What do people want?

Opportunity
How to make transition easier and add value?
7b Understanding the end user and impact for them

- **Incentive**
- **Reward**

**Temptations & rewards**

**Problematic**

- **Incentive Reward**
- **Temptations & rewards**
- **Barriers & blockades**

- **Remove**
- **Reduce**

**'Good'**

- **Incentive Reward**

**Gemeente Rotterdam**

**ROTTERDAM.**
**MAKE IT HAPPEN.**
8. Challenges

- Upfront costs, long payback period
- High risk at the start
- (innovative) Financing possibilities
- Communication and participation process
9. Road to success

Decision making process & regulation based on:

- Energy potential (*use what is available*)
- System efficiency (*create integrated energy system*)
- Cost efficiency (*look at total cost (building + system]*)

Inclusive transition:

- Housing corporations as launching partners
- Communication and citizen participation
- Transparency
- Share costs and benefits (*including social benefits*)
MAKE IT HAPPEN.
10. The integral approach in Prinsenland / Het Lage Land

Red lines: existing district heating infrastructure in surrounding neighbourhoods

Prinsenland / Het Land: natural gas heated
Characteristics Prinsenland / Het Lage Land

- 20,000 inhabitants
- Average Dutch residential areas
- Built in ‘60-’70’s
- (High rise) apartment blocks, terraced houses
- Ownership by housing corporations, also private home owners
- Unique for the world: area at -6 m below sea level!
5 urgent reasons to choose Prinsenland / Het Lage Land as a pilot

1. Housing corporation Woonstad plans to deep renovate their high rise appartement blocks (1,740 app.) and connect them district heating (2020 – 2025).

2. Housing corporation Havensteder: plans to deep renovate 518 houses in period 2020 – 2021, chance to anticipate for connection to district heat.

3. Sewenage system needs renewal in several neighbourhoods. Look for win-win to combine with installing pipe system for district heating.

4. Renewal existing pipes for natural gas as at hand in coming years. Installing district heating system in time can possibly prevent large societal costs in new natural gas pipes.

5. Prinsenland / Het Lage Land were already selected by Metropole Rotterdam / The Hague as pilots for an integral approach for transforming them to Next Generation Urban Areas (NGW).
Integral:
Connect Roadmap Next Economy (MRDH) to unleash the potential of selected urban areas for adapting “next solutions and opportunities”
Integral means also connected to the specific issues in neighbourhoods and issues of the residents.

Prinsenland & Het Lage Land 2030

INTEGRAL APPROACH

Energy  Climate Resilient  Living and Care  Social  Mobility

Digital
Prinsenland & Het Lage Land 2030

Research on suitable roll out heating system is on the go

Inclusive and together with the community

Climate adaptation measures

Aging and next care services

Next mobility concepts
Climathon 26 oct. 2018 with Climate-KIC: Public event as a start for inviting inhabitants to come their ideas of “Neighbourhood of the future”

Voor inwoners van Prinsenland en Het Lage Land: Denk en bouw mee aan de wijk waar je je thuis voelt!
Result:
5 arrangements with potential to be developed further by residents with support of public neighbourhood team

1. Local Energy Corporation, owned by citizens
2. The most sustainable playgarden for young and old
3. Creating friends gardens and stimulate contacts
4. Dealing with flooding, heavy rainfall & sewenage
5. Be social and do it together
Local Energy Corporation

Knowledge

I also want to be a member!

Union

"I am a member!"

Various roles

Promotion

Revenues

Re-invest
Arrangements mapped and presented to alderman / vice mayor Arno Bonte
The Living Lab Prinsenland / Het Land in short

Transition Paths Roadmap
Next Economy Metropol Rotterdam / The Hague

Integral approach on district themes

Connecting with energy and initiatives from residents and businesses

Citizens initiatives
1. Local Energy Cooperation
2. Most sustainable playgarden
3. Friends gardens & contacts
4. Flooding, rainfall, sewenage
5. Be social, do it together

Business initiatives (Green Business Club Rotterdam Alexander)
1. IBIS Power for Technical College
2. Circular waste management
3. Electric taxi services
4. Car sharing 2.0
5. Sustainable Business Zones
Throughout the year:
Using public events to stimulate residents to give their ideas for a better neighbourhood
Triple-A: stimulating energy effective retrofit of privately owned terraced houses

André de Groot / Oubbol Oung
(City of Rotterdam)
TRIPLE-A:
Awareness, easy Access & Adoption

Program period: 2017 - 2020
Total budget: € 5,3 mln. (60% EU)

Projectpartners:
TU-Delft (NL)
Rotterdam (NL)
Breda (NL)
Kent County Council (UK)
Antwerp (BE)
Mechelen (BE)
EOS Oostende (BE)
University of Ghent (BE)
Eandis / Fluvius (BE)
PSEE Picardie (FR)
• Supporting local authorities and regions by **developing tools** that strengthen their strategy

• **Stimulating** homeowners to retrofit their houses in a CO2-efficient way

• To develop **market offers** for retrofitting that help to speed up the market
Cooperation with observer partners and follower cities
Two focus areas

Prins-Alexander

IJsselmonde
The Triple-A approach: 4 lines of action

1: Making websites and webfunctions of local authorities more attractive for home owners

2: Introduce home energy monitoring-systems to give insight in energy use at home (HEMS)

3: To set up neighbourhood info and advice centers adviescentra (Pop ups)

4: Showing real life examples of retrofitting that were already realised (DEMO EXEMPLARS)

Targets for Rotterdam:
- 600 ton reduce CO2 per year
- 400 houses where measures were realised
Neighbourhood approach

Helping to developing the supply side and connection with regional SME’s

Preferred partner: independent regional info and advice center WoonWijzerWinkel
In onze showroom in Rotterdam kunt u zien én ervaren welke concepten en producten er zijn op het gebied van duurzaam wonen. Onze experts geven onafhankelijk en persoonlijk advies en helpen u tevens met het aanvragen van vrijblijvende offertes. U kunt ook online offertes aanvragen. Met ruim 300 WoonWijzerWinkel gecertificeerde bedrijven bent u verzekerd van kwaliteit tegen een scherpe prijs en wordt u ontzorgd met € 3.000,- WoonWijzerWinkel garantie op de werkzamehden!

- Showroom met compleet assortiment
- Objectief & deskundig advies
- Betrouwbare offertes en uitvoering

Open: Ma - Vrij | 9.00 - 17.00 uur, Za | Op themadagen - 9.00 - 13.00 uur
Gratis parkeren!
Different goals and take into account the different steps in the process of decision making of homeowners:

- Awareness
- Access to advice
- Access to measures
- Aid by execution
- Recognition (sharing experiences and willingness to take next steps)
Rotterdam website with functionalities developed under Triple-A
Succes stories

### Eengezins tussenwoning - Ommoord

Jeroen is een jonge man met een partner en een kind. Zij wonen in Ommoord, een wijk met veel houten huizen. Het huishouden bestaat uit een eengezinswoning uit 1979. De woning is gelegen aan het punt van een oude residentie. Het is een moeilijk gebouw, dat een lange tijd heeft gedurende verschillende jaren in de geschiedenis van de stad. Dit maakt het moeilijk voor de bewoners om de woning te onderhouden. Het is een kwestie van tijd dat het bijna verlaten is.

### Rotterdams energiebesparing

<table>
<thead>
<tr>
<th>Genoegen</th>
<th>Gedragsoverzicht,</th>
<th>Contact,</th>
<th>Partners</th>
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<tbody>
<tr>
<td>Gebruik</td>
<td>Gedragsoverzicht,</td>
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<tr>
<td>maatregelen</td>
<td>Gedragsoverzicht,</td>
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<tr>
<td>Energiebevordering</td>
<td>Gedragsoverzicht,</td>
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### Rotterdams energiebesparing

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25 september 2019

IEA / Triple-A meeting
Home Energy Monitoring/Management Systems (HEMS)

OP=OP actie:
Gratis energieverbruiksmanager voor woning eigenaren in Prins Alexander en IJsselmonde in Rotterdam

Wilt u duidelijkheid over uw energieverbruik?

Waarom deze actie?
In het kader van het Europees onderzoeksprogramma TRIPLE-A wordt gewerkt aan de beste manier om woning eigenaren per wijkbaagrijpelijk te
Home Energy Monitoring / Management Systems (HEMS)

Schrijf nu in; slechts vijf huishoudens worden uitgekozen!

In samenwerking met de gemeente Rotterdam mag de WoonWijkWinkel deze unieke winactie aanbieden aan vijf huishoudens in Rotterdam. Bij aankoop van een SolarWatt paneel ontvangt u 24 maanden een batterij opslag in bruikleen. Met deze batterij opslag kunt u volgens gebruik maken van de energie die de zonnepannelen overdag hebben opgewekt. De aanschaf van een batterij opslag van 2,4kWh kost normaal gesproken €5,000,-.

Wat moet u hiervoor doen?
Er zijn slechts drie voorwaarden aan deze actie verbonden:
1. De aanschaf van minimaal 8 SolarWatt panelen
3. Alleen huishoudens in Rotterdam komen in aanmerking.

Wij denken dat het accupakket zeker de teakor!
POP UP: Sustainability concept center IJsselmonde

Concept with wide scope:
- Energy saving measures
- District heat / free of natural gas
- Climate adaptation
- Water
- Green roofs
- Circular / Waste separation …

Several values:
- Livability of the neighbourhood
- Comfort of houses
- Sustainable lifestyles

In cooperation with partners:
WWW, VVE010, JINC, BWT, SB, MO, W&I

Duurzaamheidswinkel in Keizerswaard 80 IJsselmonde.
per 1 nov. 2018 open voor 1 jaar
→ Opening period extended with 1 year !!!
What to do in 2020?

- Reaching Triple-A program targets on the WP’s!
- Optimising local website, combining energy saving with other subjects
- Starting sustainability shops in other neighbourhoods, also on initiatives of citizens (not only in shops)
- Keep working on optimising supply side with observer partners
- Dissemination activities (MRDH, Province of South-Holland, etc.)
- Triple-A closing conference in december 2020 with next steps
Meer informatie over Triple-A

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- Of via een Triple-A project partner: contactgegevens in Triple-A brochure:

WWW.triple-a-interreg.eu

25 september 2019
IEA / Triple-A meeting
For more information, please contact:

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City of Rotterdam, Department of City Development  
Next Generation Urban Areas / Energy transition  
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+31 (0)6 53331432
Experiences regarding building renovation at district scale

Group renovation of owner-occupant’s houses in Mechelen

Ighor Van de Vyver – City of Mechelen

IEA EBC Annex 75 Workshop on Upscaling energy renovation to the district level
Delft, Wednesday 25.09.2019
Towards a decarbonising building stock in Flanders

• Ambition: decarbonised building stock by 2050
Challenges

- 95% of the Flemish houses do not meet this target
- Increase needed: renovation rate from 0.8% to 3% per year
- Estimated cost of approximately 40,000 to 150,000 € per in-depth energy renovation
nZEB district renovation to the rescue?
Energiesprong Countries

- Energiesprong Projects
- Projects inspired by Energiesprong

California  New York State

© Energiesprong.org
Barriers

• Energy savings: **Performance gap** makes it difficult to make a successful business case

• **Investment cost**: homeowners are difficult to convince to invest > 40,000 €

• Owner structure (**individual homeowners**) is a barrier for district renovation
Experiences in Flanders...

Group renovation in Leuven

- Neighbourhood with same building typology
- Renovation package based on this typology
- Result: Only one renovation...

City-zen Fuck-up Night, geleerde lessen #1: Klimaatneutraal worden begint bij de bewoners – maar ze gaven niet thuis

De Fuck-up Night in Aalst begon op 22 november '18 plaatsvindend, ter ondertekening van een beetje energievoorraad. De bewoners van Leuven, waaronder een reeks van drie verhalen over de geleerde lessen bij het maken van fouten. Lees, knui en doe er je voordeel mee; fouten die je niet meer hoeft te maken 😊

Klimaatneutraal begint bij de bewoners thuis – maar ze gaven niet thuis

Geert Vanhorebeek houdt zich bezig met het programma ‘Leuven klimaatneutraal in 2030’. Met als doel Leuven bewust te maken; vanuit het oog op duurzamheid gedrag. Het doel was een collectief renovatieproject te starten, waarin bewoners een rol spelen bij het uitvoeren van duurzame energiemaatregelen. Maar ook de bewoners van Leuven werden geïnspireerd om hun eigen woningen te renoveren. Het succes van het project was het resultaat van een samenwerkingsverband tussen de bewoners van Leuven.

Het proces: in 5 quotes...

1. “Uiteindelijk hebben we twee homogene wijken op een beeldervoor uitschakelen. In deze wijken hebben we goed uitgepakt, onder andere met een mobiel energieloos en renovatie begeleiders. Maar wat bleek in de homogene wijk, was geen sprake meer van gelijke woningen. Een groot gedeelte van de woningen waren alvast weer verbouwd. Zo zie je dat de praktijk vaak anders uitwijkt dat de theorie.”

© City-zen FP7, LKN2030
Esdoornplein

- Neighbourhood (street) in sub-urbs of Mechelen
- 44 single family homes
- Majority owner-occupied
- Building age < 1970 (1958)
- Row-houses, semi-detached

Awareness-raising campaigns revealed highly motivated citizens with interest in improving the energy efficiency of their home(s)

"Ons doel? Een klimaatneutrale wijk worden"

In het Esdoornplein, aan zijaant 44 woningen, namen bewoners en zijn hun buurt het voor- en opdracht om samen daaraan te bijwonen en het licht erop te plaatsen. De bewoners verwachten dat hun aandeel in het verbruik vrij snel op een niveau zal worden afgezwakt.

Bouw: "In 2015 kwam het idee voor om het wonen zoals in het Esdoornplein, als een basis voor het bouwen van een doeldeel voor een nieuw woningtype. De bouw is momenteel in volle gang en de woningen zullen in de toekomst worden ingezet als een model voor duurzame woningbouw."

Majority owner-occupied: "Het Esdoornplein is een voorbeeld van een wijk waarbij er veel aandacht wordt gegeven aan duurzaamheid en energielering. De bewoners zijn enthousiast over de mogelijkheden die dit biedt en zijn zien dat dit een positieve werking heeft op de energielering van hun woningen."

"De coach maakt ons het leven veel makkelijker"

"Dat onze woningen bijna identiek zijn, is handig voor onder meer verhuur- en koopvragen. Zo is de betekenis van de woninglijn niet alleen beperkt tot de woning zelf, maar heeft ook een grotere betekenis voor de omgeving."

"Het is belangrijk om te weten dat we een belangrijke rol spelen bij het behouden van onze woningen en de toekomst van ons dorp. Het is belangrijk om te blijven actief en samenwerken om het beste voor ons dorp te behalen."

"Dankzij de awareness-raising campaigns, hebben we een beter begrip van de energielering en de noodzaak om ons verantwoordelijk te richten op de energielering van onze woningen."

"De bewoners hebben een belangrijke rol te spelen bij het behouden van onze woningen en het behouden van de toekomst van ons dorp. Het is belangrijk om te blijven actief en samenwerken om het beste voor ons dorp te behalen."

"Het is belangrijk om te weten dat we een belangrijke rol spelen bij het behouden van onze woningen en de toekomst van ons dorp. Het is belangrijk om te blijven actief en samenwerken om het beste voor ons dorp te behalen."
Home renovation

- **Initially:** interest in **home improvement**
- Home-visits with free renovation advice ca. 10#, resulting in:
  - Roof insulation (4#)
  - LED-relighting
Group renovation

- **Next step:** group renovation
  - Ca. 10 households interested

- Neighbourhood subsidy
  - Financial support Mechelen Klimaatneutraal (3.750 €)
  - Neighbourhood initiatives for climate action

- NZEB-coach
  - System launched by DSO Fluvius (Eandis – Infrax)
  - Technical assistance for energy renovation measures
  - Grant: min. 10 households, €400 per household
Maar wat doet zo’n BENOvatiecoach precies?

**ADVIES**
Begin je best met een nieuwe condensatieketal, of met deisoleit? Wat je ook doet, start niet in het wilde weg maar vertrac van een duidelijke visie.

De BENOvatiecoach staat je bij voor het opstellen van jouw BENOvatieproject, om onaangename verrassingen te vermijden.

En vergeet niet dat er tal van onduidelijkheidsmaatregelen zijn: premies, subsidies, energieloven… ook hier kan de BENOvatiecoach je helpen.

**PLANNEN**
Wil je meer details over bepaalde werken? De BENOvatiecoach gaat voor jou op zoek naar offertes.

Let wel op: alle offertes zijn anders! Er zitten veel verschillen in de opmetingen, materieel, material, techniek… Samen met de BENOvatiecoach analyseer je de offertes, zodat je duidelijk weet wat er gedaan is, en vooral wat er niet inbegrepen is.

Nog niet overtuigd? Dan zoekt de BENOvatiecoach verder, tot je genoeg informatie hebt.

**UITVOERING**
Is de beslissing genomen? Ge je voor de uitvoering van één of meerdere energiebespaarding ingrepen? Super, gefeliciteerd! Je hebt net de juiste keuze gemaakt om jouw woning klaar te maken voor de toekomst!

Nu wordt het spannend: Zijn er duidelijke afspraken met de aannemer(s)? Worden de werken uitgevoerd zoals meegeschreven in de offertes? Is de materiaalkeuze correct? Zijn er zaken over het hoofd gezien? Worden er ‘onvoorziene meerwerk-’ uit de mouwen geschuurd? Dit moet tijdens de werken goed opgevolgd worden.

De BENOvatiecoach houdt contact met de aannemers, en bezoekt gereeld de werf. Zo blijft alles onder controle.

**PREMIES**
De werken zijn uitgevoerd, we kunnen opgelucht ademhalen. De factuur is betaald, alles is terug schoon gemaakt. Meer je hebt natuurlijk nog recht op een aantal premies!
Weer te beginnen? Welke premies zijn van toepassing? Hoeveel krijg je van je? Gaan paniek, ook hier zorgt de BENOvatiecoach ervoor dat de premiebedragen rechtstreeks op jouw rekening komen.
Wat is het effect van de energiebesparende maatregelen op uw EPC?

Plaatsen van spouw- en buitengevelisolatie en schrijnwerk
- Voor- en achtergevel van de "originele" woning
- $R_v = 2.35 \text{ m}^2\text{K}/\text{W} \text{ (spouw)} + 3.5 \text{ m}^2\text{K}/\text{W} \text{ (gevel)}$
- Schrijnwerk in PVC, 2+ kamers, $U_v = 1.1 \text{ W/m}^2\text{K}$
$\Rightarrow$ EPC 191 kWh/m$^2$jaar (-26%)

Huidige situatie:
- Zoldervloer geïsoleerd met 12 cm minerale wol
- Buitenschrijnwerk in PVC met dubbel glas
- Geen gevelisolatie
- Verwarming en SWW met condenserende HR Top ketel
$\Rightarrow$ EPC 259 kWh/m$^2$jaar
Analyse van de offertes

**Spouwmuurisolatie**
- Prijzen variëren sterk per aannemer
  - 17-19€/m²
  - ~22€/m²
  - 29 €/m²
  - 24-38€/m²
- Voor sommige woningen is afbakening nodig

**Gevelisolatie buitenzijde**
- Prijzen per aannemer zijn zeer uiteenlopend
  - Incl/Excl dakafwerking
  - Incl/Excl blauwe hardsteen
  - Incl/Excl beschermingslaag
- Invloed van het aanbrengen van isolatie is 1500-2000€
  (bij rijwoningen)

**700 – 1400 €**
Rijwoning – voor- en achtergevel

**3500 – 5000 €**
Rijwoning – voor- en achtergevel, geen isolatie

* Prijzen zijn indicatief
Results

• 17 participants out of 44 households
• Measures: cavity wall insulation (#13), external insulation with ETICS (#7), high performance glazing (#5), attic floor insulation
• 6 out of 17 required a building permit
Triple-A
Awareness • Access • Adoption
European Regional Development Fund
Expected impact

CO₂ savings per energy measure [tCO₂e/y]

<table>
<thead>
<tr>
<th>CO₂ savings per measure</th>
<th>Average</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cavity wall insulation</td>
<td>0.51 tCO₂e/y</td>
<td>0.162 tCO₂e/y</td>
<td>1.638 tCO₂e/y</td>
<td>8.64 tCO₂e/y</td>
</tr>
<tr>
<td>Exterior wall insulation</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Double glazing</td>
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<td></td>
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<tr>
<td>Roof insulation</td>
<td></td>
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</tbody>
</table>
Support from the local authority

- Information and advice
  - Info-sessions
  - Mobile pop-up
  - Home-visits with technical advice and thermograph

- Financial support
  - Neighborhood initiatives (€3 750)
  - Energy loan 1% (for 4 households)

- Technical support
  - NZEB-coach
  - Building permit
Conclusions

- **More than one third** of the inhabitants participated in the project (>33% compared to renovation rate 3%)
- Reflections
  - Renovation rate: only captures building permits
  - No deep renovation => but increased chance to engage homeowners => do not only focus on deep renovation
  - Same building typology (BUT: nice-to-have or must-have?)
- Success factors
  - Highly motivated citizens with good group dynamic
  - Client-focused NZEB-coach
  - Facilitation from local authority
- Building further on the success factors...
Integrated approach: supporting the whole customer journey
Integrated approach: Towards a one-stop-shop
Group approach: empowering neighbourhoods + collective support
Thank you

• Ir. Arch. Ighor Van de Vyver
• Projectcoördinator Triple A
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• E ighor.vandevyver@mechelen.be
• W www.mechelenklimaatneutraal.be | http://www.triple-a-interreg.eu/
The role of ESCO’s in large scale renovation

Factor4, Johan Coolen
Delft, September 27th 2019
Agenda

• Factor4
• EPC why
• EPC how
• EPC further improvements
  – Quality standards
  – Residual value
  – Circular materials
• **Building Performance Consultants**
  – Since 2006
  – 10 senior experts, Belgium

• **Scope**: improve building performance of existing buildings:
  – Energy
  – Maintenance
  – Comfort
  – Circular materials

• **Approach**: performance based implementation via energy performance contracts (‘EPC’)
  – Facilitator of EPC contracts: public sector
  – ESCO in private sector (SMEs)
EPC why?

Energy audit → Engineering → Construction → Maintenance

- What now? Correct?
- Carry audit again? Independency?
- Control? Aftercare? Financing?
- Preventive maintenance? Control? Aftercare?

Cost inefficient and only small part of energy saving potential realised...
ESCO

Energy saving %

Residual value

Comfortscore

Circular materials

Fix renumeration investment & maintenance

Bonus-malus

Building

Source: Factor4, 2019
## Two types of performance based contracts

<table>
<thead>
<tr>
<th>Name</th>
<th>ESCO guarantees...</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EPC</strong></td>
<td><strong>...energy saving%</strong> e.g. 35% energy cost saving</td>
<td>EPC-contract 9 municipal buildings (44,000 m², energy cost 520k€/year) of City of Sint-Niklaas</td>
</tr>
<tr>
<td>Energy performance contract</td>
<td></td>
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<tr>
<td><strong>ESC</strong></td>
<td><strong>... fix price per unit supplied energy</strong> e.g. fix price per unit supplied thermal power ($MW_{heat}$) and heat ($MWh_{heat}$)</td>
<td>ESC contract 24 MW district heating plant of University campus VUB in Brussels</td>
</tr>
</tbody>
</table>
Easiness of application of performance-based contracts in case of ‘energy renovation on the district level ‘?

<table>
<thead>
<tr>
<th>EPC guaranteed saving on heating, cooling and/or electricity</th>
<th>Residential buildings</th>
<th>Non-residential buildings</th>
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</thead>
<tbody>
<tr>
<td>Points of attention:</td>
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</tr>
<tr>
<td>• Limit transaction costs -&gt; many decision makers (unless housing corporation)</td>
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<tr>
<td>• How to control/influence energy consumption behaviour of building users?</td>
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<tr>
<td>Big market potential!</td>
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ESC supply of heat, cooling and electricity

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<td>🌿 🌿 🌿</td>
</tr>
</tbody>
</table>
Compared to conventional contracting:

- Up to **3x more energy saving** per € investment thanks to performance based contracting
- Up to **2x less facilitation costs**, internal staff and external consultant/engineer

-> and significant further improvements are possible!
Main objectives QualitEE:

• Development of quality assurance standards of EPC
  – Technical Quality
  – Financial Quality
• Increased trust in EPC by clients and financers
• Easier financing and more EPC-projects

More info: www.qualitee.eu/be
9 Technical quality assurance criteria of EPC-projects

<table>
<thead>
<tr>
<th>QC-1</th>
<th>Adequate analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>QC-2</td>
<td>Quality of implementation of technical EE improvement measures</td>
</tr>
<tr>
<td>QC-3</td>
<td>Savings guarantee</td>
</tr>
<tr>
<td>QC-4</td>
<td>Verification of energy savings (M&amp;V)</td>
</tr>
<tr>
<td>QC-5</td>
<td>Value retention and maintenance</td>
</tr>
<tr>
<td>QC-6</td>
<td>Communication between the EES provider and the client</td>
</tr>
<tr>
<td>QC-7</td>
<td>Compliance with users’ comfort requirements</td>
</tr>
<tr>
<td>QC-8</td>
<td>Information and motivation of users</td>
</tr>
<tr>
<td>QC-9</td>
<td>Comprehensible contractual stipulations</td>
</tr>
</tbody>
</table>

-> verified via 38 assessment criteria

The problem:

• EPC-projects until now: only ±27% energy saving...
• Mainly technical measures (HVAC, lighting,...), almost no insulation measures

ישון, insulation measures are crucial for realising climate neutral buildings...

The solution:

• Create incentive for ESCO for proposing measures with lifespan of 30 years

❓ but how to do it within a reasonable contract duration, ie ± 10 years?
### Conditie 3

**56105 CV-leidingen onderstation**

<table>
<thead>
<tr>
<th>Understation</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>K2GV01</td>
<td>Verval tussen 50%-75% van de levensduur</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ernst</th>
<th>Intensiteit</th>
<th>Omvang</th>
<th>Conditie</th>
<th>Risico/prioriteit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gering</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>Gebruik en bedrijfsproces - matig effect</td>
</tr>
</tbody>
</table>

**Activiteit:**

<table>
<thead>
<tr>
<th>Year</th>
<th>Activity</th>
<th>Volume</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>Herstellen</td>
<td>80,00 m³</td>
<td>€ 1,000</td>
</tr>
</tbody>
</table>

Enige tekenen van corrosie geconstateerd, niet ernstig, incidenteel.

---

### Conditie 2

**56101 CV-expansievat voorschakelvat**

<table>
<thead>
<tr>
<th>Understation</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>K2GV02</td>
<td>Verval tussen 75%-87,5% van de levensduur</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ernst</th>
<th>Intensiteit</th>
<th>Omvang</th>
<th>Conditie</th>
<th>Risico/prioriteit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gering</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>Gebruik en bedrijfsproces - matig effect</td>
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</tbody>
</table>

**Activiteit:**

<table>
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<tr>
<th>Year</th>
<th>Activity</th>
<th>Volume</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2026</td>
<td>vervangen expansievat</td>
<td>1,00 st</td>
<td>€ 2,050</td>
</tr>
</tbody>
</table>
ESCO guarantees ‘Residual value’ at the end of the contract:

- Measured via standard ‘NEN 2767’
- Proper maintenance and long life-span measures guaranteed
- ESCO motivated to take long-term measures (e.g., insulation)

EPC further improvements: residual value

Change of residual value by ESCO (€)

Year
Performance criterium: **environmental impact** of elements installed (e.g. pump, boiler, insulation material,...) =

- **Environmental cost** of materials during production
- **Demontability, reusability** and **recyclability** of elements
I HAVE A LOT OF QUESTIONS.
Factor4, Johan Coolen
Email: johan.coolen@factor4.eu
Mobile: 00-32-494-729795
Website: www.factor4.eu
Office: Antwerp, Belgium
Business Model, Political Instruments and Stakeholder Dialogue

Refurbishment on district level with simple owner structure

by taking the example of Salzburg city

DI Patrick Lüftenegger
Institute for spatial planning and housing
City of Salzburg, Austria

patrick.lueftenegger@salzburg.gv.at
SIR - Salzburger Institut für Raumordnung und Wohnen
institute for spatial planning and housing

Consultant for all municipalities in the political district of Salzburg

- research, surveys, frame conditions
- information work, shaping of political ideas
- implementation of demonstration projects
For city of Salzburg we developed a Smart City Masterplan

Important parts are: refurbishment strategy and energy in urban planning process
Refurbishment strategy on basis of „Smart City Masterplan“

energy consumption, owner structure, age of building stock,…
...located district: Goethesiedlung

20 buildings, 1000 units, built in 1960/70

Shop, bank, cafe, kindergarten,…

Site owned by the city of Salzburg

Buildings owned by 3 social housing companies

District heat owned by the energy supplying company
...to whom shall we talk to

**Residents**: you have to pay more rent and will live on a construction site

**Building owner**: you’ll have to invest a huge amount of money to protect the environment

**Energy supplying company**: we will need just half amount of your district heat in the future because of reducing the energy consumption

**Policy makers**: we’ve planned a refurbishment nobody asked for but it’s good for the environment
...develop a refurbishment concept which offers some more

1. step: is the easiest

Find other reasons for refurbishment, create co-benefits and then find the right persons to talk to...
Ecology: How can climate goals be fulfilled?

2. step: not so easy

Development of scenarios depends from calculation models and used benchmarks (system boundaries, conversion factors, reference value e.g. per m² or per capita, …)
Economy: How can comprehensive concepts be financed?

3 step: makes it not easier

Economic consideration is also influenced by the calculation model and the circumstances (condition of the building stock, lifecycles of components) and there is the dilemma that the one that invests is often not the one who benefits

Who has to pay for what? Example of a district development fond

8,0 Mio €
EVB-Erhöhung um 0,40€/m²

7,5 Mio €
Wohnraumschaffung

7,3 Mio €
Ergänzende Förderungen von Bund, Land und Stadt

22,8 Mio €
Sanierungsmaßnahmen

eingesparte Energiekosten:
Ca. 3,9 Mio €
4. step – now it’s getting really difficult

Different points of view of the different stakeholders (property owners, energy supplying company, city, residents) and their individual situation can block the ideal solutions (because against personal plans, business models,…)

When process starts, a lot of parallel activities
- Stakeholder process
- Planning process
- Public participation process

important

Process design, communication structure, overall coordination
...important

**for district refurbishment in general**: what are the triggers to get district refurbishment going (co-benefits like elevator and balcony on single building level)

**for Annex**: arrange agreement on calculation model (based on optimum ecologic scenarios, costs are very different and depend on business model)

**for workshop “business model”**: what do stakeholders need to initiate a renovation, who has to pay for what, how to gain money

**for workshop “policy instruments”**: which instruments help to initiate renovation
Integral team works iterative
Who is the customer and what is the problem?

Home owner

How can I...
Behavioral psychological effect
"People are only willing to listen to a solution if it is financially feasible."
Customer journey | 6 steps to energy-neutral refurbished home

1: Personal interview
2: Free refurbishment plan
3: Measuring on location
4: Quotation and financing
5: Execution
6: Monitoring and maintenance
Types of home owners

- Private owner / occupant
- Home owners association
- Social housing corporation
- Private landlord
- Institutional real estate investor

Potential energy sources

- All-electric
- Hydrogen
- Bio-gas
- District heating
- Geo thermal

All individual situations with unique business cases and services
Market situation as - is

• Prices are rising in the construction and installer sector
• Prefab manufacturers have/had focus on new houses
• Traditional offering based on transactions
• Not prepared for a mainstream service model
• Consultants advice but don’t take responsibility
What we do different

• Home owners receive complete integrated retrofit plan
• Investment and periodic costs in one proposal
• System guarantee for 30 years
• One-stop-shop for logistics, production and waste flows
• Flexible and scalable value chain
• Home owners are ‘in control’
(not for) Profit model

- Knowledge institute and innovation
- Central facilities
- Risk fund
- Construction team
- Recruitment and training of staff
- Technical & financial plan check
- Energy counter
- Coordination with municipalities
- Management and automation

Profit for execution

Manufacturers

Housing costs

Profits for execution

Profits for execution

Housing costs

Profits for execution
**Real situation | 1.600 m³ gas | 2.700 kWh electricity**

<table>
<thead>
<tr>
<th>Housing costs</th>
<th>now:</th>
<th>afterwards:</th>
</tr>
</thead>
<tbody>
<tr>
<td>maintenance costs</td>
<td>€ 160,64</td>
<td>€ 321,86</td>
</tr>
<tr>
<td>raise for actual roof renovation</td>
<td>€ 8,68</td>
<td>-</td>
</tr>
<tr>
<td>maintenance / replacement installation</td>
<td>€ 20,36</td>
<td>-</td>
</tr>
<tr>
<td>gas consumption</td>
<td>€ 84,00</td>
<td>-</td>
</tr>
<tr>
<td>transportation costs for gas</td>
<td>€ 15,50</td>
<td>-</td>
</tr>
<tr>
<td>electricity consumption</td>
<td>€ 45,00</td>
<td>€ 11,58</td>
</tr>
<tr>
<td>transportation costs for electricity</td>
<td>€ 19,75</td>
<td>€ 19,75</td>
</tr>
<tr>
<td>energy tax reduction</td>
<td>€ -31,11</td>
<td>€ -31,11</td>
</tr>
<tr>
<td>financial tax reduction</td>
<td>-</td>
<td>€ -44,59</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>€ 322,82</td>
<td>€ 277,49</td>
</tr>
</tbody>
</table>
Home owners
- Privately owned, Social housing, HOA, Investor

Governement
- Conditions to achieve CO$_2$ goals
- Energy poverty
- Market failure in the construction, installation and financial sector

Businesses
- New customers
- Logistics
'Goals are only achieved with an integral approach that provides both homeowners with expert support and financing tools and takes care of it with an excellent offer.'
Annex 75 | Cost-effective Building Renovation at District Level Combining Energy Efficiency & Renewables

Subtask D: Policy Instruments, Stakeholder Dialogue, and Dissemination
Break-out Session 2: Discussion on Business Models for energy-efficiency renovations

Subtask D: Policy Instruments, Stakeholder Dialogue, and Dissemination
Barriers to renovation identified by the BPIE survey "European buildings under the microscope."

*Figure from: BPIE, 2011*
Cost-effective **Building Renovation at District Level**
Combining **Energy Efficiency & Renewables**

- Refurbishment
  - Building/complex level

- Business Models

- Renewable energy
- District heating
- Energy management

- Financing

- Stakeholders
Cost-effective **Building Renovation at District Level**
Combining **Energy Efficiency & Renewables**

Refurbishment
Building/complex level

- Value creation system
- Value proposition / Offering
- Revenue model

Renewable energy
District heating
Energy management
Catalogue of BM
- Literature
- Identify stakeholder
- Motivation/values
- Barriers to district level

Best practice example
On district level
- Analyse best practice example from STC
- Classify examples to the BM catalogues
- Identify how barriers were overcome

BM for case studies
- Exemplify the process for business model development
- Workshops/Interviews of main stakeholders

Recommendations for stakeholders dialogue
<table>
<thead>
<tr>
<th>Values proposition</th>
<th>Costumer relation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Traditional/atomised market model</strong></td>
<td>Dedicated personal assistance.</td>
</tr>
<tr>
<td>energy cost savings, Single measures focus</td>
<td>Finance is arranged via third party with little involvement in the retrofit process</td>
</tr>
<tr>
<td><strong>Market intermediation model</strong></td>
<td>One point of contract for sales, typically by an intermediary. Additional interface for finance</td>
</tr>
<tr>
<td>energy cost savings, Single measures focus</td>
<td></td>
</tr>
<tr>
<td><strong>One-stop-shop</strong></td>
<td>One point of contract for sales of the full retrofit package</td>
</tr>
<tr>
<td>energy cost savings and home improvement</td>
<td>Finance may be provided and arranged by the retrofit provider,</td>
</tr>
<tr>
<td>Multiple Measures or comprehensive retrofit</td>
<td></td>
</tr>
<tr>
<td><strong>Energy services agreement (ESA)</strong></td>
<td>ESPC/ESA structure to fund retrofits. Lender captures energy savings and charges back to property owner</td>
</tr>
<tr>
<td>Multiple Measures or comprehensive retrofit.</td>
<td></td>
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<tr>
<td>Emphasis on energy services of temperature and hot water volume. Home improvement and comfort Energy savings performance contract (ESPC)</td>
<td></td>
</tr>
<tr>
<td><strong>Revolving fund 'Gebouwgebonden financiering' (GGF)</strong></td>
<td>Special Purpose Vehicle (SPV) receive new investment funds from different sources and to invest these in energy efficiency and low carbon measures in households</td>
</tr>
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Recommendations
for stakeholders dialogue
Aim

• To get an overview on existing stakeholders structures in the countries/regions/cities of the participants

• To reflect on barriers to upscale energy renovation to the district level.
Round 1: 15.30-16.15

Stakeholder motivations and barriers to engage in district renovation business models

Round 2: 16.15-17.00

How to solve main barriers for business model development (financial mechanisms, supporting policy,..).
Round 1: 15.30-16.15

A. Distribute main stakeholders to the Actor Analysis Triangle
Actor Analysis Triangle

Policy
Public

Civic
Demand

Private
Supply
Round 1: 15.30-16.15

A. Distribute main stakeholders to the Actor Analysis Triangle
   • Where do you identify your role within those stakeholders

B. Write in **post-its** motivations for building and district renovation, with whatever they think is relevant
   • Distribute the post its according to actors
Round 2: 16.15-17.00

- Make smaller groups around the 3 Business Models archetypes

One-stop-shop

Energy Service Agreement

Financing schemes, such as revolving fund
<table>
<thead>
<tr>
<th>Model</th>
<th>Values proposition</th>
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</tbody>
</table>
Round 2: 16.15-17.00

- Make 3 smaller groups around the 3 BM archetypes
- Think from the perspective of the municipality and discuss how to implement those models
- Answer the following question

Which are the main stakeholder involved?

Main motivation/value for them

What are the barriers/bottlenecks for those models to district?

How the BM help to overcome those
Break-out Session 2: Discussion on Business Models for energy-efficiency renovations

Subtask D: Policy Instruments, Stakeholder Dialogue, and Dissemination
What do you think is the most effective way to move an unwilling donkey?

A. hitting the donkey with a whip
B. holding a carrot in front of the donkey
C. a dog barking at the donkey
D. turn the donkey's head to make it see other donkeys are moving

Votes:
- A: 3
- B: 9
- C: 3
- D: 17
What do you think are the most important stakeholders we need to activate to achieve sustainable housing?

- Policy actors: 9
- Suppliers: 2
- Residents: 21