NEPBC

www.nepbc.be

FWO-SBO-project S009617N 2017-2021
Next generation building energy assessment methods towards a carbon neutral building stock (NEPBC)

Slotevent 27 oktober 2021

Welkom en opening

Prof. Arnold Janssens, UGent

GHENT UNIVERSITY

KU LEUVEN

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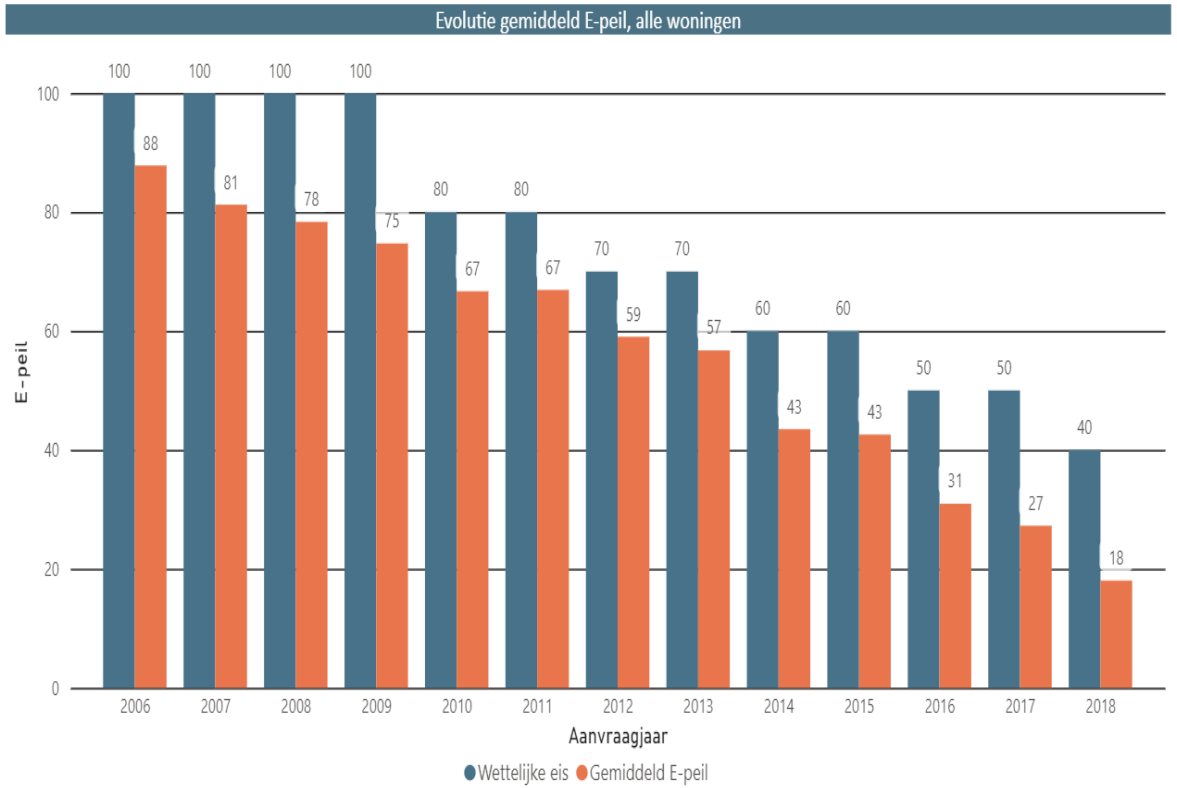
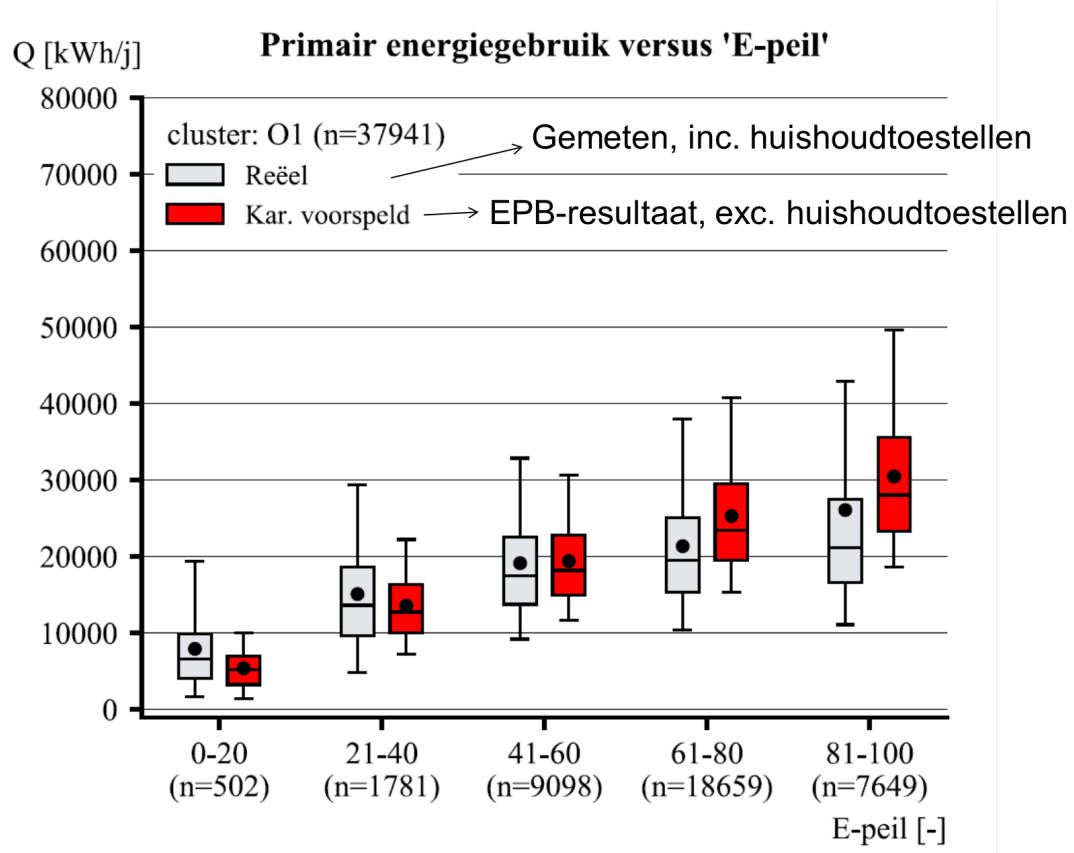
fwo
Opening new horizons

Problem statement

- ✓ Building energy assessment methods are important instruments to meet societal challenges
- ✓ Performance gap between predicted and actual energy use
- ✓ Changing context: NZEB, PV, heat pump, smart grid, BIM,…
- ✓ How should building energy assessments methods, tools and policies evolve?



https://apps.energiesparen.be/energiekaart/vlaanderen/epb-e-peil-res-evolutie



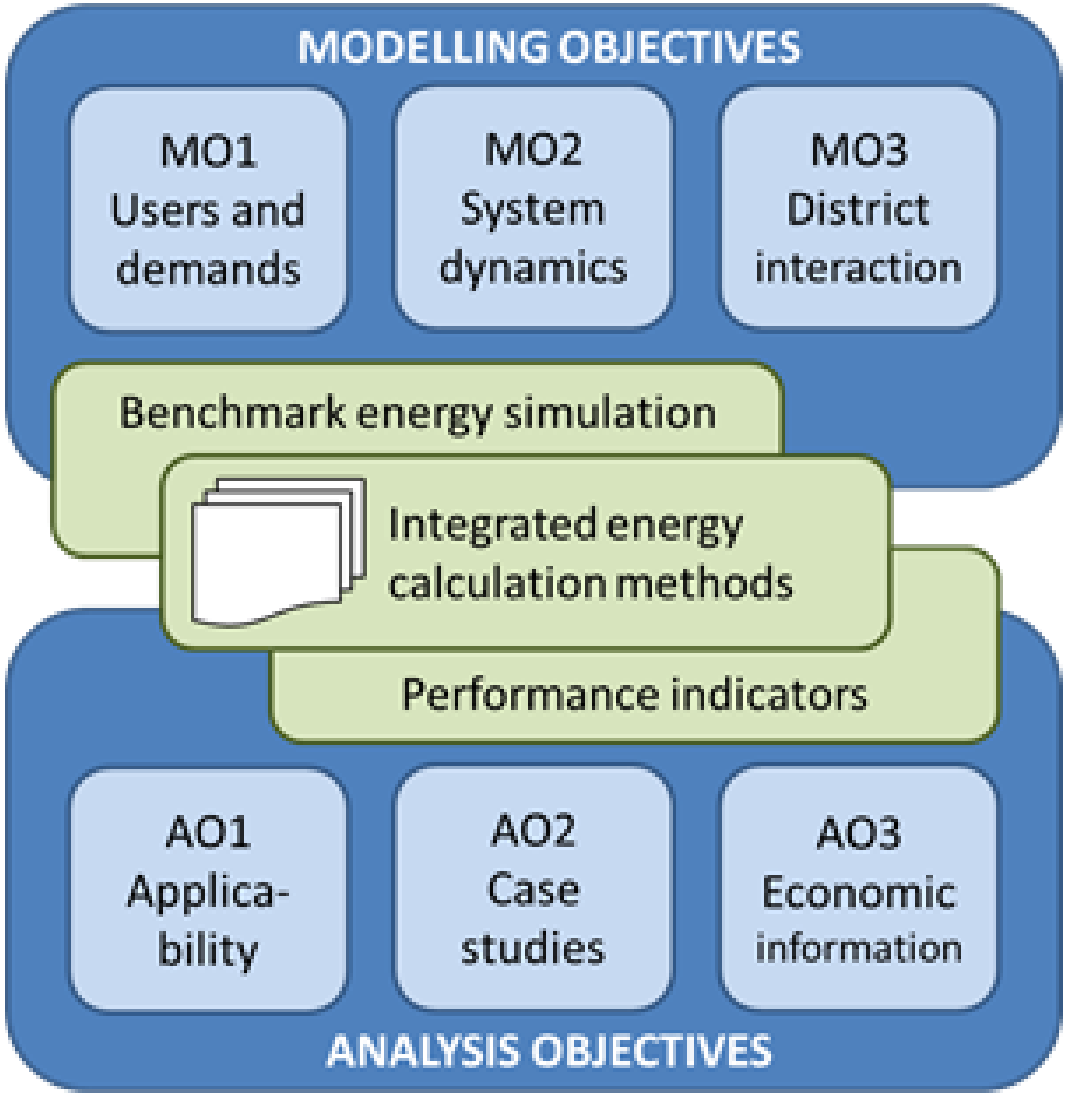
[Van Hove et al. 2021]

Project mission

- Developing future-proof building assessment methods to support the transition to a carbon neutral housing stock, while assessing the techno-socio-economic impact at the individual building, the local grid and the housing stock level
- Creating knowledge to develop a baseline for building assessment tools by 2025-2030 both for new and existing houses

Scientific objectives

- Close the knowledge gap related to **modelling**
  - ✓ Occupant behaviour
  - ✓ System dynamics
  - ✓ Grid interaction
- Extract performance indicators and **analyse the impact** of adapting the building energy assessment framework
  - ✓ Spatial-temporal resolution
  - ✓ Setting requirements to sets of indicators
  - ✓ Market consequences



Consortium

NEPBC

UGent

- Building Physics
- STFES
- EELab
- Environmental Economics

GHENT UNIVERSITY

KULeuven

- Building Physics

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BBRI

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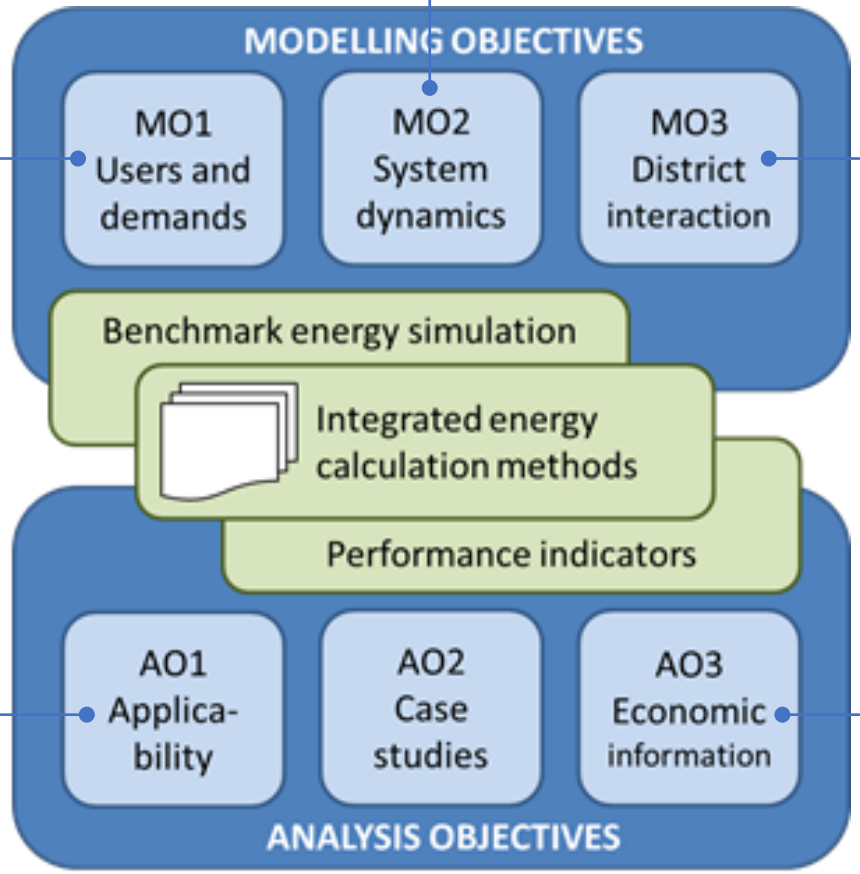
Researchers

Katarina Simic (UGent, STFES)

Silke Verbruggen (UGent, BP)

Christina Protopapadaki (KULeuven, BP)



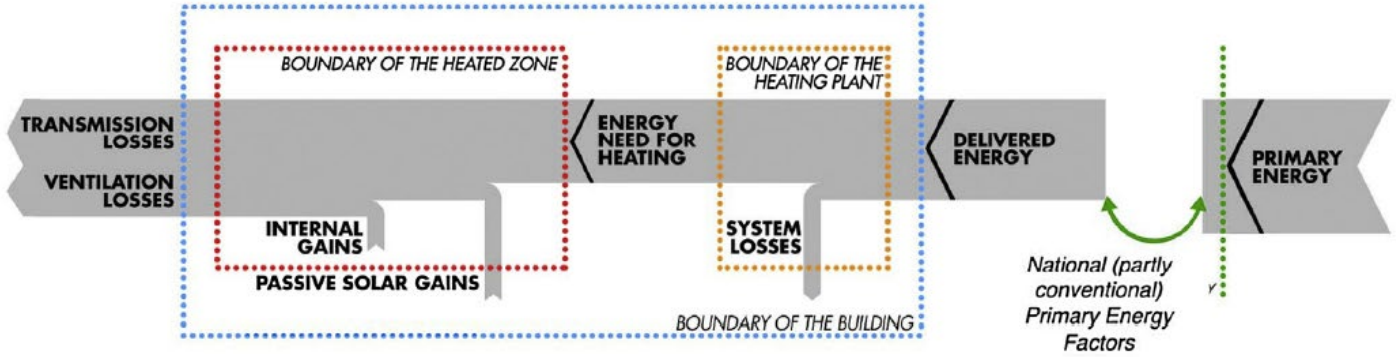
Kjartan Van den Brande (UGent, BF)

Sam Hamels (UGent, EE)

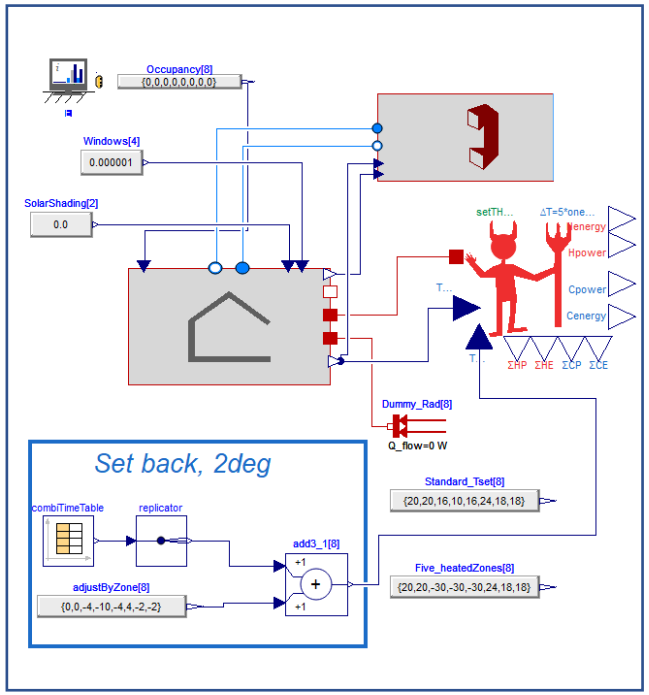
Marc Delghust (UGent, BP), scientific support

BBRI, support in relation to regulations, standards and practice

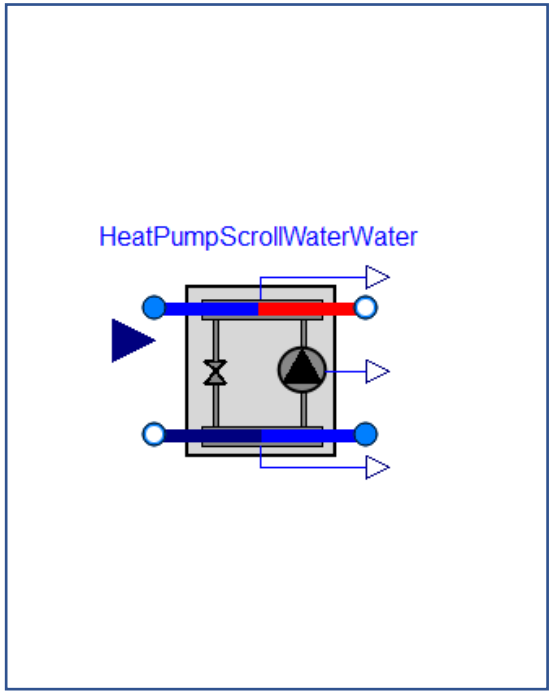
Modelling approaches



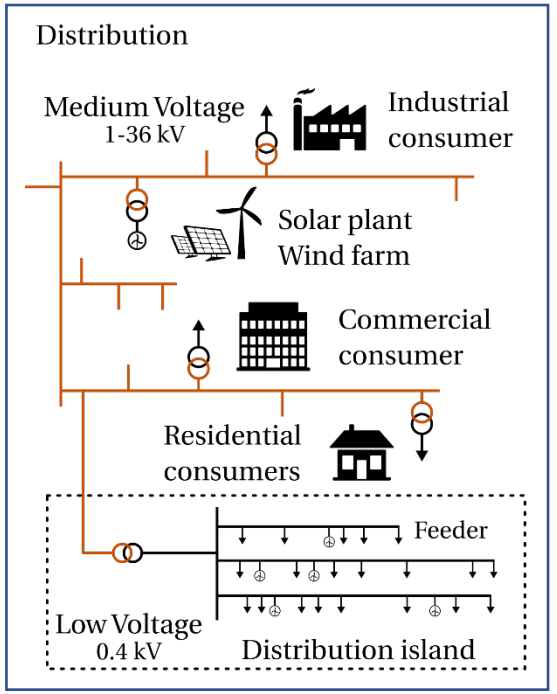
Building energy performance calculation



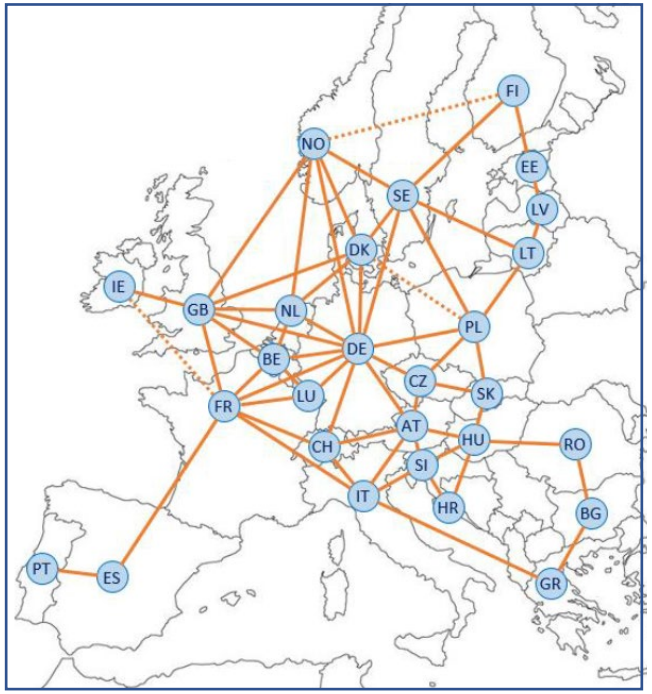
Building and user modelling



Energy systems modelling



District electricity grid modelling



European electricity system modelling

Resultaten

Website:
new.nepbc.be

Results

On this page, the results and reports of the NEPBC project are published.

Report: Building-grid interaction: assessment framework 24 AUG 2021

This report presents a framework to assess the impacts of buildings on the low-voltage electricity grid. The interaction of buildings and the grid becomes a crucial aspect of the energy transition as more low-carbon technologies are adopted in buildings that require or produce large amounts of electricity. Technologies such as heat pumps and rooftop photovoltaic systems are among those expected to be widely adopted in Belgium in the near future. It is therefore important to assess what their impacts will be on the electricity grid, what the latter depend on, and how building design can contribute to limit them.

→ Report_Building-grid-interaction-Assessment-Framework.pdf

Video presentation: on present and future Primary Energy Factors 30 OCT 2020

Sam Hamels provides an overview of the different aspects related to calculating primary energy factors (PEF's) for electricity consumed by buildings.

Aspects include the geographical scope, temporal resolution and taking into account electricity imports.

Taking these aspects into account, Sam also provides indicative PEF results for the years 2020, 2025, 2030 and 2040.

Report: Towards a grid friendliness assessment for buildings 24 AUG 2021

Low-carbon technologies, such as heat pumps and photovoltaic solar panels, could have important impacts on the low-voltage electricity distribution grid. To avoid that high penetration of these technologies is hindered by distribution grid constraints, and also to manage potential grid reinforcements efficiently, it is important to assess the interaction of buildings with the electricity grid.
Taking a building perspective on this issue, a grid friendliness assessment of buildings is proposed. Such an assessment and rating of buildings could in uence building owners and occupants, building designers, investors, technical system manufacturers and others to adopt practices that can bene t the integration of more low-carbon technologies while limiting the grid reinforcement costs.
This report investigates possibilities to develop such a grid friendliness assessment of buildings, by examining existing building energy-related performance rating approaches, reviewing possible available indicators, and employing a grid impact assessment framework to propose a method for deriving requirements for the indicators.

→ Report_Towards-a-grid-friendliness-assessment-for-buildings.pdf

Report: Barriers and motivators driving the renovation of the residential building stock 18 FEB 2020

Enormous investments in renovation activities are necessary to realize a carbon-neutral building stock by the year 2050. Home owners need to invest in a variety of measures, like replacing their heating system and improving insulation levels. However, the rate at which these invests are happening is much too slow.

To better understand what is causing this low renovation rate and how to increase it, this report reviews the most recent academic literature on the subject. Many so-called 'barriers' can be identified, which hinder renovation investments in some way. But we also identify many 'motivators'. These are

Resultaten: doctoraatsthesissen, papers, modellen, data

NEPBC

International Conference on Probabilistic Method
Conference on Probabilistic Methods Applied to P

25. S. Hamels, E. Himpe, J. Laverge, M. Delghust, K. energy factors and CO2-intensities for electricity and critical evaluation of the contemporary litera 111182, 17 pp.
26. S. Hamels, "CO2-intensities and primary energy f "Electrical Engineering for Sustainable and https://doi.org/10.3390/en14082165
27. K. Van den Brande, S. Hamels, M. Delghust, J. Lav energy factors on building energy performance", 4039.
28. K. Van den Brande, M. Delghust, J. Laverge, A. Jan building energy performance assessment metho Conference series: Material Science and Enginee Urban Planning Symposium WMCAUS 2021, Pragu
29. K. Van den Brande, M. Delghust, J. Laverge, A. Jar performance calculation method on the Flemi Conference, IBPSA, Bruges.
30. K. Van den Brande, M. Delghust, J. Laverge, A. J performance calculation method on the Flemi Conference, IBPSA, Bruges.
31. W. Bracke, M. Delghust, J. Laverge, and A. Jan normalization concept," Building Research and inf
32. S. Verbruggen, M. Delghust, J. Laverge, and A. residential energy use in nearly zero energy build Conference, Syracuse, NY, USA, 2018, pp. 685–69
33. S. Verbruggen, M. Delghust, J. Laverge, and A. Jan model on the prediction of the residential energy indoor climate : 40 years of AIVC, Proceedings, Gh
34. S. Verbruggen, J. Laverge, M. Delghust, and A. residential energy use," in Proceedings of Building vol. 16, pp. 2310–2317.
35. A. Janssens, E. Vandenbussche, K. Van den Brand energy performance assessment of NZEB houses Series, 8th International Building Physics Conferen
36. Faes, Willem, Hugo Monteyne, Michel De Paepe, Heat Recovery Units in Partly Heated Low Energy Charles S Barnaby and Michael Wetter, 2701–270
37. Faes, Willem, Hugo Monteyne, Michel De Paepe, a Heated Dwellings." In 38th AIVC Conference, 6t Healthy Low-energy Buildings Proceedings, 337–3
38. Janssens, W. Bracke, M. Delghust, E. Himpe, S ventilation : steady-state two-zone heat loss anal Building Physics Conference, Syracuse, NY, USA, 2
39. S. Hamels, Renovation-related financing constrai 'Energy and Buildings', 2021.

Research reports, available to members of the Societa

40. S. Hamels, "Barriers and motivators driving the renovation of the residential building stock", 2020, 37 pp.
41. S. Hamels, "Trade-offs for a cost-efficient transformation of the residential buildings sector", 2020, 61 pp.
42. "Fitting of the current EPB calculation method with the EN 52000 framework", 2020, 43 pp.

FACULTY OF ECONOMICS AND BUSINESS ADMINISTRATION

Realising a carbon-neutral European electricity system and building stock - technoeconomic and financial challen

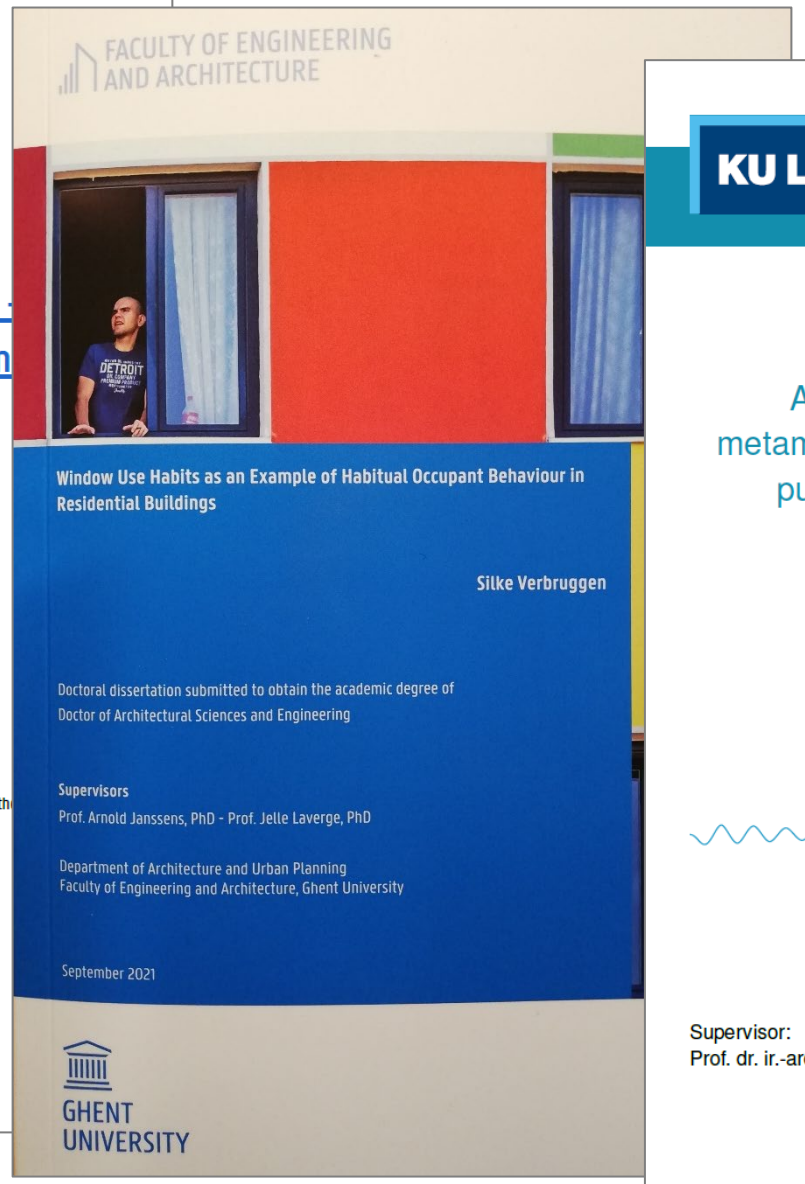
Sam Hamels

Supervisor: Prof. Dr. Johan Albrecht

A dissertation submitted to Ghent University in partial fulfilment of the requirements for th Doctor of Business Economics

Academic year: 2020-2021

GHENT UNIVERSITY



KU LEUVEN

ARENBERG DOCTORAL SCHOOL
Faculty of Engineering Science

A probabilistic framework towards metamodeling the impact of residential heat pumps and PV on low-voltage grids

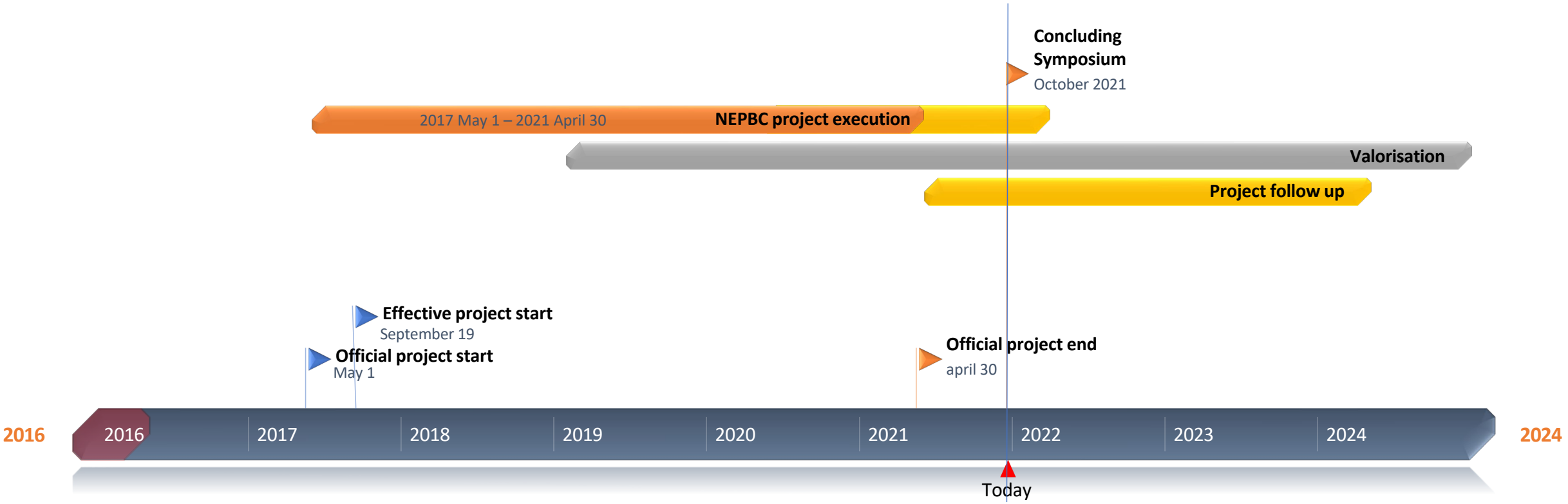
Christina Protopapadaki

Supervisor:
Prof. dr. ir.-arch. Dirk Saelens

Dissertation presented in partial fulfillment of the requirements for the degree of Doctor of Engineering Science (PhD): Civil Engineering

December 2018

Time line project & valorisation actions



Programma

09:00	Onthaal, inschrijven en welkomskoffie		
09:30	Welkom en opening	Arnold Janssens	UGent
09:40	Gebruikersgedrag: verbeterde modellering en impact op het energiegebruik	Silke Verbruggen*	UGent
10:00	Hoe de interactie tussen gebouwen en elektrische netten beoordelen	Dirk Saelens*	KUL
10:20	Are HVAC heating systems hidden house occupants? Is it possible to predict their behavior?	Katarina Simić	UGent
10:40	Van BIM of EPB naar BIM en EPB: pistes en opportuniteiten	Louis Casteleyn	WTCB
11:00	Pauze		
11:30	De evaluatiemethode van de energieperformantie van gebouwen geëvalueerd: doelen, rekenmethode en beoordeling	Kjartan Van den Brande	UGent
11:50	Welke koolstofvrij gebouwenpark moeten we nastreven en welke hindernissen moeten we daarbij overwinnen?	Sam Hamels*	UGent
12:10	Aanbevelingen uit NEPBC en het energiebeleid van morgen	Wim Lameire	VEKA
12:30	Lessons learned en slotbemerkingen	Marc Delghust	UGent
12:45	Vragen		
13:00	Lunch + netwerking		