To what extent do “ambitious” scenarios of energy demand in the building stock reflect COP21 Paris targets?

Lukas Kranzl, Eric Aichinger, Sebastian Forthuber, Michael Hartner, Andreas Müller, Agne Toleikyte
Energy Economics Group
Institute of Energy Systems and Electrical Drives
TU Wien

eceee, June 2017

Article 2

1. This Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by:

(a) Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change;

Key research questions

- Do long-term scenarios (and in particular those labelled as ambitious) of energy demand in buildings reflect the COP21 target?
- If not: What are reasons for the gap?
- What can we learn for policy making and future modelling work?

Approach

- Analysis of **GHG-emission reduction in a broad range of scenarios** from the policy driven bottom-up model Invert/EE-Lab carried out recently for various European countries in several EU and national projects;
- **Compare scenarios among each other** and analyse whether the scenarios lead to an achievement of GHG-emission reductions in the range of 80-95% until 2050;
- **Identify reasons for possible gaps in GHG-emission reductions** like insufficient stringency of building codes, deficient economic incentives etc;
- **Derive conclusions regarding policy making and modelling**.

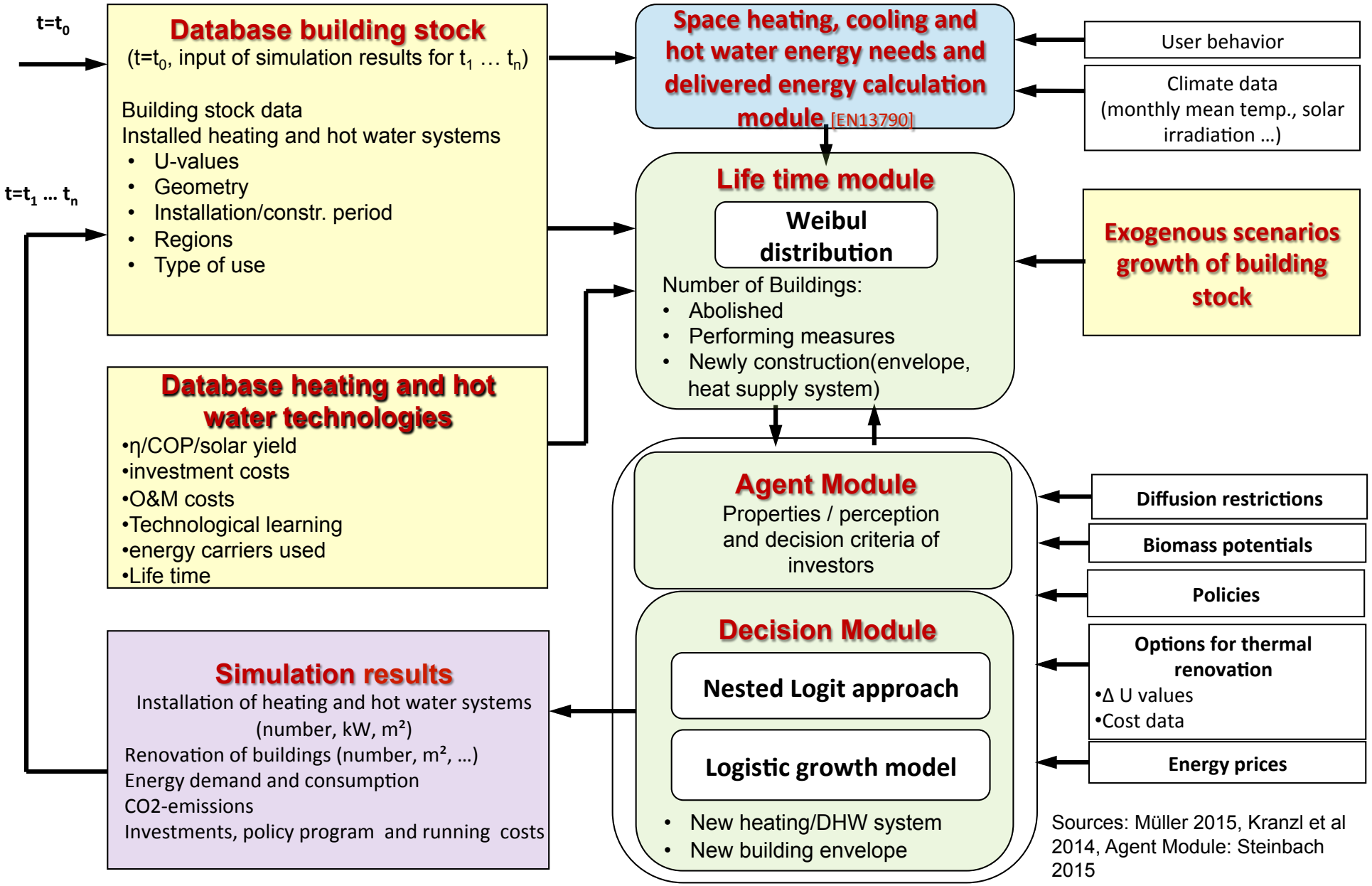
Scope and system boundaries

- **Space heating, hot water and cooling** energy demand
- Residential and non-residential building stock
- Applied mix of technologies and energy carriers and resulting CO2-emissions
- In this work, we do not explicitly include scenarios and modelling of the electricity and district heating generation mix.
- Medium- (**2030**) and long (**2050**) term scenarios
- We select **scenarios** from different countries within the EU28 from several projects, **which were to some extent labelled as "ambitious" efficiency, renewable and/or climate change scenarios**.

Selected projects and cases: 53 scenarios from …

- ✓ Policies to ENforce the TRAnsition to Nearly Zero-Energy buildings in Europe (IEE-Project): ambitious, high-energy price scenarios for 8 countries
- ➢ Nearly Zero-Energy Building Strategy 2020: ambitious policy scenario for 15 countries
- ➢ Mapping and analyses of the current and future (2020-2030) heating/cooling fuel deployment: scenarios with higher support of RES-H/C
- ➢ Energy scenarios for Austria: “with additional measures – plus”
- ➢ Long term scenarios and strategies of RES in Germany: Further enhancement of Energiewende – Scenario

Modell Invert/EE-Lab



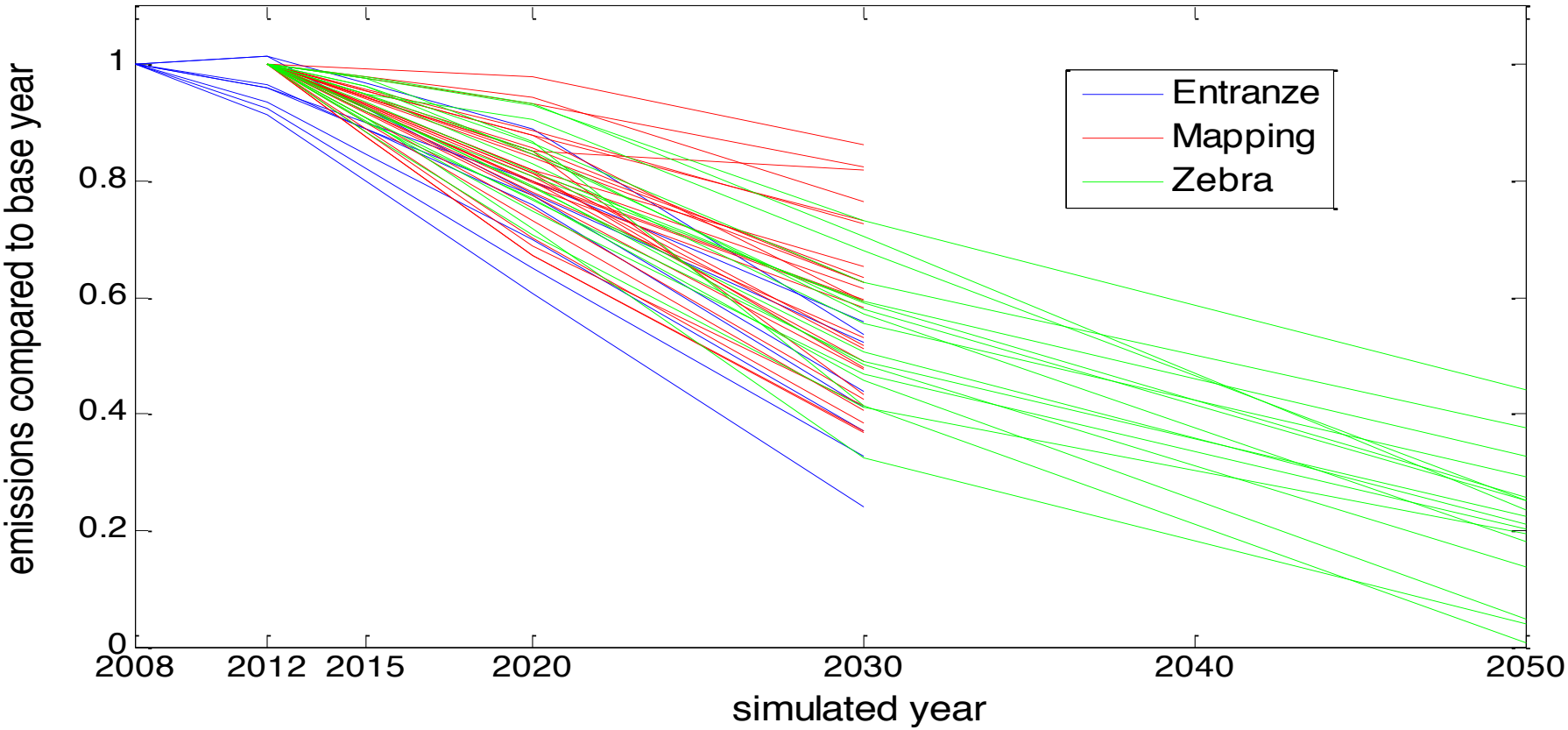
Sources: Müller 2015, Kranzl et al 2014, Agent Module: Steinbach 2015

Indicators to assess whether a scenario is in line with the Paris COP21 agreement

- CO2 emission reduction assuming constant emission factors for district heating and electricity
- CO2 emission reduction excluding electricity and district heating.
- Increase district heating from base year (pp)
- Increase electricity from base year (pp)
- Increase biomass from base year (pp)
- Energy savings compared to the base year (%)
- Installation of fossil based heating systems

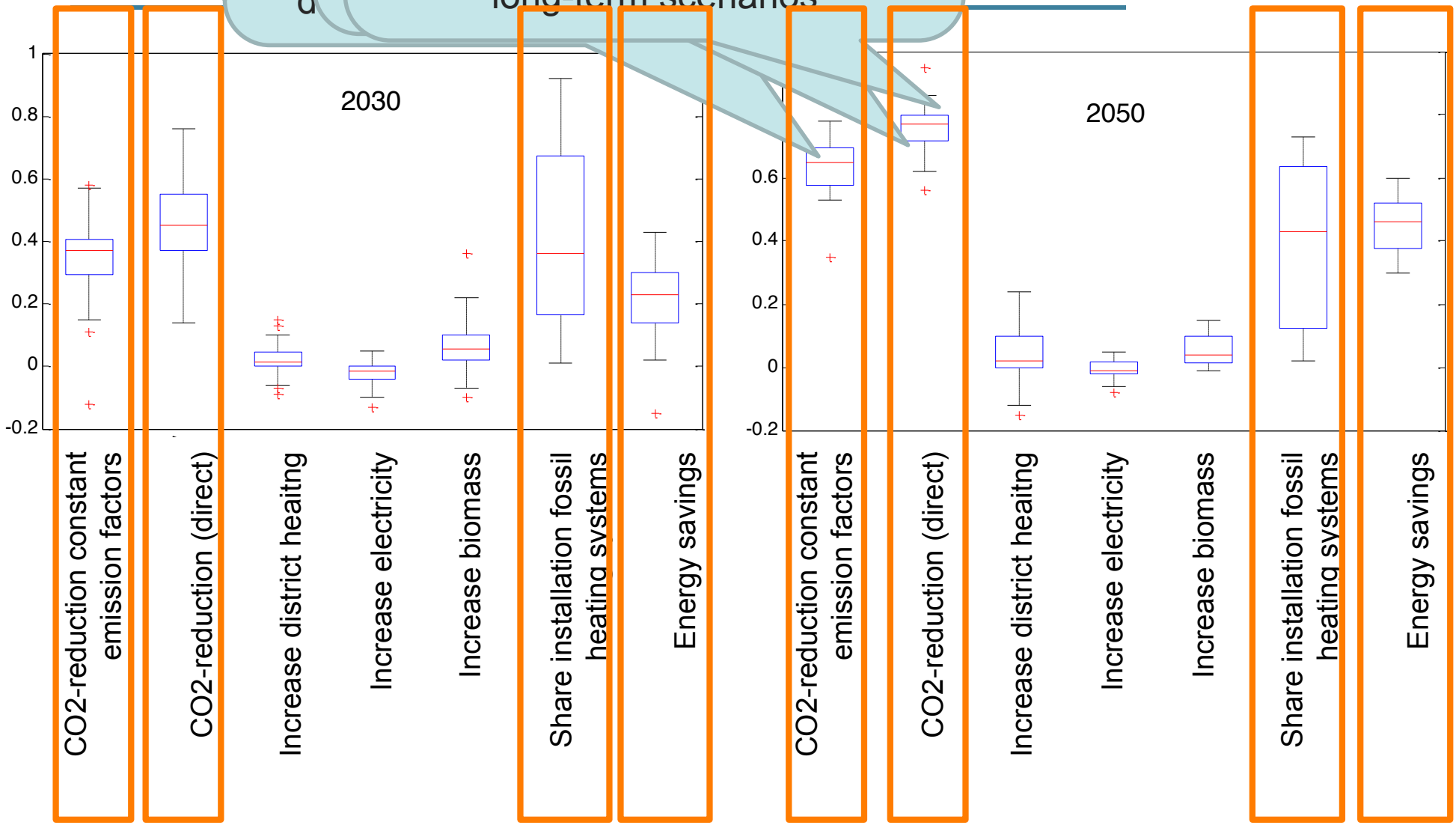
Results

Direct CO2-emissions (Base year = 1)



Only 3 scenarios 85% direct CO2-emission reduction: ES and LT (ZEBRA) and the ”base-scenario” for Germany from the project ”long-term scenarios”

Indicat…enarios



Conclusions (1):
Challenges for policy making

Challenges for policy making

- Transition in the boiler market.
  How can a complete phasing out of fossil fuel heating systems be achieved by the year 2025?
  - Will renewable natural gas (e.g. P2G) act as a game changer? (I don't think so …)
- How can high renovation depth and rates be implemented in accordance with policy requirements and social acceptance?
- Strong regulatory instruments seem to be required. However, acceptance and societal agreement are a precondition for practical implementation of such stringent policy instruments.
- Biomass allocation: how much biomass is available for heating purposes?

Conclusions (2): Challenges for modelling and scenario development?

Challenges for modelling and scenario development

- Institutional settings of modeling has an impact on results
  - Involvement of stakeholders is key for the acceptance of scenarios. However, this has an impact on the ambition level.
  - Tension between modellers' intrinsic motivation and the interests of clients, stakeholders and policy makers.
  - Responsibility of the modelling community to also actively drive the discussion process and not only act as "recipients of orders"?
- Methodological questions:
  - Inertia in models (like Invert/EE-Lab) might be realistic but not what we need to achieve climate mitigation targets.
  - Modelling community needs to reconsider paradigms and practices.

Challenges for modelling and scenario development

- To what extent do scenarios matter for the policy process? Is it important that there are Paris-consistent scenarios published?
  - Scenarios should reflect the current discourse. If this is true, then the conclusions of this paper are alarming.
  - Scenarios should show the range of possible futures. If energy scenarios do not at least include some examples of Paris consistent pathways, the discourse does not even include this agreed and adopted target as a conceivable and possible future.
  - Thus, not also policy makers but also the the modelling community is asked to develop new paradigms of modelling in future projects.

Further information:

Lukas Kranzl

Energy Economics Group

email: lukas.kranzl@tuwien.ac.at
tel: +43 1 58801 370351
web: www.eeg.tuwien.ac.at

www.progressheat.eu
www.set-nav.eu
www.invert.at
www.eeg.tuwien.ac.at