Cost-optimal level study of energy performance requirements for buildings

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Rakennusten energiamääräysten

kustannusoptimaalisuuden laskenta

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Project group

- Aalto University (Energy calculation & NPV)
  - Juha Jokisalo, Ala Hasan, Kai Siren,
  - Arto Saari (Co-ordinator)
- Technical University of Tampere (Cost calculation & NPV)
  - Juhani Heljo ,TTY
- VTT (Reference buildings, Cost calculation & NPV)
  - Terttu Vainio, Sakari Pulakka, Miimu Airaksinen,
- Equa Simulation Finland Oy (Building models & Energy calculation)
  - Mika Vuolle, Jouko Niemelä

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Background

- Several recent studies have demonstrated the negative long-term effects of suboptimal renovations where savings potentials are locked in for decades and the same goes for new constructions. This so called 'lock in' effect can only be prevented by setting legal requirements at levels that capture all savings to be reaped over the estimated economic lifecycle of the building.
- The comparative methodology framework is not meant to harmonize the minimum energy performance requirements per se, but to ensure that the level of ambition of every EU Member State in its given context is similar.

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Aim of the study

- Energy performance requirements for buildings and building elements must be set with a view to achieving cost-optimal levels.
- It is up to the Member States to decide whether the national benchmark used as the final outcome of the cost optimal calculations is the one calculated for
  - a macroeconomic perspective (looking at the costs and benefits of energy efficiency investments for the society as a whole) or
  - a strictly financial viewpoint (looking only at the investment itself).
- National minimum energy performance requirements should not be more than 15 % lower than the outcome of the cost optimal results of the calculation taken as the national benchmark.
- To new and existing buildings

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Steps

- Selection of the reference building types
- Geometry and other properties of the reference buildings
- Calculation packages
- Energy calculation
- RES package
- Global costs
- Cost optimal calculation
- Sensitive analysis

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REFERENCE BUILDINGS

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Building categories according to Finnish energy requirements (D3)

1. Single family houses, detached houses ~30%
2. Apartment buildings ~10 %
3. Offices ~4 %
4. Commercial buildings ~10 %
5. Hotels, motels etc ~2 %
6. School and day-care centres ~2 %
7. Sport halls excluding swimming and ice halls~1 %
8. Hospitals ~0,5 %
9. Other buildings ~25 %
   - Storages
   - Swimming and ice halls
   - Garages

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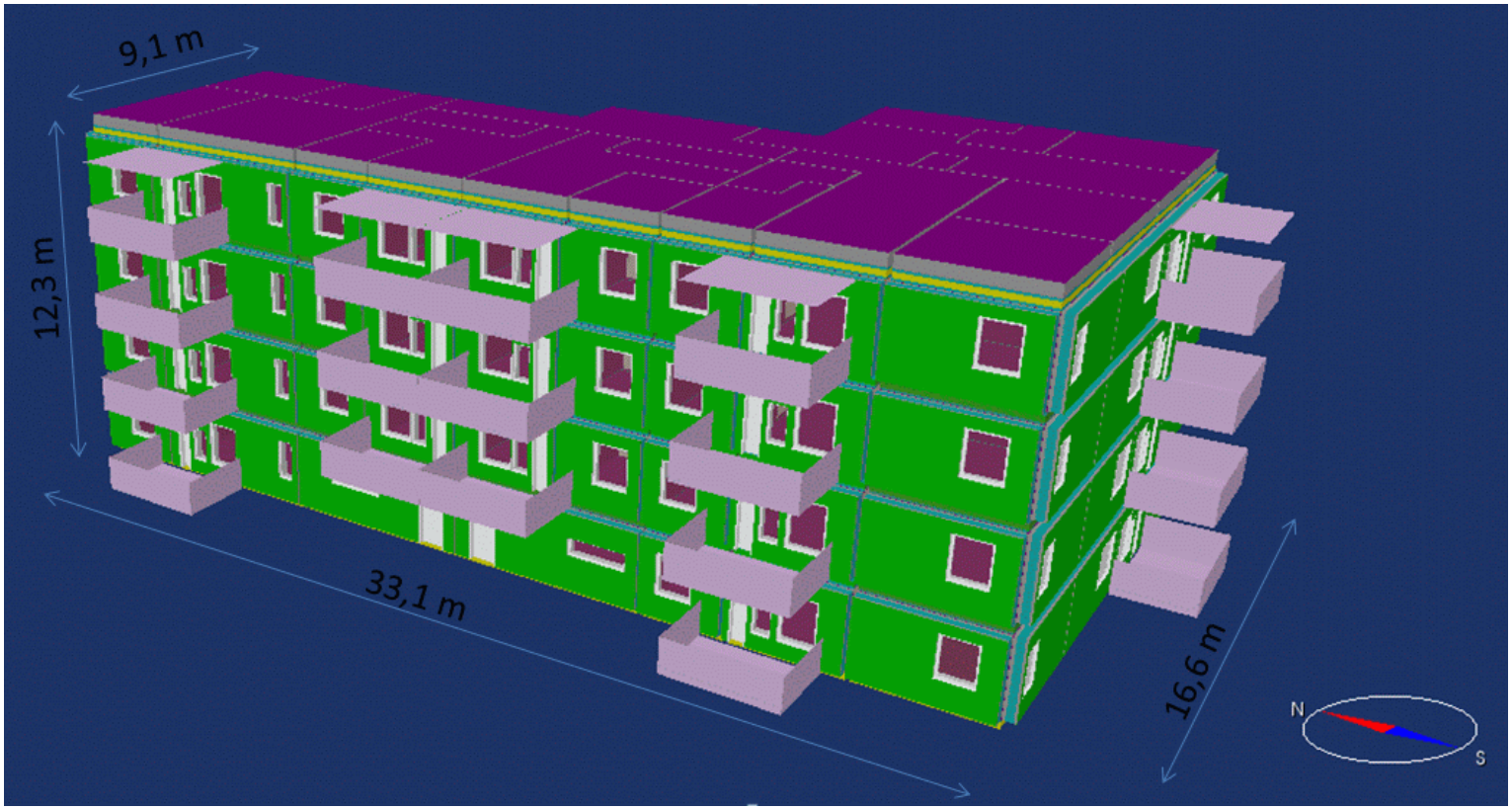
The reference of apartment house



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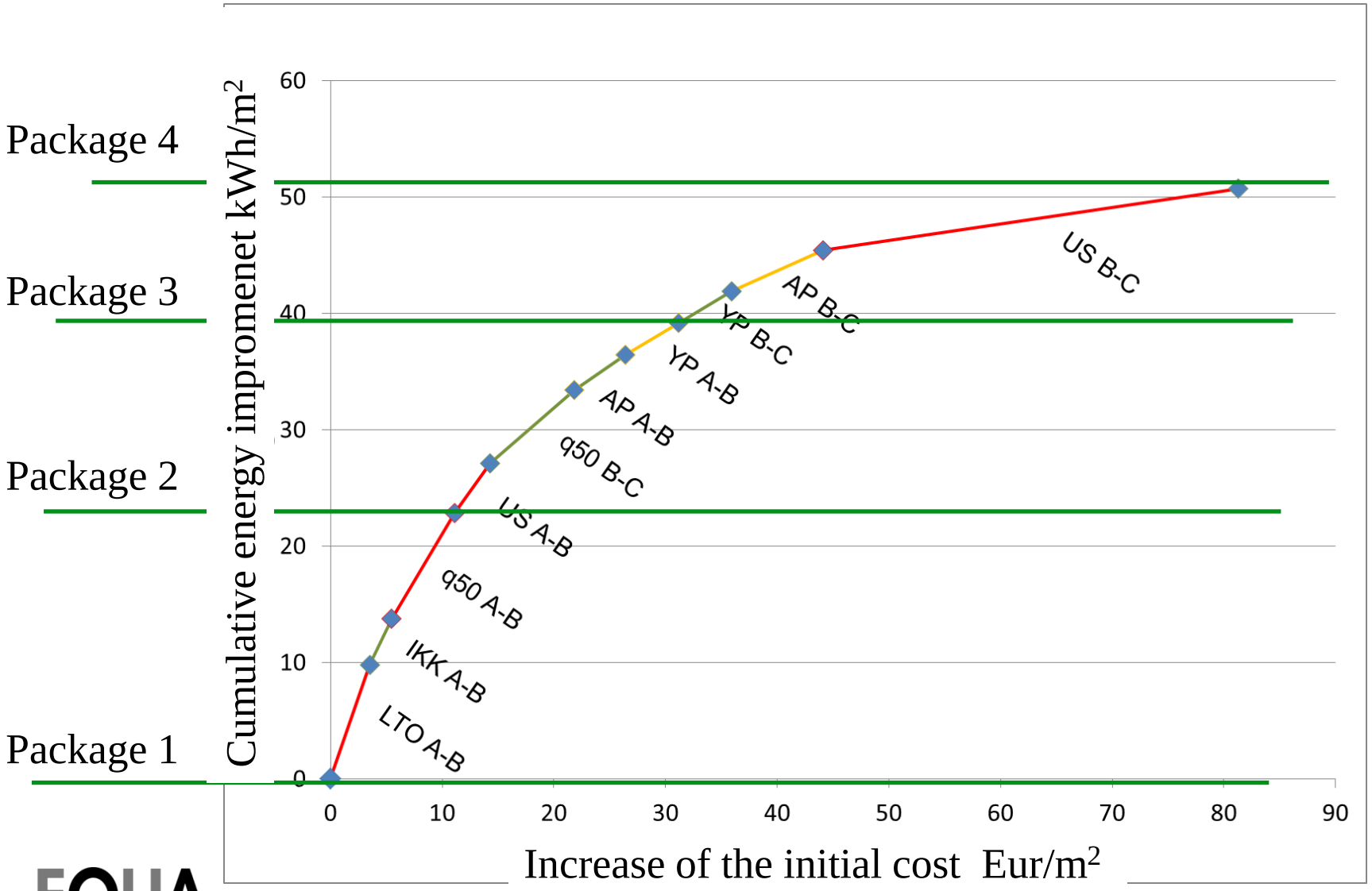
Energy packages



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Energy calculation of block of flats

- Four energy packages for
  - Fossil fuel + radiator heating (45/35°C)
  - District heating + radiator heating (45/35°C)
  - Pellet + radiator heating (45/35°C)
  - Ground source heat pump + radiator heating (45/35°C)

  - NZEB calculation to energy package 4:
    - *Solar collectors 85m²*
    - *Photo Voltage (50, 100, 150, 200 or 250m²)*

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Definition of “global costs”

Global cost calculations result in a net present value of costs incurred during a defined calculation period

- initial investment
- annual costs for every year (running costs)
- final (residual) value
- disposal costs

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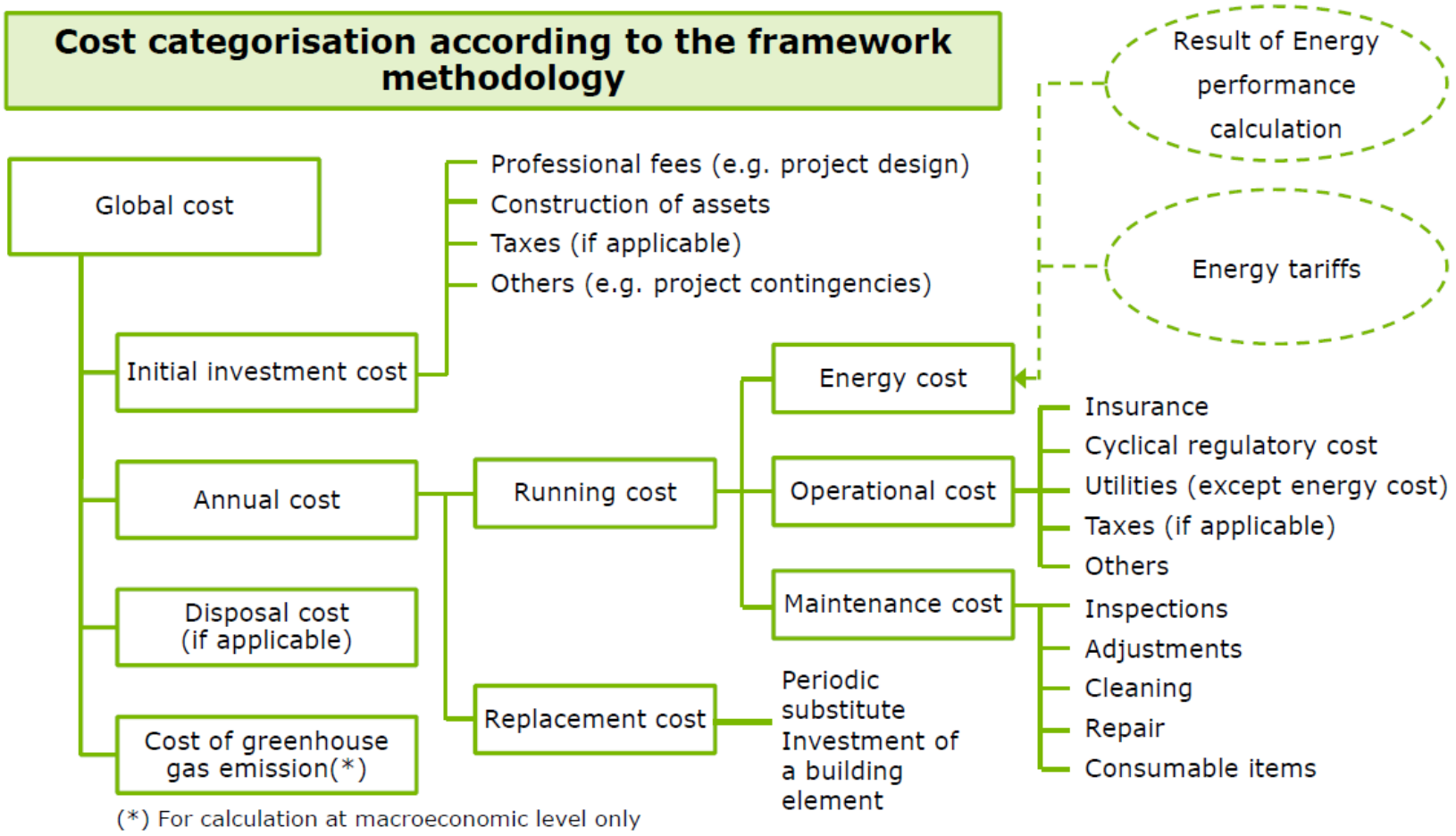
Cost categorisation



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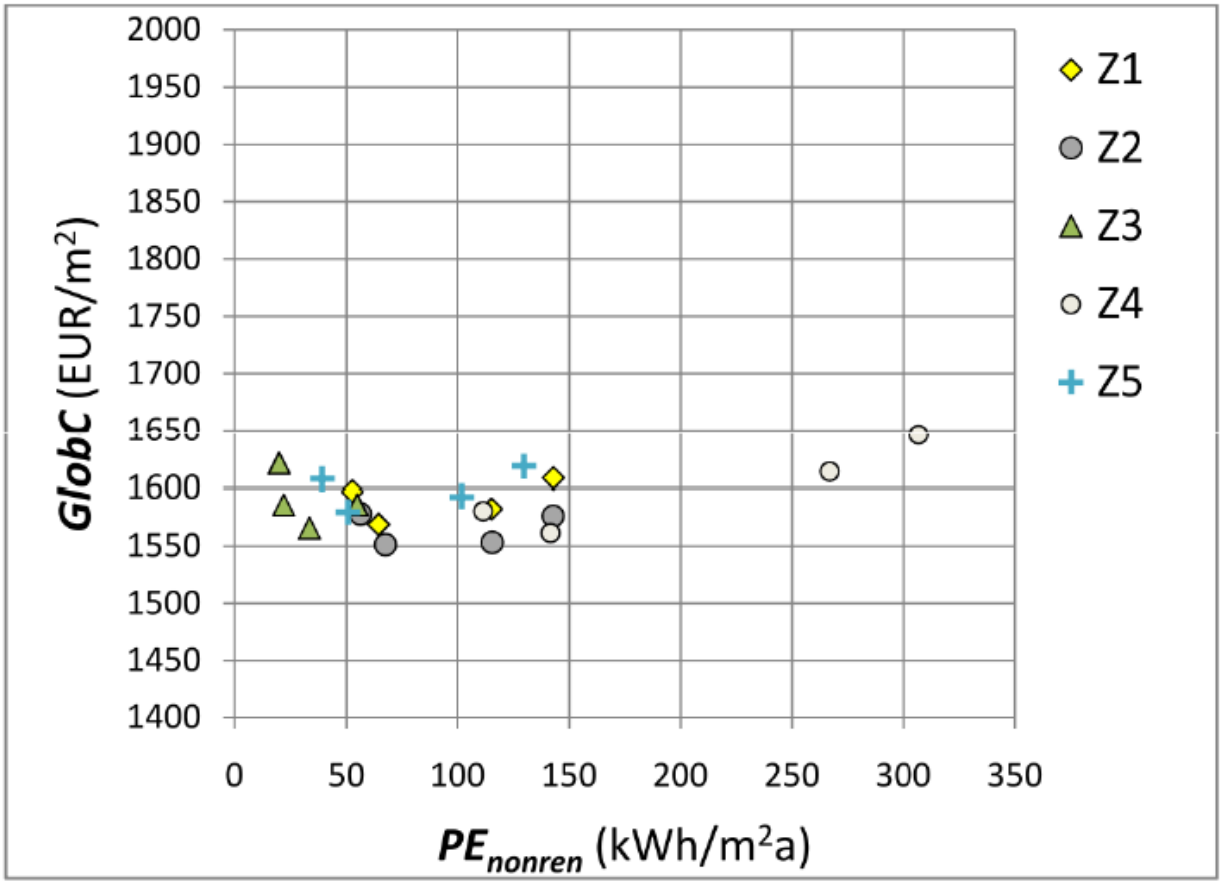
Cost optimal



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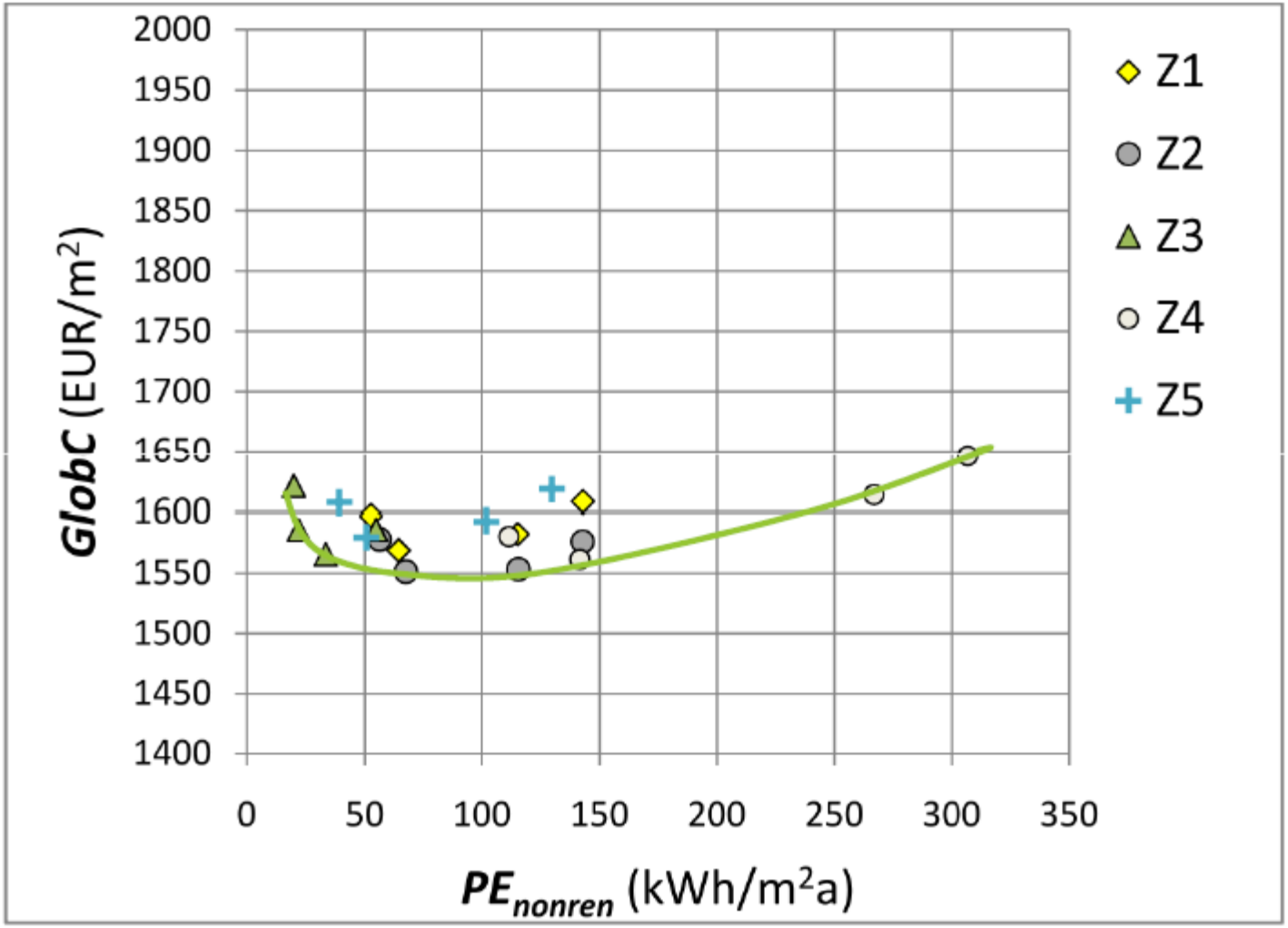
Cost Optimal



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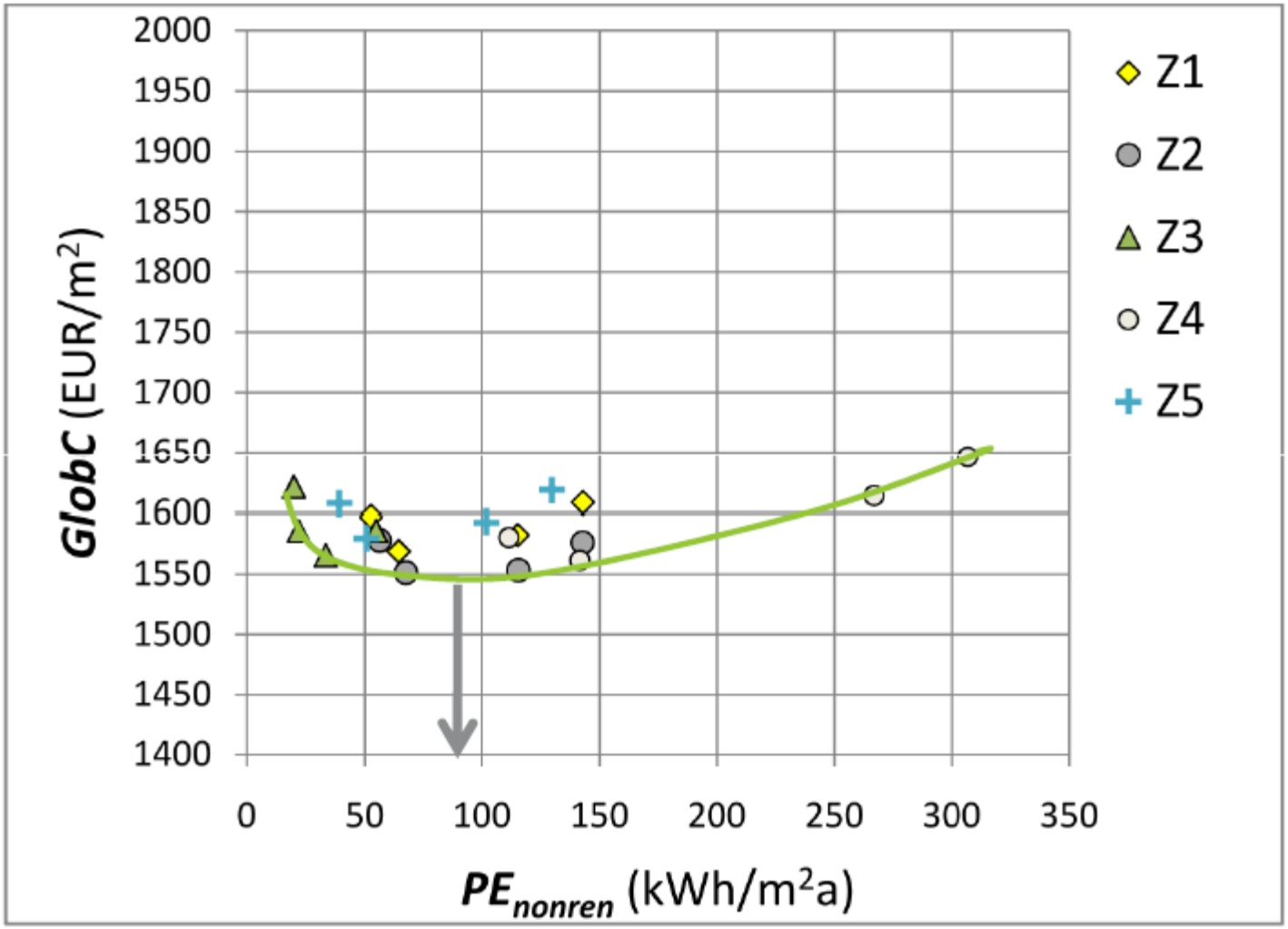
Cost optimal



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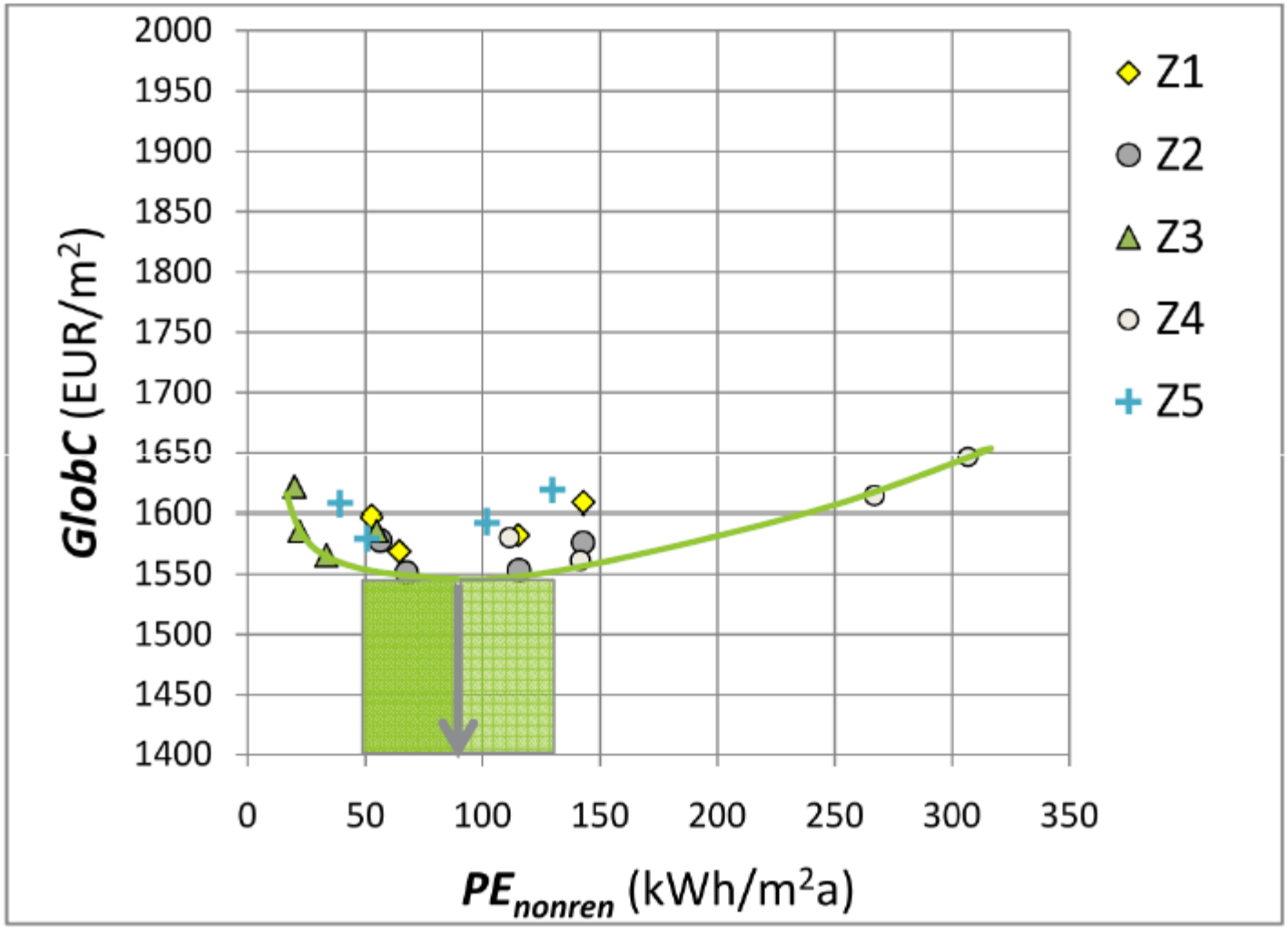
Cost optimal



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Preliminary results and conclusions

- More support is about coming to all steps.
- All calculation has to be rechecked.
- Are we within 15 % limits?
- The requirements seem to be at suitable level, some adjustments towards better energy efficiency could be made

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