



# **Draft of a EnergyADE for the Estimation of Energy Demands of the TUM**

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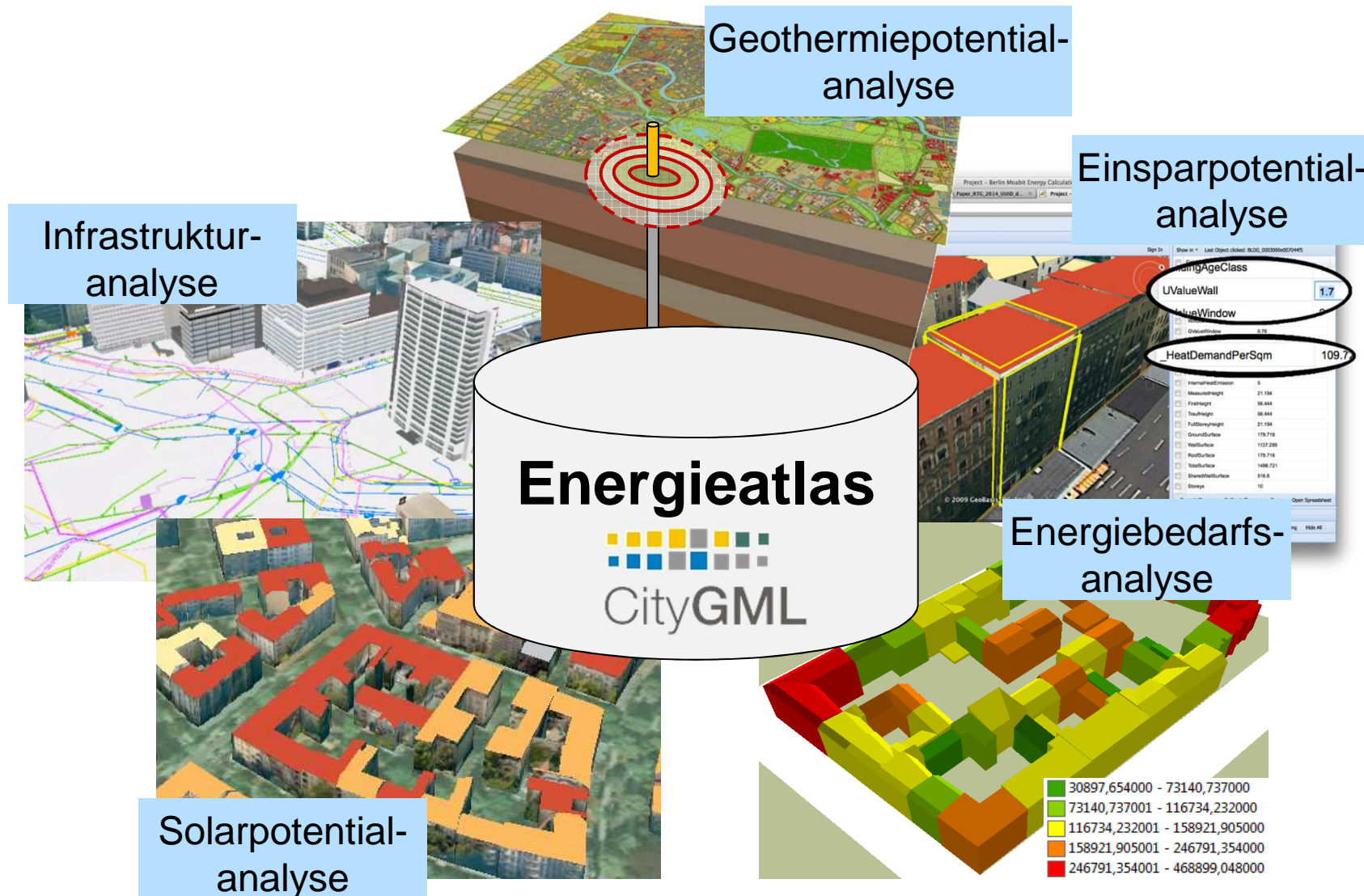
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# Concept Energy Atlas

- ▶ Design of a integrative, common Ontology
  - For the spatio-semantic representation of the city structure
  - Including energy relevant information of different disciplines
  - **Based on the semantic information model of CityGML**
- ▶ As data basis, virtual 3D city models, e.g. of Berlin and London



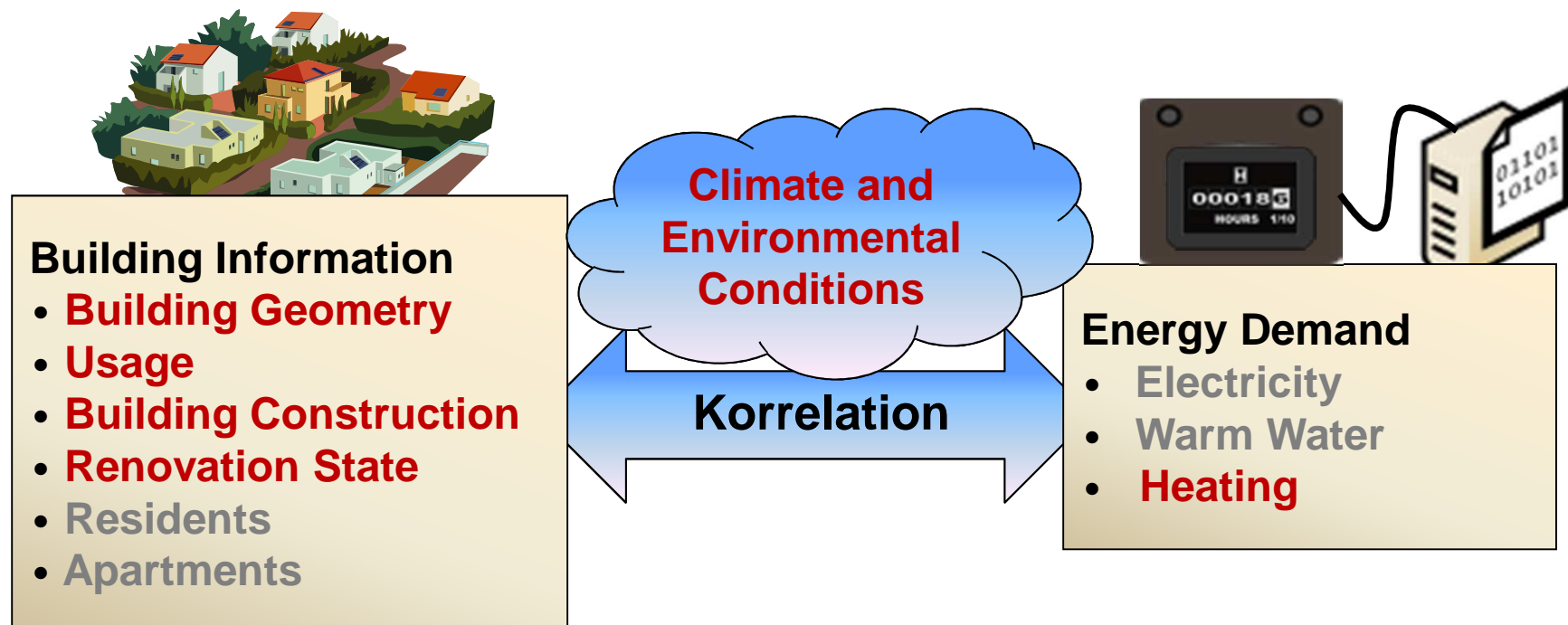
# Energy Atlas as integration platform



# Estimation of Heating Demand

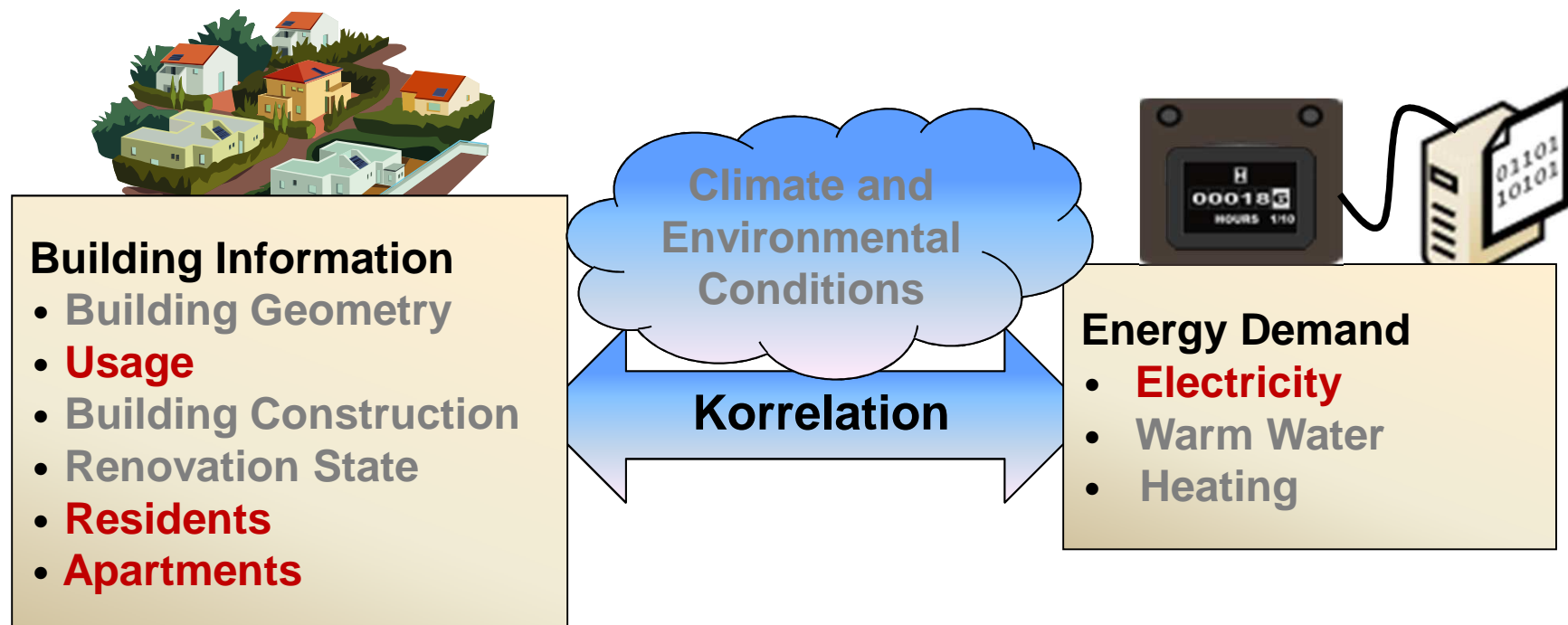
## ► Building simulation method DIN V 18599

- Estimation of the **monthly** net, end and primary energy demand for heating, cooling, airing, water and lighting



# Estimation of Electricity Demand

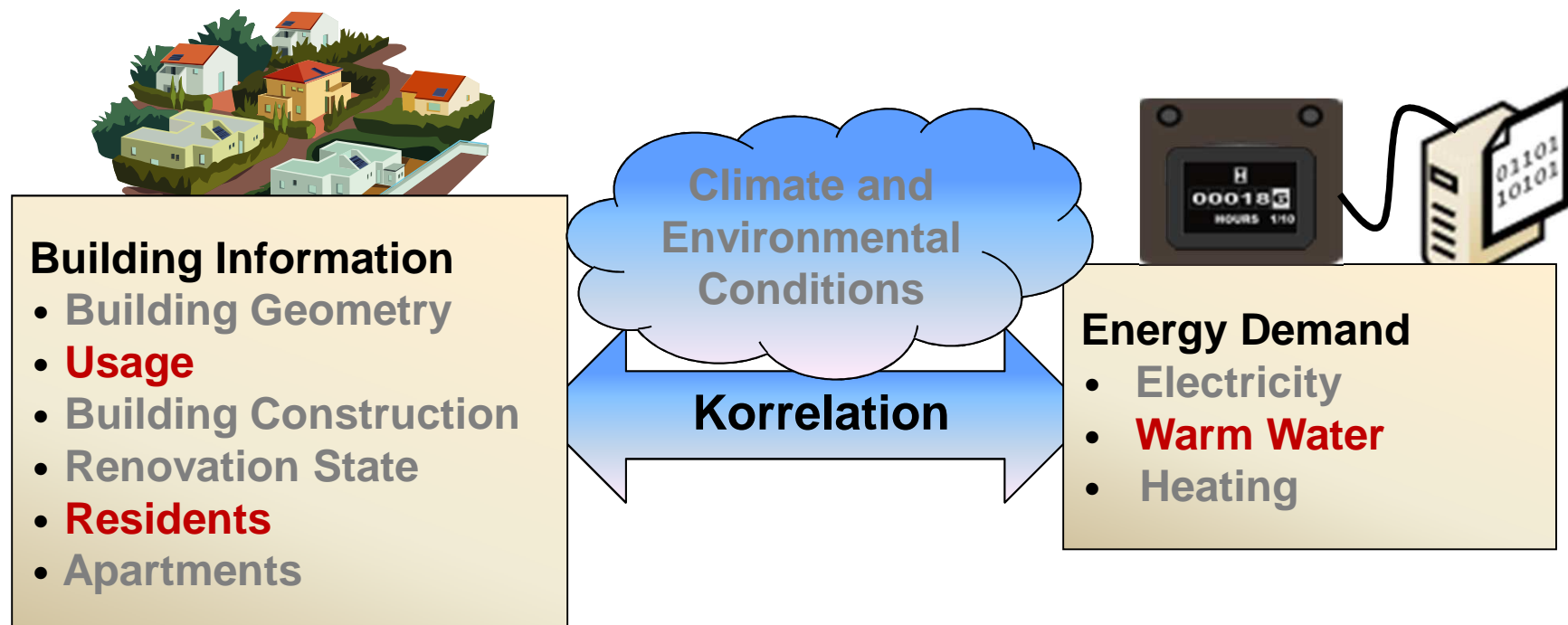
- ▶ The estimation of electricity demand of buildings is based on **mean electricity consumptions** of different household sizes, **published by Vattenfall**





# Estimation of Warm Water Demand

- ▶ The estimation of the energy demand for providing warm water is based on statistics presented by „**Energiepass Heizung/ Warmwasser**“ of the Institut Wohnen und Umwelt (IWU)



# Why this Methods?

- ▶ Building simulation method DIN V 18599 (Heating demand)
  - **Monthly balancing** of energy demand and production
  - Important for the **Evaluation of Measures** concerning renewable energy supply, e.g. geothermal, PV und solar thermal
  - Estimations based on building components allows building specific **Estimation of energy savings and renovation potentials**
  - Permitted estimation method of the current EnEV in Germany for the evaluation of the energy efficiency of buildings
- ▶ Statistical methods (Electricity and Warm water)
  - Electricity and warm water consumption depends more on the **building usage** than on the building geometry, e.g. residential area
  - Energy demands can be simulated w.r.t. the demographic changes

# Categorisation of the Input Values

Input values are differentiated between „**direct**“, „**indirect**“ und „**statistic**“ input values

- ▶ Direct input values are object properties, which directly flows into the energy estimation functions, e.g. outer wall surface, U-value, etc.
- ▶ Indirect input values are object properties, which are often available as base data and are used for the (pre)estimation of the direct input values, e.g. the geometry of the outer wall, building age, etc.
- ▶ Statistical Direct input values are non building specific values, which e.g. are presented by the DIN V 18599 and are used for estimating the direct input values and the final energy values



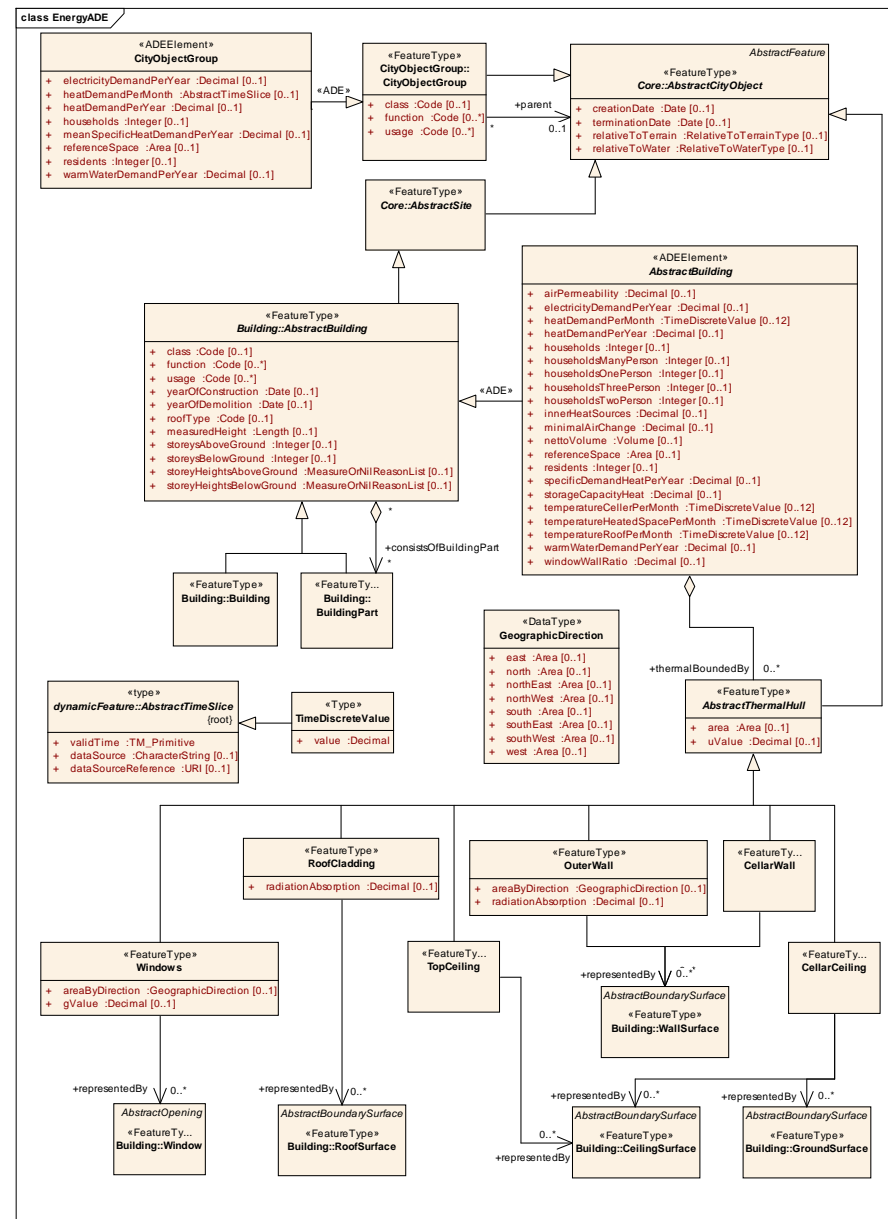
# Which input values are needed?

Eigenschaften des Gebäudes	AbstractBuilding	BaundarySurface	Opening
Geometrie der Gebäudehülle	gml:_Solid gml:MultiSurface		
Geometrie der thematischen Hüllflächen		gml:MultiSurface	gml:MultiSurface
Nutzungsart	bldg:function bldg:usage		
Fensterflächenanteil	?		
Baujahr	bldg:yearOfConstruction		
Außenwandfläche	?	?	
Außenwandfläche Süd	?	?	
Außenwandfläche Süd-Ost	?	?	
Außenwandfläche Süd-West	?	?	
Außenwandfläche Ost	?	?	
Außenwandfläche West	?	?	
Außenwandfläche Nord-West	?	?	
Außenwandfläche Nord-Ost	?	?	
Außenwandfläche Nord	?	?	
Fensterfläche	?		?
Fensterfläche Süd	?		?
Fensterfläche Süd-Ost	?		?
Fensterfläche Süd-West	?		?
Fensterfläche Ost	?		?
Fensterfläche West	?		?
Fensterfläche Nord-West	?		?
Fensterfläche Nord-Ost	?		?
Fensterfläche Nord	?		?
Dachfläche	?	?	
Kellerwandfläche	?	?	
Fläche der Kellerdecke	?	?	
Fläche der obersten Geschossdecke	?	?	

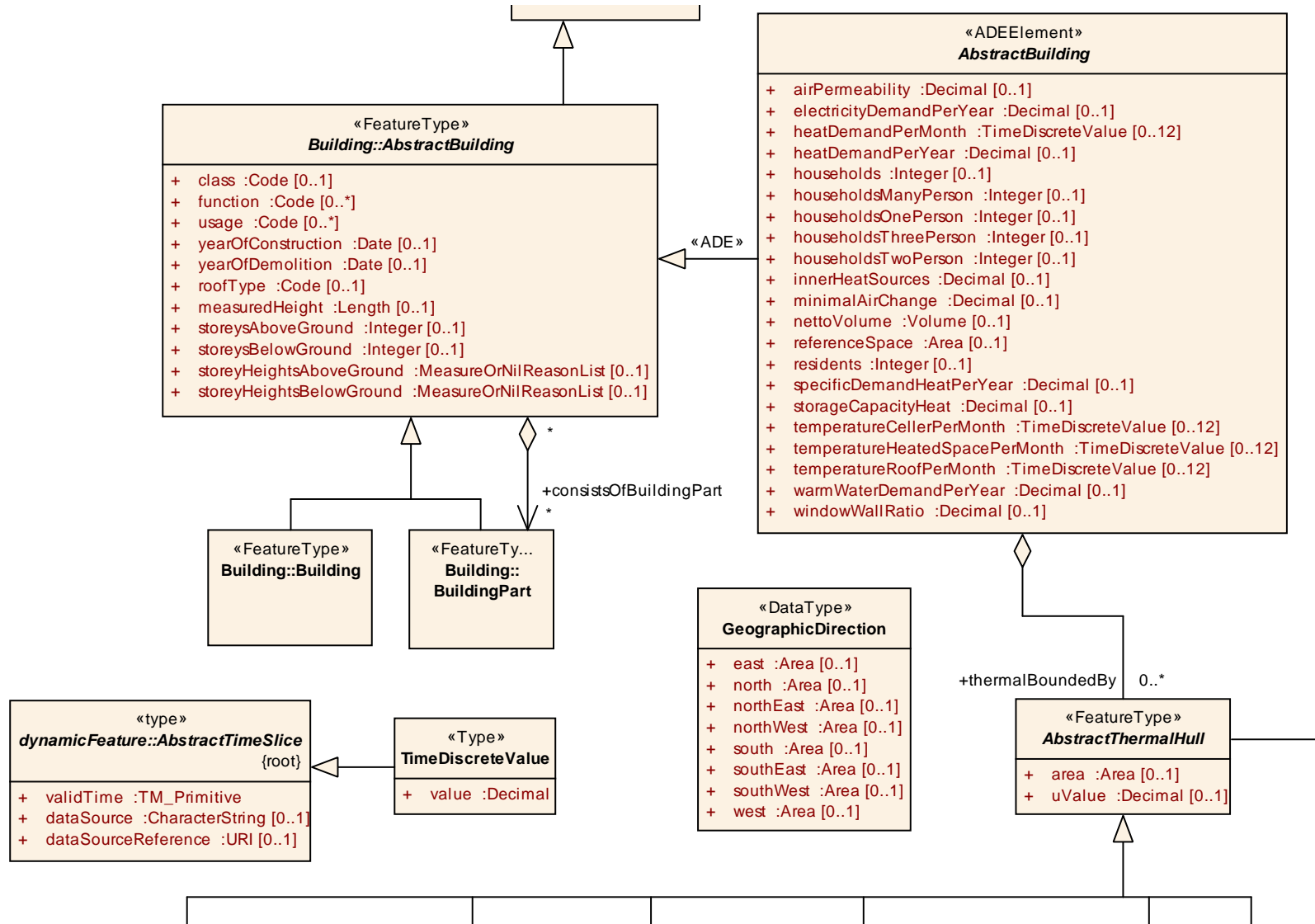
# Which input values are needed?

Eigenschaften des Gebäudes	AbstractBuilding	BaundarySurface	Opening
U-Wert des Daches	?	?	
U-Wert der Außenwand	?	?	
U-Wert der Fenster	?		?
U-Wert der Kellerwand	?	?	
U-Wert der Kellerdecke	?	?	
U-Wert der obersten Geschossdecke	?	?	
g-Wert der Fenster	?		?
Nettovolumen	?		
Bezugsfläche	?		
Strahlungsabsorptionsgrad der Wandflächen	?	?	
Strahlungsabsorptionsgrad der Dachflächen	?	?	
Hüllflächenbezogene Luftdurchlässigkeit	?		
Wirksame Wärmespeicherfähigkeit	?		
Bilanzinnentemperatur	?		
Mittl. monatl. Temperatur im Dach	?		
Mittl. monatl. Temperatur im Keller	?		
Interne Wärmequellen	?		
Lüftungsbedingter Mindestluftwechsel	?		
Anzahl der Bewohner	?		
Anzahl der Haushalte	?		
Anzahl der Einpersonenhaushalte	?		
Anzahl der Zweipersonenhaushalte	?		
Anzahl der Dreipersonenhaushalte	?		
Anzahl der Vier- und Mehrpersonenhaushalte	?		
Monatliche Heizwärmebedarfe	?		
Jährlicher Heizwärmebedarf	?		
Spezifischer Heizwärmebedarf (pro m <sup>2</sup> und Jahr)	?		
Jährlicher Strombedarf	?		
Jährlicher Warmwasserbedarf	?		

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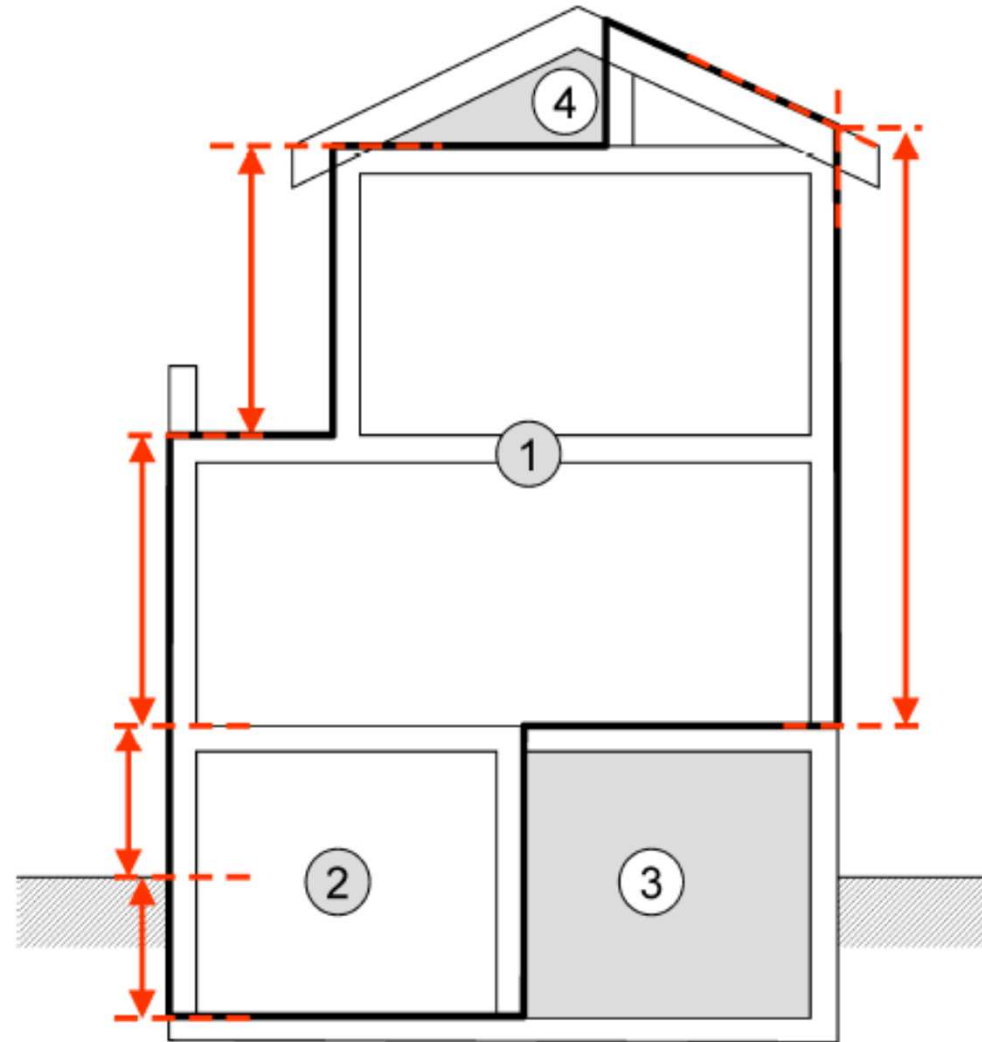


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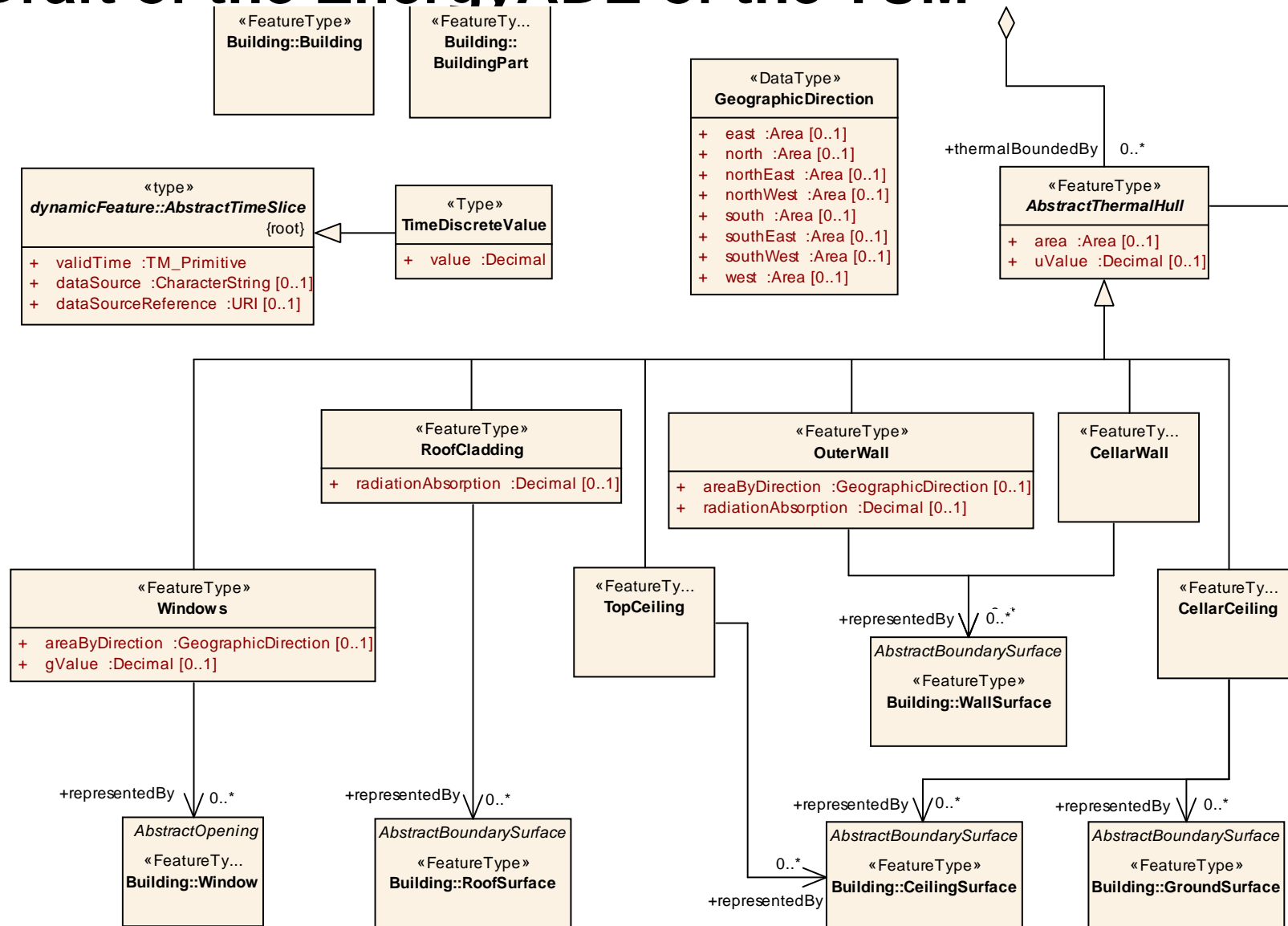


# Why modelling the thermal hull separately?

- ▶ Thermal hull in the most of the cases not coherent to the boundary surfaces
- ▶ To become independent of the used LOD
- ▶ Why not having a parallel concept to the boundary surfaces representing the thermal hull?



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