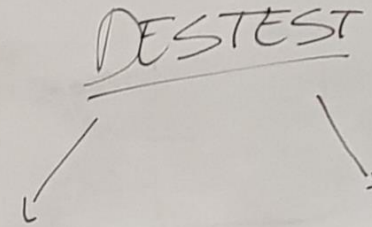


Building modelling group

IBPSA Project 1 – WP3 - DESTEST

Previous expert meeting [02/04/2019]

~ 5 months to Rome



① Dissemination

- Report / template } 1st coord. meet.
- Results (online)
- Description "CityGML" → Michael has a look

② Modelling

→ 3 typical buildings (maybe later 5)

↳ single-family dwelling OK

↳ office - small → Michael sends 1st proposal

(L) supermarket ? (cooling dominated) ??? → Wishlist (Enora)

↳ office - large

→ Variations :
* Occupant : 16 profiles (Ina)
* old/new :

RURAL

16/16

URBAN

10/16

4/16

2/16

Content

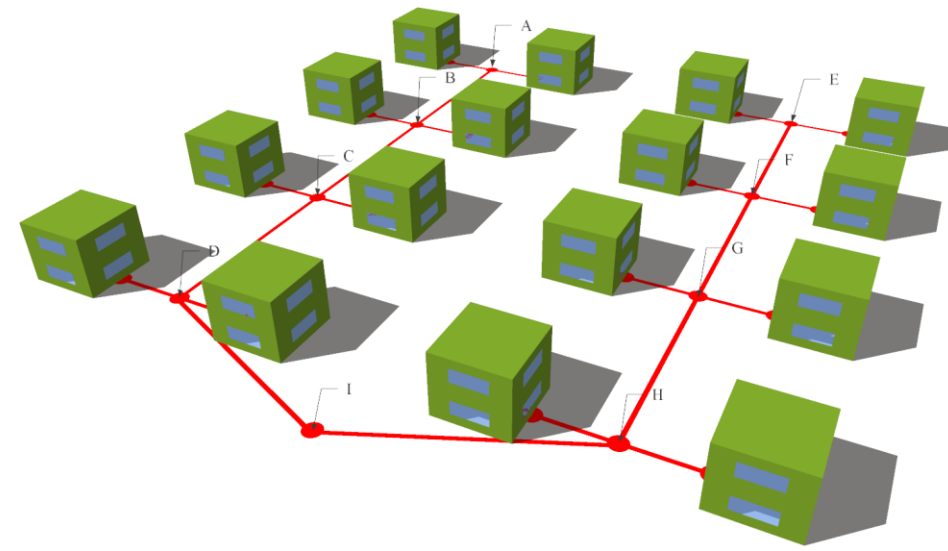
- Start simple
- Gradually increasing in complexity
 - Addition 1: 16 occupants
 - Addition 2: renovations
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Start simple: 16 identical buildings

- Single-family dwelling of 1980
 - Thermal performance based on TABULA project for Belgium
 - Two-zone model (day zone and night zone)
 - Only heat demand for space heating
 - Standard occupant (ISO 13790)

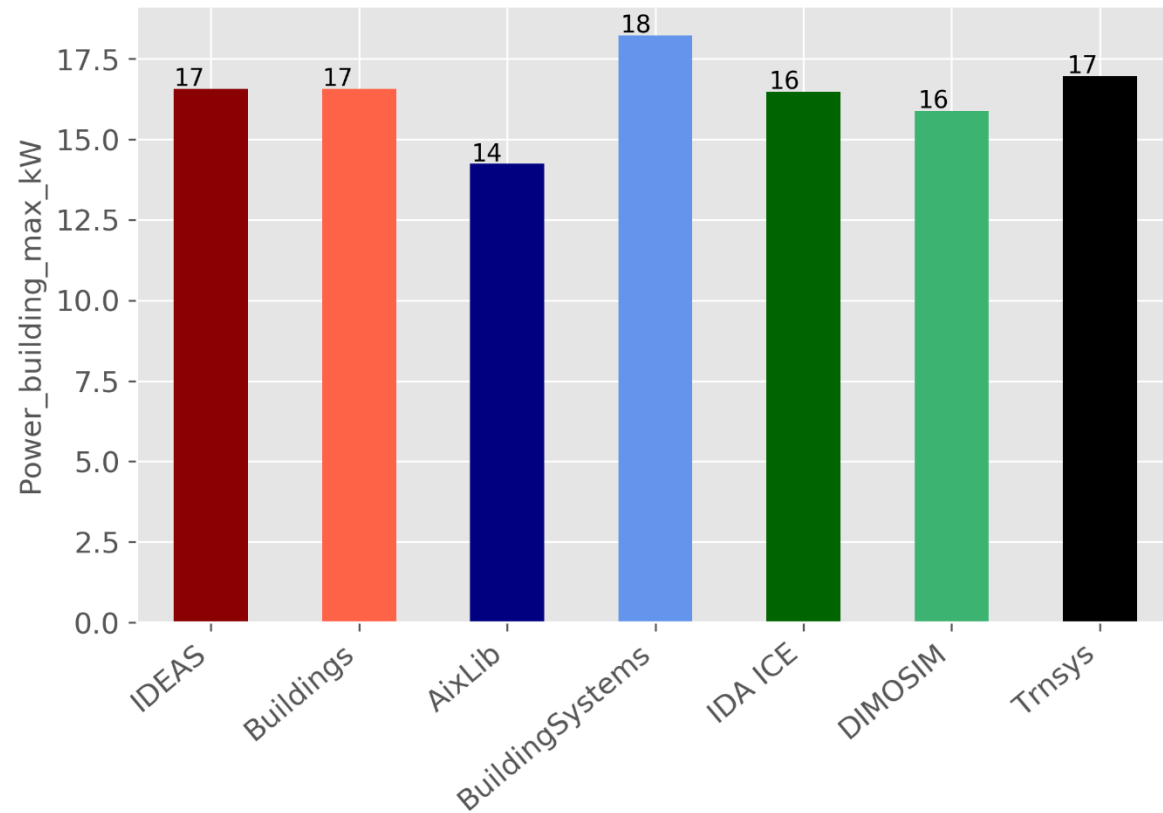


Participants

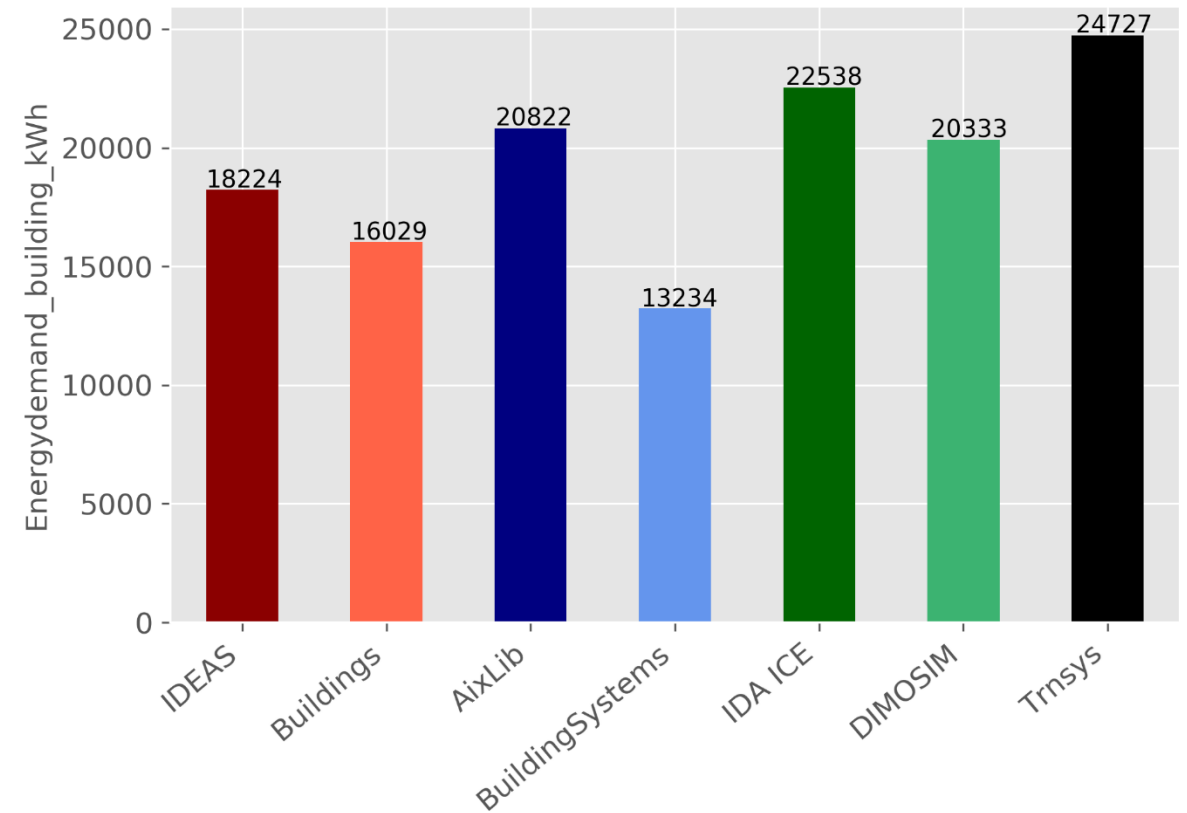
Modelling environment	Modeler	Affiliation of participant
Modelica IDEAS	Ina De Jaeger	KU Leuven / VITO / EnergyVille
Modelica Buildings	Alessandro Maccarini	Aalborg University
Modelica AixLib	Michael Mans	RWTH Aachen
Modelica BuildingSystems	Haris Shamsi	UCD Dublin
IDA ICE	Øystein Rønneseth, Igor Sartori	Sintef Norway
DIMOSIM	Enora Garreau	CSTB
Trnsys	Enora Garreau	CSTB

Peak power & energy demand

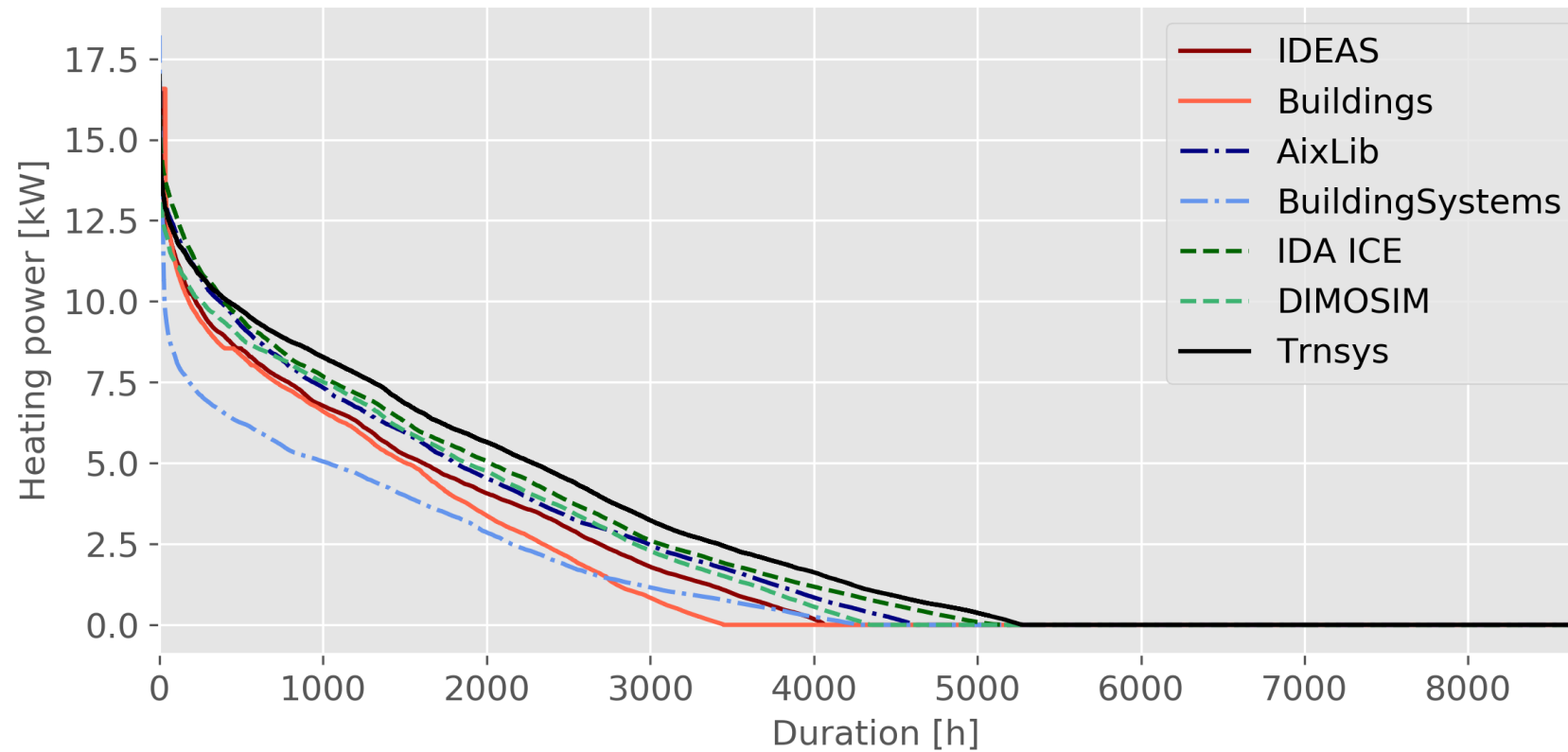
Peak power



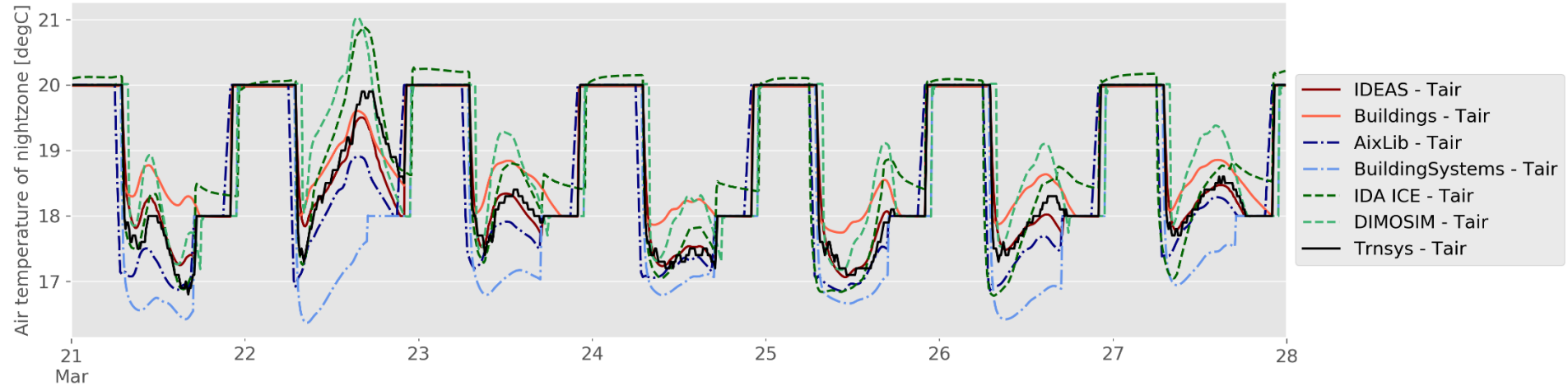
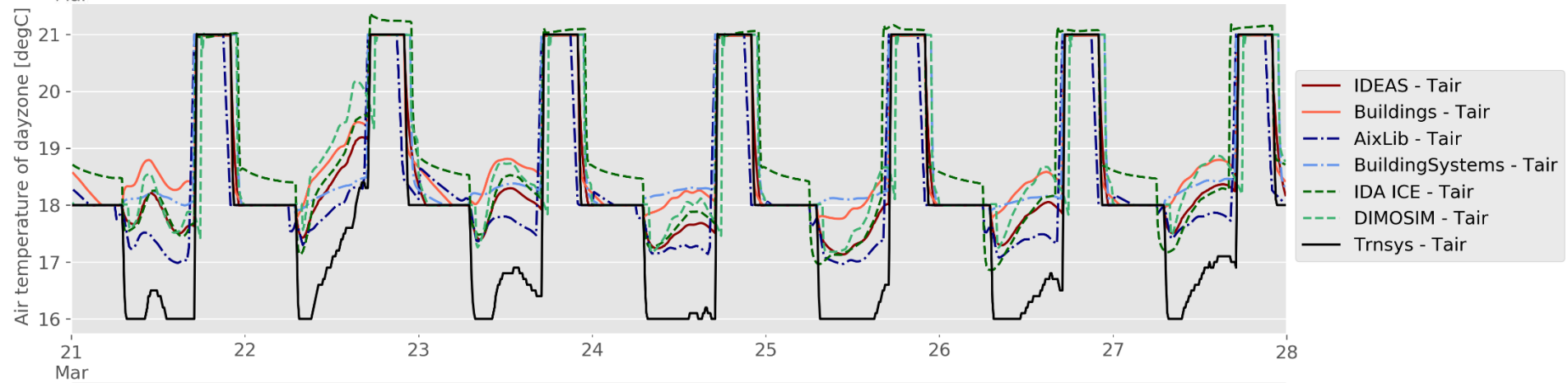
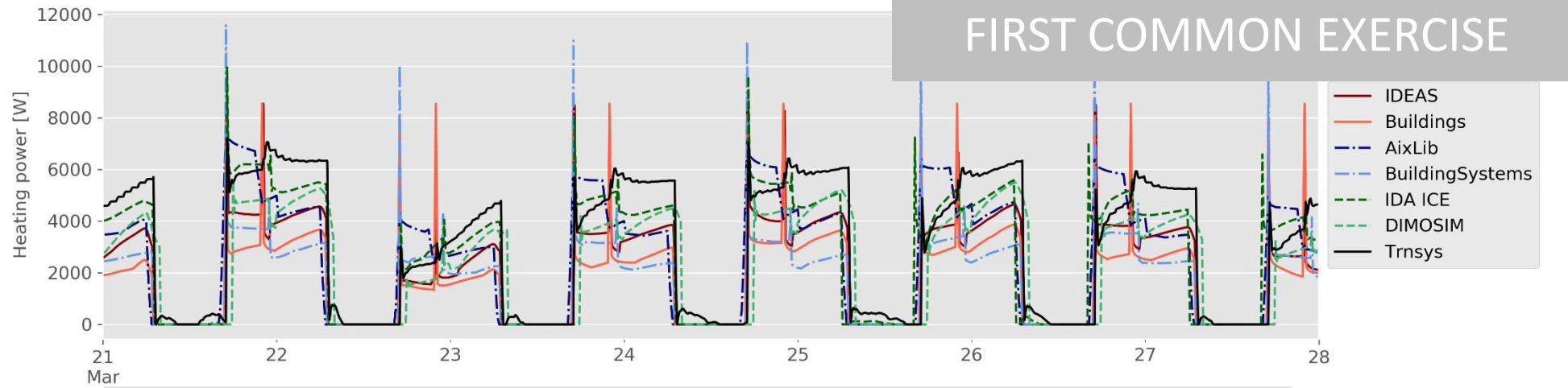
Annual energy demand



Load duration curve



Profiles: March



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Gradually increasing in complexity

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- Only heat demand for space heating
- Standard occupant (ISO 13790)

→ Also include renovation (light and heavy)

ADDITION 2

Definition ready

→ Stochastic occupants (16 different profiles)

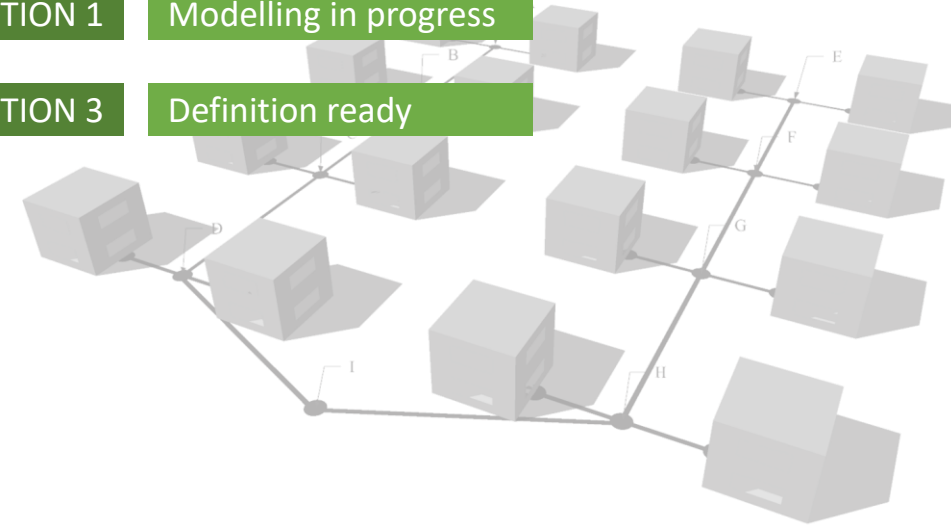
- Office building

ADDITION 1

Modelling in progress

ADDITION 3

Definition ready



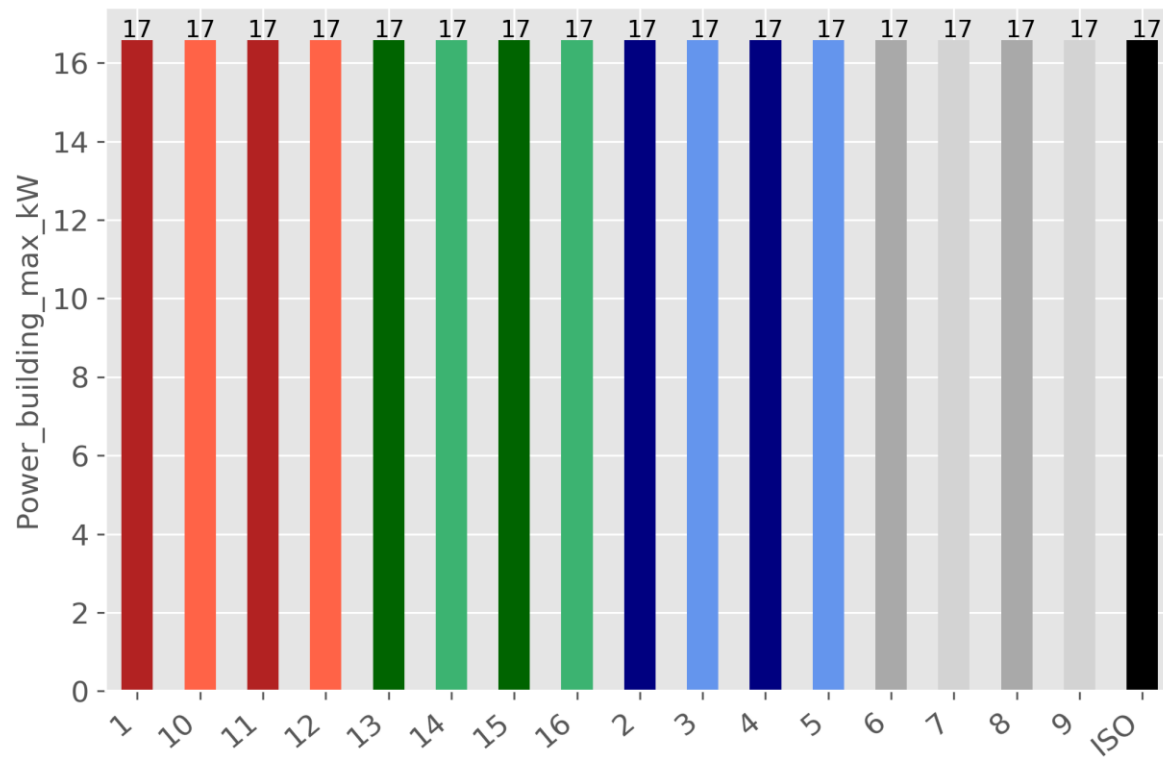
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Peak power & energy demand

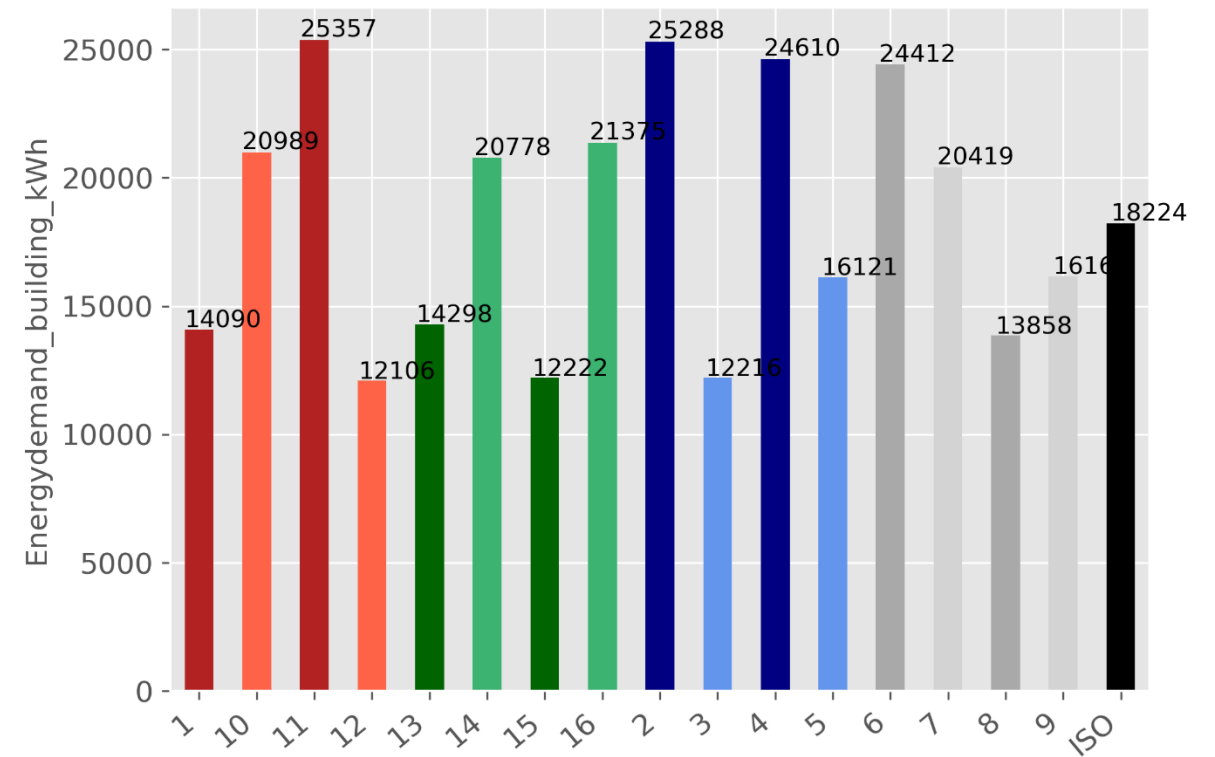
Peak power

Results for different occupants
(IDEAS, SFD, 1, 1980s)

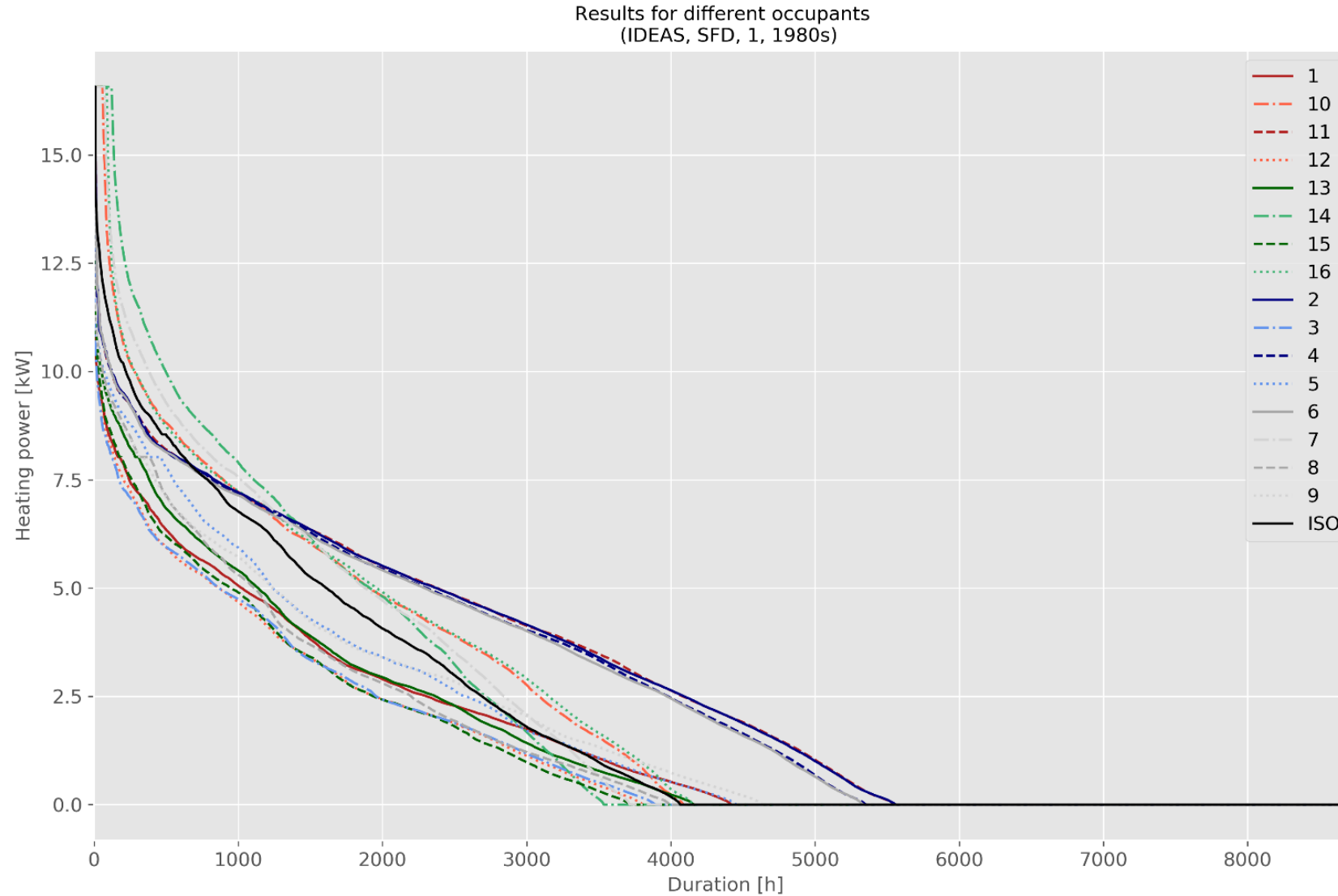


Annual energy demand

Results for different occupants
(IDEAS, SFD, 1, 1980s)

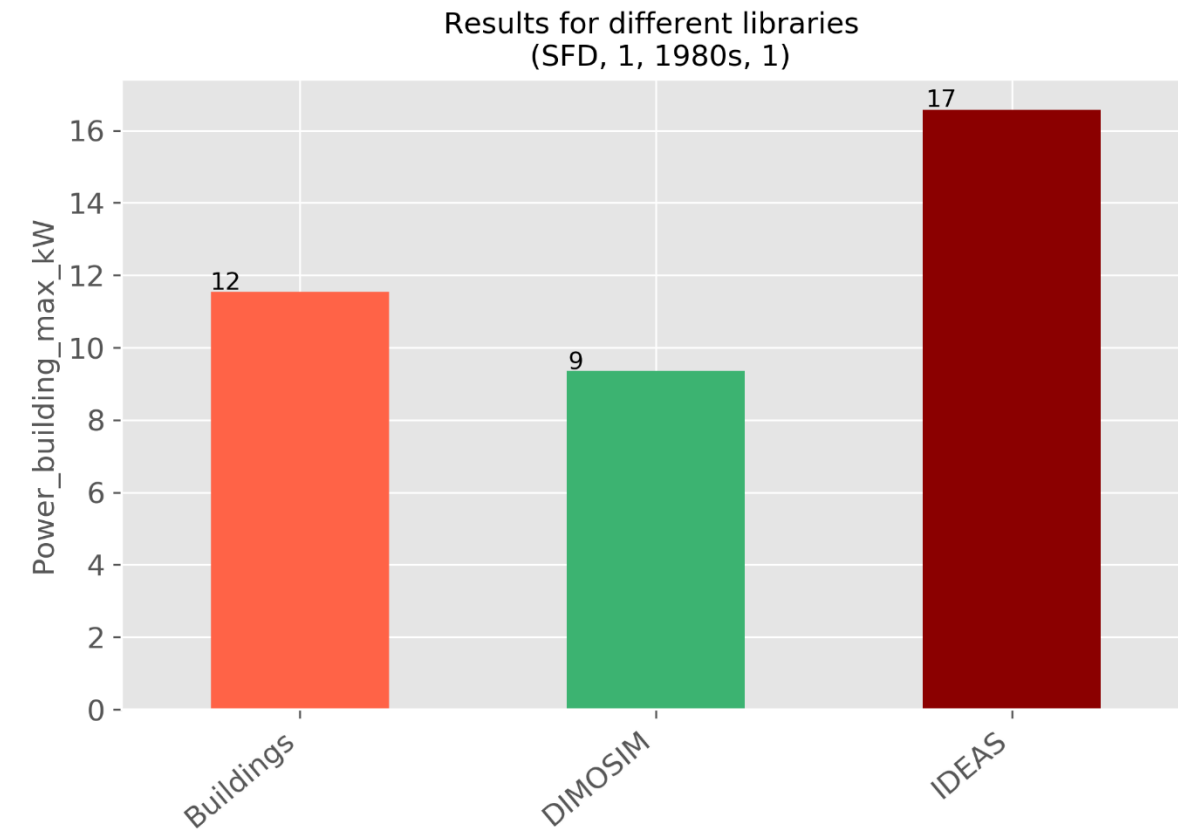


Load duration curve

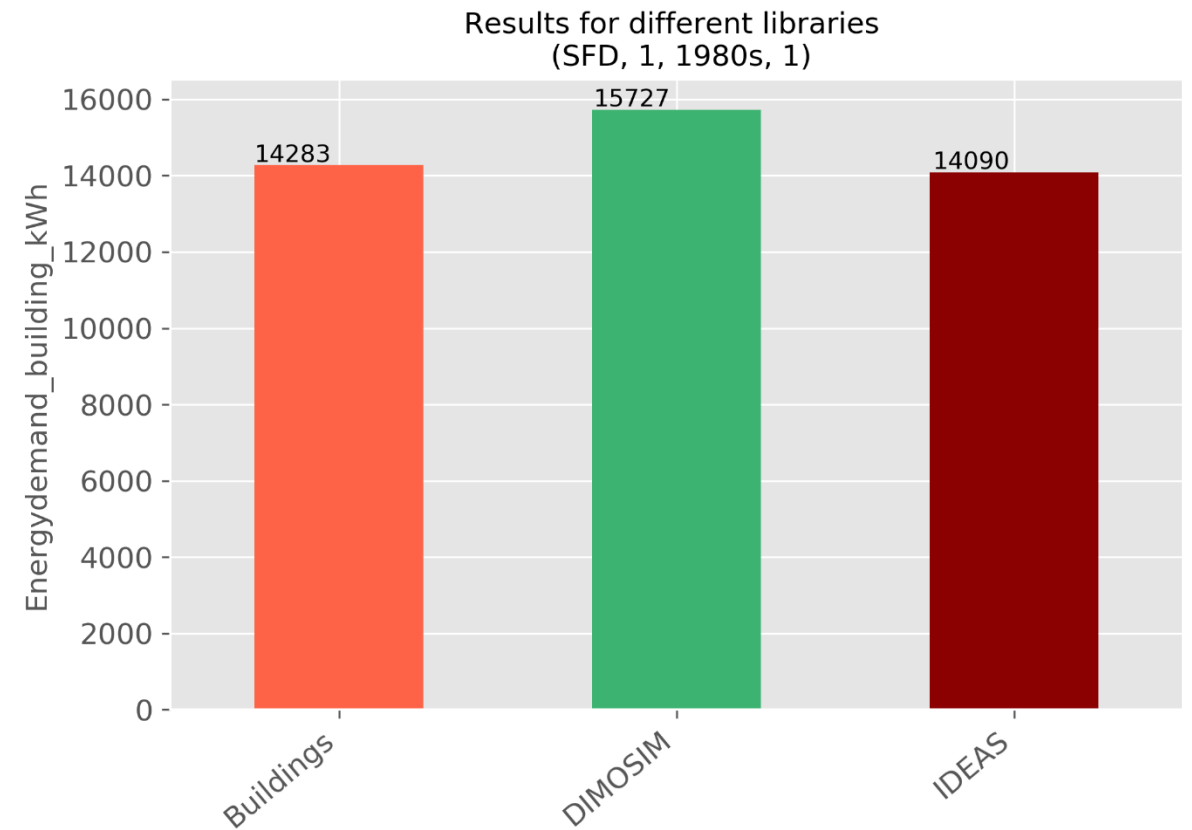


Peak power & energy demand

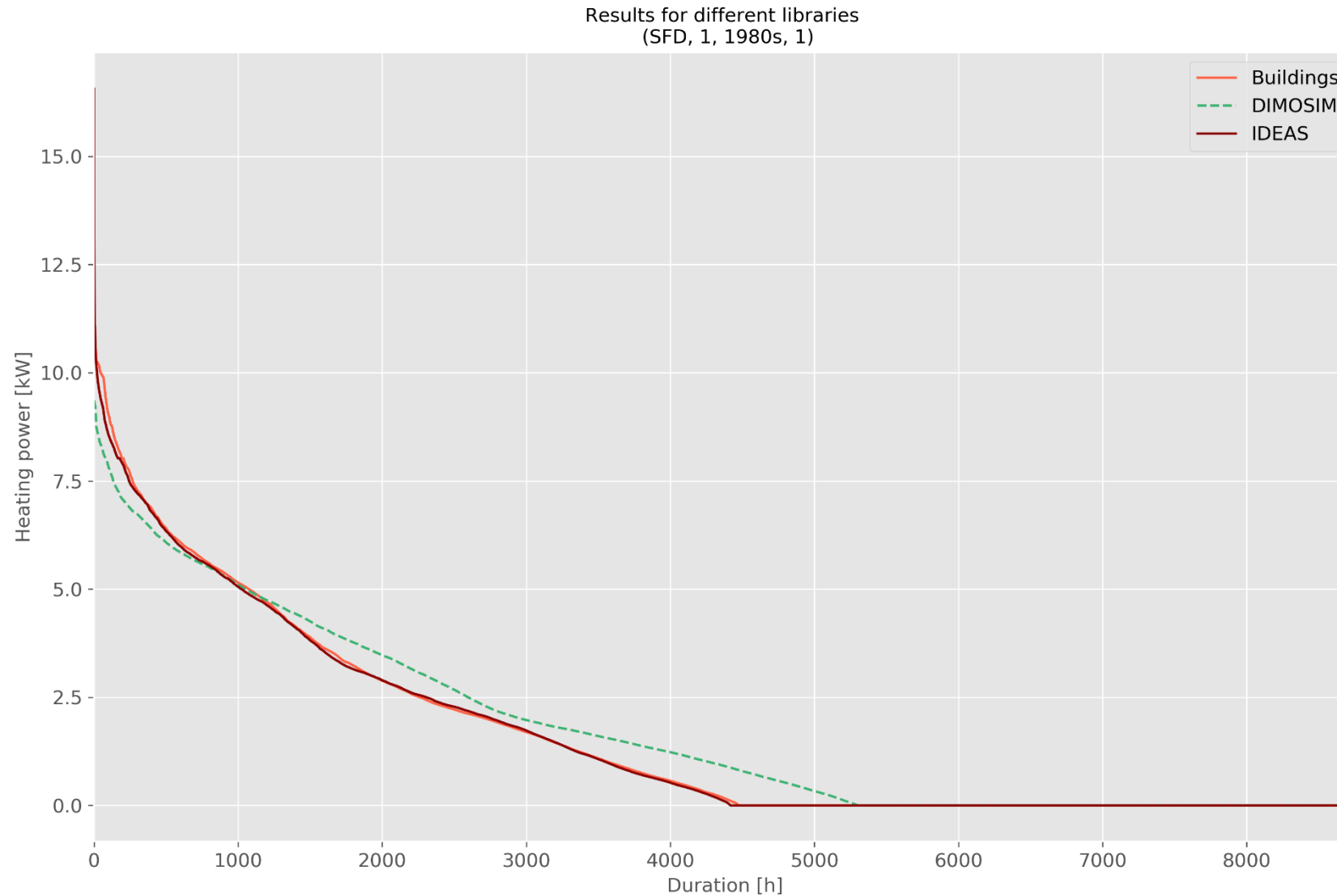
Peak power



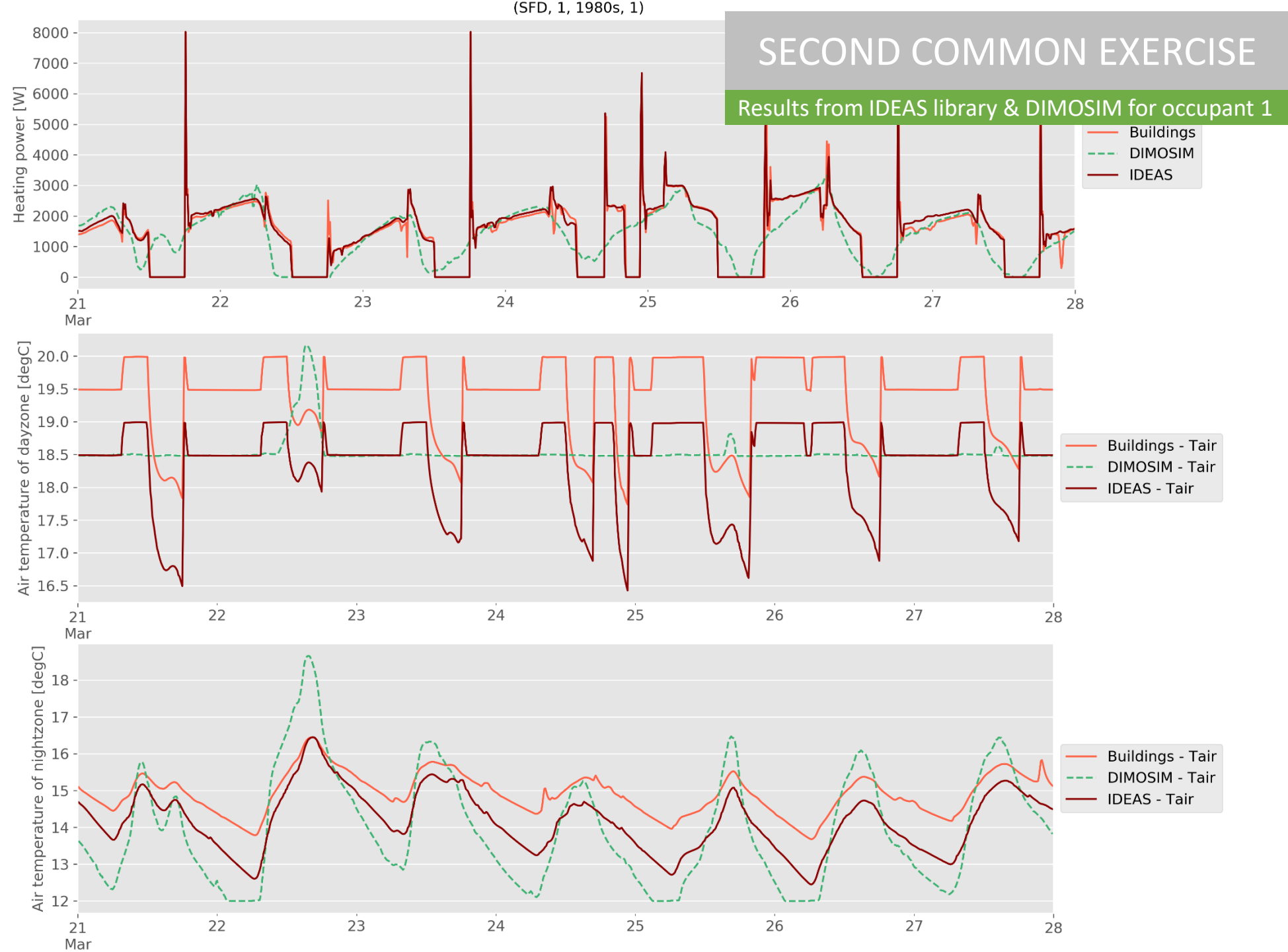
Annual energy demand



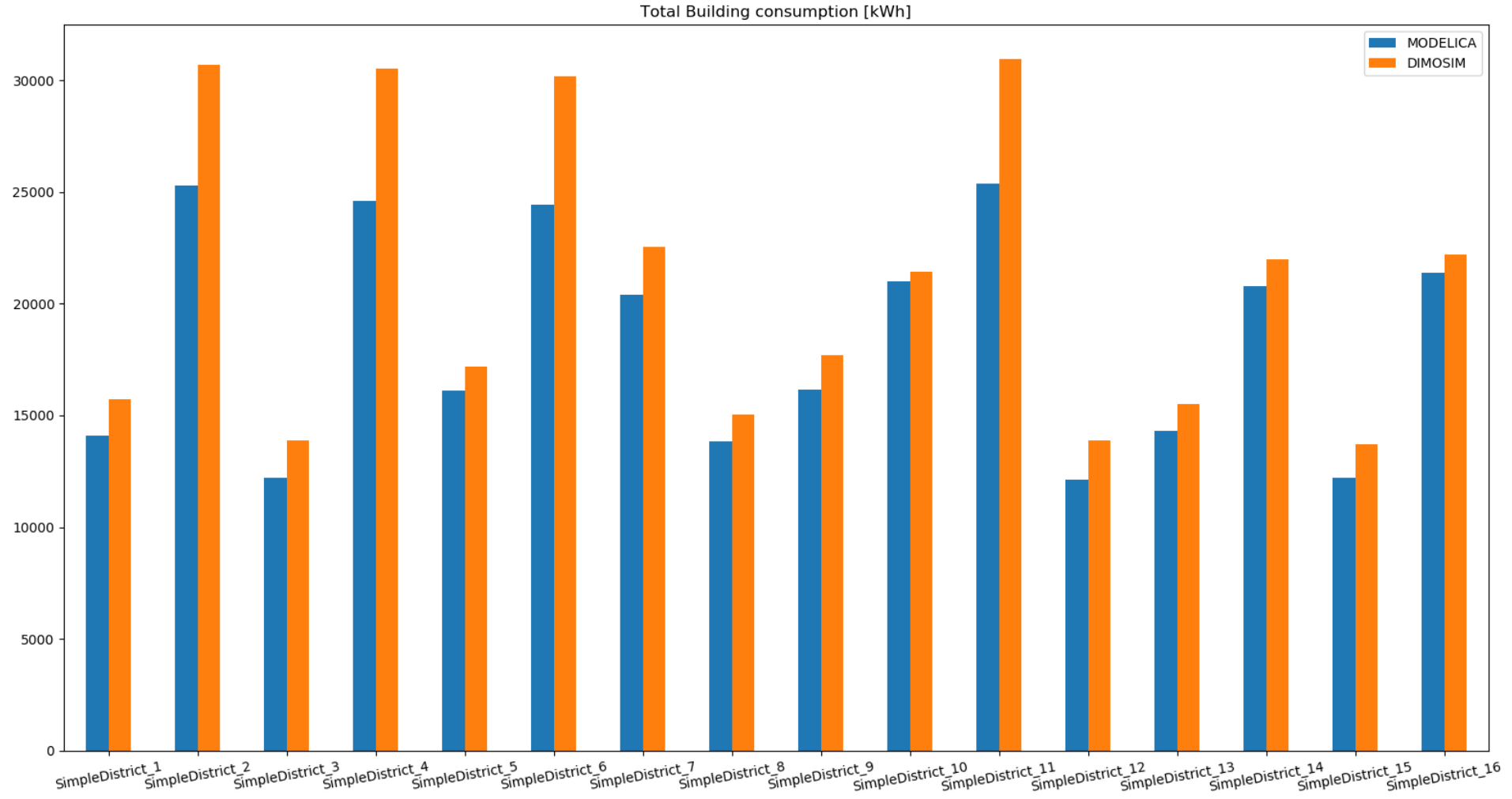
Load duration curve



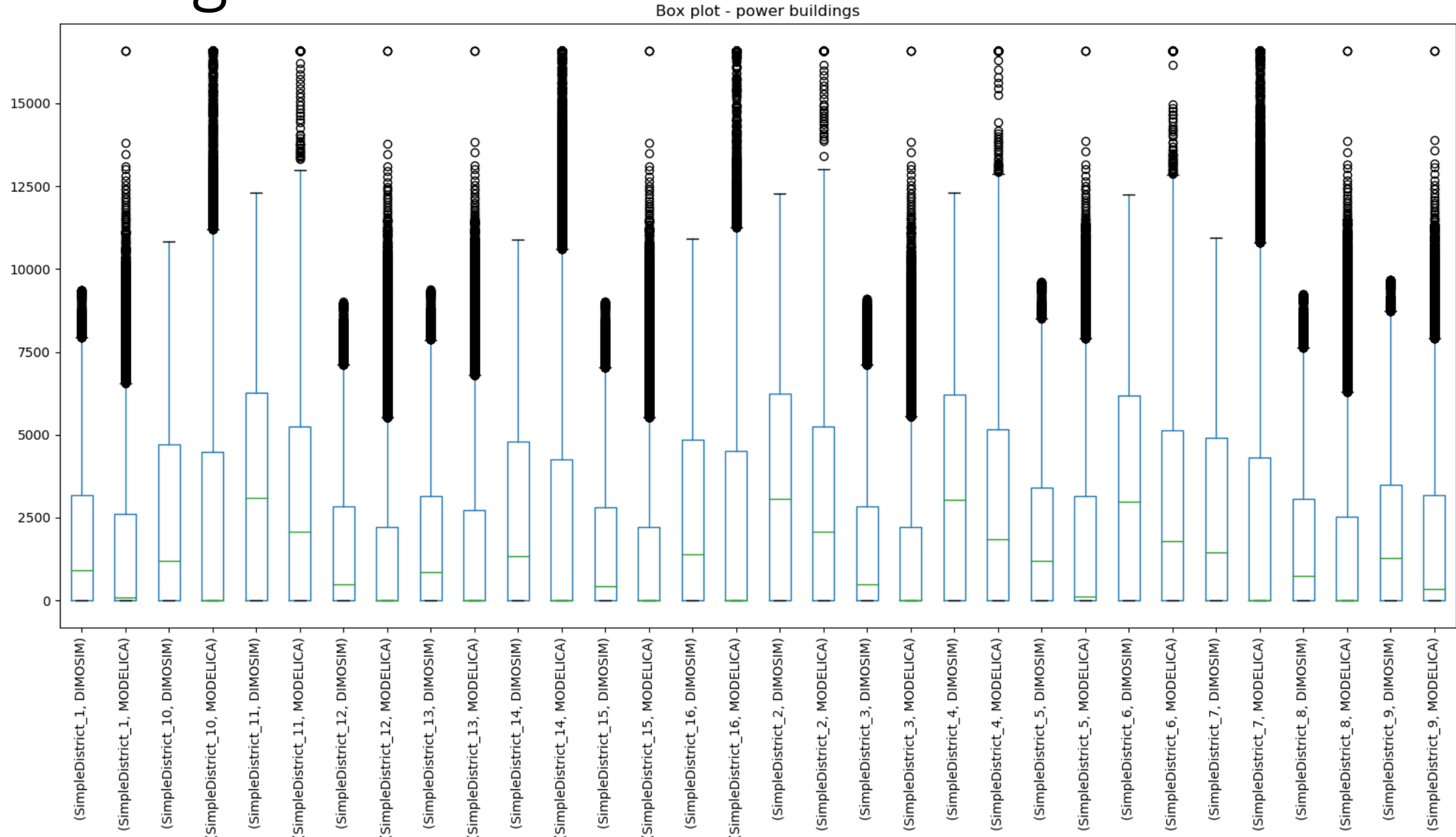
Profiles: March



Annual heat demand



Heating loads



Addition 1: 16 occupants

- Commitments?
- Next steps?

Content

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Addition 2: renovations

[Based on TABULA, Belgium]

- Proposal 1:
 - Add 6 cm of MW to external walls
 - Add 8 cm of MW to roof
 - Add 6 cm of EPS to ground floor
 - Mount new windows, double glazed, argon filled, low E ($U = 2 \text{ W/m}^2\text{K}$)
- Proposal 2:
 - Add 12 cm of MW to external walls
 - Add 22 cm of MW to roof
 - Add 12 cm of EPS to ground floor
 - Mount new windows, double glazed, argon filled, low E, insulated frame ($U = 1.6 \text{ W/m}^2\text{K}$)

External walls (area 4 x 22.4 m²)						U = 1.07 W/m²K	
	Layers	t [m]	λ [W/mK]	ρ [kg/m³]	c [J/kgK]	sa [-]	ε [-]
	Heavy masonry	0.1	1.1	1850	840	0.55	0.9
	Cavity	0.1	0.555556	100	20	0.55	0.9
	EPS	0.01	0.036	26	1470	0.8	0.9
	Medium masonry	0.14	0.75	1400	840	0.55	0.9
	Gypsum	0.02	0.6	975	840	0.65	0.9

Roof (area 64 m²)						U = 0.71 W/m²K	
	Layers	t [m]	λ [W/mK]	ρ [kg/m³]	c [J/kgK]	sa [-]	ε [-]
	Ceramic tile	0.025	1.4	2100	840	0.55	0.9
	Cavity	0.1	0.625	100	20	0.55	0.9
	Glasswool	0.04	0.04	80	840	0.85	0.9
	Gypsum	0.02	0.6	975	840	0.65	0.9

Ground floor (area 64 m²)						U = 0.81 W/m²K	
	Layers	t [m]	λ [W/mK]	ρ [kg/m³]	c [J/kgK]	sa [-]	ε [-]
	Dense concrete	0.15	1.4	2100	840	0.55	0.9
	EPS	0.03	0.036	26	1470	0.8	0.9
	Light concrete	0.08	0.6	1100	840	0.55	0.9
	Ceramic tile	0.02	1.4	2100	840	0.55	0.9

Addition 2: renovations

- Commitments?
 - Initialise case report 3 (Ina)
 - Define materials properties of new materials and add to case report 3 (Ina)
 - Make simulations in IDEAS (Ina)
 - Other simulations?

Content

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 - Next steps?
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Addition 3: office building

- Commitments?
 - Initialise report?
 - Simulations?
 - IDEAS (Arash)
 - AixLib (Michael)
- Current status?

Content

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 - **Next steps?**
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Gradually increasing in complexity – next steps?

- Single-family dwelling of 1980
 - Thermal performance based on TABULA project for Belgium
 - Also include renovation (light and heavy)
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 - Standard occupant (ISO 13790)
 - Stochastic occupants (16 different profiles)

- Office building

→ Dreamlist? Next steps? When?

ADDITION 2

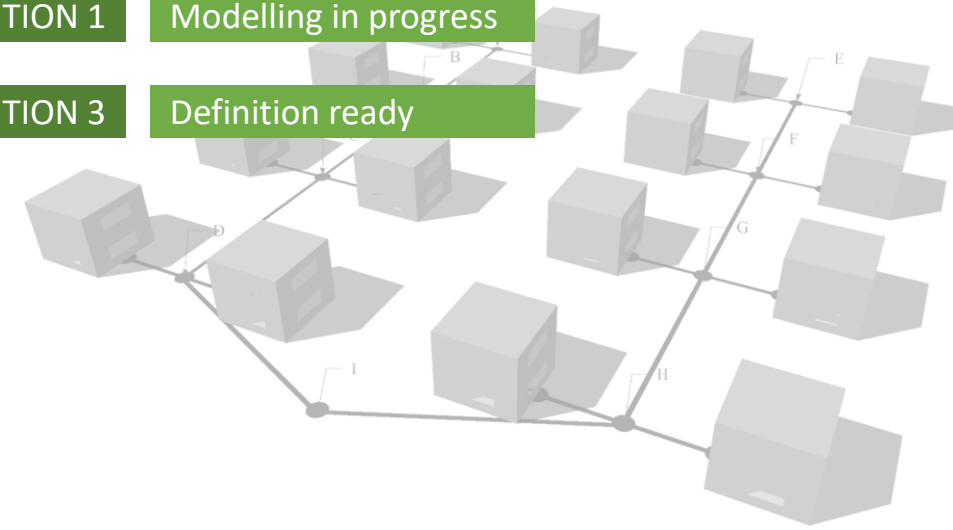
Definition ready

ADDITION 1

Modelling in progress

ADDITION 3

Definition ready



Content

- Start simple
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- **Dissemination**
 - **Case report**
 - Online results + plots
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Case report

- Finalize [case report 1](#)
- Update template for case reports (Ina)
- Start on next case reports?
 - Case report 2: stochastic occupants
 - Case report 3: renovations
 - Case report 4: office building
 - Commitments?

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Online results and plots

- Currently: [Google spreadsheet](#)
 - Very slow
- Proposal:
 - Collect results in standardized format on [IBPSA Project 1 Github \(WP2 directory\)](#)? (might become too big)
 - Python script for automated plots? (show current status)
 - Other plots to add? (E.g. plots of Enora?)

Content

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CityGML model

- Ask Joachim (Ina)