

T3.4 Virtual Neighborhood Load Emulation (VILLE)

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Team



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Objective

Create future scenarios of energy consumption (electricity, heat, oil, gas, ...) for future energy supply system design / load emulations.

A. Scenario Development

1. Future Climates
2. Future Urban Development
3. Future Building Technologies

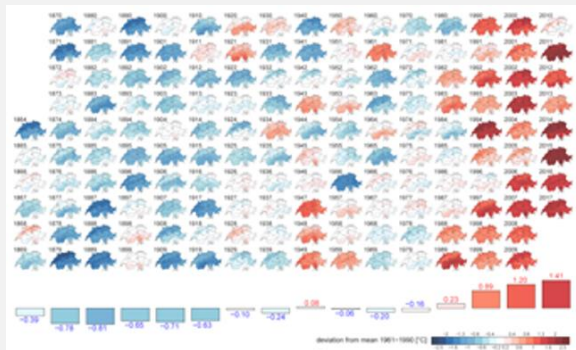
B. Connections to ReMaP partners

1. Automated scenario creation via Simulation Framework (SFW)
2. Results of typical neighborhoods available in ReMaP archive

A. Scenario Development

1. Climate

What's the climate in 2040/2060?



2. Urban Development

How many new buildings?

Are building used differently?



3. Building Technologies

How will building envelopes be renovated?

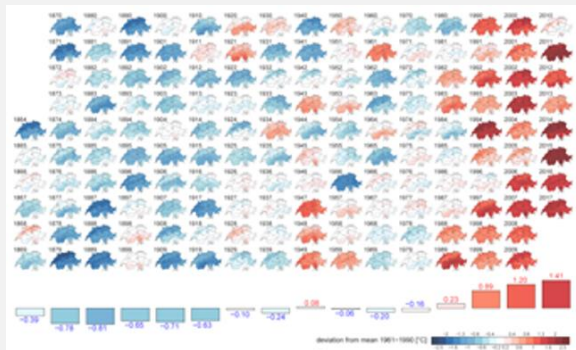
How much heat electrification?

How to supply space cooling?

A. Scenario Development

1. Climate

What's the climate in 2040/2060?



2040

RCP2.6

2060

RCP8.5

A. Scenario Development

2. Urban Development

How many new buildings?

Are building used differently?

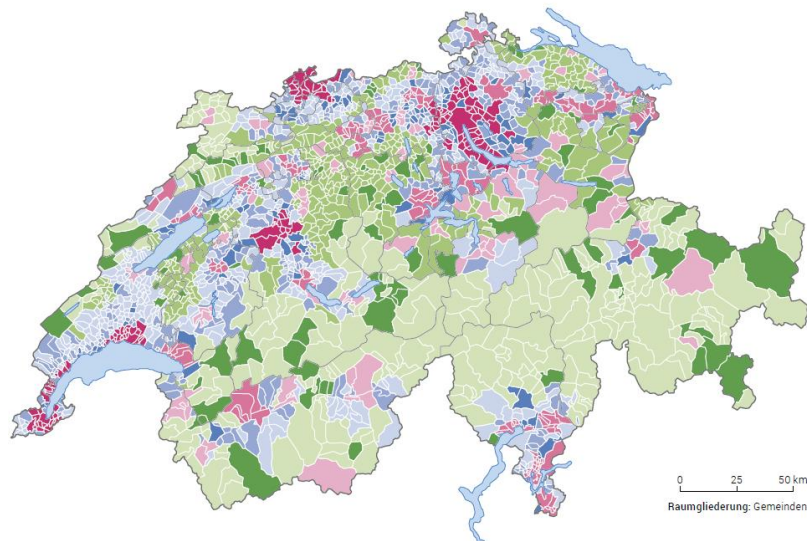


- District Archetype Definition : **3 district archetypes**
- Scenario Construction : **3 over-arching scenarios**
- Urban Building Energy Modelling: key urban development params.

A. Scenario Development

2. Urban Development

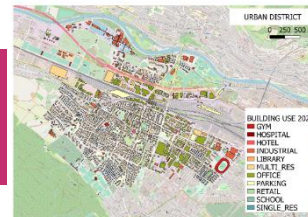
- District Archetype Definition : 3 district archetypes



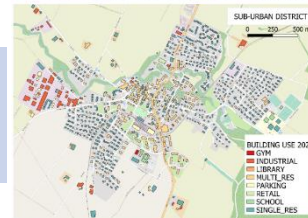
Gemeindetypologie, BFS 2017



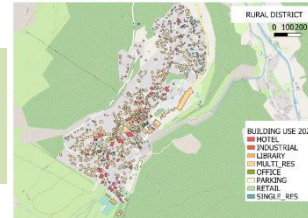
Urban:
Altstetten, ZH



Sub-urban:
Echallens, VD



Rural:
Airolo, TI



A. Scenario Development

2. Urban Development

- Scenario Construction : 3 over-arching scenarios

I. Business as usual (BAU)

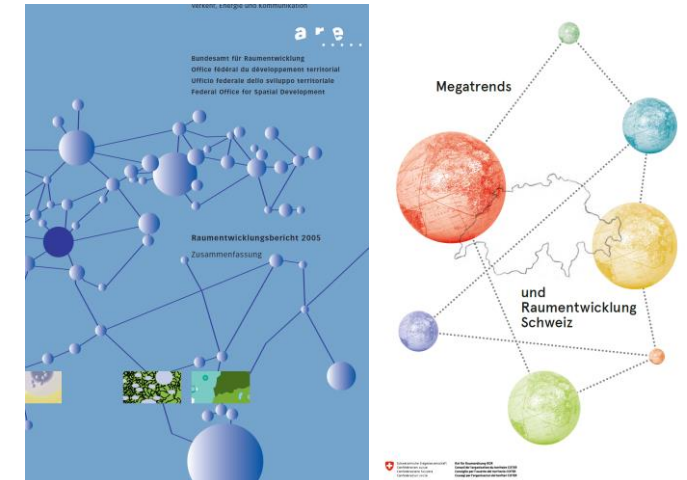
Population growth mainly in urban area.

II. Polycentric urban network (PCN)

Transform sub-urban/rural areas into well-connected hubs with attractive living conditions.

III. Digitalization (DGT)

Population growth moves to sub-urban/rural areas.



A. Scenario Development

2. Urban Development

- Urban Building Energy Modelling : 4 key urban development parameters

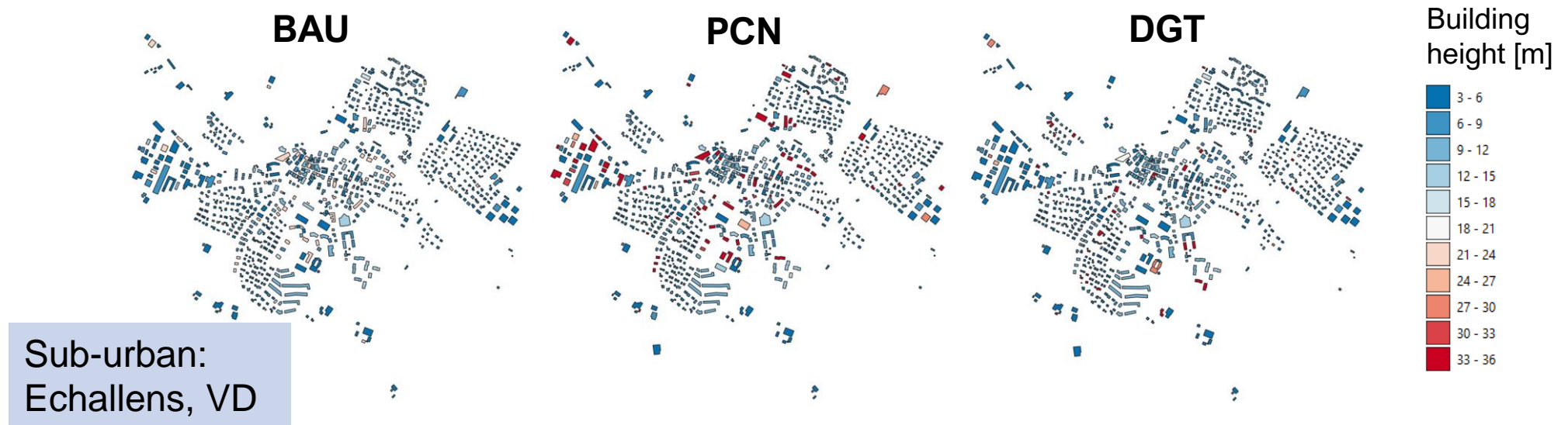
	URBAN			SUB-URBAN			RURAL		
	BAU	PCN	DGT	BAU	PCN	DGT	BAU	PCN	DGT
Population [↑#ppl]	↑↑↑	↑↑	↑	↑	↑↑	↑↑↑	↑	↑↑	↑↑↑
Occupant density [m2/p]	40	35	45	50	40	60	60	60	80
New building footprints	√	x	x	√	√	√	x	x	√
Building use ratio	-	-	+ Res.	-	core-city like	urban res.	-	-	-

BAU: Business As Usual; **PCN:** PolyCentric urban Networks; **DGT:** DiGiTalization

A. Scenario Development

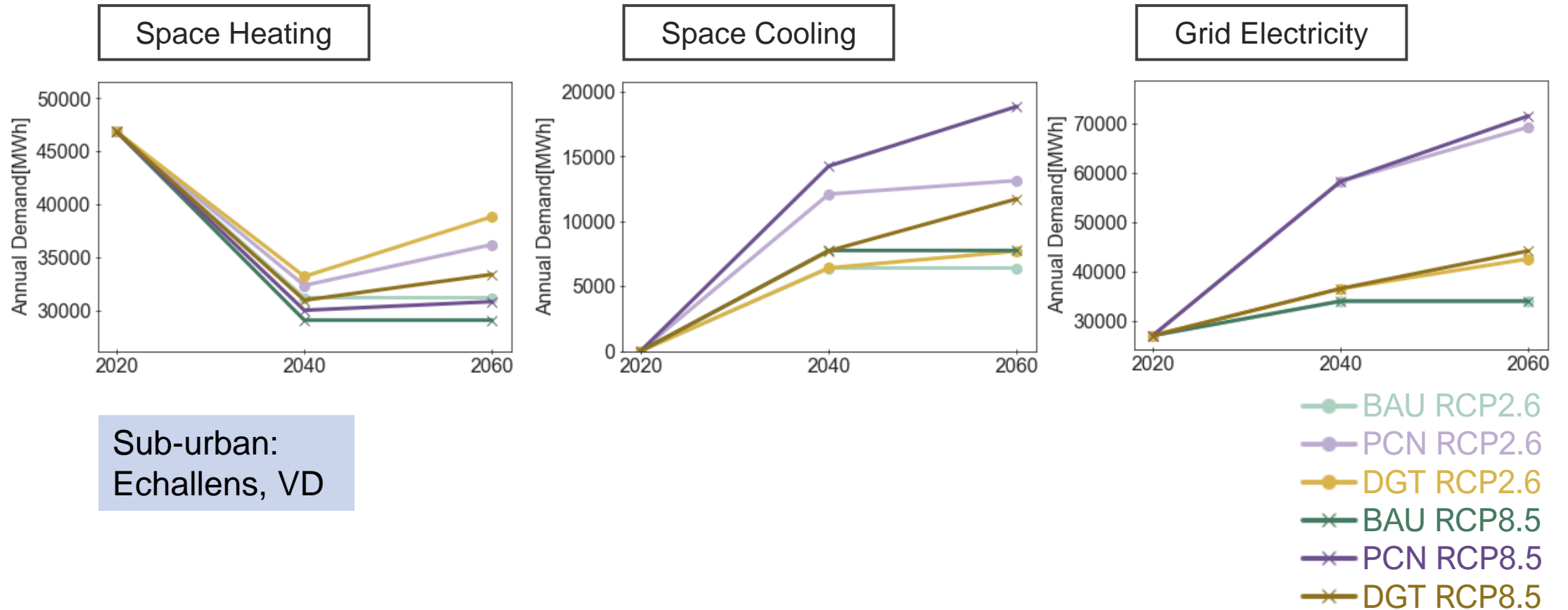
2. Urban Development

- Urban Building Energy Modelling : 4 key urban development parameters



BAU: Business As Usual; **PCN:** PolyCentric urban Networks; **DGT:** DiGiTalization

A. Scenario Development – Annual Energy Consumption



BAU: Business as usual; **PCN:** Polycentric urban networks; **DGT:** Digitalization

A. Scenario Development – Hourly Energy Consumption

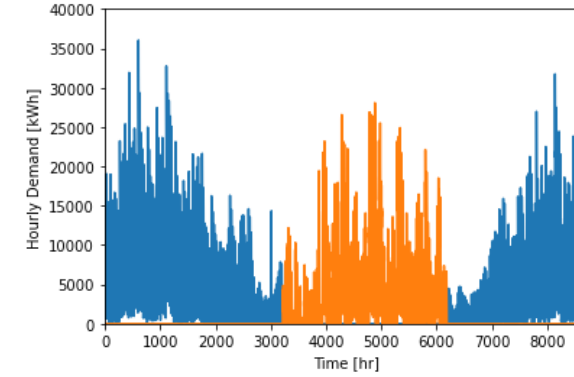
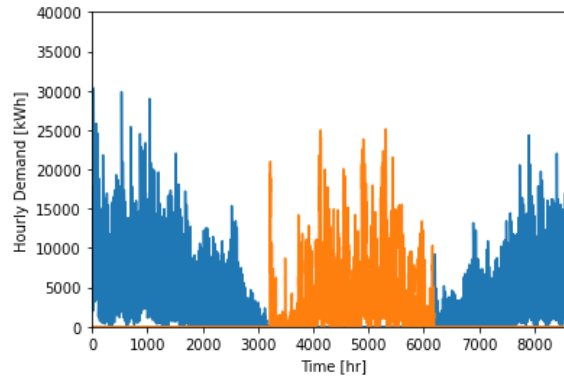
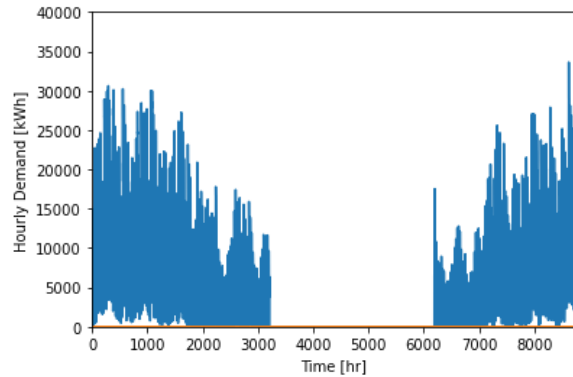
Sub-urban:
Echallens, VD

2020

2040, PCN

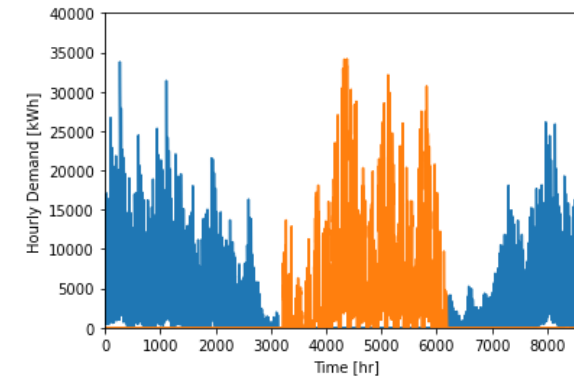
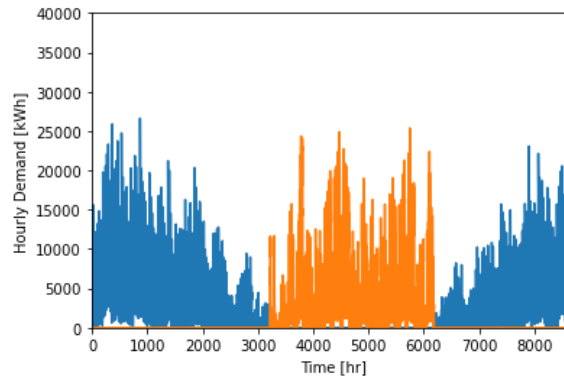
2060, PCN

RCP2.6



— Qhs_sys_kWh
— Qcs_sys_kWh

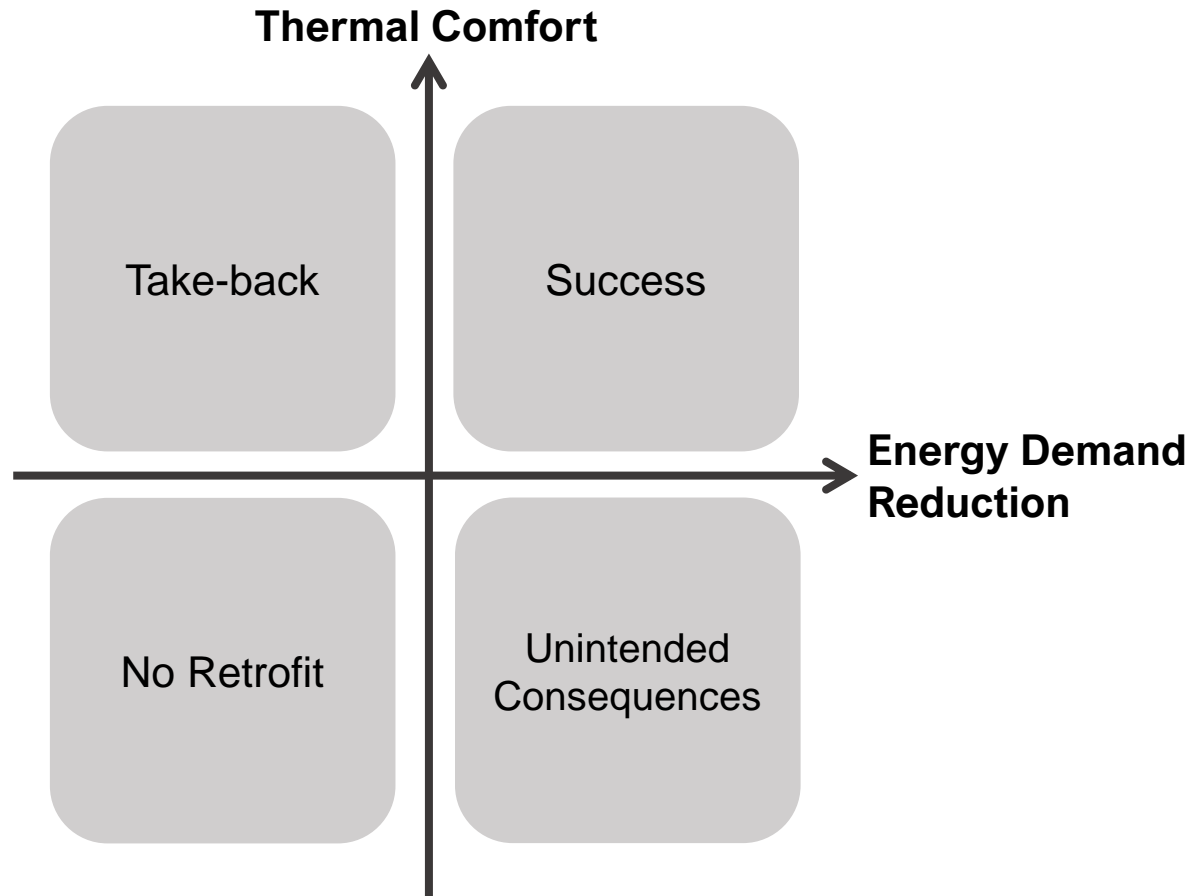
RCP8.5



— Qhs_sys_kWh
— Qcs_sys_kWh

PCN: Polycentric urban networks

A. Scenario Development



3. Building Technologies

How will building envelopes be renovated?

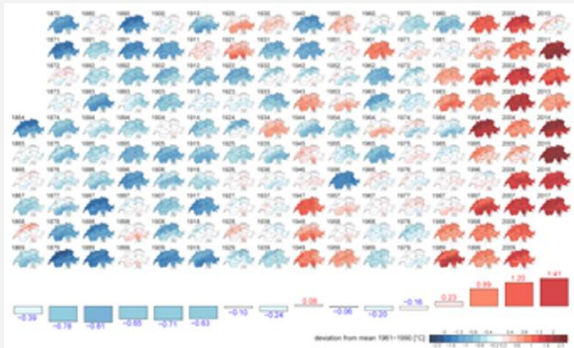
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Urban	BAU
Sub-Urban	PCN
Rural	DGT

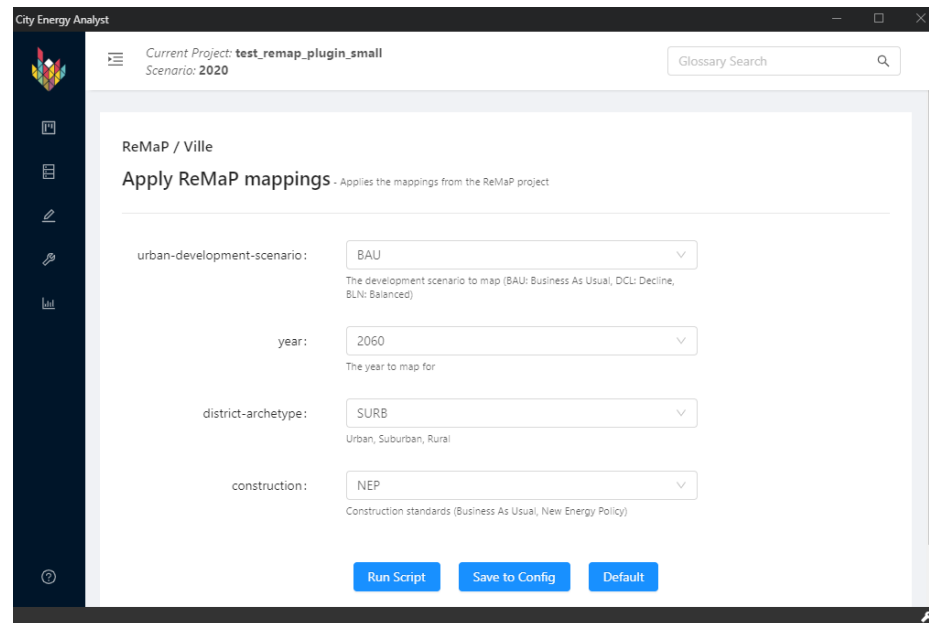
3. Building Technologies

How will building envelopes be renovated?
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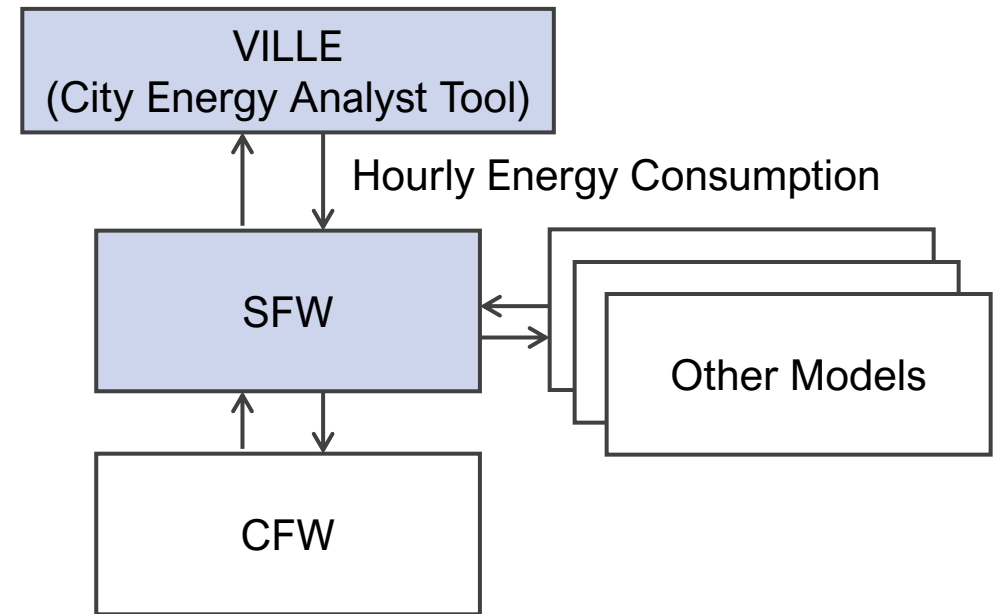
Success
Take-back
Unintended Cons.
No-retrofit

B. Connections to ReMaP partners

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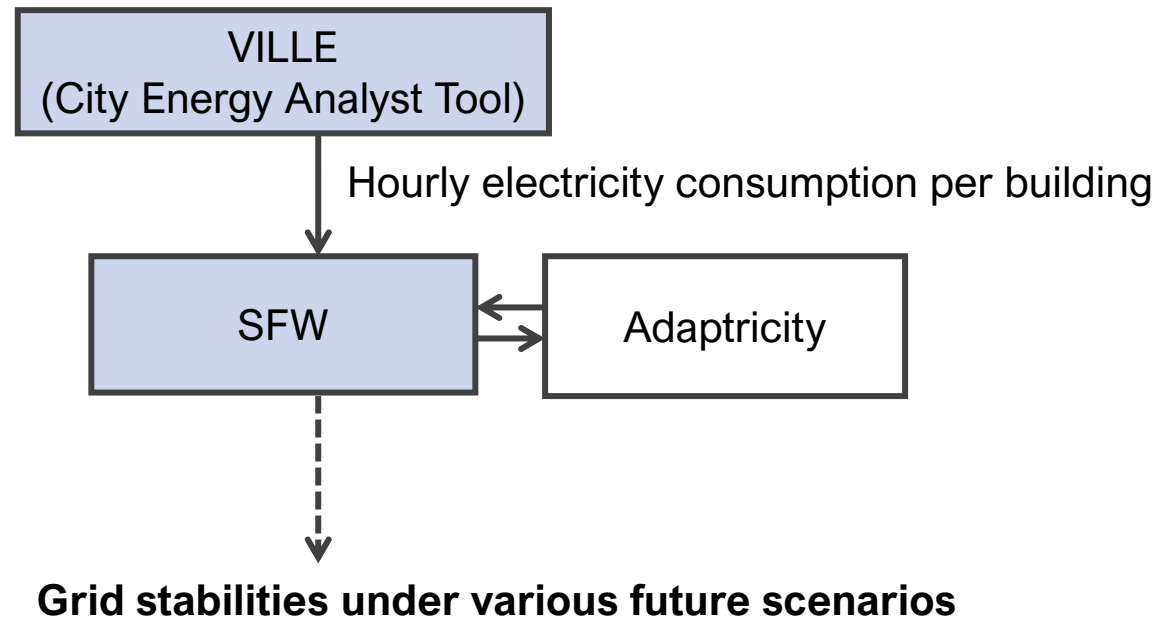
Open-source urban energy simulation toolbox:
www.cityenergyanalyst.com



B. Connections to ReMaP partners

1. Automated scenario creation via Simulation Framework

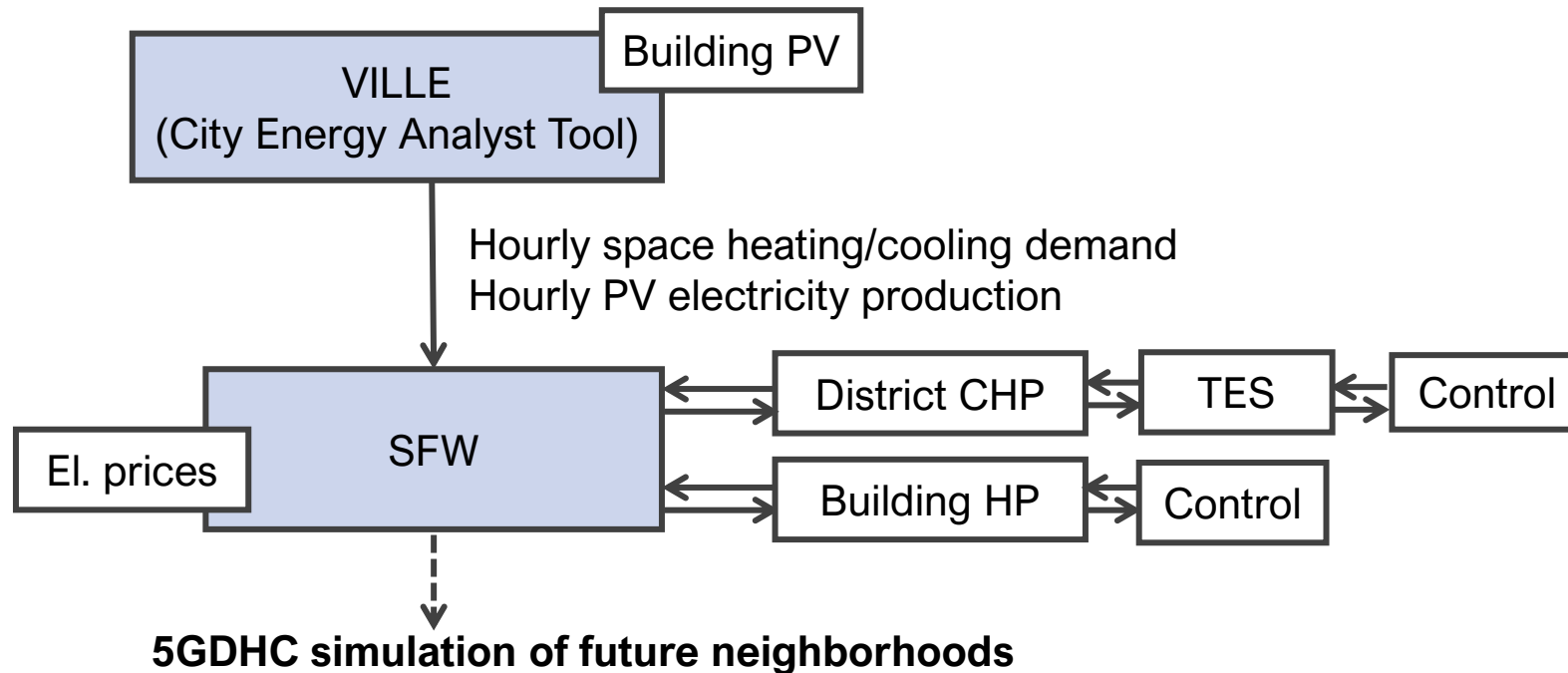
Use case (i) Power flow analysis :



B. Connections to ReMaP partners

1. Automated scenario creation via Simulation Framework

Use case (ii) flexible 5GDHC simulation :



Interested to know more?

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