



13TH NORDIC SYMPOSIUM ON BUILDING PHYSICS

NSB 2023

PRELUDE Roadmap for Building Renovation: set of rules for renovation actions to optimize building energy performance



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Estia

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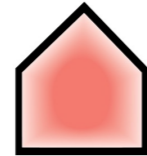
PURPOSE

**Propose a systematic approach
to list and prioritize maintenance and renovation actions**

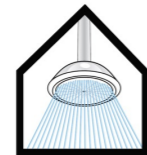
**Establish a link with the costs of the corresponding works in order
to facilitate decision-making**

**Use an intuitive language to enable people who are not necessarily
highly specialized to use it**

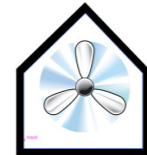
TOPICS



Heating Loads



Hot Water



Ventilation



Lighting

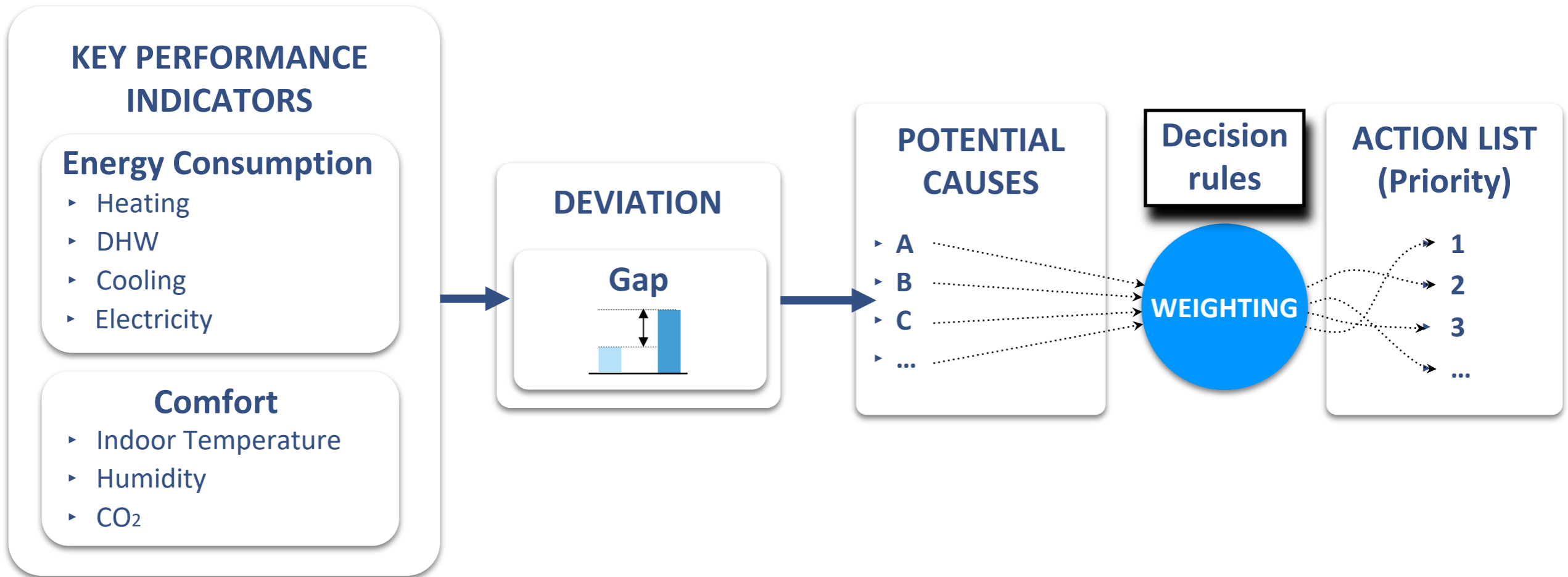


Cooling



Renewable Energy Sources

PROCESS



POTENTIAL CAUSES

BUILDING CHARACTERISTICS

- Building Envelope
- Building location
- Flat Position (floor nb.)
- Main orientation
- Technical facilities
- etc...

TECHNICAL SETTINGS

- Heating temperature
- Boiler Temperature
- Cooling temperature
- Air flow rate
- Schedules
- Automations
- Circulation pumps
- etc...

USERS BEHAVIOR

- Occupancy
- Windows opening
- Shading control
- Clothing
- Habits
- etc...

POTENTIAL ACTIONS

MAINTENANCE ACTIONS

- Technical settings
- Schedules
- Air tightness
- Lighting
- etc...

REFURBISHMENT ACTIONS

- Building envelope
- Heating system
- Ventilation system
- Cooling system
- etc...

SMART ACTIONS

- Connected sensors
- Smart control
- Automation
- Self-consumers community
- Tenants information
- etc...

RENEWABLE ENERGY SOURCES

- PV panels
- Solar thermal panels
- Energy storage
- etc...

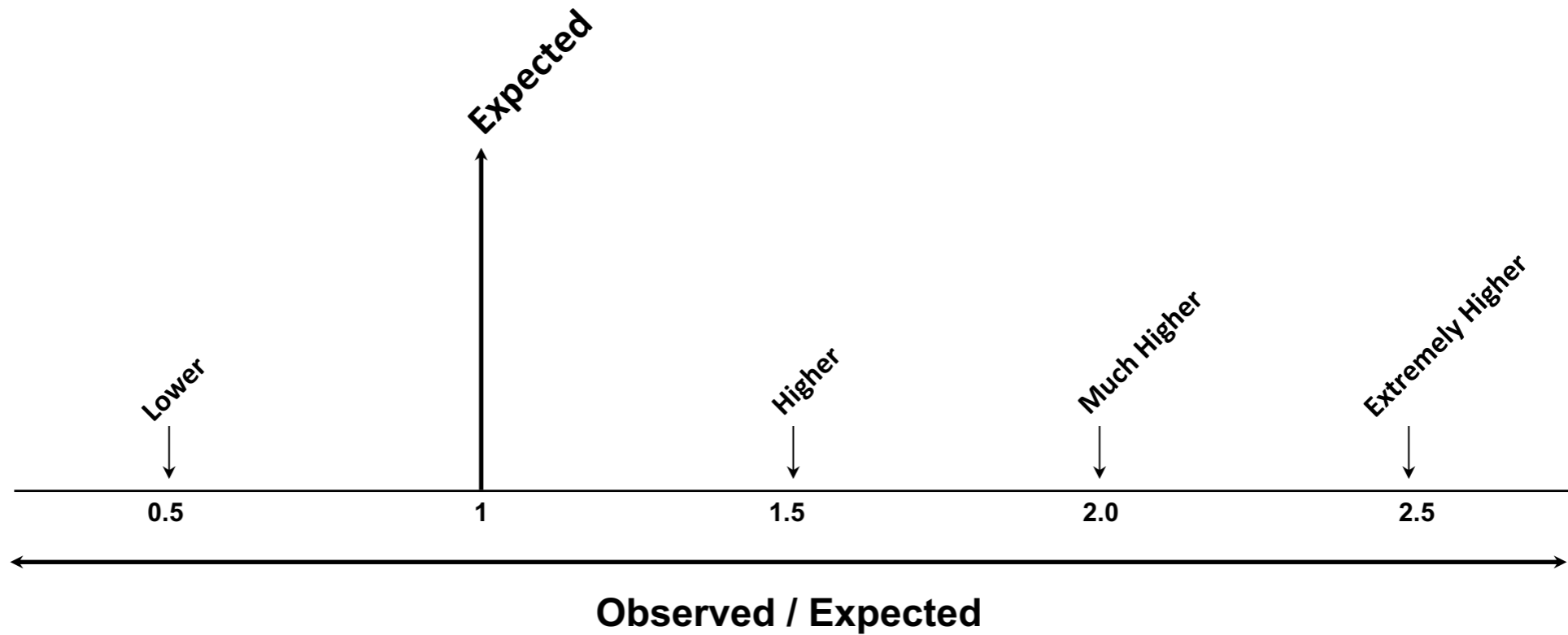
WHY FUZZY LOGIC

- **In existing buildings, many parameters cannot be described precisely**
- **Boolean logic implies precise thresholds that are questionable in this context.**
- **Fuzzy logic fits very well with the provision of linguistic advices**
- **This broadens the target audience for the application**

Energy Consumption

Relative Gap

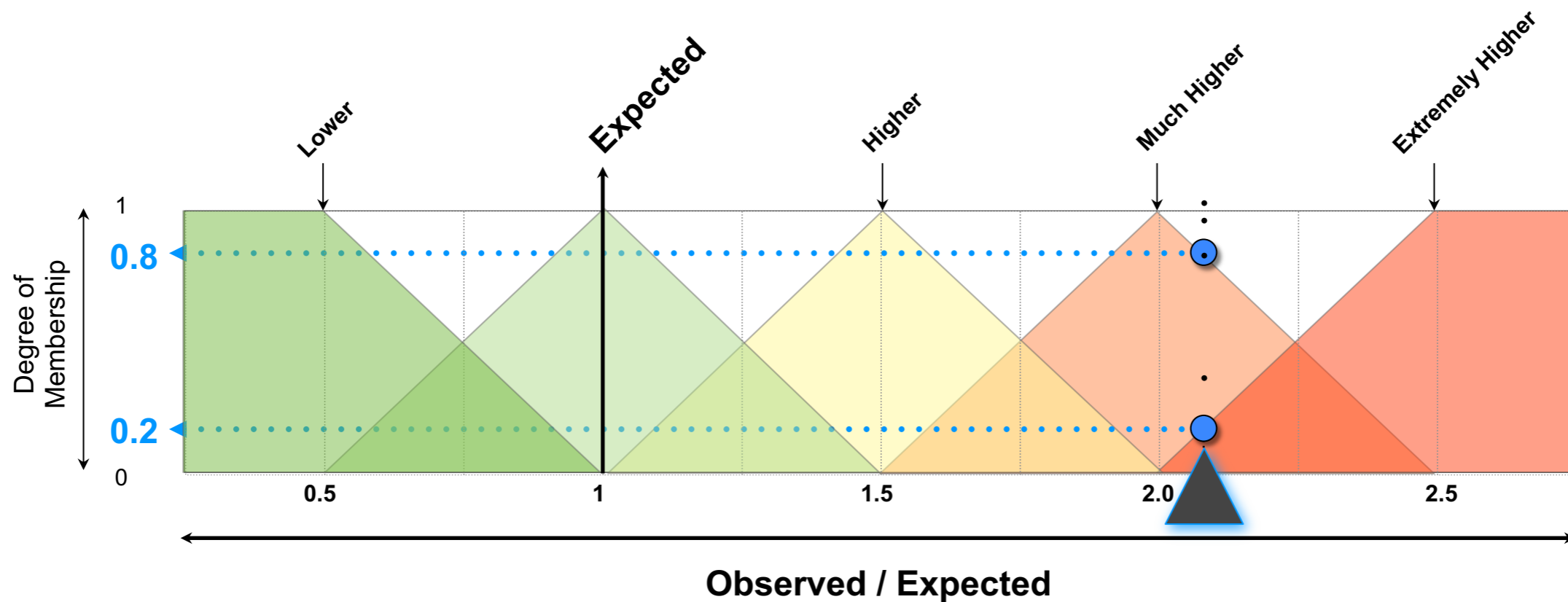
(Heating / Cooling / Hot water / Electricity)



Energy Consumption

Relative Gap

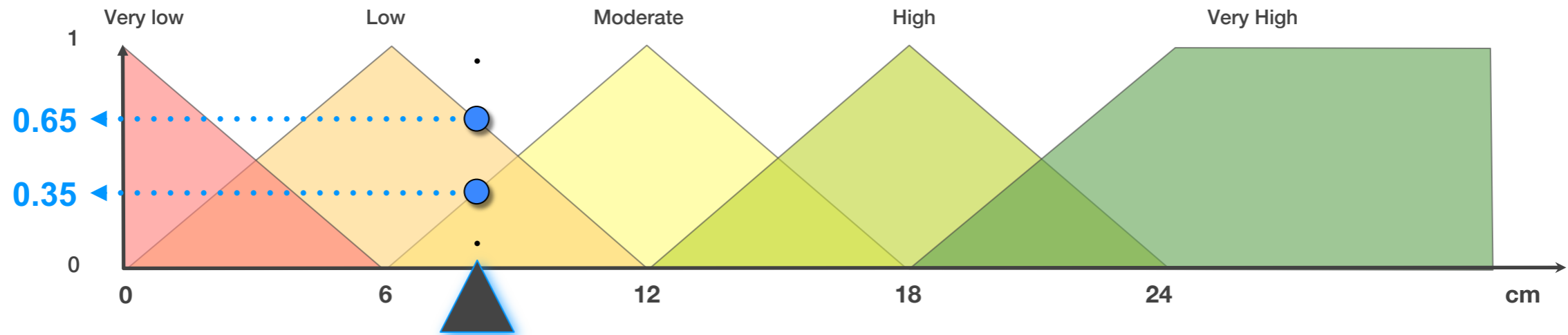
(Heating / Cooling / Hot water / Electricity)



The energy consumption is : «**Much Higher**» (0.8) to «**Extremely Higher**» (0.2)

Parameters

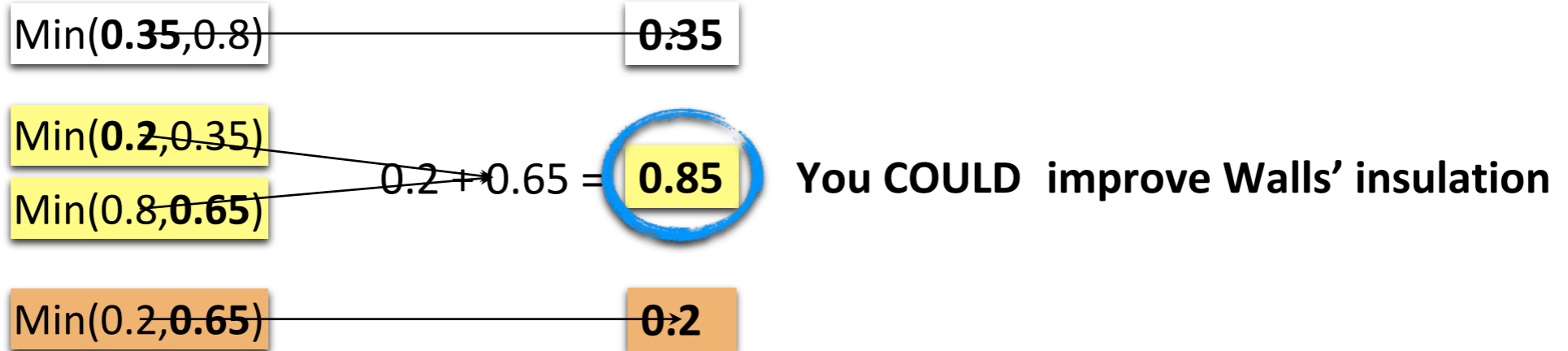
Insulation thickness (Roof, Facades & Ground Floor)



The Walls U-value is : «**Low**» (0.65) to «**Moderate**» (0.35)

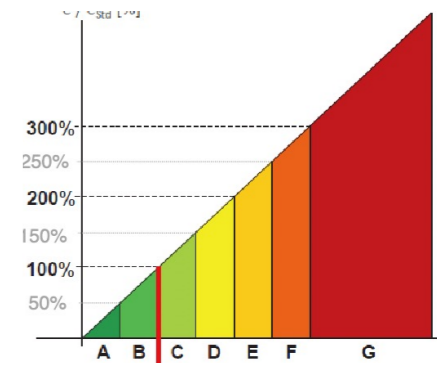
AGGREGATION PROCESS

		U-Value		
		Slightly Unfavorable	Unfavourable	Very Unfavorable
HEATING CONSUMPTION	Very High	COULD	SHOULD	MUST
	High	-	COULD	SHOULD
	Moderate	-	-	COULD

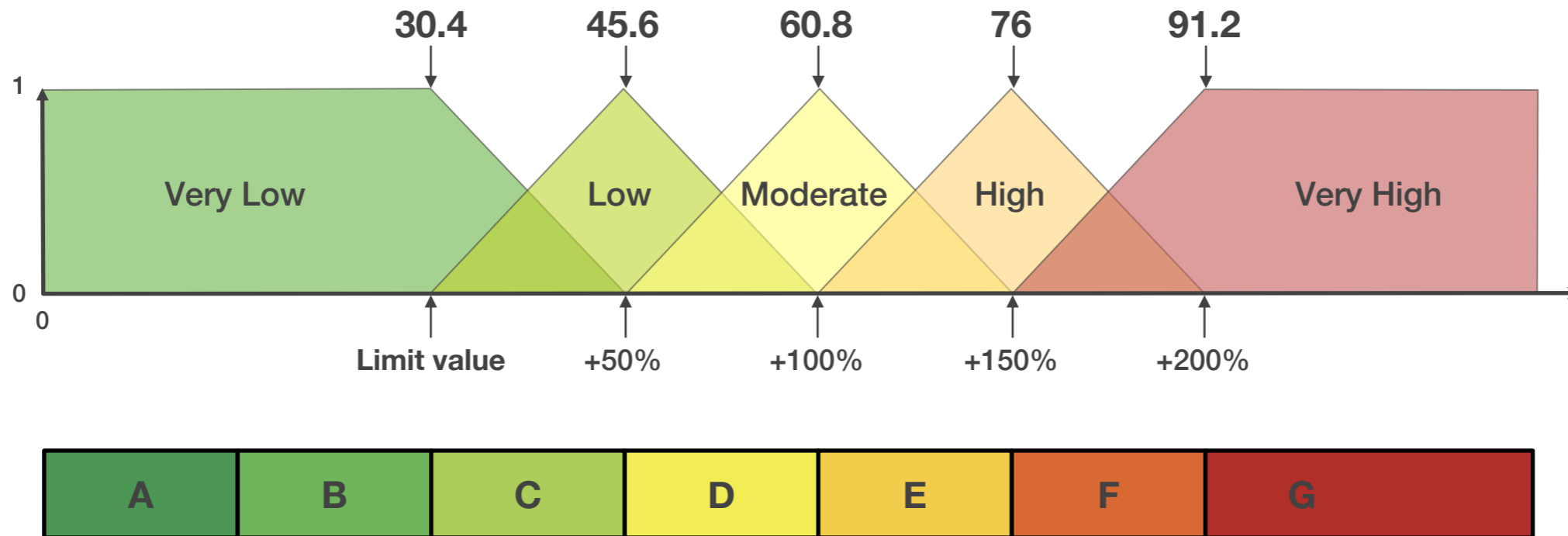


BASIS FOR ANALYSIS

Swiss Targets and limit values



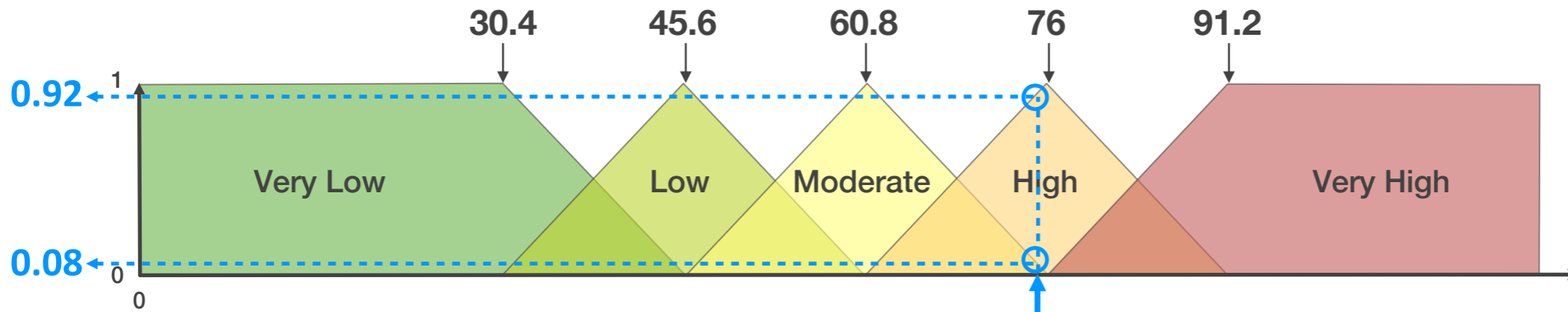
Residential building (collective housing) in GENEVA



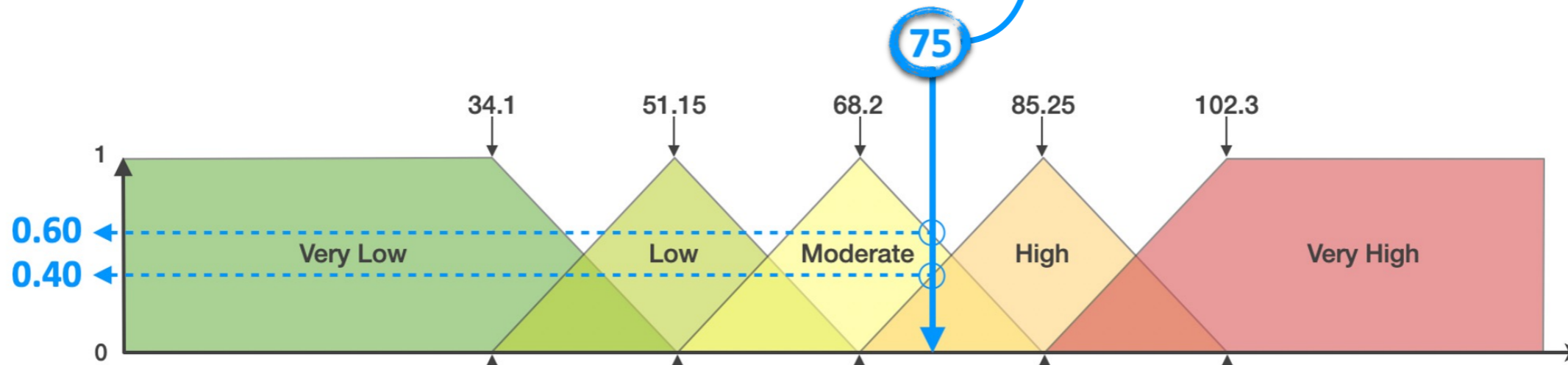
CLIMATIC ADAPTATION

Degree-Days

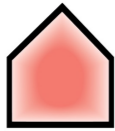
Residential building (collective housing) in GENEVA



Aalborg



Prioritized list of actions



The **HEATING** Consumption is **VERY HIGH**

List of potential actions

Estimated Cost

	You MUST	Change the glazings	123'000
		Improve the Ground-Floor insulation	34'500
	You SHOULD	Complete the Pipe insulation	8'000
		Adjust the night start schedule	1'200
	You COULD	Install thermostats on radiators	6'500

EPIQR

INPUT

Building Characteristics

Heating System

Cooling System

Lighting System

Renewable Energy Source

Additional Characteristics

GET RESULTS

Heating System

CONSUMPTION

Choose unit kWh/m² MJ/m²

Is measured? (optional) YES NO

Does it include domestic hot water?(optional) YES NO

What is your energy vector?(optional)

Fuel District Heating

WEB-APP

► Close collaboration Estia / CORE

► Intuitive interface

WINDOWS CHARACTERISTICS

PRELUDE

Glazed Percentage

U-value W/m².K

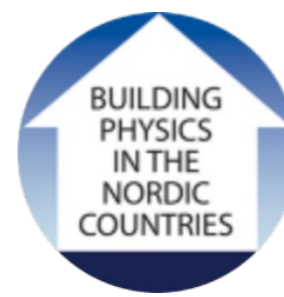
g-value ?

Very Low

Triple

Clear Glazing Low-E Reflective Glazing Tinted Glazing





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Thank you for your attention !

Estia

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