



A Summary Presentation of GPD Finland 2015: ENERGY



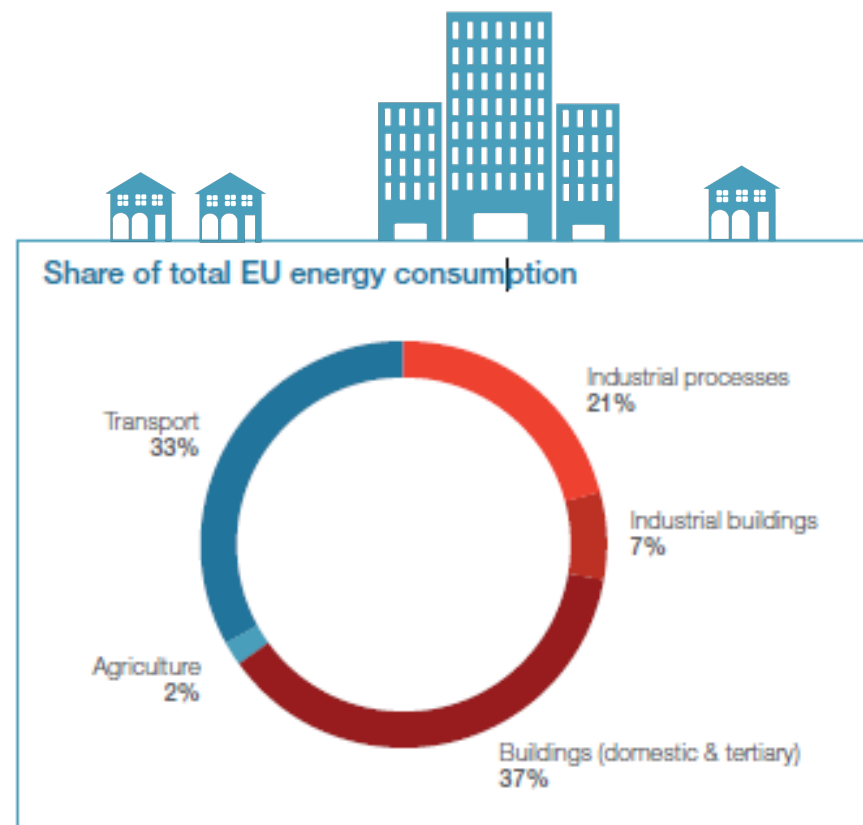


GLASS
PERFORMANCE
DAYS 2015

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Tapping into the potential of the building sector

- 'Energy efficiency first' principle
- Buildings (and transport) as priority sectors where energy efficiency gains must be reaped
- Focus of financial and regulatory efforts in these sectors
- Need to empower consumers in the energy transition



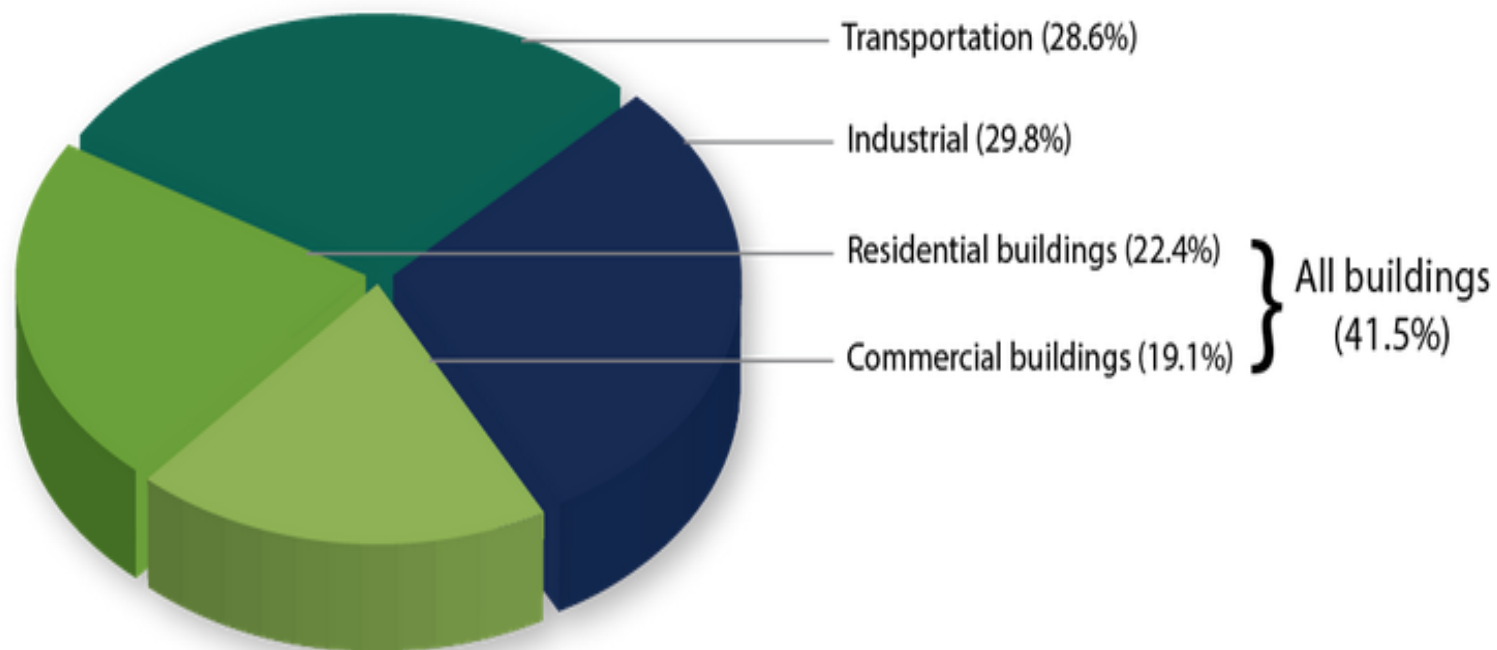
Over 40% of EU energy consumption from buildings



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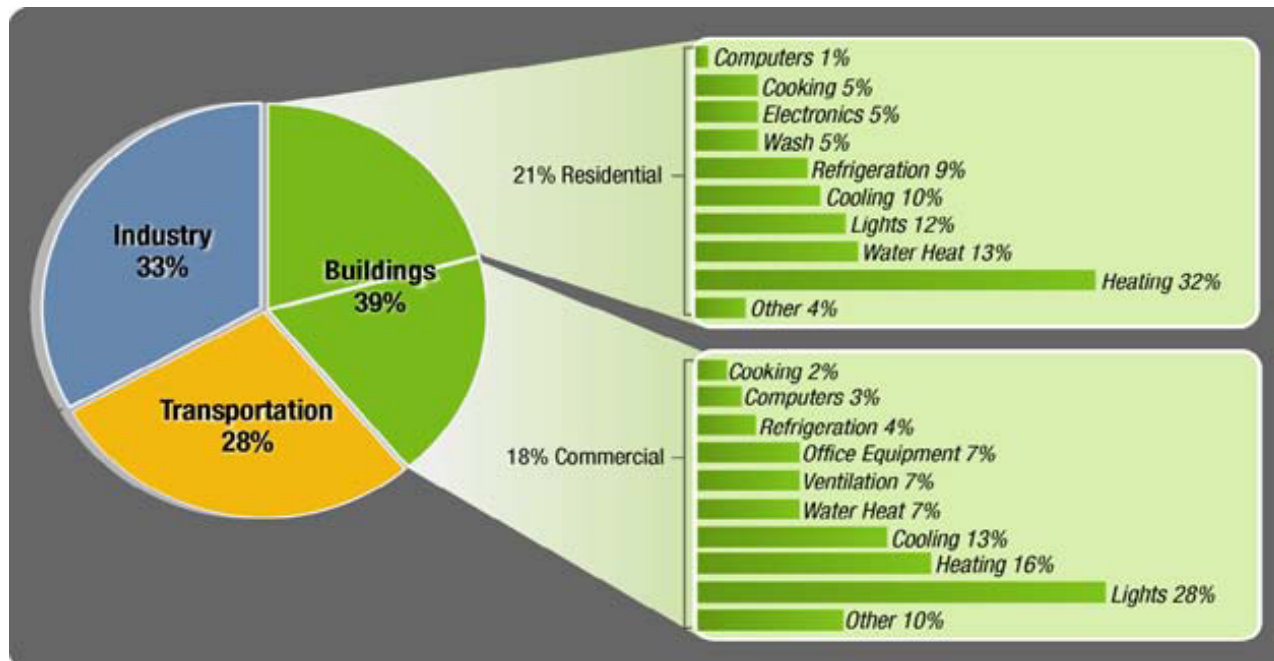
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41.5% of Energy Consumption goes to Buildings



Total 2009 US Energy Consumption by Sector (Source: *US Energy Information Administration*)

Energy Loss in Buildings

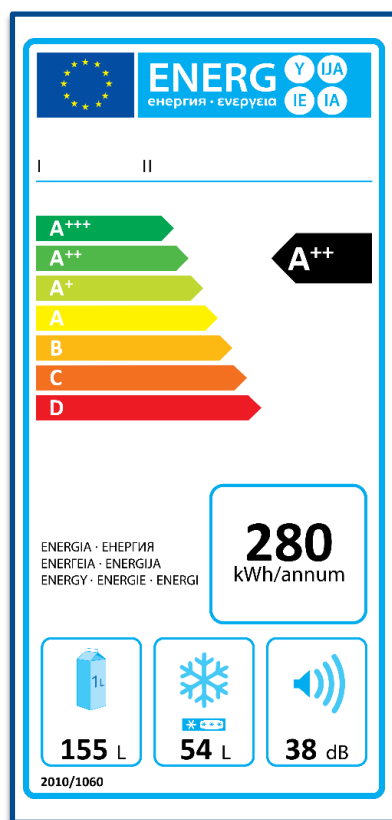


**US buildings
account for:**

- 71% of electricity
- 39% of total energy

Energy Loss Through the Windows has the Largest Impact of Any Building Envelope

An energy efficiency tool for consumers



- **EU energy labelling:**

- To inform consumers about the energy-efficiency of products
- Support the market uptake of best-in-class solutions
- Be conducive for innovation

- **The EU challenge:**

- From energy-using products to energy-related products
- Can it work for building products?



- **Updated regulatory framework in place to make it happen:**

- Revised Energy Labelling Directive (2010)
- Working Plan for 2012-2014: Windows in the “priority product groups”
- New Methodology for the Ecodesign of Energy related Products (MEErP)

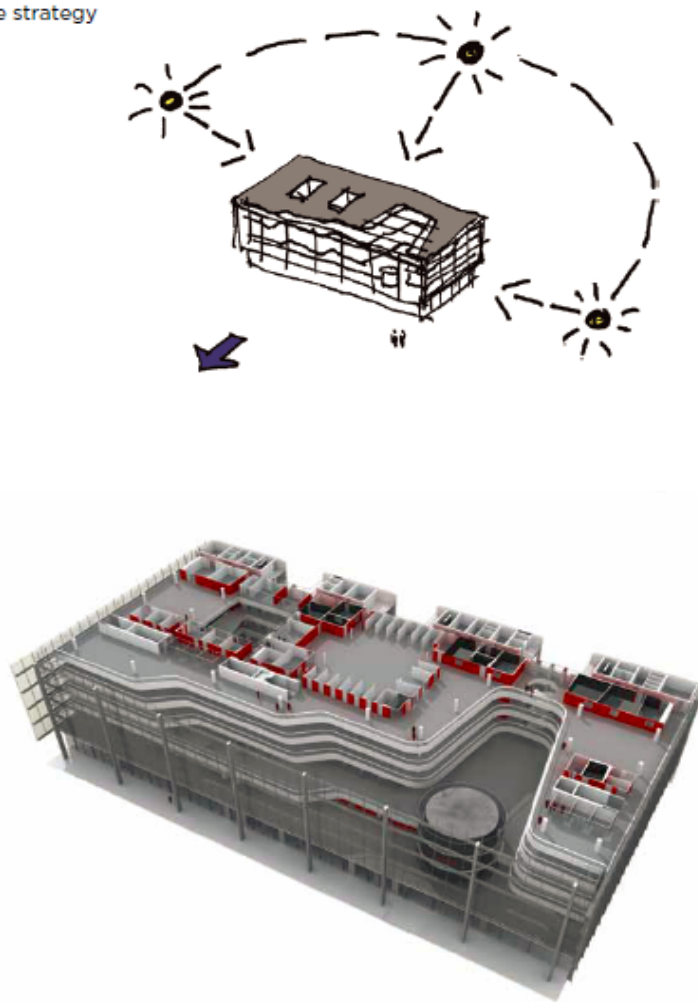
BUILDING ORIENTATION - Energy Management

News Building, Danish Broadcasting Corporation

Climate Strategy

Climate strategy

North

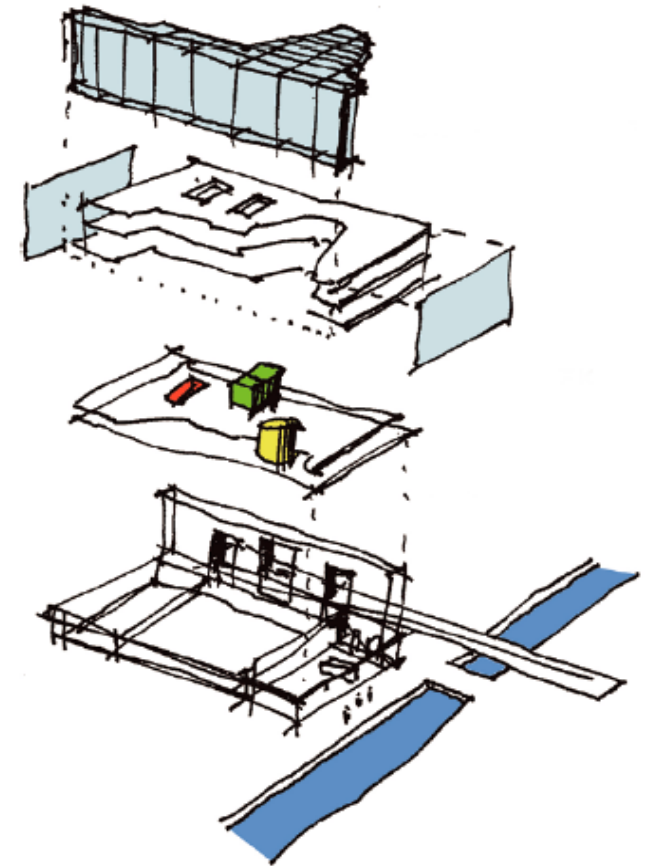


Envelope

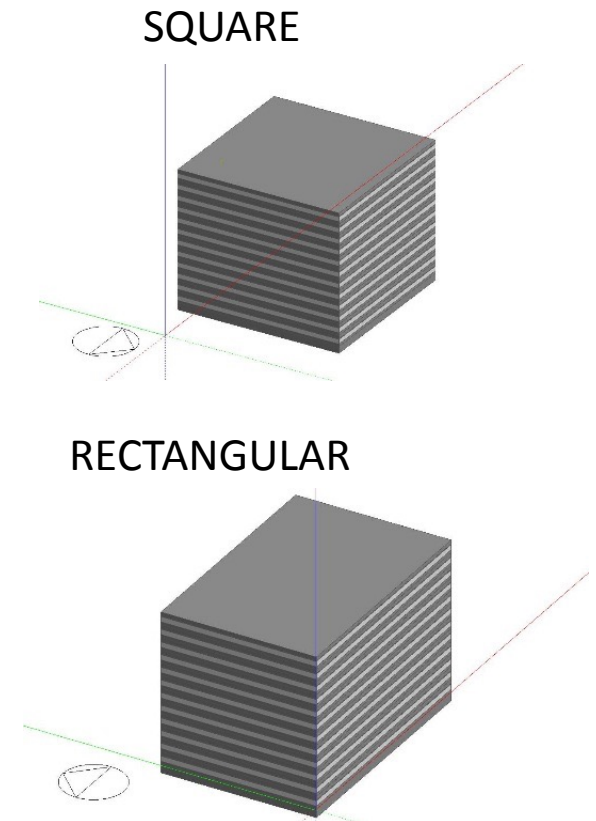
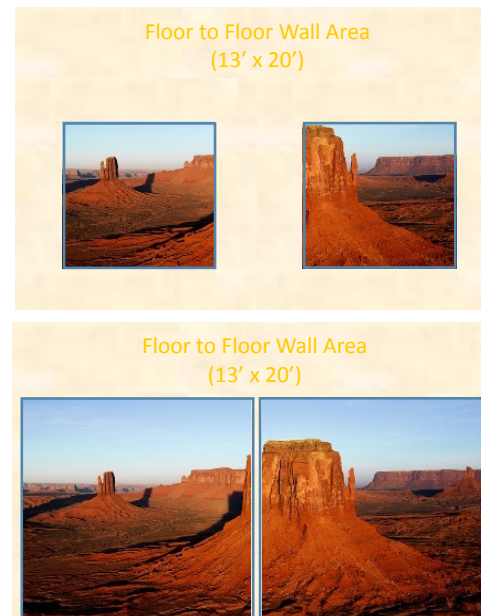
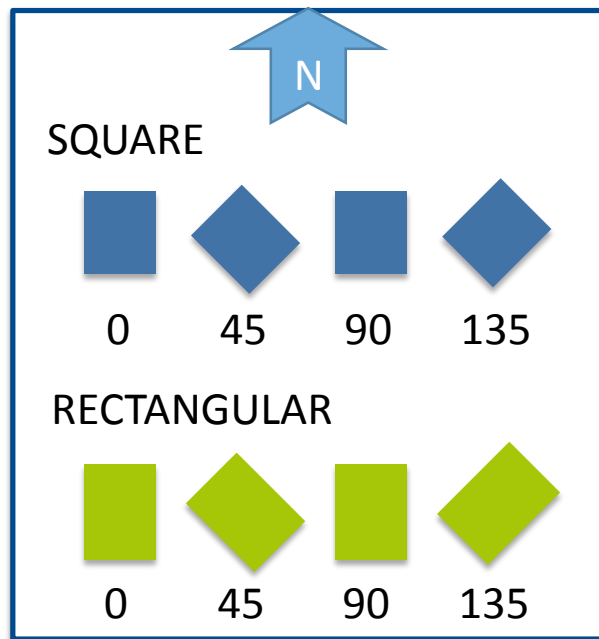
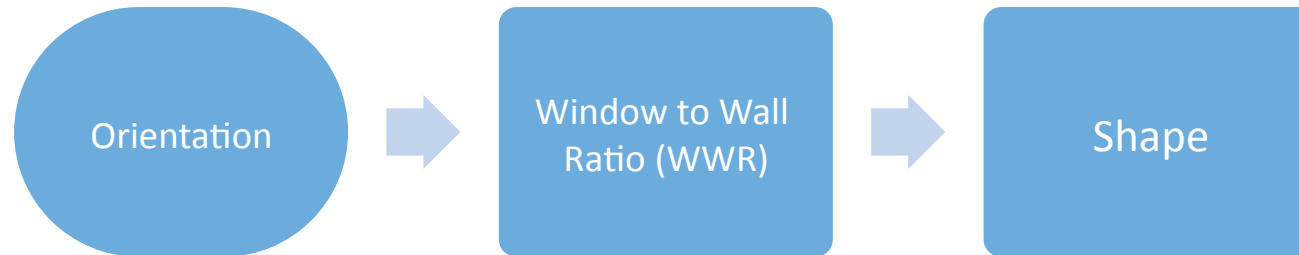
Structure

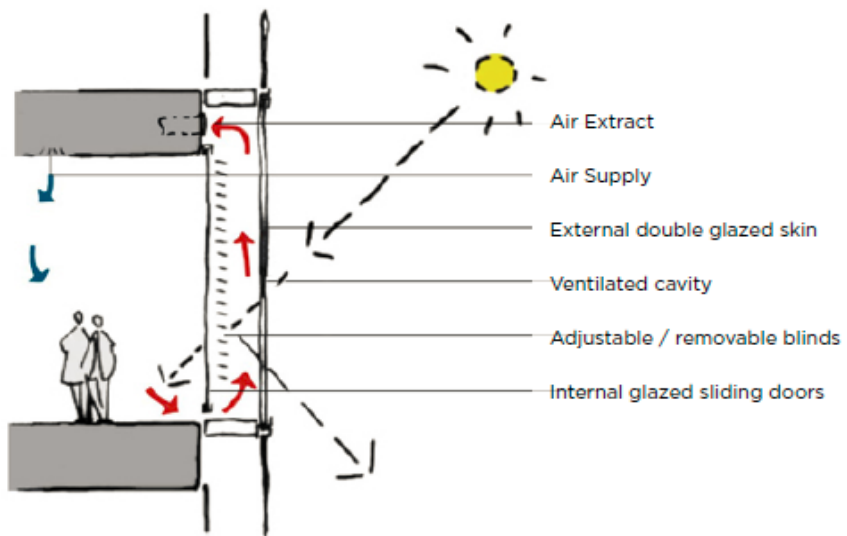
Volumes

Base and core



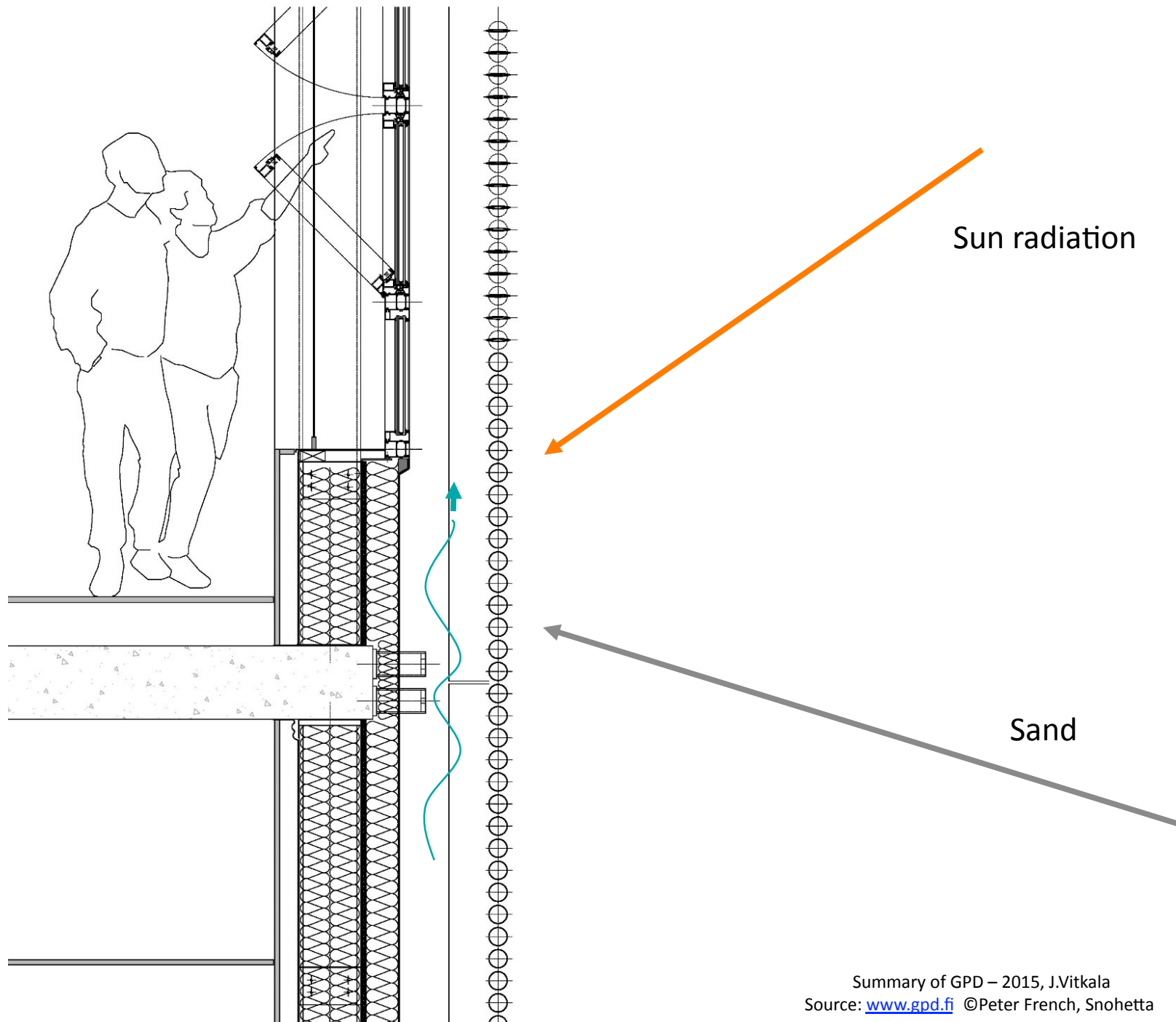
Design Building Energy Perf. & Aesthetics by Climate Zone





University of Copenhagen Royal Library Amager







Summary of GPD – 2015, J.Vitkala
Source: www.gpd.fi ©Peter French,
Snohetta



Summary of GPD – 2015, J.Vitkala
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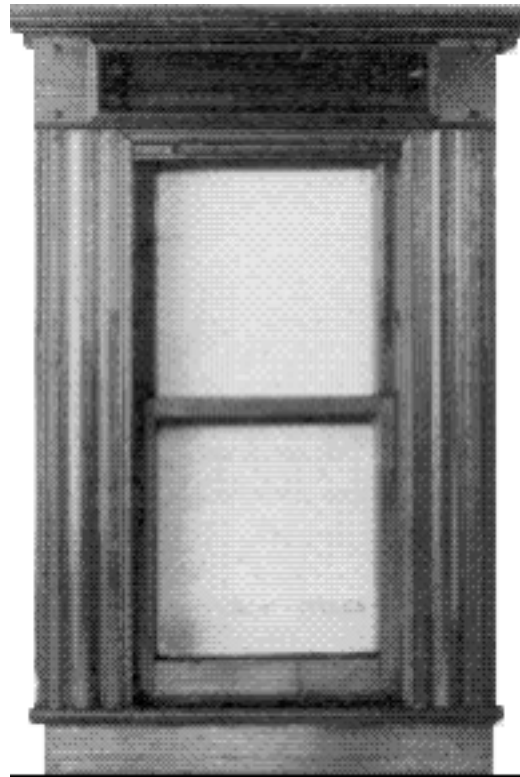


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Criteria for Selecting Optimal Facades

Energy / Carbon



- Comfort
- View/Privacy
- Security
- Acoustics
- Structure
- Recycled Materials

- Daylight
- Aesthetics
- Weatherproof
- Cleaning
- Maintenance
- Durability

Check: Where is the Real Cost in Buildings?

Annual Energy Costs in Perspective:

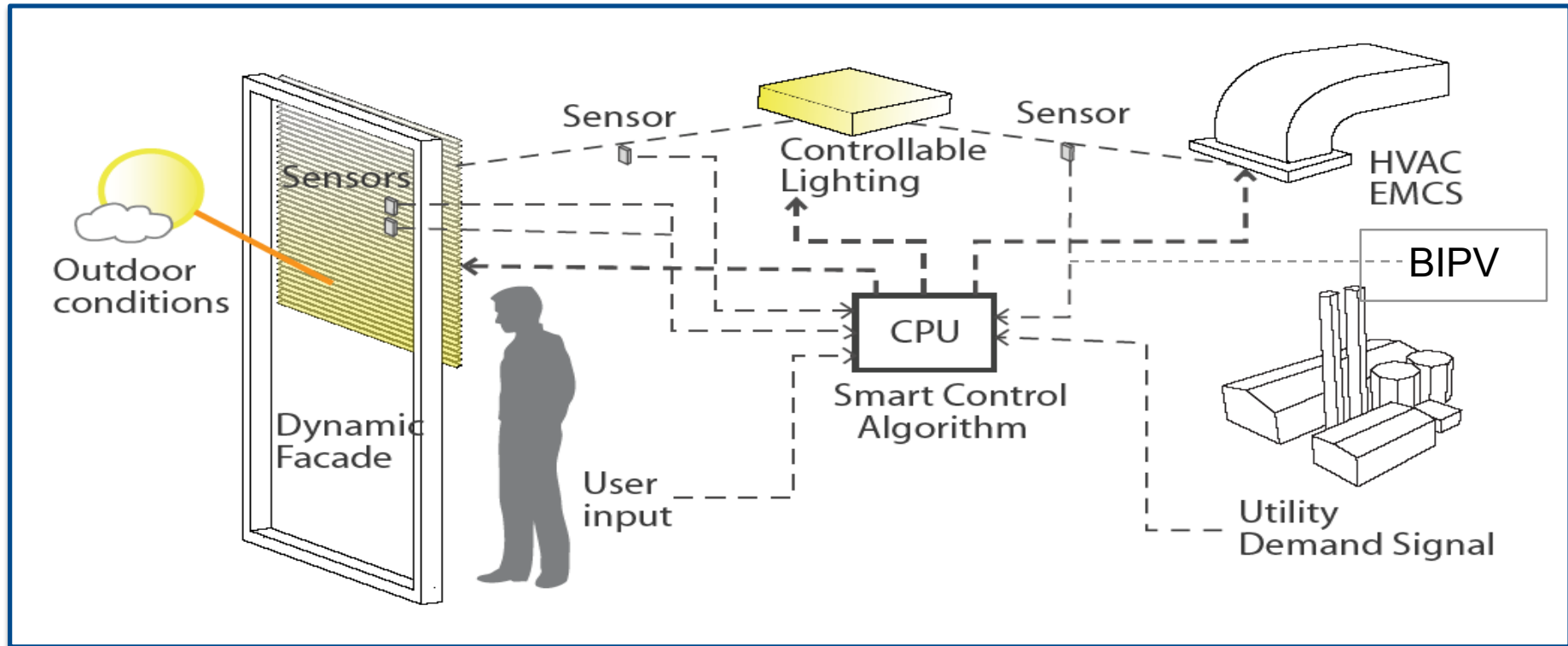
Occupancy Costs = 100 x Energy Cost

Cost / Sq. M. Floor -Year

- Energy Cost: \$50.00
- Rent: \$500.00
- “Productivity” \$5000.00+

Smart Integrated Systems will Improve Comfort!

The Integrated Façade/Lighting System “Challenge”



Facade
Solar intensity
Daylight, glare
Shade position

Lighting
Occupancy
Illuminance level
Energy use

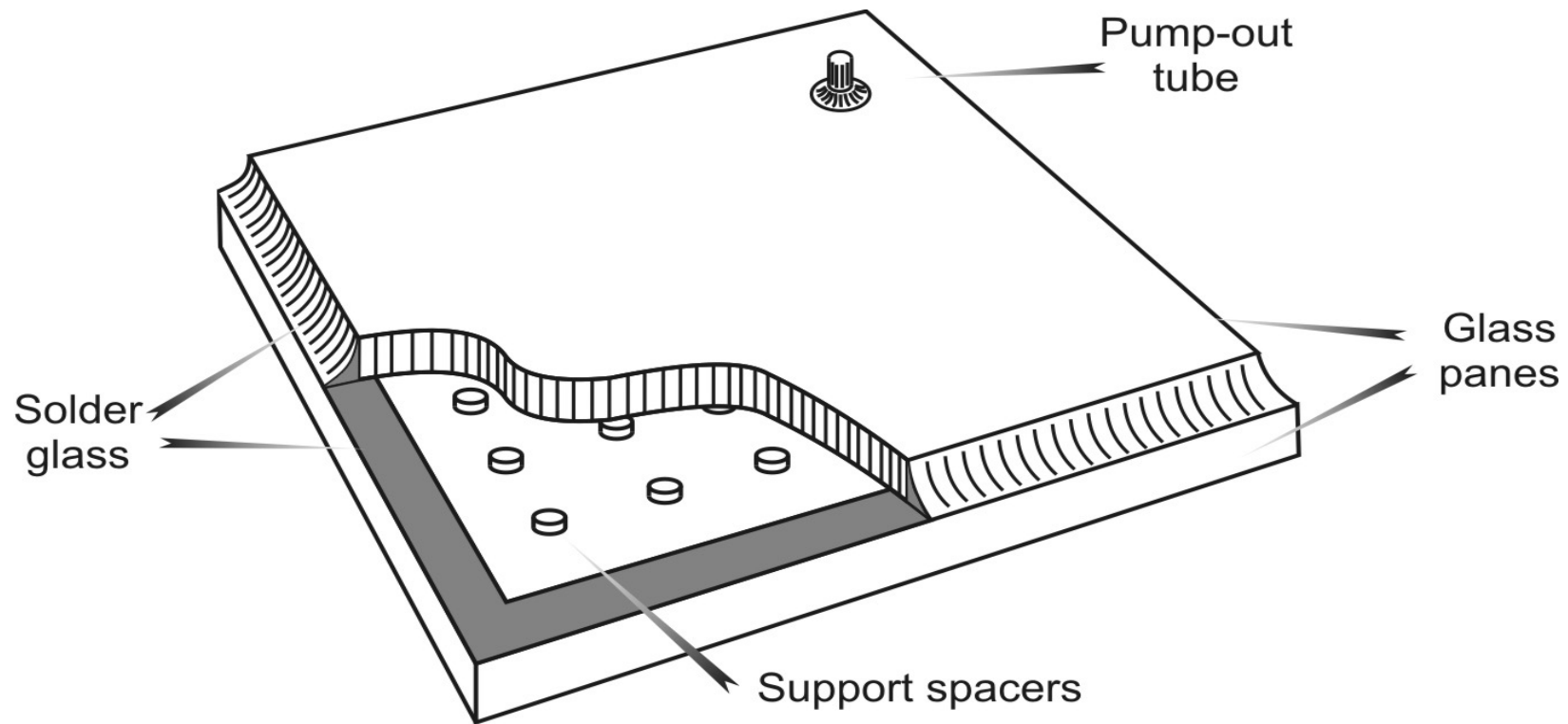
HVAC
Outdoor and indoor temp
Heat/ cool/ econ mode
COP

VIG VACUUM INSULATING GLASS

-

Glass Of The Future?

highly thermally insulating glazing – VIG – vacuum insulating glazing



two panes of glass hermetically sealed at the edges and separated by an evacuated gap, maintained under the influence of atmospheric pressure by an array of spacers

VIC - The mechanical performance

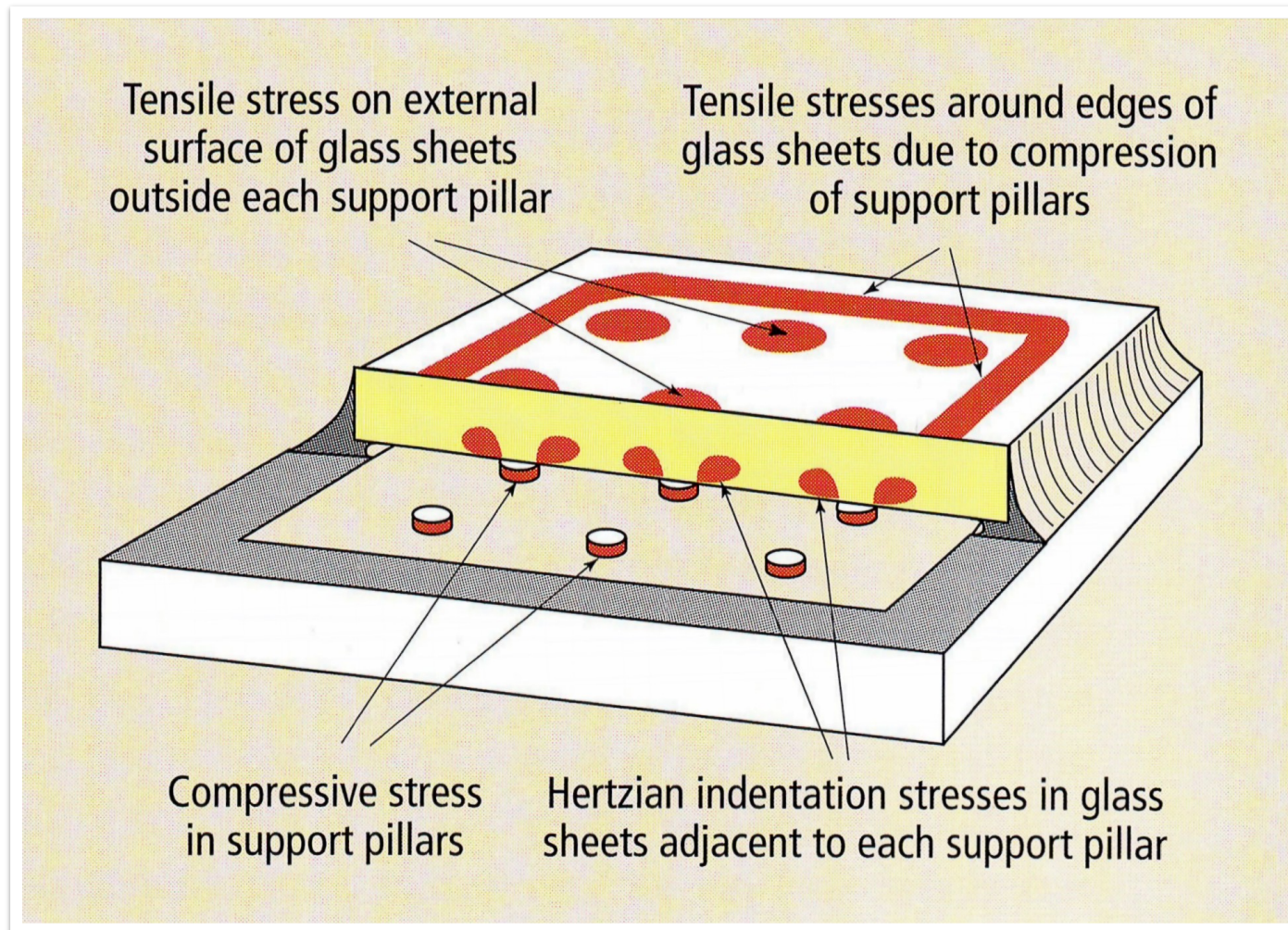
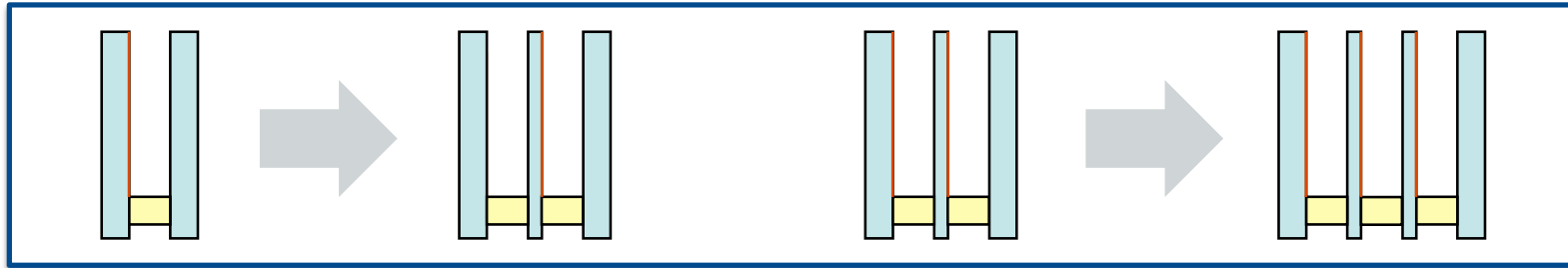


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Multiple-pane insulating glass

Energy required to manufacture the additional chamber



Outlook from 3-pane to 4-pane glass

Ug-value improvement when changing from
3-pane to 4-pane glass

$$0.6 \text{ to } 0.3 = \Delta - \mathbf{0.3 \text{ W/(m}^2\text{K)}}$$

Calculations: University of Kassel – CESR
Ug value of quadruple glazing: IFT calculation

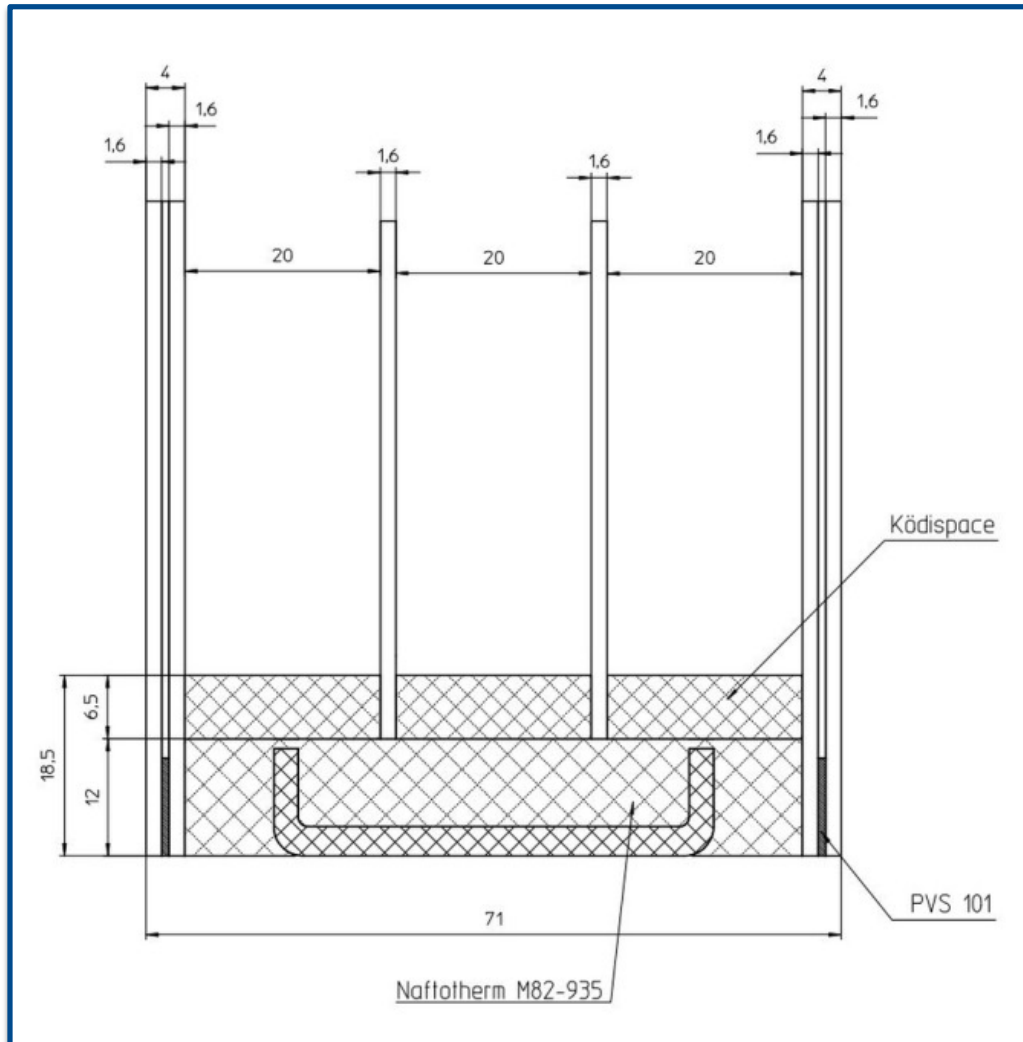
* Room temperature 20°C (standard climate D according to PHPP)

**Assumption: central heating with a gas condensing boiler.

The primary energy analysis includes all energy costs and conversion losses for supplying the fuel from the source to the furnace room ("cumulated energy demand" CED).

Targets for the insulating glass of the future

Which technologies can we use to meet these targets?



The following technologies:

- Quadruple-glazed insulating glass
- Thin glass technology
- New edge bond



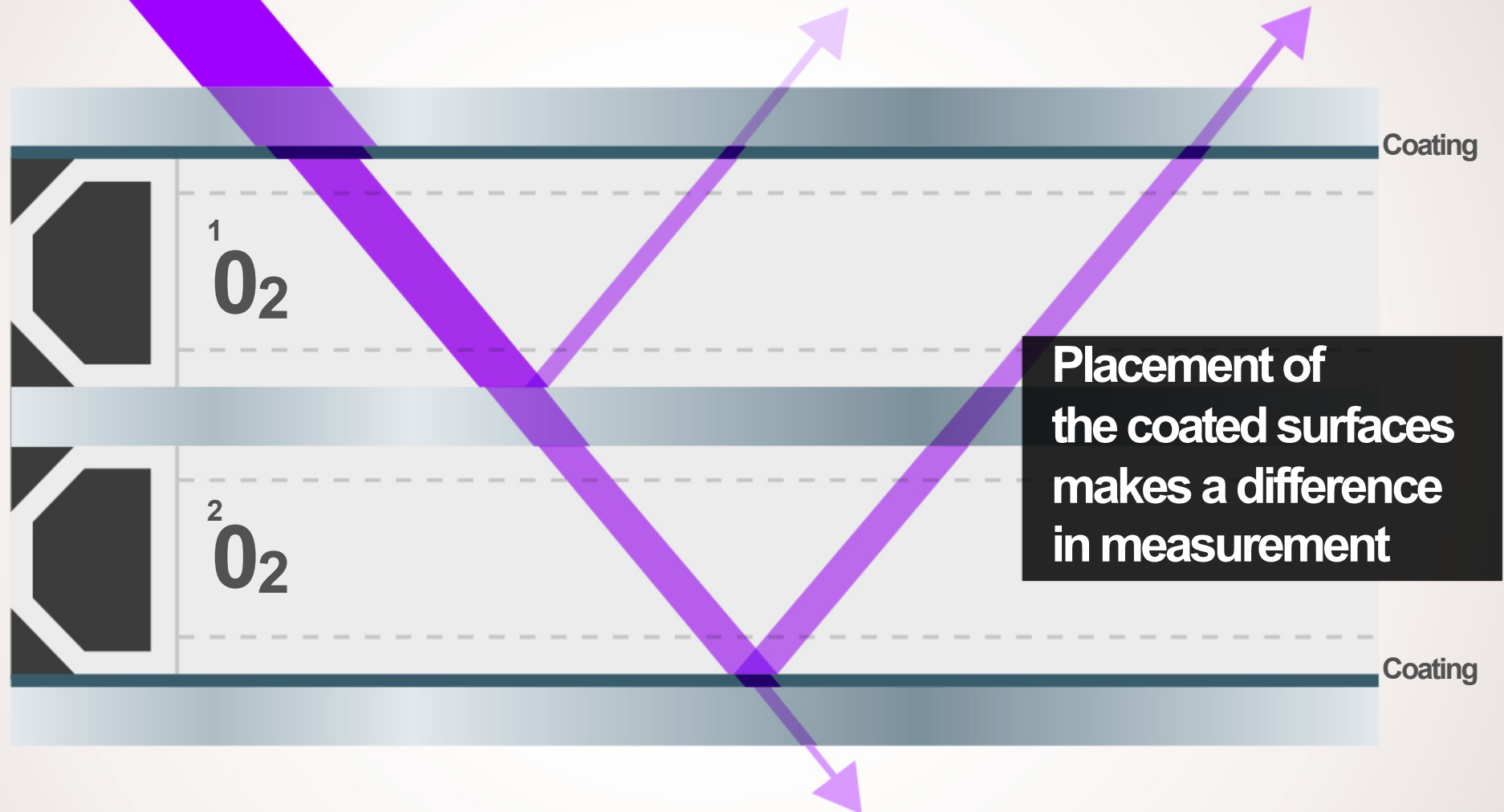
Facilitate:

- U value of 0.3 W/m²K (with argon)
- Lowering the primary energy requirement for manufacturing
- Reducing weight and costs
- Frameless, self-supporting structure

Summary of GPD – 2015, J.Vitkala

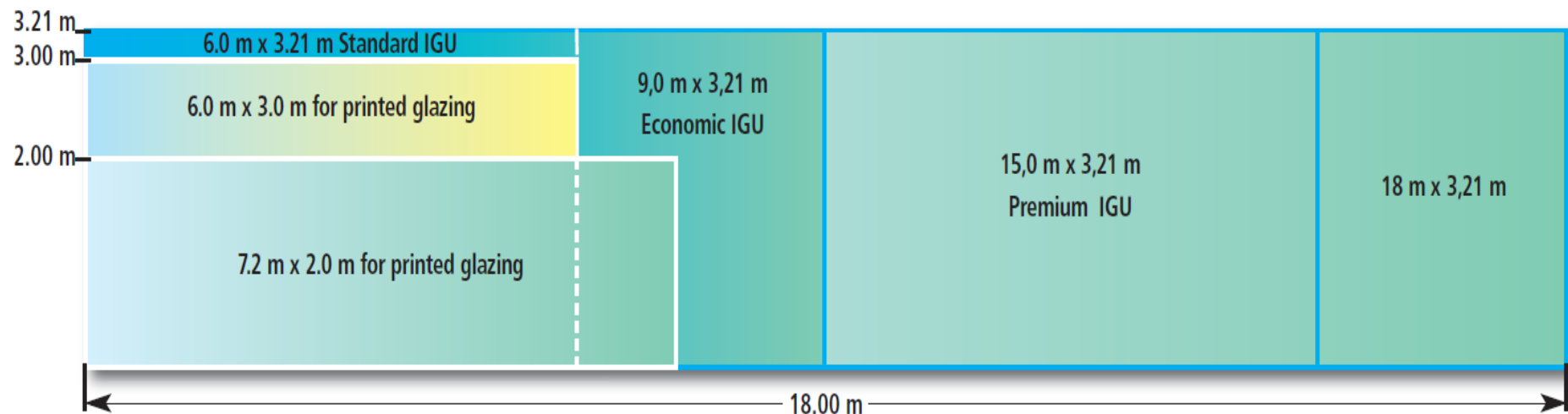
Source: www.gpd.fi ©Markus Jandl, LiSEC Austria GmbH

Measuring gas concentration without breaking the IGU – even on triples





IGU – for standard to premium sizes



18.00 m x 3.21 m for coated glass; maximum thickness 20 mm.

9.00 m x 3.21 m for tempered glass (toughened/heat strengthened safety glass) and laminated glass (in exceptional cases up to 15 m)

7.20 m x 2.00 m for printed, tempered glass

6.00 m x 3.00 m for printed, tempered glass

15.00 m x 3.21 m for premium insulating glass units (IGU)

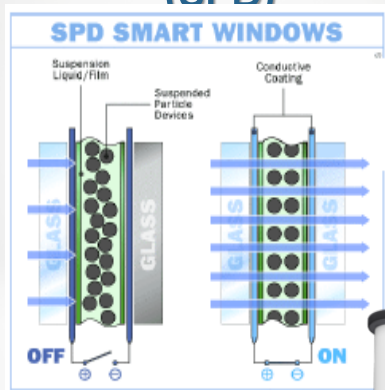
9.00 m x 3.21 m for economic insulating glass units (IGU)

6.00 m x 3.21 m for standard insulating glass units (IGU)

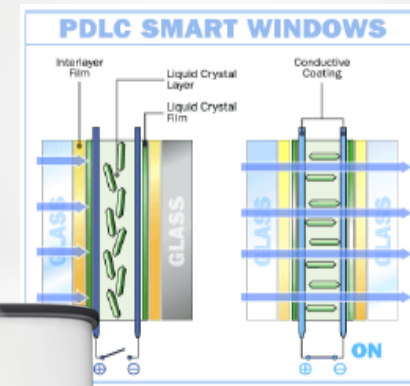
FUTURE ENERGY MANAGEMENT SMART WINDOW

Smart Window Technologies

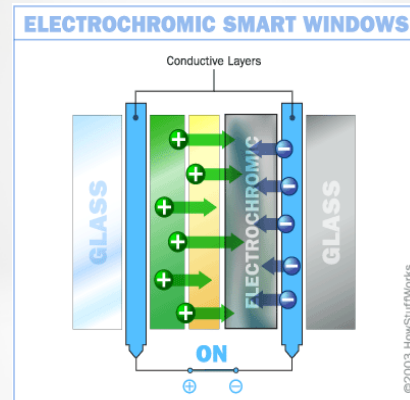
Suspended Particle Device (SPD)



Liquid-Crystal (LC)



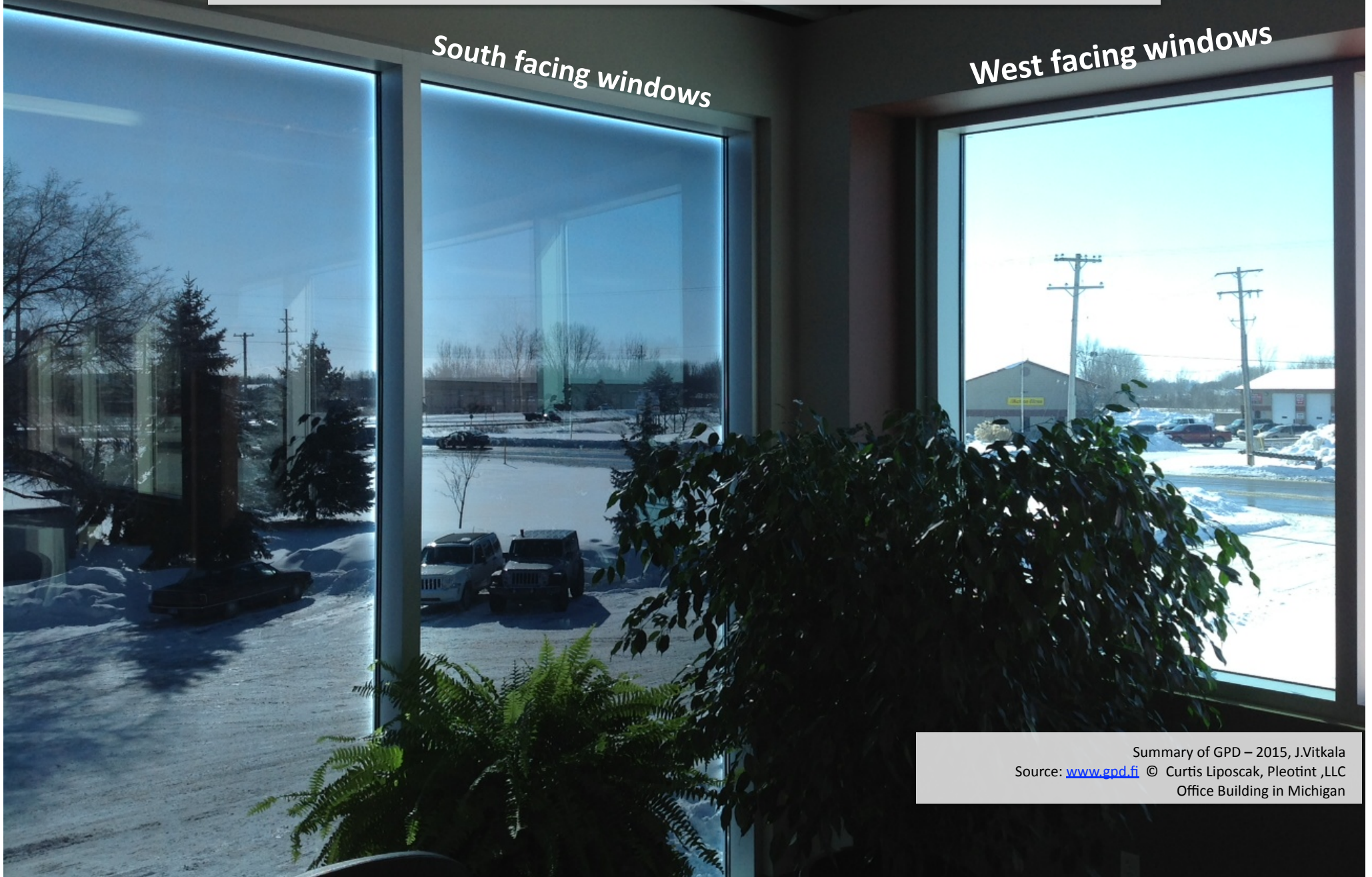
Electrochromic (EC)



Thermochromic Tinting Effect at mid-day

South facing windows

West facing windows



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Source: www.gpd.fi © Curtis Liposcak, Pleotint ,LLC
Office Building in Michigan

STEP 1



Dynamic Glare & Solar Control: Electrochromic glass

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Source: www.gpd.fi ©Helen Sanders, SAGE & Pekka Hakkarainen, Lutron Electronics

STEP 2



Dynamic Glare & Solar Control: Electrochromic glass

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STEP 3



Dynamic Glare & Solar Control: Electrochromic glass

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STEP 4



Dynamic Glare & Solar Control: Electrochromic glass

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