Comparative study Tribu Energie

2024

Context of the study

General Context

Climate Change

Rising energy prices

NEW regulatory changes
RE2020 tertiary* RENO:
Tertiary Decree **

Challenges for buildings

Reduce energy consumption and related bills

Using less energy-intensive solutions

Decarbonize

Reduce the use of fossil fuels

Increase the use of heat pumps (CAPs)

Maintain a stable temperature in all seasons

Heating and/or cooling

44% of energy consumption due to buildings***

285 TWh in 2022
Of which heating 9 TWh

12 TWh in 2022
Of which heating 5 TWh

* Primary energy consumption, share of renewable energy, Carbon indicator of primary energy consumption, Summer comfort

** Tertiary building ≥ 1000 m²

*** Sources: Bâtiments - Agence de la transition écologique (ademe.fr), www.statistiques.developpement-durable.gouv.fr/chiffres-cles-de-lenergie-edition-2023, https://www.insee.fr/fr/statistiques/6967797?sommaire=6967807, annual survey on energy consumption in

industry in 2021

Zehnder approach

On the HVAC position, support customers

in their approach to efficiency and energy efficiency

according to the constraints of their building

Provide evidence of effectiveness

radiant panels

compared to other common systems

→ Order a comparative study from the Tribu Energie design office

Scope and results of the study

Content of the study: 5 types of buildings studied

Large volume rooms

High ceilings
Lightweight ceiling structure

Gymnasiums

Industrial building

- Variant 1: Light industry, low heat dissipation
- Variant 2: Heavy industry, high heat dissipation

Warehouse building

Tertiary premises

Concrete ceiling
False ceiling mounting

School building

Office building

Content of the study: Realistic parameters, typical of a project

Software used	• Pleiades, based on COMFIE engine, SED simulation
insulation level	• OLD" building - Construction type year 2000 (rehabilitation simulation) • NEW current" building - Construction type RE2020 • *NEW future" building - C*onstruction type R*E2020 thresholds 2028-2031 (school / offices)*
Location	• Paris • Marseille ➔ Different weather conditions
Typical 12 Month Usage Scenario	• Occupancy density/ m² > Power dissipated from occupants • Power dissipated from the equipment • Power dissipated from the lighting • Heating setpoint *(or cooling depending on the building)* • Hourly occupancy, heating, lighting ranges
Market Energy Price	• Gas (€6.72 cents/kWh) • Electricity (18 cents €/kWh) • *Lighting / IT (€16.5 cents/kWh) (school and offices only)*

Study Content: Comparative Systems

High-volume rooms

- PAC 50/40 + PR
- Boiler 60/50 + PR
- Gas radiant

- heaters Gas heaters

- Boiler 60/50

+ Water Heaters

*UTCI: PAC generator + RAD type transmitter + CTA, part by part – Water + Air

Tertiary Premises

- PAC 50/40 + PR
- PAC 50/40 + Radiators

- PAC 50/40&15/18 + Radiant ceilings
- PAC 50/40&15/18 + Ceiling fan coils
- VRV (Variable Refrigerant Volume)
- UTCI* (Ind. Comfort Thermodynamic Unit.

Study content: 3 elements compared

1. Energy efficiency: Final energy consumption

kWhef/m²SU/year

= Energy consumption of the HVAC lot (Heating / Ventilation / Air conditioning, excluding lighting because identical for all) of the building over 1 year, reduced to the m² of useful area

2. Carbon impact: Carbon equivalence of energy consumption

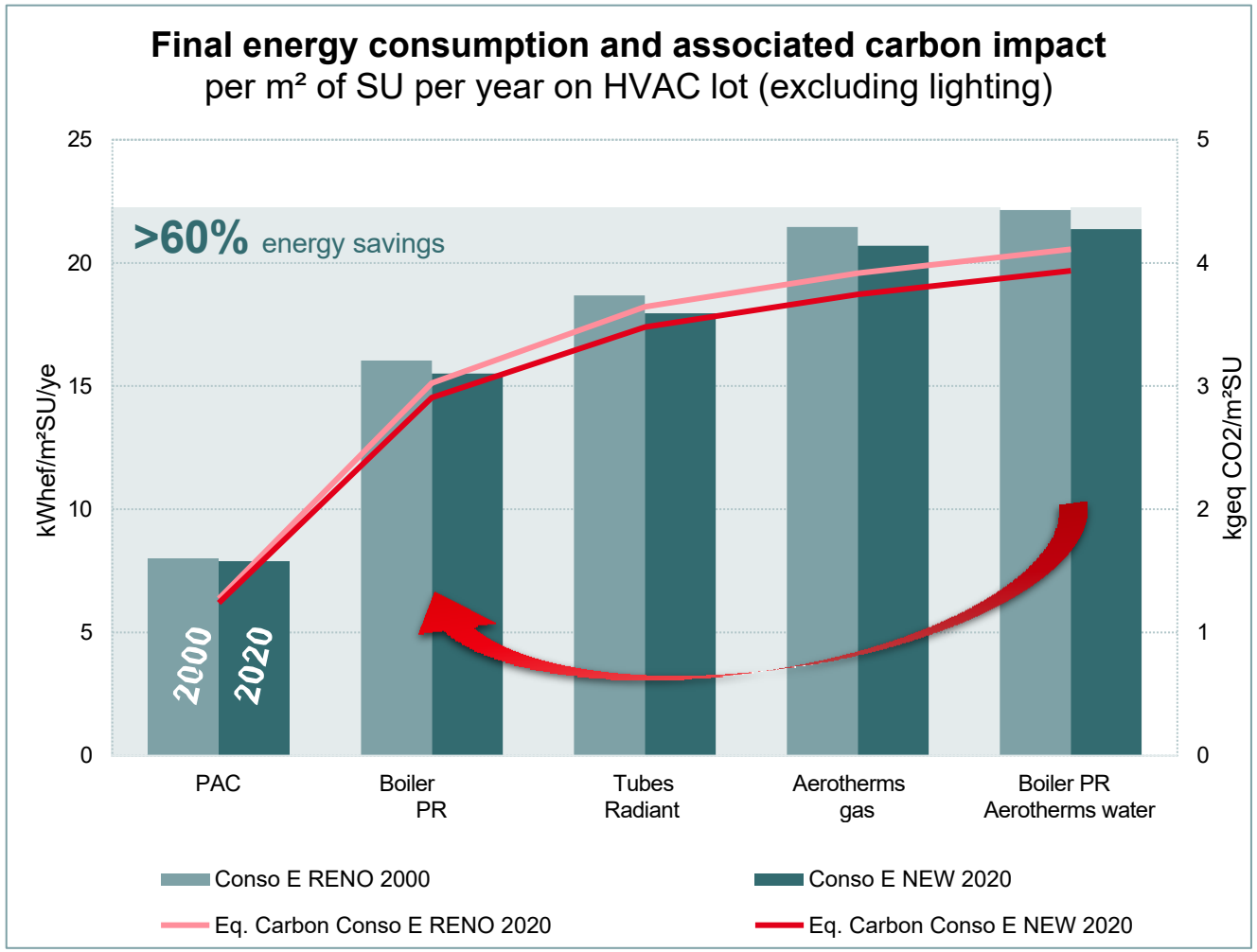
kgeq CO_2/m²SU/year

= Carbon footprint of energy consumption, related to the nature of the energy used and the level of consumption

3. Economic impact: overall cost

= Capital cost + Maintenance cost + Cost of energy consumption

Large-volume premises:
PAC + PR: Better energy efficiency



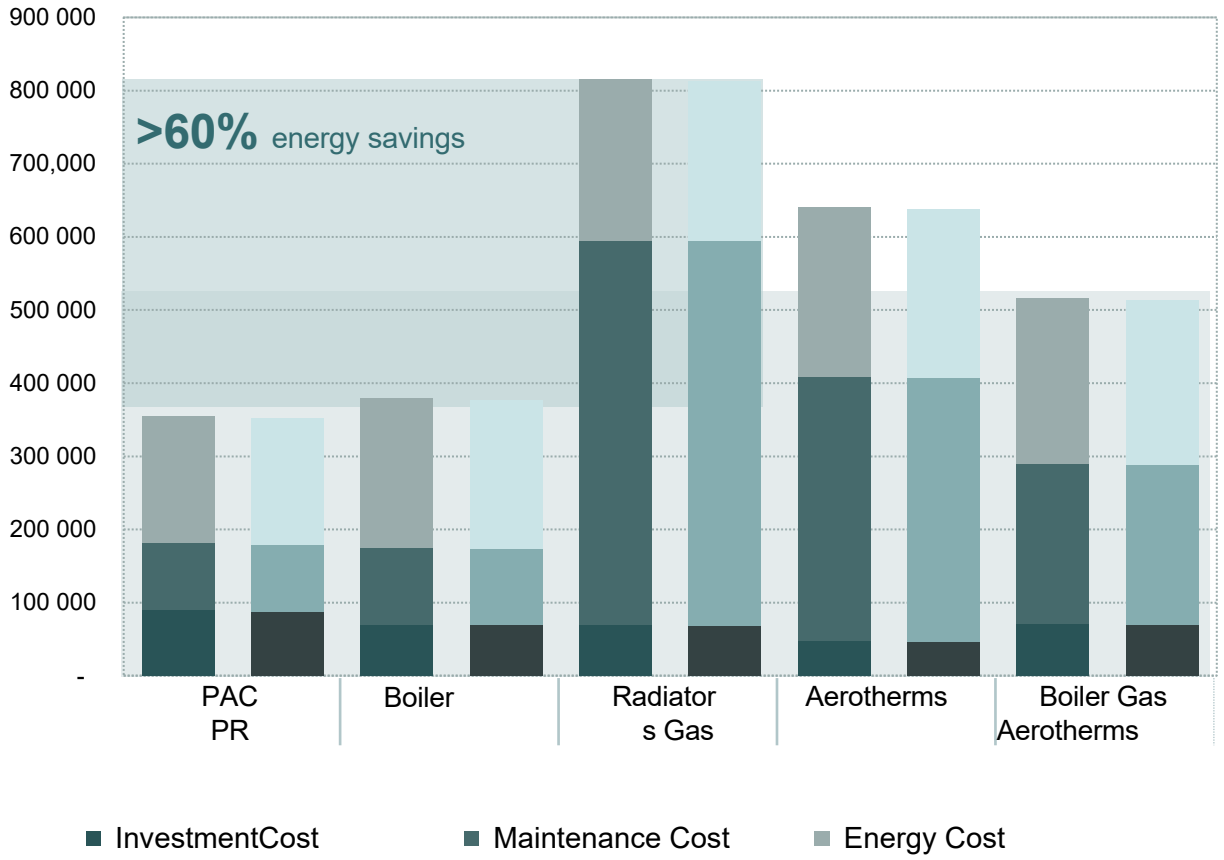
Between 55 and 60% energy savings With a PAC heater + Radiant Panels vs other common systems

30% energy savings
replacing water heater transmitters with radiant panels

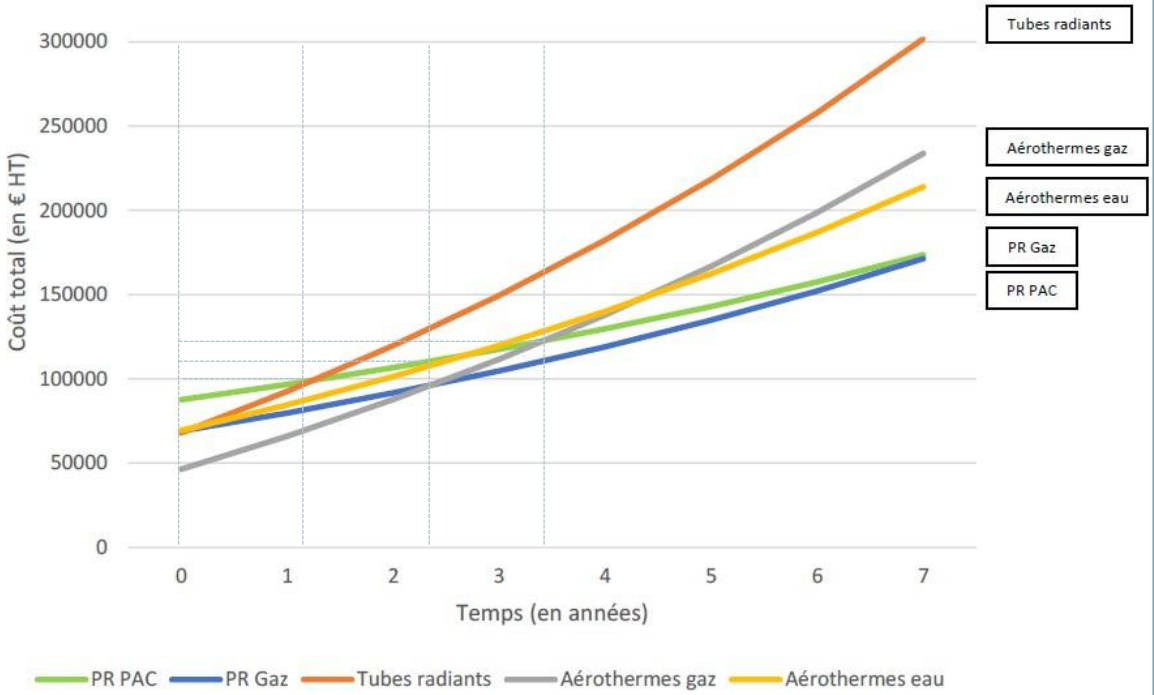
Large-volume premises:
PAC + PR: Lower overall cost from 1 to 3 years

zehnder

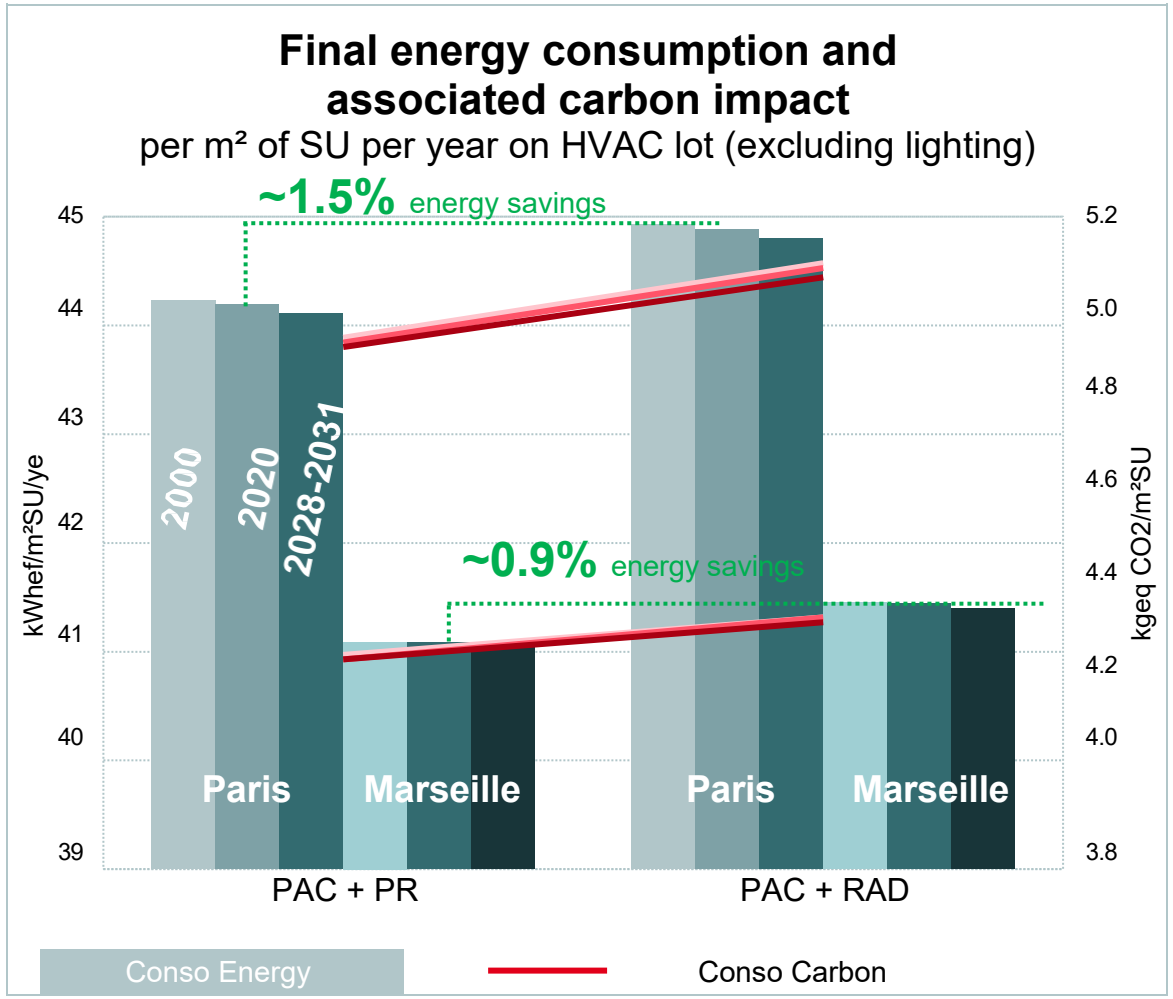
Overall cost at 15 years after investment (€excl.



Annual change in overall cost per technology (€excl. tax)



School premises:
PAC+PR: Energy efficiency comparable to radiators

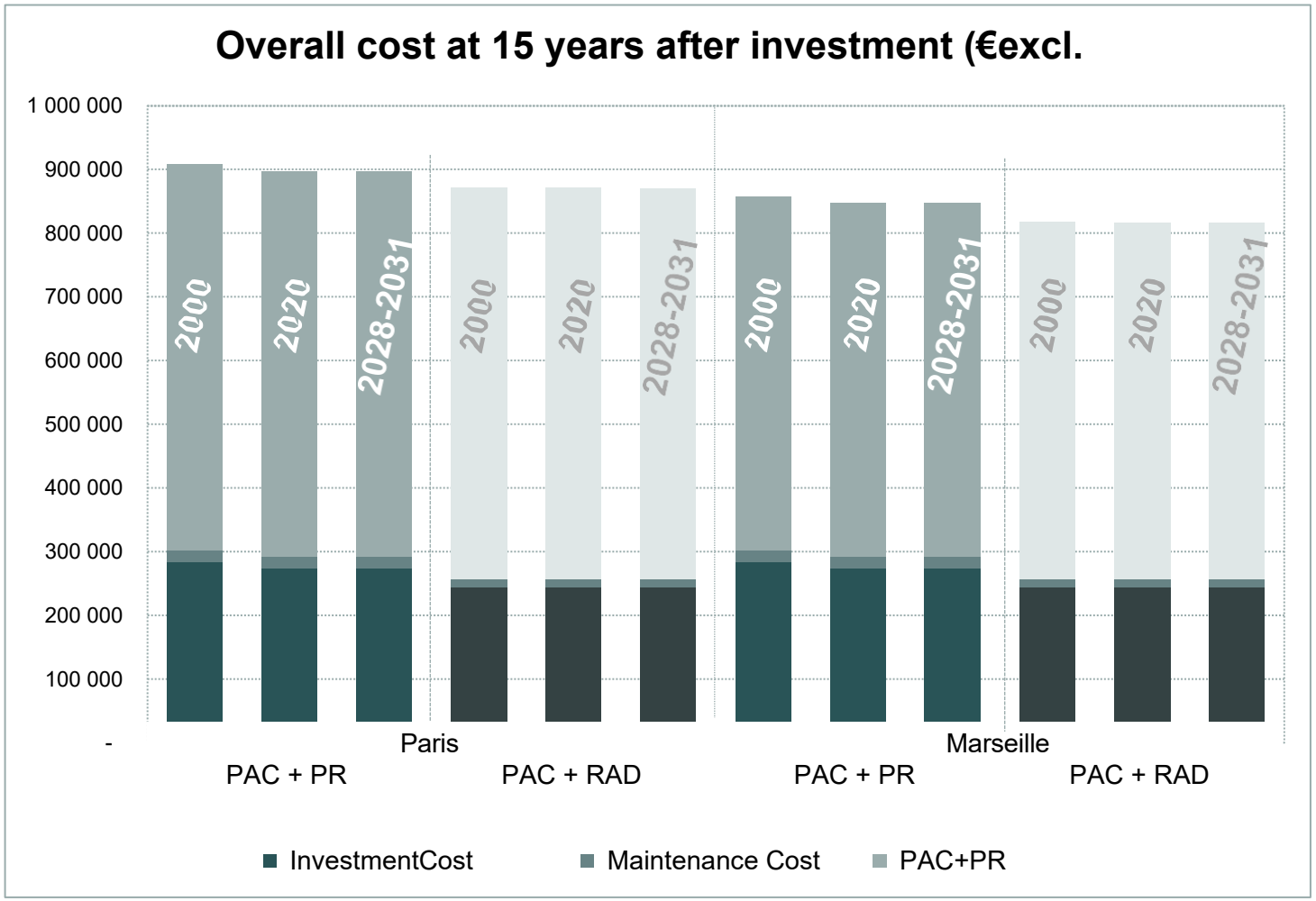


Comparable systems in

terms

energy efficiency and carbon

School premises: Equivalent overall cost



Comparable systems in terms of overall cost

Variance ~4%

Energy cost over 15 years	**PR vs RAD**	**-1%**	*~68% overall cost*
Maintenance cost over 15 years	**PR vs RAD**	**+50%**	*<2% overall cost*
Investment cost			
- Production:	PAC	~ €25k	
- Distribution:	Piping	~ €40k	
- Air treatment:	VMC DF *type Zehnder Eversky*	~150 K€	
- Heating transmitter:	**PR**	**~60 K€**	
	RAD	**~ €26K**	

School premises:
PR: Other benefits to make a difference

- **PR and RAD Common Benefits:**

Thermal comfort in heating

Acoustic comfort not impaired

Indoor air quality preserved

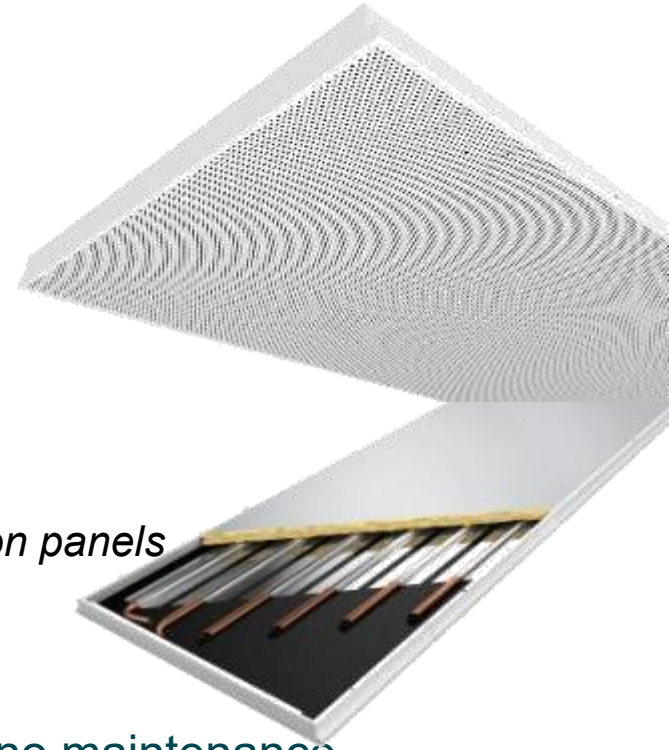
- **Benefits unique to RAs:**

→ 100% free wall space Space layout No risk of degradation Occupant Health / Safety

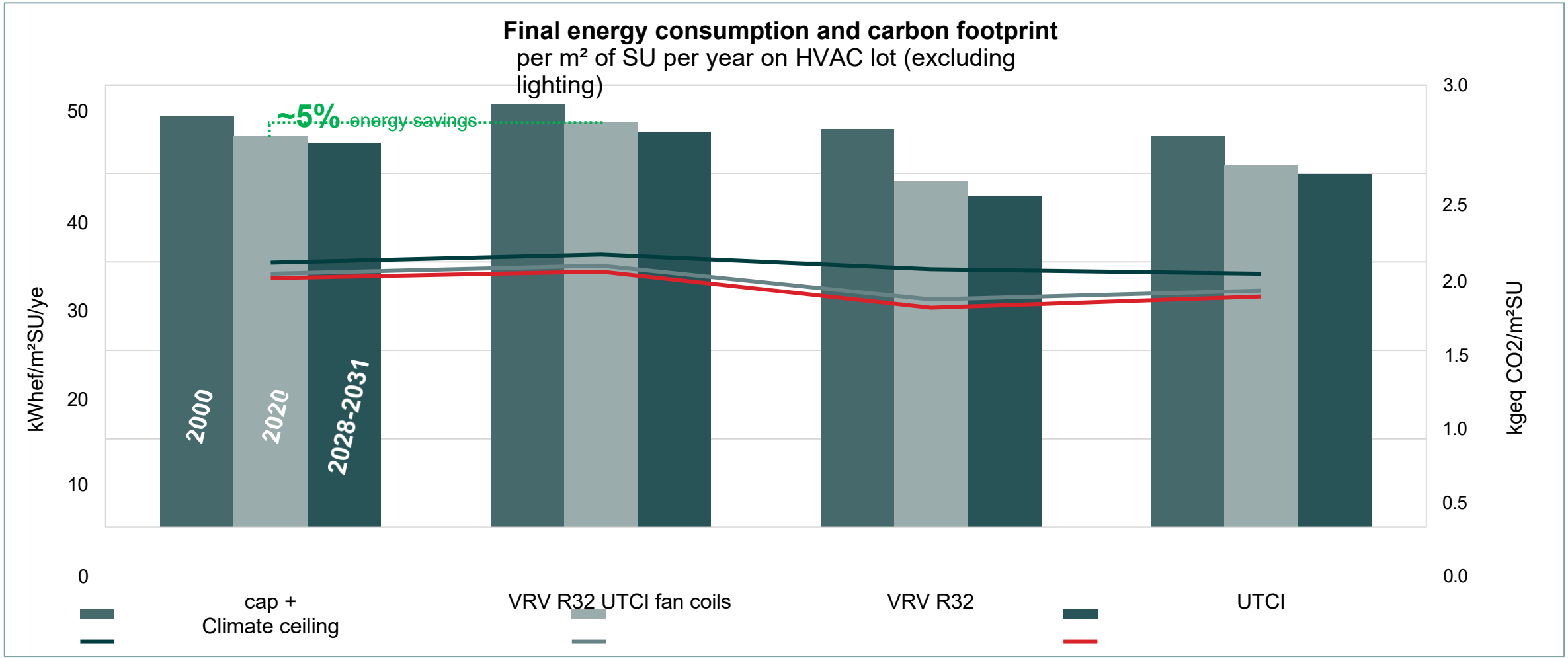
→ Summer comfort *if reversible PAC/ enough sound absorption panels*

→ with *perforated panels*

→ No classroom intervention, no maintenance



Offices:
Comparable energy efficiency across systems



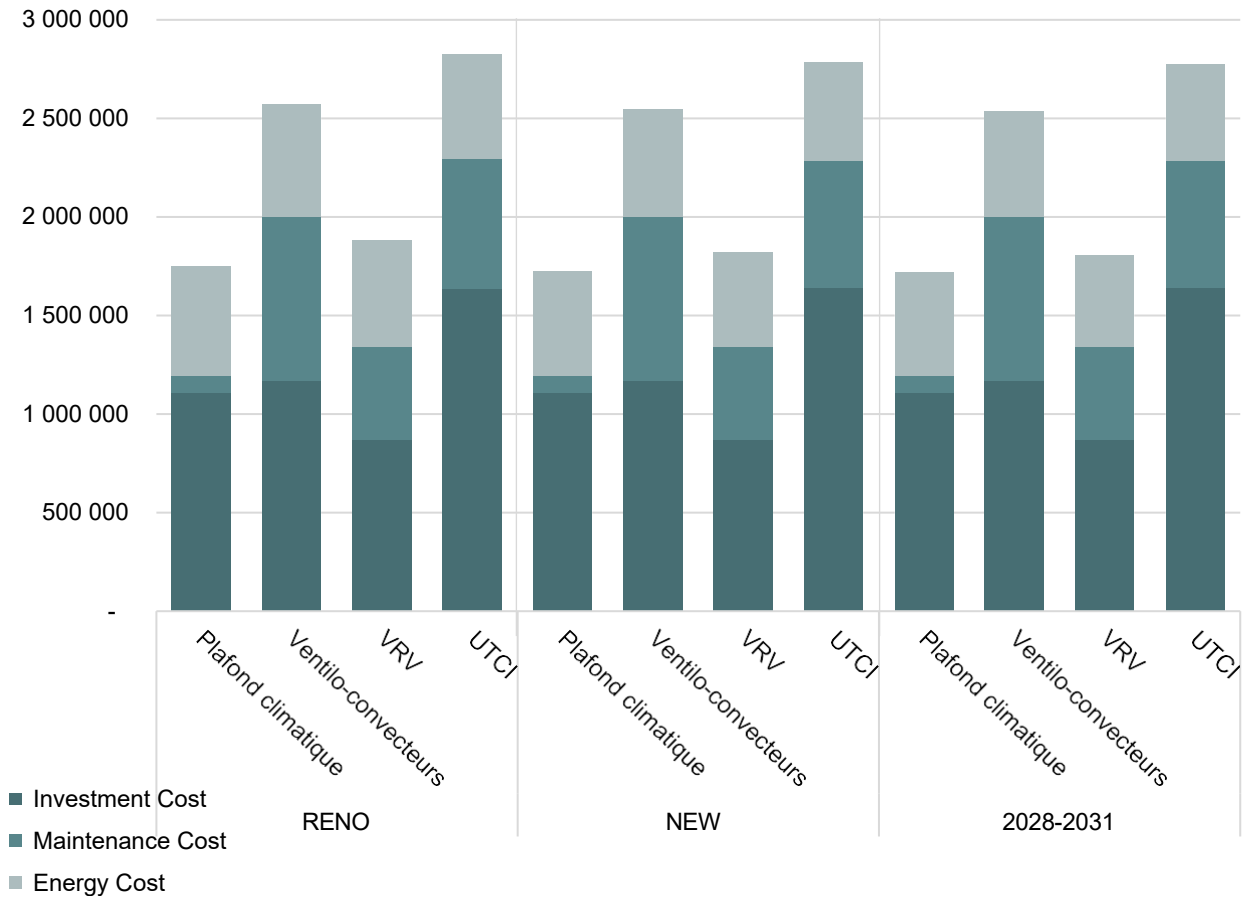
Average RENO Eq. Carbon consumption E

Average NINE Eq. Carbon consumption E

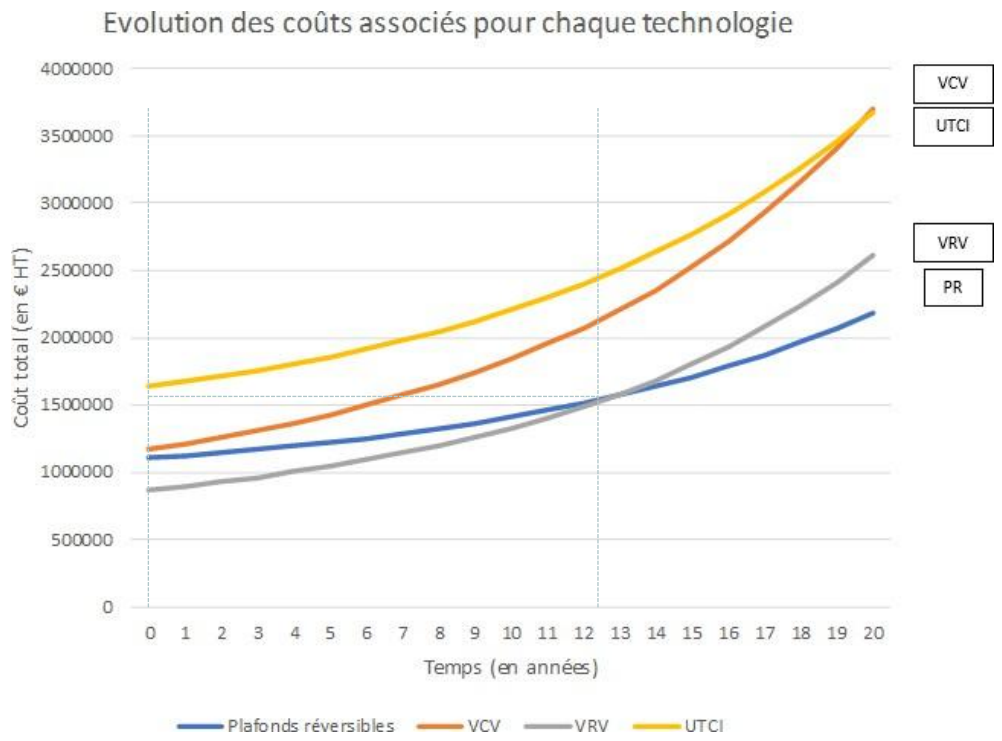
Average 2028-2031 Eq. Carbon consumption E

Offices:
Lower overall cost for climate cap and VRVs

Overall cost at 15 years after investment (€excl.



Annual change in overall cost per technology (€excl. tax)



ACO

Offices:
Differentiating benefits for Radiant Panels

✓ Thermal comfort

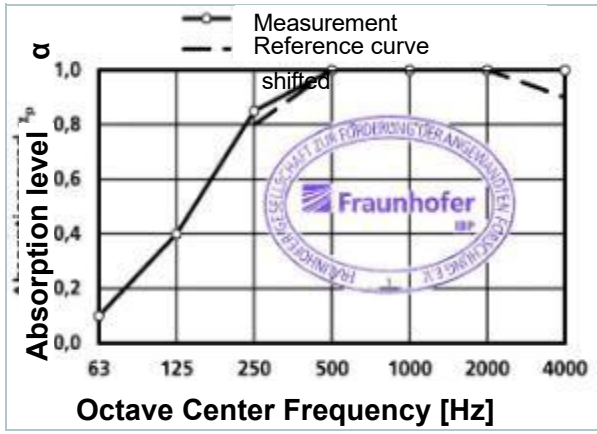
+ Stable, homogeneous temperature, low vertical temperature gradient
+ Reactive system (low water capacity)
+ No air displacement
+ Summer comfort = Refreshment with reversible PAC

✓ Acoustic comfort

+ 100% silent system

+ Sound absorption with *perforated panels*

Significant attenuation



✓ Adapted to architectural constraints:

+ No floor space, installation compatible with all elements: light structures, false ceiling, presence of IPN, sprinklers, lighting, IPN...
+ Limited weight
+ Color option, integrated led fixtures

Offices:
PR: Other benefits to make a difference

- ✓ No maintenance

+ No disturbance of the activity

- ✓ Safety

+ ATEX Compatible/Fire Protection: No electronics, non-combustible materials
+ Balloon impact protection, 100% galvanized materials as standard

- ✓ Preserved air quality

+ No stirring of dust, VOCs, bacteria

QAI

A few words about Zehnder Group France and bet Tribu Energie

always the best climate

The Zehnder Group
Interior Solutions Specialist

SUISSE

origine de notre Groupe international

812

millions d'euros de chiffre d'affaires 2022

4 000

collaborateurs

15

sites de production intégrés en Europe, Amérique du Nord et Chine

70

pays où notre groupe a une présence commerciale

Engagements RSE

900

brevets

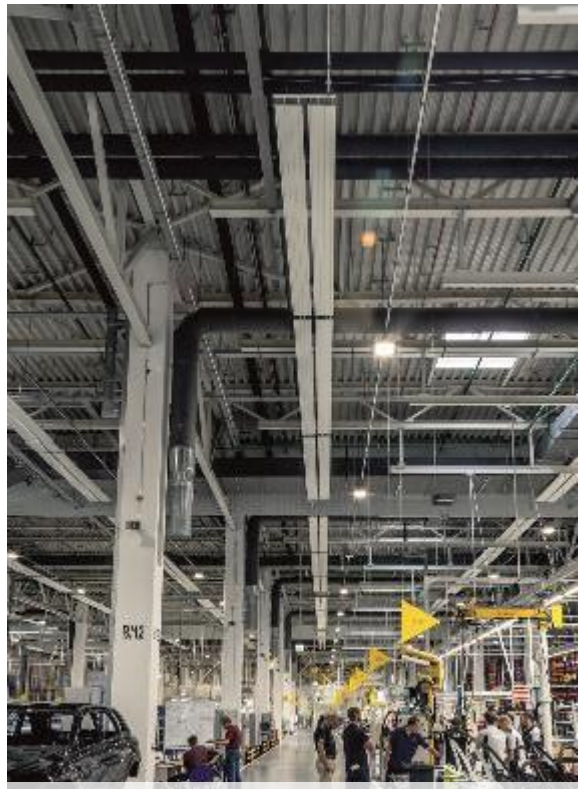
+25.000

formations clients par an dans le monde

Our mission
Always The Best Climate

Improving
quality of life
providing
the **best solutions**
indoor climate

A complete offer at the service of air quality and energy performance



Climate ceilings

Dual flow ventilation

Decorative radiators

clean air solutions

Bet Tribu Energie in a nutshell

- Design office "Energy and Sustainable Development" created in 2002
- Team of 23
- Pioneer in the field of positive energy
- Designs more energy-efficient buildings and urban areas
- Major player in energy rehabilitation
- 2 interconnected activities:
  - Building design
  - Consultant to public authorities in the development of regulations on energy efficiency of buildings:
    - Construction rules for new buildings: RT2005, RT2012, RE2020
    - Construction Environmental Labels
    - Building Energy Performance Certifications

Bet Tribu Energie in a nutshell

- Design office mission: Design and rehabilitate buildings and urban areas that are more energy efficient and more environmentally friendly.
- Areas of expertise: project management assistance, project management, consulting & strategy, R&D, software development, training, instrumentation and commissioning, communication
- Additional specialties: thermal regulations, energy audits, ventilation, heating, lighting, air conditioning, summer comfort, renewable energy, BBC and positive energy building design
- Scope of intervention: Buildings, Urban areas, Construction, Rehabilitation (e.g.: collective housing, offices, hotels, shops, health, industrial buildings, gyms, etc.)

FLUIDS

CARBON ENERGY

SUSTAINABLE DEVELOPMENT