

# Interseasonal Heat Transfer

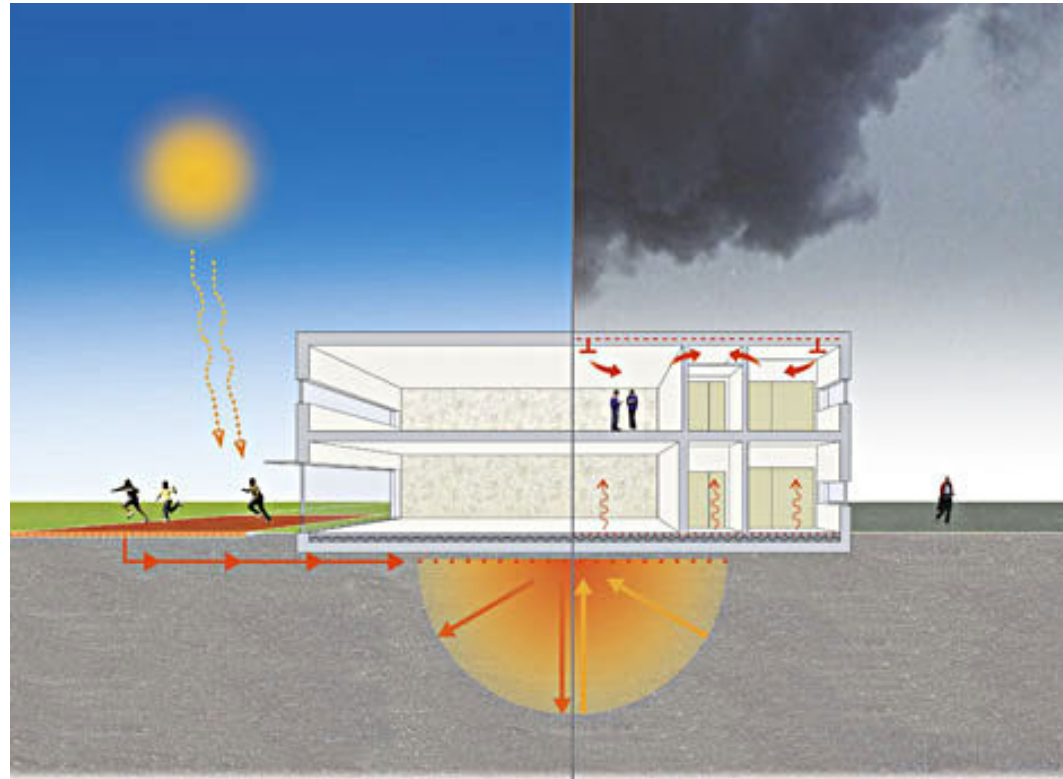
Improving ground source heat pump efficiency

What Interseasonal Heat Transfer is

How IHT works

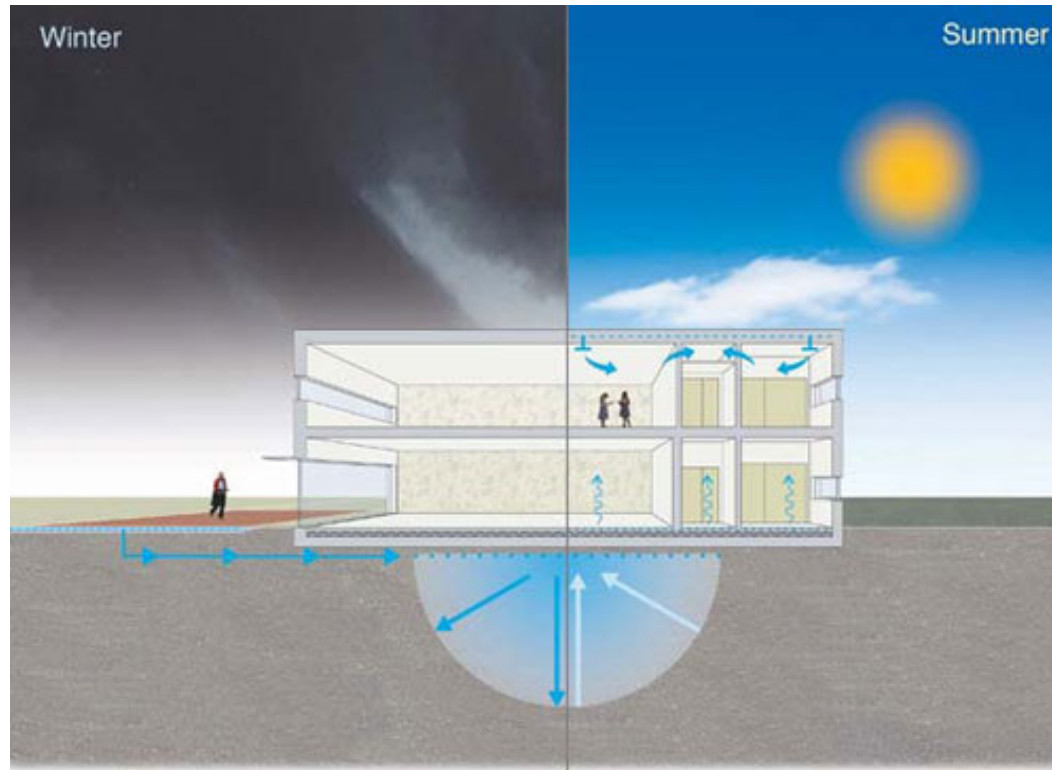
Edward Thompson

## Interseasonal Heat Transfer



IHT captures solar heat in summer  
stores it in ThermalBanks  
releases heat to buildings in winter  
via heat pumps  
without burning fossil fuels

## Interseasonal Heat Transfer



IHT captures coolth in winter  
stores it in ThermalBanks  
releases it in summer to provide cooling  
without the horrendous cost of air conditioning

How does  
**Interseasonal Heat Transfer**  
work?

By assisting the natural flow of energy

Respecting the second law of thermodynamics.

Heat moves to colder objects,  
as water finds its own level.

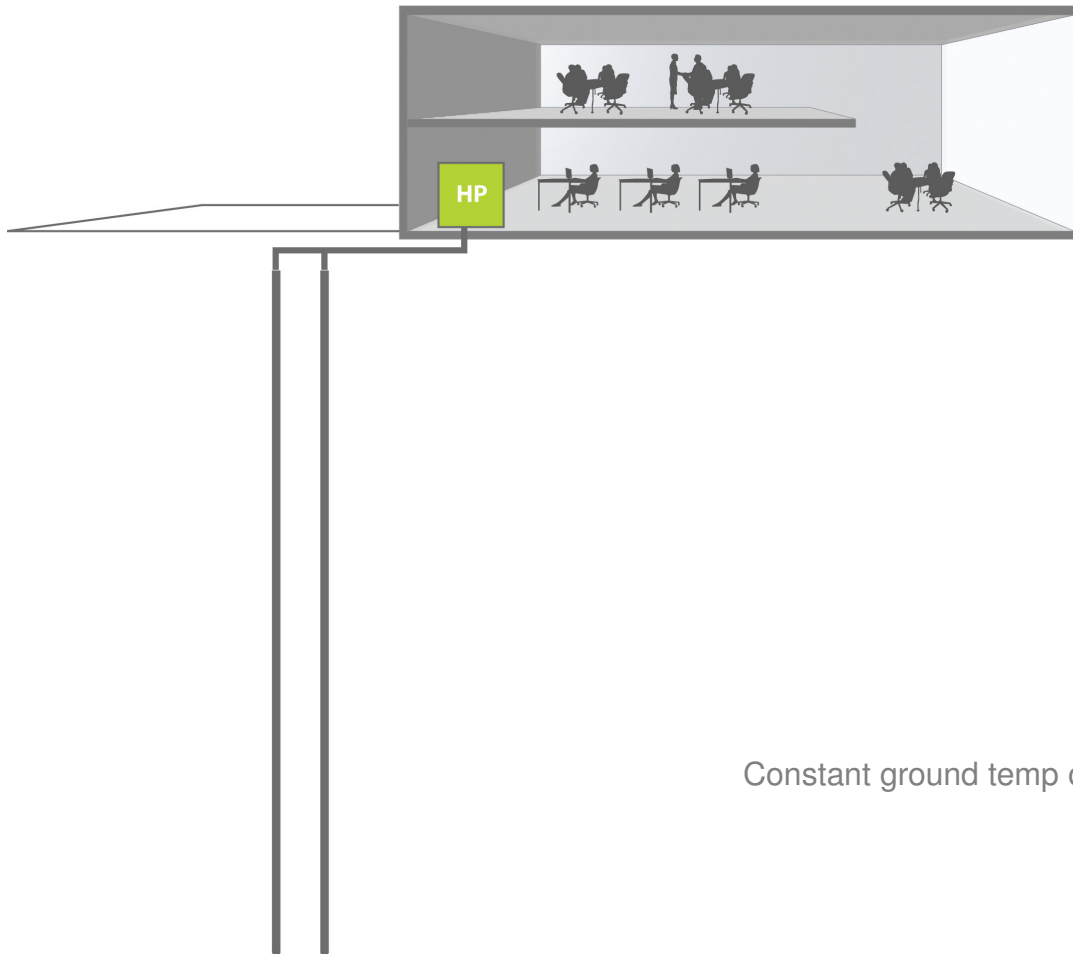
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Black surfaces absorb heat.

Heat moves slowly in the ground.

# A simple ground source energy system

## A ground loop – heat pump – underfloor heating



$$\text{CoP} = 4$$

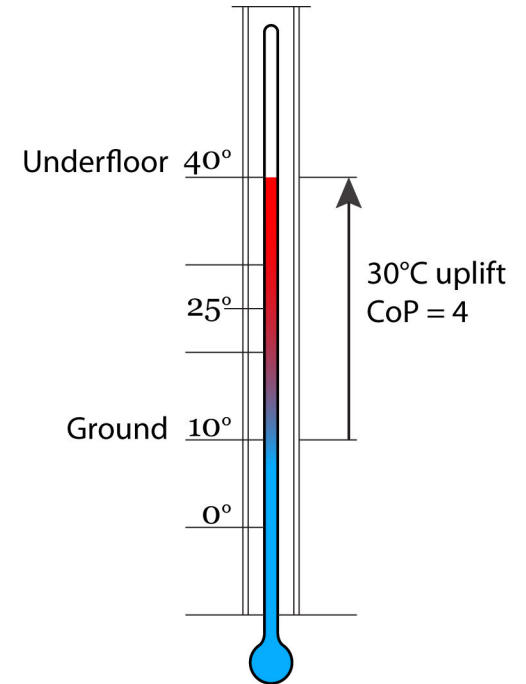
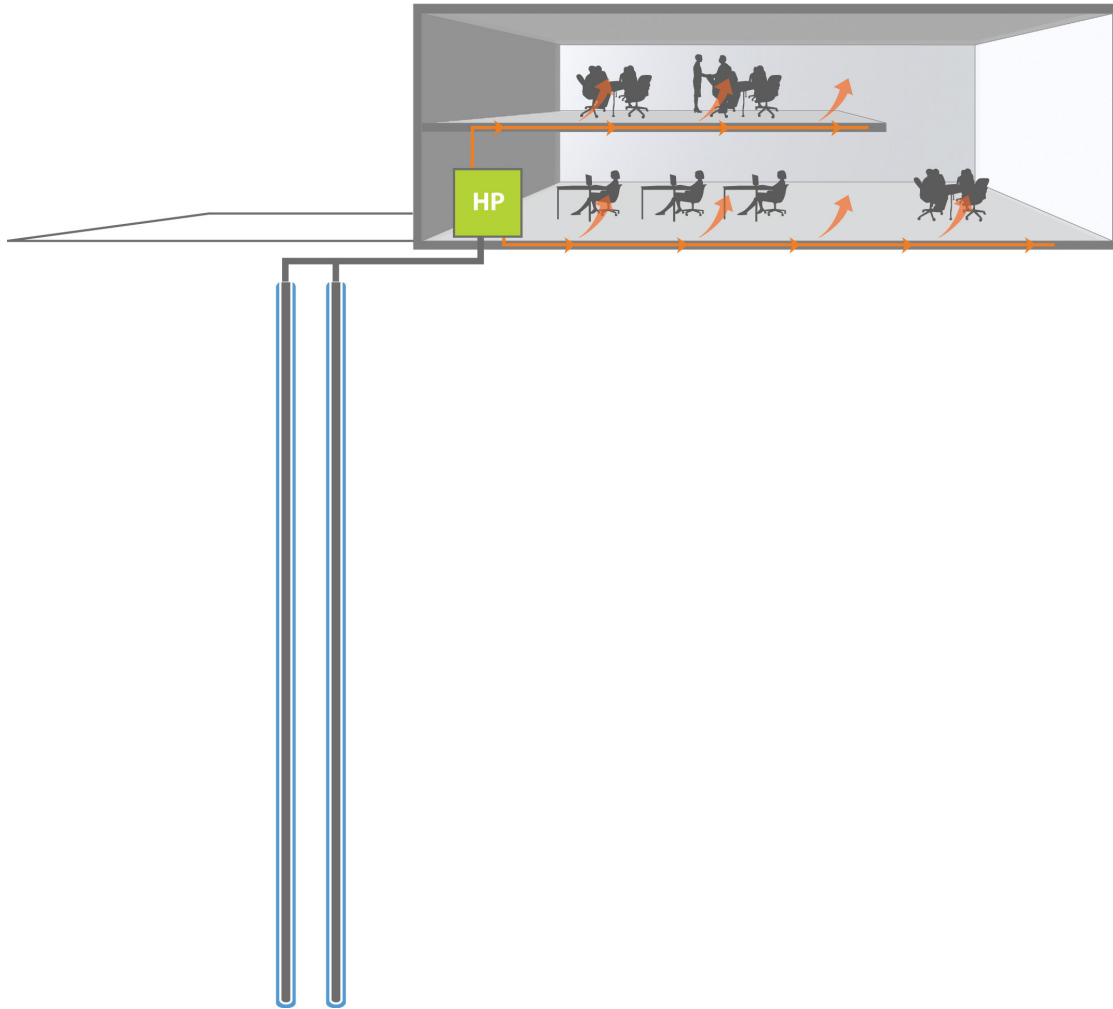
UFH = 40C

Start temp = 10C

Constant ground temp of 10C = dangerous, incomplete misleading statement

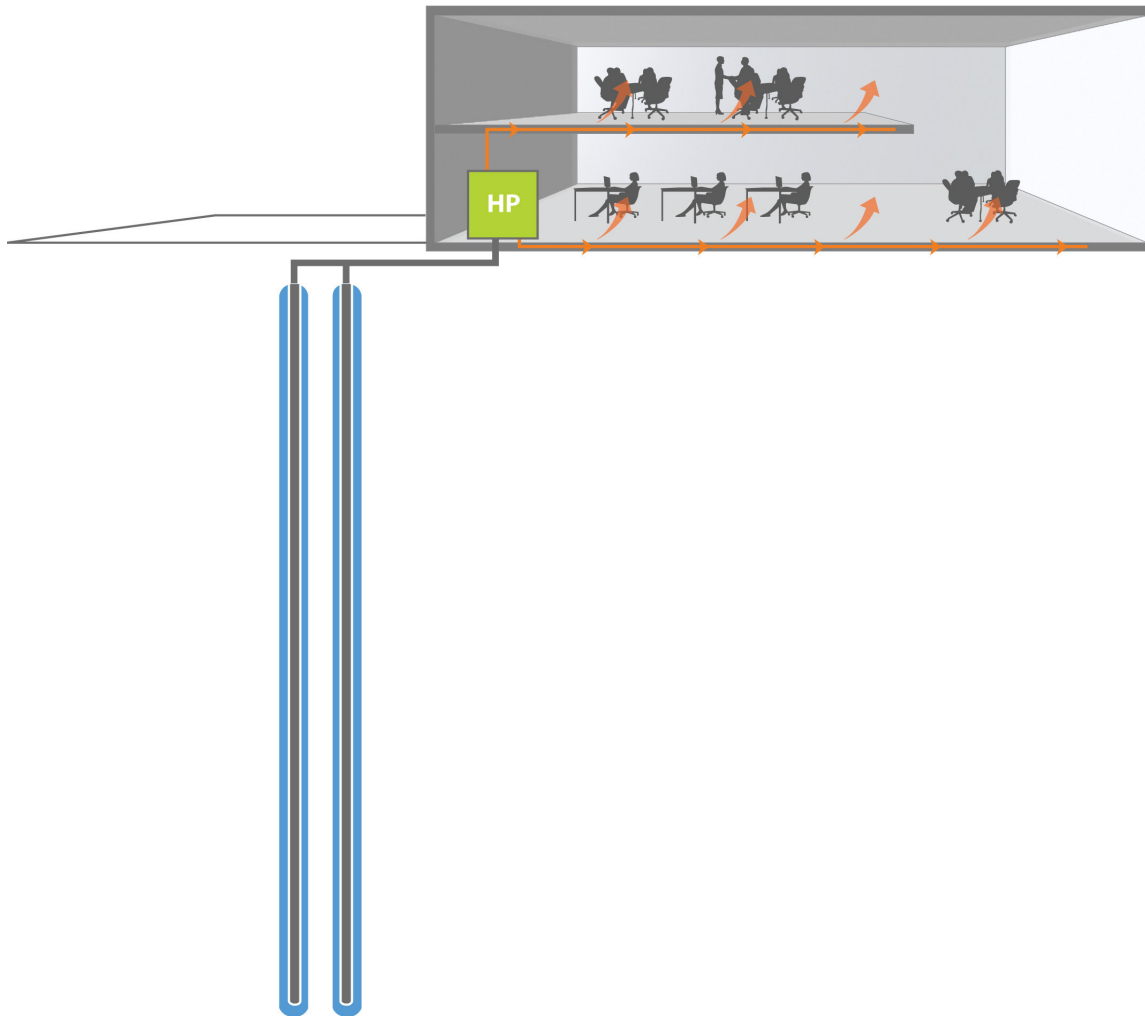
# A simple ground source energy system

Transfers heat to a building



# A simple ground source energy system

And cools the ground

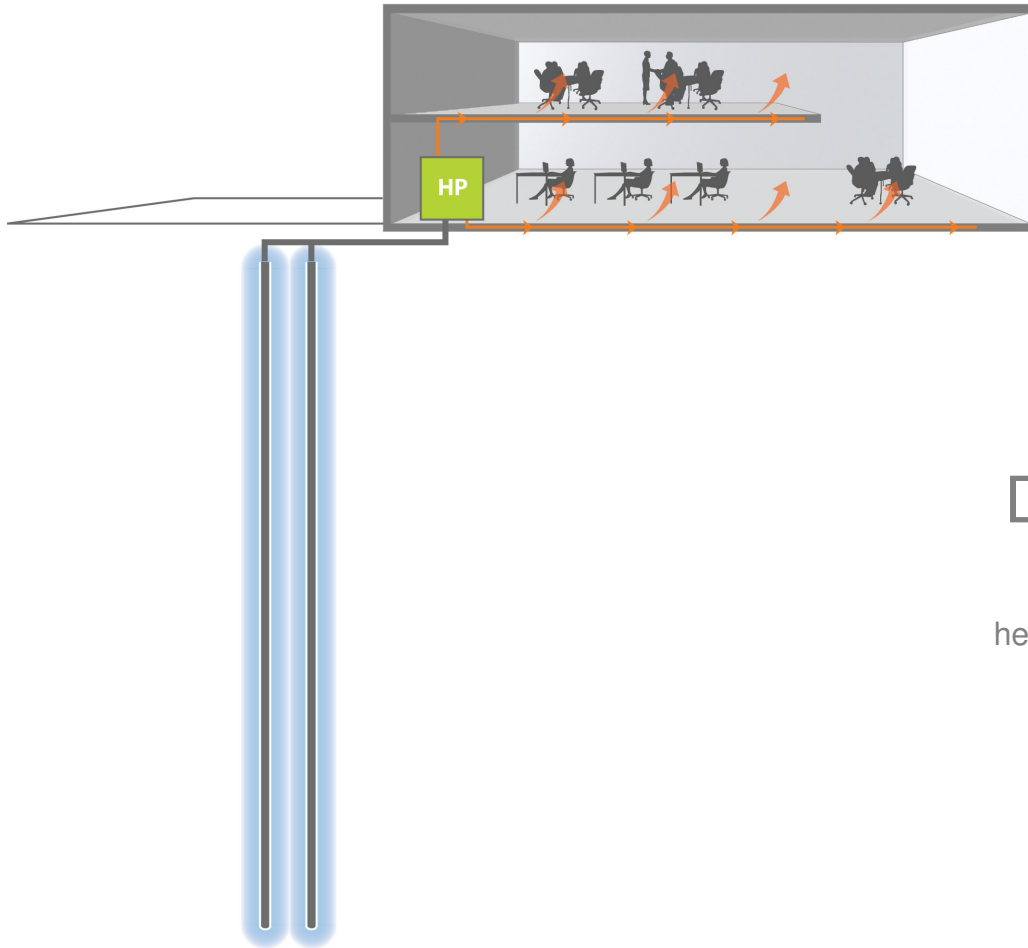


NEF

SCoP = 2.72

# A simple ground source energy system

And cools the ground

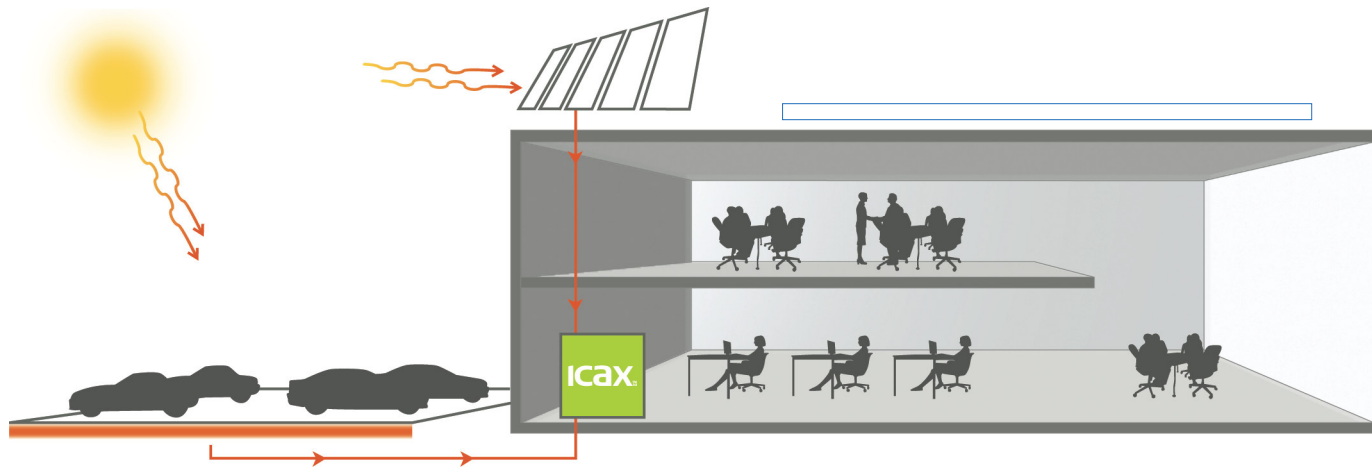


Danger of lock up  
because  
heat only moves slowly in the ground



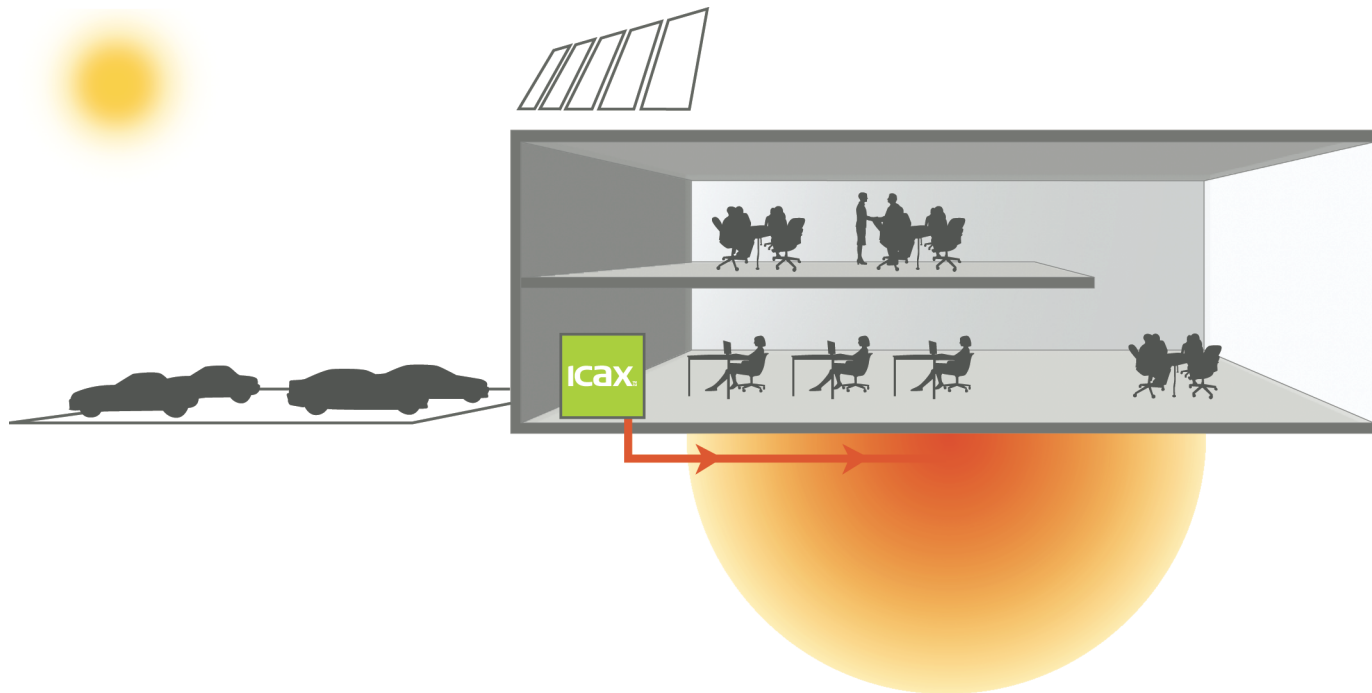
# Interseasonal Heat Transfer

Collects solar heat in summer



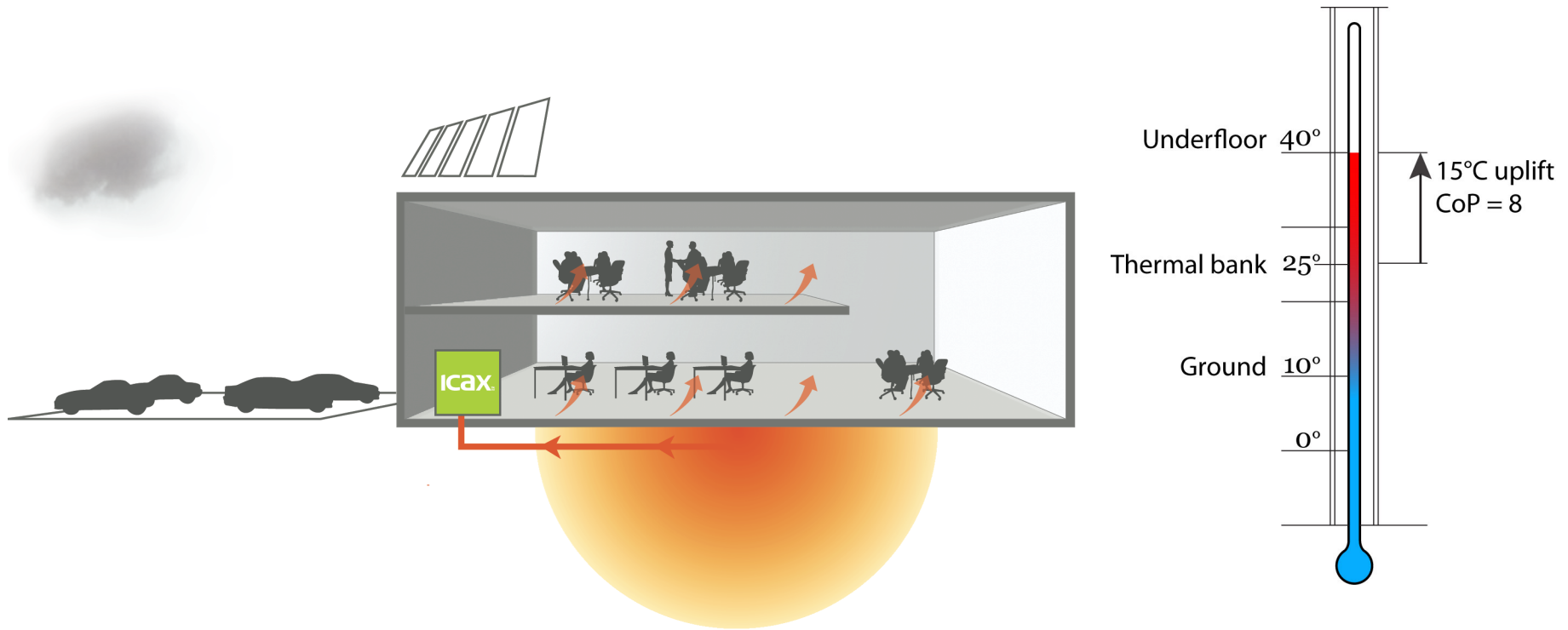
## Interseasonal Heat Transfer

Stores heat in a **ThermalBank**  
raising ground from 10°C to 25°C



## Interseasonal Heat Transfer

Doubles the performance of heat pumps by starting with warmth from Thermal Banks



# Interseasonal Heat Transfer

## Successes:

Toddington – Under Road Heating

Howe Dell School

Garth Prison

Hiroshima

Merton Intergenerational Centre

Suffolk One

Wellington Civic Centre

## Interseasonal Heat Transfer

Toddington Demonstration

Highways Agency

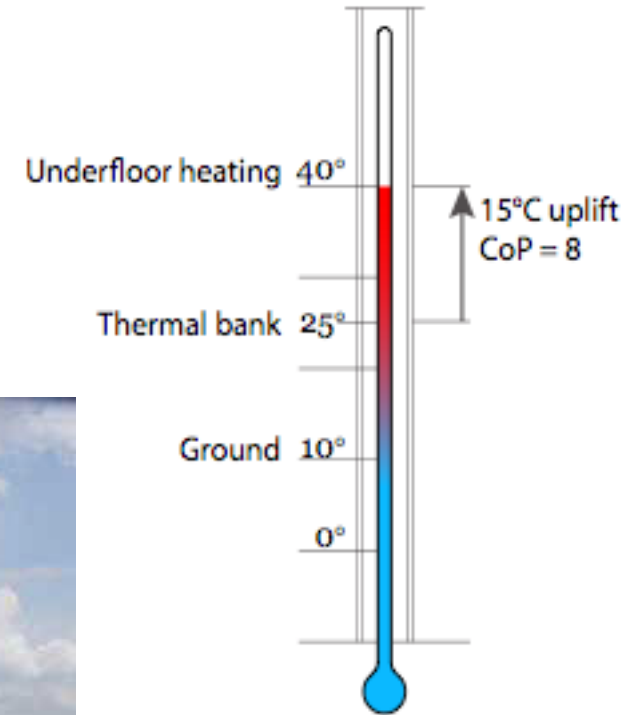
Under Road Heating



## Interseasonal Heat Transfer

Howe Dell School

Doubles the performance of heat pumps  
by starting with warmth from Thermal Banks



## Interseasonal Heat Transfer

Garth Prison  
Exercise yard



## Interseasonal Heat Transfer

Hiroshima

Misawa tests IHT in Japan  
under licence from ICAX





## Interseasonal Heat Transfer

Merton Intergenerational Centre  
Over 40% on site renewable energy



## Interseasonal Heat Transfer

Suffolk One - £65m Sixth Form College  
Doubles the performance of heat pumps  
by starting with warmth from Thermal Banks



## Interseasonal Heat Transfer

Wellington Civic Centre

Redevelopment of town centre offices and swimming pool



## Interseasonal Heat Transfer

is controlled by an ICAX Skid  
- which includes a heat pump

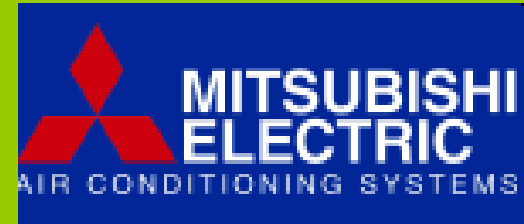


# ICaX<sup>TM</sup> Ltd



INTERSEASONAL HEAT TRANSFER  
cooperates with nature  
to provide renewable heating and  
cooling without costing us all the earth.

ICAX chooses REHAU to install pipe  
arrays for ICAX Solar Collectors and  
ICAX ThermalBanks.



ICAX uses Mitsubishi WR2 equipment to extend the principles of IHT (of collecting free heat in summer for use in winter) to allow for sharing of heat *within* a building where there are simultaneous needs for heating and cooling.

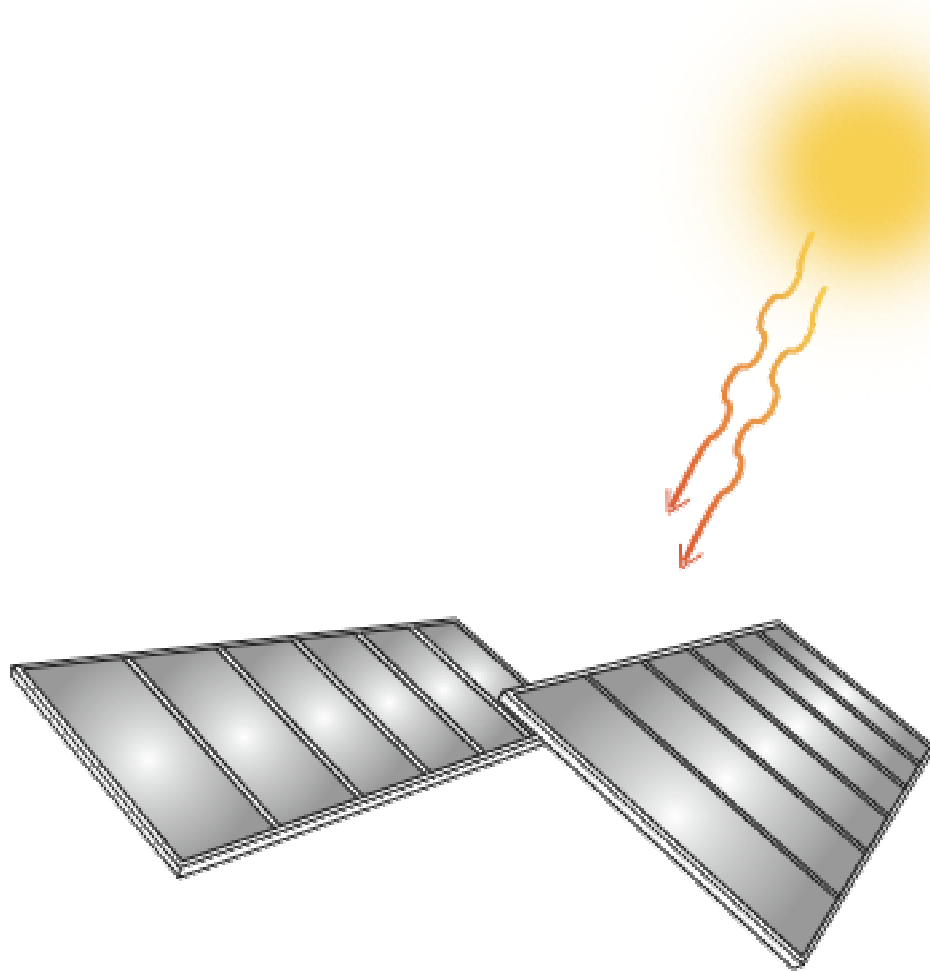
The integration of these renewable technologies is a major new step toward the target of achieving Zero Carbon Buildings.

Where next for  
**Interseasonal Heat Transfer?**

**Not just Renewable Energy**

**but**

**Economic Renewable Energy**

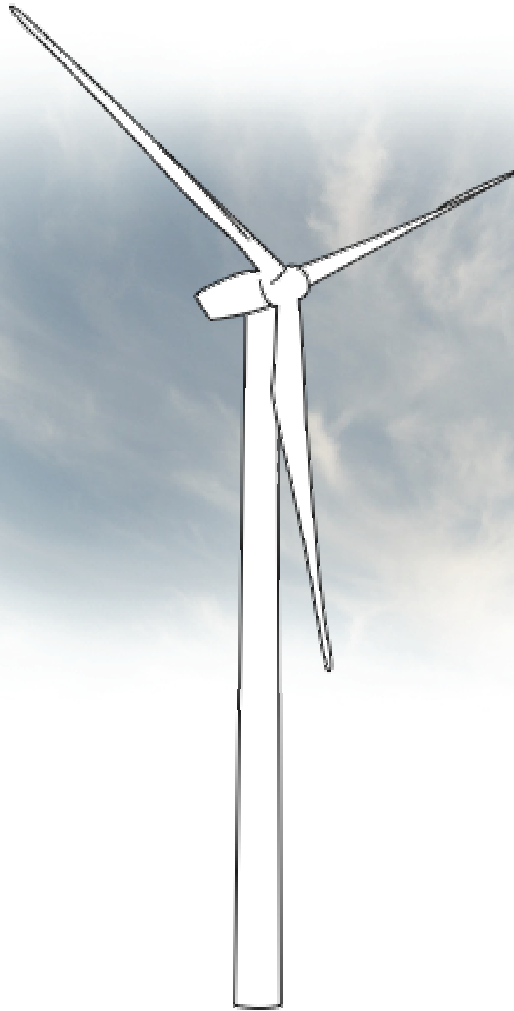


## Photovoltaic

- Generates electricity
- When the sun shines
- Efficiency of only 12%
- Difficult to store surplus electricity
- High capital cost

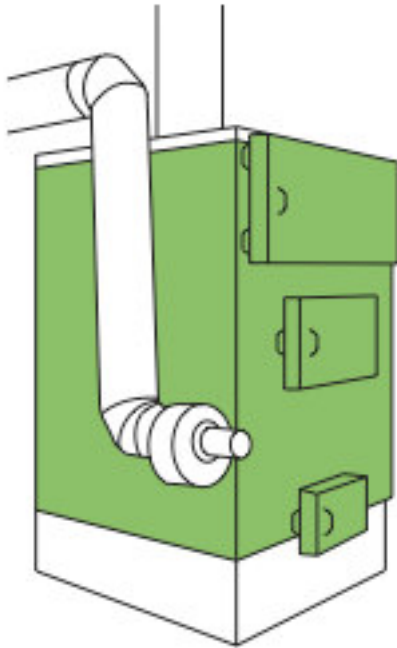






## Wind turbine

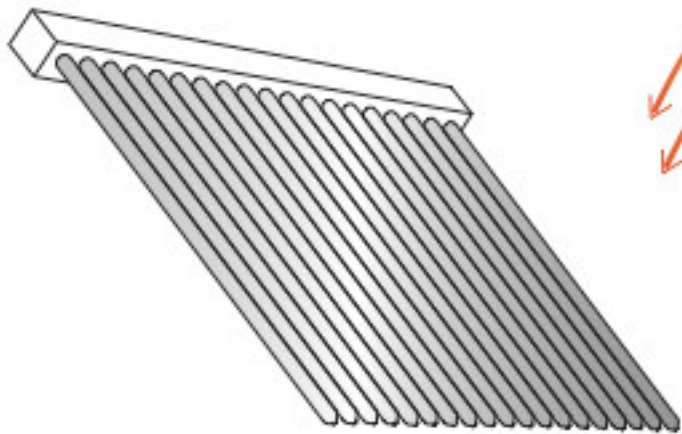
- Generates electricity
- When the wind blows
- If used on a large scale
- Difficult to store surplus electricity
- High capital cost
- Reliability and maintenance?
- Planning permission?



## **Biomass Boiler**

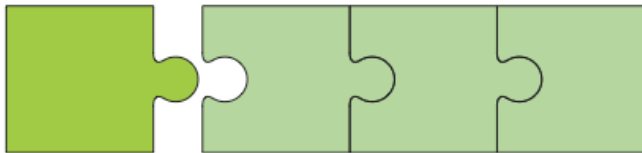
- + Generates heat
- + Cheap to buy
- Expensive to install
- On-going management costs
- Not good for hot water in summer
- No good for cooling
- Continuity of supply?
- Generates CO<sub>2</sub>
- long route from the sun (many years)

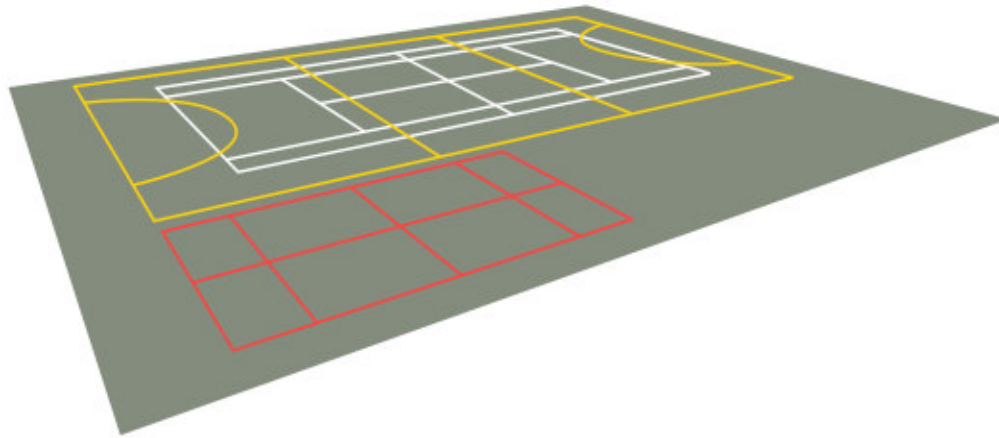




## Solar Thermal

- Short route from the sun (six minutes)
- Generates hot water
- Efficient technology and affordable
- Some heat in winter
- Lots of heat in summer
- Overheating in summer?
- Where to store all the heat?
- The real need is space heating in winter
- A valuable piece in the jigsaw



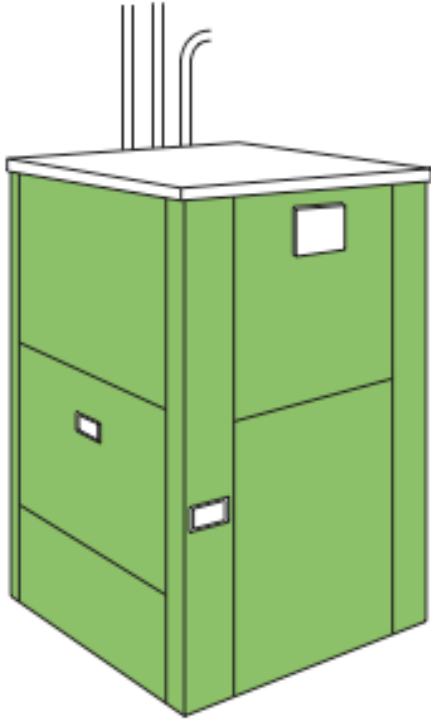


## Asphalt Solar Collector

- Black surfaces absorb heat
- Lots of heat in summer
- Cheaper than solar panels
- Gives second function to tarmac
  - car parks
  - playgrounds
  - access roads
- Invisible – no planning issues
- Where to store surplus heat?

*“Seasonal Thermal Storage is the Holy Grail of the renewables industry”.*



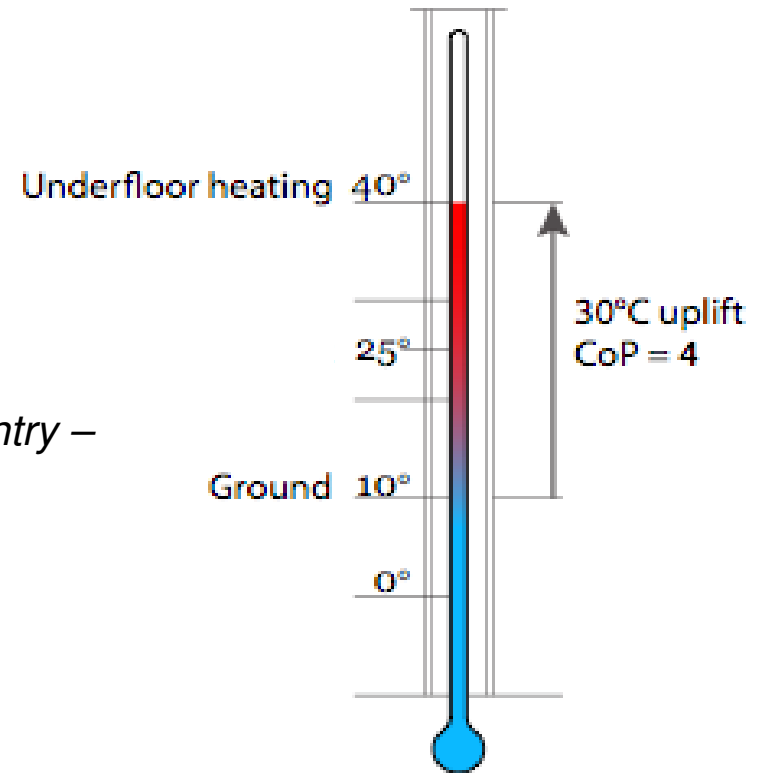
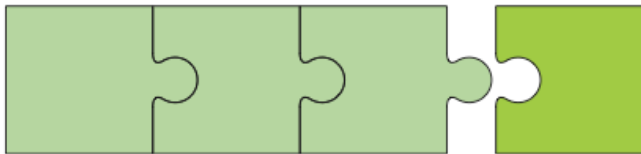


## Heat Pump

- Transfers heat from ground
- Coefficient of Performance of 4 in autumn
- In standard conditions
- But CoP falls as heat is extracted from ground

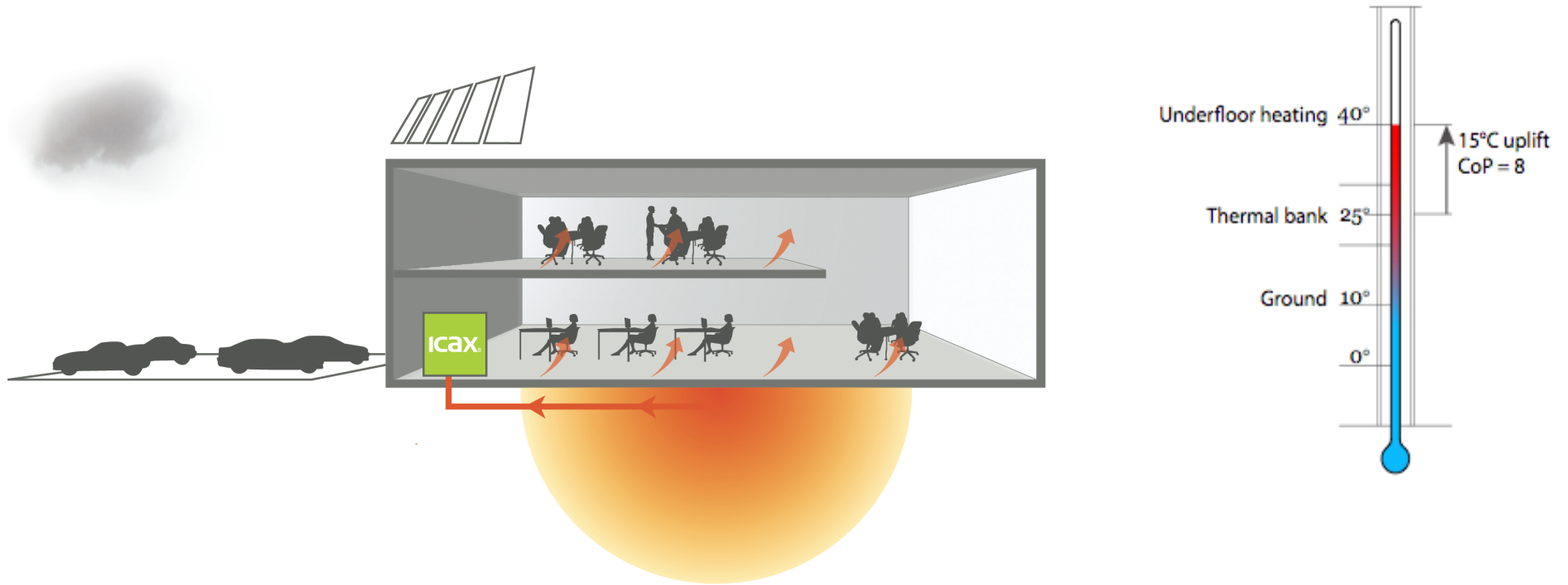
*“Temp is a constant 10°C at 7m depth – across the country – from summer to winter”.*

But, this is only true if you don't extract the heat.



# Interseasonal Heat Transfer

By integrating successful renewable technologies:  
Solar collection – Thermalbank storage – heat pump delivery



# ICaX<sup>TM</sup> ltd

ICAX has demonstrated successful integration for heating.

ICAX is able to take integration further than this.

Cooling has become a key issue in well-insulated, well-designed buildings.

## Interseasonal Heat Transfer

Collects cold temp in winter

Stores it in a ThermalBank

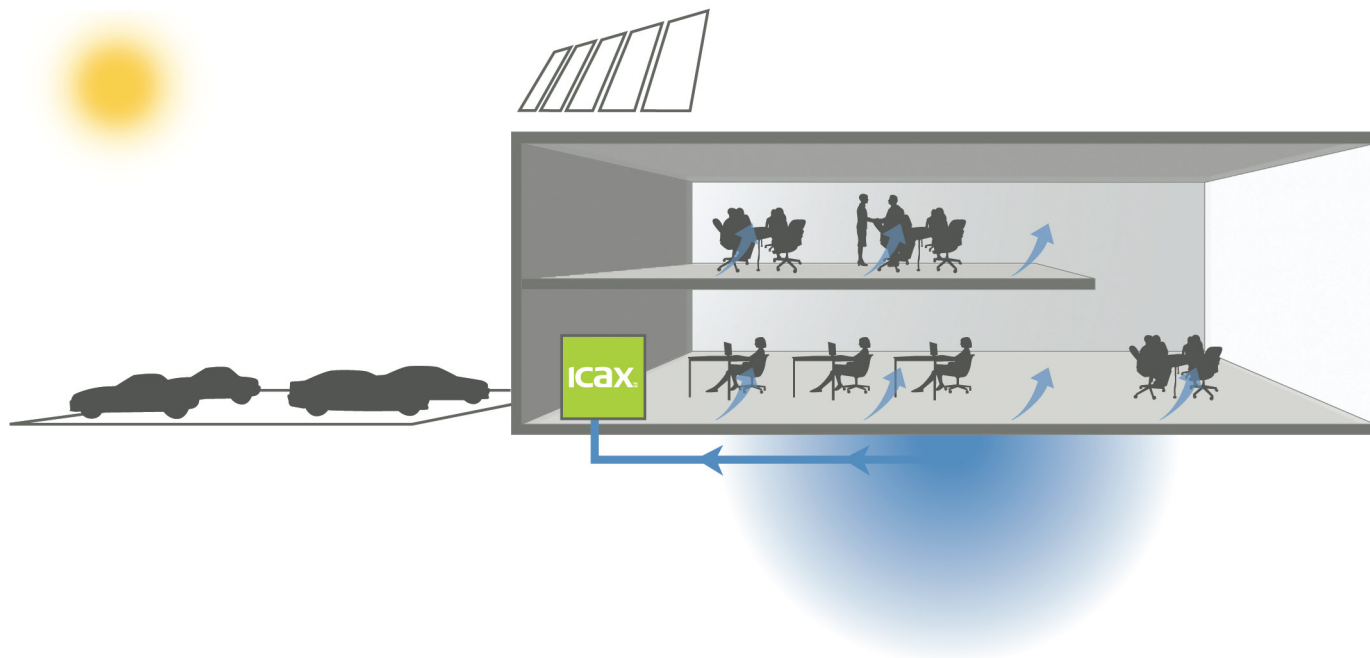
Reducing ground temp to 3°C





And releases coolth in summer to cool buildings,  
at a fraction of the cost of air conditioning.

A CoP of 20 can be achieved by use of just a circulation  
pump to allow heat to escape to cold ThermalBank.



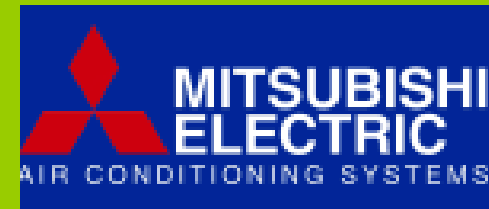
# Icax<sup>TM</sup> ltd

INTERSEASONAL HEAT TRANSFER

THERMALBANKS

Edward Thompson

# ICaX<sup>TM</sup> Ltd



## INTERSEASONAL HEAT TRANSFER

ThermalBanks

Renewable Heat

Renewable Cooling

[www.icax.co.uk](http://www.icax.co.uk)

# ICaX<sup>TM</sup> Ltd

INTERSEASONAL HEAT TRANSFER

**Economic Renewable Energy**

Edward Thompson