Interseasonal Heat Transfer

Improving ground source heat pump efficiency

What Interseasonal Heat Transfer is

How IHT works

Interface with ground source energy systems

Assessing IHT: Successes

Assessing IHT: Teething problems

Where next for IHT?

Edward Thompson

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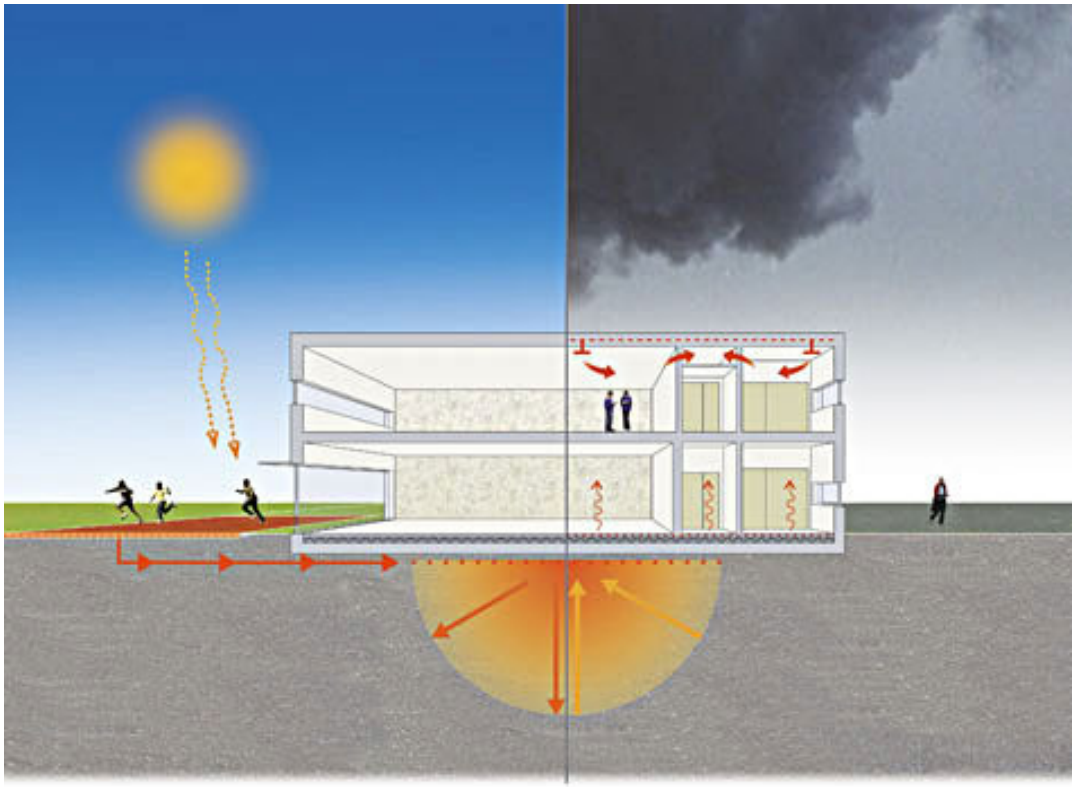
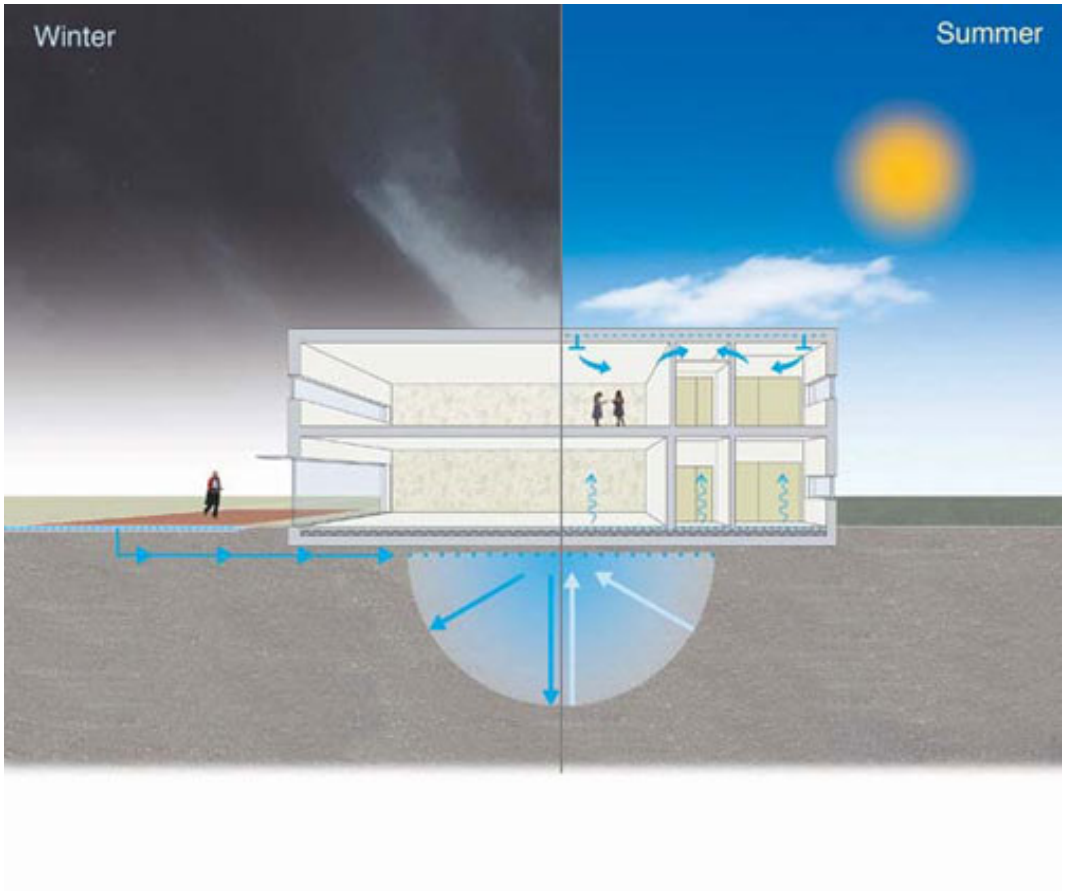
Interseasonal Heat Transfer



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.

.....

Black surfaces absorb heat.

Heat moves slowly in the ground.

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How does

Interseasonal Heat Transfer

interface with ground source energy systems?

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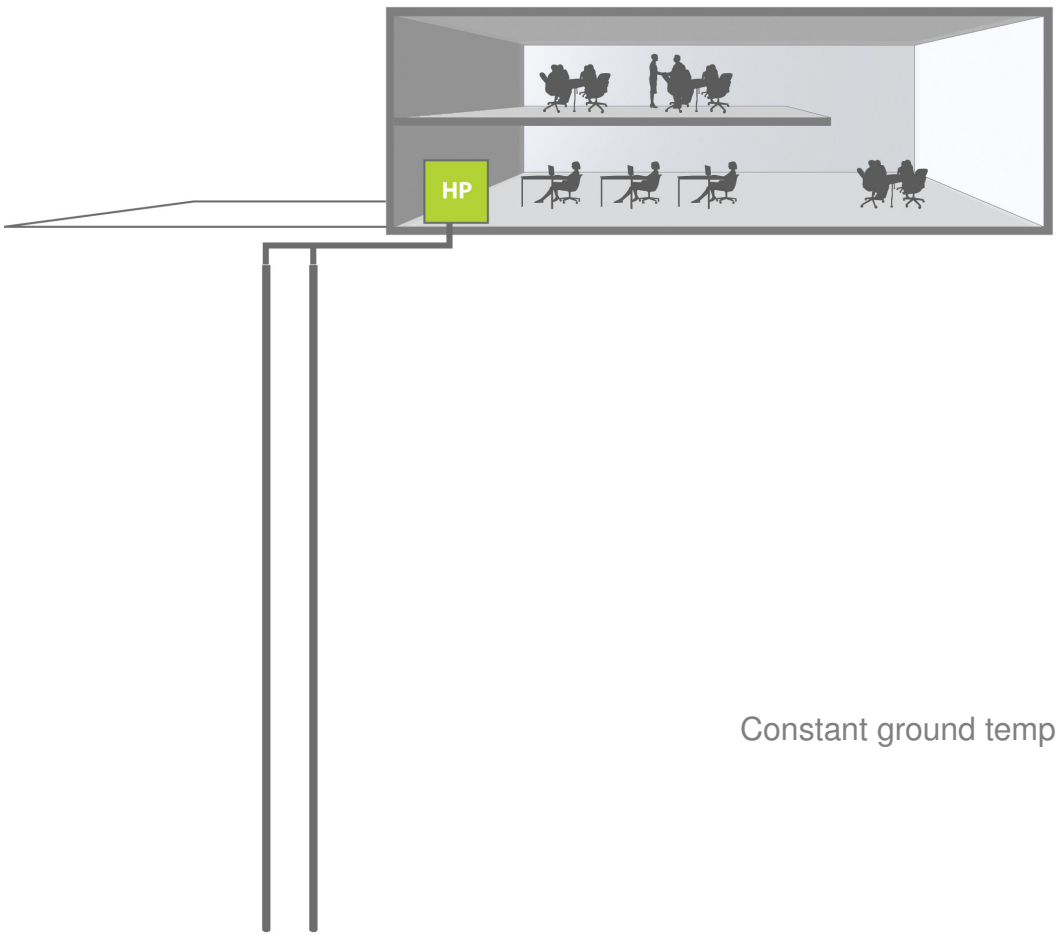
A simple ground source energy system

A ground loop – heat pump – underfloor heating



CoP = 4

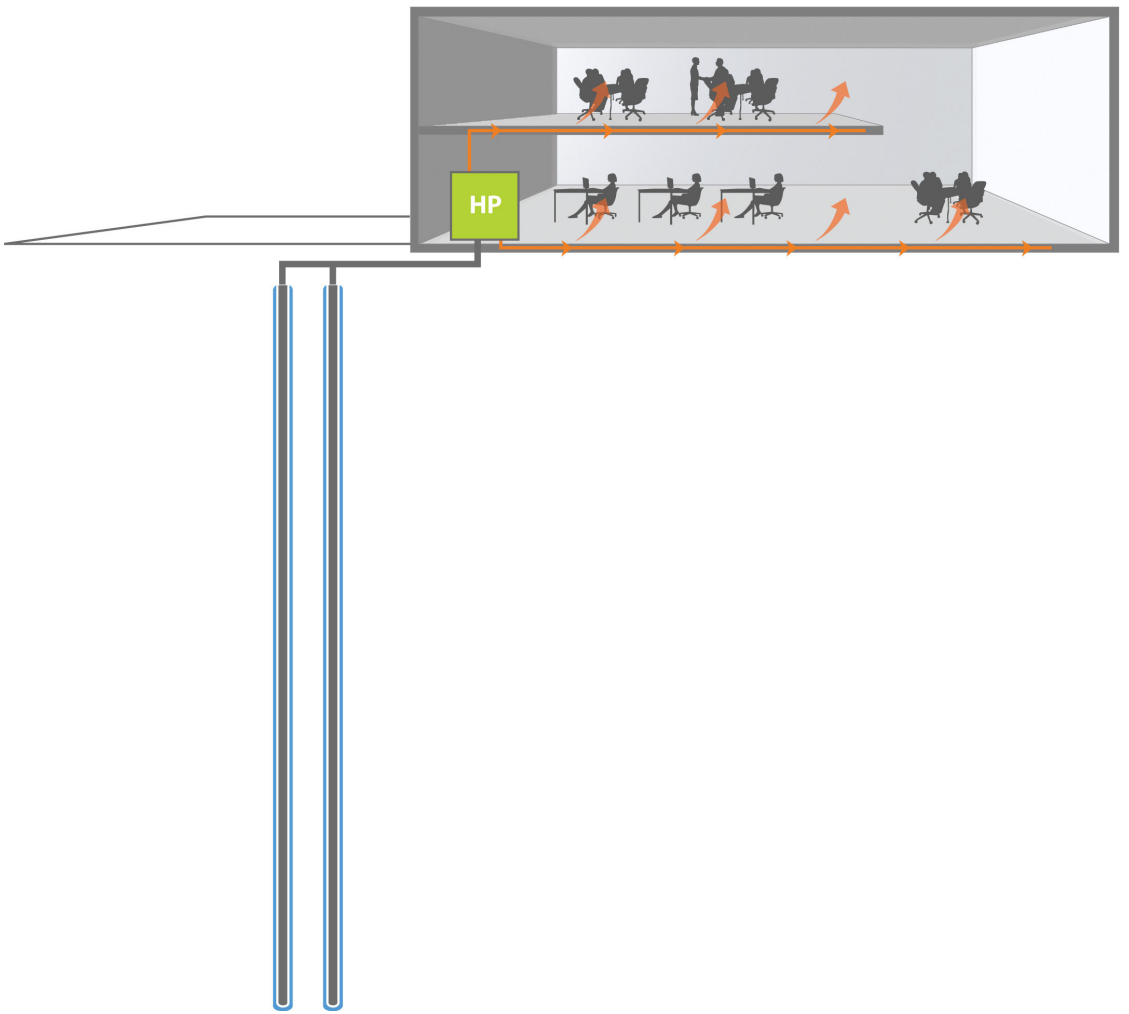
UFH = 40C

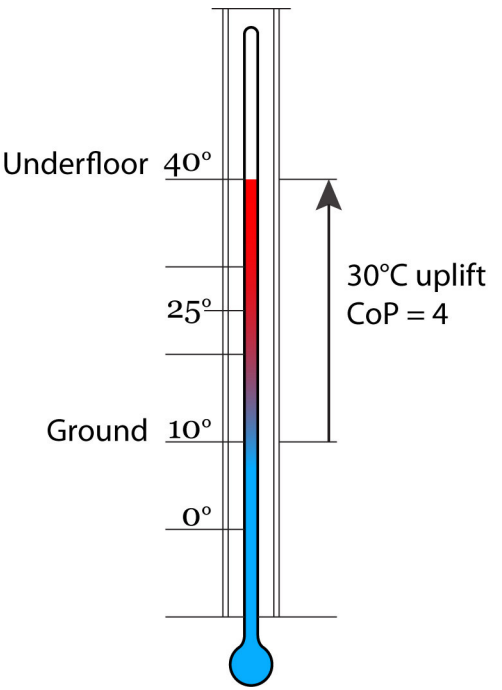
Start temp = 10C

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

A simple ground source energy system

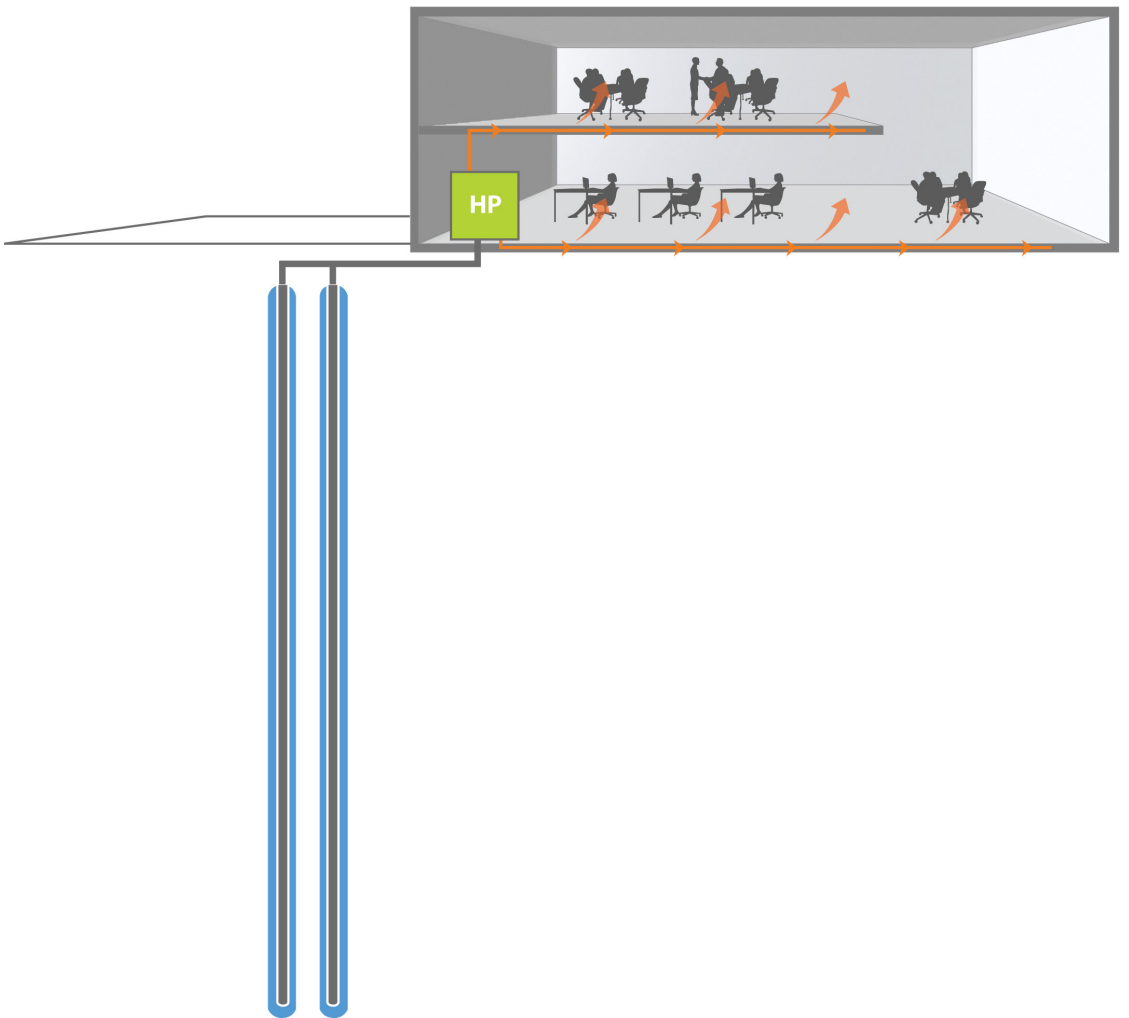
Transfers heat to a building





A simple ground source energy system

And cools the ground

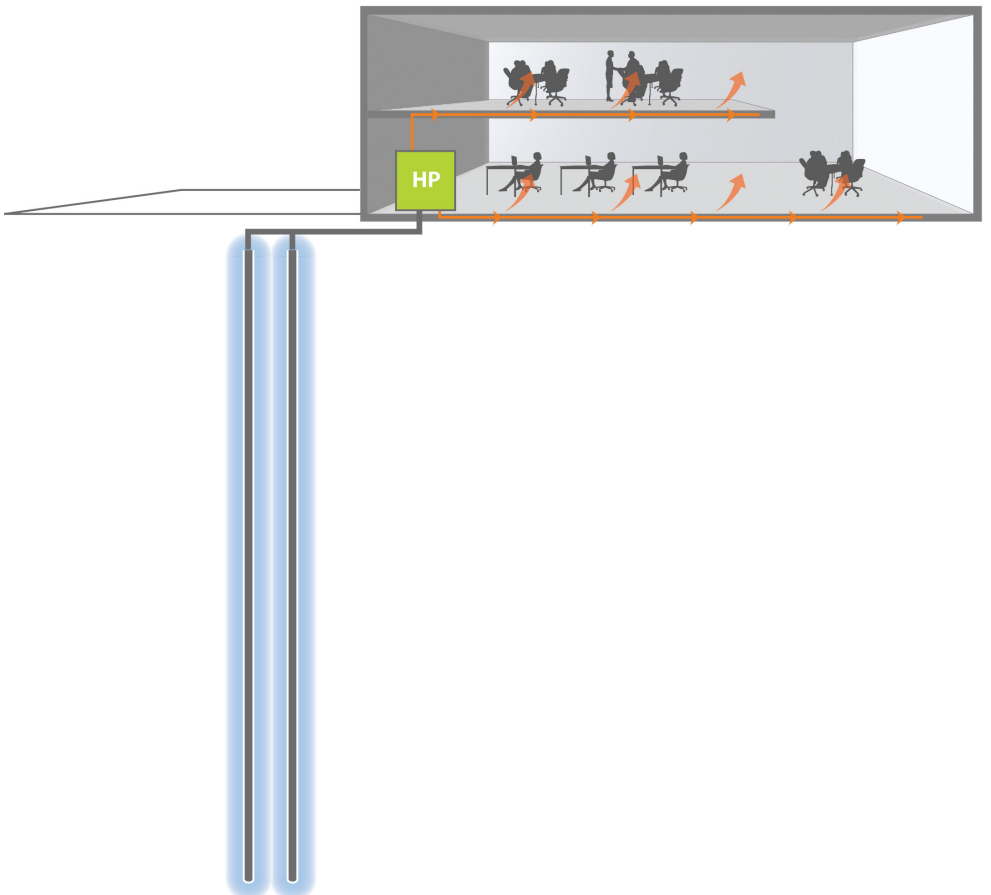


NEF

SCoP = 2.72

A simple ground source energy system

And cools the ground



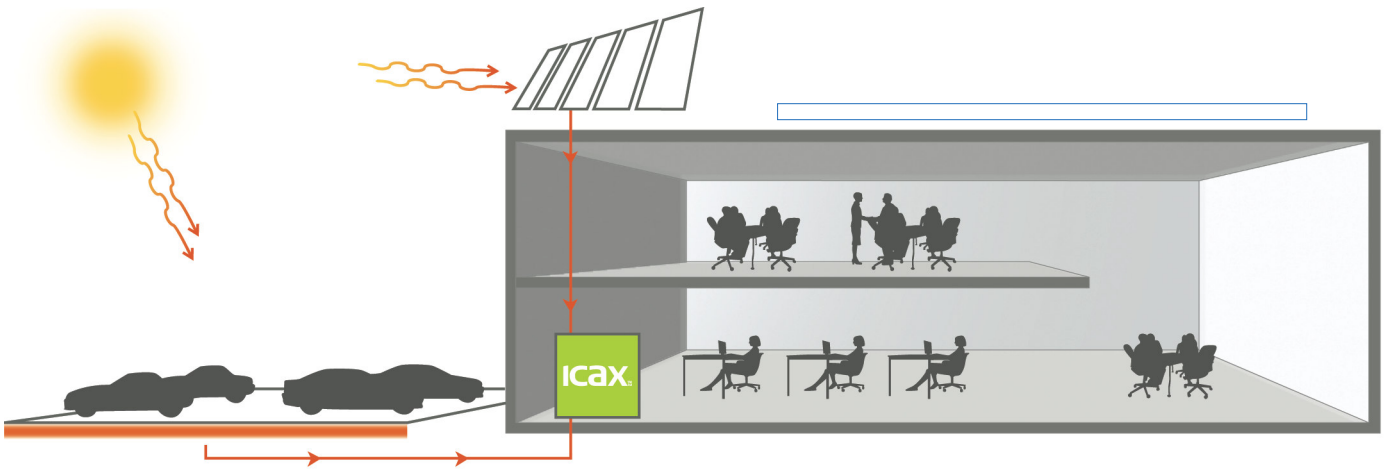
Danger of lock up

because

heat only moves slowly in the ground

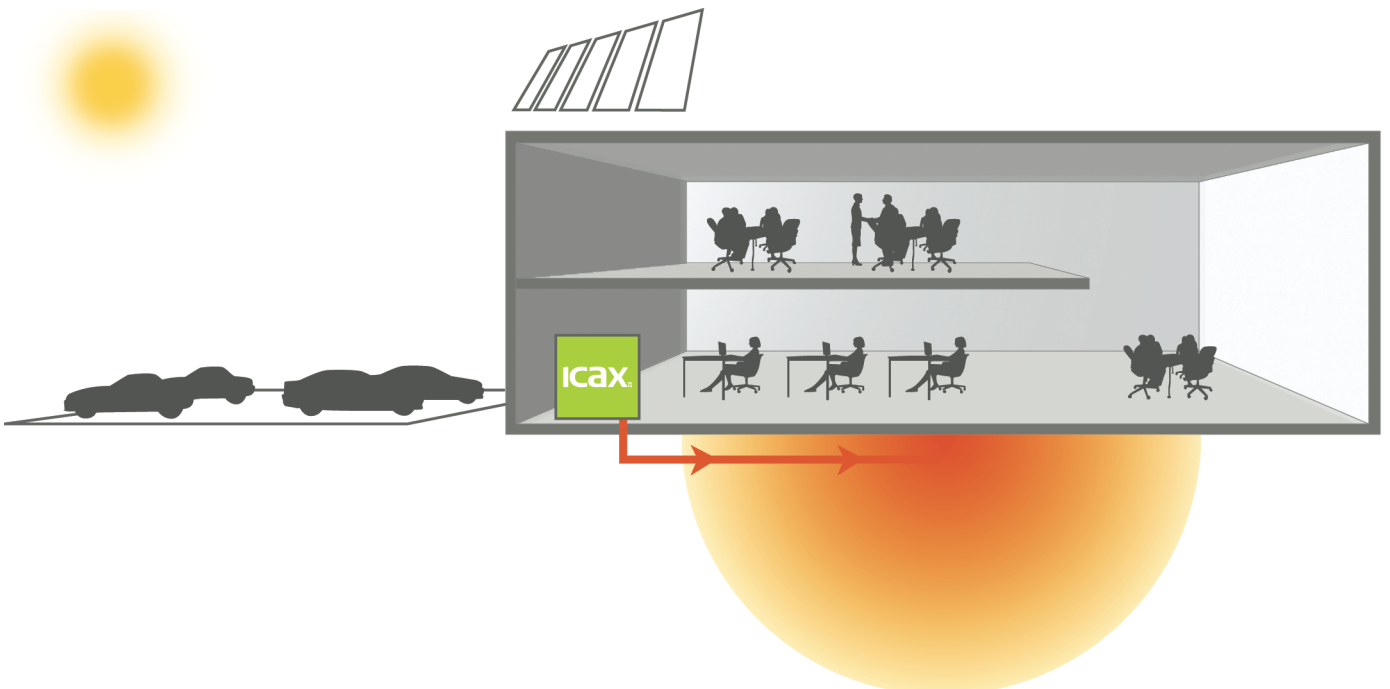
Interseasonal Heat Transfer

Collects solar heat in summer



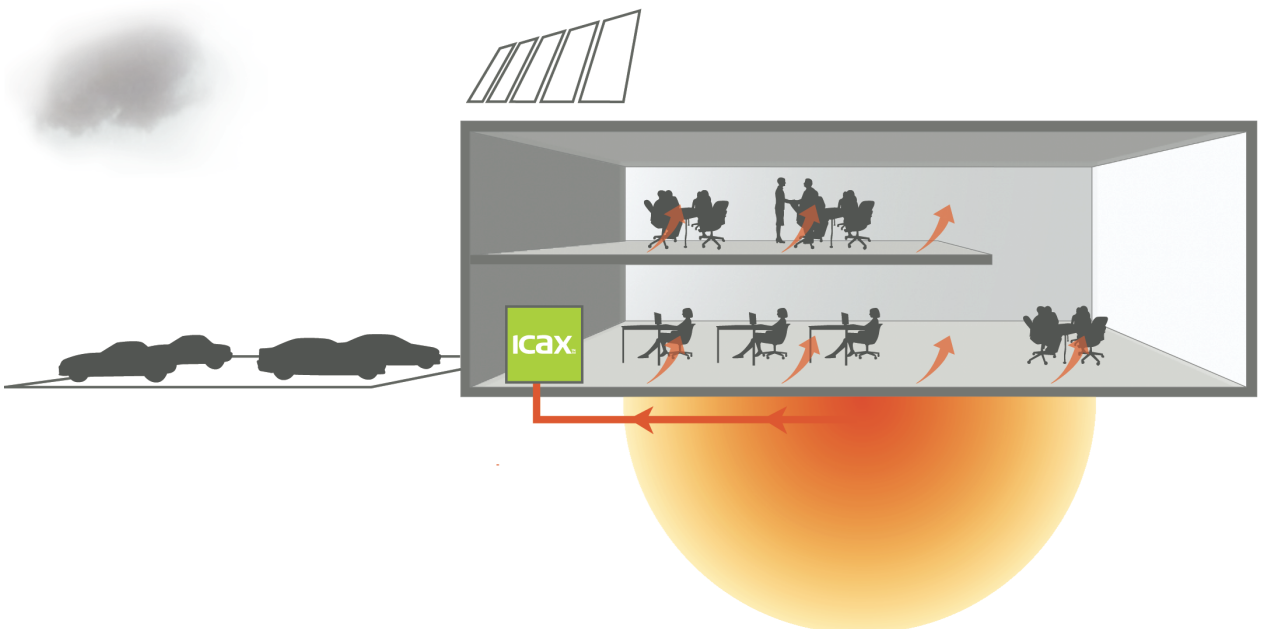
Interseasonal Heat Transfer

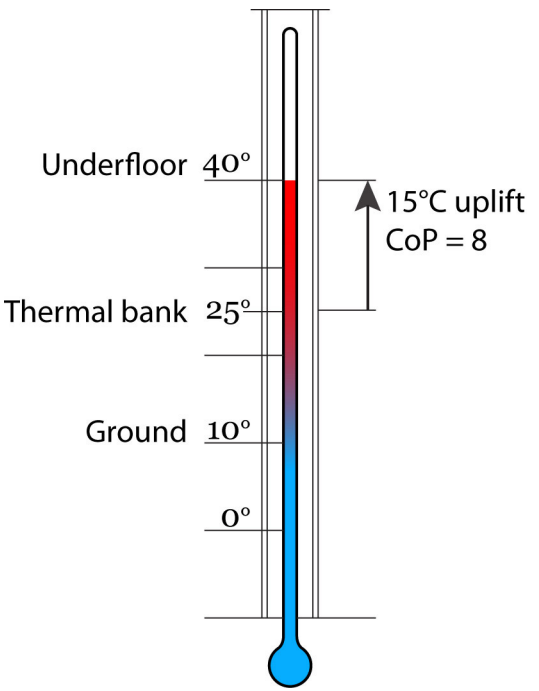
Stores heat in a ThermalBank
raising ground from 10°C to 25°C



Interseasonal Heat Transfer

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





Interseasonal Heat Transfer

Assessing IHT: Successes

Toddington – Under Road Heating

Howe Dell School

Garth Prison

Hiroshima

Merton Intergenerational Centre

Suffolk One

Wellington Civic Centre

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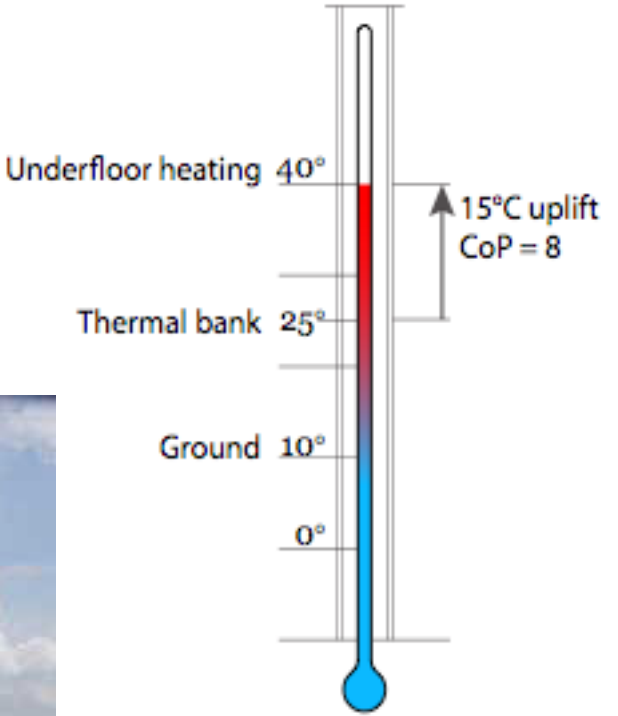
Interseasonal Heat Transfer

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

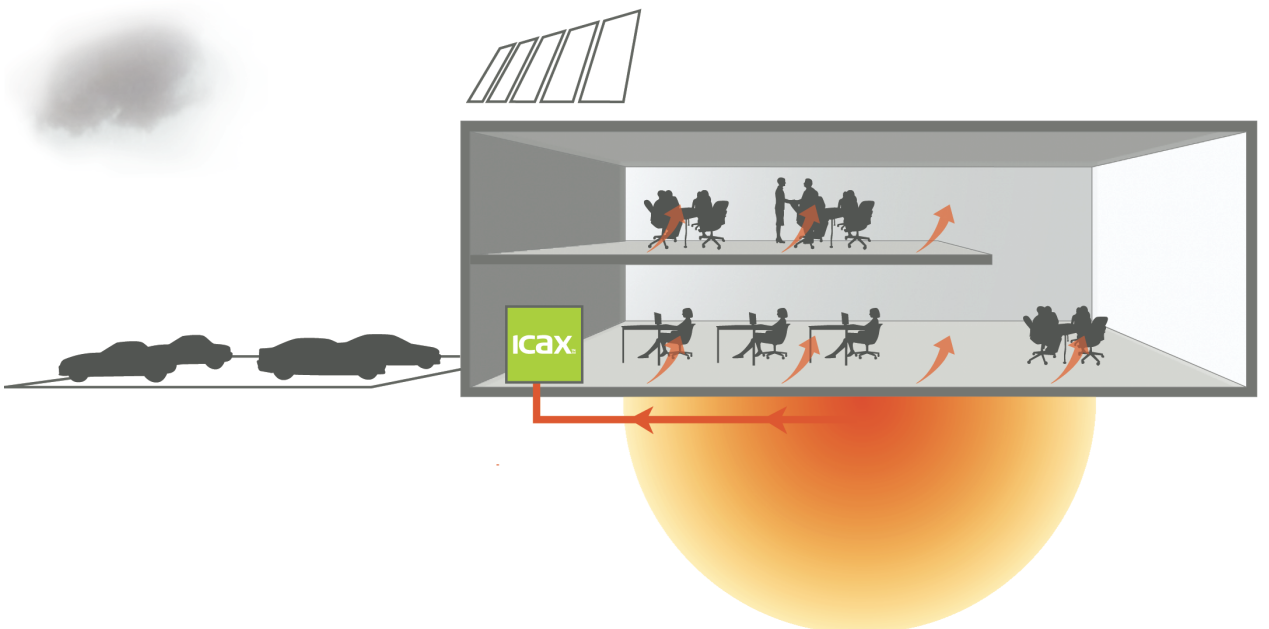
Suffolk One

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



Where next for

Interseasonal Heat Transfer

Teething problems

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Interseasonal Heat Transfer

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

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

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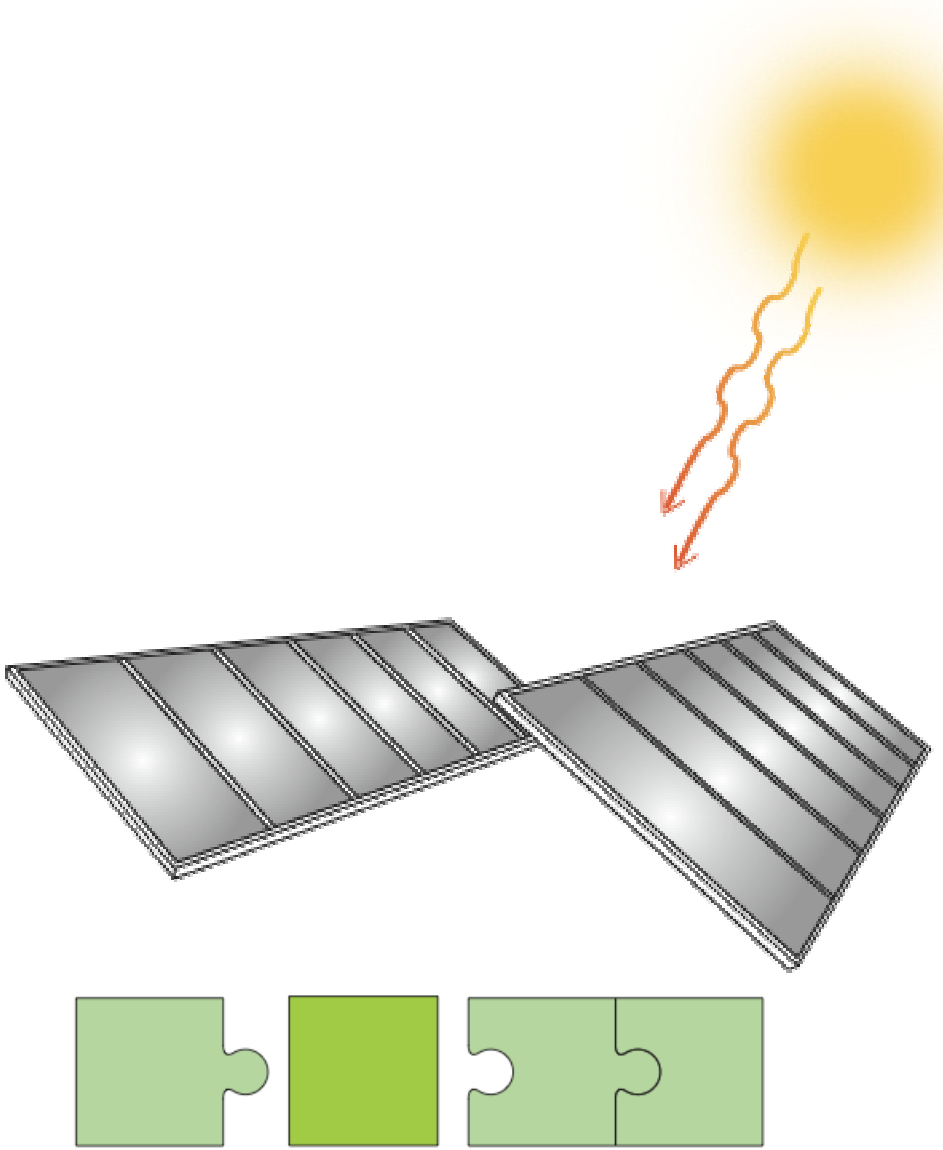
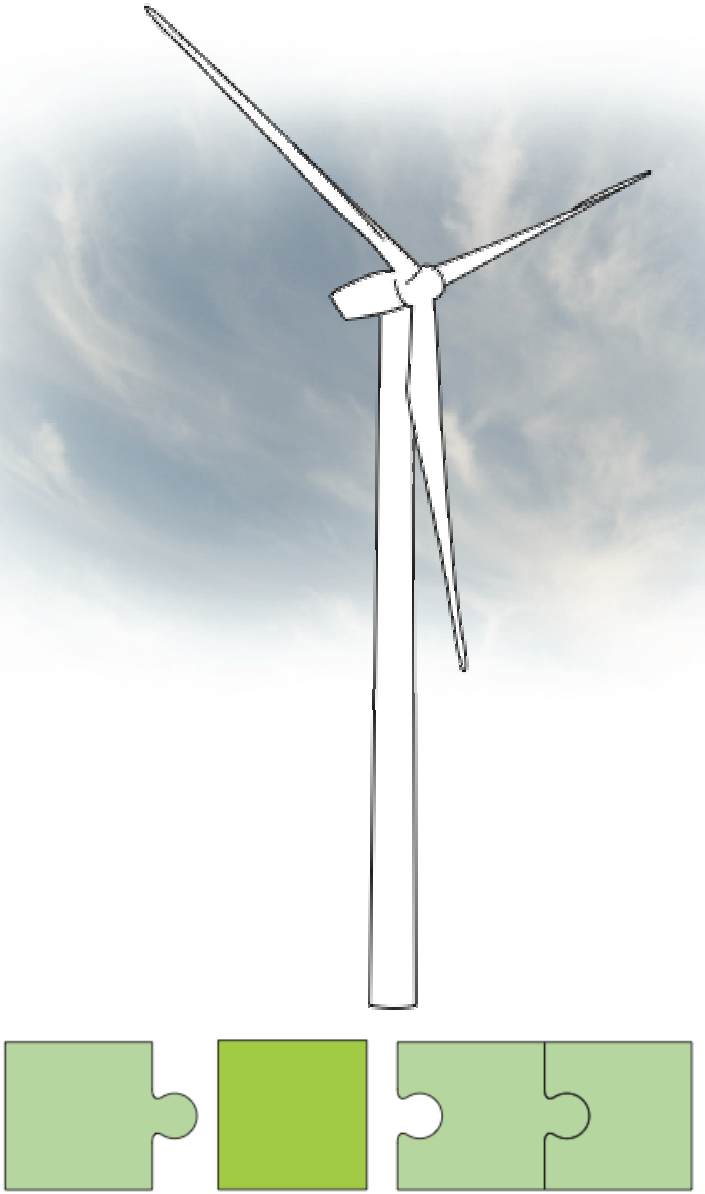


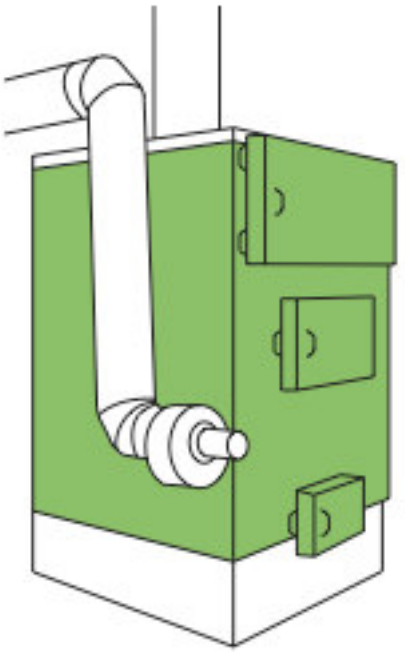
Photovoltaic

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



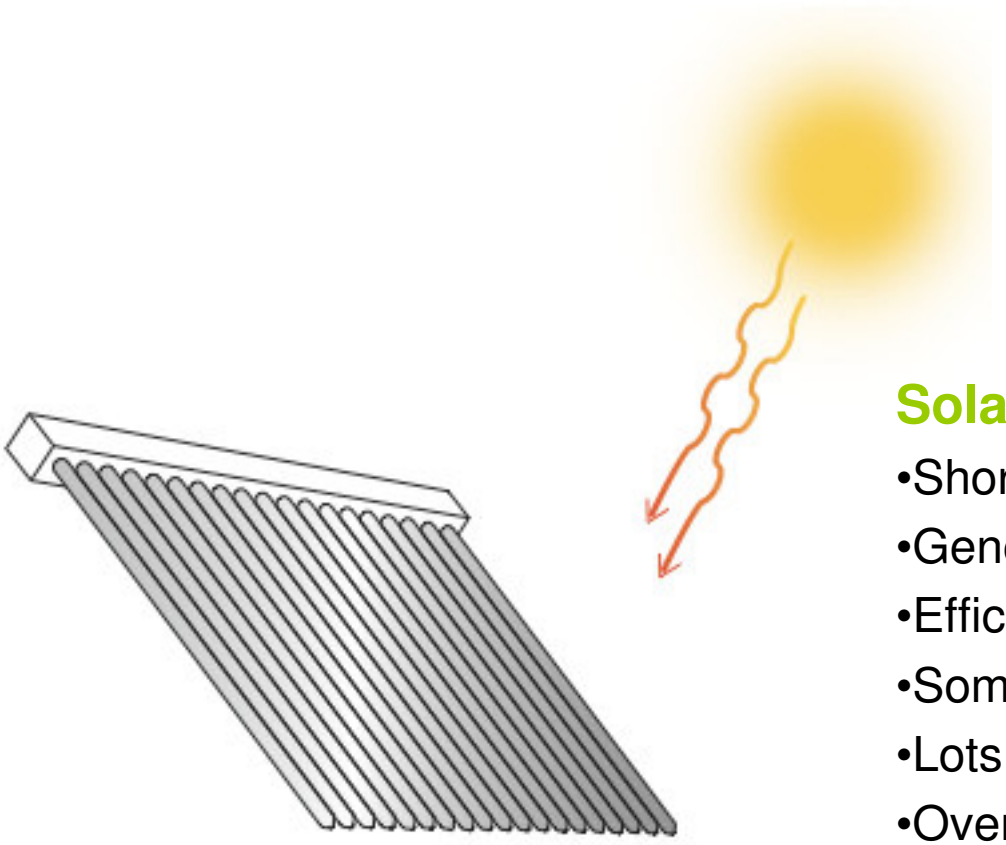
Wind turbine

- 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?



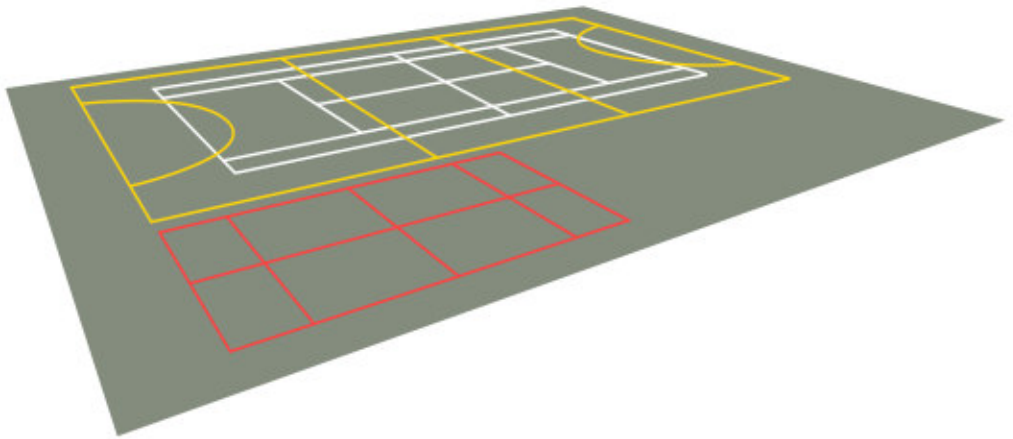
Biomass Boiler

+ 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_2
- 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?

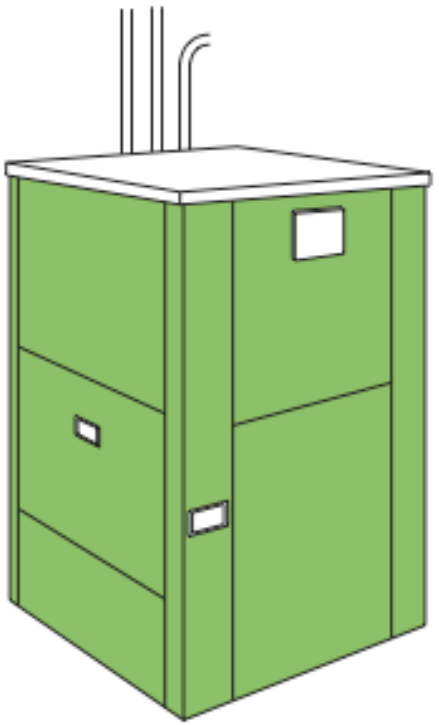
"*Seasonal Thermal Storage is the Holy Grail of the renewables industry*".

Solardec™

Watertight Solar Collector

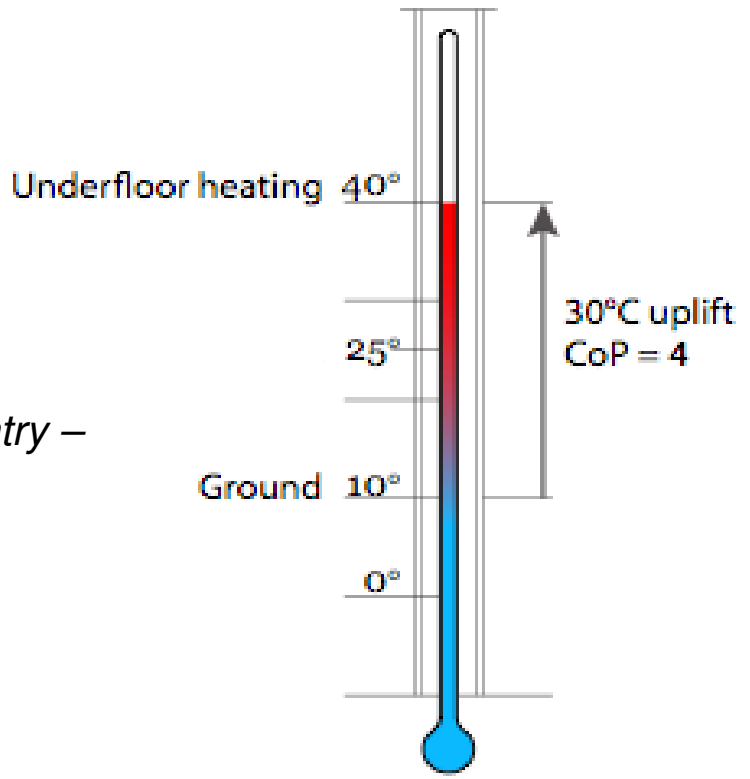
- Seals flat roofs
- Black surfaces absorb heat
- Lots of heat in summer
- Cheaper than solar panels
- Gives second function to flat roofs
- Where to store heat?

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



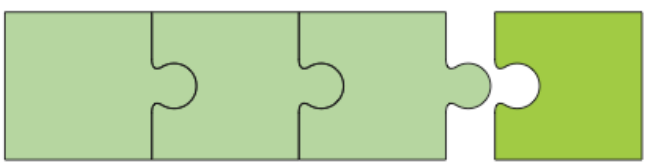
Heat Pump

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



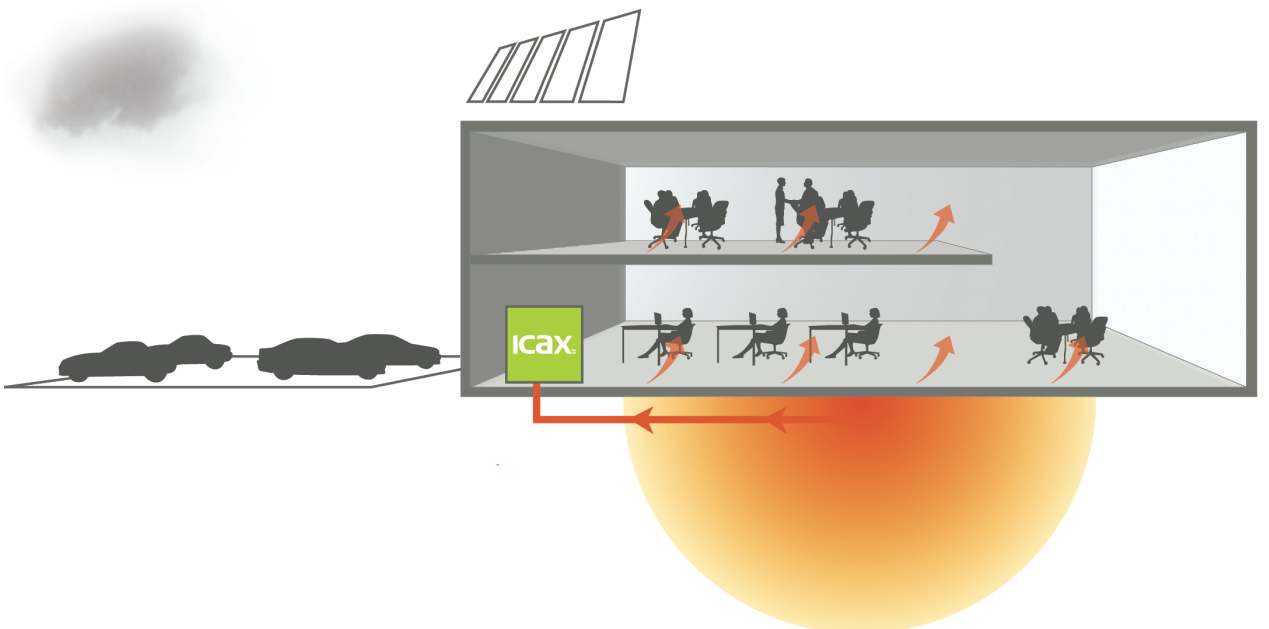
"Temp is a constant 10°C at 7m depth – across the country – from summer to winter".

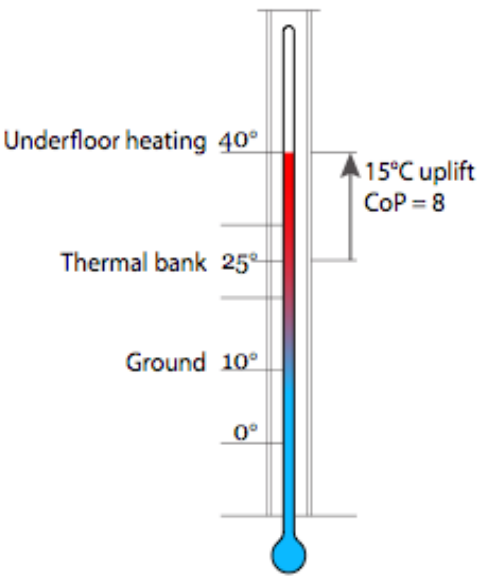
But, this is only true if you don't extract the heat.



Interseasonal Heat Transfer

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





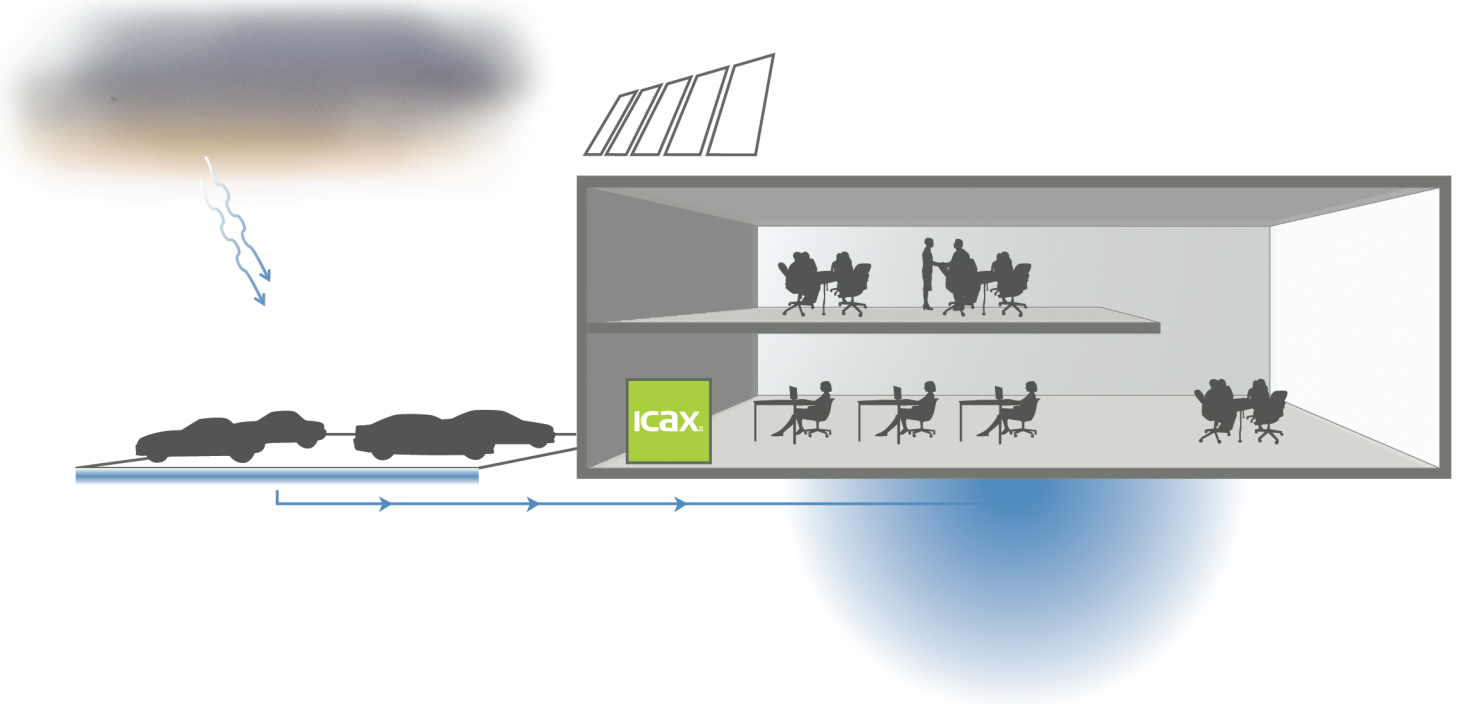
ICAX has demonstrated successful integration for heating.

ICAX is able to take integration further than this.

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

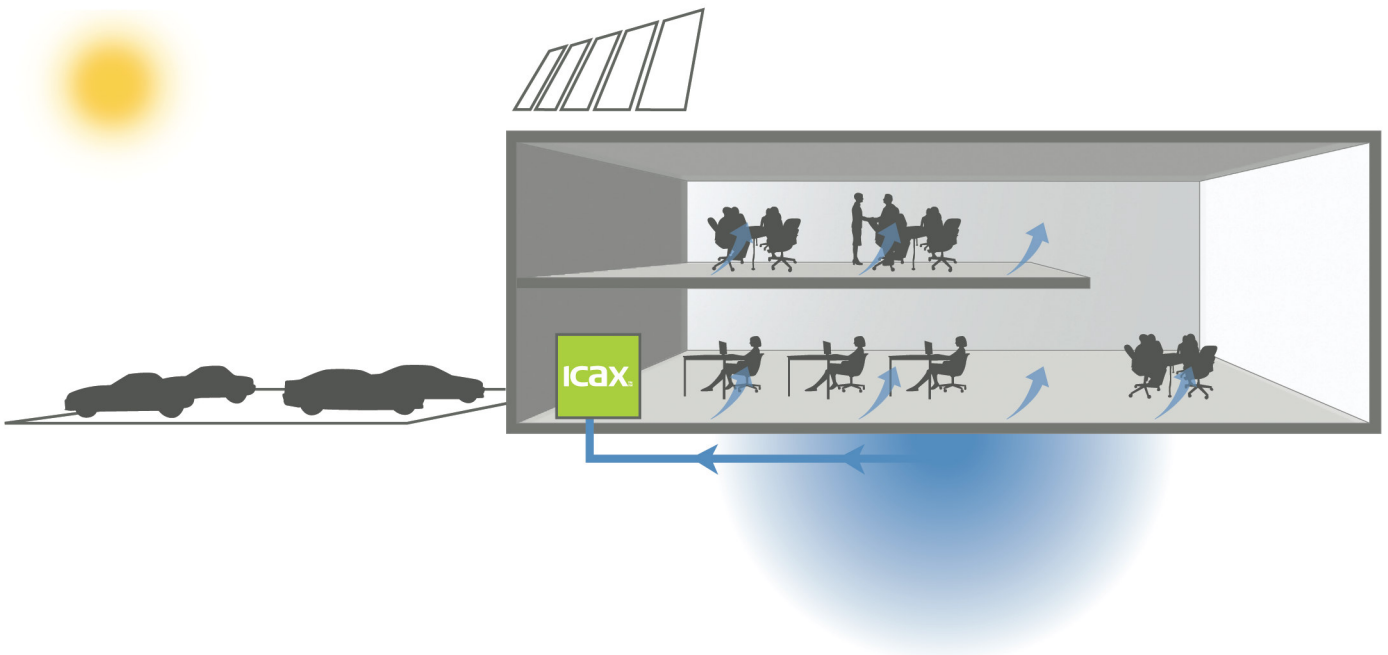
Interseasonal Heat Transfer

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.



INTERSEASONAL HEAT TRANSFER

THERMALBANKS

Edward Thompson

Ground Source Energy

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REHAU
Unlimited Polymer Solutions

MITSUBISHI ELECTRIC
AIR CONDITIONING SYSTEMS

INTERSEASONAL HEAT TRANSFER

ThermalBanks

Renewable Heat Renewable Cooling

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Ground Source Energy

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INTERSEASONAL HEAT TRANSFER

Economic Renewable Energy

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Ground Source Energy

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