

“Change we can believe in – Refrigerant choice as if climate change really mattered”

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Available, Affordable and Appropriate HFC-free Refrigeration and Cooling Technologies for Replacing CFCs and HCFCs in Developing Countries, GP/EIA Side Event, OEWG, Bangkok

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Overview

- Introducing the Green Cooling Council
- CO₂ revolution has started:
 - Supermarket refrigeration using cascade and transcritical CO₂
 - Australian examples
 - Thailand – Tesco Lotus Salaya
 - First Southern Hemisphere and warm climate CO₂-only supermarket
- Hydrocarbons in AC split systems
 - Benson AC, Fujin/Recom Engineering
 - Australian Experience of HCs in Motor Vehicle Air Conditioning Systems
- Harnessing renewable energy with CO₂ and NH₃
 - Geothermal Heat Pumps, Deep Well Direct Exchange systems
 - Energy Concepts ISAAC, Ammonia Solar Ice Maker



Dr Michael Bellstedt discussing transcritical CO₂

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Introducing the Green Cooling Council

- Founded in 2003 by Dr Michael Bellstedt as the “Natural Refrigerants Transition Board” or NRTB.
- A not-for-profit company acting as a membership based industry association to reduce the environmental footprint of the refrigeration and air conditioning industries.
- Initial funding from sponsors, members and events, conferences and seminars.
- Granted AUD\$2M Federal Government funding over 4 years under “Greenhouse Gas Abatement Program” (GGAP) in October 2006.



February 2008 Site Visit To Newly Opened Transcritical CO2 Store, Angle Vale, Adelaide, South Australia

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- Purpose: to demonstrate and evaluate natural refrigerant solutions in the supermarket sector.
- Seven stores will receive assistance to meet additional expense of CO₂ supermarket refrigeration systems, six cascade systems and one transcritical.

AIMS:

- Our primary aim is to achieve the wider use of low Global Warming Potential (GWP) refrigerants, by providing information and facilitating training and education on the best practice use of these refrigerants.
- To cease Australian use of synthetic greenhouse gases in all new systems by 2015

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The CO₂ revolution has started:

Supermarket refrigeration using cascade and transcritical CO₂ systems are the clear choice of major operators' new stores.

To find out more and stay up to date, for “everything CO₂” join:

www.r744.com



Dorin CO2 Compressor Rack



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Background – Cascade and Transcritical CO₂ supermarkets explained

- Adopting CO₂ (R-744) refrigeration systems will make a substantial contribution to beginning to reduce greenhouse gas emissions from the supermarket sector.
- These potent global warming gases leak at about 23% or more of the very large charges (800-1000 kg) used in conventional direct expansion systems.
- Because supermarket owners from July 2008 are subject to HFC emission reporting obligations, And will have to pay for them under the emissions trading scheme from 2010 in Australia, there are now strong economic as well as environmental reasons for the use of CO₂ as a refrigerant.
- Use of CO₂ refrigerant reduces global warming emissions from a store by at least 25%. With good design, even greater emission reductions are achievable.



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CO₂ may be used in either transcritical or cascade supermarket refrigeration systems.

Both systems use CO₂ as a refrigerant gas inside the freezer and refrigerated display cabinets to take heat from the cabinet and reject it to the environment.

Cascade Systems – Subcritical cycle

- There is much greater industry experience with the use of cascade systems, which in addition to the CO₂ refrigerant circuit, need another refrigeration system to cool down the CO₂ refrigerant and reject this heat to the environment via condensers on the roof.
- This “high stage” refrigerant system in the CO₂ cascade systems being built in Australia currently uses HFC 134a, which has a lower Global Warming Potential (1430) than HFC 404a (3922) used in conventional systems, and uses a much smaller refrigerant charge in a much more leak-tight system.
- Cascade systems thereby reduce the potential for direct refrigerant leakage by around 95% compared to conventional systems.
- With the use of HCs or ammonia in the high stage (as Tesco UK refrigerant policy requires), direct greenhouse gas contributions can be reduced to a negligible amount.



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Transcritical CO₂

- Transcritical CO₂ uses the refrigerant in a way that avoids the need for this additional refrigeration system, and operates using CO₂ only in all parts of the refrigeration system.
- It is a more advanced system because it completely avoids the need for HFCs and delivers theoretically higher energy efficiency.
- The Angle Vale store in Adelaide is the only transcritical store in Australia and is demonstrating how well transcritical CO₂ can perform in high ambient temperatures.
- Many thousands of cascade systems are in use in Europe, and around 100 transcritical systems.
- In Australia, supermarket owners have made their intentions to build only CO₂ supermarkets very clear. Cascade systems are now well established and accepted by the major operators, and there is great interest in the potentially superior performance of transcritical systems.



GCC president Mr. Don Griffiths Inspecting Angle Vale CO₂ Transcritical Compressors

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Angle Vale, Adelaide SA Drakes Foodmarket



Is the First:

- ☺ Transcritical CO₂ Supermarket outside Europe;
- ☺ Transcritical system to be built in a hot climate and in the Southern Hemisphere;
- ☺ to receive the inaugural CoolWorld Industry award for “Refrigeration Installation of the Year”.



Bitzer, Drakes and GCC accept prize at Awards night sponsored by Australia’s leading RAC trade magazine, “Climate Control News” (coming soon to the web)

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Evaporative Coolers Pre cooling Supply Air to CO₂ Gas Coolers

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Tesco Lotus CO₂ Supermarket, Salaya, Thailand

- First cascade CO₂ supermarket in Asia, Tesco Lotus in Salaya is less than 1 hour to the West of BKK.

- A major step forward for the spread of carbon dioxide refrigeration, and for the Australian commercial refrigeration contracting company Frigrite.

- This system is the first of five supermarket projects in Thailand.



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Tesco Lotus Salaya

- Frigrite designed and built the CO₂ plant in Melbourne, then shipped the plant and associated equipment to Thailand ready for installation.
- Carrier supplied the local installation labor and Frigrite provided an experienced project manager to supervise the installation also carrying out training and plant commissioning.



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Hydrocarbon Solutions in Split System Air Conditioning

- Hydrocarbons are ideally suited to small domestic and commercial split systems.
- Improvements of up to 20% reductions in electricity consumption are possible.
- Offers huge potential for prevention of emissions from the bank, if retrofits are undertaken with care and due regard for safety measures specified in relevant standards.
- Major suppliers need to follow early adopters to address rapidly rising emissions.



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Benson
Airconditioning
ENVIRO 3

Now using Refrigerant with only 3 Global Warming Potential
Engineered by Australians for Australian Conditions

Benson Airconditioning
Email: bensonaci@bigpond.net.au
Web: www.bensonairconditioning.com.au
Phone: (618) 9450 1110
Fax: (618) 9450 1118

We are Proud Supporters of

asthma foundation of WA

Offsetting emissions with carbonneutral.com.au

 **HyChill**
HYDROCARBON REFRIGERANTS

Environmental Choice Australia
Lic 187-2008 OBCA 26 - Refrigerant

Currently available HC split system technology in Australia
www.bensonairconditioning.com.au

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Benson Equipment

Benson equipment is not just your 'off the shelf' product with our name on it. Our products have been selectively chosen and are made to our own specifications.

We have worked jointly with our manufacturers to reengineer equipment to ensure compliance to the new stringent Australian Minimum Energy Performance (MEP) standards.

We are pleased to advise that all the units in our current range of Wall Splits and Ducted Systems comply with AS/NZs 3823.2 (MEPs Oct 2007).

Energy Rating

We have achieved some fantastic energy ratings and we recommend that you look at www.energyrating.gov.au and compare for yourself.

Controllers

Customer Feedback continually indicates that the controllers are user friendly on the entire Benson Airconditioning product range.

Scroll Compressor

Benson Airconditioning has incorporated the highly efficient scroll compressor into some of its range of air conditioning equipment. The scroll compressor is proven to be the most efficient and durable compressor available.

Advantages of scroll technology are:

- Quieter operation due to fewer moving parts
- Low start current
- Low vibration

Zone Control

Utilised on a ducted system to meet your needs by offering greater flexibility. Zoning allows you to use a smaller unit to air condition only part of the house instead of cooling or heating the entire house at once.

Please discuss your zoning requirements with your Benson Airconditioning dealer today to achieve a customised air conditioning solution.

Heat Pump Heating

Heating power (kw) indicated in this catalogue is based on the following conditions: outdoor temperature of 7 C and indoor temperature of 20 C, as specified in the Australian standards

The heating capacity decreases as the outdoor temperature drops.

When heated air rises and collects in a room with a high ceiling, a ceiling fan to push the warmer air down is recommended.

Noise Emissions

The noise emissions rate indicated in this catalogue shows values (A scale) measured in a special acoustic chamber.

In actual conditions, noise emission is generally higher than the indicated rate due to surrounding noise and echoing.

Please discuss this with your Benson Airconditioning agent for the best position of installation

Benson Airconditioning

Hello, my name is Steve Smith and I am the director of Benson Airconditioning, a Western Australian owned company.

We specialise in Ducted, Wall Split, Airconditioning and Misting fan systems for commercial, industrial and personal use - serving customer's state wide, nationally and internationally.

We seek to continually improve our products to ensure our systems:

- represent the best value for money for our customers
- are designed to maximise their effectiveness while minimising any environmental impact.
- are easy to operate and are backed by a comprehensive service and warranty system
- surpass stringent safety standards

Feedback we receive from our customers is unanimously positive - especially in regard to low noise levels, unit performance, the user friendly controls and the outstanding value for money that Benson Airconditioning systems offer.

We have selected air conditioning specialists to sell Benson Airconditioning products, ensuring they offer great customer service and knowledge in our systems.

I would like to thank you for taking the time to consider our fantastic range of Benson Airconditioning systems.

Benson Products

Benson Airconditioning products are easy to operate, extremely quiet, very reliable and manufactured specifically for Australian and International conditions.

Benson Airconditioning stands behind its product. The manufacturing company that we utilise fully supports our product and can provide us with engineering backup if required. Enhancements to products do occur from time to time. Both quality assurance and quality control techniques are utilised in the manufacturing company to ensure that only units meeting our high standards are delivered.

Can you trust our products?

YES. Both our standard equipment and some custom designed/engineered equipment are currently used on rescue modules in underground locations throughout the world.

These units have undergone stringent testing to ensure that they operate in emergency situations, providing Airconditioning for ten to twenty people utilising special battery packs for up to thirty six hours.

If Benson Airconditioning can be relied on throughout the world for superior performance under such extreme conditions, then there is no reason why you can not trust Benson Airconditioning products in your home or business.

Word of Mouth

Our product is so reliable and cost effective that we have not been required to actively advertise as our customers are selling our product for us by 'word of mouth'.

The Name: Benson Airconditioning

The name Benson was created by using my father's name Ben and my relationship to him, being his son thus Benson. My father has been in the air conditioning industry for over 52 years and I have been assisting and working in the industry for the last 23 years.

Disclaimer

The information in this brochure was deemed correct at time of printing May 2008 however may be subject to change. Benson Airconditioning reserves the right to discontinue or vary products and offer without notice.

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Engineered by Australians for Australian Conditions

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Engineered by Australians for Australian Conditions

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Benson
Airconditioning
*Just doing it
for our Kids!!*
Using a Refrigerant
with only 3 GWP
Global Warming Potentials



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ENVIRO 3

Now using Refrigerant with only 3 Global Warming Potentials
Engineered by Australians for Australian Conditions

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Benson
Airconditioning
*Wall Spilts
Ducted
Cassette
2.5 - 20 kw*

Benson
Airconditioning

ENVIRO 3

With only 3 Global Warming Potentials
Engineered by Australians for Australian Conditions

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- Market is beginning to grow, with other actors joining the market.

Soon to be available HC split systems technology (only splits in near future) from Recom Engineering, in conjunction with Fujin Air Conditioners, China.

The four seasons of **Fujin** airconditioners

Split Greencool R290

Cassette Type

Portable Units

Window Type

2 Head Split Systems

Splits Systems

Duct Type

Fujin airconditioners
Trade Only

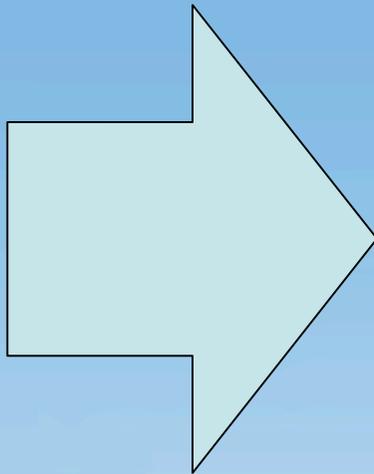
NEW

Fujin Greencool airconditioners

The advertisement features a central hub diagram with 'Fujin airconditioners Trade Only' in the center, connected to seven categories: Cassette Type, Portable Units, Window Type, 2 Head Split Systems, Duct Type, Splits Systems, and Split Greencool R290. Below the diagram are images of a Fujin indoor unit with a 'NEW' tag, an outdoor unit, and a wall-mounted control panel with copper pipes. The background includes seasonal images of sunflowers, autumn leaves, and a tropical scene.

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**Safety is
imperative:
*essential
precautions***



Benson
Airconditioning



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Email: bensonac@bigpond.net.au
A.B.N.: 57101696315

Date: 8 July 2008

**Minimum Safety Requirements for Hydrocarbons
A3 Refrigerants**

Source Document: **Australia Standards AS 1677.2 current day**

All units above 250 grams to 1kg of refrigerant

- High Pressure cut out
- Fusible Plug
- Electrical connection in occupied space to be non-sparking
- Room to be large enough for 20% LEL (kg/m³)
- *Extra safety that should be added is a Low Pressure controller (in case of a refrigerant leak on the low side, air can be drawn into the system in the event of a total gas loss and the charge could get to the lower explosive limit or LEL)*

1kg and above requires the following

- High Pressure cut out
- Fusible Plug
- Electrical in occupied space to be non-sparking
- Room to be large enough for 20% LEL (kg/m³)
- Pressure relief valve set above the High Pressure controller
- *An extra safety measure that should be added is Low Pressure controller (in case of a refrigerant leak on the low side, air can be drawn into system in the event of a total gas loss and the charge could get to the LEL)*

Largest Domestic Charge is 1.5kg of refrigerants per circuit.

Largest Commercial Charge 2.5kg of refrigerants per circuit.

Please note: Any system converted to Hydrocarbons must have these following safety measures fitted.

Produced by Steven M Smith
(Associate Diploma of Refrigeration and Airconditioning)

Hydrocarbon Refrigerant Applications - Mobile

- Peer-reviewed research published in 2004 in the International Journal of Refrigeration established:
 - At the end of 2002, the number of motor vehicles using hydrocarbon refrigerant reached 5,000,000 across the USA and Australia
 - Over 18,000,000 car-user-years of safe use as a drop-in replacement for R-12 or R-134a
 - Updated independent assessment of extent of existing use in service market globally is urgently required



Other mobile applications:

- Trucks, buses
- Refrigerated transport
- Off-road farming equipment
- Off-road mining equipment
- Mining equipment



Companies using HCs

Miele

Scottish & Newcastle

 **Electrolux**



EBD FORUM SPYELFACIT
EFS HAUSGERÄTE GMBH

DeLonghi
Living innovation

Panasonic
ideas for life

SIEMENS

Coca-Cola

AEG

Interlevin
REFRIGERATOR

Life's Good  **LG**

 **YORK**

LIEBHERR

VESTFROST
COOL EXPERTS

Fisher & Paykel


FOSTER'S

BOSCH

Whirlpool
JUST IMAGINE




Unilever

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Ammonia ISAAC Solar Ice Maker

- The ISAAC Solar Icemaker is an Intermittent Solar Ammonia-water Absorption Cycle.
- The ISAAC uses a parabolic trough solar collector and a compact and efficient design to produce ice with no fuel or electric input, and with no moving parts.
- The ISAAC Solar Icemaker operates in two modes. During the day, solar energy is used to generate liquid ammonia refrigerant.
- During the night, the generator is cooled by a thermosyphon and ice is formed in the evaporator compartment as ammonia is reabsorbed to the generator.

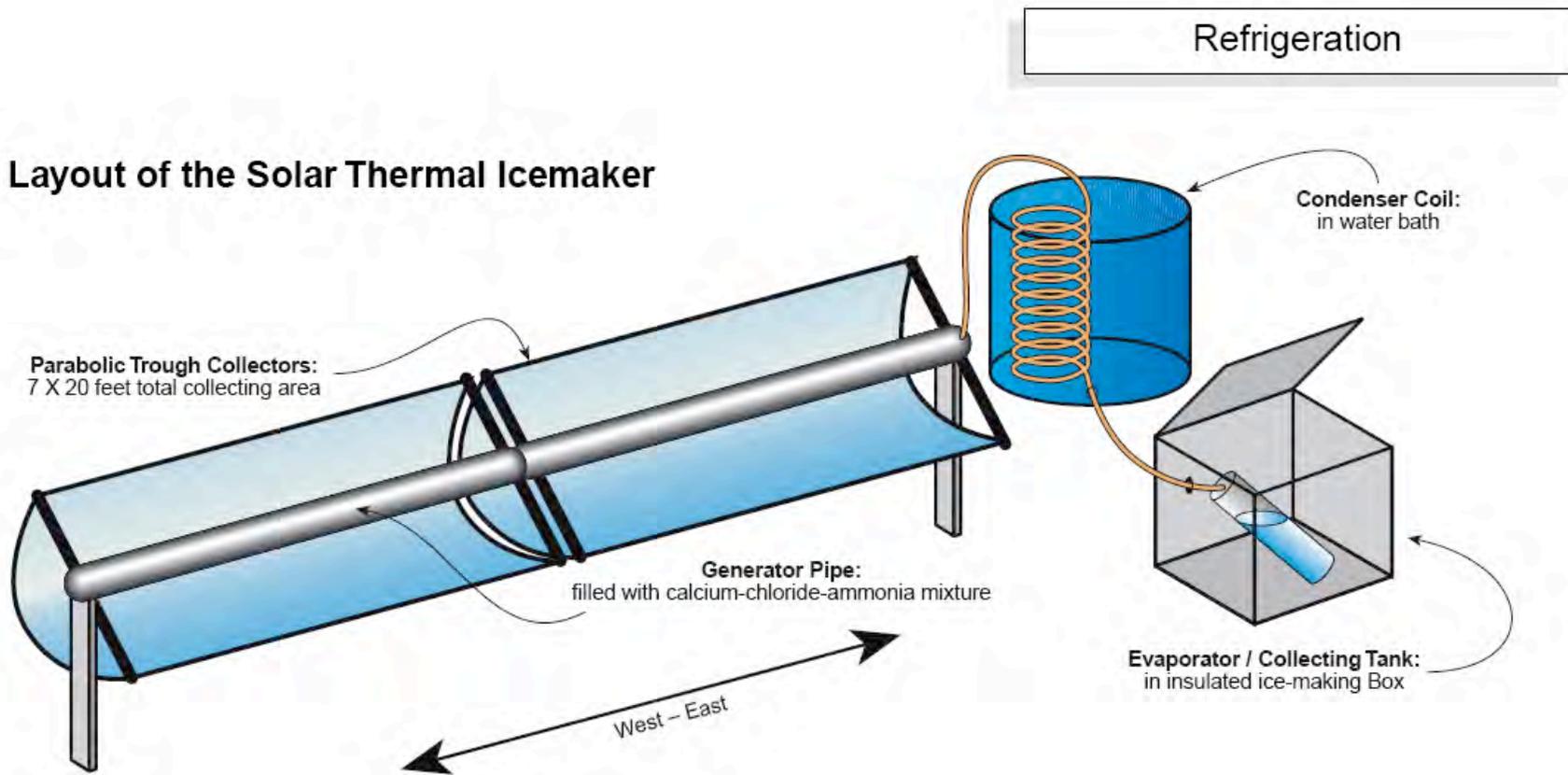


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Layout of the Solar Thermal Icemaker



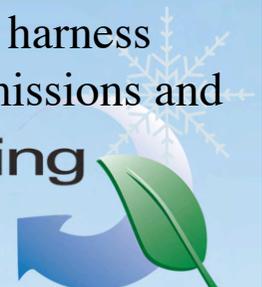
Witty caption

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Geothermal Heat Pumps

- Geothermal Heat Pump (GHP) technology is as a proven, reliable, efficient, and cost-effective choice for space heating, cooling, and water heating in many building types.
- GHPs achieve extraordinary energy efficiency by using the Earth rather than ambient air as a heat source and sink.
- Ground temperatures are cooler than the ambient air in the summer and warmer during winter, so GHPs benefit from pumping heat over smaller temperature differences and therefore more efficiently year round (Figure 2).
- The U.S. Environmental Protection Agency (EPA) has identified GHPs as a technology that significantly reduces greenhouse gas and other air emissions associated with space heating, cooling, and water heating. The EPA has determined that GHP.s are the most energy efficient and environmentally friendly while saving consumers money, compared to conventional technologies.
- Using CO₂ in deep well direct exchange GHPs will enable natural refrigerants to harness renewable energy. This has massive potential to reduce both direct and indirect emissions and energy costs, in domestic and commercial buildings.



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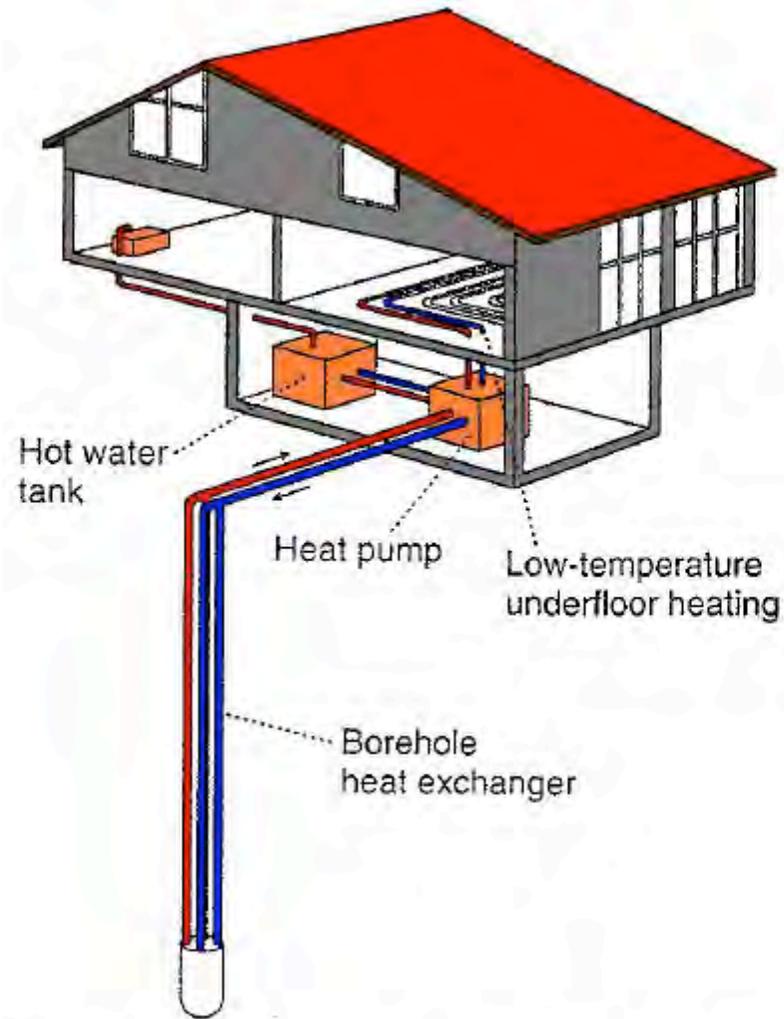


Figure 2 - Household Geothermal Heat Pump

Direct use of CO₂ for heating and cooling

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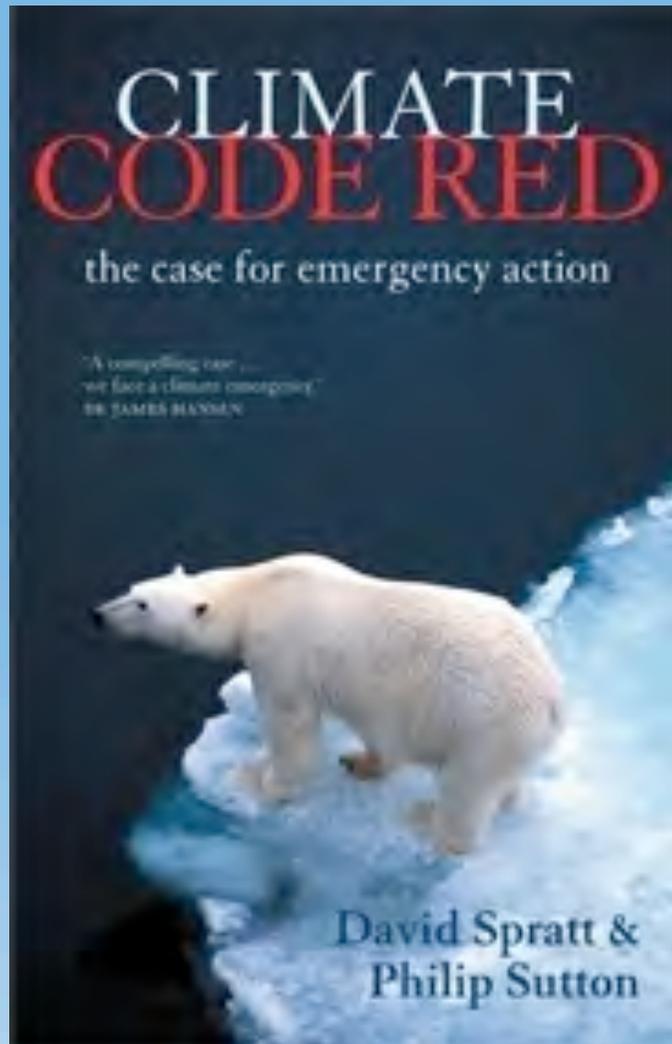
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CLIMATE CODE RED: the case for emergency action

by David Spratt & Philip Sutton / Scribe Publications

Climate policy is characterised by the habituation of low expectations and a culture of failure. There is an urgent need to understand global warming and the tipping points for dangerous impacts that we have already crossed as a sustainability emergency, that takes us beyond the politics of failure-inducing compromise. We are now in a race between climate tipping points and political tipping points.

More:

<http://www.climatecodered.net>

In bookshops 5 July or order online:

<http://www.abbey.com.au/items.asp?id=124271>

(best for outside Australia)

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