



Heat Pumps in Future Energy Systems: ***Energy and sustainability in abundance***

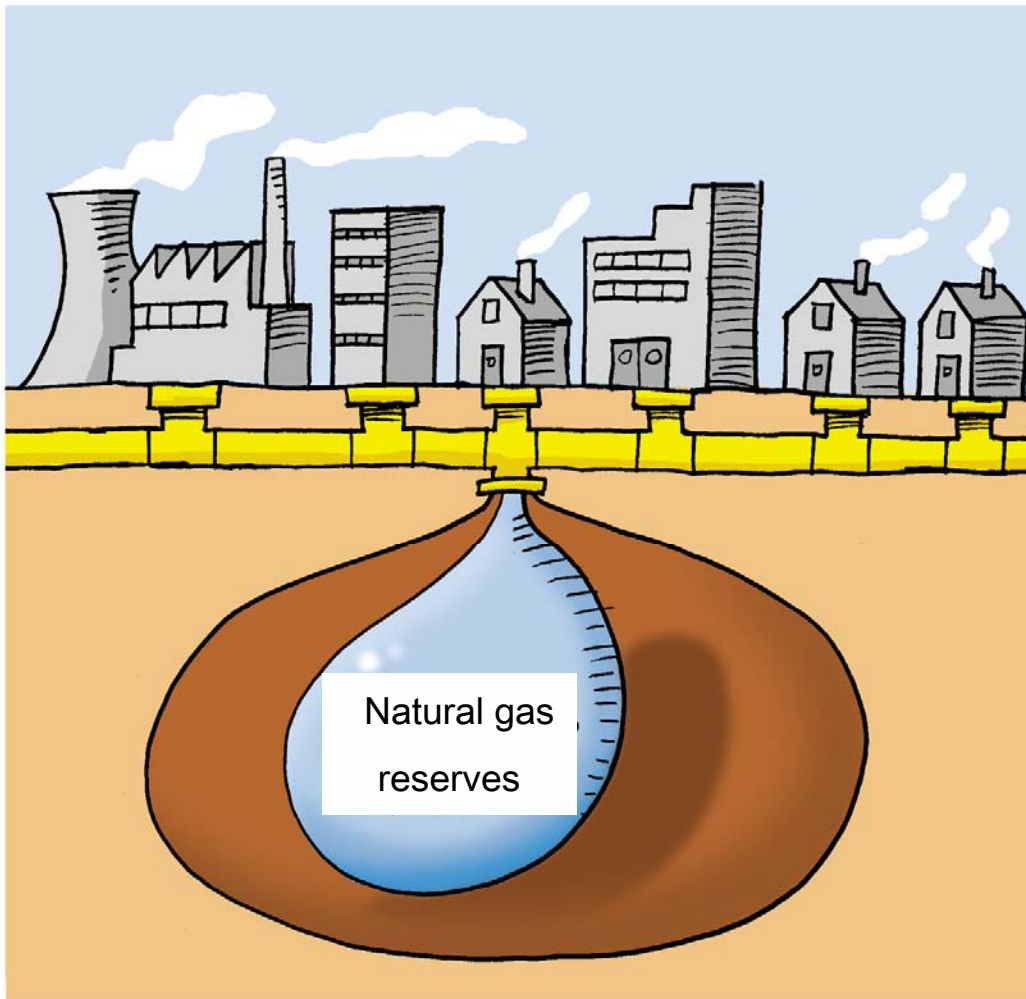
"Don't be afraid..... of even all too big dreams"

Krijn Braber

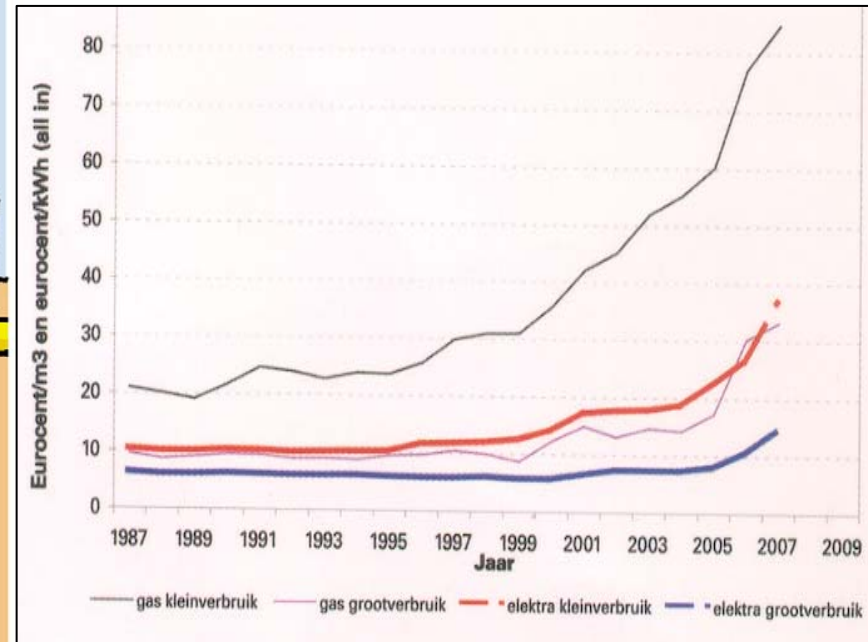
Amersfoort, 13 May 2009

DOWN ↓

UP ↑



Development energy prices 87-07



Gas: increase by factor 4

Electricity: increase by factor 2,5

How long will it last, 2030... ?

The future is 'electric'..... !?

- ✓ Sun (thermal, photovoltaic)
 - ✓ From the soil ((geothermal) heat, cold: aquifers)
 - ✓ Dynamic sources (wind, hydro and tidal power, waves)
 - ✓ Fuels derived from biomass, residues and wastes
-
- ✓ **“Problems”:** place, time, pattern of demand and supply, energy low density + Quality and costs to ‘harness’ / harvest
 - ✓ **Requiring solutions such as storage (a.o. soil, batteries) and / or ‘space’**

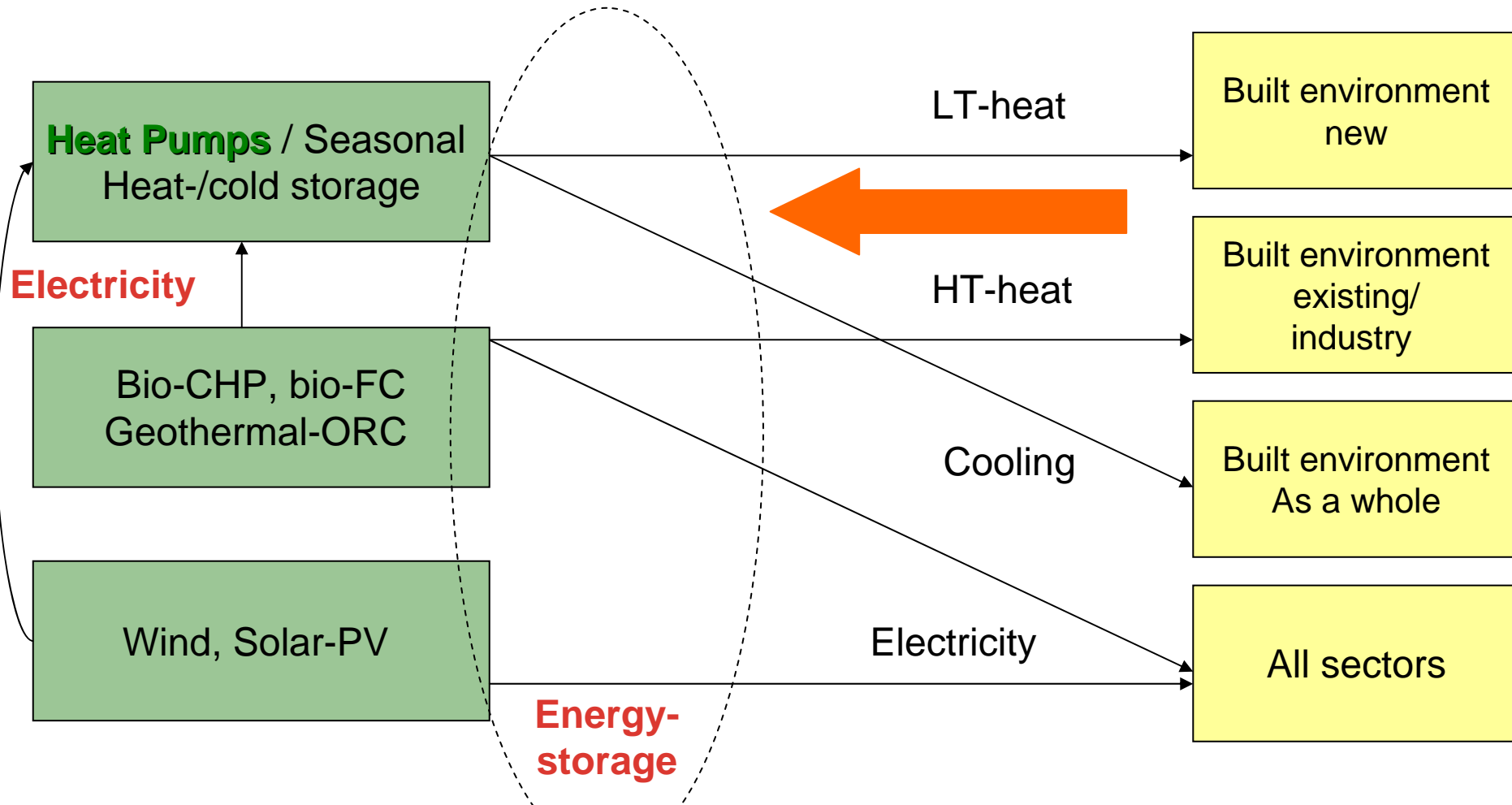


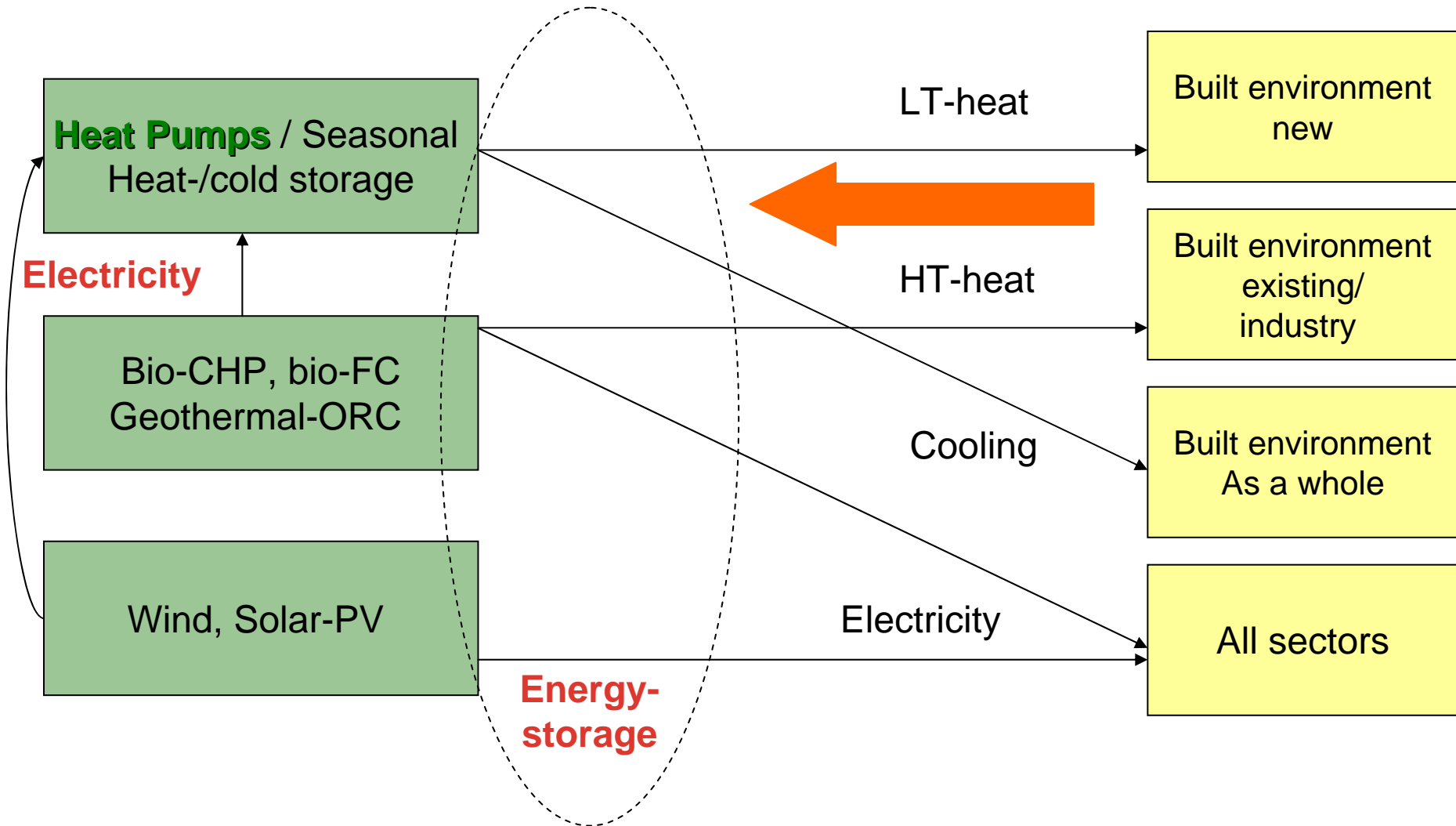
The Prime Directive in energy optimization:

**Combining and integrating LOCAL options and
sectors starts at DEMAND side**

...

and requires energy storage





... All proven technology, so **energy neutrality attainable** and becomes only an issue of smart dimensioning and proper infrastructure, hence smart economics....

Example 1

**Energy / climate neutrality in
Zaanstad / Kreekrijk:**

Heat Pumps Keep It Simple!

Zaanstad/Kreekrijk:



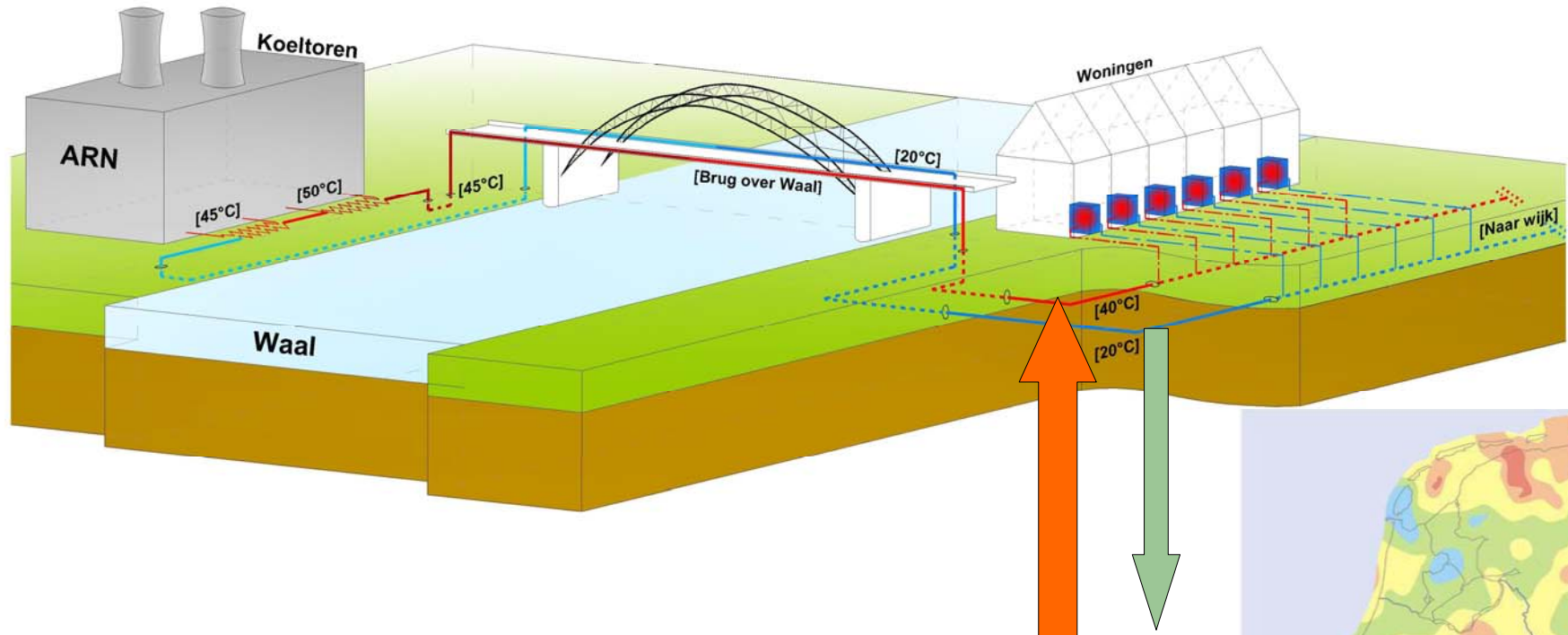
A new residential area of 1000 dwellings will be made entirely climate neutral by equipping all houses with electric heat pumps and 1 dedicated wind turbine for the entire area of 2 MW: cost effective and all proven technology!!!

Example 2

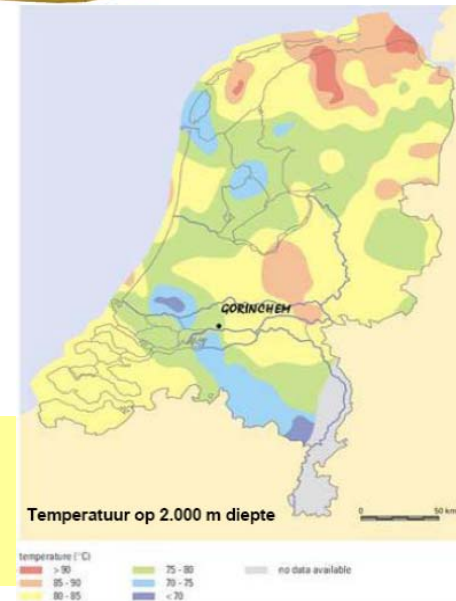
Powerfull new energy concept
“hybrid heat distribution LT”

requires only $\frac{1}{4}$ of original energy demand

Utilizing *real* residual heat of *low temperatures* at Area Level: Waalsprong Nijmegen

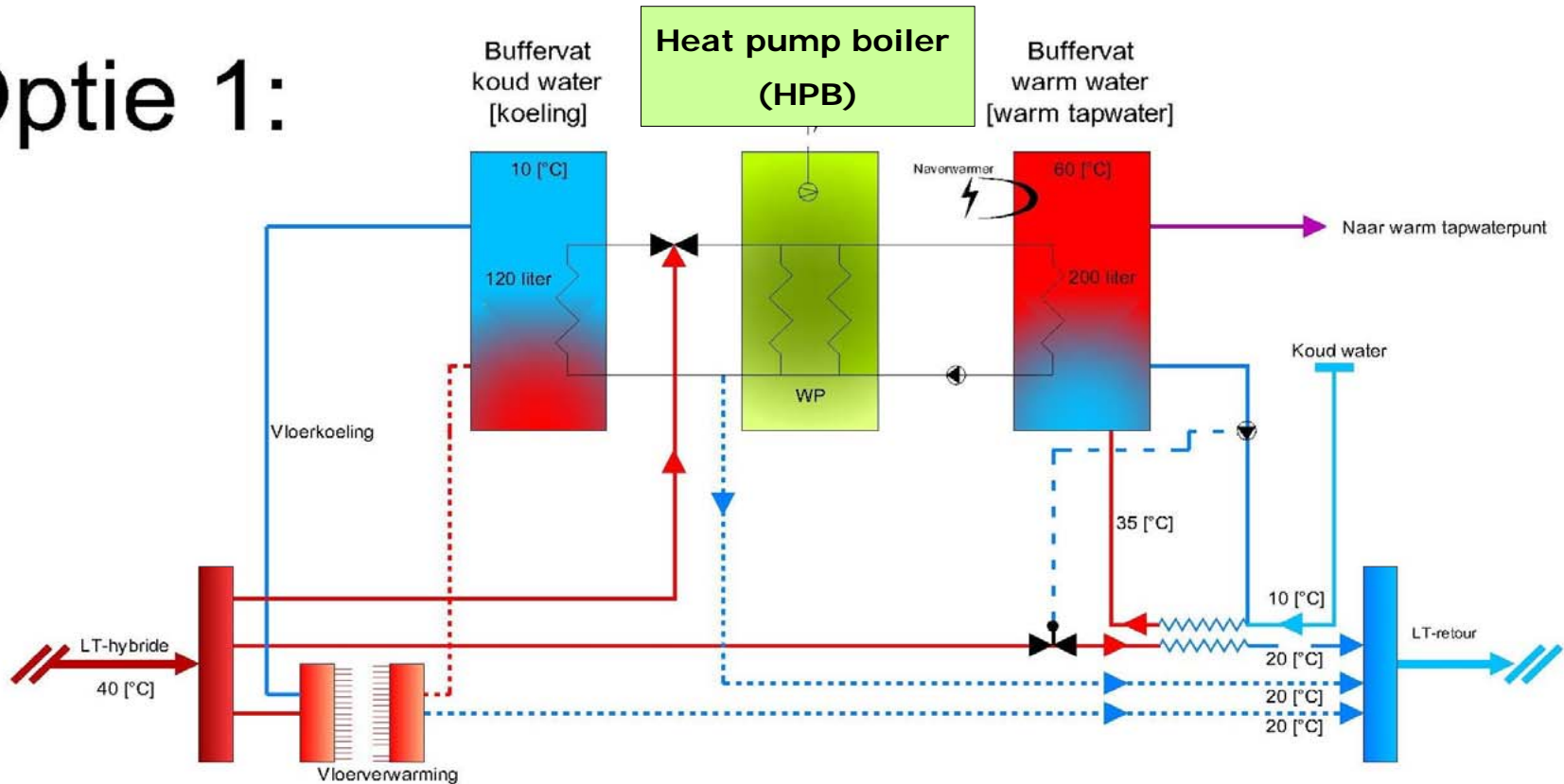


Supplying LT-heat (**45 °C**) from sources like 'near by' waste incinerators or shallow geothermal (1 kilometer)



Building Level

Optie 1:



+ "Free" cooling by the use of extra vessel (left) for storage of cold water

Residual heat: **electricity consumption HPB 600 kWh/a**, not 2000-2500 kWh (HP)

Example 3

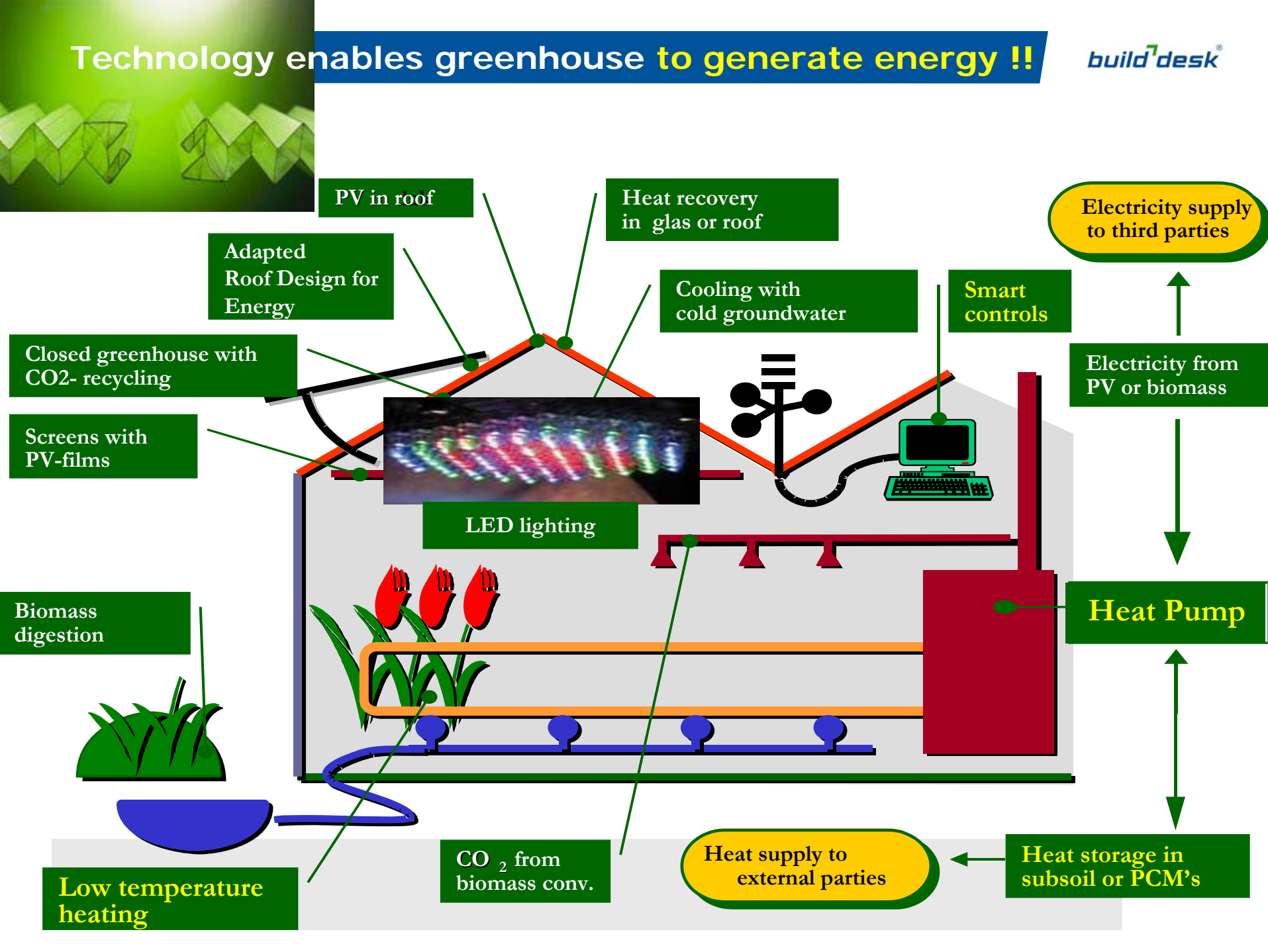
Greenhouse as energy source

Featuring...

Heat Pumps and renewable power generation

Technology enables greenhouse to generate energy !!

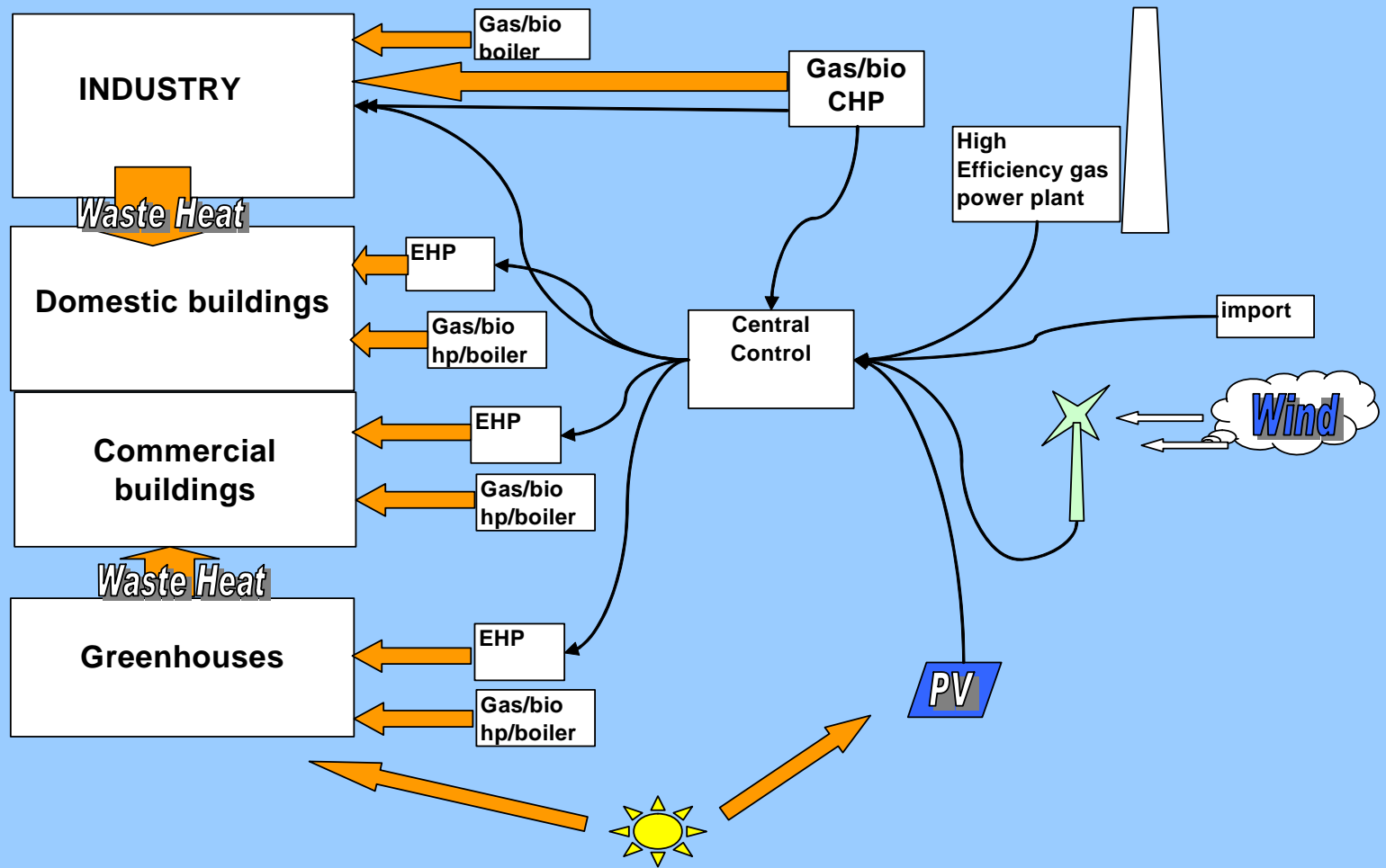
build⁷desk®



- They MULTIPLY free renewable, ambient energy by a factor of 4 or more
- Using renewable electricity makes them entirely climate neutral
- Extra comfort by producing VALUABLE COLD at the same time as HEAT
- Proven technology in “made to measure” variety that matches almost any application



Vision: Heat pumps in a Renewable Society

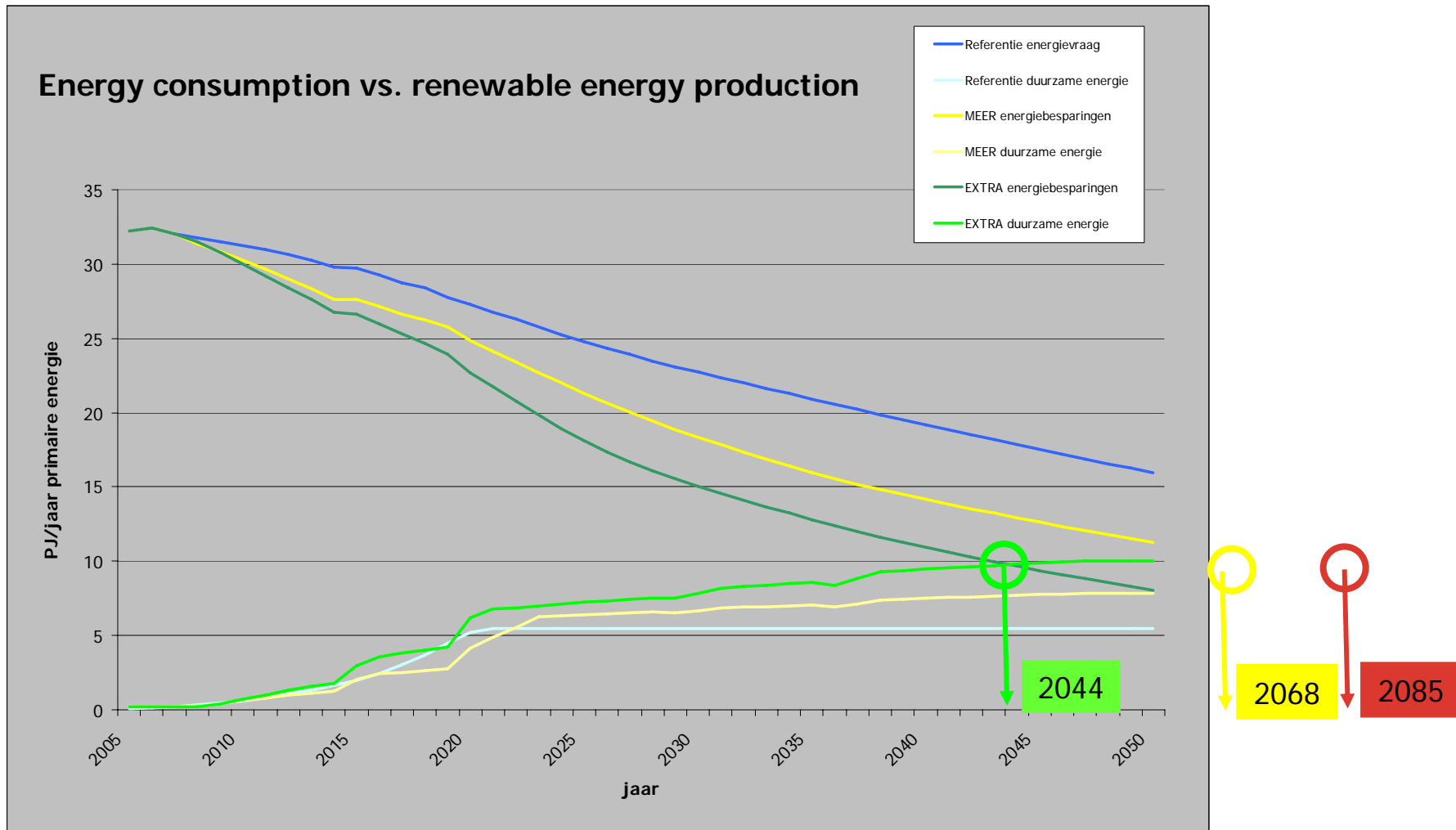


©SenterNovem

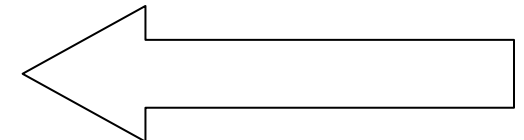
Amerstroot, 13 May 2009

"...a system shift is necessary in thinking about our energy supply..."

build^{desk}



“Forward” policy brings intersection closer



- ... radical changes in existing “systems” **at 3 levels:**
 - **structure:** how we as Nederland Inc./Ltd are organized: economically, physically including State’s interest
 - **culture:** our set of paradigms, values, perspectives
 - **methods:** the ways we deal with things, rules, routines, behaviour and our flexibility and creativity
- **Keep in Mind: thinking in renewable energy in abundance (enabled by heat pumps) in stead of usual scarcity and limitations turns economical systems totally up side down**
- And: WHERE THERE IS A “DRIVE” THERE IS A “DETOUR”
- Or: YES, WE CAN!!!

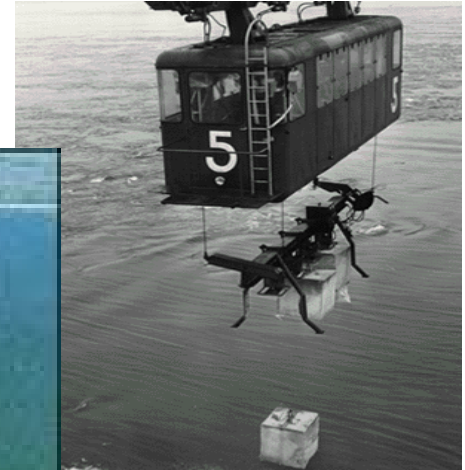
USA Race to the moon: ONE GOAL: defeat the Russians



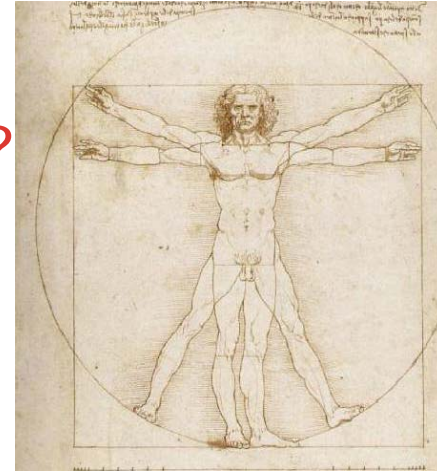
Dutch Delta Works: ONE GOAL: struggle against water

19 13 May 2009

Krijn Braber



Humanity is key.... What's holding us back ?



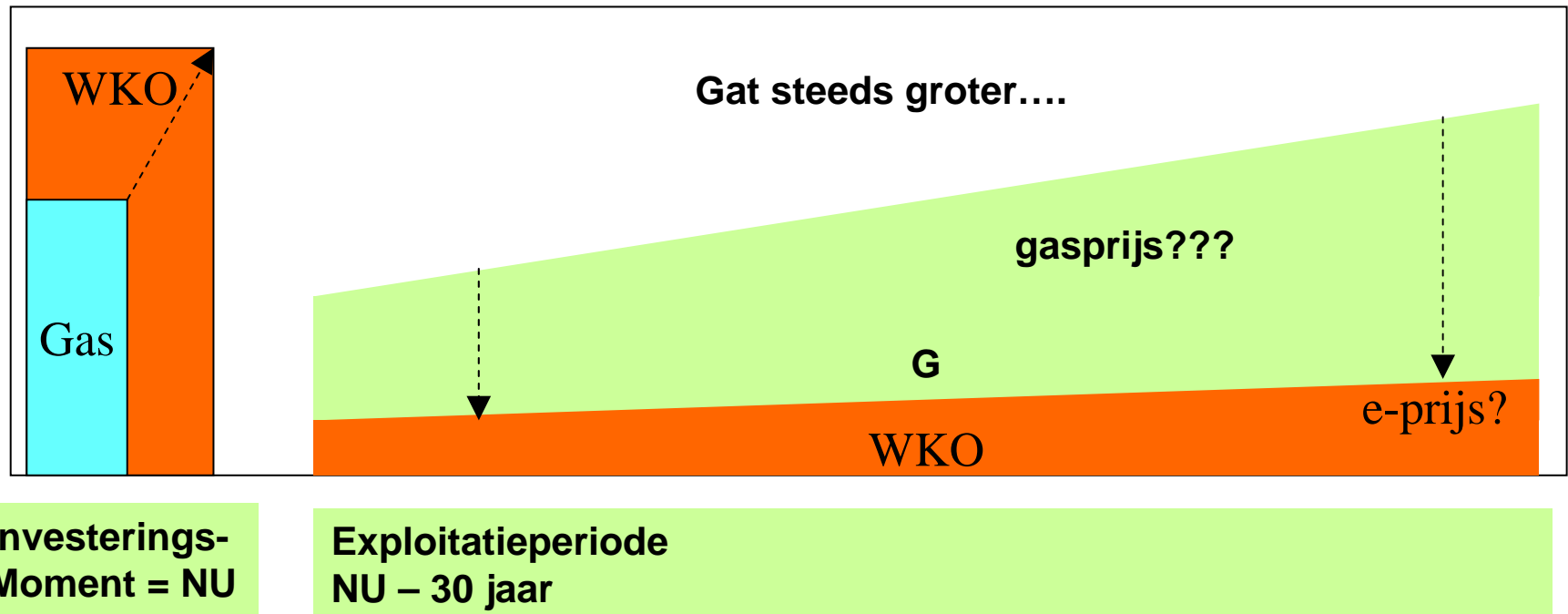
- Lack of imagination ???
- Abundance of micro 'interests' !!!
- Thinking in barriers and problems instead of opportunities
- LACK OF COMMON PURPOSE AND SENSE OF URGENCY
- Lack of choices with a real long term vision, ignoring micro interests
- The others ('politics') have to start.....
- **But keep in mind:**
- The later we start, the more it will cost in the end to solve our problems (Sir Nicolas Stern)!
- The Stone Age didn't end due to a lack of stones !

- *The world provides enough to satisfy every man's need*
- *But not every man's **greed***

Ghandi



Hogere kapitaallast "verzekeringspremie" voor onzekere ontwikkeling energie ? !



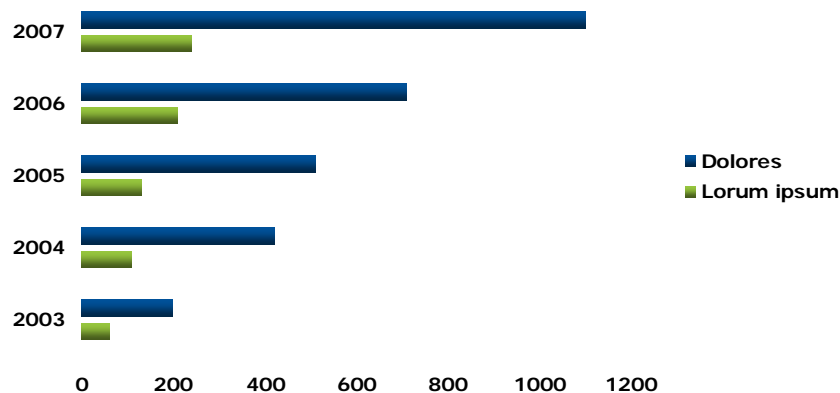
- We staan nu voor de **FUNDAMENTELE keuze** tussen:
 - Lagere kapitaalslast nu en onzekere, variabele energielasten (.... + gas OP)
 - Hogere kapitaallast en zekerheid van (vaste) energielasten in de toekomst
 - Keutendenken versus exploitatie- en waardedenken

- Use this to spice up your slide if you don't want to add a picture
- Use this if your content is very colourful or complicated

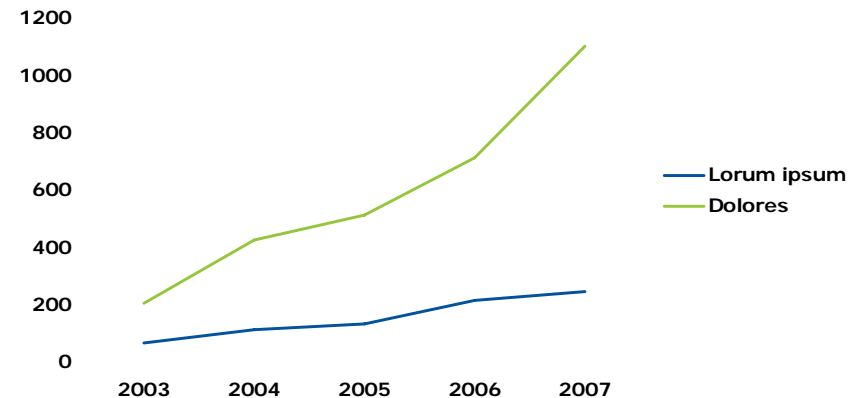
- Use this to spice up your slide if you don't want to add a picture
- Use this if your content is very colourful or complicated

- Use this slide with or without the graphs
- Use text field in the bottom-right corner for e.g. subtitles or a reminder of the subject in question

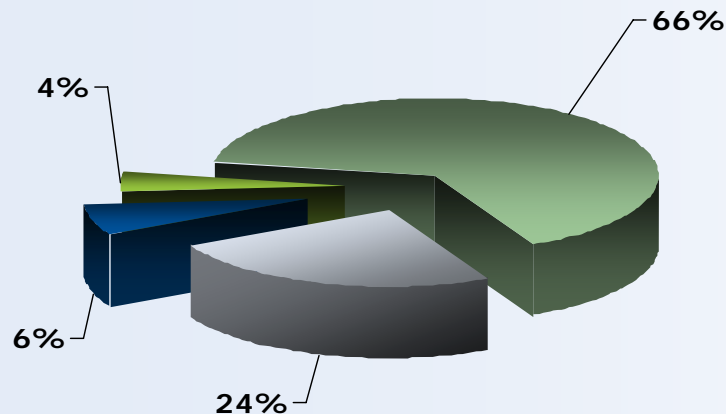
Nulla commodo 2007



Nulla commodo 2008



- Use this slide with or without the graphs
- Use the space underneath the bow to support the message above the bow



Accompanying
text to
graphical
illustration



Insert photo & introduce
new subject



Insert photo
& introduce
new subject

- Use a picture that supports your message
- Remember to optimize your picture for the web
- Height of bow = medium



- Use this slide to support your message
- This slide should only be used if you have an appropriate panorama picture
- Remember to optimize your picture for the web
- Height of bow = low



*Use this slide for
powerful statements*

Energy neutrality asks for more energy conservation and more renewable energy in a few decades

