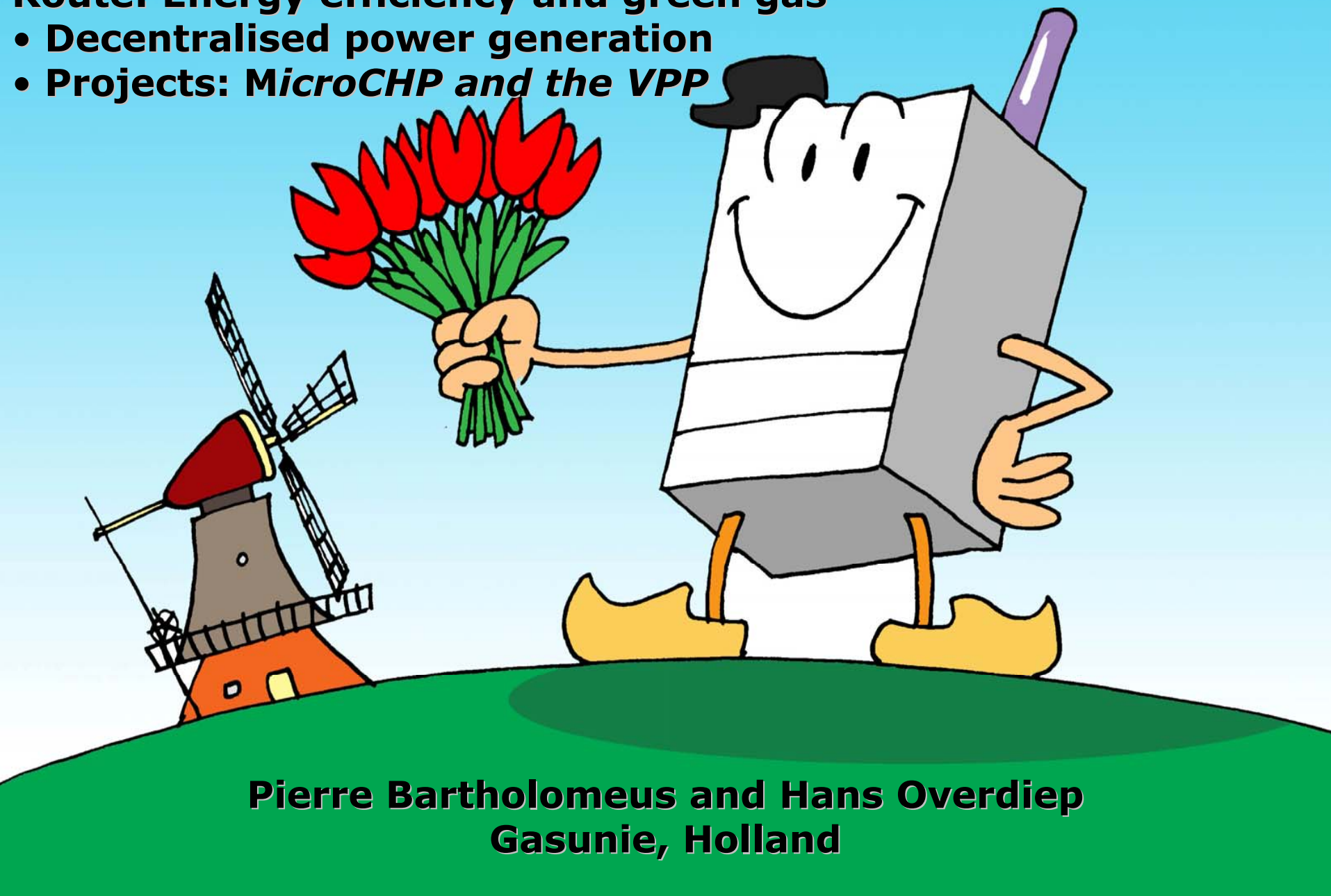
Transition towards a sustainable energy system

Initiative from the Ministry of Economic Affairs

Route: Energy efficiency and green gas

- **Decentralised power generation**
- **Projects: M*icroCHP and the VPP***



Pierre Bartholomeus and Hans Overdiep
Gasunie, Holland

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Holland is a natural gas country:

- **>50% of total energy demand**
- **Nearly all households use NG**
- **>50% of power-prod. is CHP on NG**
- **Gasunie sells 80 billion m3/y**
- **40 billion m3/y at home**
- **40 billion m3/y abroad**

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HE-boiler (invention of Gasunie):

- **condensing boiler (107%)**
- **saved in billions m3 gas**
- **efficient, cheap**
- **high comfort**
- ***the standard***

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Knowing that:

- **demand of power increases**
- **need for more power stations**
- **more import of power**
- ***Kyoto, Energy Transition***

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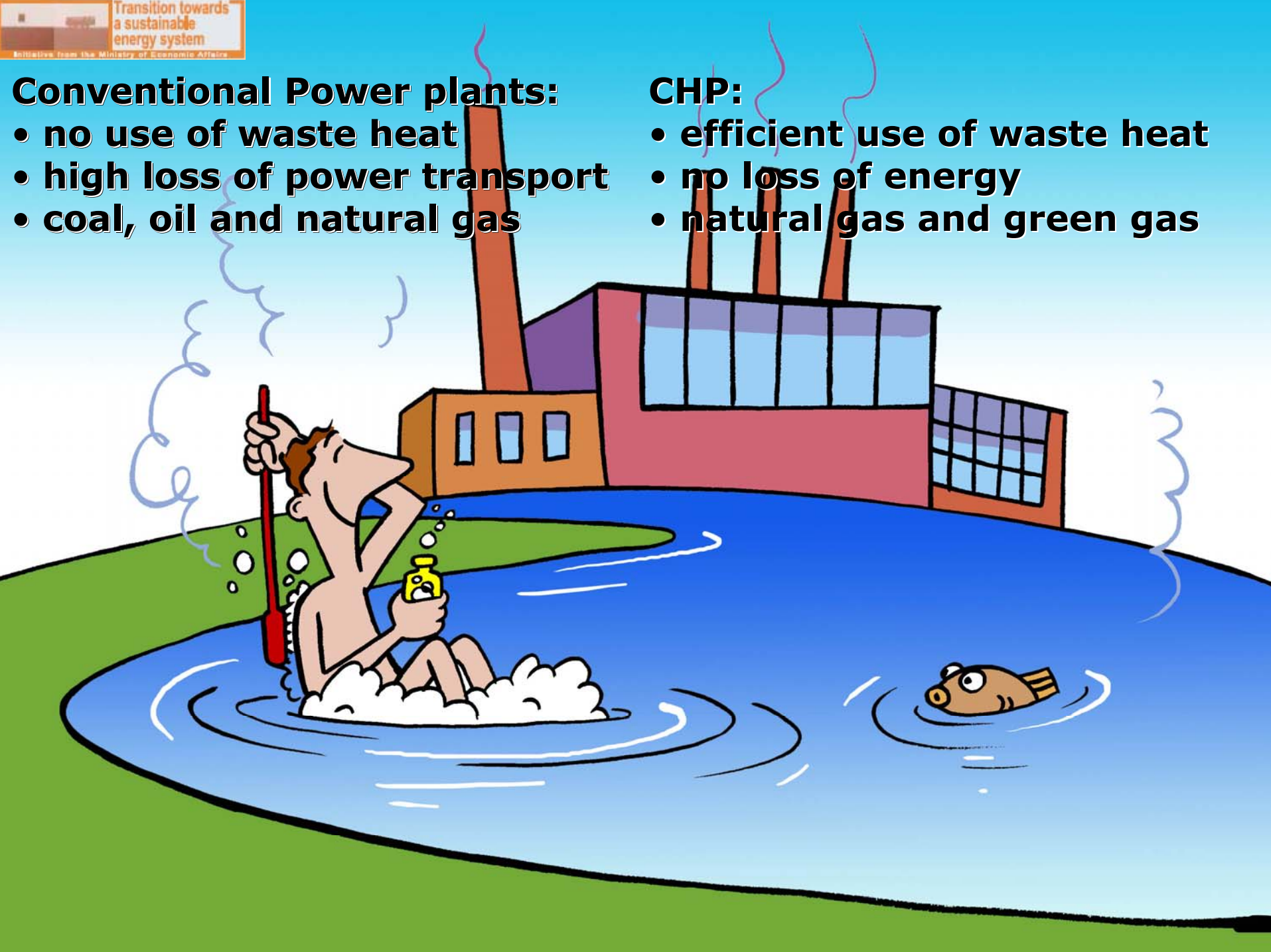
Conventional Power plants:

- no use of waste heat
- high loss of power transport
- coal, oil and natural gas

CHP:

- efficient use of waste heat
- no loss of energy
- natural gas and green gas



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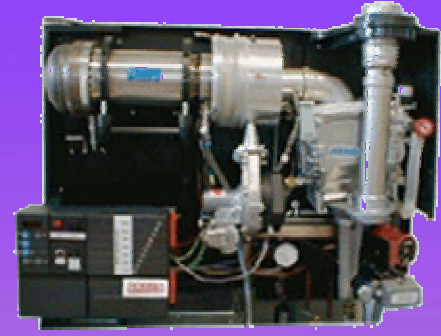
Decentralised power generation:

- **CHP in industry**
- **MiniCHP (> 5kWe) in utility (offices, stores)**
- **MicroCHP (< 5kWe) in houses?**
- ***HE-boiler with a generator***



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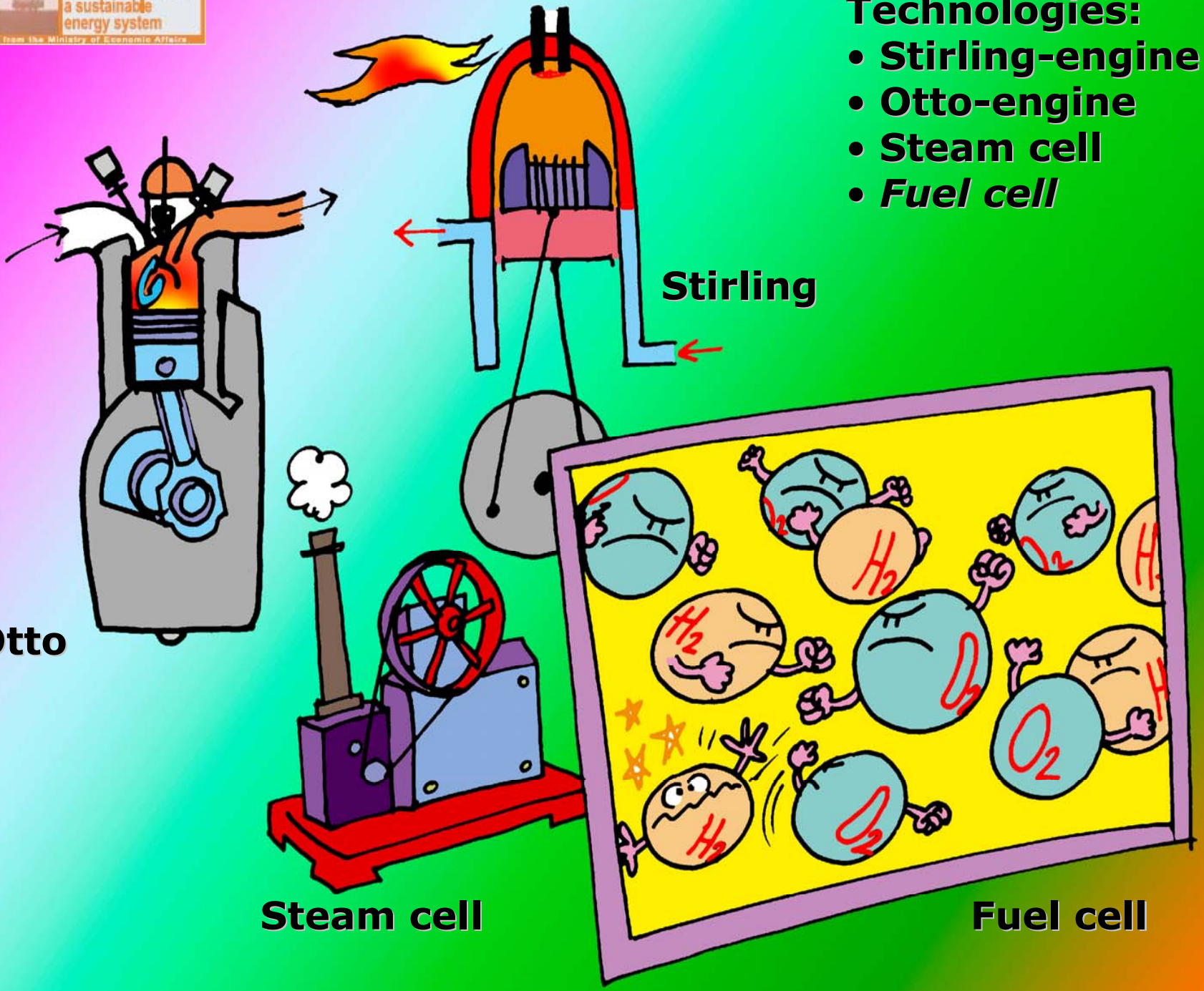
Technologies:

- **Stirling-engine**
- **Otto-engine**
- **Steam cell**
- ***Fuel cell***



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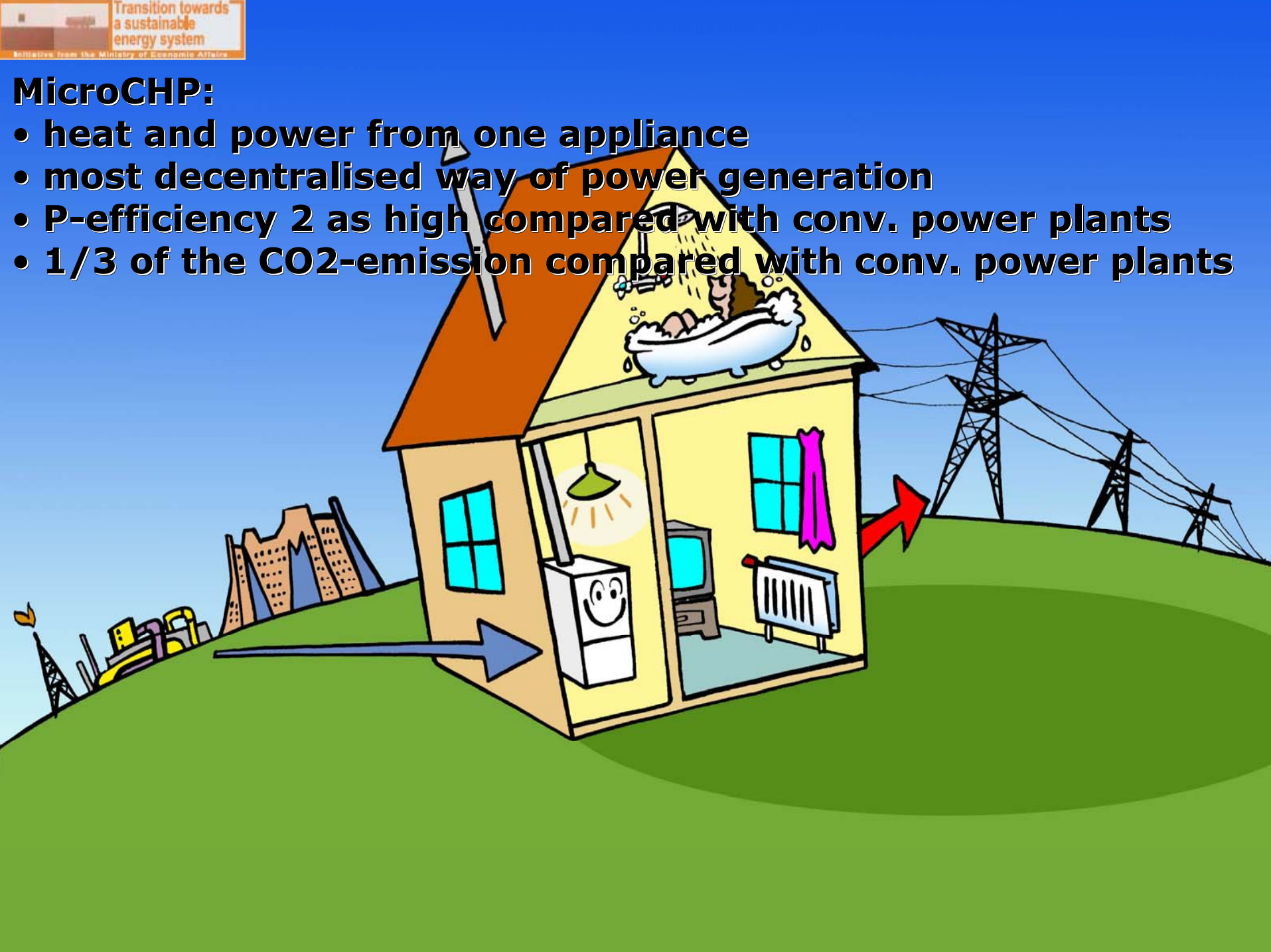
MicroCHP:

- **heat and power from one appliance**
- **most decentralised way of power generation**
- **P-efficiency 2 as high compared with conv. power plants**
- **1/3 of the CO2-emission compared with conv. power plants**



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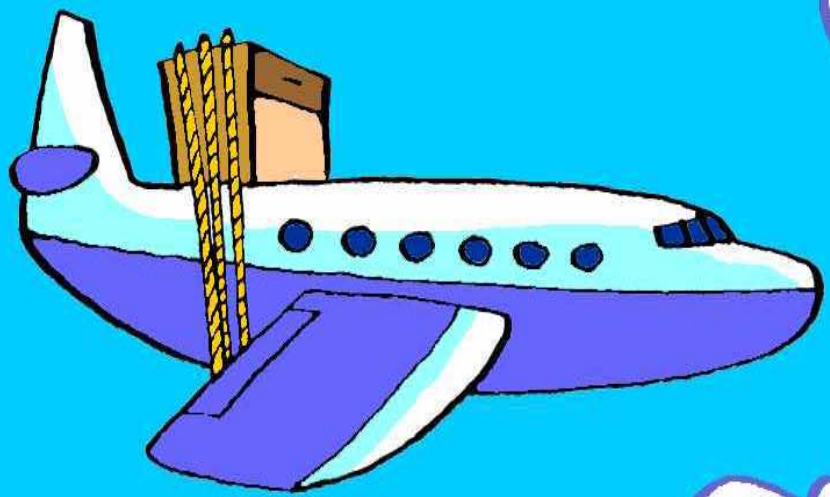
Example of one of our microCHP-projects:

- **Whispertech (New Zealand)**
- **Whispergen, 4 cyl. Stirling engine**
- **Power: 1 kWe, Heat: 7 kWth**



Gasunie developed:

- **heat storage**
- **smart control unit**

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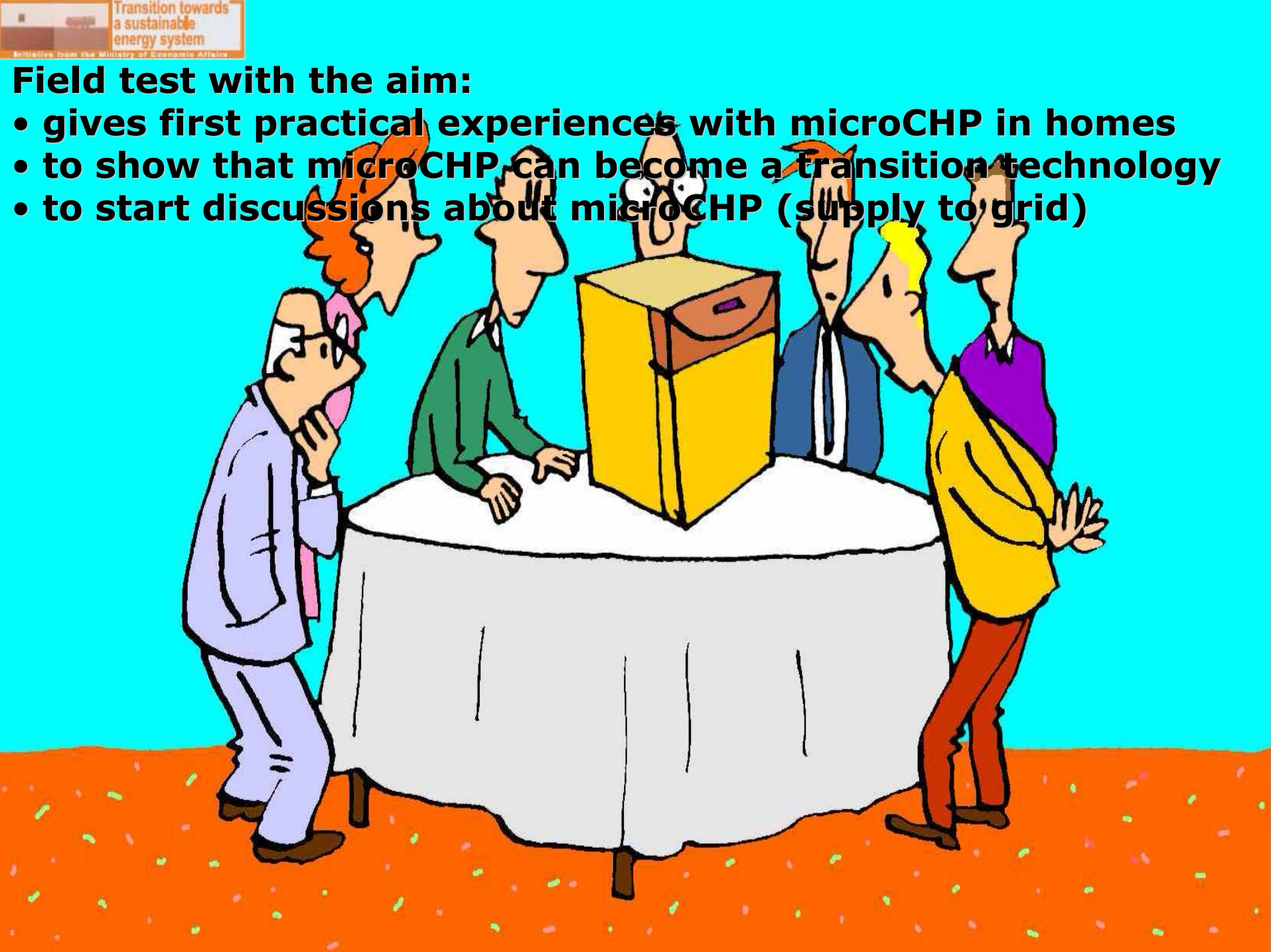
Field test with the aim:

- **gives first practical experiences with microCHP in homes**
- **to show that microCHP can become a transition technology**
- **to start discussions about microCHP (supply to grid)**



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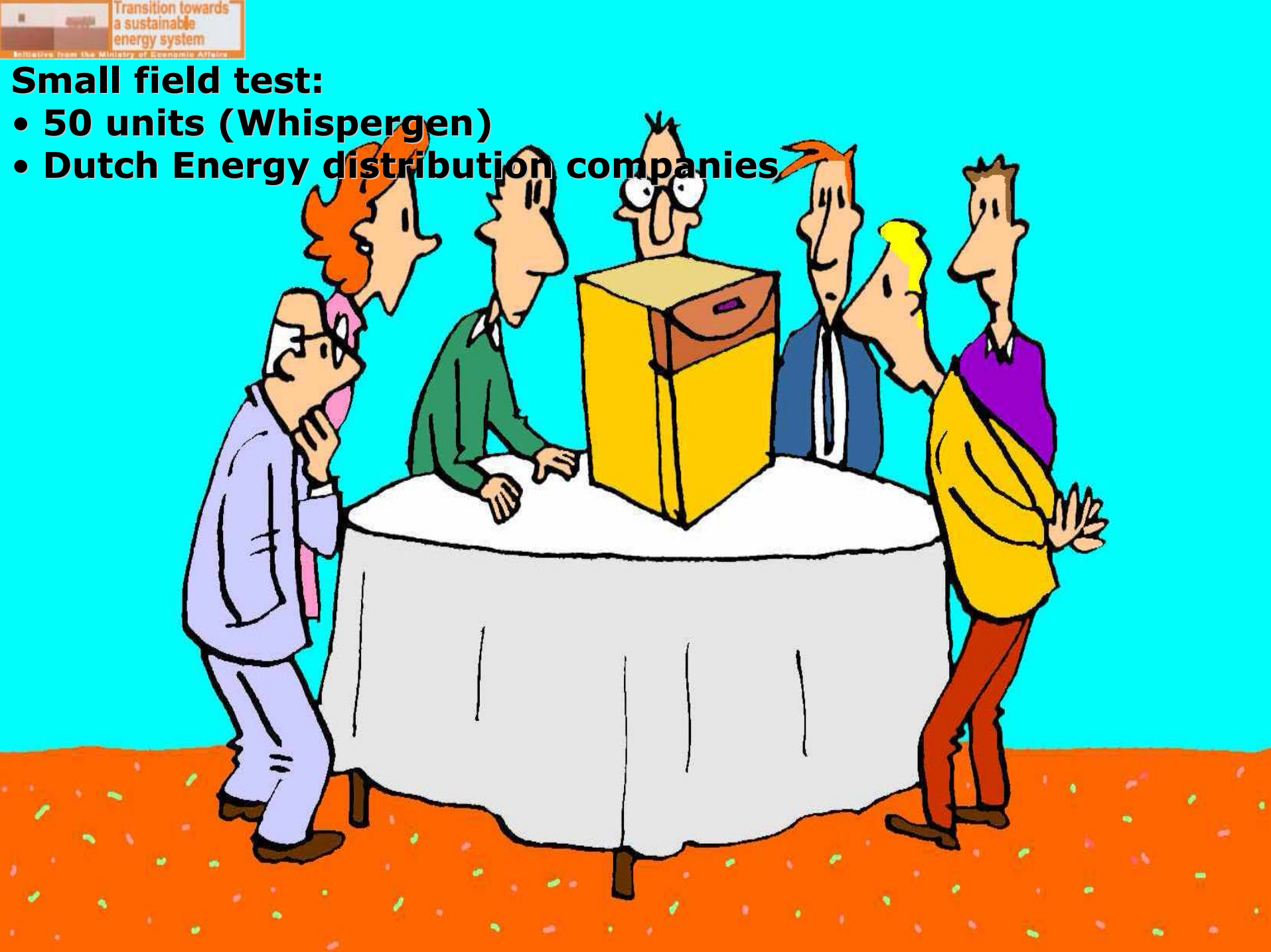
Small field test:

- **50 units (Whispergen)**
- **Dutch Energy distribution companies**



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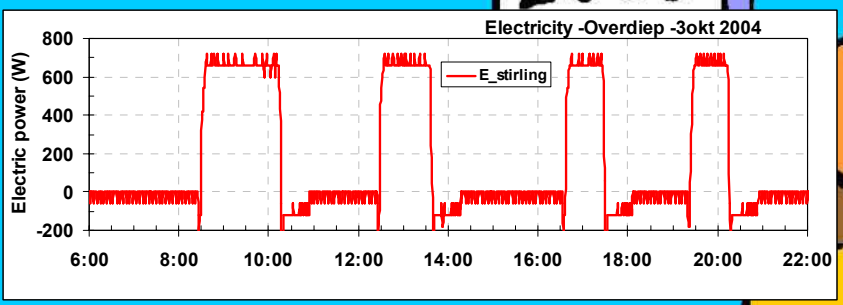
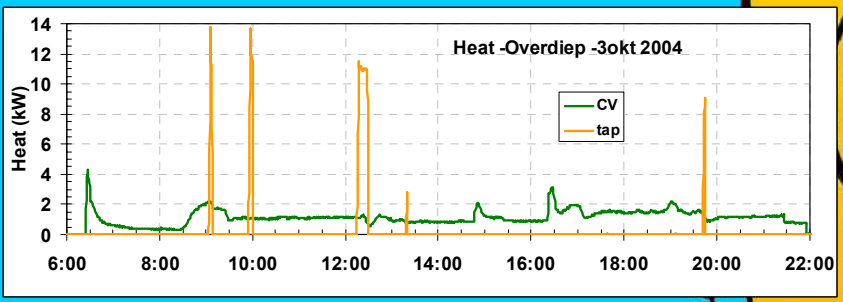
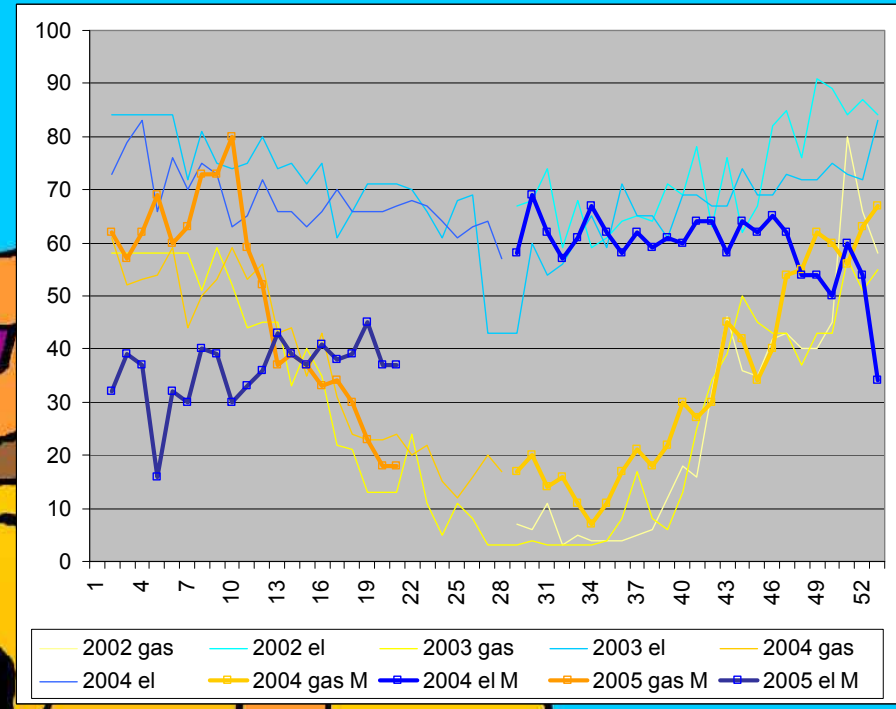
First results:







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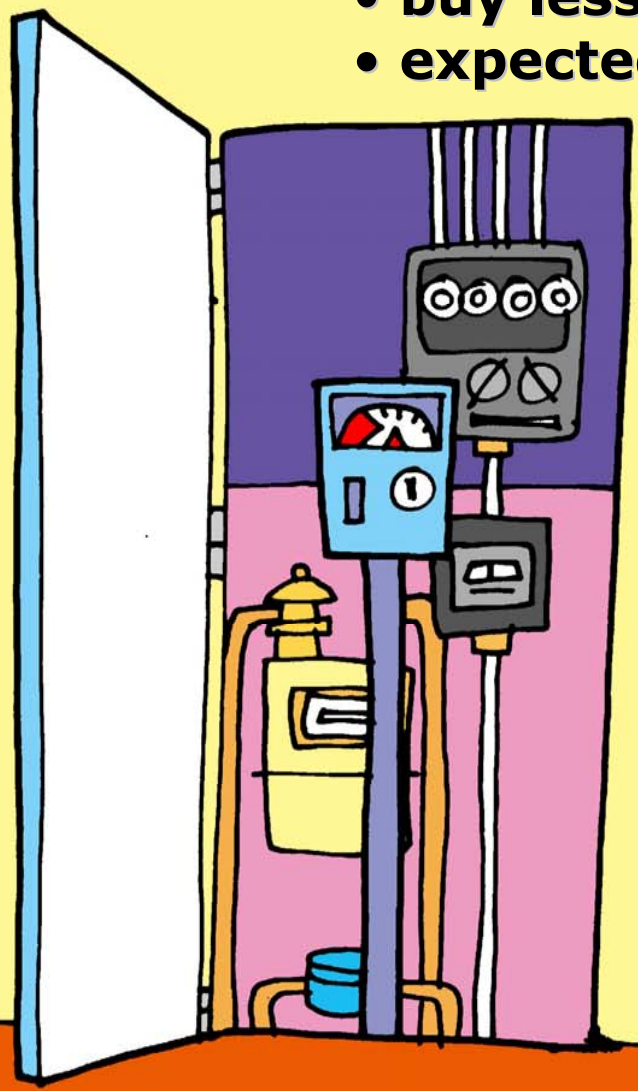
Consumer:

- **buy more gas**
- **buy less electricity**
- **expected pay back time 5 years**



First result of Energy Transition:

Virtual parking of power the most attractive option (E-grid used as a virtual battery)

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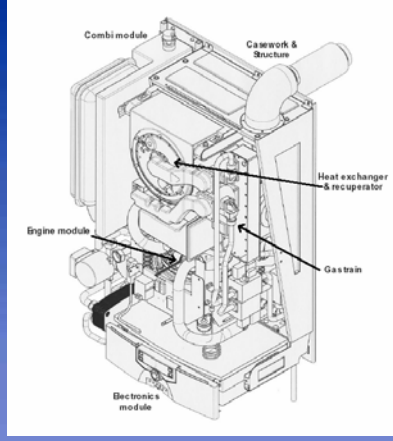
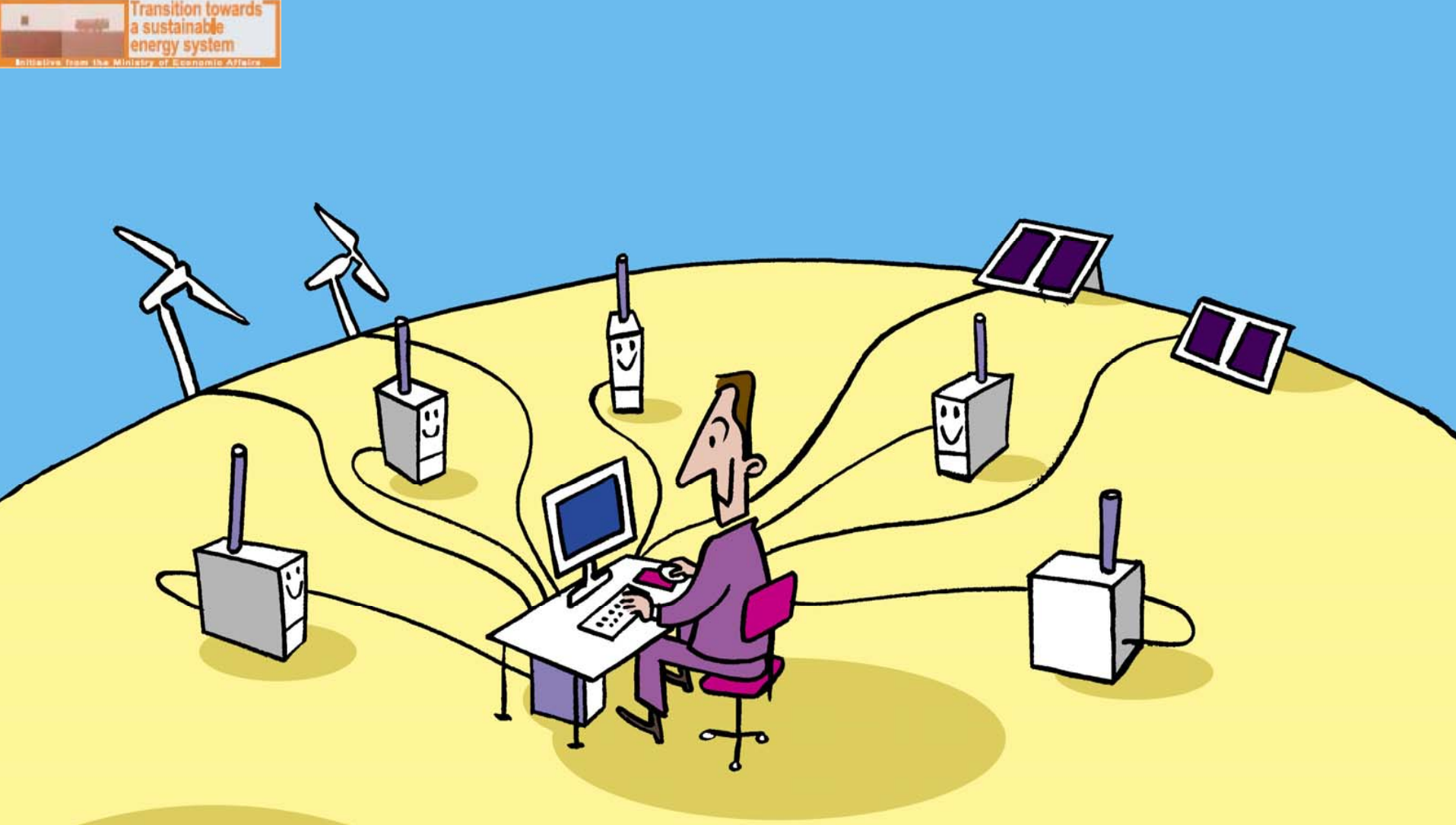
It's just the beginning of microCHP, Gasunie works together with manufactures:

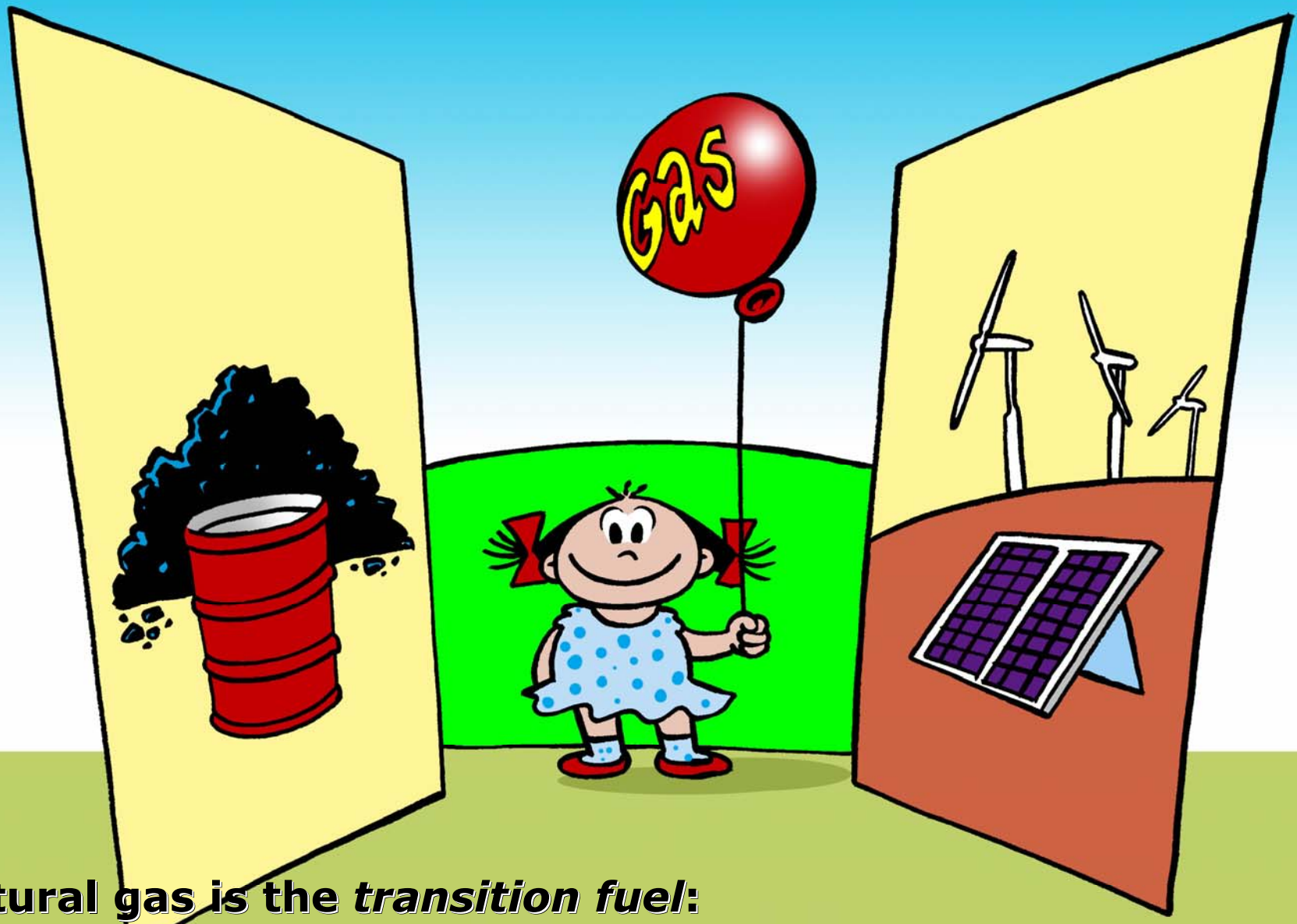
- higher efficiency
- quieter
- more compact
- light weight
- cheaper
- wall mounted
- cooling
- controlling
- storage





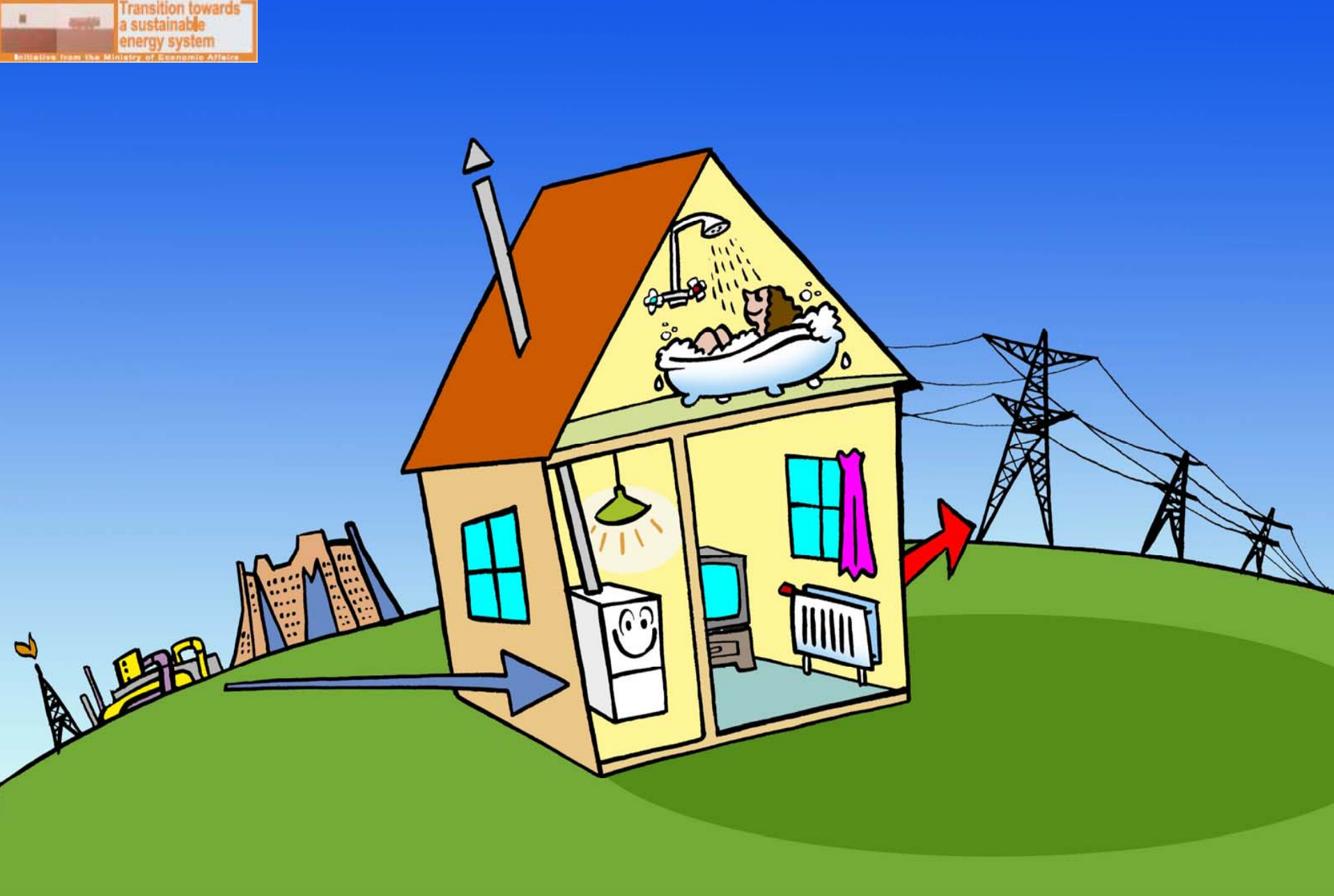
Virtual Power Plant:

- **optimizing decentralised power generation**
- **Solar power, wind power, (micro, mini)CHP**
- **smart combination of renewable energy and fossil fuels**



Natural gas is the *transition fuel*:

- **most clean fossil fuel**
- **in the future mixed with biomass, hydrogen**



MicroCHP is a *transition technology*:

- **saving a lot of fossil fuels and CO2**

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Virtual Power Plant is a way of *Transition thinking*:

- **fossil fuels will become a back-up fuel**

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In 2007 a demonstration project:

- 1000 microCHP appliances
- Meerstad, new urban area
- Small Virtual Power Plant

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Knowing that:

- **demand of power increases**
- **need for more power stations**
- **more import of power**
- ***Kyoto, Energy Transition***

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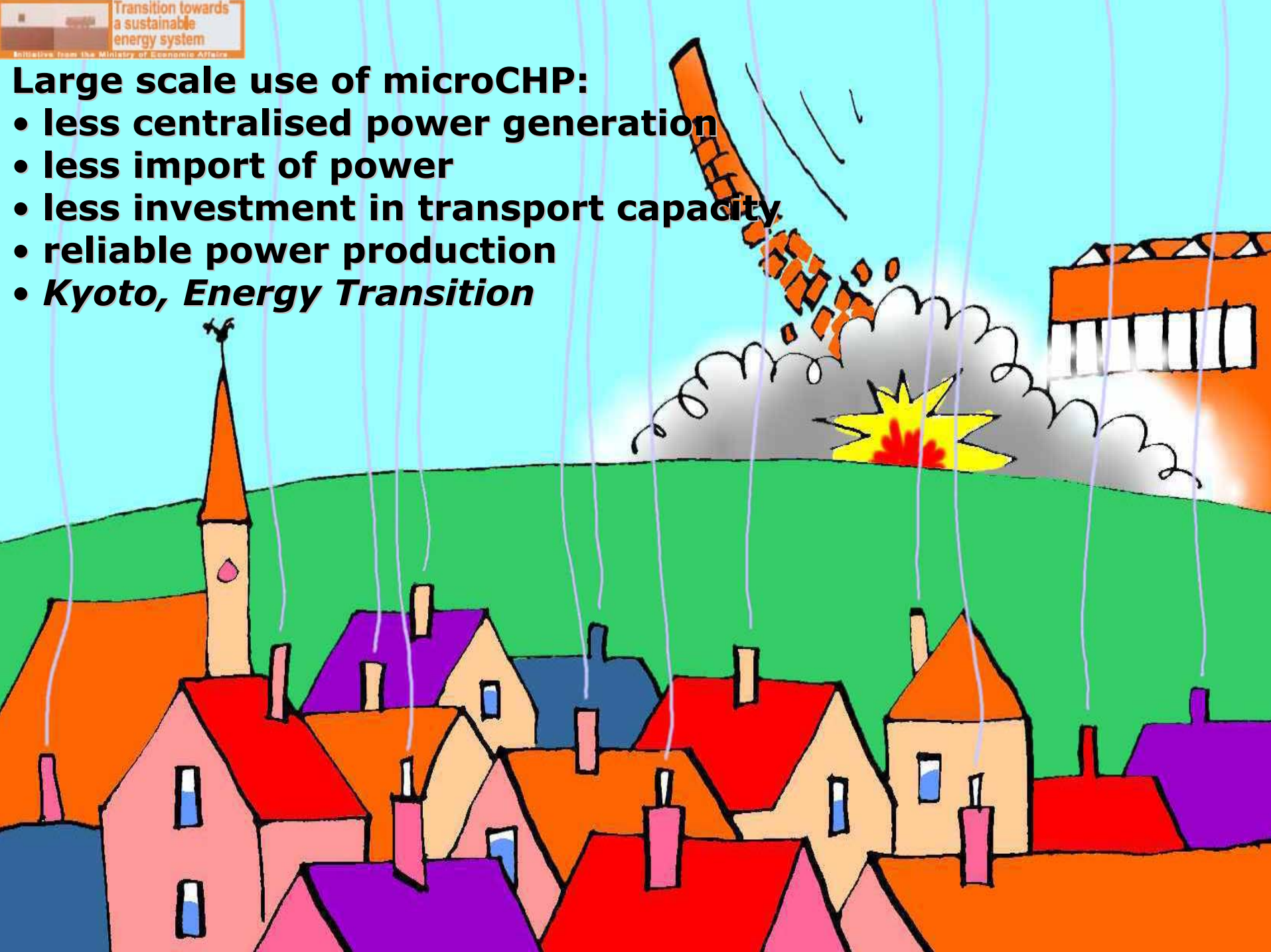
Large scale use of microCHP:

- **less centralised power generation**
- **less import of power**
- **less investment in transport capacity**
- **reliable power production**
- ***Kyoto, Energy Transition***



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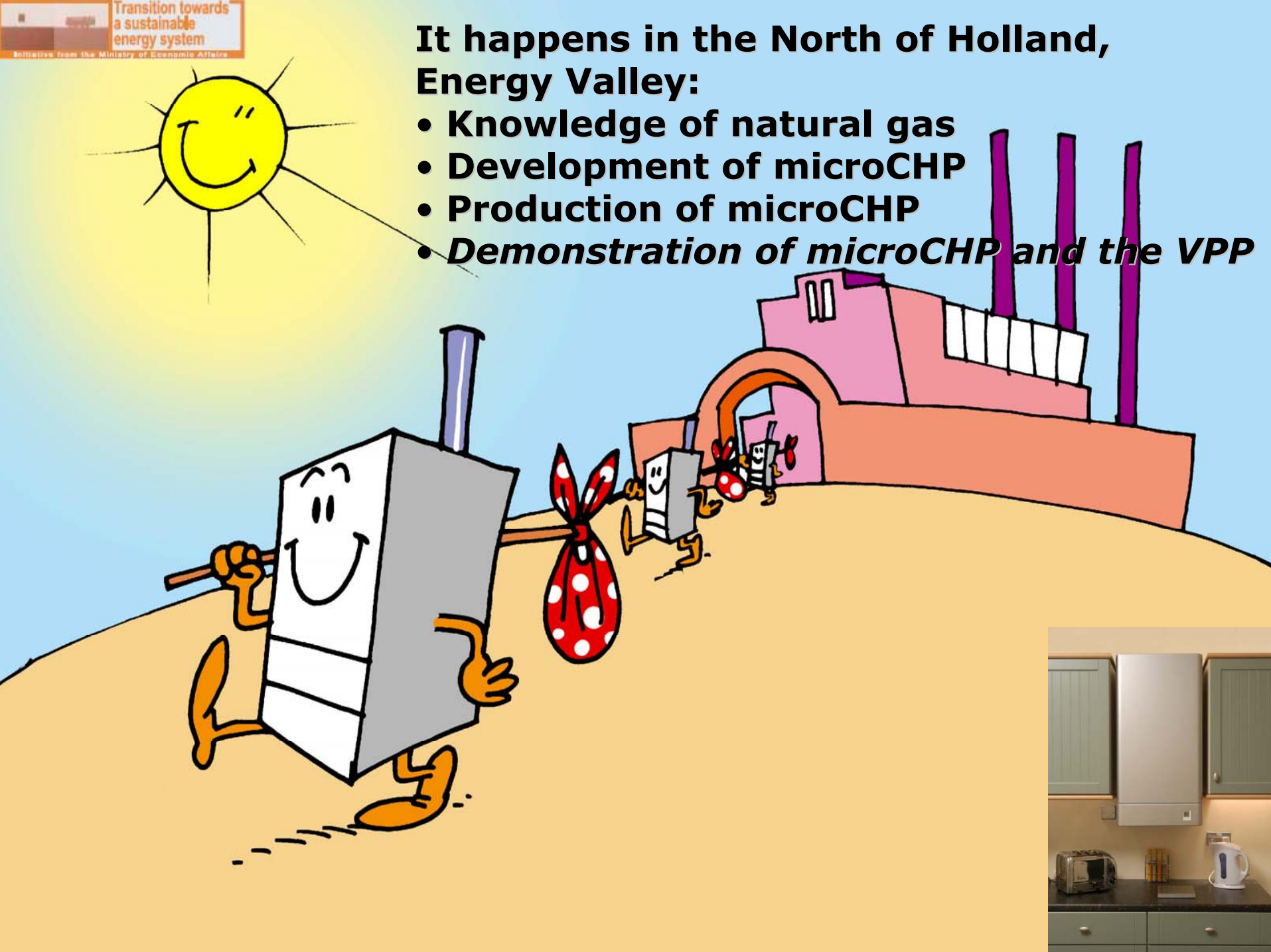
It happens in the North of Holland, Energy Valley:

- **Knowledge of natural gas**
- **Development of microCHP**
- **Production of microCHP**
- ***Demonstration of microCHP and the VPP***



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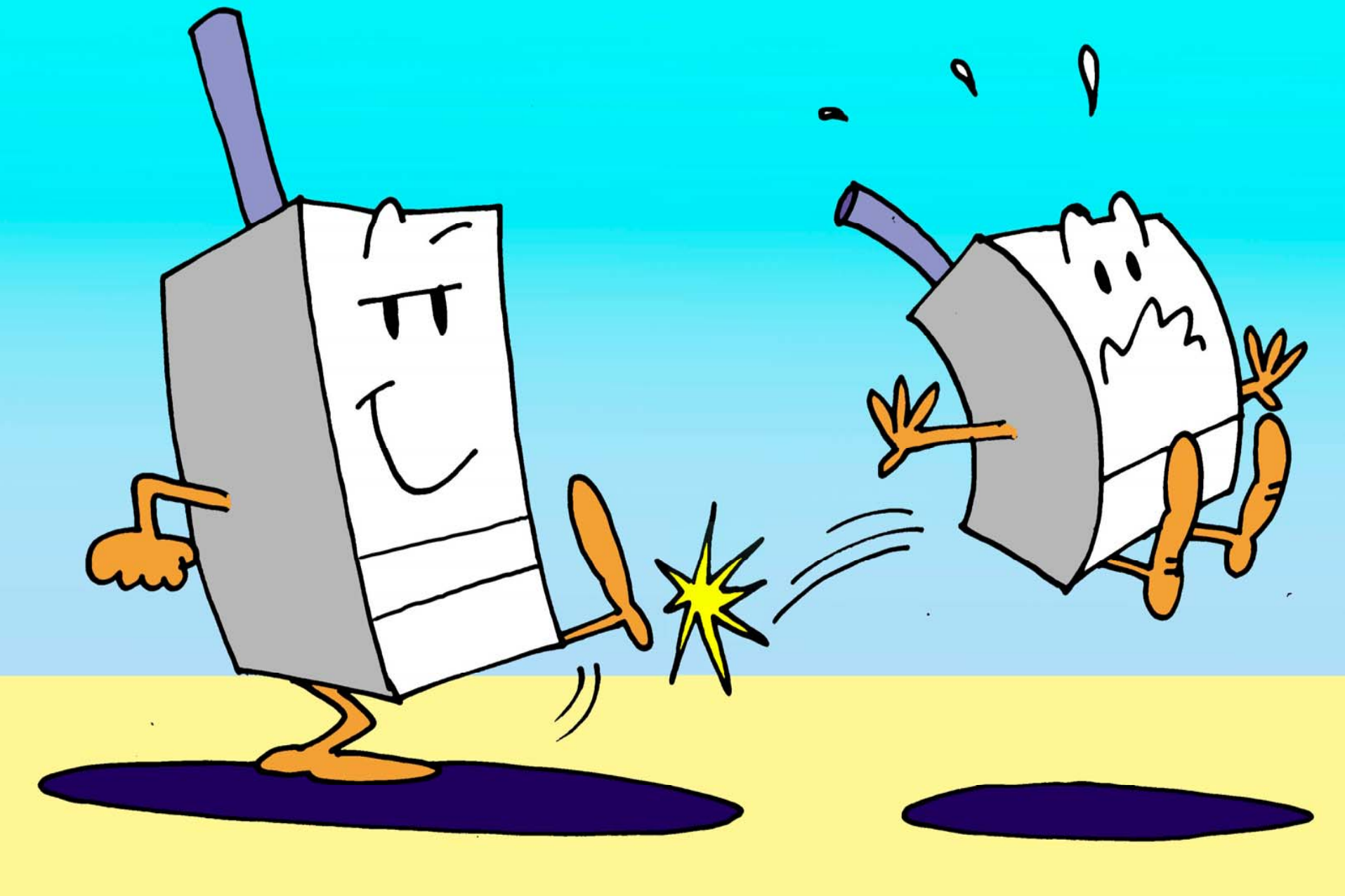
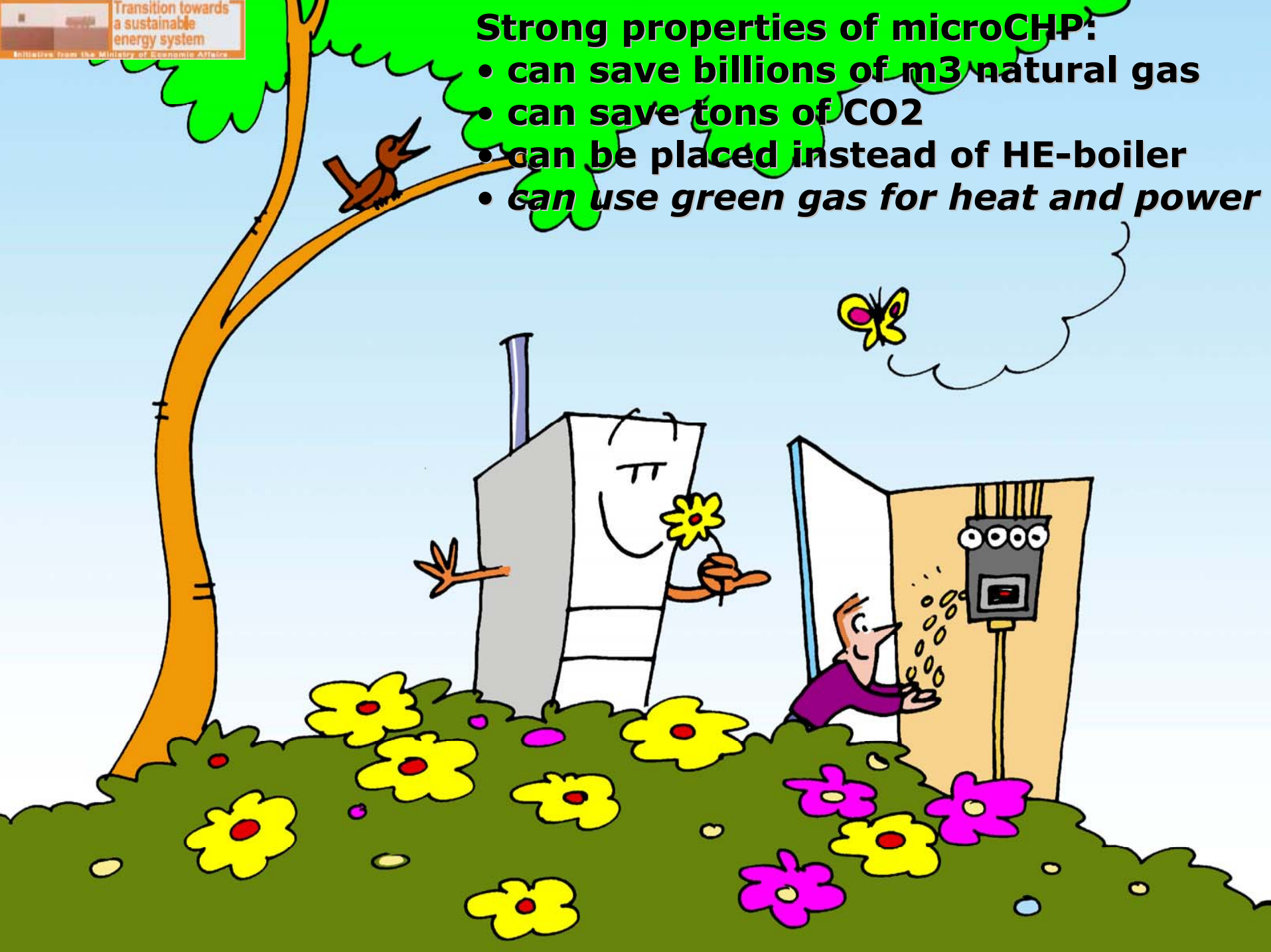
Can MicroCHP become a successor of the HE-boiler?

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Strong properties of microCHP:
• can save billions of m3 natural gas
• can save tons of CO2
• can be placed instead of HE-boiler
• *can use green gas for heat and power*

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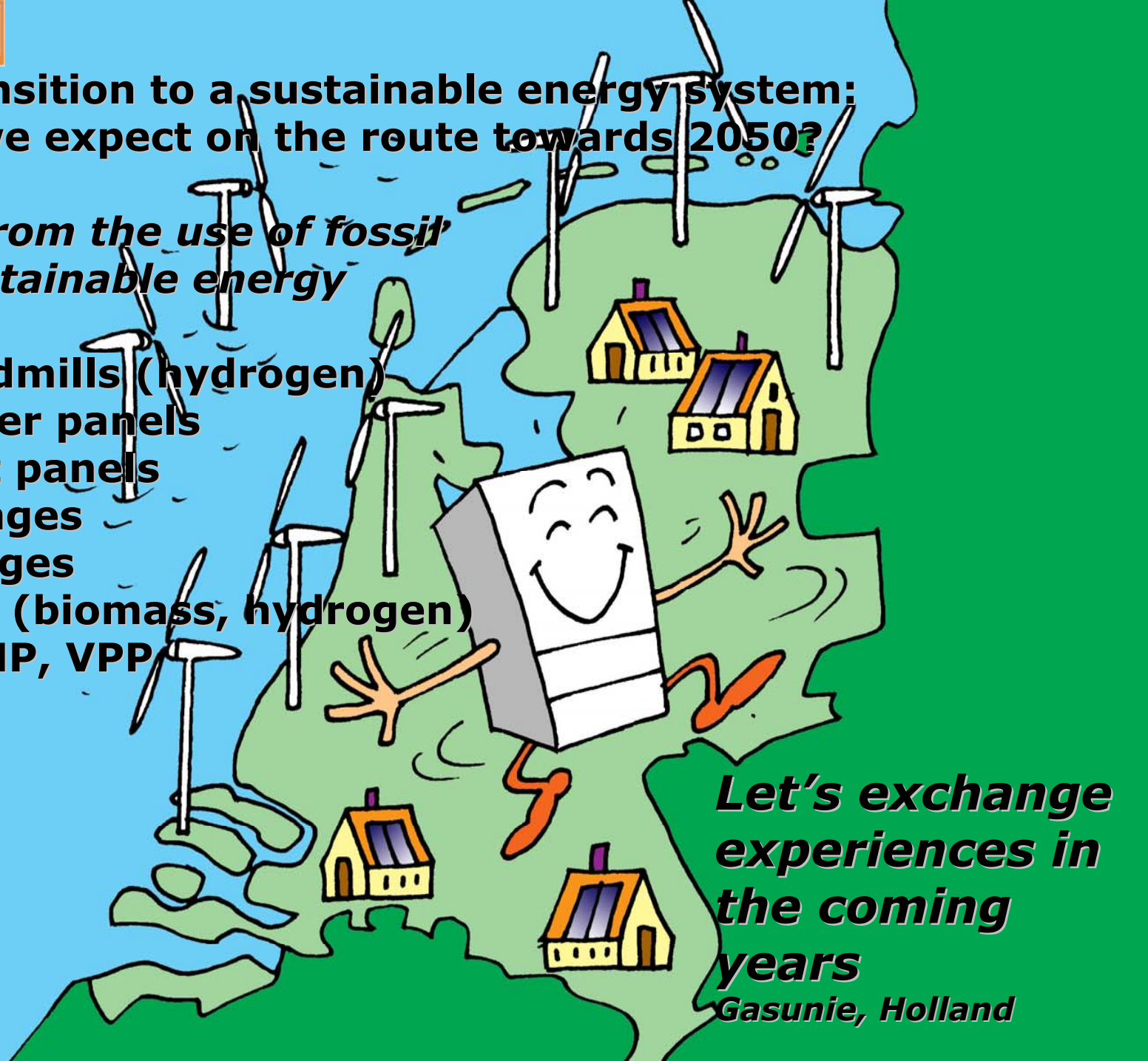
Energy Transition to a sustainable energy system: What can we expect on the route towards 2050?

A shifting from the use of fossil fuels to sustainable energy

- more windmills (hydrogen)
- solar power panels
- solar heat panels
- heat storages
- CO2 storages
- green gas (biomass, hydrogen)
- (micro)CHP, VPP



Let's exchange experiences in the coming years

Gasunie, Holland