

The Passive House in the Electricity System of the Future

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Content

- Introduction
- The current electricity system
 - Basics
 - Costs
- The future electricity system
 - From consumers to 'prosumers'
- Implications for the passive house

Introduction

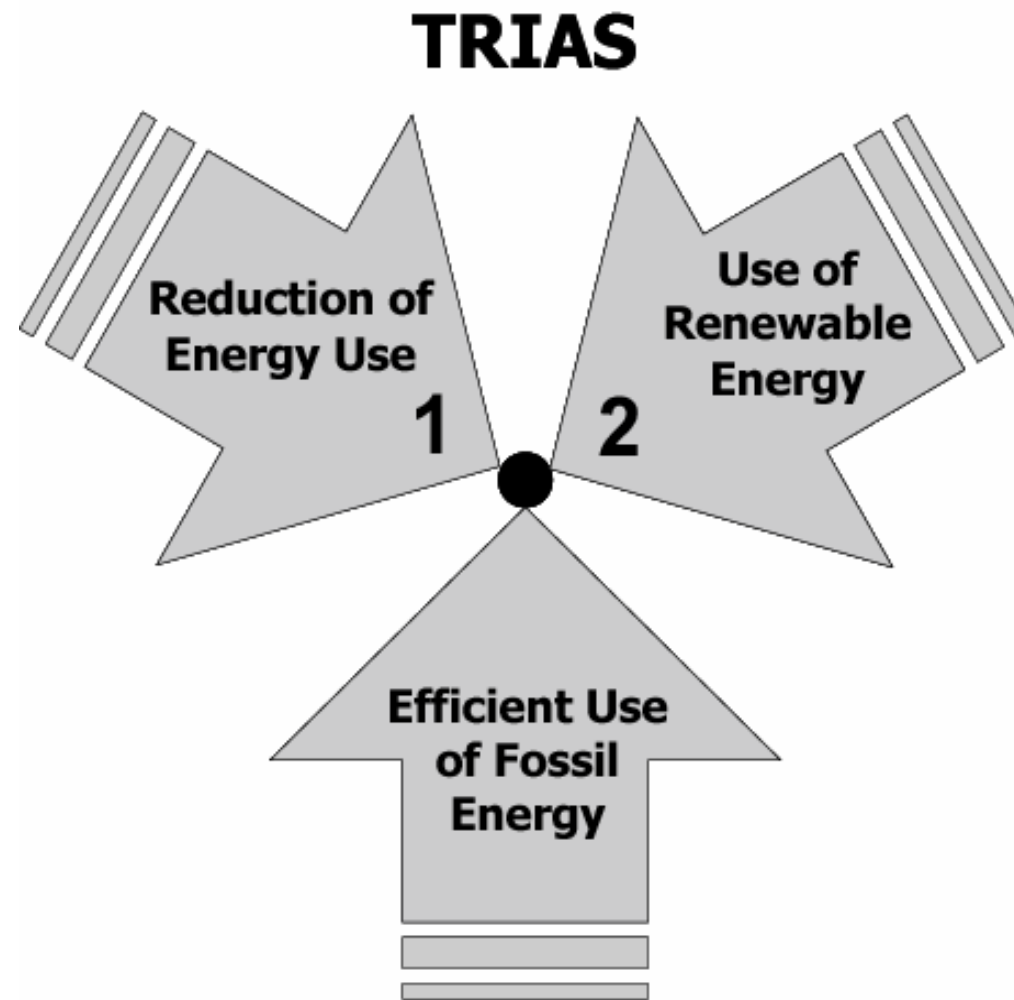
About Leonardo ENERGY

(Web) community for sustainable energy professionals

- Technical information
- Qualified through partner network
- Comprehensive coverage
- Open for qualified debate
- Best practice approach

Introduction

Trias Energetica (TU Delft – 1996)



TRIAS

Reduction of
Energy Use

1

Use of
Renewable
Energy

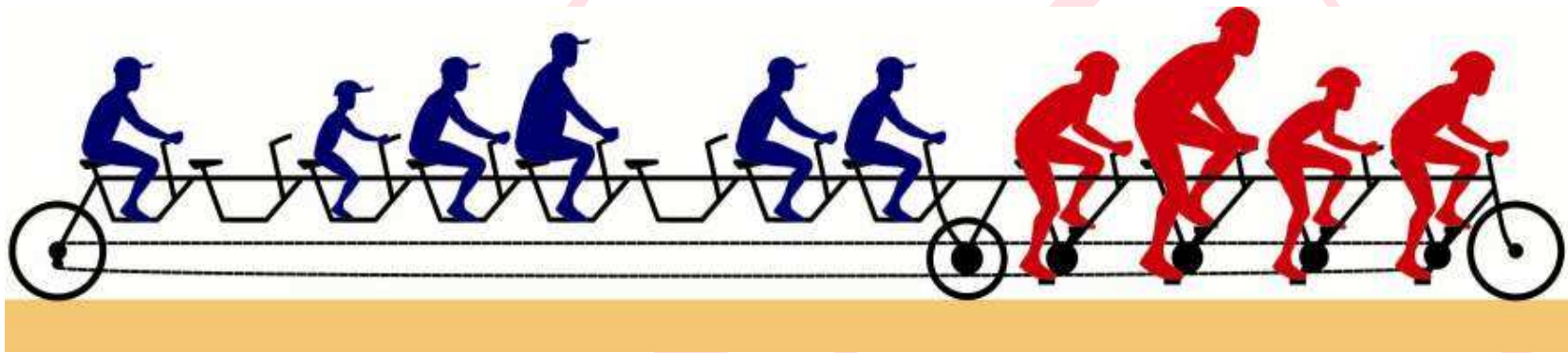
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Efficient Use
of Fossil
Energy

ENERGETICA

The electricity system

Basic representation

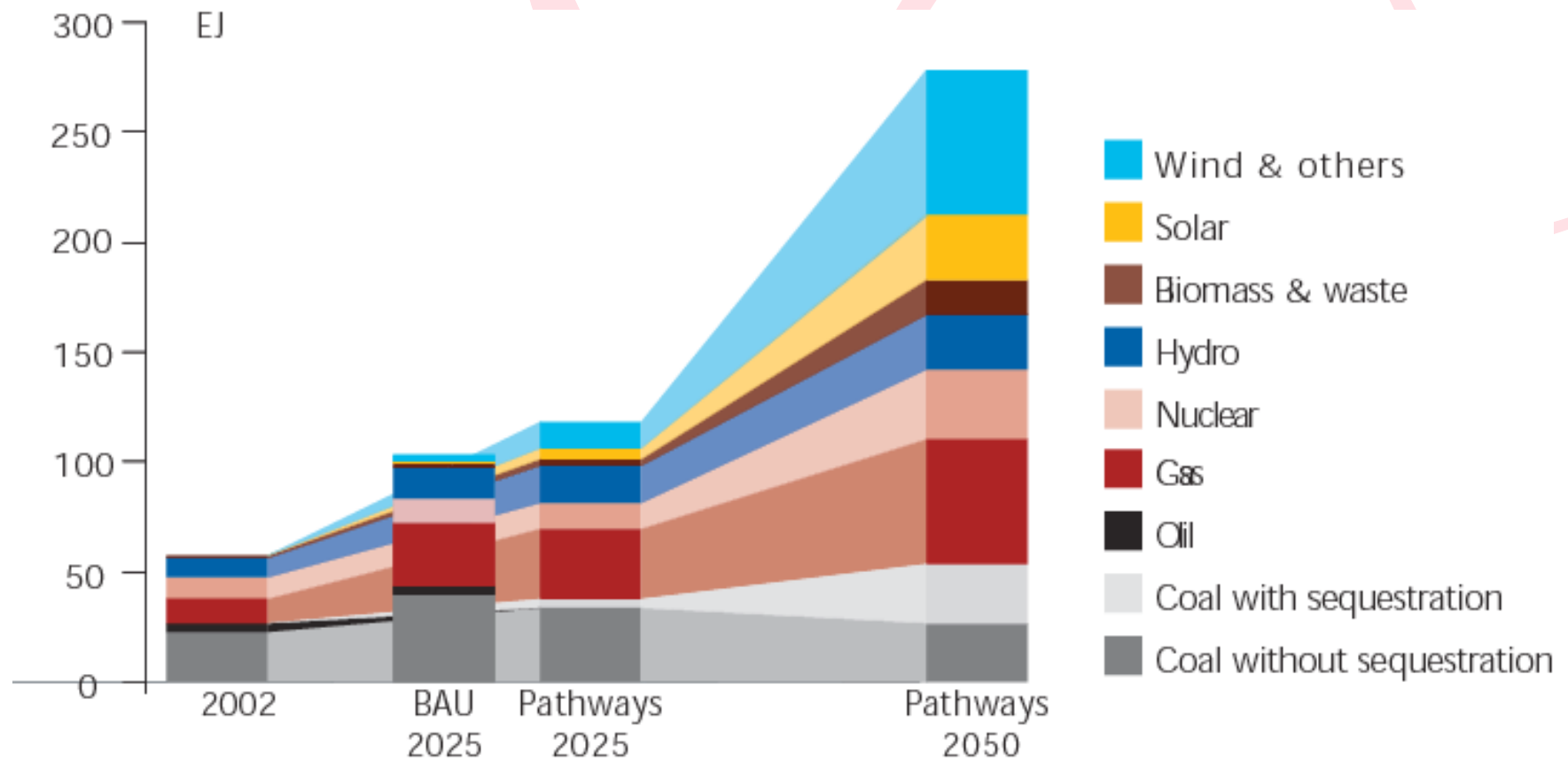


- Tandem bicycle moving at constant speed
- Goal: keep the blue figures moving
- Blue figures = load (industrial loads, private dwellings)
- Red figures = power stations (different sizes)

The electricity system

Fast growing demand

An increasing number of options for low-carbon electricity are becoming available



The electricity system

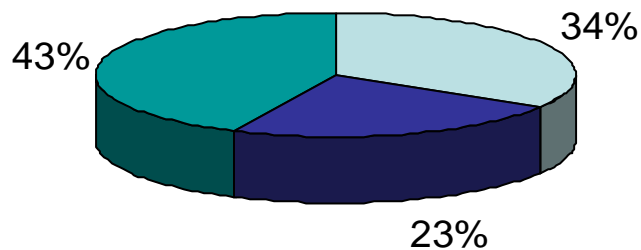
The cost of generation

Production technology	EUR-cent per kWh		
	Investment	Fuel	Total
Nuclear	2.2	0.9	3.1
Natural Gas Combined Cycle	1.1	2.1	3.2
Wood Gasification Combined Cycle	2.2	4.9	7.1
Coal Gasification Combined Cycle	2.6	1.6	4.2
Gas Turbine	4.6	3.2	7.8
Onshore Wind Turbines	6.5	0.0	6.5
Nearshore Wind Turbines	4.5	0.0	4.5
Offshore Wind Turbines	5.8	0.0	5.8

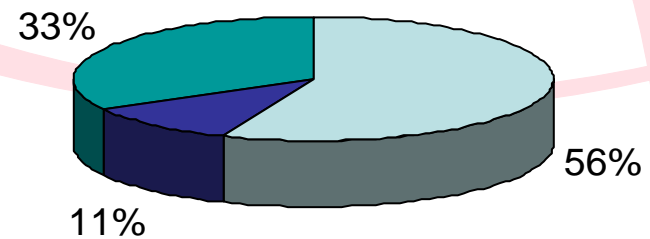
The electricity system

Structure of energy prices in the Netherlands (2006)

Electricity



Natural gas



The electricity system

Other characteristics

- Pros
 - High efficiency at the point of use
 - From microwatt to Megawatt
 - No emissions at the point of use
 - Allows low loss distribution networks
 - Easy to manage
 - Impressive safety track record
- Cons
 - Economics, efficiency, siting of storage systems
 - Conversion losses in thermal power plants

The future system

What's new

- Improved efficiency
 - Less energy/service but more services
- Digital society
 - Increasing vulnerability, while electricity becomes increasingly a critical infrastructure
- Environmental concerns
 - Need for low carbon energy
- Distribution
 - From 'passive' to 'active'
- Users
 - From consumers to 'prosumers'

The future system

Smart grids



Source: EU

The future system

Expand & rebuild the system “*in flight*”

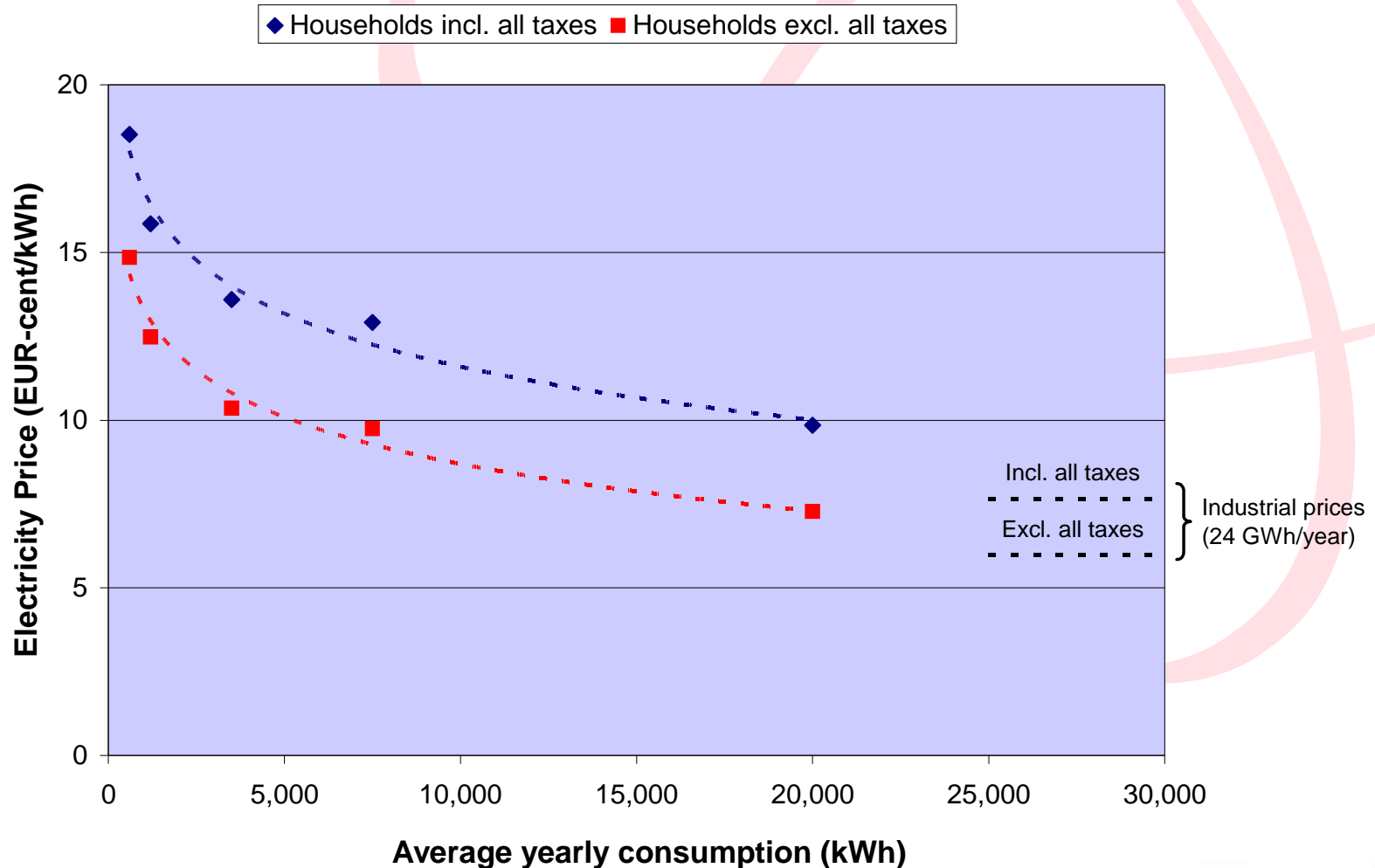


Source: Airbus

Implications

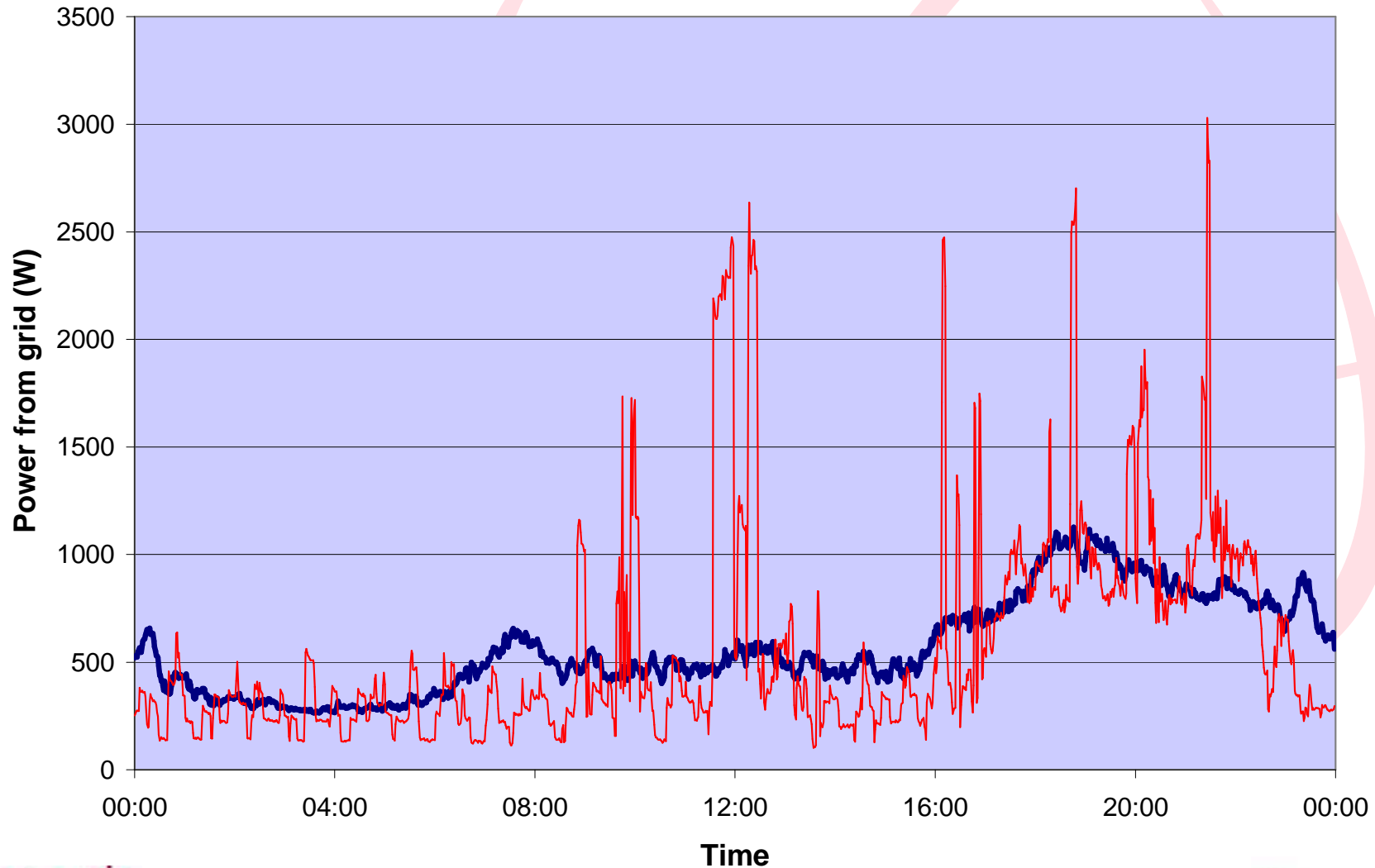
Average electricity prices in EU-25 countries

Average electricity prices in EU-25 countries



Implications

Loading for residential customers



Implications Conclusions

- Large-scale use of passive houses makes dual energy distribution infrastructure uneconomical
- Off-grid homes uneconomic due to demand pattern of residential users
- An all-electric concept for passive houses provides several advantages:
 - Increased hosting capacity of intermittent renewables
 - Participate to the electricity market (peak load reduction)
 - Lower cost distribution infrastructure