

NGinfra



Next Generation Infrastructures

Back to the future: Co-evolution of infrastructure systems and values

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PowerWeb conference, TU Delft, 4 June 2019



The energy transition?



Energy transitions



decentralized
supply of coal
gas and oil
gas

city (coal) gas
electricity

distance gas
(regional)

natural gas
(inter)national

petroleum

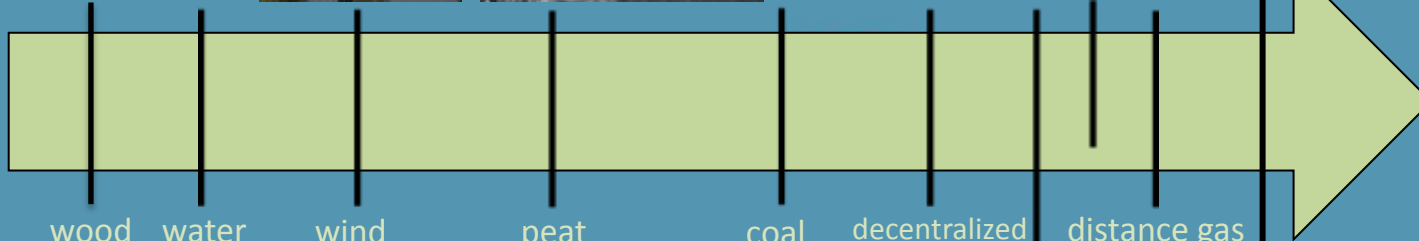
wood

water

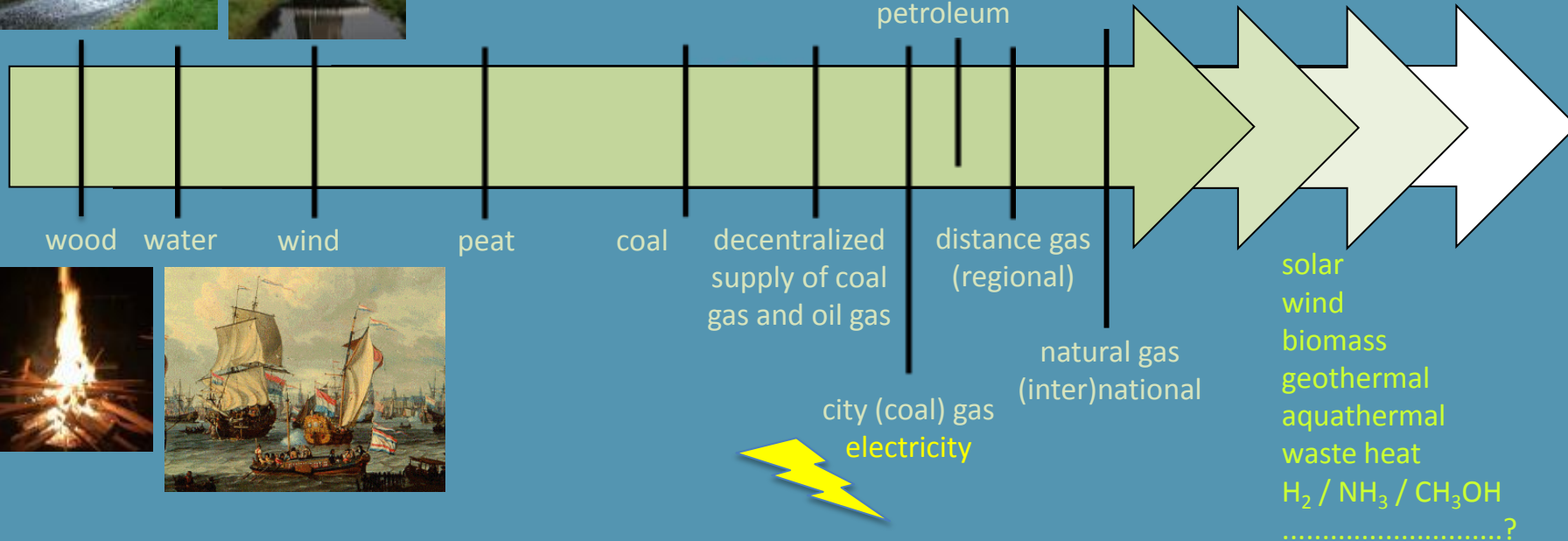
wind

peat

coal



Energy transitions



CLINGENDAEL
INTERNATIONAL
ENERGY
PROGRAMME

CIEP

Integrated Energy System Transition

From one backbone to the next

CIEP-NOGEPA Gas Day
7 September 2017

The energy system is a System-of-Systems

- Exhibiting many barriers to change
 - Capital intensity
 - Technical lifespan of physical components
 - Established actors
 - Vested interests
 - Established patterns/routines of energy use
 - Interdependencies within and beyond the energy system, across multiple scales (spatial and temporal)
 - Infrastructure (market) and sector-specific laws and regulations
 - National and supranational institutions

Infrastructure is an accumulation of the past

- In spatial structure and landscapes
 - urbanization pattern, urban structure
 - natural, industrial and cultural heritage
- In economic structure
 - industrialization pattern
 - explicit stimuli for energy intensive industry
 - digital economy
- In social routines and user behavior
 - mobility patterns, telecommunications
 - comfort levels in built environment



Infrastructure embodies the values of the past

- Private initiative:
 - Innovative service provided to affluent customers (industries and the happy few)
- Public utilities:
 - Local >>> regional >>> national monopolies (efficiencies of scale)
 - Vertically integrated supply chains (efficiencies of scope)
 - Universal access/universal service obligation
 - Regulations for protection of health, safety and environment
- Liberalization, deregulation, unbundling and privatization
 - Introduction of competitive market forces
 - Encouraging private sector initiative

Infrastructure embodies the values of the past

- Private initiative:
 - Innovative service provided to affluent customers (industries and the happy few)  ➤ Exclusiveness
- Public utilities:
 - Local >>> regional >>> national monopolies (efficiencies of scale)
 - Vertically integrated supply chains (efficiencies of scope)
 - **Universal access/universal service obligation**  ➤ Inclusiveness
 - Regulations for protection of health, safety and environment  ➤ Availability of service
- Liberalization, deregulation, unbundling and privatization
 - Introduction of competitive market forces
 - Encouraging private sector initiative  ➤ Innovation
 - Regulations for consumer protection  ➤ Affordability of service

What about the values of the future?

- Combating climate change (Paris agreement)

- Urgency to restrict global warming
- Radical change towards climate neutral energy system
- Renewable energy resources/new energy technologies
- New energy carriers and physical infrastructure



- Innovation
- Efficiency/digitization
- Citizen and community initiatives

- Security of supply (geopolitical volatility)

- Radical change in supply chains towards/within the energy system
- New criticalities e.g., critical materials



- Innovation
- Availability of service

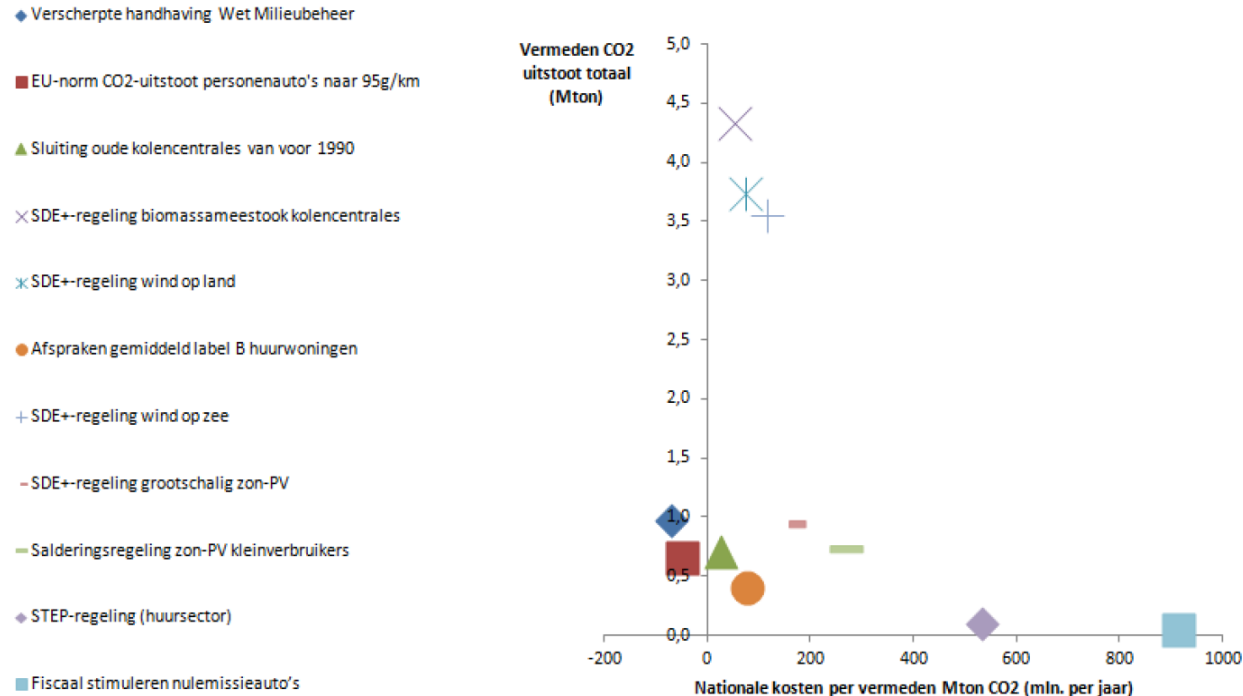
- Inclusiveness - back on the agenda

- Rising concerns about future availability and affordability
- Rising concerns about distribution of costs and benefits
- Both at local scale (neighborhoods, cities) and global scale (SDGs)



- Affordability (poverty)
- Acceptability (justice, fairness, privacy, security, etc.)

Cost efficiency of CO₂ reductions (2020) accomplished through various policy interventions



Source: IBO Kostenefficiëntie CO₂-reductiemaatregelen, Inspectie der Rijksfinanciën, April 2016.

Cost efficiency of CO₂ reductions (2020) accomplished through various policy interventions

◆ Verscherpte handhaving Wet Milieubeheer

■ EU-norm CO₂-uitstoot personenauto's naar 95g/km

▲ Sluiting oude kolencentrales van voor 1990

× SDE+-regeling biomassameestook kolencentrales

✱ SDE+-regeling wind op land

● Afspraken gemiddeld label B huurwoningen

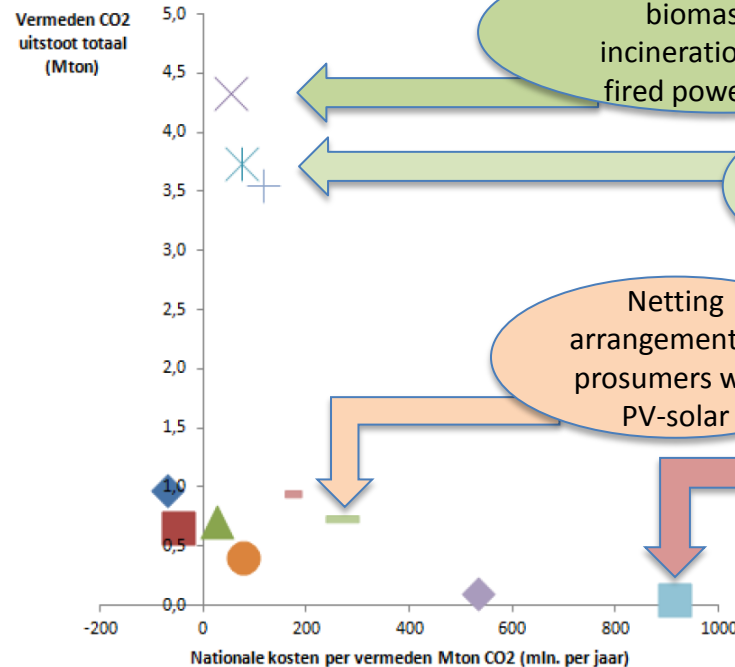
+ SDE+-regeling wind op zee

- SDE+-regeling grootschalig zon-PV

— Salderingsregeling zon-PV kleinverbruikers

◆ STEP-regeling (huursector)

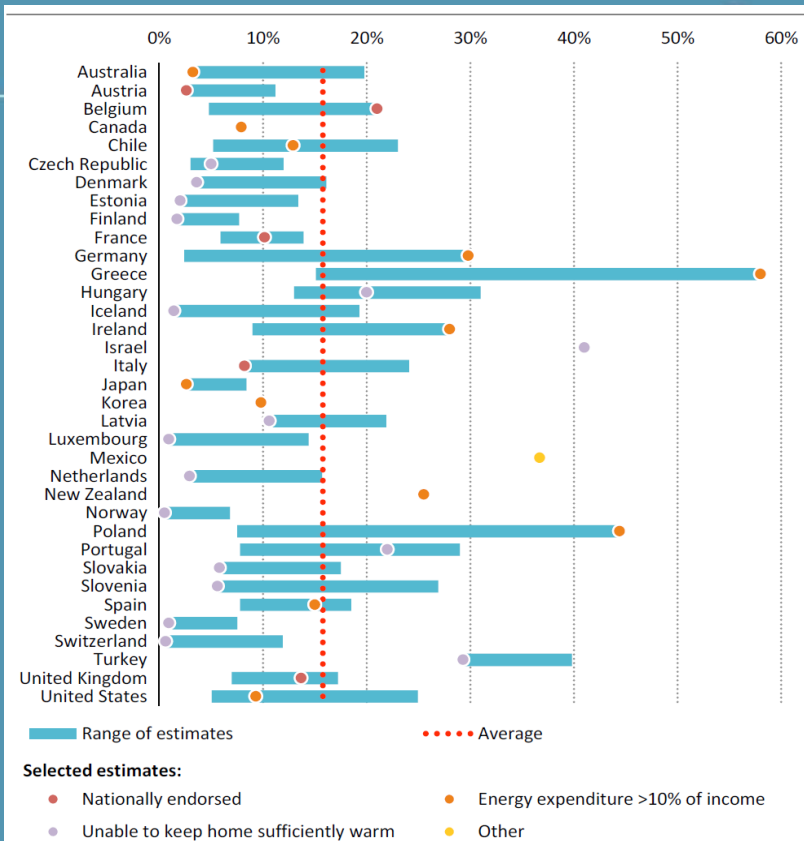
■ Fiscaal stimuleren nulmissieauto's



Source: IBO Kostenefficiëntie CO₂-reductiemaatregelen, Inspectie der Rijksfinanciën, April 2016.

EU Energy Poverty Observatory

launched 29 January 2018



Energy poverty affects a significant proportion of the population in developed countries, although estimates for each country depend on the measure used

Sources: IEA analysis based on various national sources, academic research papers and European Union Survey of Income and Living Conditions (EU-SILC, 2013).

European Pillar of Social Rights

The Pillar of Social Rights is about **delivering new and more effective rights for citizens**. It builds upon 20 key principles, structured around three categories:

- Equal opportunities and access to the labour market
- Fair working conditions
- Social protection and inclusion

20. Access to essential services

Everyone has the right to access essential services of good quality, including water, sanitation, **energy**, transport, financial services and digital communications. Support for access to such services shall be available for those in need.



Shaping 'the' energy transition

- Is about more than new technology and infrastructure
- It will shape
 - The quality of our natural environment
 - The quality of our living environment
 - Our quality of life, as individuals
 - Our way of living and coexisting as a society
- **Infrastructure is the fabric of our society, constantly evolving**
 - How to acknowledge the social dimension of energy infrastructure?
 - How to shape the transition wrt emergent societal values and priorities?
 - How to involve citizens and communities in a meaningful way?

Infrastructure is not a goal in itself,
but a means to accommodate the
society we want to be.

May it be an inclusive society ...