



EIRES

EINDHOVEN INSTITUTE
FOR RENEWABLE
ENERGY SYSTEMS

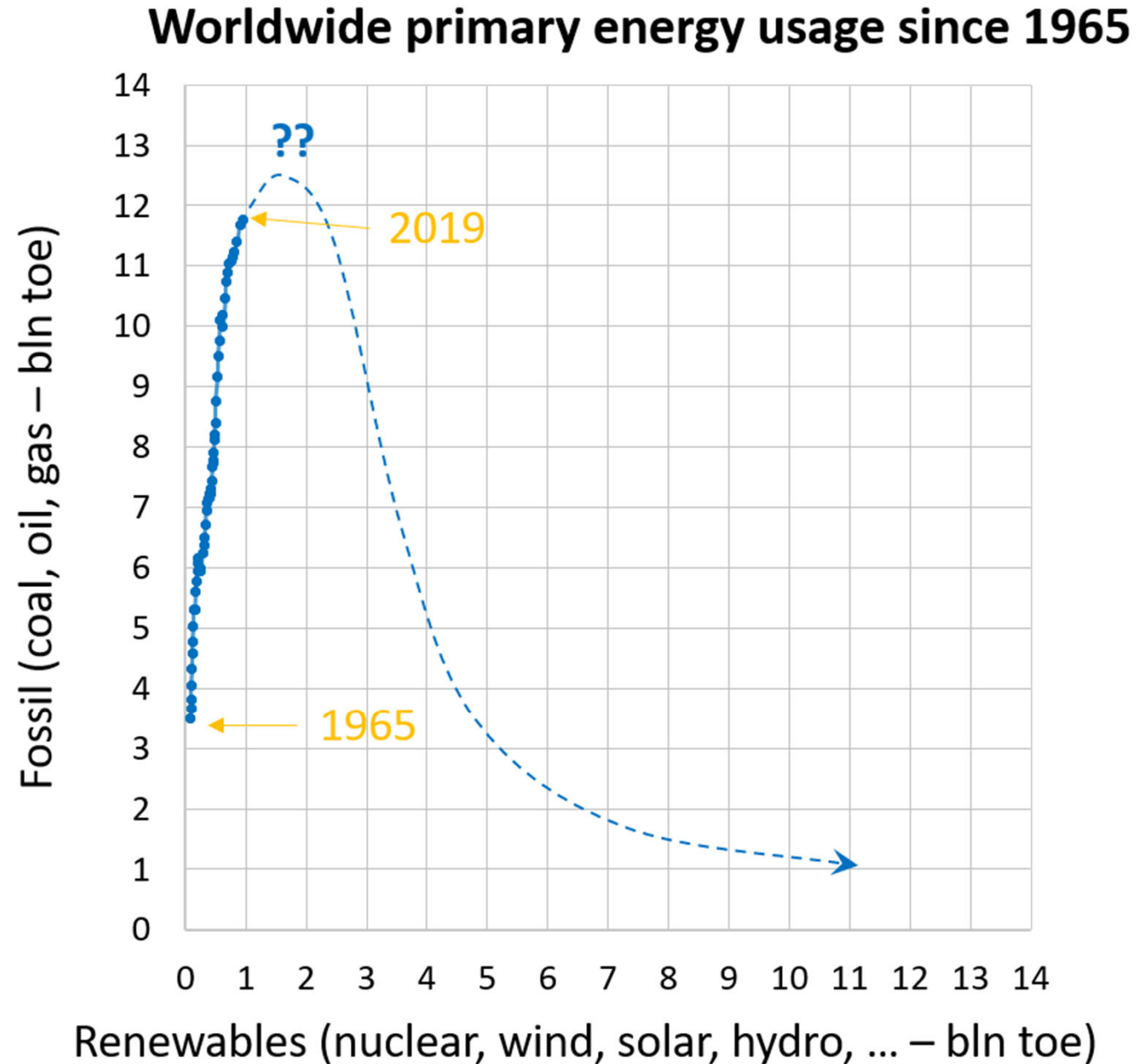
TU/e

DRIVING THE ENERGY REVOLUTION

Mark Boneschanscher
Presentatie KIVI-ESNL Webinar 20 mei 2021

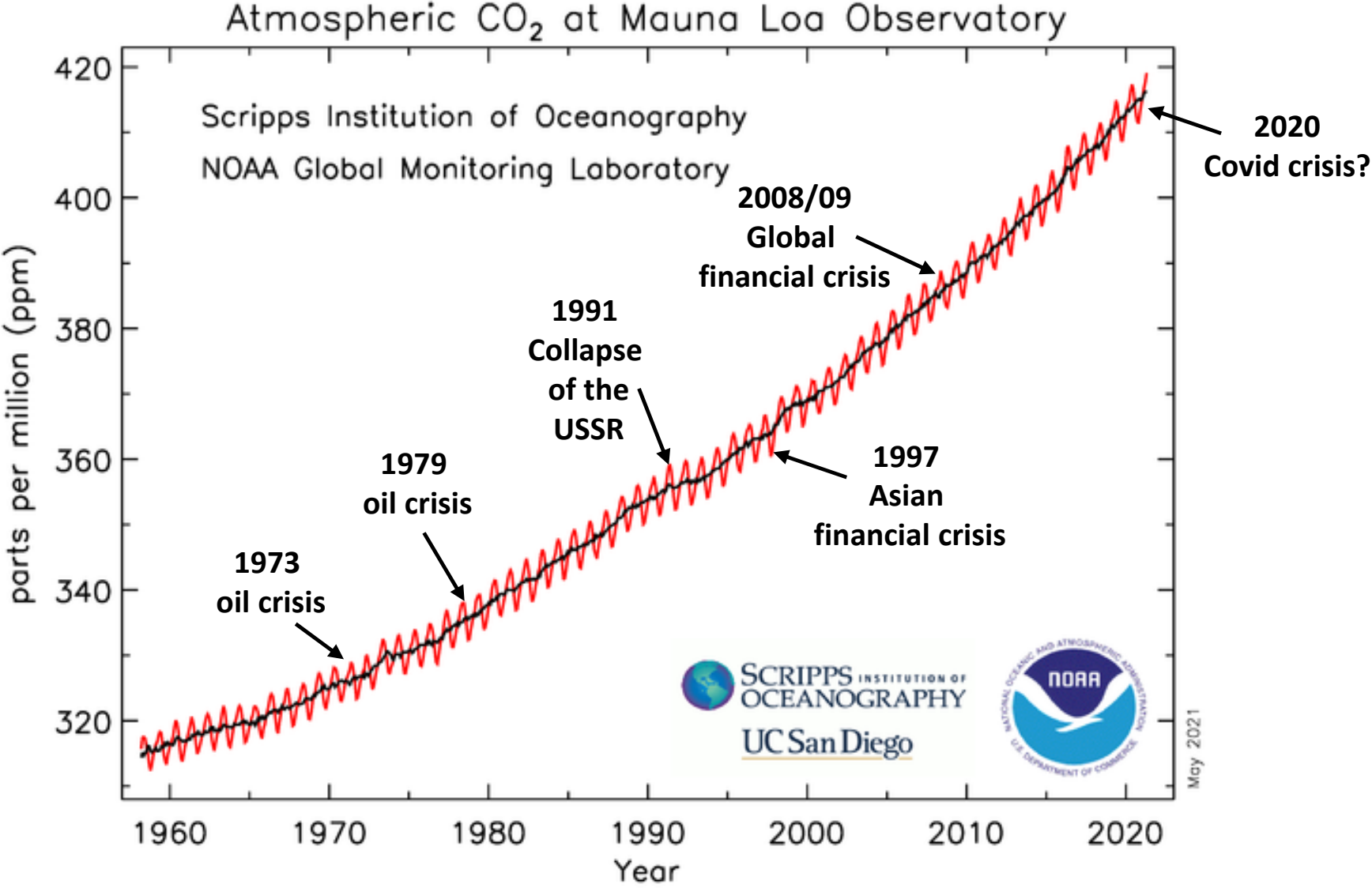
more info: www.tue.nl/eires | eires@tue.nl

The energy transition: where do we stand?



Based on prof.dr. Vianney Koelman
Data: Hannah Ritchie, OurWorldInData.org, 2020

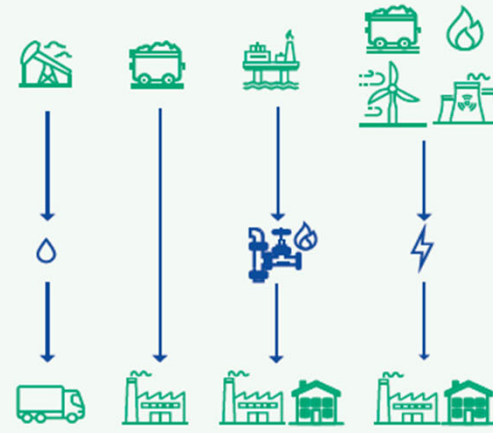
The energy transition: where do we stand?



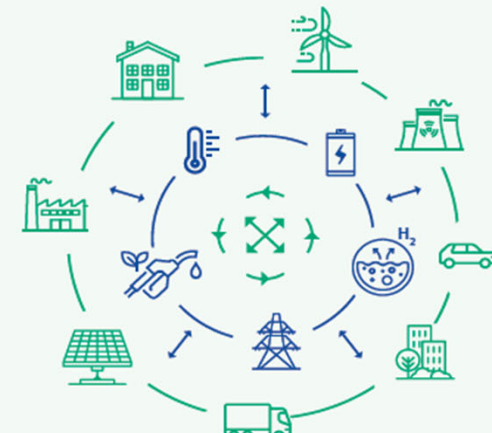


Renewables bring new challenges

The energy system today : linear and wasteful flows of energy, in one direction only

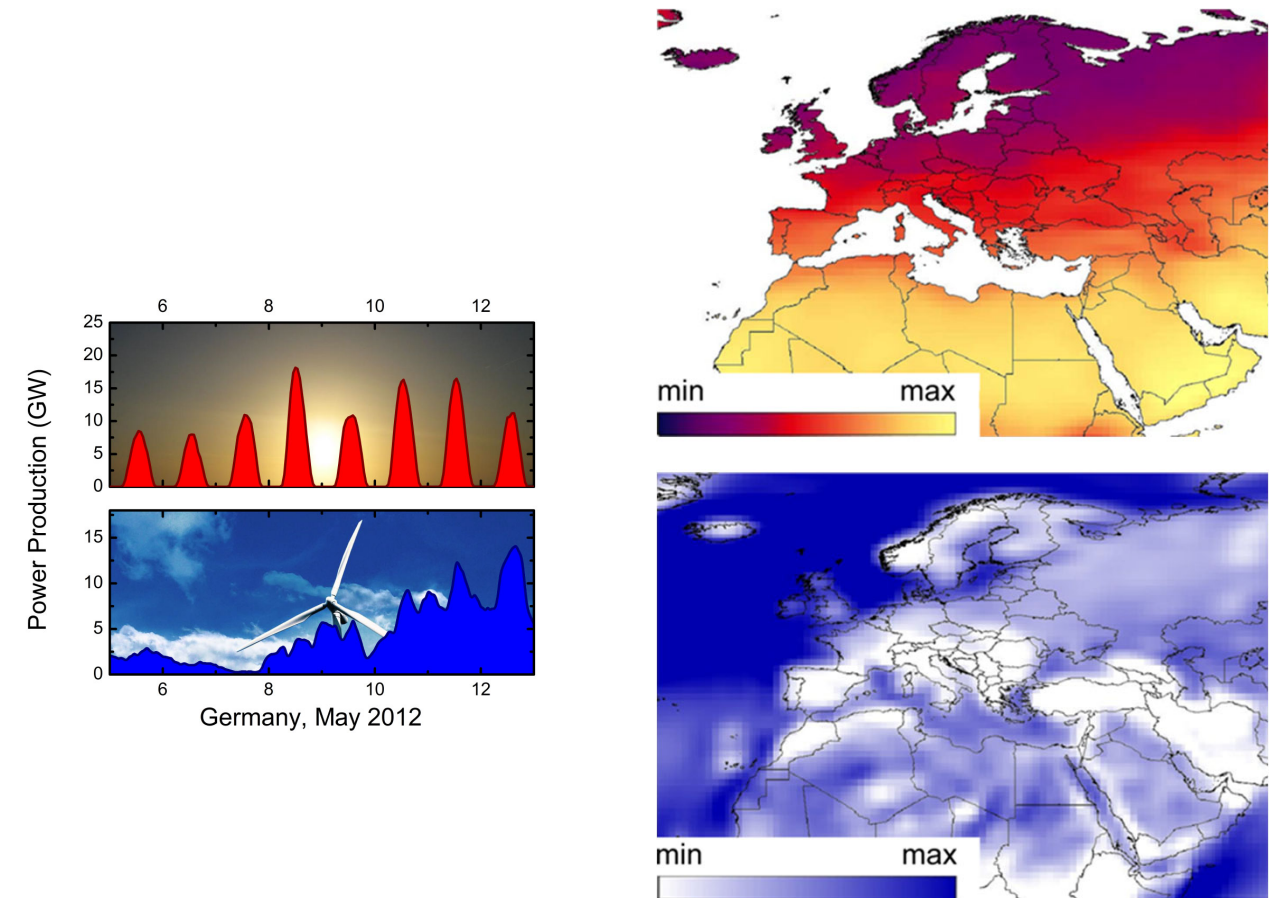


Future EU integrated energy system : energy flows between users and producers, reducing wasted resources and money



An Integrated EU Energy System will have **three main characteristics:**

- A more **efficient and “circular” system**, where waste energy is captured and re-used
- A **cleaner power system**, with more direct electrification of end-use sectors such as industry, heating of buildings and transport.
- A **cleaner fuel system**, for hard-to-electrify sectors like heavy industry or transport



Supply and demand: a mismatch in time and place

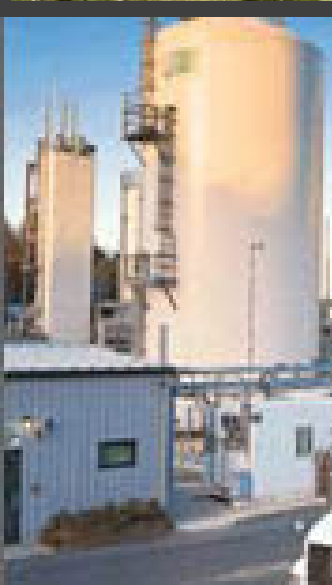
→ Transport, conversion and storage of renewable energy is key!



The role of granularity

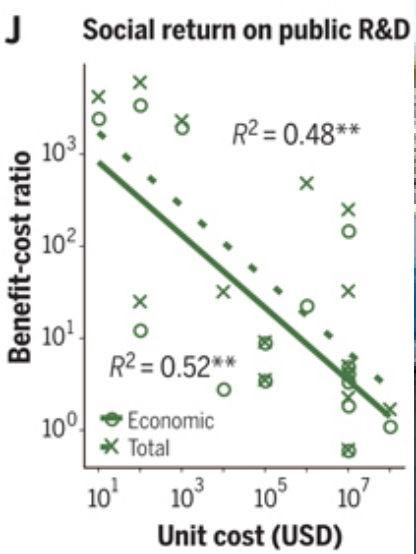
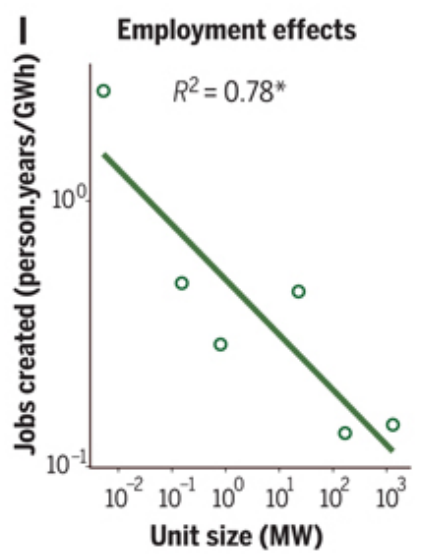
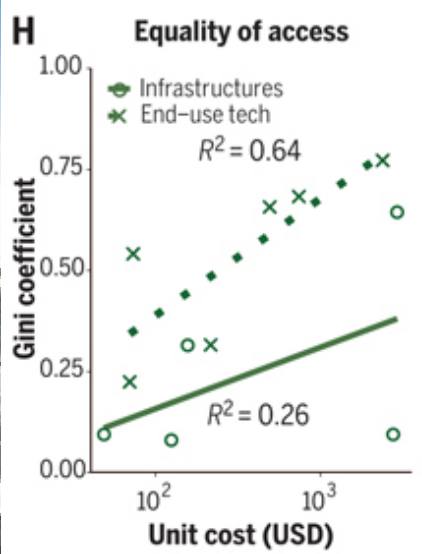
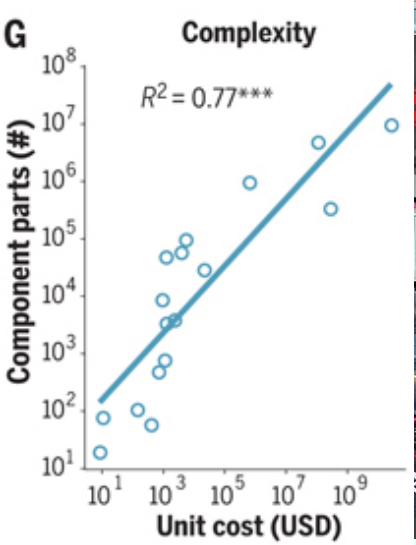
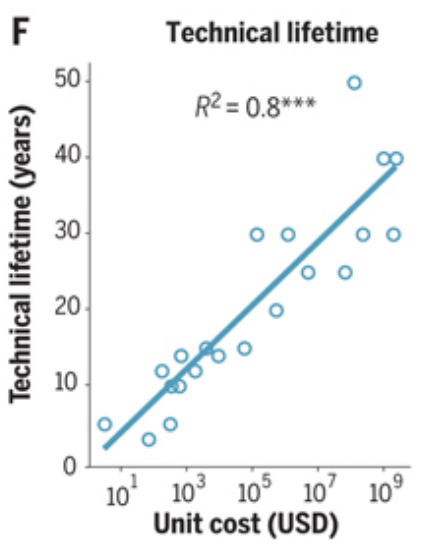
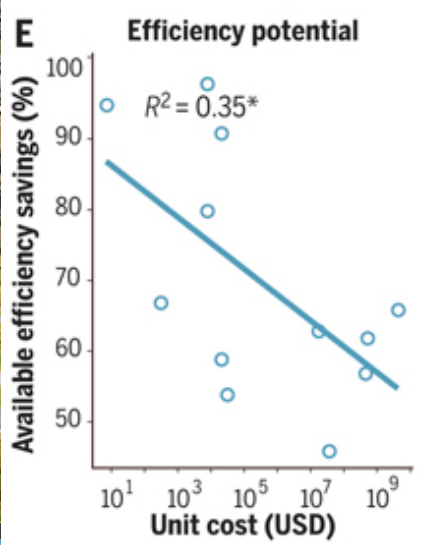
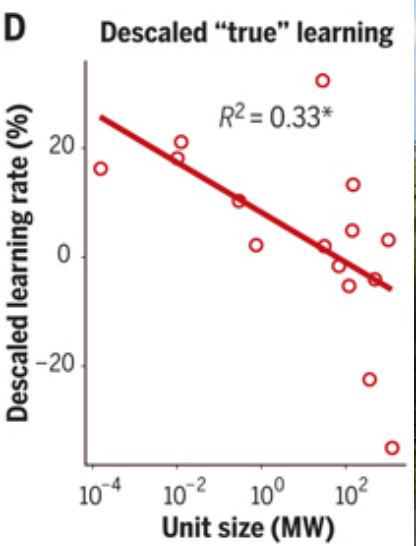
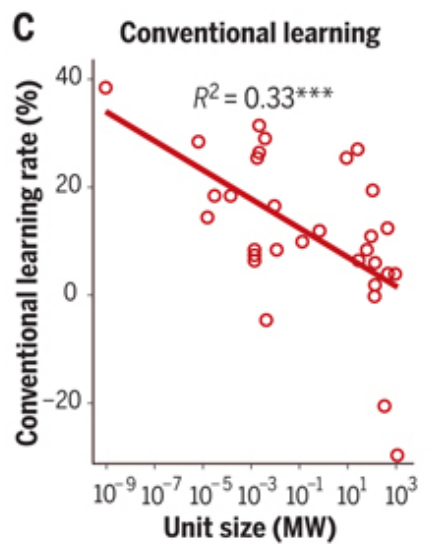
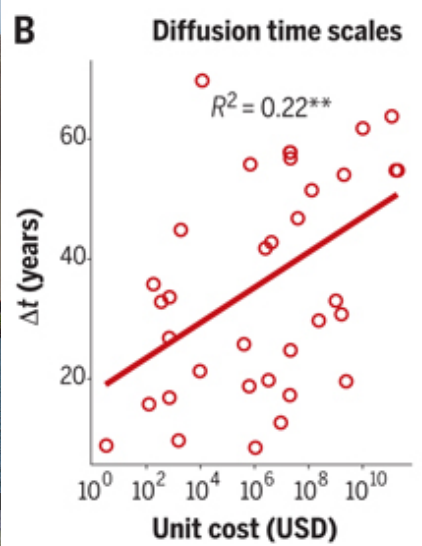


C Wilson *et al.*, Science 368, 6486 (2020)
images taken from Wikipedia



The role of granularity

● Rapid technology deployment ● Escaping lock-in ● Social legitimacy



C Wilson *et al.*, Science 368, 6486 (2020)

images taken from Wikipedia

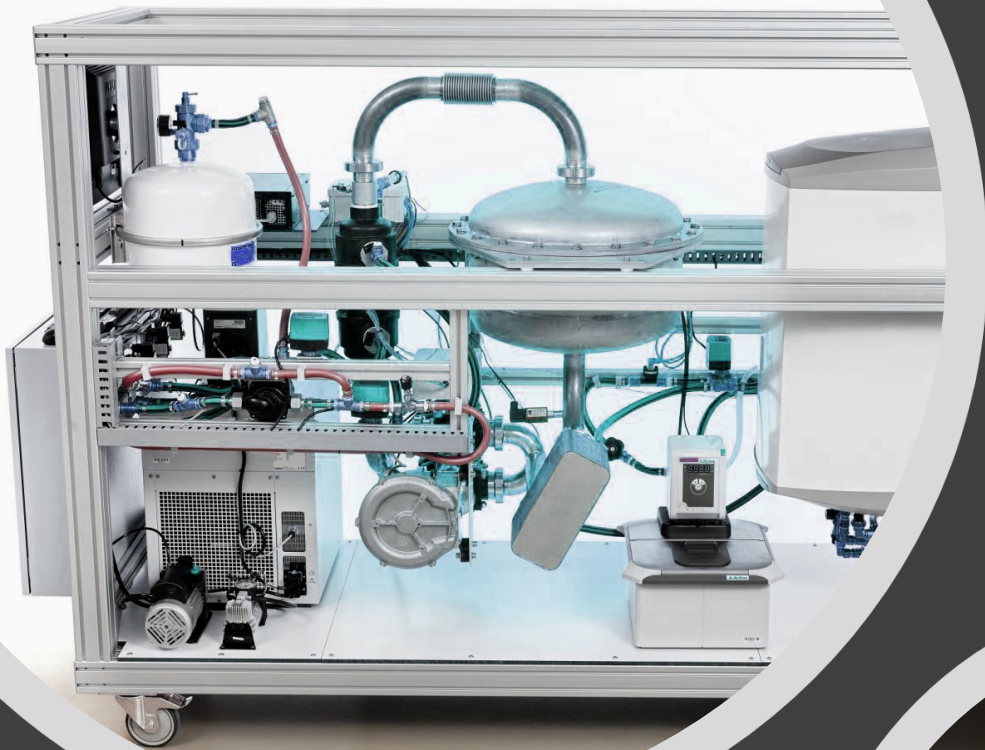
EIRES

- Opened 31 August 2020 by state secretary Van Veldhoven
- Signing of MoU with VDL
- Bringing together TU/e research aimed at systems for energy conversion and storage
- Development of iron systems together with the high-tech manufacturing industry

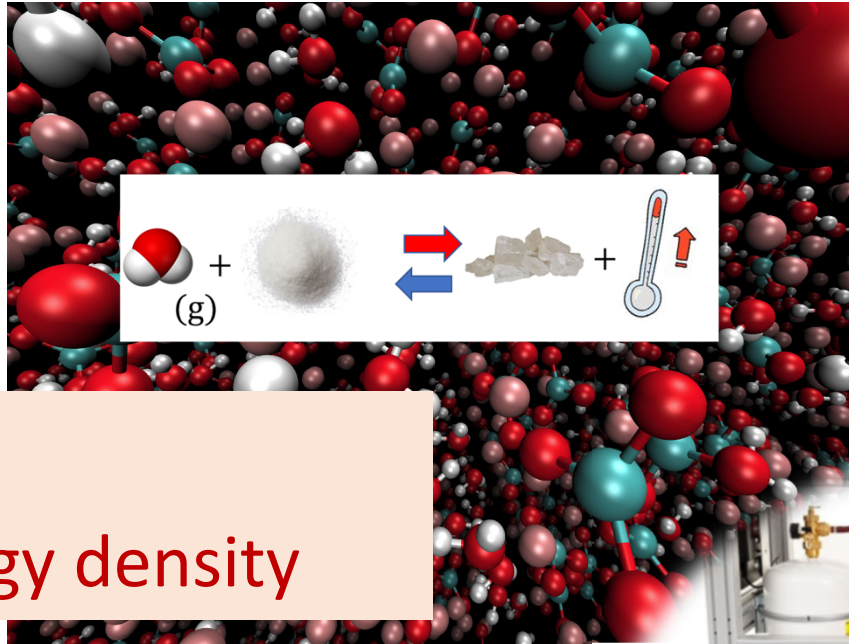


Systems for Sustainable Heat

- Chairs: Silvia Gaastra-Nedeia and Henk Huinink
- Focus on development of new materials and systems for heat storage and transport
- Icon project heat battery
- Partners:

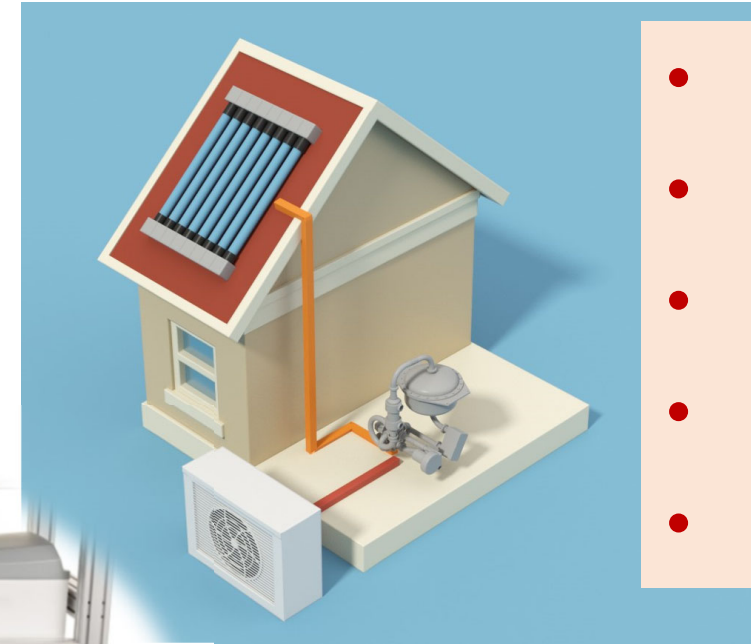


The thermochemical principle



- loss-free
- high energy density

En route to applications

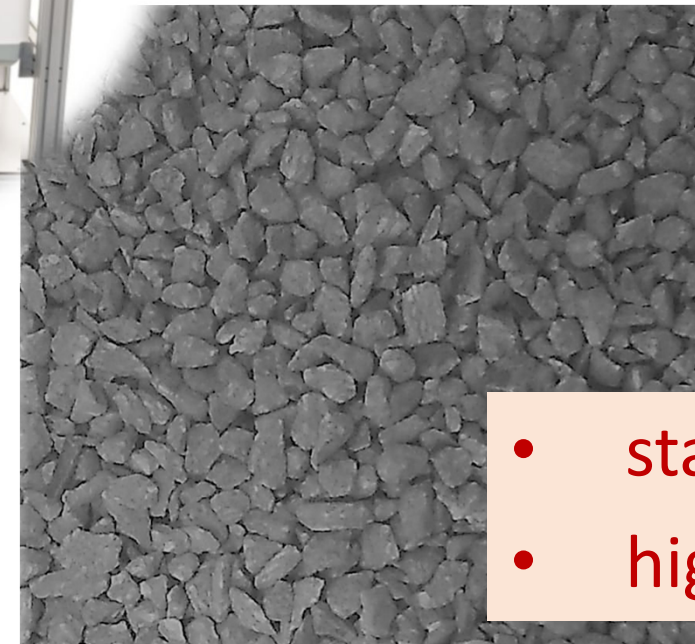


- affordable
- compact
- scalable
- silent & safe
- option: cooling



- simplicity:
4 components

new device principle

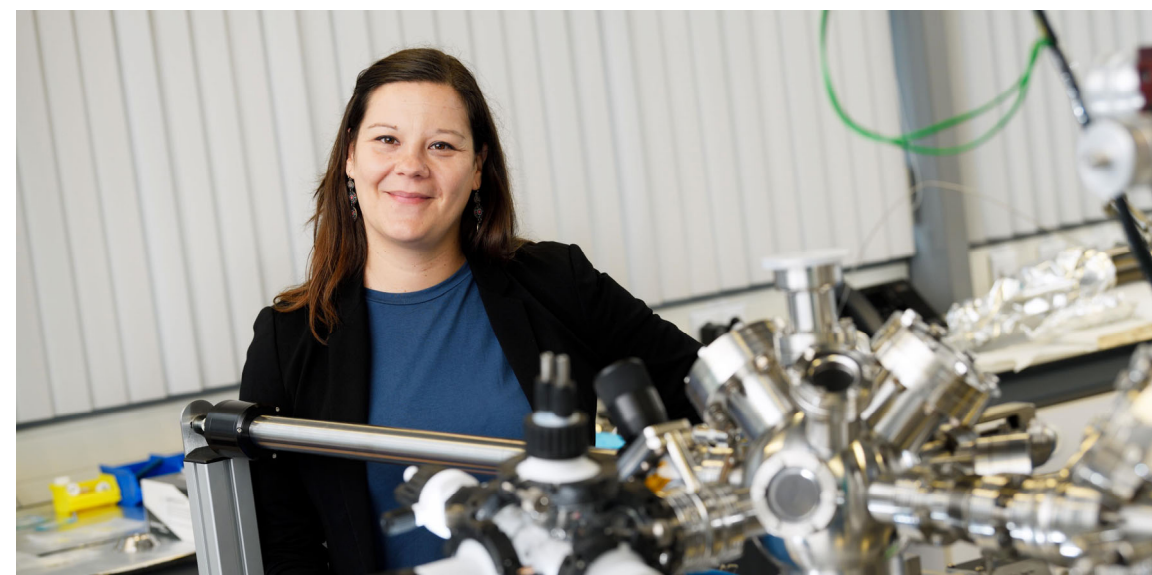
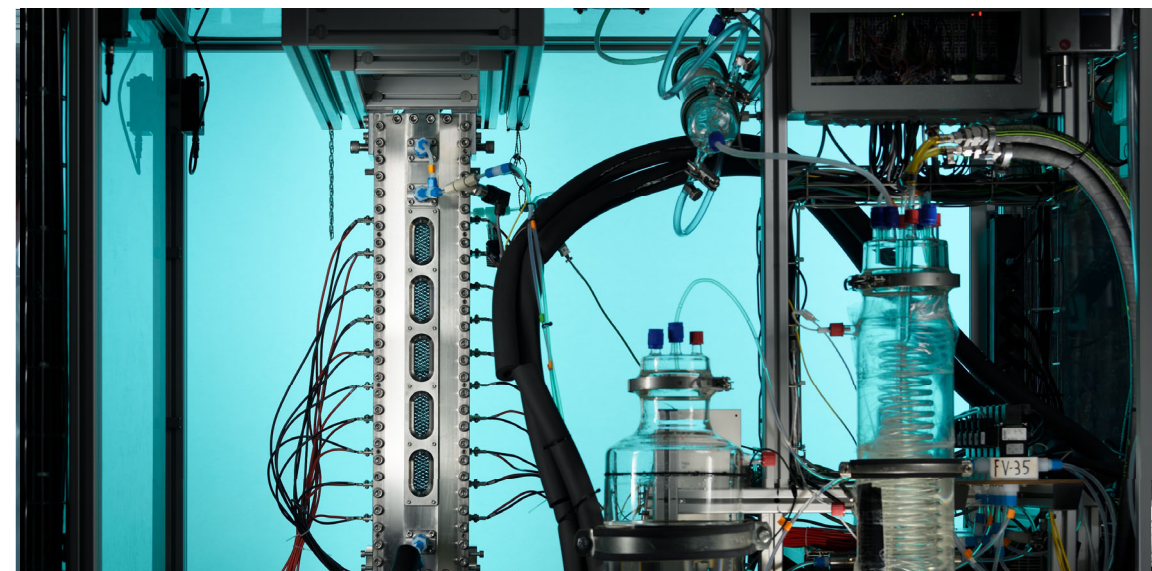


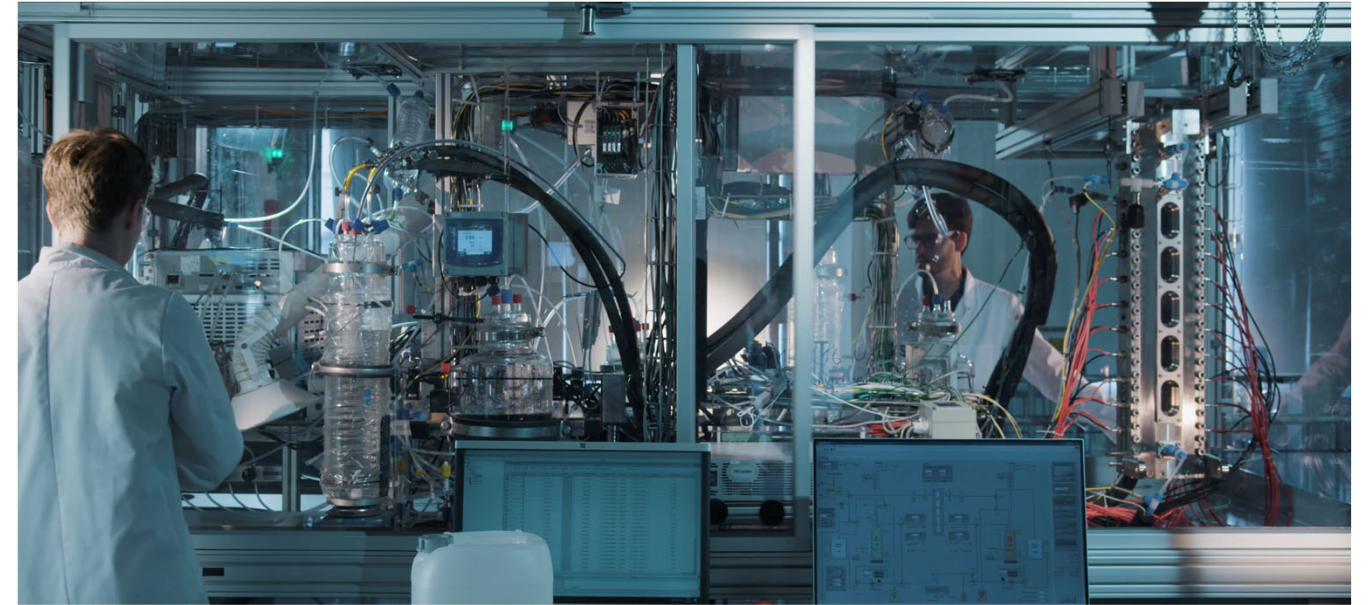
- stable
- high power

K₂CO₃-composite

Chemistry for Sustainable Energy Systems

- Chairs: Marta Costa Figueiredo and Adriana Creatore
- Focus on materials and structures to improve the performance of (electro)catalysts
- Icon project Dutch Electrolyzer
- Partners:





Alkaline

- + Relatively cheap and robust
- + Critical or scarce raw materials are not required
- Big and relatively inflexible

PEM

- + Small and flexible
- Expensive
- Critical and scarce raw materials required

AEM

- + Small and flexible
- Expensive
- + No critical or scarce materials required



Systems Integration

- Chairs Lisanne Havinga and Guus Pemen
- Focus on modeling the production, conversion, and storage of renewable energy
- Icon project Digital Toolbox
- Partners:



WOONinc.



TRUDO



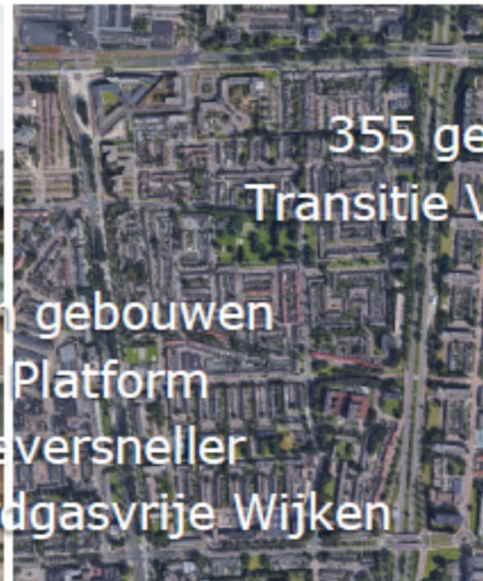
De Beijer RTB B.V.



Gebouw



Wijk



Gemeente / Stad



Regio / Land



Continent / Wereld



'Rekenkern'
Digitale Platform

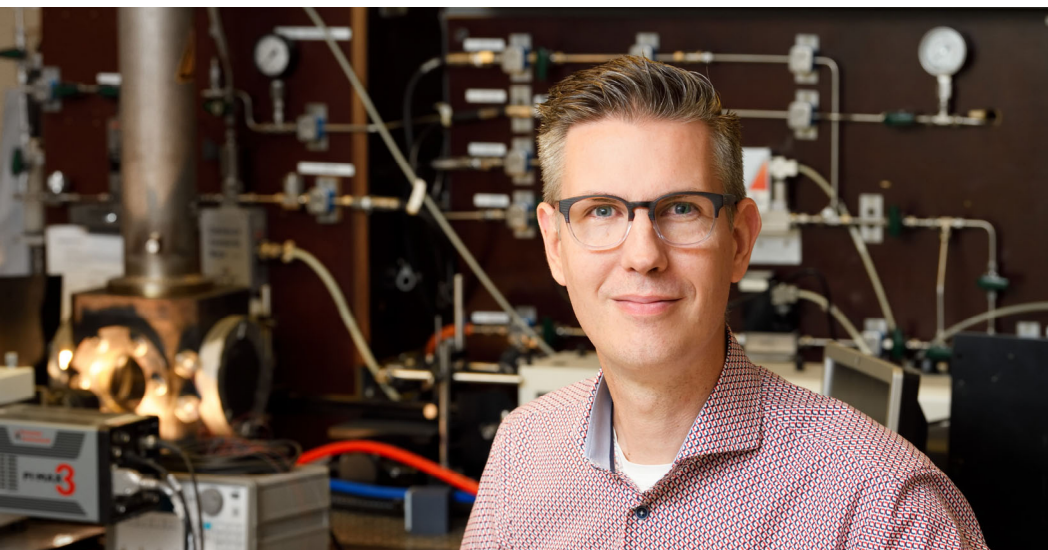
modellen t.b.v. optimalisatie renovatie-oplossingen bestaande woningen
gegeven de TVW op wijkniveau

Multi-Energy, Multi Scale (MEMS)
System Integration in the Built Environment

modellen t.b.v. optimalisatie TVW
o.b.v. systeemintegratie op gebouw,
wijk en stadsniveau

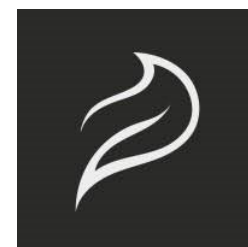
modellen t.b.v. optimale transitiepaden met
een focus op regionaal en landelijk niveau
en op hernieuwbare energie en mobiliteit

New Energy and mobility Outlook
for the Netherlands (NEON)



Engineering for Sustainable Energy Systems

- Chairs Niels Deen and John van der Schaaf
- Focus on the design and testing of technical solutions for sustainable energy storage and conversion
- Icon project metal fuels
- Partners:



Provincie Noord-Brabant



Foto credits Bart van Overbeeke and Mees van den Ekart



Conclusions

- The energy transition requires scaling up rapidly
- Transport, conversion and storage of sustainable energy is key
- EIRES focus is therefore on small, modular scalable systems
- Research is organized around icon systems defined with industry



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Questions or comments?

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