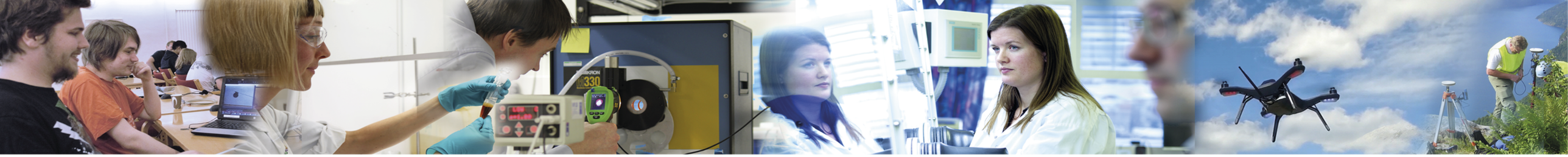


UiO : Department of Technology Systems
University of Oslo

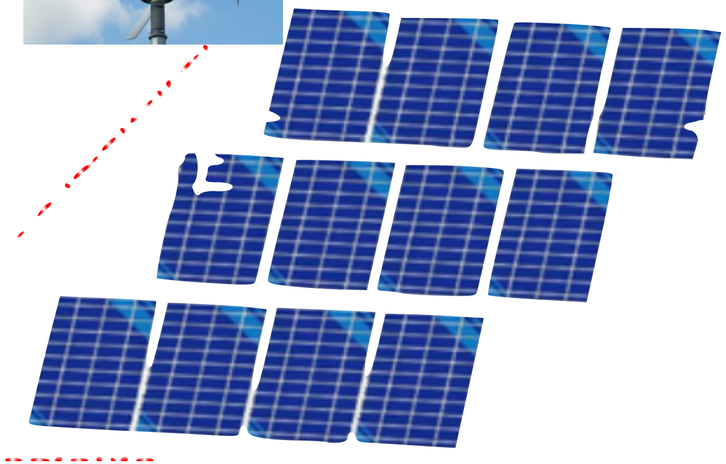
ITS seminar Lysebu, 10Oct2022

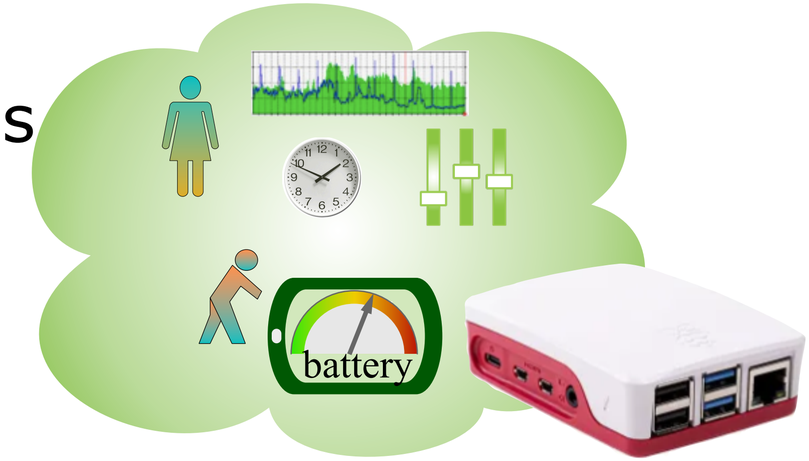
Distributed Energy System and Security Infrastructure (DESSI)

Josef, Øivind, Marianne, Sabrina,… (Energy & Security)

Infrastructure for UiO

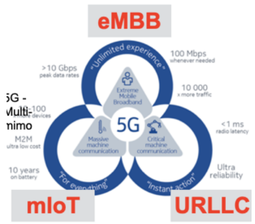
- Background
  - Digital (Energy) Systems
  - Societal vulnerability (tibber…)
    - security, privacy
- Energy system modelling
  - home/building
  - industrial systems
  - neighbourhood
  - country level



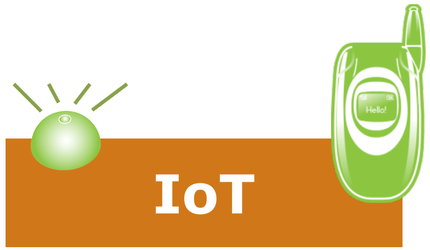


Digitalisation as enabler

People
Society



5G/6G



IoT

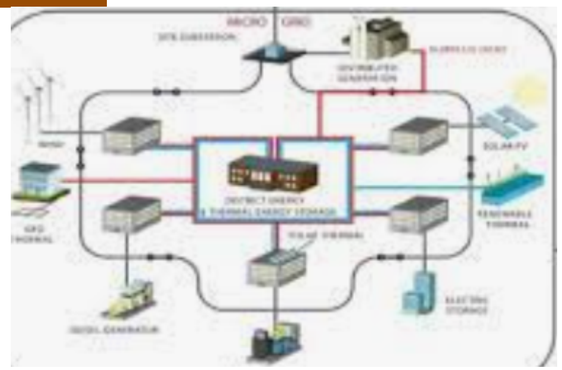
Machine Learning

Artificial Intelligence

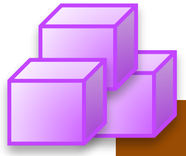
Blockchain

knowledge
KISS (simple)
for all people

PhotoVoltaics



MicroGrid



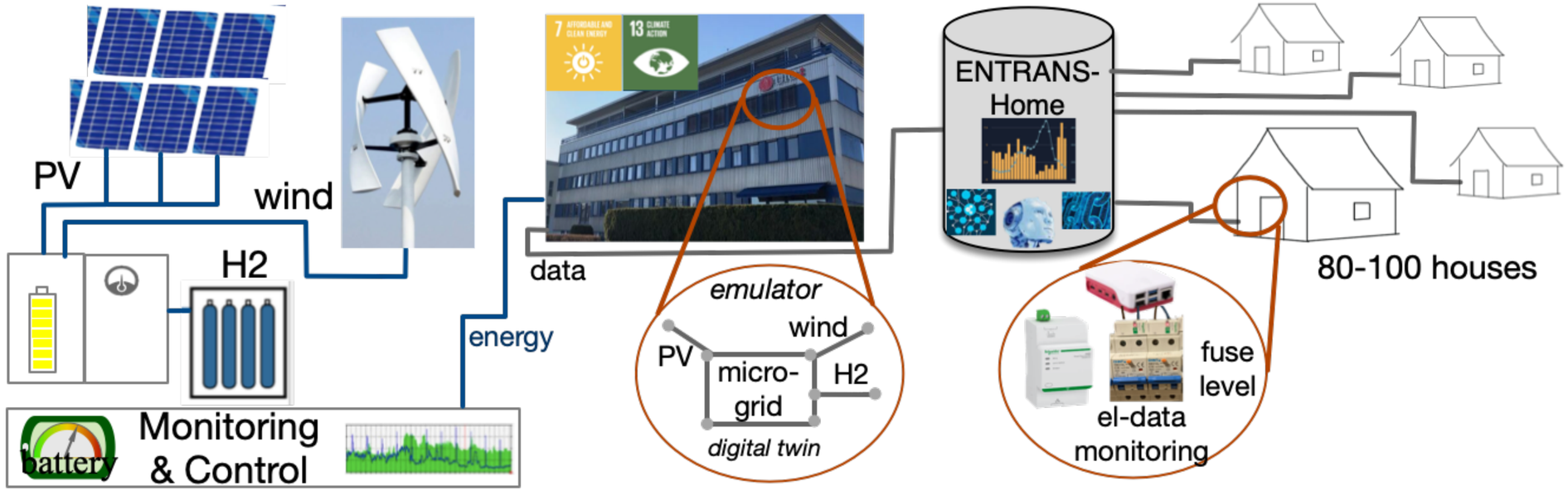
battery

waste 2 energy

electrical vehicles

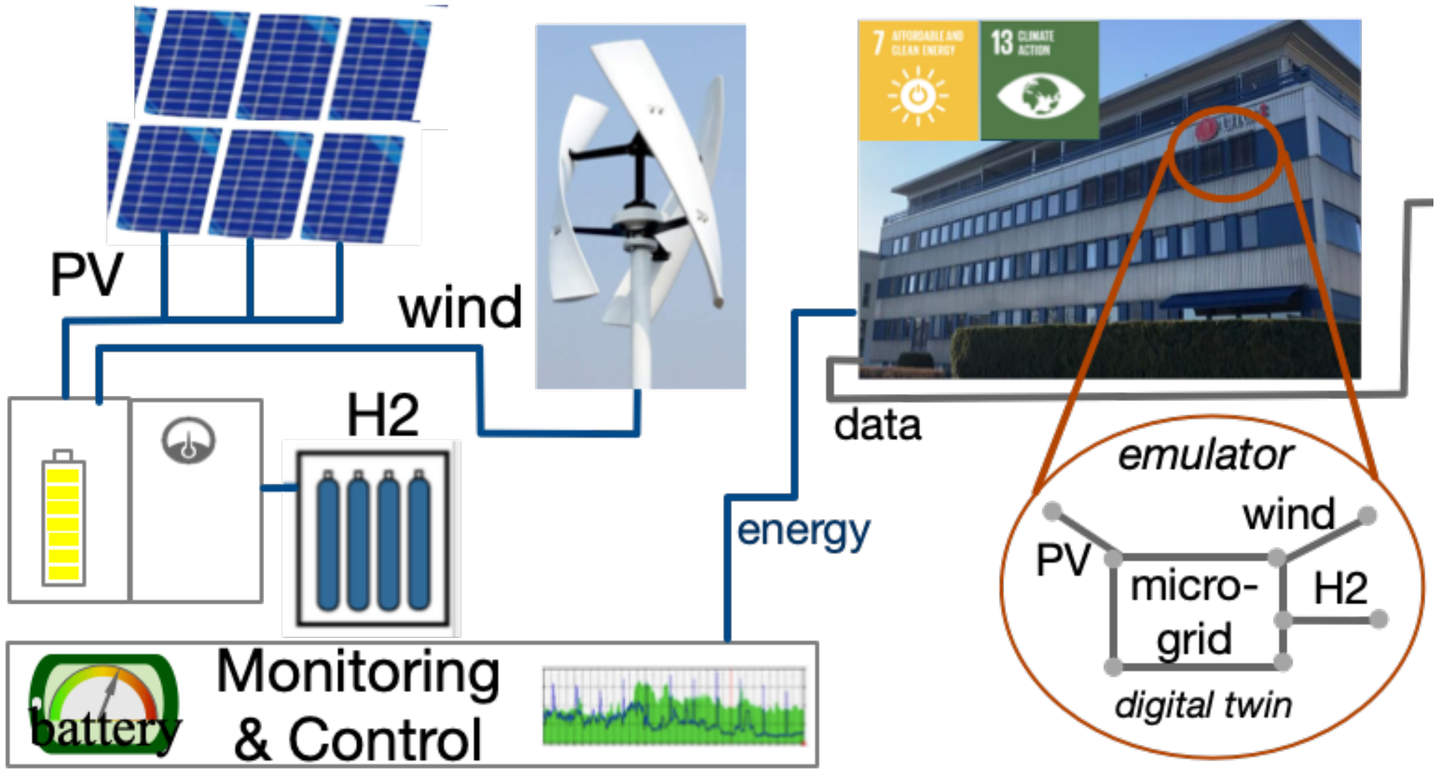
Distributed Energy System and Security Infrastructure (DESSI)

- Physical infrastructure (PC, H2, wind)
- Digital Twin (Simulator)
- ENTRANS-Home scientific database



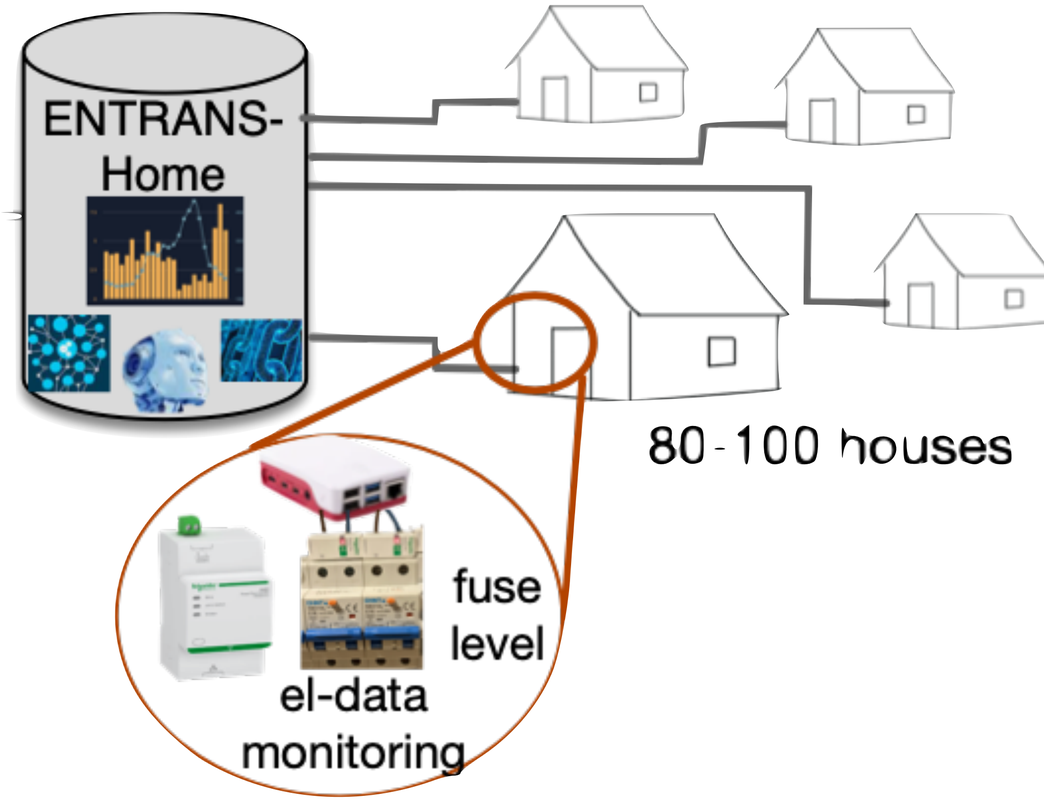
Physical infrastructure & Digital Twin

- Physical infrastructure
  - understanding real data
  - weather (effect)
- Simulator lab
  - Digital Twin
    - SFF: *Twins4Life: The Science of Digital Twins (322299)*
  - Simulate
    - Climate effect
    - daily/seasonal variations
- Outcome
  - Education & research
  - Recommendations & public



ENTRANS-Home scientific database

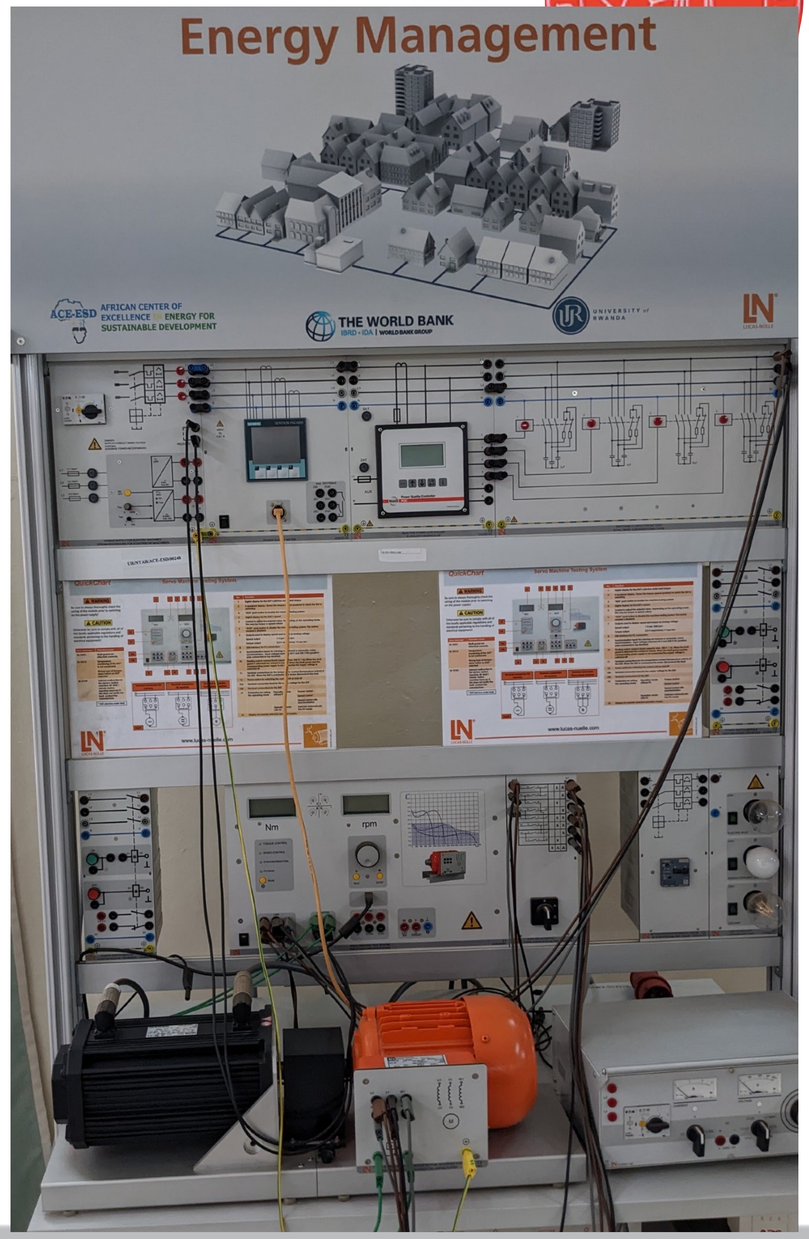
- Unique Scientific database
  - high-resolutions electricity data
  - every 10 s, per fuse
  - commercial actors (tibber, homely,…)
- Outcome
  - Recruitment: VGS Oslo-Viken (Nittedal, Strømmen, Ullern,… Elektrofagdag)
  - Research:
    - privacy awareness (10 s, 1 min, **15 min, 1 h**…)
    - H2020 unique database
  - Recommendations: "*Nettleiemodell*"



Bruk aldri vaskemaskin, tørketrommel eller andre husholdningsapparater når du ikke er til stede eller sover.

[Source: https://www.elvia.no/nettleie/alt-du-ma-vite-om-ny-nettleie-for-2022/

Vision - a lab for our students



DESSI Lab equipment

International collaboration

- H2020

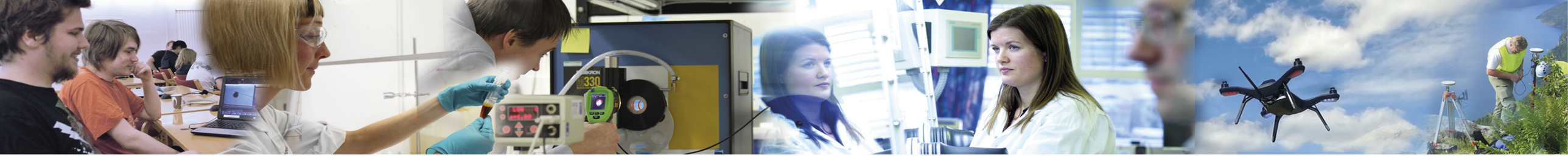
- EU-Africa

DESSI Lab equipment

Photovoltaic, Wind power, Micro-grid synchronisation

Battery, Hydrogen storage

Energy Management



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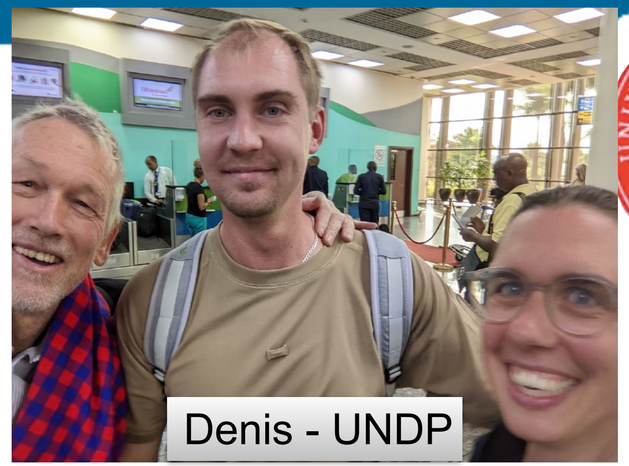
Strategic Dimension of DESSI

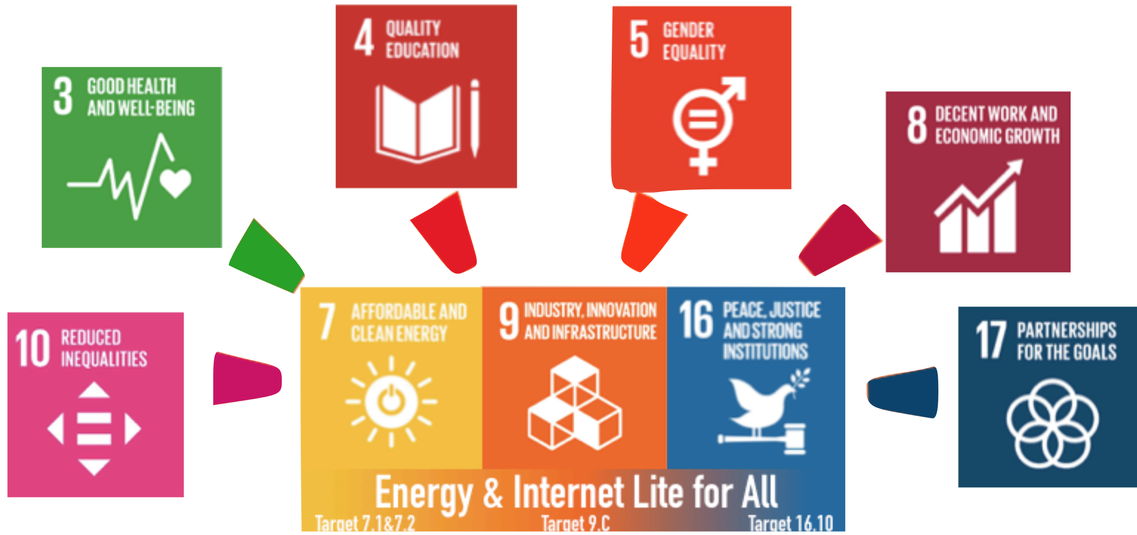
(Distributed Energy System and Security Infrastructure)

Josef, Øivind, Marianne, Sabrina, Matylda, Jonathan…
(Energy & Security)

Strategic Dimension for ITS and UiO

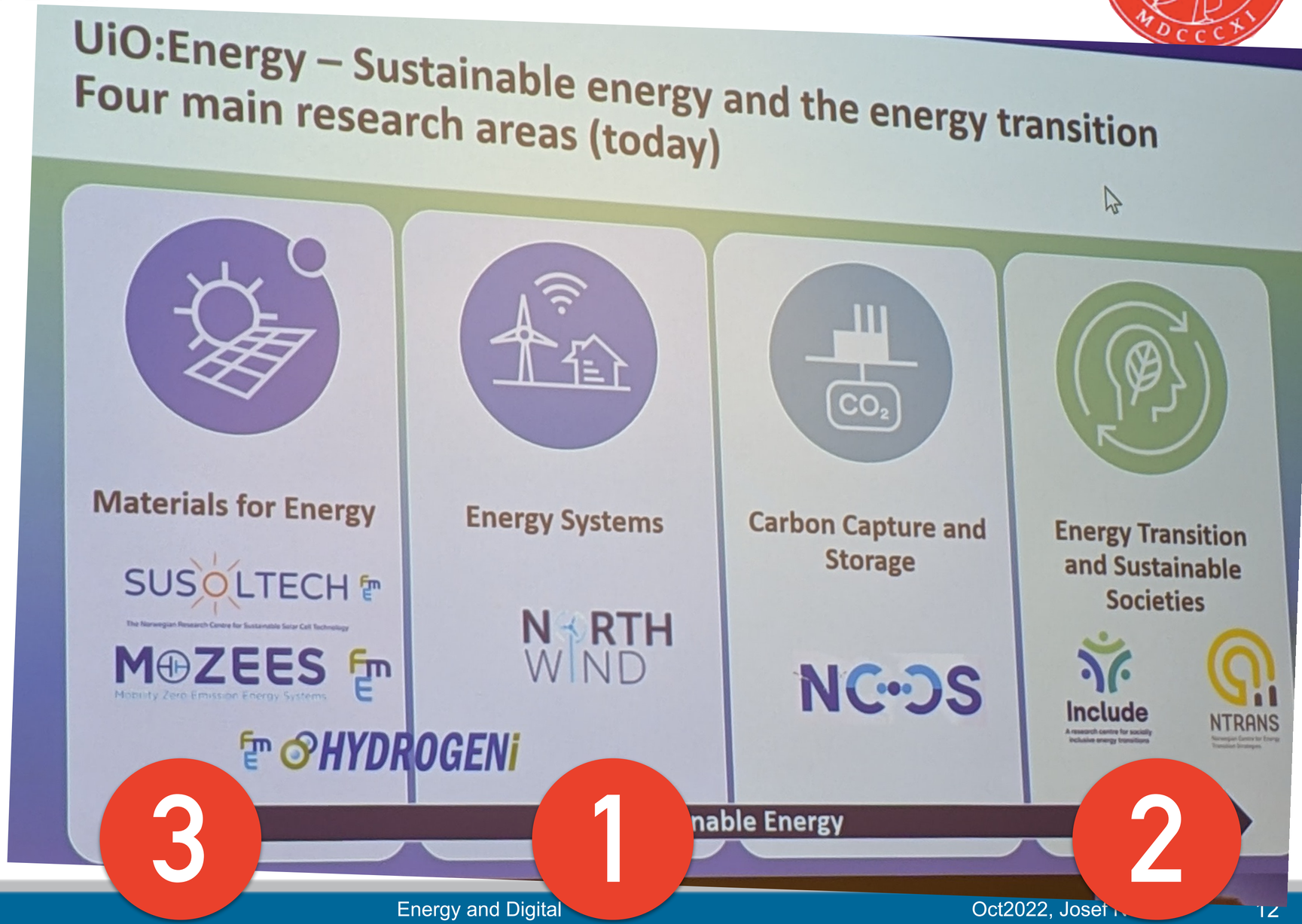


- "*UiO som bærkraftsuniversitet*"
  - Building blocks for empowerment & climate
  - Energy & Digital
- UiO:Energy & Environment
- NO: Transformation of the society
- EU-Africa
  - The Guild - ARUA
  - Global Gateway



UiO - perspective

- UiO:Energy & Environment
  - DESSI > Physics
  - Energy transition > UiO:Energy
- Digital Twin > Science
- Societal security > UiO:Democracy



NO (Oslo/Kjeller) - perspective

- Oslo Science City
  - digitalisation and computational science
  - democracy and influence
  - health and life science
  - climate, energy & environment: climate adaptation, climate neutral cities, carbon capture, hydrogen; battery tech; energy systems (and electrification), circular economy;
- Lillestrøm/Kjeller
  - “Klimabygg”
  - Kjeller ~~flyplass~~ (2023)
    - Gerrit Mosebach (Lillestrøm kommune)

https://www.lillestrom.kommune.no/samfunnsutvikling/byutvikling-og-stedsutvikling/planprosjekter/kjeller---ny-bydel-i-lillestrom/

UiO:Kjeller

UiO:Blindern

UiO campus Kjeller
- study & life
- “a real campus”

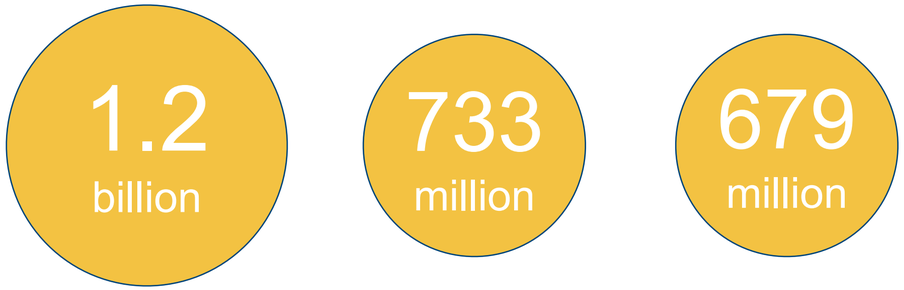
https://www.cityclub.org/blog/2021/04/05/free-speech-on-campus-universities-need-to-create-safe-but-critical-spaces-for-debate--heres-how-they-can-do-it

EU-Africa:
Energy & Digital & Climate

SDG 7.1 calls for universal access to …. energy by 2030

SDG 9c calls for universal, affordable internet access by 2020

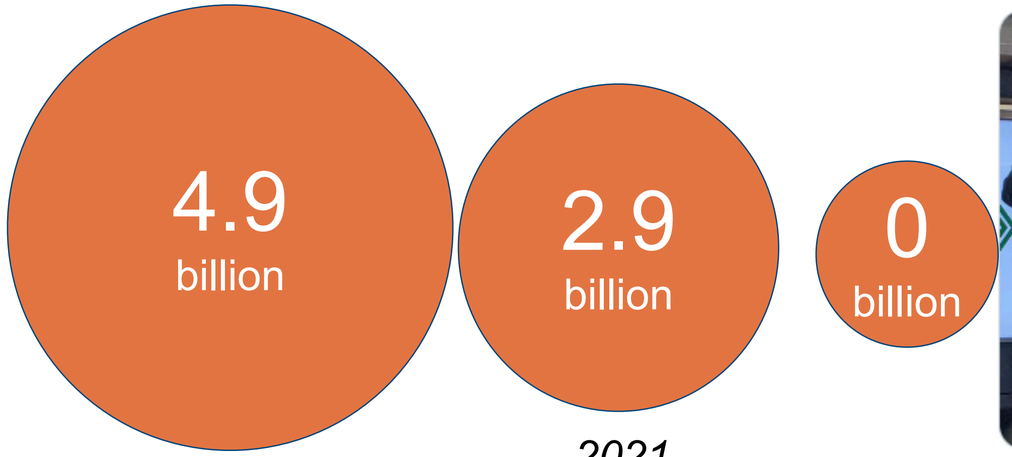
People without electricity



2010 | 2020 | 2030 (trend)

[WorldBank 2021]
https://www.worldbank.org/en/news/press-release/2021/06/07/report-universal-access-to-sustainable-energy-will-remain-elusive-without-addressing-inequalities

People not using Internet

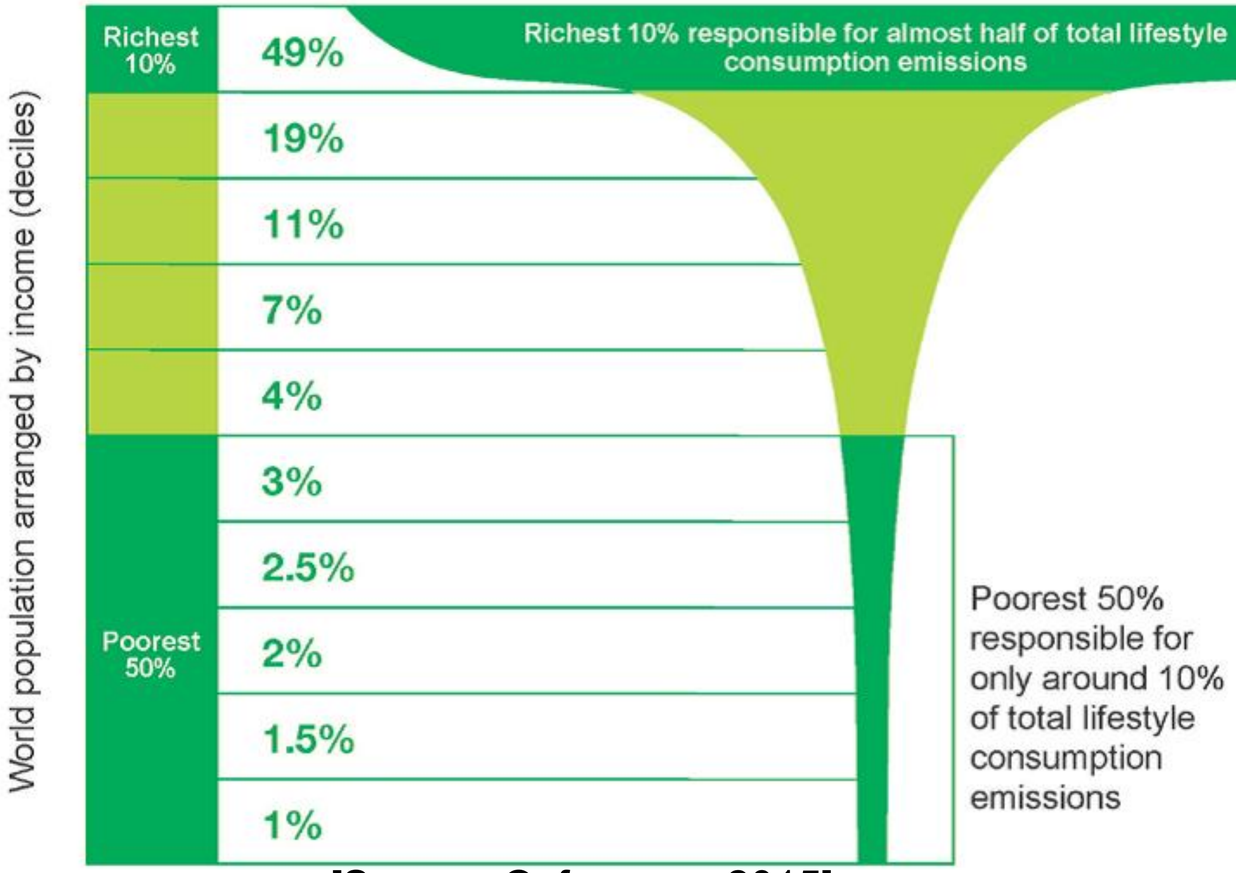


2010 | *2021* 96% in dev countries | 2030 (hope)

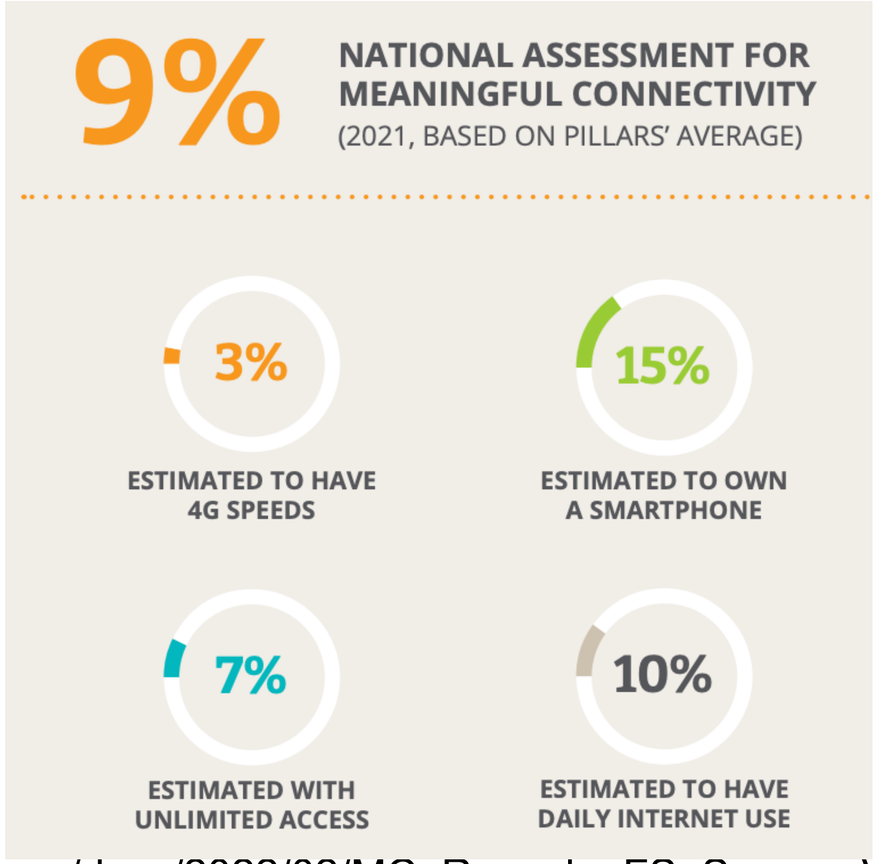
WSIS Forum 2022

[ITU 2010, 2021]
https://www.itu.int/hub/2021/11/facts-and-figures-2021-2-9-billion-people-still-offline/

Inequality in Energy & Digital Access



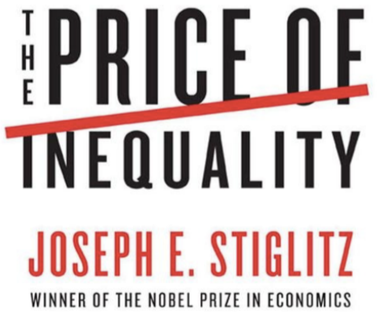
[Source: Oxfam.org, 2015]

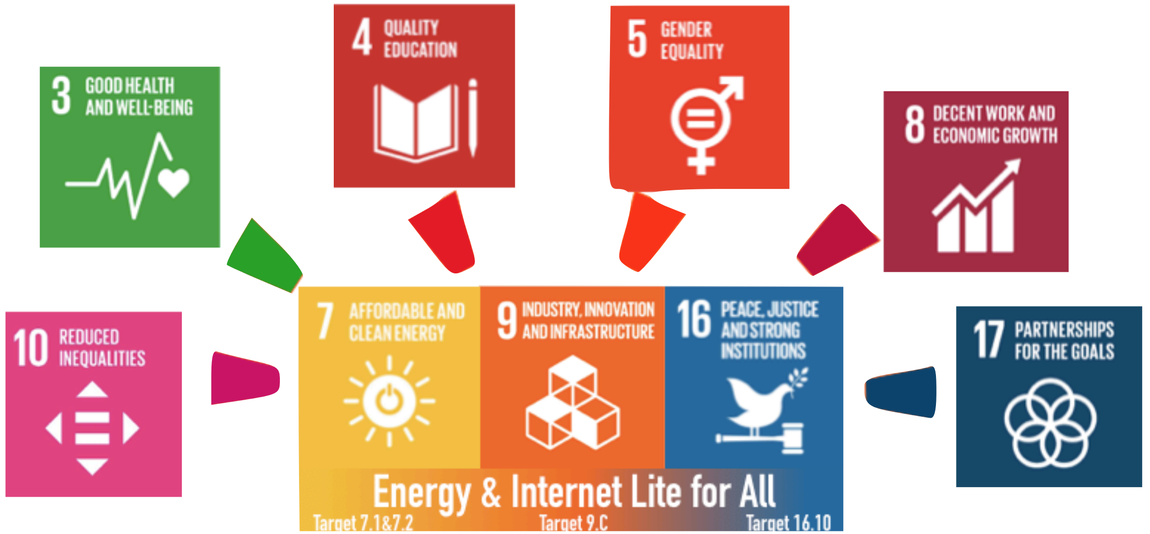


[https://webfoundation.org/docs/2022/02/MC_Rwanda_FS_Screen_V1.pdf]

Summary:
Digitalisation & Energy for Sustainability

- Digitalisation as enabler
  - KISS: Keep it simple, stupid
  - Decentralised, empower the communities
  - Knowledge4Africa, 5GforPeople
- Renewable energy
  - micro-grid, decentralised
  - production <> consumption balance
  - empowerment for communities
- Self-sustained communities
  - Building blocks for
  - job-creation, educating, energy





Renewable Energy Systems
Strategic dimension for ITS

1. **Climate changes** and the impact on energy systems
2. **System modelling**, ranging from micro- to macro-systems
3. **Energy informatics,** computing and communications technologies and their applications
4. **Energy control systems**, addressing the interaction of heterogeneous energy components
5. **Storage systems**, supporting autonomy and transition towards renewable energy
6. **Material technology** for renewables, including photo-voltaic, battery components, hydrogen
7. **Digital transformation** of energy systems, including cyber-physical energy systems
8. **Sustainability and Innovation** of energy solutions, including circular economy for energy materials
9. **Social justice & energy equity** in the energy market, addressing an inclusive transition towards renewables
10. **Energy education**, contributing to an innovative and inclusive adoption of renewable energy solutions
11. **Cybersecurity,** addressing security, safety, privacy and trust aspects of energy components and systems

Goal: 300 students every year **by 2030**

Study directions

1. **Climate and system modelling**
2. **Energy Informatics**
3. **Storage & material technology**

Crosscutting issues: Sustainability (8), Energy Education (10), Digital transformation (7) and Cybersecurity (11)

Kjeller: attractive study place
- cost of travel
- attractiveness of building
- visibility

& Blindern: strategic influence

Lillestrøm: Ny campus