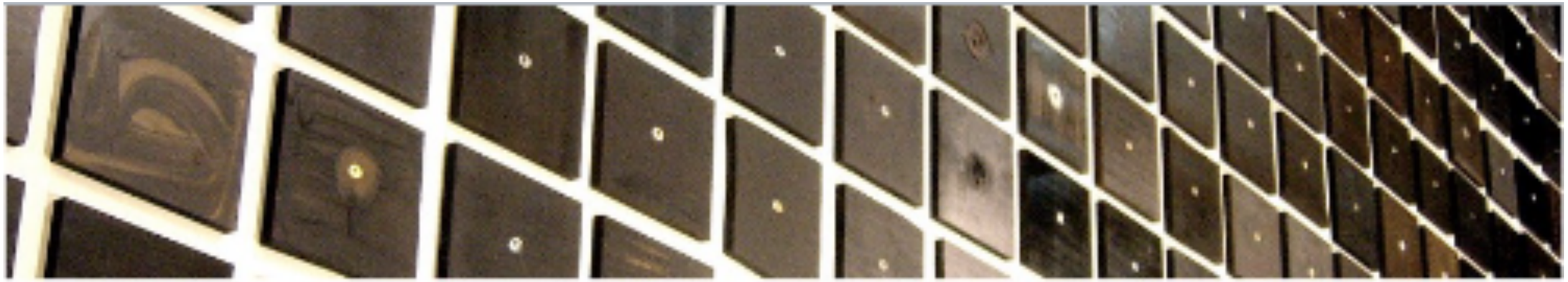


UiO : Universitetet i Oslo

Master “Renewable Energy” Meeting, Nov2019

Research Areas: Energy (Grid, Smart Grid, IoT) for Sustainable Development

Shujun Zhang · 2nd

Associate Professor at Western Norway University of Applied Sciences,Høgskulen på Vestlandet (HVL)

Bergen, Hordaland, Norway · 500+ connections · Contact info

Josef Noll

Secretary General at the Basic Internet Foundation, Professor at the University of Oslo

Oslo Area, Norway · 500+ connections · Contact info

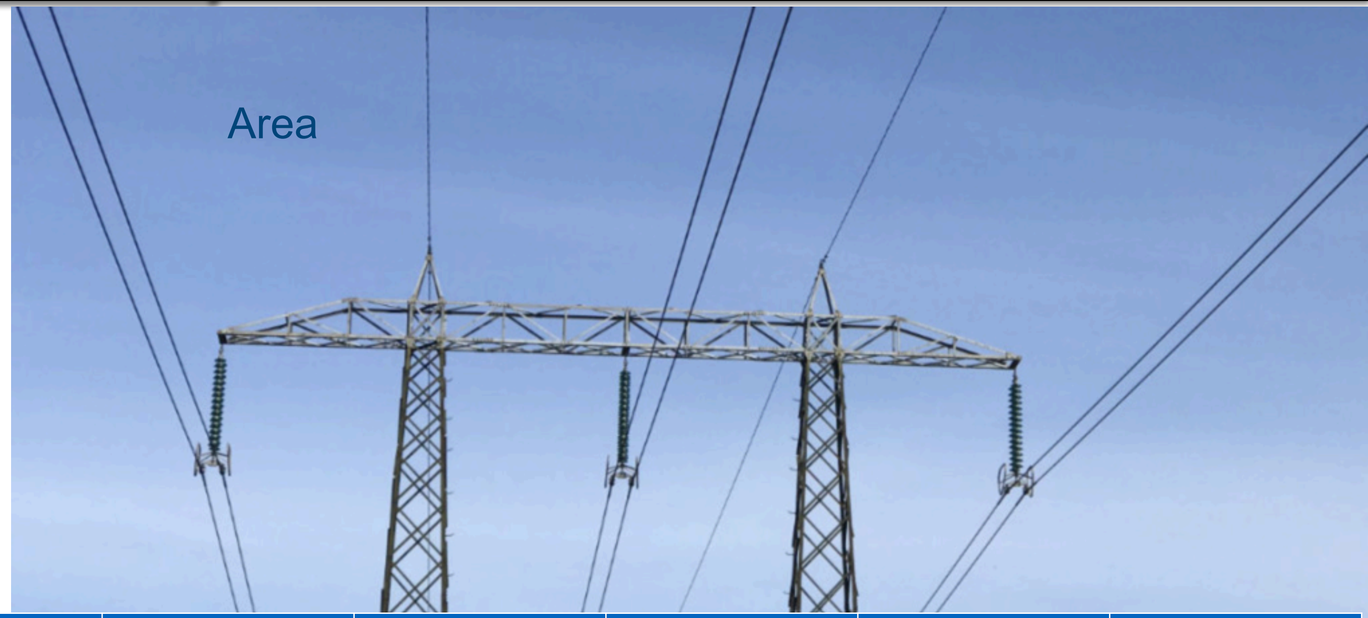
György Kálmán, Ph.D., CISM, CCSP · 1st

Technical Information Security Officer (TISO) at DNB Retail and Corporate

Nordby, Akershus, Norway · 497 connections · Contact info

Energy usage Norway

- Energy production (2018)
  - 95.8% water
  - 2.3% burning
  - 1.9% wind
-



	produced [TWh]	used [TWh]	Export/ Import [TWh]			
2018	145.7	135	10			
2017	149.3		21.3/6.1			
2016	149.6					
2014						

[1] https://www.tu.no/artikler/norge-brukte-rekordmye-strom-i-fjor/430005
[2] https://enerwe.no/norges-stromforbruk-okte-til-1354-twh-mens-produksjonen-falt-til-1457-twh-i-2018/166697

Enerdata

Global Energy Statistical Yearbook 2019

Share Tweet Recommend

TOTAL ENERGY | CRUDE OIL | OIL PRODUCTS | NATURAL GAS | COAL, LIGNITE | ELECTRICITY | RENEWABLES | CO_2 FUEL COMBUSTION

2018 Selected figures

Total energy
3.7%

China's energy consumption growth rate.

Crude oil
16.5%

Sharp rise in crude oil production in the **US**.

Oil products
-3.3%

Decline of oil product consumption in **Latin America** continues for fourth consecutive year.

Natural gas
10%

Major increase in gas consumption in the **US** (half of world increase).

Coal, lignite
11%

Surge in **Turkey**'s coal consumption .

Electricity
72%

Contribution of **BRICS** to the global increase in power consumption between 2010 and 2018.

Renewables
+30 pts

Rise in the share of renewables in the **British** power mix between 2000 and 2018.

CO_2 fuel combustion
3.1%

New growth in CO_2 emissions in the **US**.

Vision and Mission

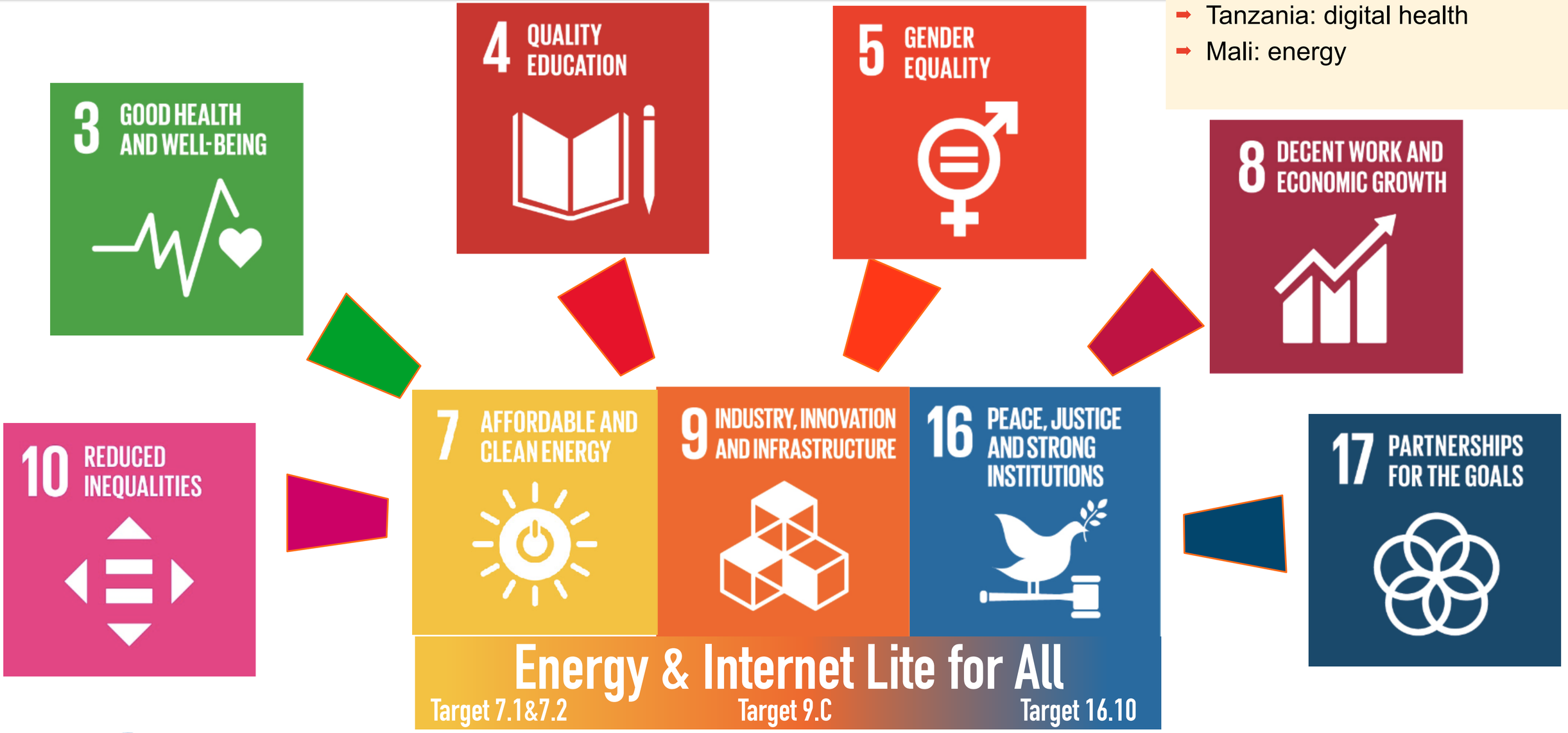
- Vision:
  "Transformation to affordable zero-net energy systems for All"
- Mission:
  - ➡ Research for modern and sustainable energy
  - ➡ Create the technology vision for a renewable energy systems
  - ➡ Empower the society for sustainable development through energy systems

- Answering SDG 7 targets:
- 7.1 By 2030, ensure universal access to affordable, reliable, and modern energy services
- 7.2 Increase substantially the share of renewable energy in the global energy mix by 2030
- 7.3 double the global rate of improvement in energy efficiency by 2030
- 7.a By 2030, enhance international cooperation to facilitate access to clean energy research and technologies, including renewable energy, energy efficiency, and advanced and cleaner fossil fuel technologies, and promote investment in energy infrastructure and clean energy technologies
- 7.b By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, particularly LDCs and SIDS

Affordable Energy & Internet Lite for All
the catalysts for the goals

Showcase
"Non discriminating access" project

- funded by RCN and Mfa/Norad (14.9 MNOK for 2017-2020)
- Tanzania: digital health
- Mali: energy



Given the fact that only few women have access to

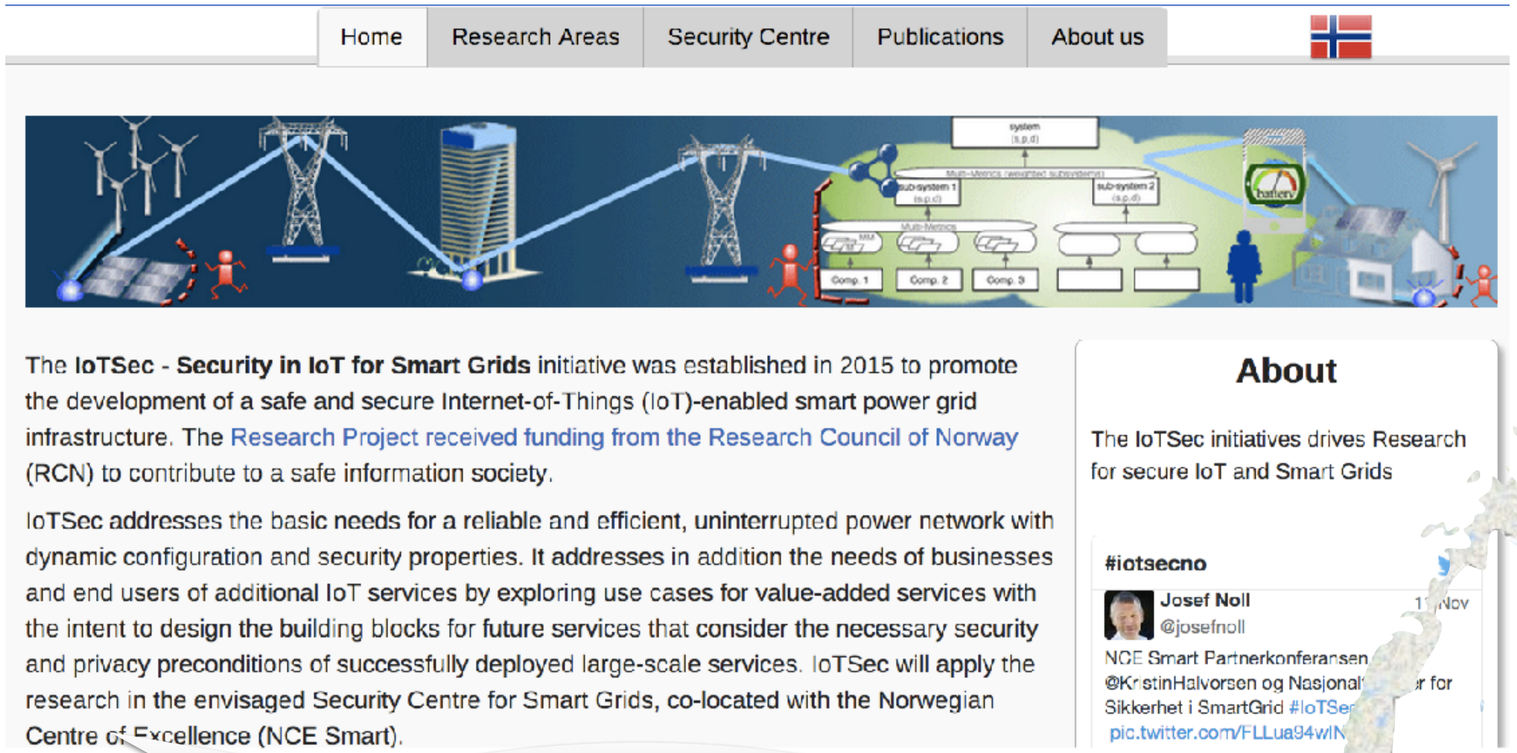
- Smartphones and
- Mobile broadband subscriptions (internet)

Free access to Digital Public Goods is key to empowering women for entrepreneurship

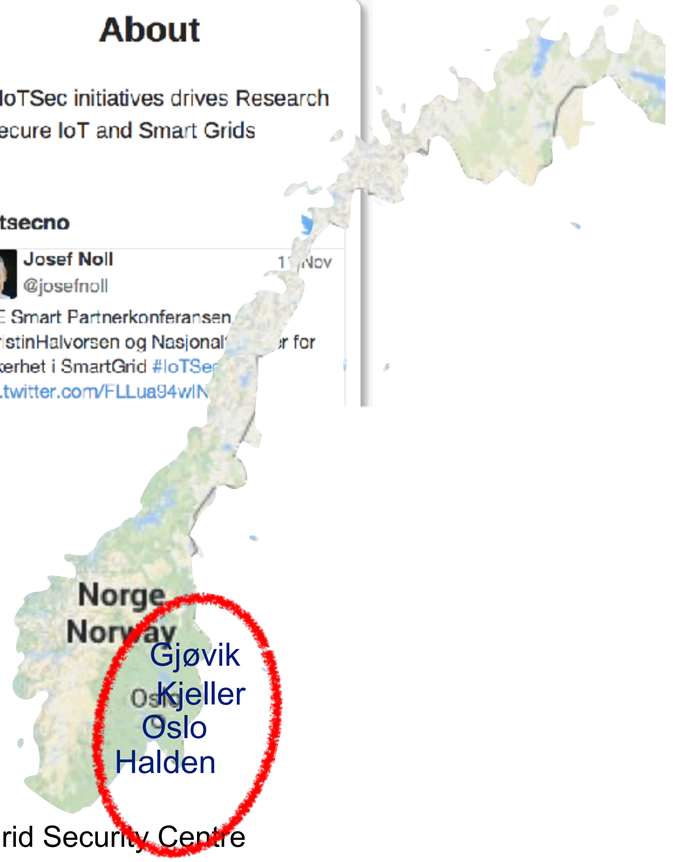
Adoption from Maslow

National initiative for a more secure future in IoT

IoTSec.no - Security for IoT for Smart Grids



«Open World Approach»
everything that is not declared closed is open



Smart Grid Security Centre

SMARTGRID SECURITY CENTER

Partners and Collaborations

Academia
- UiO
- UNIK
- NR
- Simula
- NTNU

Industry
- Smart Innovation Østfold
- eSmart Systems
- Fredrikstad Energi
- EB Nett
- Movation

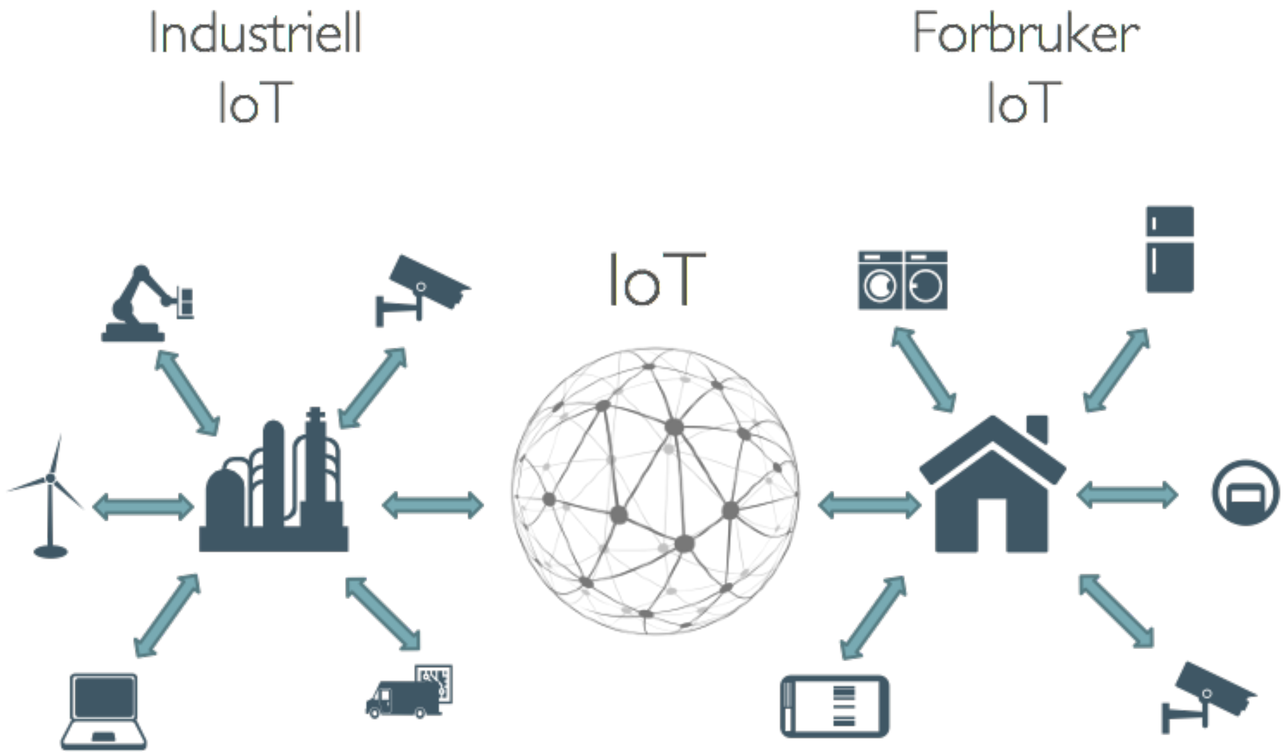
Interest Org.
- Smartgrid Centre
- Norw. Data Protection Auth.
- Forbrukerrådet

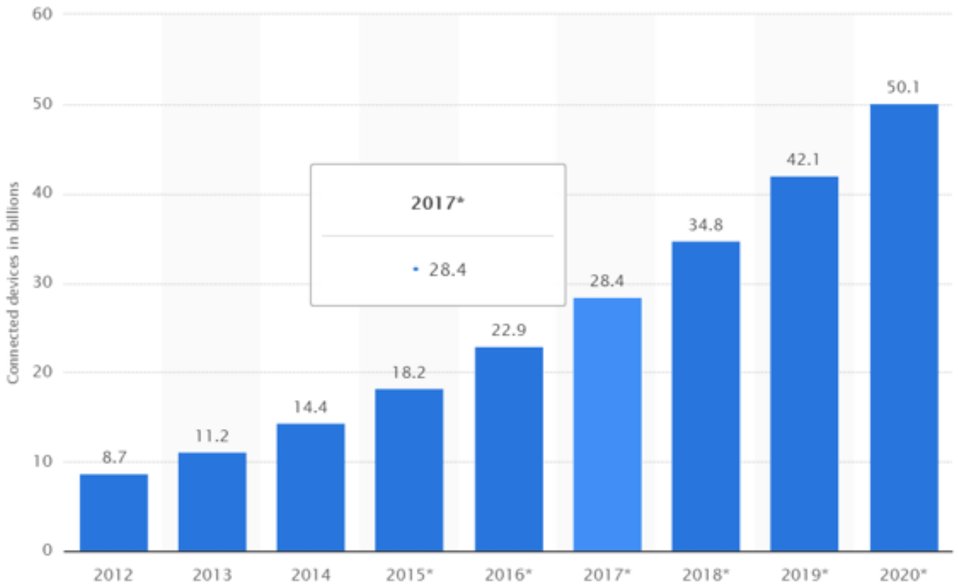
Industry
- EyeSaaS
- mnemonic

International
- Mondragon Unibersitatea
- University of Victoria
- Universidad Carlos III
- La Sapienza
- COINS Research School
- Nimbeo
- H2020 and ECSEL projects

Industrial view versus Consumer view

- IoT threats on critical infrastructures





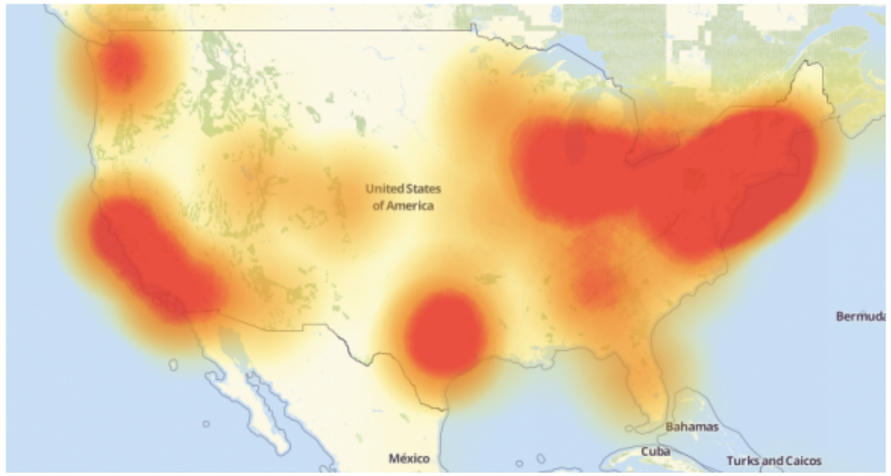
Treath examples

21 Hacked Cameras, DVRs Powered Today's Massive Internet Outage

OCT 16

A massive and sustained Internet attack that has caused outages and network congestion today for a large number of Web sites was launched with the help of hacked "Internet of Things" (IoT) devices, such as CCTV video cameras and digital video recorders, new data suggests.

Earlier today cyber criminals began training their attack cannons on **Dyn**, an Internet infrastructure company that provides critical technology services to some of the Internet's top destinations. The attack began creating problems for Internet users reaching an array of sites, including Twitter, Amazon, Tumblr, Reddit, Spotify and Netflix.



[Source: https://krebsonsecurity.com/2016/10/hacked-cameras-dvrs-powered-todays-massive-internet-outage/]

Computing

Ukraine's Power Grid Gets Hacked Again, a Worrying Sign for Infrastructure Attacks

Russian hackers may be behind attacks leveled at the nation's power grid and artillery. The West should take note.

by Jamie Condliffe December 22, 2016

[Source: https://www.technologyreview.com/s/603262/ukraines-power-grid-gets-hacked-again-a-worrying-sign-for-infrastructure-attacks/

NB-IoT in praxis - Monitoring the Grid (heimdall.no)

- Until now: no control of electricity

- With Heimdall “neurons”, measure
  - power, line inclination, line vibration,
  - snow load and wire temperature
- Science: vibration amplitude is linked to energy flow [1]
- Communication through NB-IoT [2]

[1] https://www.researchgate.net/publication/282956268_Measurement_of_vibration_characteristics_of_power_cable_line_under_typical_laying_conditions
[2] https://www.telia.no/magasinet/norsk-oppfinnelse-kan-lose-arhundrets-stromutfordring/

“Internet Lite & Affordable Energy for All”

- Energy, Digital & Health, the building blocks for societal empowerment
- Freemium model for access
  - ➡ Free: text, pictures & local video
  - ➡ Premium: broadband services
- Build Village Information Spots
  - ➡ Free access to information
    - Energy usage
    - Health
    - Education
    - Entrepreneurship, e.g. Agriculture