

What can 5G offer to the energy sector ?



Artificial Intelligence and 5G Technologies in Future Integrated Energy Systems

Mario Dionisio

*Directorate General for Energy
Unit C2 – New energy technologies,
innovation and clean coal*



EU Energy Policy

Horizon 2020 and beyond

The energy transition

5G in the energy sector

Conclusions

EU Energy Policy

Horizon 2020 and beyond

The energy transition

5G in the energy sector

Conclusions



EU Energy Policy

2030

50% of electricity to come from renewables



2050

Electricity completely carbon free



COP24·KATOWICE 2018
UNITED NATIONS CLIMATE CHANGE CONFERENCE

Thanks to the EU - ambitious **energy and climate commitments**



Unique opportunity to **modernise our economy** and to

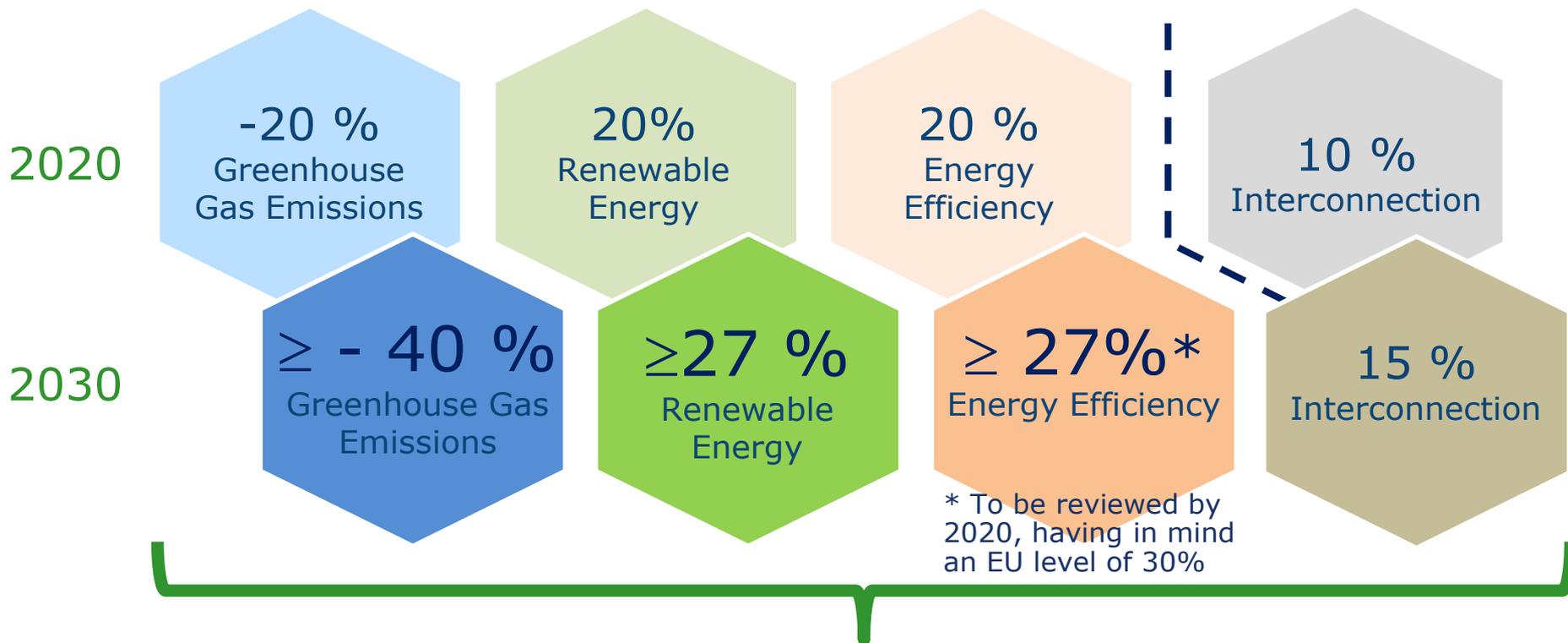
boost competitiveness

create growth and jobs



European
Commission

EU Energy targets



New governance system + indicators

Energy Union



1. Security, solidarity and trust
2. A fully integrated internal energy market
3. Energy efficiency
4. Decarbonising the economy
5. Research, innovation and competitiveness

Clean energy for all Europeans



Putting energy
efficiency first

- Reducing greenhouse gas emissions
- Securing energy supply
- Creating jobs and growth



Demonstrating
global leadership
in renewables



Delivering a
fair deal for
consumers



Bridge initiative

Data
management

Business Models

Regulations

Customer
engagement

- It is a European Commission initiative
- It gathers Horizon 2020 Smart Grid and Energy Storage demonstration projects
- Creates a structured view of obstacles to innovation
- Fosters continuous knowledge sharing amongst projects
- Deliver conclusions and recommendations with a single voice

<https://www.h2020-bridge.eu/>



EU Energy Policy

Horizon 2020 and beyond

The energy transition

5G in the energy sector

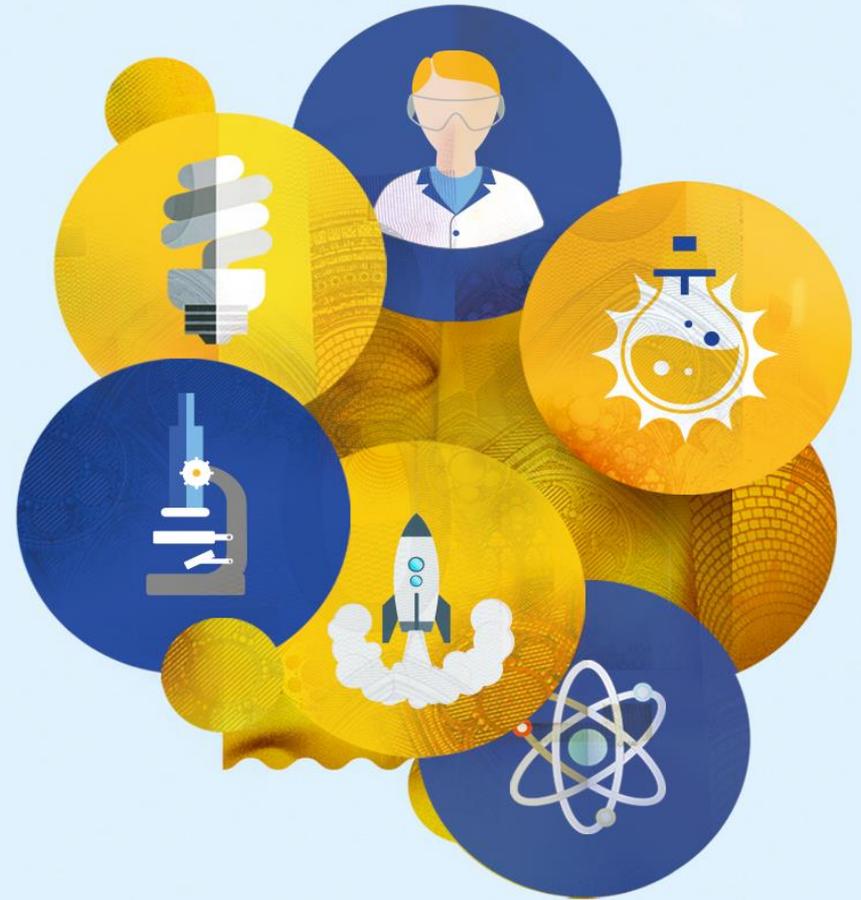
Conclusions

From policy... ...to implementing instrument



Commission proposal for Horizon Europe

THE NEXT EU RESEARCH & INNOVATION
PROGRAMME (2021 – 2027)



Horizon Europe

- Commission proposal for a € 100 billion research and innovation funding programme for seven years (2021-2027)
 -  • to strengthen the EU's scientific and technological bases
 -  • to boost Europe's innovation capacity, competitiveness and jobs
 -  • to deliver on citizens' priorities and sustain our socioeconomic model and values
- Additional € 4.1 billion are proposed to be allocated for defence research, in a separate proposal for a European Defence Fund

Horizon Europe: what is new?

Lessons Learned from Horizon 2020 Interim Evaluation

-  Support breakthrough innovation
-  Create more impact through mission-orientation and citizens' involvement
-  Strengthen international cooperation
-  Reinforce openness
-  Rationalise the funding landscape



Key Novelties in Horizon Europe

European Innovation
Council

R&I Missions

Extended association
possibilities

Open science policy

New approach to
Partnerships



European Commission

Synergies with other Union programmes

Horizon Europe



Enhanced synergies

Other Union Programmes, including

Common Agricultural Policy	<i>LIFE</i>	Erasmus
ERDF	<i>Connecting Europe Facility</i>	<i>Innovation Fund</i>
External Instrument		Internal Security Fund
Maritime & Fisheries Fund	<i>Digital Europe</i>	ESF+
<i>InvestEU</i>	Space Programme	Single Market Programme

Compatibility

Harmonisation of funding rules; flexible co-funding schemes; pooling resources at EU level

Coherence and complementarity

Alignment of strategic priorities in support of a common vision

EU Energy Policy

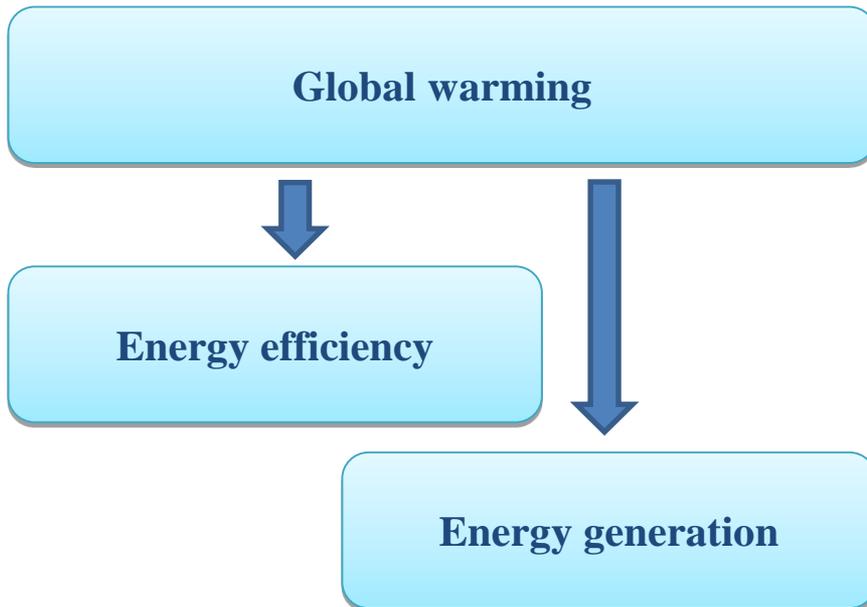
Horizon 2020 and beyond

The energy transition

5G in the energy sector

Conclusions

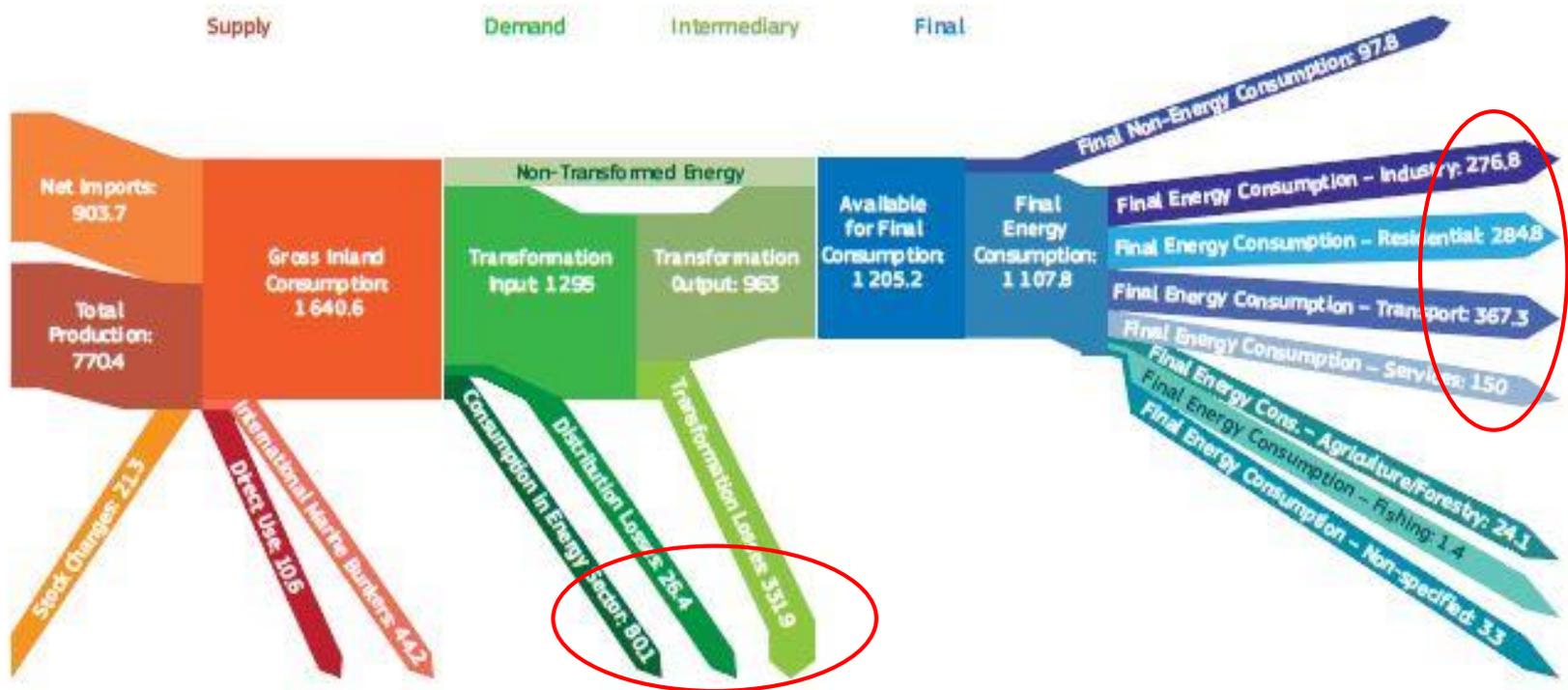
Energy transition





European Commission

EU-28 Energy Flow – 2016 (Mtoe)



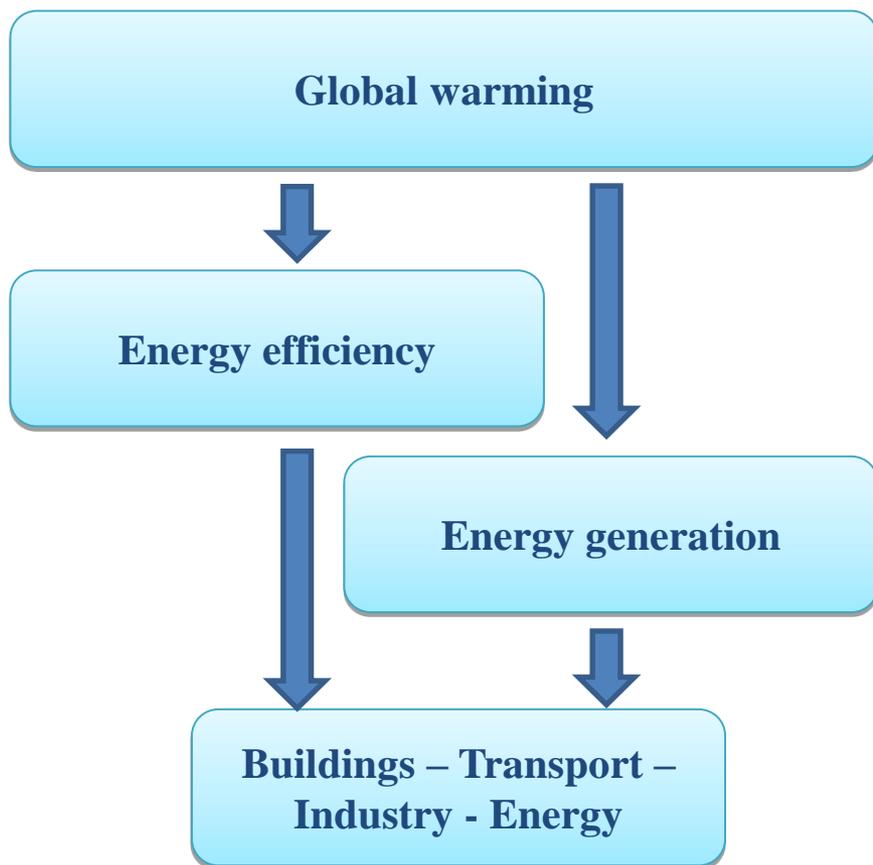
Source: Eurostat, May 2018

Vienna, 29 April 2019



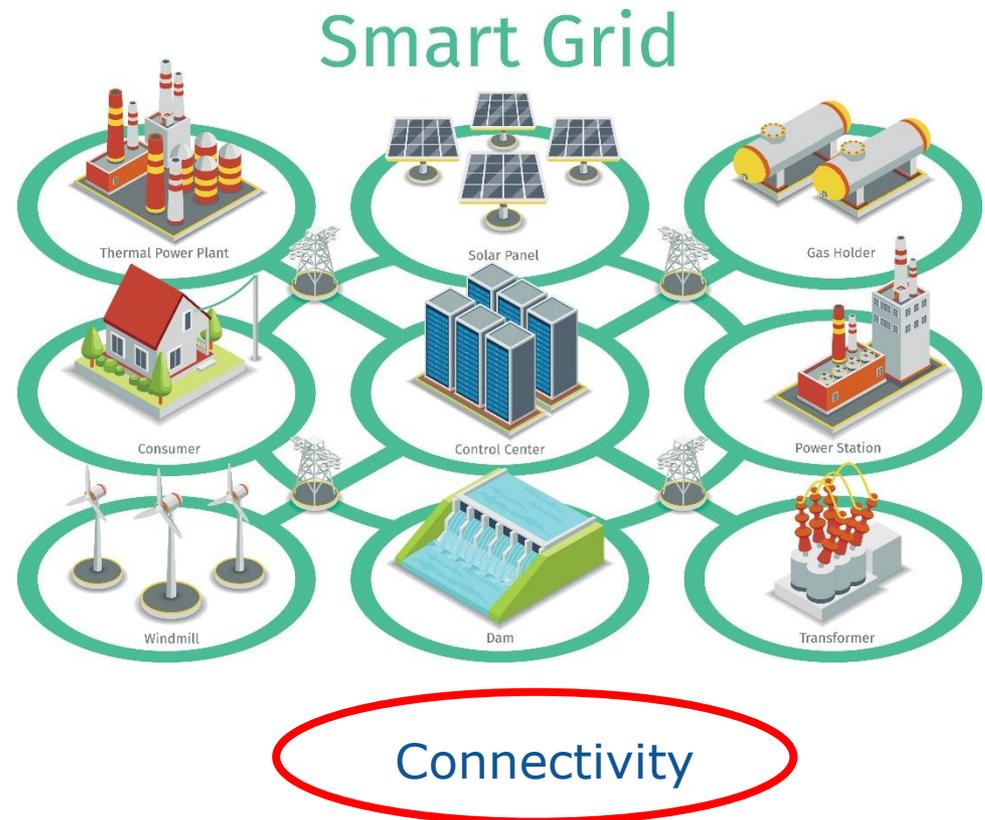
European
Commission

Energy transition



New energy system

- Electrification (EV, smart charging, etc.)
- Decentralisation (demand response, PV, storage, etc.)
- Digitalisation (network technologies, smart metering, beyond the meter measures, smart appliances, IoT, etc.)





EU Energy Policy

Horizon 2020 and beyond

The energy transition

5G in the energy sector

Conclusions



European Commission

5G - European vision

Factories of the Future

- 1 Time-critical process control
- 2 Non time-critical factory automation
- 3 Remote control
- 4 Intra/Inter-enterprise communication
- 5 Connected goods

ENERGY

- 1 Grid access
- 2 Grid backhaul
- 3 Grid backbone

AUTOMOTIVE

- 1 Automated driving
- 2 Share My View
- 3 Bird's Eye View
- 4 Digitalization of Transport
- 5 Information Society on the road




5G empowering vertical industries



5G VERTICAL SECTORS

With 5G, networks will be transformed into intelligent orchestration platforms.

By cementing strong relationships between vendors, operators and verticals, 5G will open the field to new business value propositions.

Use-cases originating from verticals should be considered as drivers of 5G requirements from the onset with high priority and covered in the early phases of the standardization process.

e-HEALTH

- 1 Assets and interventions management in Hospital
- 2 Robotics
- 3 Remote monitoring
- 4 Smarter medication

MEDIA & ENTERTAINMENT

- 1 Ultra High Fidelity Media
- 2 On-site Live Event Experience
- 3 User Generated Content
- 4 Immersive and Integrated Media
- 5 Cooperative Media Production
- 6 Collaborative Gaming



Energy sector: one of the main 5G verticals

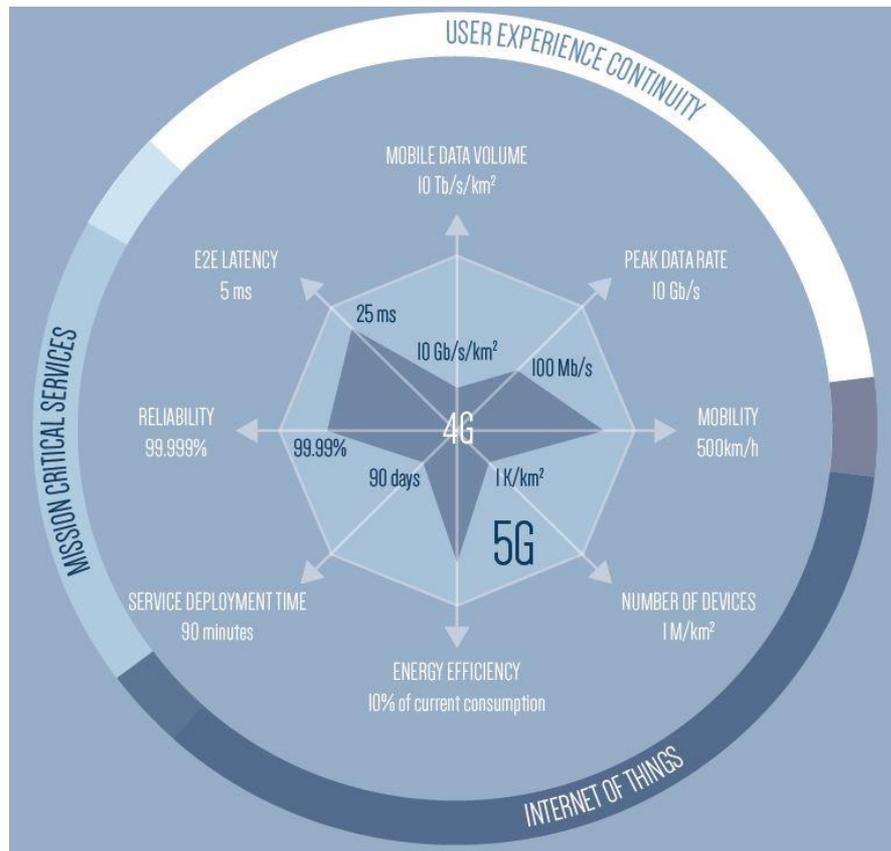
- Lots of prospects, but also challenges:
 - Smart grids driven by the emergence of renewables
 - Highly variable communications needs
 - New business models will need to be supported by:
 - ...Research and Innovation (by versatile industry consortia)
 - ...Standardisation efforts, which are increasingly important
- Active involvement at workshops on 5G verticals
- Energy in the White Paper on 5G verticals at MWC 16

Requirements from the energy sector use cases

Widely versatile and demanding needs

- Latency: from 1 ms to 1s;
- Data speeds: between 1 kbps and 1 Gbps;
- Coverage: essential (substations, metering);
- Resiliency: is key for the safety of energy supply (Including battery backup of base stations)
- QoS: provisioning will be a must for 5G business case!

Radar diagram of 5G disruptive capabilities



Source: 5g-ppp, February 2015



How: 5G PPP

- Joint initiative between the European Commission and European ICT industry
- Solutions, architectures, technologies and standards for the ubiquitous next generation communications infrastructures of the coming decade
- Secure Europe's leadership in the particular areas:
 - smart cities, e-health, intelligent transport, education or entertainment & media
- Reinforce the European industry
- Strengthen the global technological lead

Details on the 5G PPP Roadmap

5G PPP Phase 3: > 200 M€ for trials

User needs, partnerships with vertical industries

ICT-19-2019 Focus

ICT-17-2018 E2E 5G Platforms
Kick-off at EuCNC 2018

Phase I Core Technologies

5G R&I for "Long Term Evolution"

Early 5G introduction
Lower frequency bands

Later 5G introduction
Higher frequency bands

Phase 3 b) Integrated Verification Trial
- radio+network+applications

5G Connected Cars in the EU
cross-border corridors

Phase 3 a) Verification
Demo/Trial Platform
- Integration radio + network

Phase 2 - Demos
PoC - Core Techs
Components



5G PPP phase 3 objectives

Reinforce 5G PPP as an industry-driven & impactful initiative, supporting the EU positioning in the global 5G competition through:

- Support implementation of the EU Vision <https://5g-ppp.eu/wp-content/uploads/2015/02/5G-Vision-Brochure-v1.pdf>
- Reinforce links with new players, especially vertical sectors (incl. Energy)
- Reinforced trend towards demos and pilots with high industrial impacts
- Preparing for deployment, trial support, and longer term needs
- Programmatic approach through collaboration agreement between projects



EC activities

Several round tables and workshops among which joint workshops DG CNECT – DG ENER

- 1st workshop on 14 March 2017
 - To foster the EU-wide discussion & cooperation across the sectors
- 2nd workshop on 22 November 2017
 - Use cases to support the need of 5G in the digitalised and interconnected energy system of tomorrow
- The outcome is the ICT-19-2019 call: Advanced 5G validation trials across multiple vertical industries



ICT-19-2019: Advanced 5G validation trials across multiple vertical industries

- Challenge: European 5G Vision of "5G empowering vertical industries" closer to deployment with innovative digital use cases involving cross industry partnerships.
- Scope: Vertical use cases focusing on those outlined in the 5G PPP White paper "5G empowering vertical industries" (Automotive, smart factories, energy, media, smart healthcare)
- Expected impact: Validated core 5G technologies and architectures in the context of specific vertical use cases and deployment scenarios, from high to low density regions.
 - Opening: July 2018
 - Deadline: 14 November 2018
 - Budget: up to **92 M€** (6 to 9 projects)
- <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/ict-19-2019>

EU Energy Policy

Horizon 2020 and beyond

The energy transition

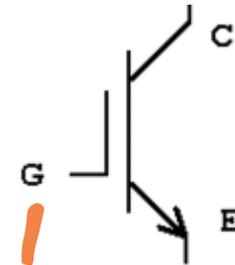
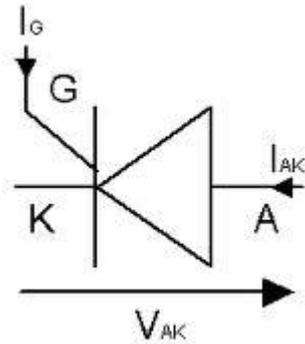
5G in the energy sector

Conclusions



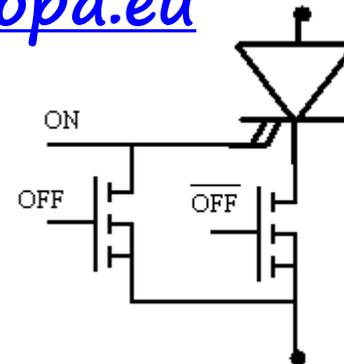
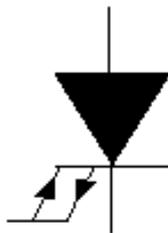
Conclusions

- The end goal is reducing the global warming of our planet → decarbonisation of the energy system and our economy.
- Innovation and digitalisation bring benefits to the energy system (demand flexibility, integration of variable renewables, smart charging for EVs, etc.) → high demand for an efficient communication system such as 5G.
- The European Commission supports R&D&I through the Work Programmes and other Union Programmes. Horizon 2020 and Horizon Europe funds demonstration projects to de-risk technologies and enable the energy transition.



Thank you!

mario.dionisio@ec.europa.eu





Useful links

Directorate General For Energy: <https://ec.europa.eu/energy/en/home>

Horizon2020 web site: <http://ec.europa.eu/programmes/horizon2020>

Horizon Europe: <http://ec.europa.eu/horizon-europe>

5G Action Plan for Europe:

- <https://ec.europa.eu/digital-single-market/en/5g-europe-action-plan>

ICT Work Programme:

- <https://ec.europa.eu/programmes/horizon2020/en/what-work-programme>

5G PPP: <http://www.5G-PPP.eu>

Funding and tender opportunities:

- <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/home>