ETSI approach to Technology Research and
Some initial thoughts on 6G

Presented by: David Boswarthick. ETSI Director NET
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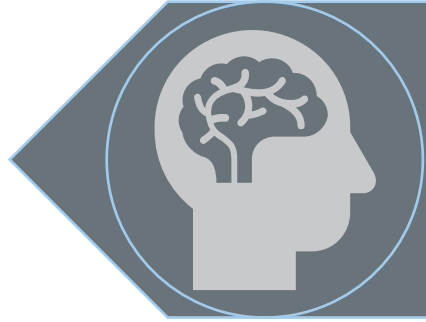
12th March 2024
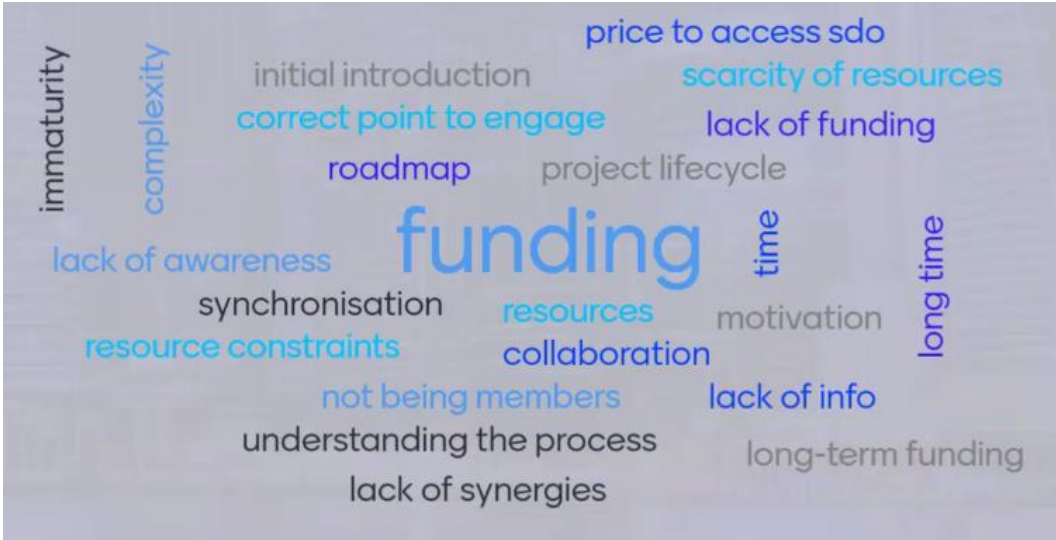
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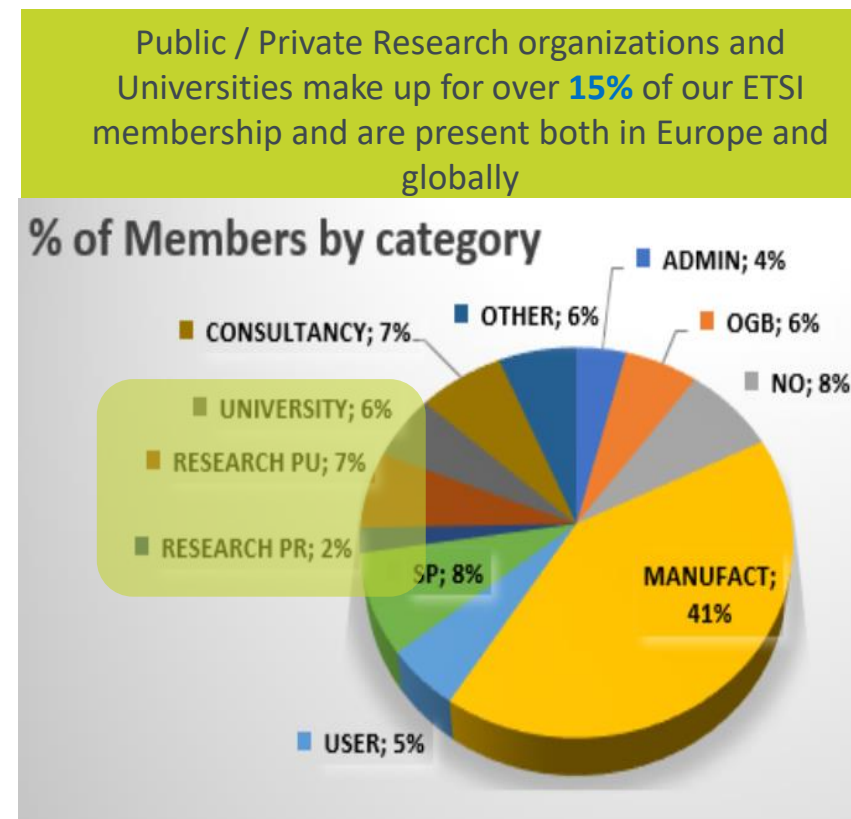ETSI Approach to R&I

6G Opportunity

6G Challenge

CONTENT

ETSI Approach to R&I

Barriers to Remove

immaturity
complexity
initial introduction
price to access sdo
scarcity of resources
correct point to engage
lack of funding
roadmap
project lifecycle
funding
time
long time
lack of awareness
synchronisation
resources
motivation
resource constraints
collaboration
not being members
lack of info
understanding the process
long-term funding
lack of synergies

access to sdo org
working items
motivation
collaboration
use case impact
funding
access to sdos
alignment
fundings
knowledge
link to rapporteurs
process
multi-party interactions
identify open wi in sdos

more resources on stds
coordinations
on the job training
raise awareness
standardization skills
educate
education
ec's code of practice
make sustainable 6g
incentive structure
industry engagement
raise awraness
value of standards
incentives for sdo work

ETSI, Bringing People Together

- Independent, non-profit standards organization

- Officially recognized by the European Union to support EU regulation

- **35+** year track record of technical excellence in the ICT sector

- Founding Partner of both **3GPP** and **oneM2M**

- Over **approx. 900** members from more than **60+** countries

- Diverse community: private companies, research and academia, governments, public bodies, societal stakeholders

- All deliverables are available for download for FREE from https://www.etsi.org/standards

Public / Private Research organizations and Universities make up for over **15%** of our ETSI membership and are present both in Europe and globally

% of Members by category

ADMIN; 4%
OTHER; 6%
OGB; 6%
CONSULTANCY; 7%
NO; 8%
UNIVERSITY; 6%
RESEARCH PU; 7%
MANUFACT; 41%
RESEARCH PR; 2%
SP; 8%
USER; 5%

Source: Jan 2024 edition of the ETSI Enjoy! magazine
https://www.etsi.org/newsroom/magazine

https://www.etsi.org/

ETSI Approach to Research and Innovation

ETSI encourages a constant flow of research & innovation into our standards work.

1 ⦿ **Enablers for Research and Innovation.**
Build strong links between researchers, innovators, projects & standardization

- ⦿ Working with EU platforms
  (such as Horizon Europe, SNS JU, 6G-IA, NetworldEurope)

- ⦿ Working with national / EU / global research platforms &
  projects (e.g. HEXA-X / Next G Alliance / one6G / IOWN)

2 ⦿ **Technology Radar & Foresight.**
Aware of the near-Future Technology Trends and their potential impact:

- ⦿ ETSI Technology Radar (ETR) linked to market trends and research agendas

3 ⦿ **Initiation of New Activities / Initiatives in ETSI & Education / Outreach.**

- ⦿ Enable the creation of new technical groups, areas of work in ETSI

- ⦿ Outreach to universities and Education about Standardization

- ⦿ Research Helpdesk, outreach and Technology Foresight … and more

2 ETSI TECHNO. RADAR

1 Links to RESEARCH

3 Enable New Work in ETSI
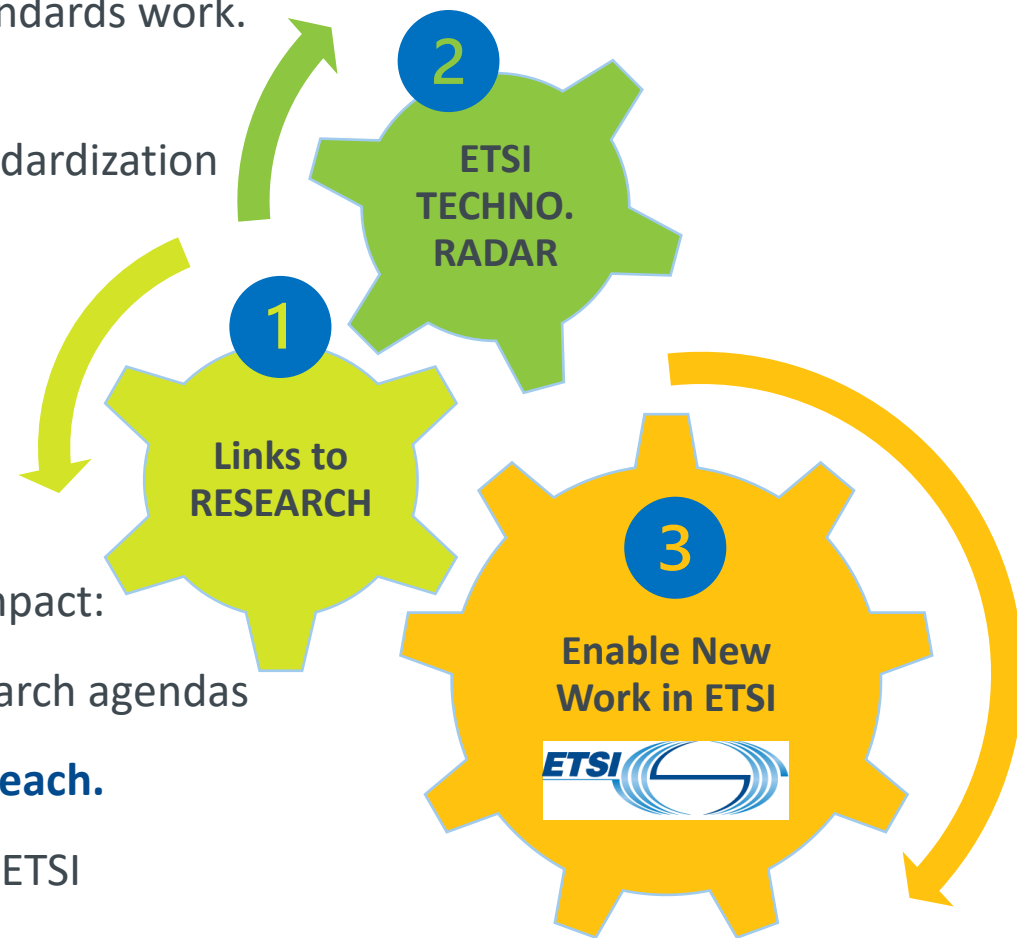
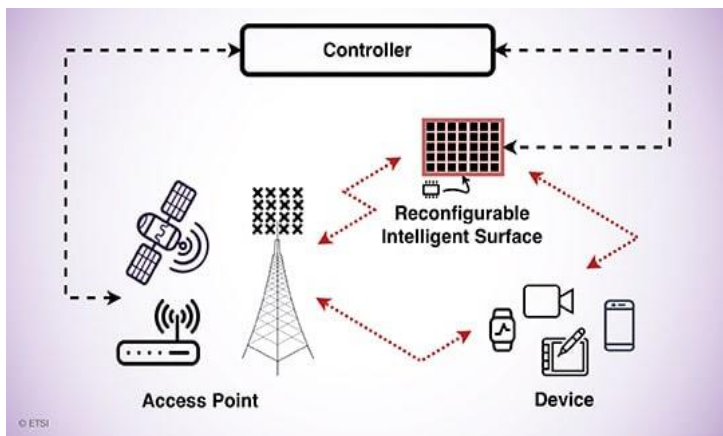# ETSI Technology Radar -> Foresight
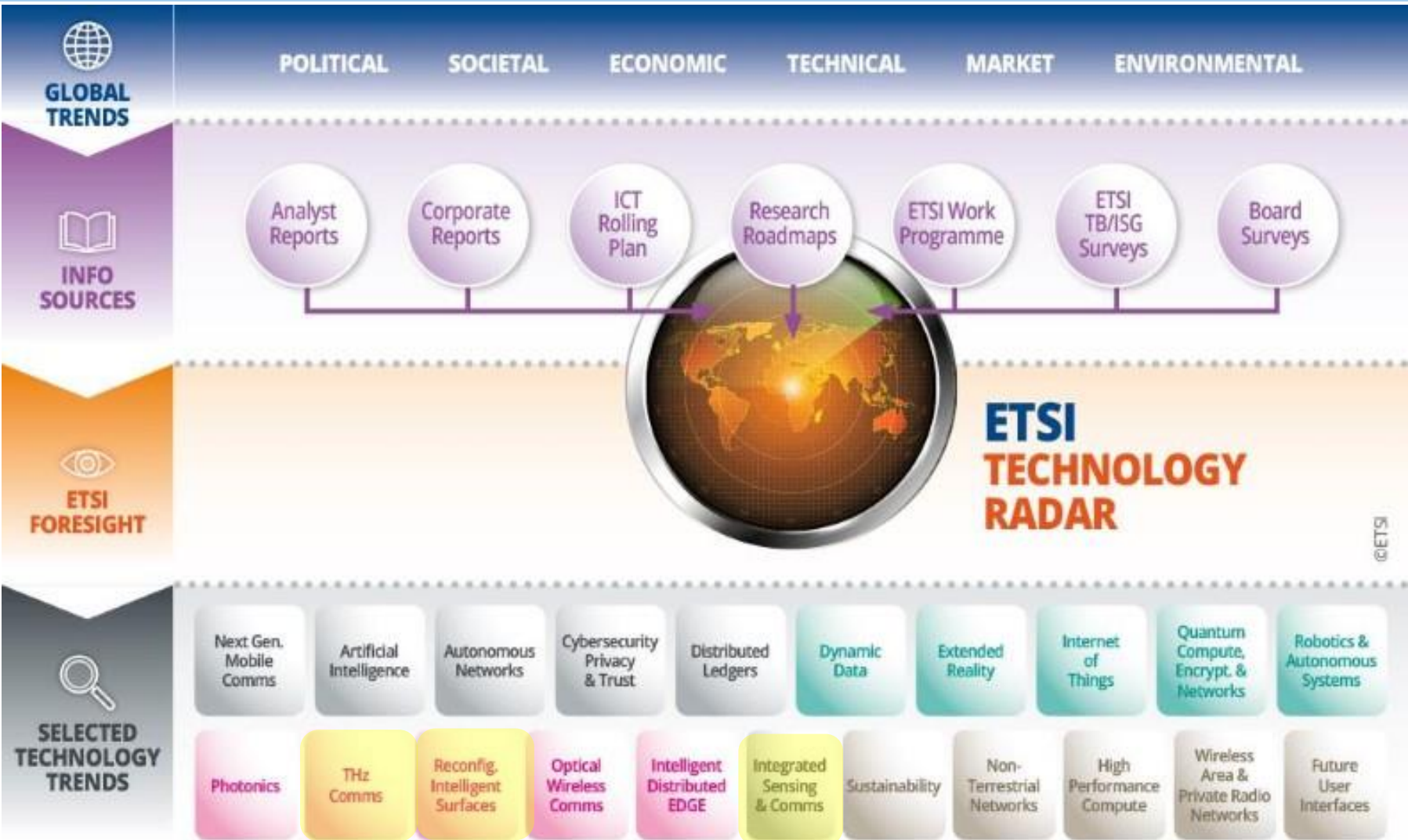
- ETSI Technology Radar (ETR) tracks the major technology trends that are *just over* the horizon .

- Latest ETR describes 21 technology trends & identifies opportunities for new ETSI work areas.

- Revised ETR WP published Dec. 2023.
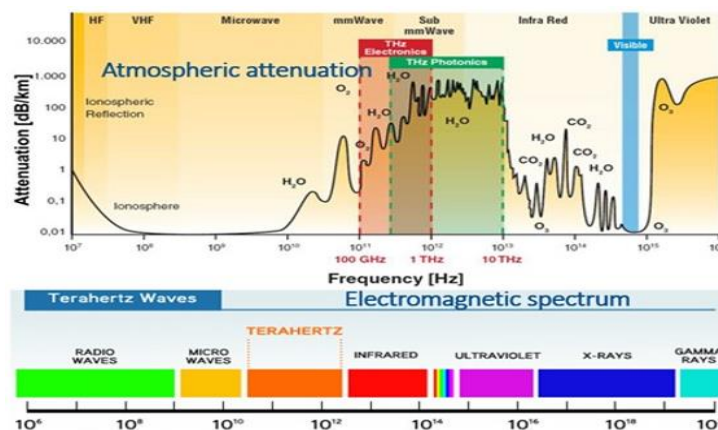
- Your feedback on the ETR is welcome.

ETSI Technology Radar: https://www.etsi.org/technologies/technology-radar
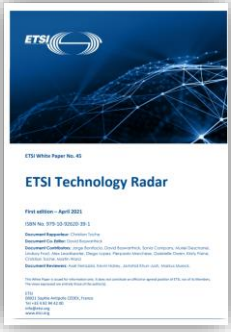
ETSI ISGs, recent pre-standards Groups for B5G / 6G

ISG RIS (Sept. 2021)
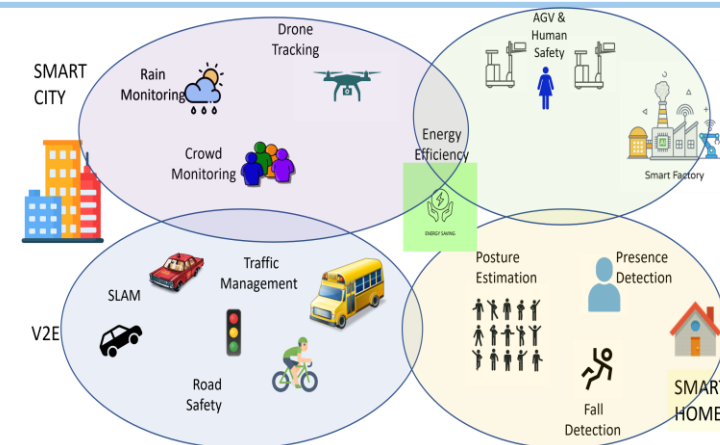
ETSI ISG RIS Mission:
Pre-standards activities based on outcome of research on RIS (Reconfigurable Intelligent Surfaces) from EU/UK collaborative projects, extended with relevant global initiatives, towards paving the way for future standardization of the RIS tech.

44 members, 4 participants
3 x deliverables published
3 x deliverables being drafted

ISG THz (Sept. 2022)

ETSI ISG THz Mission:
Establish technical foundations for sub-THz (100 GHz -> 10 THz). Place for ETSI members *(and non-members)* to progress their pre-standardization activities resulting from EU/National research efforts in the domain of sub / full THz technologies.

45 x member organizations
2 x participant organizations
4 x deliverables being drafted

ISG ISAC (Oct. 2023)

ETSI ISG ISAC Mission:
Provide an opportunity for ETSI members to coordinate their pre-standards 6G research efforts on integrated sensing and communication technology across various European/National funded collaborative projects, extended with relevant global initiatives.

21 Founding members
Kick off meeting 17th Nov 2023
More members welcome to join

ETSI Tools for Pre-standardization (ISGs and SDGs)

ETSI Industry Specification Groups (ISGs)
A pre-normative incubator for Research

- ETSI ISGs are the perfect tool for developing 'early' standardization work resulting from research projects / other sources of innovation.

- This tool has been used for many successful standards efforts on technologies such as mWT, NFV, Edge, Artificial Intelligence, AR/VR/XR, Quantum Safe, Quantum Key and many more.

- Any group of at least four ETSI members can a request to the ETSI Director-General the creation of new ISGs in ETSI as long the relevant criteria are met.

- Streamlined ISG process enables **deliverables (GSs and GRs)** to be published in matter of months, an ideal mechanism for **early stage (pre)standardization**.

- ETSI ISGs are open to both ETSI members and non-members.

- New ISGs can be initiated by ETSI both members and non-members, potentially opening up new domains / areas of work for ETSI.

- **Researchers and academics can take up official positions** (Chair / Vice-Chair), become rapporteurs for ETSI deliverables and actively drive the current and future standards work of ETSI.

ETSI Software Development Groups (SDGs)
A toolbox for Research and Standardization

- ETSI SDGs are the perfect tool for developing 'early' implementation work resulting from research projects / other sources of innovation.

- This tool has been designed for collaborative software development at ETSI based on the successful experience with **Open Source MANO** and **TeraFlowSDN**.

- SDGs allow for early experimentation, prototyping, validation and testing of concepts defined by ETSI Technical Groups and provide them with **early and regular feedback**. It's an ideal mechanism for **optimizing the quality of standards and reducing their time to market**

- Any group of at least four ETSI members, can request to the ETSI Director-General the creation of new SDG in ETSI, as long the relevant are criteria are met.
Various licence types are allowed, including Open Source

- ETSI SDGs are open to **ETSI members, non-members and individuals**.

- **Researchers and academics can take up official positions** (Chair / Vice-Chair), apply for technical leadership positions (TSC, MDL), lead the alignment and feedback to ETSI Technical Groups, and take an active role in driving the current and future work of ETSI.

- 2 SDGs created in 2023: **OpenSlice** and **OpenCAPIF**

Simple Narrative:

- We seek to enable a competitive EU industry *(large, medium, small enterprises)* – ultimately generating wealth *(and wellbeing)* for EU citizens / business / institutes.

- Standardisation is a major competitive advantage.

- EU enterprises / EC funded projects / academia should be encouraged and helped to engage in standardization.
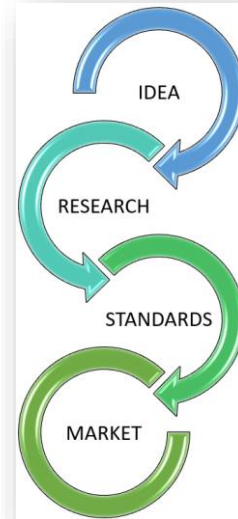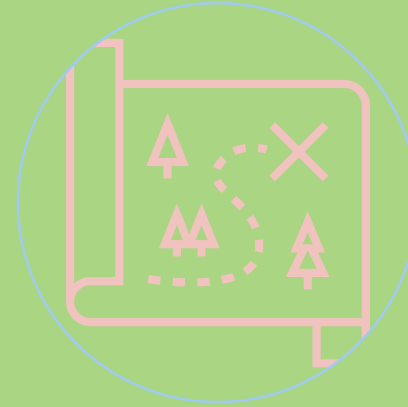
ETSI Support to Projects and Researchers

General Advice on Standardization

Letter of Support to Projects

ETSI presence on Advisory Committee

Mapping of research to ETSI working groups

CAT-ALYSTS

Between research projects & standards groups

We are here to help.   Contact research@etsi.org

ETSI Support to Researchers & Projects

General Advice on Standardization

Researchers and Projects can seek advice from research@etsi.org on

1) General Standardization topics and 2) ETSI specific questions

Much information, guidance and extensive FAQ are available on the ETSI research website: https://www.etsi.org/research

ETSI provides guidance on <u>where</u> and <u>how</u> researchers and research projects may get involved in standardization

ETSI provides support to a number of EC / National funded projects

BUT <u>any</u> project may ask ETSI for advice, with no need for a pre-signed LoS

ETSI Support to Research Projects

Letter of Support to Projects

ETSI is able to provide a Letter of Support (LoS) to project consortia making project proposals <under certain conditions>. For both EC and National projects

If the project 1) is related to ETSI's scope 2) contains at least 2 ETSI members and 3) considers ETSI standards as input and/or output – then we can talk LoS

The ETSI LoS process is simple, and fast,

A LoS can be produced within 2 weeks if all conditions met & info is provided

A LoS from a recognized SDO *may* be considered positively in project proposal reviews as it demonstrates a plan for the project to engage in standardization

ETSI Support to Research Projects

ETSI presence on Advisory Committee

Members of ETSI staff and representatives of ETSI Technical Committees may be present on EXTERNAL Advisory Committees of projects where we have a LoS

'TYPICALLY' ETSI in NOT inside the project consortium and does not receive payment from the funding organization – our efforts are free of payment

Being inside the project external advisory committee allows ETSI to provide greater levels of standardization advice and support to the project

As our activities on the advisory committee are not funded 'TYPICALLY' we only participate to remote meetings with no travel for F2F interactions

'TYPICALLY' indicates there may be exceptions to the rule

ETSI Support to SNS JU Projects (mapping)

Project Name	Project Long Name	Fun... n...	Str... n...	Stream Type	Ty...	Cordis Link	Project General Objectives	Technologies Covered	Map to ETSI Groups
6G-SHINE	6G SHort range extreme communication IN entities	SNS	B	[6G] Radical technology advancement in preparation for 6G, IoT, devices and software	RIA	https://cordis.europa.eu/project/id/101095738	6G-SHINE project will pioneer the main technology components for in-X wireless subnetworks, short range low power radio cells to be installed in a wide set of vertical and consumer entities like robots, vehicle, production modules, classrooms, for the sake of supporting extreme communication requirements in terms of latency, reliability, or data rates. 6G-SHINE will leverage the opportunities offered by the peculiar deployment characteristics of such short range subnetworks, for a highly performant yet cost-efficient radio design that allow to bring wireless connectivity to a lever of pervasiveness which has never been experienced earlier. 6G-SHINE copes with topics ""New IoT components and devices"" and ""New physical layers and associated protocols"" of strand B-01-03 in the SNS work programme. Research will span physical layer, medium access control protocols, radio resource management of these in-X subnetworks, as well as connection with a broader 6G 'network of networks'. The performance of the designed solutions will be analyzed via simulations, and -for selected technologies- over demonstrator platforms. The project will result in a broad set of technology solutions that will be disseminated via scientific publications. Also, the designed solutions will be brought to future 6G standardization, and will be used in future telecommunication equipment and networks. The consortium consists of 12 partners that together bring essential expertise to each of the identified technologies with a mixture of academic institutions and industry players with a strong research department, representing the	Network of sub-networks, sidelink, RIS-aware PHY/MAC protocols, sub-THz PHY/MAC protocols	3GPP, ETSI RIS ISG, ETSI THz ISG (potentially new ETSI ISAC ISG)
6GTandem	A Dual-Frequency Distributed MIMO Approach For Future 6G Applications	SNS	B	[6G] Radical technology advancement in preparation for 6G, IoT, devices and software	RIA	https://cordis.europa.eu/project/id/101096302	6GTandem project will demonstrate ultra-high-capacity coverage, off-load of lower frequency bands and new services such as sub-cm resolution sensing and positioning in high traffic areas by adding sub-THz carriers to lower frequency bands in a seamless, tightly coordinated fashion. The two frequency bands will form a network collaborating and supporting each other in a "tandem" configuration enabling an introduction of high capacity, energy efficient, sub-THz enabled services, while mitigating known drawbacks of the sub-THz frequency bands such as susceptibility to line-of-sight blockage, coverage, and cost. Deployment will be addressed through the introduction of a thin and light dielectric waveguide to distribute a sub-THz RF signal through a daisy chain of integrated low-power antenna units, referred to as a "radio stripe". We will demonstrate the use of lower, sub-10 GHz frequency bands to support the sub-THz band with resilience and coverage and the implementation of a distributed MIMO system to extend the coverage of the sub-THz band as well as offering capacities in the order of Tbps system throughput. We will demonstrate the possibility to implement local fronthaul solutions for added sub-10GHz access points using the high bandwidth of sub-THz radio stripes. Key elements for 6GTandem: - A system defining an 'aligned tandem' dual-frequency distributed MIMO architecture - Medium-aware waveforms, transmission schemes and communication strategies for energy-	dMIMO, Antennas, Radio, sub-THz	ISG THz
ADROIT6G	Distributed Artificial Intelligence-Driven Open And Programmable Architecture For 6G Networks	SNS	B	[6G] Radical technology advancement in preparation for 6G, IoT, devices and software	RIA	https://cordis.europa.eu/project/id/101095363	As the world moves from the 5G towards the 6G era, the mobile communications fabric needs to be architected differently to accommodate the emerging stringent requirements of innovative extreme future-looking applications that cannot be served by existing 5G mobile networks. Heading towards the next decade, when 6G is expected to be widely deployed, 5G application types will be redefined by morphing the classical service classes of URLLC, eMBB, and mMTC and introducing new services. ADROIT6G is an SNS JU project supporting the EC's 6G policy by implementing the first phase of the 6G SNS roadmap towards the evolution of a 6G architecture. ADROIT6G proposes disruptive innovations in the architecture of emerging 6G mobile networks that will make fundamental changes to the way networks are designed, implemented, operated, and maintained. Such innovations include: (i) AI/ML-powered optimizations across the entire network, for high performance and automation; (ii) Transforming to a fully cloud-native network software, which can be implemented across a variety of edge-cloud platforms, including Non-Terrestrial Networks, with security built integrally into the network user plane; (iii) Software driven, zero-touch operations and ultimately automation of	AI/ML, cloud native	ETSI SAI ISG, ETSI ENI ISG, ETSI MEC ISG

The ETSI CAT•ALYST tool

It would be great to talk with the standards experts...

It would be great to talk more about research topics

Researcher/Innovator(s)

Standards Expert(s)

The ETSI "Come-and-Talk" (CAT•ALYST) tool is designed to encourage open exchange on research & technology topics.

CAT•ALYST sessions are made available upon demand and help the research community discuss with standards experts on specific topics of common interest.

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ETSI Resources for Researchers and Academics

Helpdesk for Researchers

www.etsi.org/research

https://www.linkedin.com/
showcase/etsi-standardization-
research-innovation-education

Helpdesk:
research@etsi.org

Director New Technologies:
David.Boswarthick@etsi.org

Dedicated research Webpages

Dedicated contact email

Guides / Leaflets / Videos

Support to EU Projects

Advice on EU Research
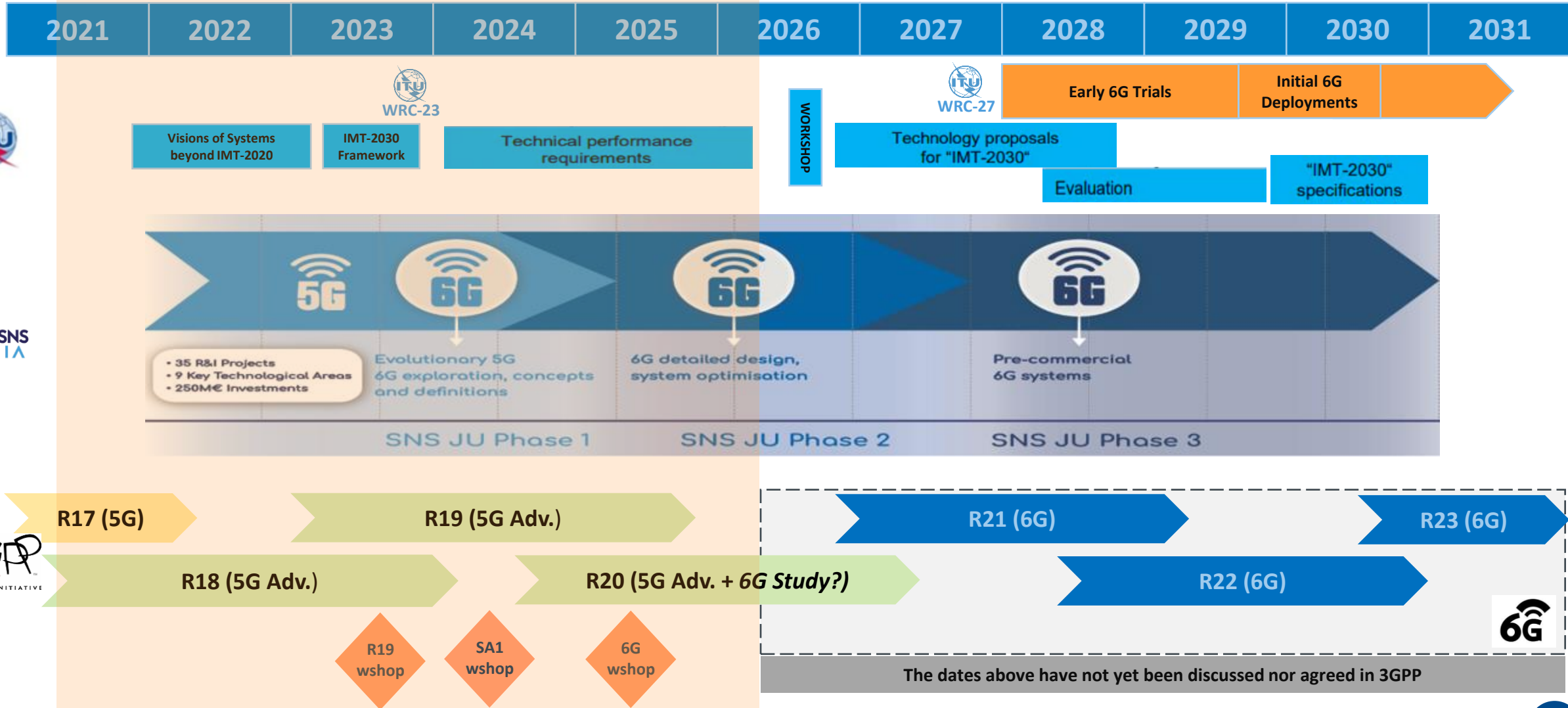
Setting up new Standards Groups

Advice on Standards Activities

… and more

© ETSI

CONTENT

6G Opportunity

6G, Window of Opportunity (for pre-standards work)

ETSI

| 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 |

ITU

WRC-23 | WORKSHOP | WRC-27 | Early 6G Trials | Initial 6G Deployments

Visions of Systems beyond IMT-2020 | IMT-2030 Framework | Technical performance requirements | Technology proposals for "IMT-2030"

Evaluation | "IMT-2030" specifications

6G SNS IA

- 35 R&I Projects
- 9 Key Technological Areas
- 250M€ Investments

Evolutionary 5G 6G exploration, concepts and definitions

6G detailed design, system optimisation

Pre-commercial 6G systems

SNS JU Phase 1 | SNS JU Phase 2 | SNS JU Phase 3

3GPP A GLOBAL INITIATIVE

R17 (5G) | R19 (5G Adv.) | R21 (6G) | R23 (6G)

R18 (5G Adv.) | R20 (5G Adv. + *6G Study?*) | R22 (6G)

R19 wshop | SA1 wshop | 6G wshop

The dates above have not yet been discussed nor agreed in 3GPP

Is there a "Right time" for moving research into standards?

The Innovation Chain: Converting Science into Wealth
Source: uk-cpi.com

- Different maturity levels for research (TRLs = Technology Readiness Levels)

- Early, exploratory research (TRL 1, 2, 3) is *typically* not ready for standards *(there are exceptions)*.

- As soon as research moves to TRL 4, 5 -> and up is considered 'mature' enough to be developed further via early-standards work (pre-standards).

- Before moving to market (TRL 7, 8, 9) standards are generally required to ensure interoperability of solutions, equipment and services.

- NOTE: This is a guideline and there are exceptions.
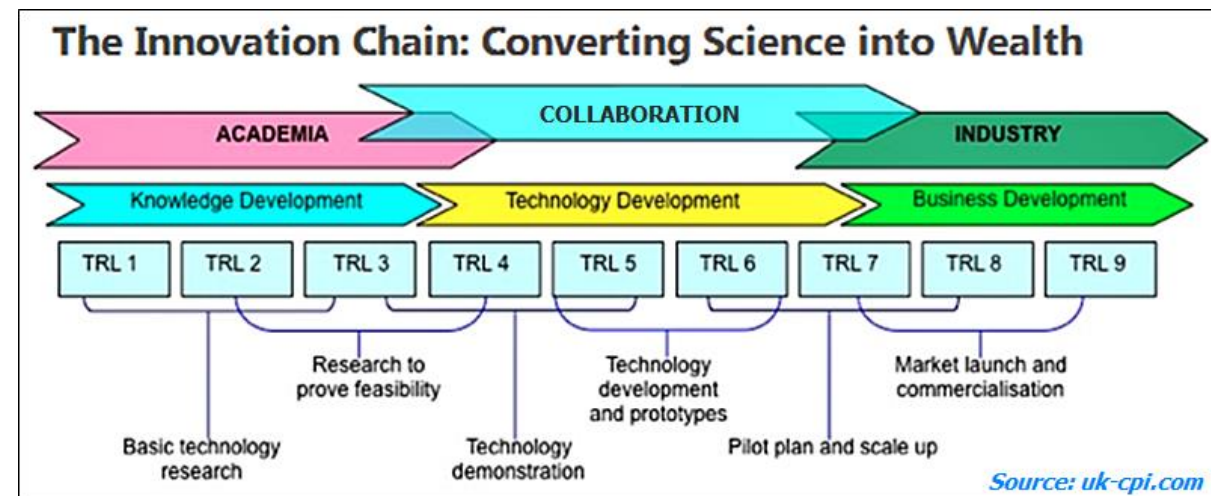
(Example RIS) The Innovation - Standards - Market Flow

Perfect Timing

2018 · 2021 · 202? · 2030

Timing

EU Funded R&D

Work in Private R&D Labs

NO PROJECT

OTHER PROJECT

AIMM

Standards

ISG RIS

3GPP

Increase the % of EU / National research results
making it to market via standardized solutions

Work in Public R&D Labs (Uni)

HEXA-X

Meta Wireless

Pathfinder

Reindeer

RISE-6G

P U T

Corporate Funded R&D

The Graveyard of great ideas
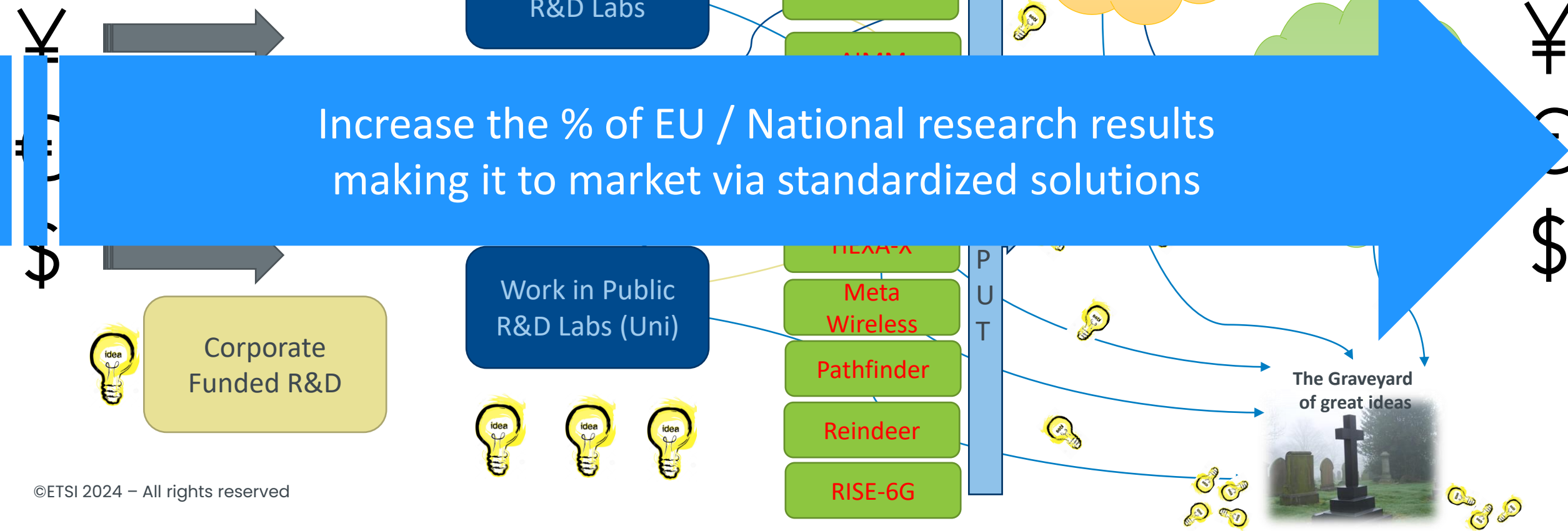
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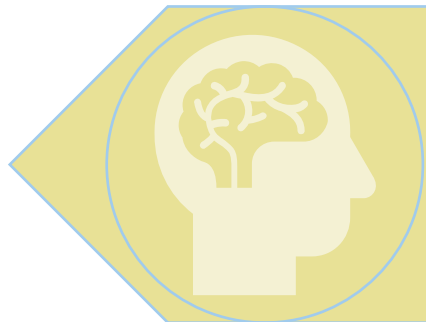
6G Challenge

6G, are we there yet?

ETSI

Current assumption is the first 6G services *may* be deployed in 2030, but of course expectations may change due to market pressures

6G is currently only at the Research & Vision phase, investigating potential technologies. More formal standards for 6G will follow later

We see many announcements of national, regional, corporate 6G programmes & visions with large investments in global 6G research

6G is expected to begin in 3GPP in Rel-20 (6G initial studies) and Rel-21 (6G service requirements), starting around 2024 -> 2025 ***

There is no consensus on "what is 6G" – it will be a mixture of gradual technology **evolutions** from 5G & some **revolutionary** new concepts

New ETSI ISG THz

Quantum Networks

(sub)THz & THz

Sustainable Networks

Reconfigurable Intelligent Surfaces

New ETSI ISG RIS

Optical Wireless Comms

New ETSI ISG ISAC

Integrated Sensing and Comms

AI Native

Shared Spectrum

Non-Terrestrial Networks

Advanced MIMO
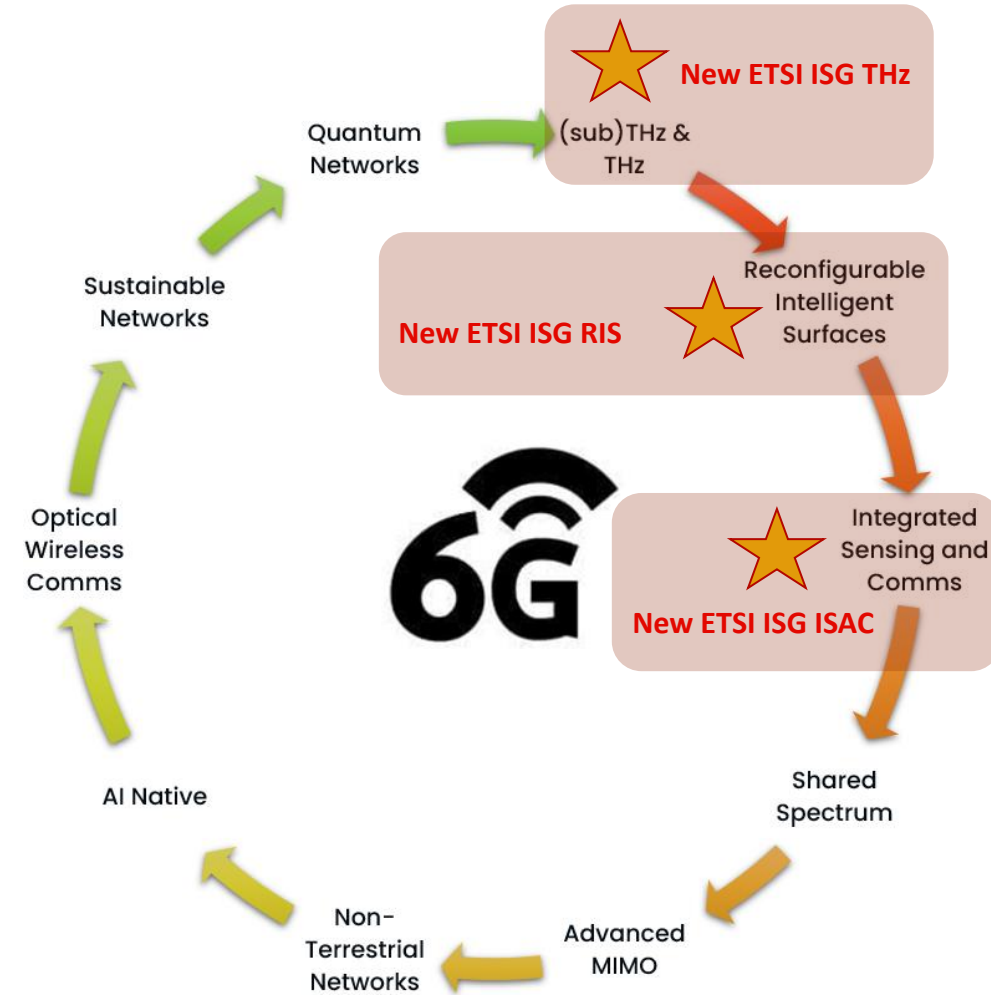
Potential candidate B5G / 6G Technologies

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NOTE: BEYOND R19, These are "indicative and estimated" dates only

Agenda item SNS Projects >>>

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Thank you for your attention

Contact:

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