

INSTITUTE  
OF COMMUNICATION,  
INFORMATION  
AND PERCEPTION  
TECHNOLOGIES



Scuola Superiore  
Sant'Anna

# **Produzione e distribuzione di energie sostenibili: prospettive a livello europeo e nazionale**

Luca Valcarengi  
Scuola Superiore Sant'Anna, Pisa

# TeCIP Intitute

Director: Prof. G. Buttazzo



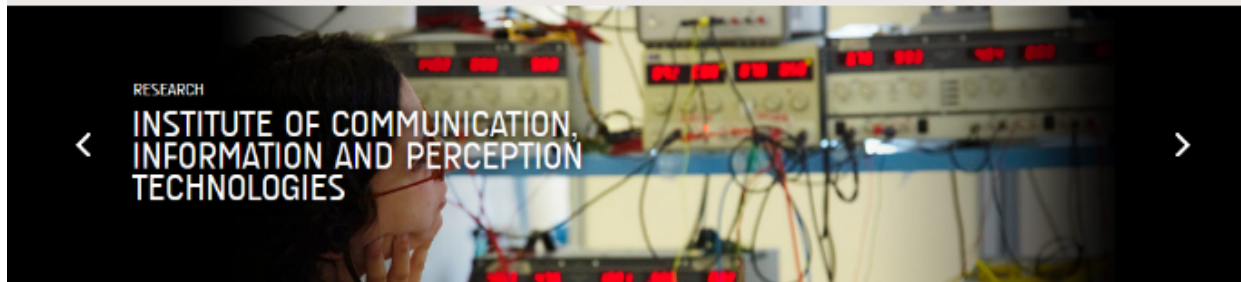
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The TeCIP Institute was created in Pisa in 2001 as a Centre of Excellence of the Italian University, Scientific and Technological Research Ministry.

Core activities of the Institute are **research** and **education** linked to **Communication, Information and Perception Technologies**.

Main research areas are:

- optical communication networks through the use of photonic technologies, also in the fields of sensors and biophotonics;
- IT applications of embedded real-time systems and sensor networks for the Internet of Things;
- virtual environments and interface robotic systems for the study of human-machine interaction and human perception.

**Scientific and technological research** has an **interdisciplinary** character and is developed inside Laboratories, equipped with the utmost leading edge instruments and technologies.

The around 300 professors and researchers can count upon an annual budget of more than 10 million euro to develop their research activities, with the main objective of leading the innovation to an extent of technological development to be used on field.



# Location



## TeCIP Institute, Scuola Superiore Sant'Anna

Scuola

Indicazioni stradali   Salva   Nelle vicinanze   Invia al telefono   Condividi

### Verifica informazioni su questo luogo

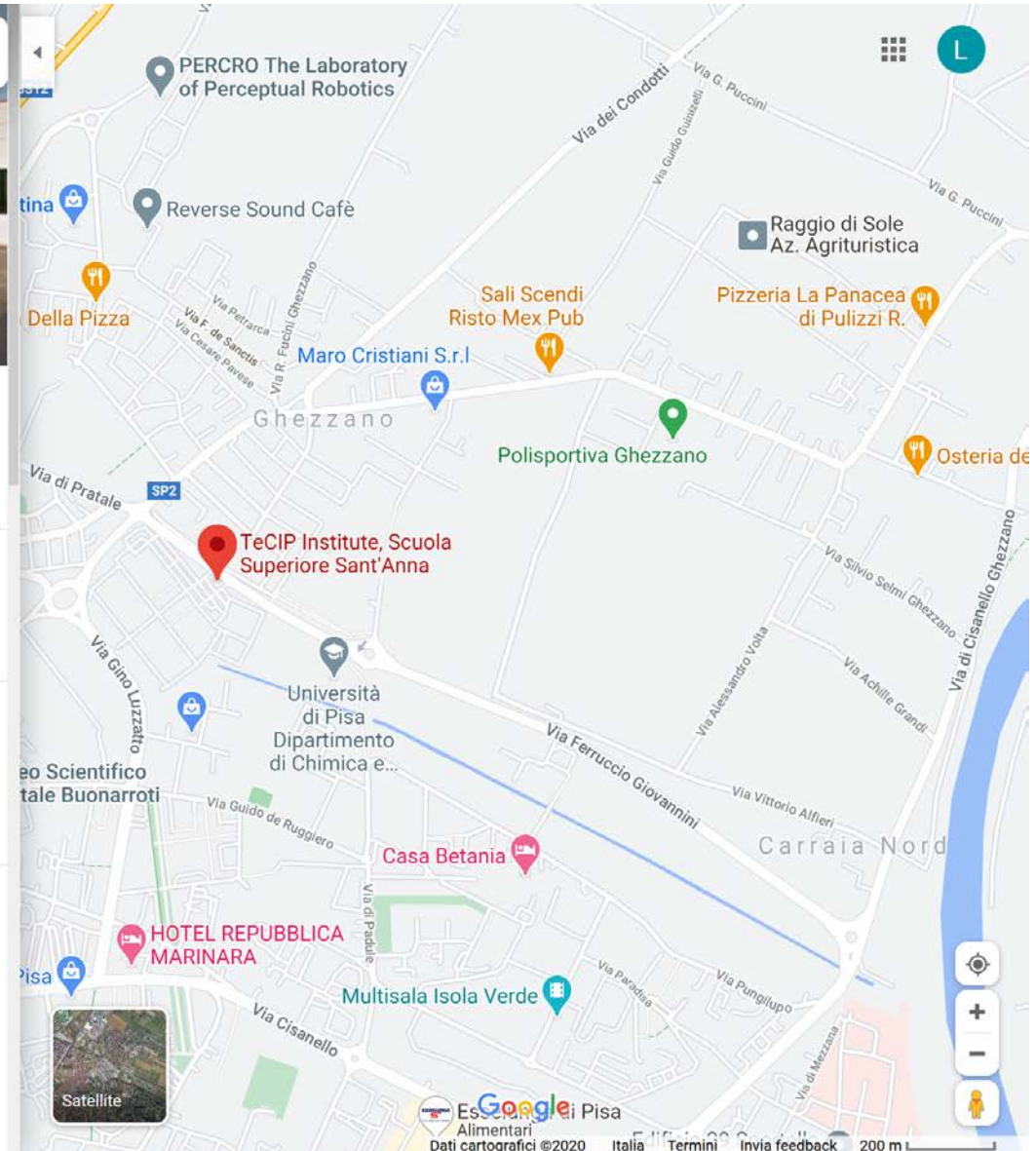
Gli orari o i servizi potrebbero variare a causa dell'emergenza COVID-19

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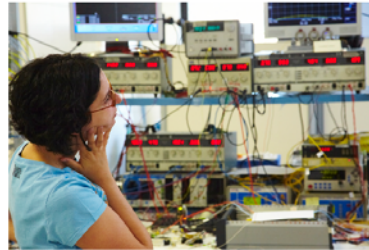
Si trova in: Consiglio Nazionale delle Ricerche Area della Ricerca di Pisa

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- > HIGH-CAPACITY OPTICAL COMMUNICATIONS
- > NETWORKS & SERVICES
- > OPTICAL COMMUNICATION SYSTEMS
- > OPTICAL COMMUNICATION THEORY & TECHNIQUES
- > OPTICAL FIBER SENSORS & INTEGRATED PHOTONICS SUBSYSTEMS
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- > PROJECTS



The research and teaching of the macro-area communications is particularly active in the field of Photonic Networks and Technologies, which stands as a unique example of a nationwide centre for research, thanks to the collaboration between SSSA, Ericsson AB Company and the National Consortium for Telecommunications (CNIT). The Institute TeCIP hosts at its headquarters one Research and Development Center of Ericsson and the National Lab of Photonic Networks CNIT, already cited.

The area of communications is able to develop relevant projects through the complementarity of skills, the international-level scientific qualification and its size, both in terms of human resources and equipment; namely, it can produce experimentations that even include technology demonstrations in relevant (industry) environment, i.e. up to TRL6. The research staff consists of professors, researchers, graduate students and technicians. In addition, the area offers high quality training and professional education in the field of communications.

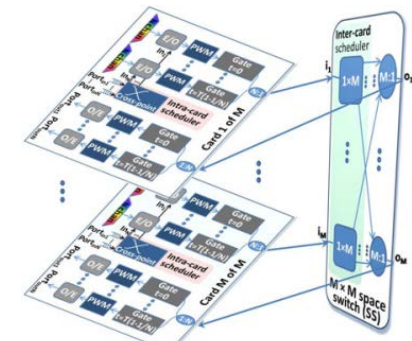
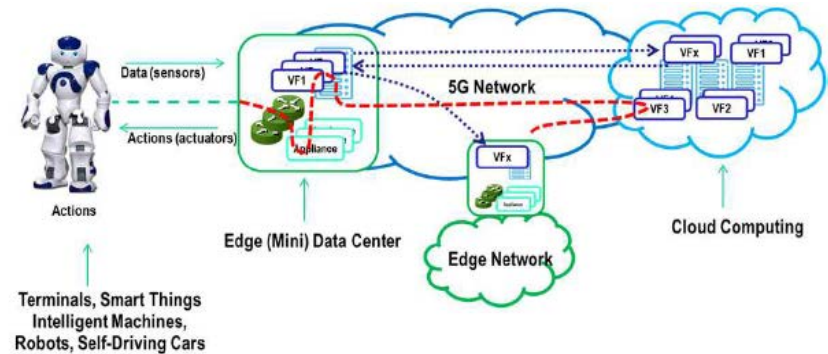
The area is currently structured into seven research areas:

- networks and services
- optical communication systems
- theory and techniques of optical communications
- digital and micro-wave photonics
- optical sensors and integrated photonic subsystems
- high-capacity optical systems
- advanced technologies for integrated photonics

In addition to several formal agreements for scientific collaboration with universities and

# Networks & Services

- Provisioning, resilience, and QoS support in data networks
- Network Softwarization
- Zero Touch Network and Service Management based on AI/ML
- Architectures and technologies for 5G/6G
- 5G/6G for Vertical Industries
- Optical interconnection for Data Center and High-Performance Computing
- Industrial networks for railway control applications
- Distributed and interconnected robotics
- Service for Assisted driving and road safety
- e-Health, m-Health



# Bringing 5G to Power

- Opportunities, business values and barriers associated with introducing mobile connectivity in electric distribution networks
- Study conducted between April and November 2019
- Scope covered the Swedish power distribution network market.
- Main drivers
  - Emissions from fossil fuel powered energy generation are a major contributor to global warming.
  - The UN estimates that up to 85 percent of electricity must be renewable by 2050, in order to combat the effects of climate change
  - Society is investing in renewable energy such as solar and wind
  - Consumers are becoming “prosumers”
  - Electricity is a difficult product to store; therefore, a balance between generation and consumption is vital
  - More and faster responses to adjust the balance between generation and consumption is needed
  - Connectivity can play a key role when it comes to enabling this need of fast and accurate power grid balancing.

## Key findings

To cater for future demand, improve quality and adhere to environmental policies, power distribution networks need significant investments.

- Investments of EUR 1.5 billion per year are expected for the Swedish market, of which our interviews indicate EUR 150 million is Information and Communication Technology (ICT) related.

Connectivity and automation can deliver higher reliability and better protection of the electric power grid, unleashing high potential values.

- The cost of interruptions to society is high – estimated at around EUR 150 million every year for the Swedish market.
- Interruption durations are expected to be reduced by 50–75 percent with the use of ICT, resulting in an annual revenue increase for a single Swedish distribution system operator of up to EUR 40 million.

Cellular communication is an important enabler to support new power grid architectures and operational models.

- Power grid protection and remote control can be implemented using cellular technologies, which requires 5G in order to handle demanding use cases such as automated protection.

Distribution system operators (DSOs) expect communications service providers to be responsive to the industry’s needs and regulations.

- DSOs want to be able to own critical parts of the communication infrastructure to meet performance and regulatory requirements.
- Support for private and hybrid communication networks will be important.

Source: <https://www.ericsson.com/en/reports-and-papers/industrylab/reports/bringing-5g-to-power>

# National 5G Energy Hub Germany

## National 5G Energy Hub – A Future-Oriented Communication Architecture for Electrical and Thermal Energy Systems

Sebastian Kraemer<sup>1,\*</sup>, Martin Knorr<sup>1</sup>, Stephan Wiemann<sup>1</sup>, Etienne Gasch<sup>1</sup>, Ilya Sychev<sup>1</sup>, Wojciech Kozak<sup>1</sup>, Joachim Seifert<sup>1</sup>, and Peter Schegner<sup>1</sup>

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- 5G Energy Hub is a research association between the TU Dresden and the RWTH Aachen as well as companies from the information technology sector.
- The project scope: digitalization of the energy sector.
  - Key points
    - sector coupling in the domain of thermal and electrical energy
    - wireless communication technologies for a scalable sensor and actuator pool
    - flexible cloud infrastructure with respect to data privacy awareness.

# Ongoing Programs: EC Horizon Europe

## Our vision

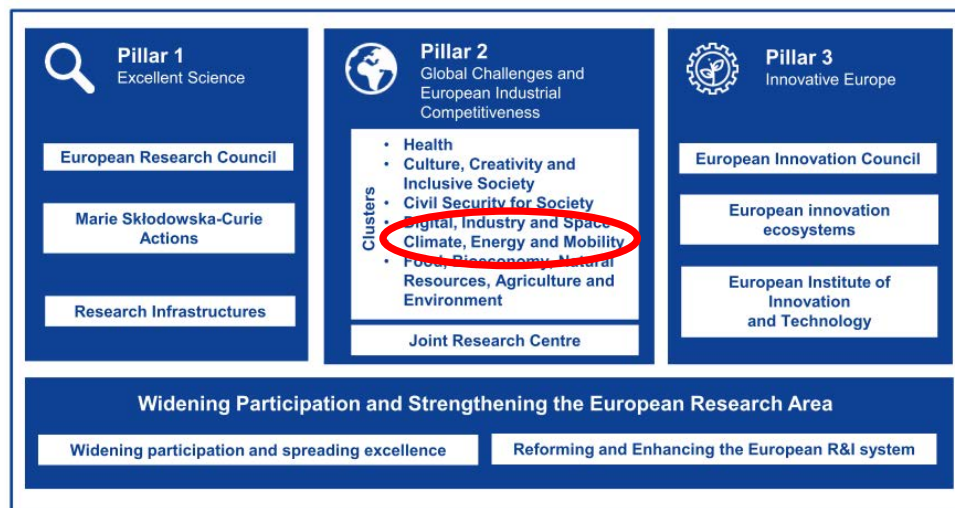
A sustainable, fair and **prosperous** future for **people** and **planet** based on European values.

- Tackling **climate change** (35 % budgetary target)
- Helping to achieve **Sustainable Development Goals**
- Boosting the Union's **competitiveness and growth**



Source: <https://www.un.org/sustainabledevelopment/>

## Horizon Europe: Preliminary structure



Source:

[https://ec.europa.eu/info/sites/info/files/research\\_and\\_innovation/strategy\\_on\\_research\\_and\\_innovation/presentations/horizon\\_europe\\_en\\_investing\\_to\\_shape\\_our\\_future.pdf](https://ec.europa.eu/info/sites/info/files/research_and_innovation/strategy_on_research_and_innovation/presentations/horizon_europe_en_investing_to_shape_our_future.pdf)



# Ongoing Programs: Next Generation EU

## Main elements of the agreement

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More than 50% of the amount will support modernisation, for example through:



research and innovation, via Horizon Europe



fair climate and digital transitions, via the Just Transition Fund and the Digital Europe Programme



preparedness, recovery and resilience, via the Recovery and Resilience Facility, rescEU and a new health programme, EU4Health

In addition, the package pays attention to



modernising traditional policies such as cohesion and the common agricultural policy, to maximise their contribution to the Union's priorities



fighting climate change, with 30% of the EU funds, the highest share ever of the European budget



biodiversity protection and gender equality

Source: [https://ec.europa.eu/info/strategy/recovery-plan-europe\\_en](https://ec.europa.eu/info/strategy/recovery-plan-europe_en)

# Ongoing Programs: Next Generation Italia

- La **transizione, verde e digitale** è al centro di questo progetto ambizioso, che vuole disegnare l'Italia del futuro, portandola sulla frontiera dello sviluppo, a livello europeo e mondiale.
- Il PNRR è costituito da **6 missioni**, che a loro volta raggruppano **16 componenti** in cui si concentrano **48 linee di intervento**, con progetti selezionati privilegiando quelli trasformativi e con maggiore impatto sull'economia e sul lavoro, e riforme a essi coerenti. (to be confirmed)



<https://www.mef.gov.it/focus/Next-Generation-Italia-il-Piano-per-disegnare-il-futuro-del-Paese/> (date 18/01/2021)

# Conclusions

- Outlook of possible exploitation of 5G/6G in the energy sector
- Outlook of ongoing initiatives
- LIVING GRID research and development is very timely

**THANKS A LOT  
QUESTION ?**