SUSTAINABLE PLACES 2021
Sep. 28 - Oct. 1, 2021 | Rome, Italy

TIG ON

TIGON will demonstrate a comprehensive and market-ready solution for DC-hybrid grids for replication across Europe

Hybrid microgrid innovations for greener, more resilient and secure power networks

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 957769.

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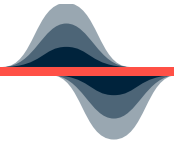

3 The Consortium

	Research Centres and Universities	Small-Medium Entreprises	Large Companies
Technology validators	ceder, cea		
Technology developers	circe, CERTH, CARTIF	UBITECH	efacec, PREMO
Manufacturers			
End users and validators	TURKU AMK	Vakuo	"МЕТРОПОЛИТЕН" ЕАД, ieit
Dissemination, communication, replication	ICONS	HYPERTECH energy labs	RINA

TIGON at a glance

https://tigon-project.eu/

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TIGON – Fast Facts

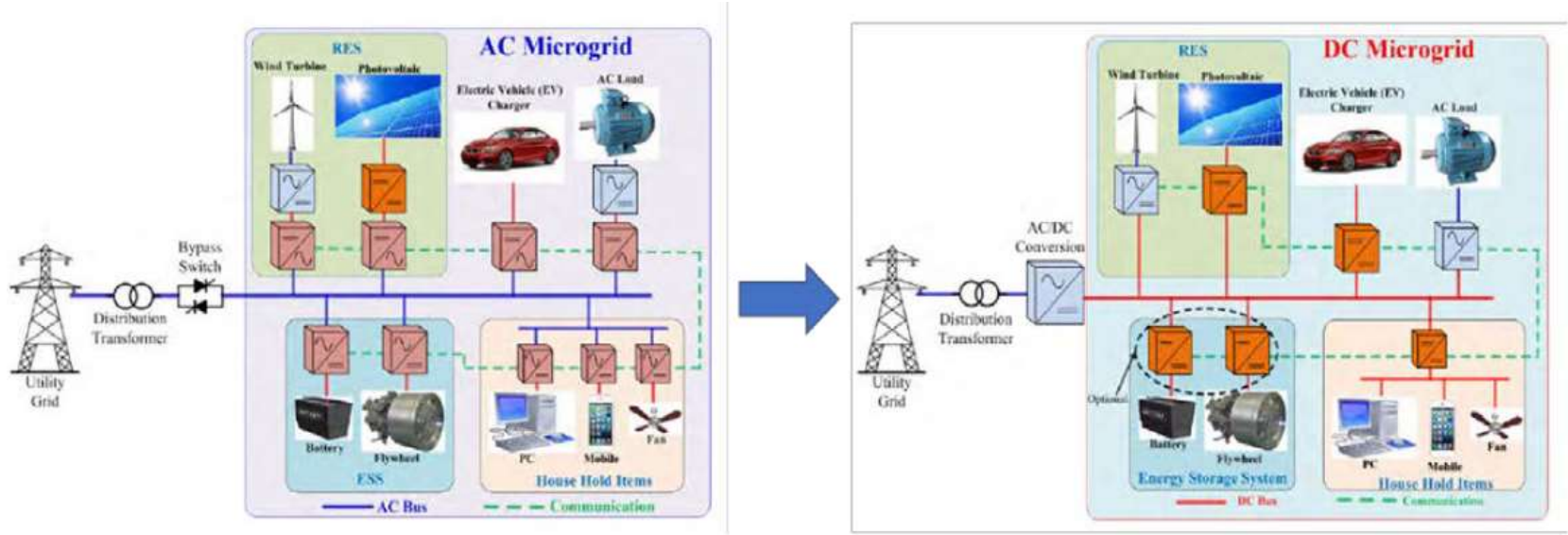
- **Topic: LC-SC3-ES-10-2020**
  DC – AC/DC hybrid grid for a modular, resilient and high RES share grid development
- **Type of action:** Innovation Action

- **Total Costs:** 7’996’115€
- **Max. Grant Amount:** 6’957’197€

- **Duration:** 48 months (Sept 2020 - Aug 2024)
- **Coordinator:** CIRCE
- **Number of partners:** 15 + 1LTP

7 Background and existing challenge

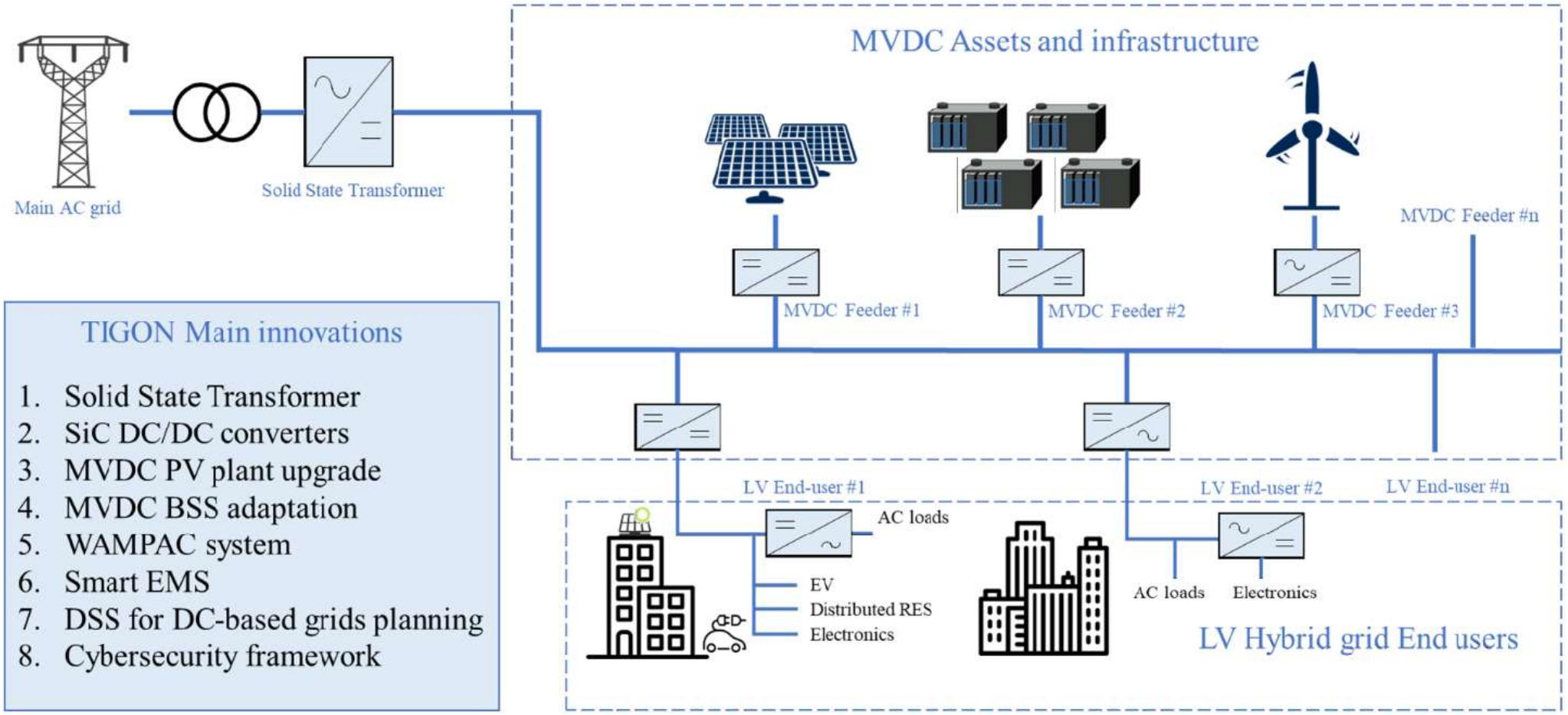
Moving from AC towards hybrid DC power grid scenarios



Challenges

- Enable an efficient interconnection between microgrids
- Increase grid resilience and reliability with new protection schemes
- Provide efficient control, management and protection of the grid
- Ensure the power grid quality of hybrid-grid schemes
- Take the pioneering technologies to the market

8 The TIGON solution

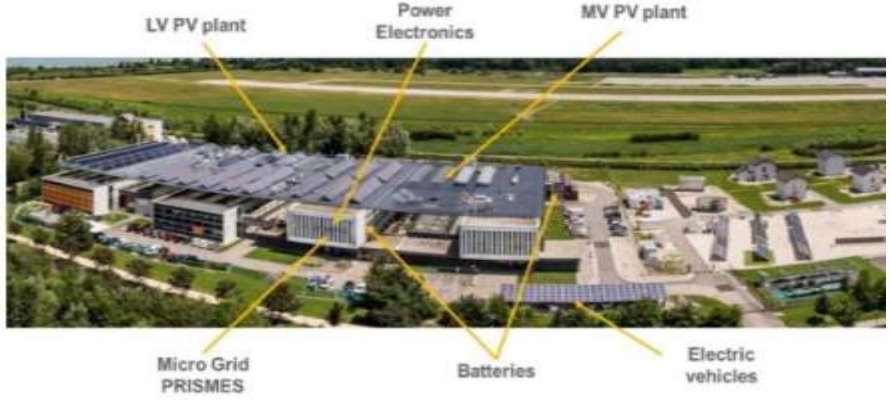


TIGON Main innovations

1. Solid State Transformer
2. SiC DC/DC converters
3. MVDC PV plant upgrade
4. MVDC BSS adaptation
5. WAMPAC system
6. Smart EMS
7. DSS for DC-based grids planning
8. Cybersecurity framework

9 TIGON demo-sites and use-cases

Demo-site INES-CEA (France)



Demo-site CIEMAT (Spain)

Use-case Turku region (Finland)

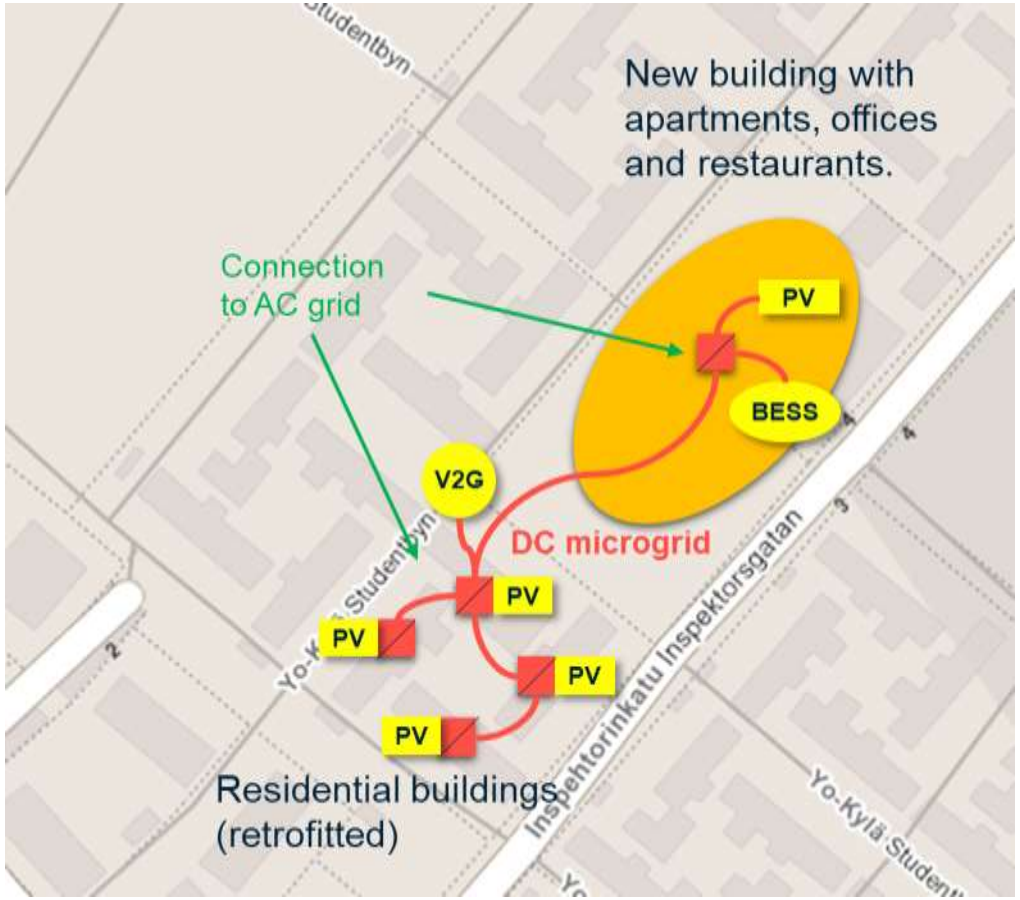
Use-case Sofia (Bulgaria)

10 Use Case: Turku region, student village (Finland)

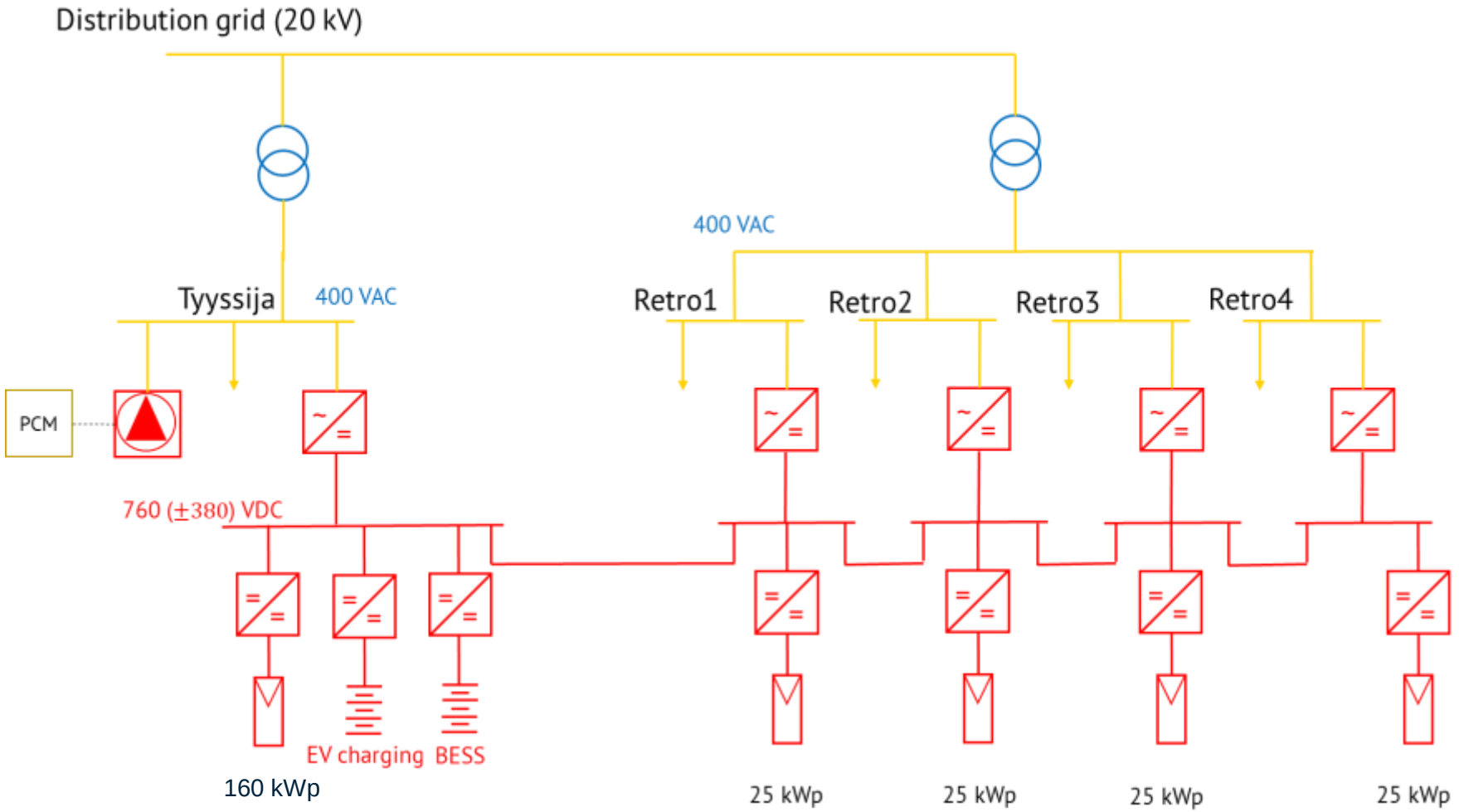
Areal view of the piloting district

11 Use Case: Turku region, student village (Finland)

Turku region, student village (Finland)	
Specific location	City of Turku
Type of network	LV DC microgrid
Deployment and set-up	03.2022 - 09.2022
Operation, evaluation and impact assessment	09.2023 - 08.2024
Keywords	#Energy Management System, #Bifacial Solar PV & BES Storage
Main study	Optimized RES-Produced Management + Improve Smart DC microgrid efficiency
Result	Integrate Photovoltaic Power Plant and Energy Storage System



12 Student village microgrid schematics



13 Use Case: Turku region, Naantali residential district (Finland)

Areal view of the piloting residential district

Residential houses with LVDC Microgrid

Public Beach PV canopies

14 Use Case: Turku region, Naantali residential district (Finland)

Turku region, Naantali residential district (Finland)	
Specific location	Luonnonmaa Res.Dist.
Type of network	LV DC Residential Microgrid
Deployment and set-up	03.2021 - 08.2022
Operation, evaluation and impact assessment	09.2023 - 08.2024
Keywords	#Energy Management System, #Solar&Storage
Main study	Optimized RES-Produced Management + Improve Smart DC microgrid efficiency
Result	Integrate Photovoltaic Power Plant and Energy Storage System

15 Naantali residential district, solar canopies

Local DSO is operating Solar Canopies and offering RES electricity to Residential district.

16 Interventions at Turku region cases

1. **Hybrid network model** to be completed with **e-vehicle charging capabilities, PV energy production and storage**

2. Adaptation of the TIGON **energy management system (EMS), decision support system (DSS) and cybersecurity system**

3. Development of **new business models for LVAC and LVDC microgrids** for residential applications

17 Key Exploitable Results

TIGON KERs expected to be generated are:	Type	Group
KER1: Solid State Transformer (SST) – *Market: 2026* • Between other applications, SSTs enable the interconnection of MV AC and DC grids.	Technology Hardware	Hardware development
KER 2: SiC DC/DC converters – *Market: 2026* • SiC WBG DC/DC converters topologies to improve efficiency in the interconnection of DC grids.	Technology Hardware	
KER 3: DC protection schemes – *Market: 2026* • Overall DC protection scheme covering both MV and LV sides of the hybrid grid.	Advancement in technical knowledge/new DC protection model	
KER 3: MVDC PV Plant – *Market: 2024* • Solar power plants for production at MVDC directly.	Model for upgrading solar plants	
KER 5: WAMPAC system – *Market: 2027* • Monitoring and Protection system whose main purpose is to control the stability and safe operation of the whole system.	Technology: Hardware and software	Software solutions
KER 6: Energy Management System (EMS) – *Market: 2024* • Operation modes and strategies integrated into a control software able to manage hybrid grids.	Software/Strategy services	
KER 7: DSS tool for DC-based grids – *Market: 2027* • Software tool that will provide with guidelines and simulations facilitating the planning of grid expansions or the development of new hybrid-grids	Software/Strategy services	
KER 8: Cybersecurity Defence System – *Market: 2027* • Cybersecurity defence framework that will enable the protection of digitalised DC-based hybrid grids	Framework/model/services	

18 Expected impacts of TIGON as a whole

- ***Easier planning and targeted investments in the sector***
  - DSS will be able to provide with guidelines facilitating the planning of grid expansions or the development of new DC-based hybrid grids across the EU.
- ***Electricity grid more resilient to faults and cyberattacks***
  - To achieve immune and resilient by design DC-based hybrid grids configurations including robust management and control techniques (WAMPAC and smart EMS) as well as innovative power electronics (SST and SiC DC/DC converters) that allow maximizing the integration of RES.
  - TIGON will develop a cybersecurity defence system.
- ***Greater share of renewables into the power network***
  - DC-based hybrid architectures are able to accommodate higher rates of RES in a more flexible and controllable way.
  - SST will allow enhance the stability and power flow control of the whole system while providing ancillary services to the main grid.
- ***More efficient electricity system***
  - New configurations of DC-DC converters based on SiC technology and resonant circuits are expected to achieve energy efficiencies over 98%.
  - Thanks to developed BSSs and EMS, TIGON is expected to increase in at least an additional 25% the original energy efficiency of the systems.

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TIGON

www.tigon-project.eu

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