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Reliable Sustainable Connected

EDSO
for smart grids

enel

esa

business
applications

SPACE-BASED SERVICES FOR DISTRIBUTED ENERGY NETWORKS [SMART-GRIDS] webinar

November 28th 11:15 – 12:15 (CET)

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European Space Agency

→ AGENDA

- 11:15 – 11:25 (ESA)
 - Welcome
 - ESA background
 - Space-based Services For Distributed Energy Networks [Smart-grids] : planned invitation to tender

- 11:25-11:35 (ENTSO)
 - ENTSO background
 - Key topics of relevance

- 11:35-11:45 (EDSO)
 - EDSO background
 - Key topics of relevance

- 11:45-11:55 (ENEL)
 - ENEL background
 - Key topics of relevance

- 11:55-12:15
 - Open Questions & Answers session

→ WELCOME

➤ Welcome to participants

➤ Guidelines how/when to interact during the webinar:

- Please keep your microphones muted and webcams off at all times
- Please use the chat function anytime to submit your questions to the presenter. They will be addressed during the Q&A at the end of the webinar

PURPOSE OF ESA



“To provide for and promote, for exclusively peaceful purposes, cooperation among European states in space research and technology and their space applications.”

Article 2 of ESA Convention

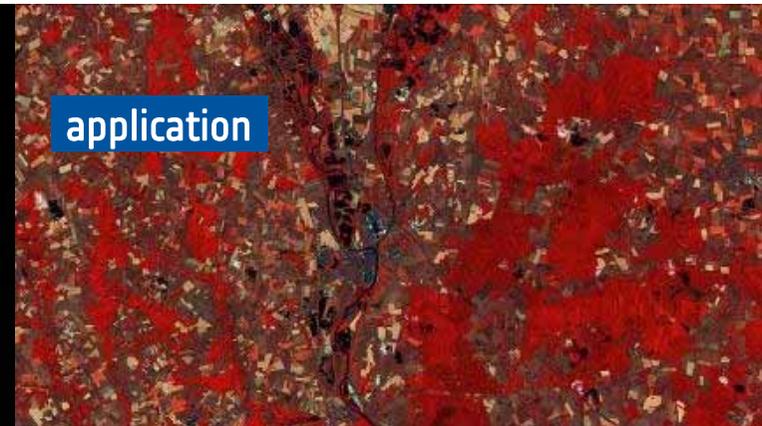
science



human spaceflight



application



earth observation



space transportation



navigation



exploration



technology



telecommunication



→ FUEL FOR YOUR BUSINESS

Could you be leveraging Space technology and data for the benefit of life on Earth?



→ OUR OFFER TO YOU

We'll work together to make your idea commercially viable, with:



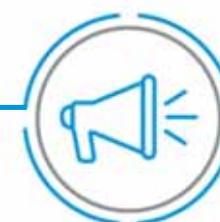
Zero-Equity
Funding
(€60k-€2M+)



Tailored Project
Management
Support



Access to
Our Network
& Partners



Use of the
ESA Brand for
Credibility

The background of the slide features a series of high-voltage power transmission towers, also known as pylons, silhouetted against a dramatic sky. The sky transitions from a deep blue at the top to a bright orange and yellow near the horizon, suggesting a sunset or sunrise. The towers are connected by a network of power lines that stretch across the frame. The overall scene is a classic representation of the electrical power grid.

→ **SPACE-BASED SERVICES FOR DISTRIBUTED ENERGY NETWORKS [SMART-GRIDS]**
PLANNED ESA'S FUNDED INVITATION TO TENDER



→ SPACE-BASED SERVICES FOR DISTRIBUTED ENERGY NETWORKS



Objectives

- Assess **technical** feasibility and **economic** viability of **space** based applications for **SmartGrid** and **electricity grid maintenance & operations**
- Get **anchor customers commitment** towards services implementation and **sustainable operation**.
- Define a **roadmap** for services **implementation** and **demonstration** (potentially through a follow-up ESA co-funded project).

Invitation to tender planned to be issued in Nov 2018

Funding up to **€250K** per Activity

→ KEY AREAS OF INTEREST

- **Smart Grids:** demand and response management, integration of electric vehicles into the electricity grid, home automation, virtual power plants and industrial microgrid management, etc.
- **Electricity grid maintenance:** conductivity and hot spot measurements, vegetation and infrastructure monitoring, weather event impacts on energy infrastructure and supply, assessment of building electrical consumption, use of satellite communication for utilities, etc.
- **Technology enablers:** Data analytics & big data, artificial intelligence, internet of (nano-) things, cybersecurity, 5G, etc.



Study Application areas

→ SmartGrid



Satellite Navigation

- ✓ Geolocate sensors and actuators data



Satellite Communication

- ✓ Communication from/to sensor networks not reliably covered by terrestrial networks
- ✓ Where high resilience is required (e.g.: terrestrial network back-up)
- ✓ IoT SatCom supported services
- ✓ 5G supported services



Earth Observation

- Predict peaks in both energy production and consumption
- Early warning of potential grid outages

- Automatic load balancing/self-healing of the electricity grid and Distributed energy storage.
- Virtual Power Plants (VPP): VPPs operate portfolios of distributed energy generators and operate them as one flexible energy source.
- Demand Response (DR): DR is enabled by real-time dynamic pricing for households and enterprises.
- Smart meter enabled services: home automation / AMI.
- Predictive outage and maintenance.
- Integration of Electric Vehicle (EV) fleet into the energy system

Study Application areas

→ Electricity grid maintenance



Satellite Navigation

- ✓ DGNSS to monitor the stability of critical infrastructure
- ✓ DGNSS for UAV navigations



Satellite Communication

- ✓ Communication from/to sensor networks not reliably covered by terrestrial networks
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- ✓ IoT SatCom supported services
- ✓ 5G supported services



Earth Observation

- SAR for monitoring ground displacements
- SAR/ Optical for vegetation monitoring
- Extreme weather events forecast
- Thermal sensors to provide coarse temperature information over large areas

- Conductivity and hotspot measurements
- Infrastructure monitoring
- Vegetation monitoring
- Weather events impacts on energy infrastructure and supply
- Assessment of building electrical consumption
- Satellite communication back-up platform for utilities emergency data and voice communication

→ FUNDING

- Funded participation to ESA Business Applications is open to any company and/or organisation, be it as group of users, public body or non-governmental organisation, residing in any of those states that subscribe to the ARTES IAP programme.
- To date, **Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, The Netherlands, Norway, Poland, Portugal, Romania, Sweden, Switzerland and the United Kingdom** have subscribed.

**At ENTSO-E we
enable Europe's
energy transition.**

[Learn more](#)

ENTSO-E in figures

43 TSOs

operating electricity systems & facilitating power markets in

36 countries
(EU + 8)



±435 TWh of electricity exchanged across borders



±480,000 km of interconnections
This is more than the distance between the Earth and the Moon

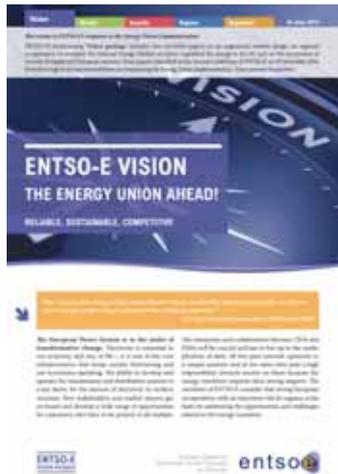


Highest load **581 GW** 18/1/2017
Lowest load **265 GW** 11/6/2017



What does ENTSO-E do?

Contributes to the design and implementation of the Internal Energy Market



Develops the necessary IT tools for enabling the implementation



Common Grid Model

Provides regular reporting and recommendations for the development of the network

Mid-term Adequacy Forecast @ a glance



Electricity grid maintenance & operations

Conductivity and hot spot measurements

- Detection of Hot Spots in Core Equipment
- Conductor Sag

Vegetation monitoring

- Information on vegetation status
- Identification of new objects in right of way

Infrastructure monitoring

- Pylons Displacement:
- Incidents on overhead lines, long cable connections, submarine cables

Weather events impacts on energy infrastructure and supply

- Ice Load Alarms

Satellite communication back-up platform

- Satellite backup platform to support inter-TSO emergency data and voice communication, and out of band communication for inter-TSO data network

THANK YOU FOR YOUR ATTENTION

Our values define who we are, what we stand for and how we behave.

We all play a part in bringing them to life.



EDSO



Shaping smarter grids for your future



What is EDSO?

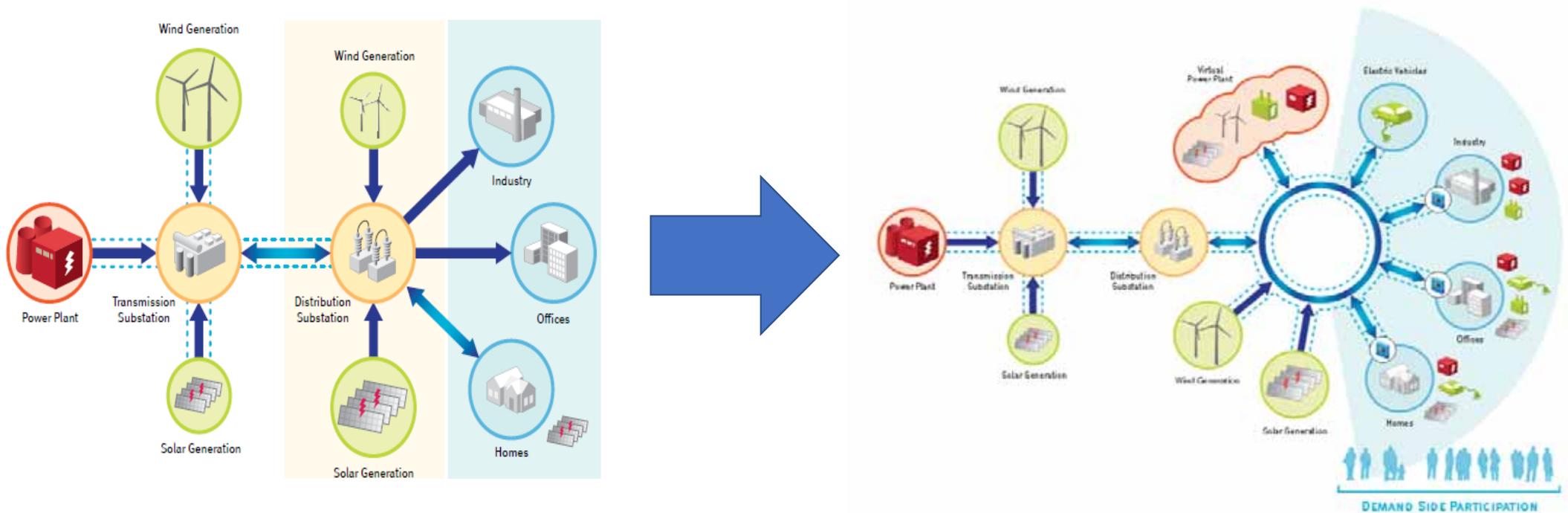
European Distribution System Operators for Smart Grids (EDSO) gathers 37 leading electricity distribution system operators (DSOs), including 2 associations, from 21 European countries connected to 200 million metering points serving more than 350 million EU citizens.

Through its work on electricity distribution-related technologies, policies and projects, its members cooperate to ensure the reliability of Europe's electricity supply for customers and enabling their active participation in our energy system.



Energy Transition

Europe's electricity distribution system is facing an unprecedented energy transformation driven by the EU's low-carbon transition. The European Distribution System Operators (DSOs) are committed to this evolution and plan to tackle it in a timely, cost-effective and reliable manner while being a neutral market facilitator.

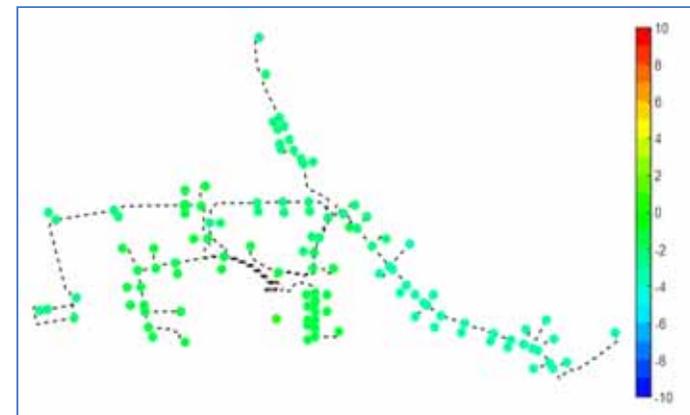
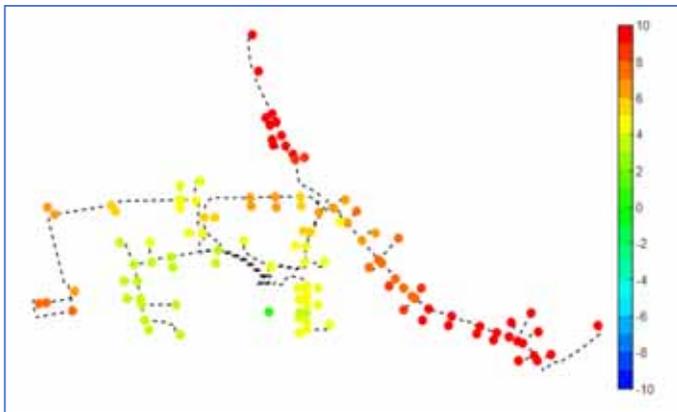


Smart Digital Grids

Solar power, e-mobility and electricity storage systems will change significantly the power flows and the infrastructure needed in the future. It is imperative for DSOs to use new technologies to be as efficient as possible managing resources and personnel for thousands of safe and reliable operations.

Areas of interest:

- **Network design and Planning:**
- **Field Operations & Crew Safety**
- **Control Center Management**
- **Preventive Maintenance**



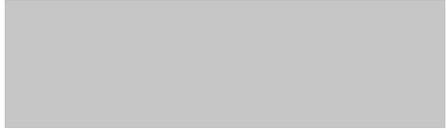
Smart Customers

Additionally it is of high importance the employment of technology and communication infrastructure to advance on the customer side of the distribution network in order to assure full smart metering potential, especially with regards to grid-relevant information collected by the meter that can be exploited in order to optimize consumer performance:

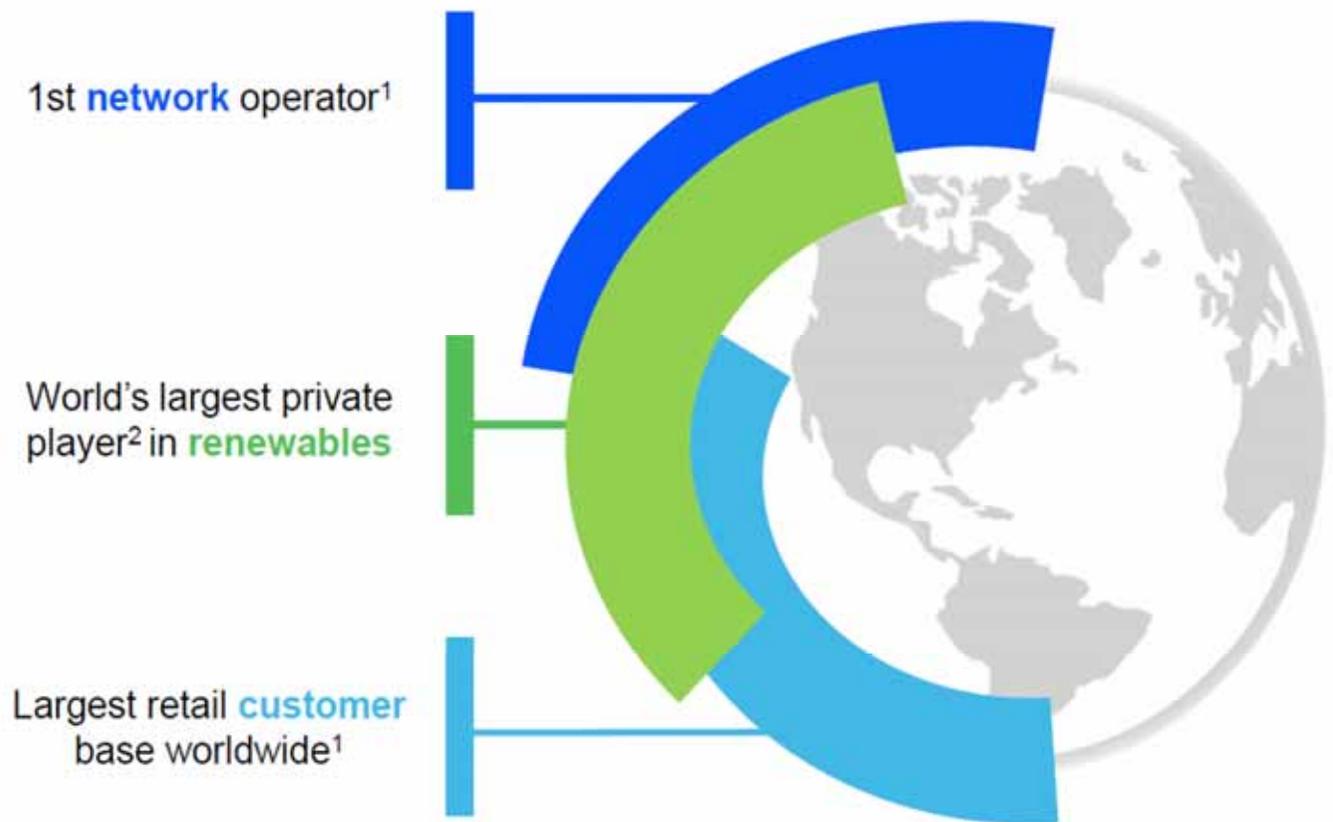


Areas of Interest:

- Customer Service
- E – Mobility & Smart Charging
- Cybersecurity
- Data analytics & Big Data
- Internet of Things



We are a leader in the new energy world



73 mn end users



43 GW capacity²



46.5 GW capacity³



5.7 GW demand response



~ 64 mn customers⁴

1. By number of customers. Publicly owned operators not included
 2. By installed capacity. Includes managed capacity for 4.2 GW
 3. It includes nuclear
 4. Includes customers of free and regulated power and gas markets

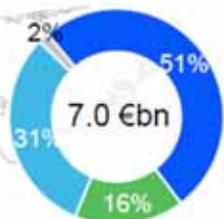
Our business model is well diversified and provides long term visibility



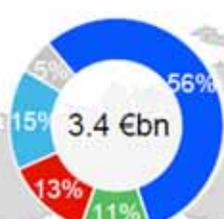
North & Central America



Italy



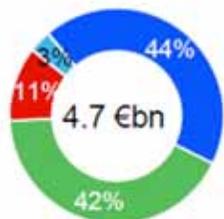
Iberia



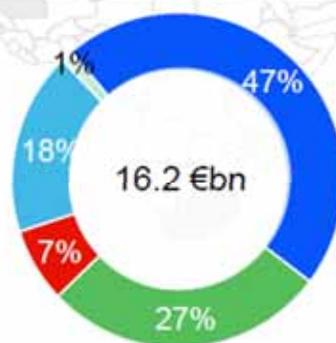
Europe & North Africa



South America



2018E Group EBITDA¹



Africa, Asia & Oceania



- Networks
- Renewables
- Thermal generation
- Retail
- Other

1. As of 2018E. Breakdown excludes -0.1 €bn from holding and services Presence with operating assets or through Enel X

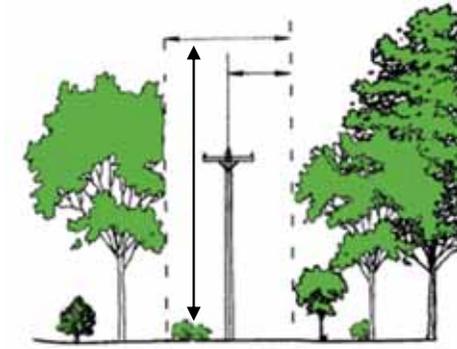
Vegetation Management



managing the risk associated to vegetation or other sources interfering with overhead electrical lines

The feasibility study would investigate possible innovative approaches to address the data collection solution and growth estimation with an important focus on the capability to build up a risk management tool able to plan and prioritize maintenance initiatives in field:

- proper data collection solution capable to retrieve all relevant information regarding vegetation status and other manufactures surrounding grid infrastructures in particular overhead lines;
 - such solution (historically LiDAR/photo/video made from helicopters) should also allow deeper information collection such as vegetation species and ground characteristics and/or lower costs and higher density.
 - a comprehensive growth estimation algorithm capable to take into consideration main relevant environmental factors to allow the estimation of vegetation growth.
- A comprehensive growth estimation algorithm capable to take into consideration main relevant environmental factors to allow a proper estimation



Non Technical Losses analysis



Space Based methodology for consumption estimation at level of building or customer premise

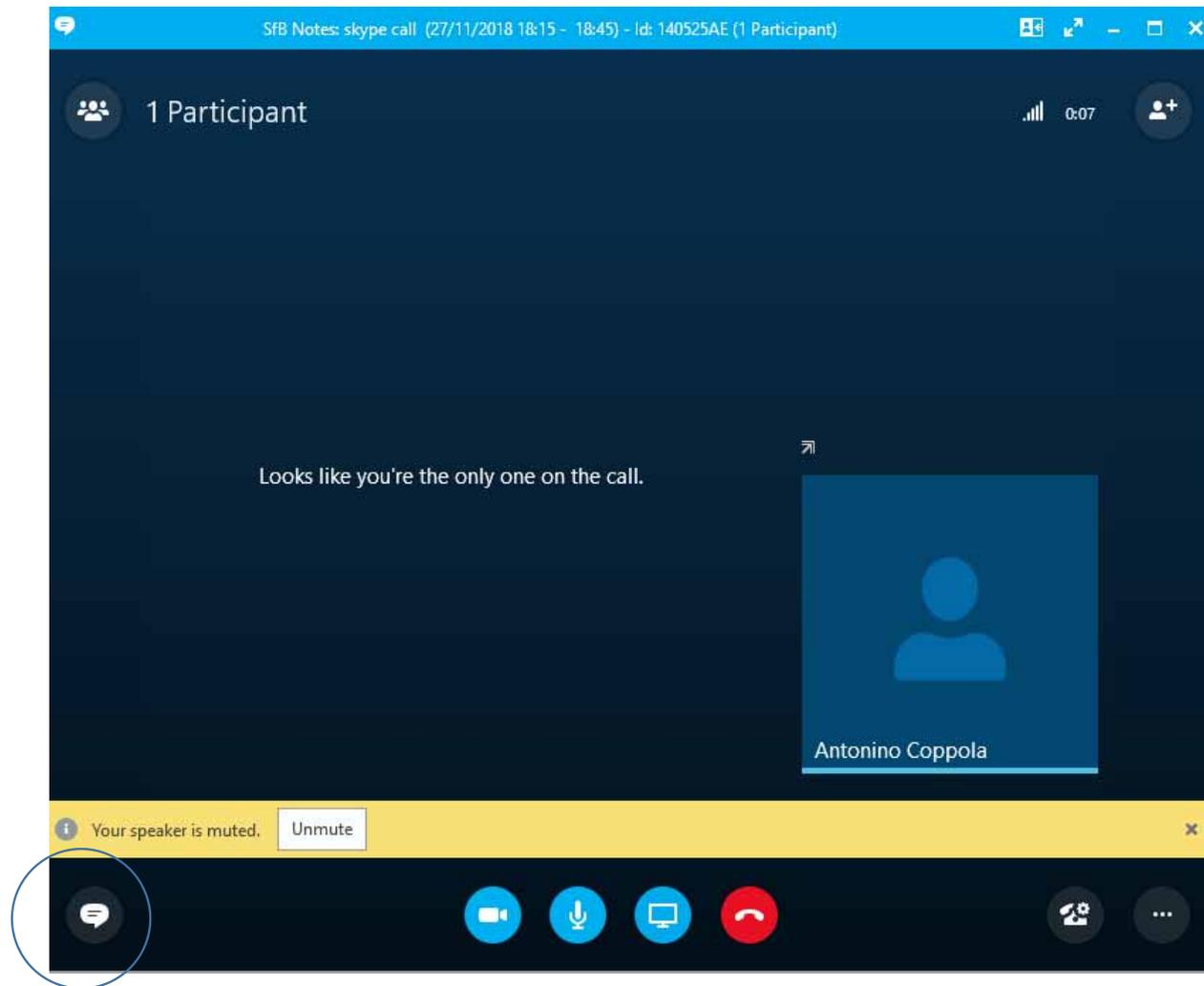
- evaluating a methodology aimed at estimating the electrical consumption of every building based on its characteristics as observed from satellites, such as: building height, floor number, kind of neighbourhood, commercial/industrial/residential use, temperature observed, type and quantity of facilities (e.g. photovoltaic plants, pools, gardens, fountains, refrigerating towers, lighting, etc. etc.)
- satellite information could be complemented with other typology of geolocalized databases like i.e. list of trades, public cadastre, social networks, other utilities APIs, other services APIs, etc.

The aim of the feasibility study would be to:

- Identify a group of data sources useful for the purpose, as well as the form in which those data should be arranged in order to fit the model
- Define an algorithm that, starting from the above mentioned sources, calculate the most reliable estimation for electrical consumption at a building level or at a customer premise level
- Establish an algorithm mock-up

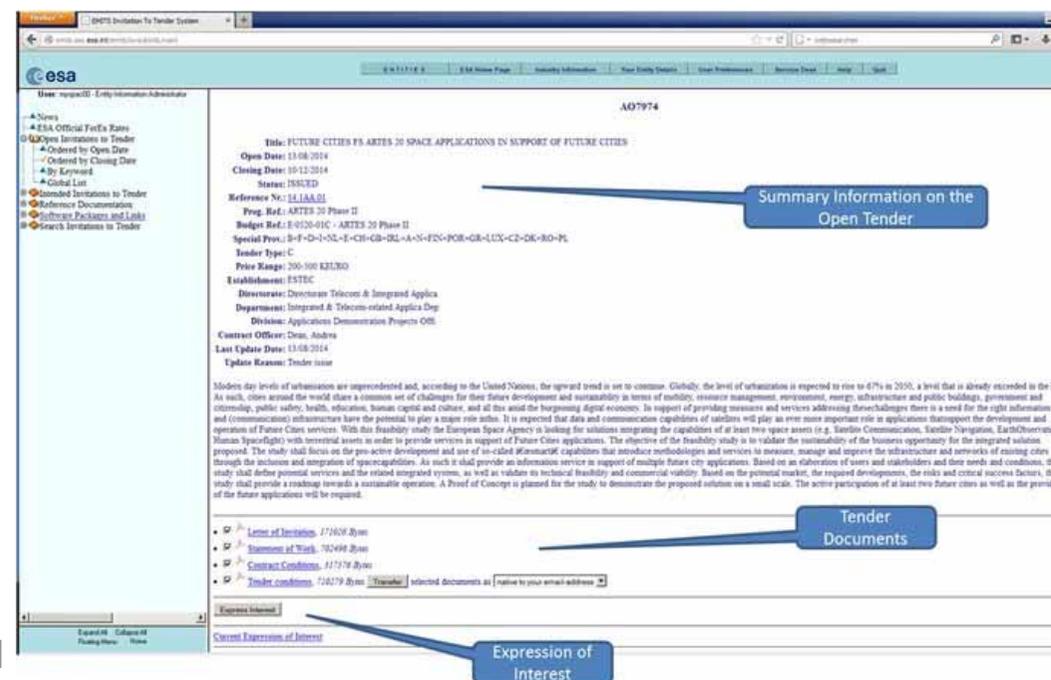
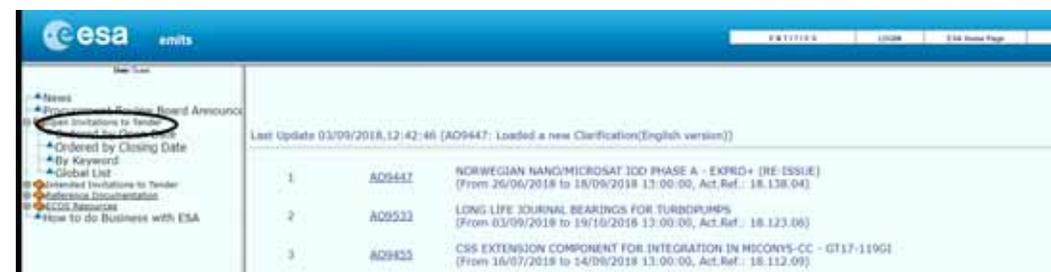


OPEN QUESTIONS & ANSWERS SESSION



→ FAQ

- Invitation to Tender will be shortly published in the ESA EMITS system
<http://emits.sso.esa.int/emits/owa/emits.main>
- EMITS reference: AO 9612
- EMITS allows to express your interest to the tender
https://www.esa.int/About_Us/Business_with_ESA/How_to_do/Expressing_Interest_in_an_Invitation_To_Tender_ITT_Intended_Invitation_To_Tender_IITT
- How to do business with ESA: the latest information on the registration process:
http://www.esa.int/About_Us/Business_with_ESA/How_to_do/esa-star_Registration_Process





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→ YOUR BUSINESS
POWERED BY SPACE

<https://business.esa.int/funding/invitation-to-tender/space-based-services-for-distributed-energy-networks-smart-grids>

European Space Agency