



ASIA CLEAN ENERGY FORUM 2026

Beyond Transition: Building Secure, Resilient, Inclusive, and Intelligent Energy Systems

8–11 June | ADB Headquarters, Metro Manila, Philippines



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EUROPEAN EXAMPLES OF HOW DIGITALIZATION CAN SUPPORT ENERGY CONNECTIVITY AND INTEGRATION

8 June 2026 | 2–3:30 p.m. (GMT+8)



JAIMES KOLANTHARAJ
Asian Development Bank
Principal Energy Specialist
[Moderator]



BERTRAND FURNO
Asian Development Bank
Executive Director



LUDVINE HALBRECQ
Asian Development Bank
Alternate Director



JAMILA AMODEO
Asian Development Bank
Senior Energy Specialist



STANISLAS VERLEY
SUEZ Air & Climate
Advisor for Southeast Asia



FRANCESCO COMITO
CESI S.p.A.
Area Manager – Asia
Pacific Countries



ALAIN DARDY
Energy Pool
APAC Regional Director



YVES BARTHELEMY
Asian Development Bank
Digital Technology
Specialist

In cooperation with





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Opening Remarks

Bertrand FURNO

Executive Director for Belgium, France, Israel, Italy,
Spain, Switzerland, and Portugal

Asian Development Bank

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Moderator's Address

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Principal Energy Specialist

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DMC challenge: Renewable growth is outpacing system and grid readiness

The bottleneck has shifted from generation capacity to system operation



More distributed PV

Thousands of small generators connected behind meters or at feeder level



New flexible demand

Data Centers, EVs, cooling, water treatment, agriculture and industry reshape load profiles



Storage scaling up

BESS can help, but only if coordinated with generation, demand and grid constraints



Regional connectivity

Interconnection and power trade increase value, but require better forecasting and controls

Digital system capability must evolve at the same speed as physical deployment

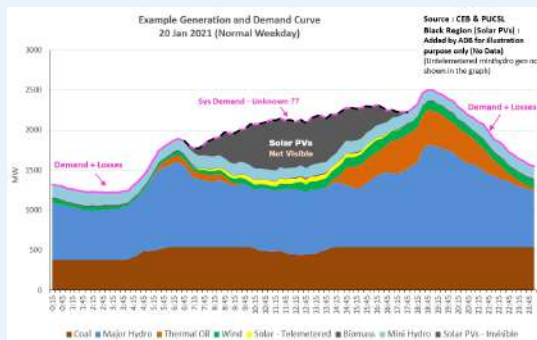


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Sri Lanka: When rooftop PV becomes a system operation issue



No visibility

AMI / telemetry gaps



Forecast uncertainty

PV ramps and cloud events



Limited control

Few DER control levers



Lower system strength

Inertia and fault level concerns

Need: forecasting, telemetry, operational rules

"Total chaos": Monkey blamed for nationwide power cut in Sri Lanka

Energy minister says monkey 'came into contact with grid transformer', causing hours-long outage in sweltering heat



Monkeys have become an increasing problem in Sri Lanka due to their booming numbers, with the endemic toque macaque thought to number 2-3 million on the island. Photograph: Ishara S Kodikara/AFP/Getty Images

NEWS

Govt. accused of jeopardizing 100,000 solar panel users

Published 11 months ago on March 8, 2025
By editor



It is reported that over 100,000 homeowners who have installed solar power systems on their roofs are at serious risk.

Advertising space value

CEB requests rooftop solar owners to temporarily switch off systems

12 April 2025 (Thu) 17:00 Views: 5941 27 Comments 15 Shares 4 Likes 0 Dislikes 0 Comments

CHATURANGA PRADEEP SAMARAWICKRAMA Follow

Mirror AI Summary - Quick Read Generated by Mirror AI



Colombo, April 12 (Daily Mirror) - The Ceylon Electricity Board (CEB) appeals to all rooftop solar system owners across the country to voluntarily switch off their systems during daytime hours - till 3:00 PM each day - from April 13 to April 21.

In a media release, Chief Engineer of the Kelanitissa Combined Cycle Power Station and CEB Media Spokesman, Eng. Dhammika Wimalaratne, explained that this request is being made due to the extended holiday period and prevailing sunny weather. As a result, the national electricity demand has dropped to historic lows, while the high contribution from Variable Renewable Energy (VRE) sources is placing significant stress on the national power grid.

This situation has led to a critical reduction in grid inertia, making the system highly vulnerable to sudden disruptions. Even minor fluctuations in supply or demand could result in partial outages or, in the worst case, a nationwide blackout.

The CEB appreciates the cooperation of all solar system owners in helping to maintain the stability and reliability of the national grid during this sensitive period.

CEB renews call to pause rooftop solar systems, but energy experts question decision

Event	Challenge	Digitalization need
2025 system blackout	A 33 kV fault at Panadura GSS initiated a wider system disturbance	Protection coordination, system strength monitoring, real-time situational awareness
2026 rooftop solar switch-off requests	Rooftop PV had to be manually curtailed during low-demand periods	DER visibility, inverter control, forecasting, operational rules



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India: Distribution feeders are becoming active energy platforms



Voltage rise
reverse flow

Power quality
harmonics

Protection
fault direction

Congestion
local overloads

Dispatch
curtailment

Need: AMI, DERMS, digital twins, adaptive protection



No more new solar panels, KSEB transformers can't handle load

M K Sunil Kumar / Apr 14, 2026, 03:58 IST



Kochi: Consumers are relying widely on solar power to reduce their electricity bill but new applicants in the city may not be able to tap the energy. Reason: The capacity of KSEB transformers has reached its limit.

India's next power crisis is after sunset as solar curtailment, grid stress rise

Despite rapid renewable energy expansion, India is struggling to manage non-solar-hour electricity demand due to weak storage capacity and transmission bottlenecks. Citi estimates the country will require Rs 7.3 trillion in grid investments over the next decade.

Written by **Saurav Anand**

May 11, 2026 20:16 IST



As rooftop PV, feeder solarization, EVs and flexible loads grow, distribution grids must move from passive networks to actively managed platforms.



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Beyond South Asia: the same digitalization challenge is emerging globally

Different grids, same pattern: variable renewables are growing faster than visibility, flexibility and operational control.

Common lesson

Digitalization is not an “advanced option”; it becomes a prerequisite for secure renewable integration.

Australia VIC

Millions of Australian households will soon be offered three hours of free daytime power



April Glover
Updated March 25, 2026 - 9:53am. First published at 3:21am

9NEWS



Bangladesh

Renewable scale-up will require a more flexible grid, storage and automated distribution.

Digital implication: grid flexibility, digital controls, substation upgrades and storage planning.



Viet Nam

Rapid solar growth has created congestion and curtailment where grid and storage lag deployment.

Digital implication: congestion management, dispatch flexibility, grid planning and storage.



Australia

High rooftop PV penetration is pushing minimum-demand limits and requiring emergency backstop mechanisms.

Digital implication: DER orchestration, dynamic operating envelopes, inverter settings and customer-safe curtailment.



Pacific islands / Maldives

Small weak grids need to coordinate PV, BESS, diesel and critical energy-water-food loads.

Digital implication: EMS, forecasting, BESS dispatch, diesel optimization and resilience-oriented operation.



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What Europe can bring: Digital experience that is adaptable, not copy-paste

The opportunity is to translate European lessons into DMC-ready architectures and implementation pathways



Smart grids & interconnections

Cross-border operation, congestion management, system coordination



Visibility & data platforms

AMI, SCADA, IoT, data spaces and interoperable information models



Forecasting, AI & optimization

Renewable forecasting, predictive maintenance, digital twins and decision support



DER flexibility & control

Flexible connections, dynamic envelopes, DERMS and local flexibility



Cybersecurity & resilience

Secure-by-design critical energy infrastructure and operational continuity



Market & regulatory design

Rules that align technology, incentives, procurement and consumer protection

Which European approaches can be simplified, modularized and financed for DMC contexts?



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Questions for European experience

Today's discussion should help identify which European digital solutions are mature, affordable and adaptable enough to support DMC utilities in the next 3–5 years.

- ? What minimum digital visibility and control should utilities have before DER penetration becomes high?
- ? How can flexible connections, dynamic envelopes and curtailment rules be designed without discouraging investment?
- ? Which European digital grid solutions are mature enough for rapid deployment in DMCs?
- ? How can digitalization support interconnections, regional power trade and integrated system operation?

Key takeaway: digitalization is the operating system of the clean energy transition

Thank you



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Stanislas VERLEY

Advisor for Southeast Asia
SUEZ Air & Climate

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Bridging Air Quality, Climate and Energy Through Digital Transformation

Stanislas Verley

Advisor for ASEAN, Suez Air & Climat





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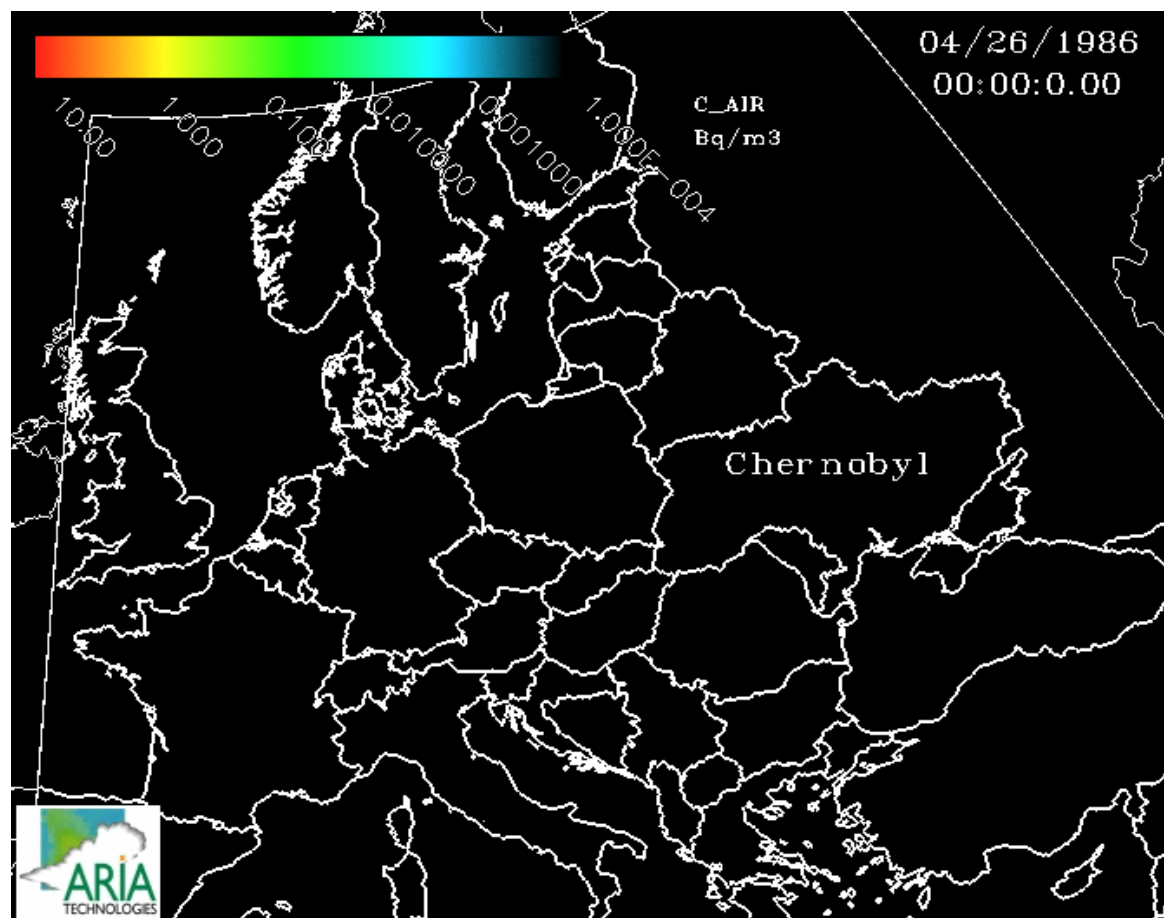
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40 Years ago
EXACTLY !

CHERNOBYL
RADIOLOGICAL
ACCIDENT





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Who we are

The strength of a global group.
The agility of a specialist company.

SUEZ Group		SUEZ Air & Climate / ARIA Technologies	
160 years	of environmental services	35+ years	dedicated to air quality and climate
40,000	employees worldwide	100+	experts
€10 billion	annual revenue	700+	projects per year
10	R&D centres	80+	countries
Global	industrial capabilities	Scientific excellence	and operational agility

Combining the resources of a global environmental leader
with the precision and responsiveness of a highly specialized engineering company





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5 Thematic Lines: A Comprehensive Spectrum of Action



Industry

- Emission inventories, online monitoring, odor studies, chemical/biological mapping.



Urban & Regional

- High-res concentration mapping, human health impact, emission reduction scenarios, 3D forecasting.



Extreme Risks

- Toxic release mapping, fire/plume propagation, CBRN risk management, inverse modeling for source estimation.



Climate Change

- GHG inventories, IPCC downscaling, extreme event forecasting (heatwaves, hurricanes), urban heat islands (UHI).



Renewable Energy

- Wind atlases, micro-siting, LIDAR measurement, solar exposure forecasting.



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The Closed-Loop Atmospheric Value Chain

OPTIMISE

- Post-implementation tracking and action plans.
- **Core Business Value:** CAPEX & OPEX optimization.

MONITOR

- 3D modeling and predictive models.
- Real-time continuous surveillance platforms.



DIAGNOSE

- Impact studies and pollutant characterization.
- Legal compliance and advisory services.

REMEDiate

- Customized treatment for indoor/outdoor air quality and odors (dust, emissions).
- Targeted **green innovation** and treatments.





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The Technology Engine: Spatial Downscaling

Transforming global Copernicus data into real-time, street-level action.



Layer 1: Macro (Regional)

Visualizes global meteorological data and Copernicus CAMS flux integration.

Layer 2: Meso (Urban)

Assimilates data from complex fixed and mobile urban sensor networks.

Layer 3: Micro (Street-Level)

Executes real-time 3D Computational Fluid Dynamics (CFD) with 3-meter metric resolution.

Analysis, Forecasts, and Scenarios are based on dynamic maps, not static values.





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Visualisation immersive
par construction d'une maquette 3D





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Trusted partner for IFI-funded projects

Delivering air quality, climate and environmental solutions worldwide

80+ countries

Africa, Asia, Latin America,
Middle East

20+ years working
with IFIs

UN Agencies, MDBs, Bilateral
Donors, EU Institutions

700+ projects/year

Studies, systems, implementation
and capacity building

KEY INTERNATIONAL PARTNERS



UNEP



UNDP



WORLD BANK



ASIAN DEVELOPMENT BANK



AFRICAN DEVELOPMENT BANK



AFD



KfW



EUROPEAN UNION



JICA

TYPICAL IFI-FUNDED ASSIGNMENTS

Air Quality Management

- Emission inventories
- Monitoring strategies
- Forecasting systems
- Compliance support

Climate & Resilience

- Climate risk assessments
- Adaptation planning
- Vulnerability studies
- Early warning systems

Decision Support Tools

- Environmental digital twins
- Atmospheric modelling
- Scenario analysis
- Data platforms

Institutional Strengthening

- Capacity building
- Governance frameworks
- Regulatory support
- Knowledge transfer

Implementation Support

- Project management
- Technical assistance
- Stakeholder engagement
- Training & workshops

Monitoring & Evaluation

- Performance indicators
- Impact assessment
- QA/QC and validation
- Reporting & dashboards

From policy design to operational implementation:
combining scientific excellence, engineering expertise and local capacity building





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Air Quality and Climate: Cairo, Egypt (2024–2025 – ongoing)

World Bank Technical Assistance – Supporting a cleaner, more resilient Cairo



Territorial challenge

- Halve **air pollution** and **greenhouse gas** emissions.
- Adapt to **climate extremes** and strengthen urban **resilience**.



Project – €500k

- **Scenarios** to reduce emissions and air pollutants.
- Development of an **integrated response mechanism** for climate and air quality emergencies.
- **Capacity building** and **knowledge transfer** for sustainable action.



Expected benefits

- **GHG reduction**: -30% in waste sector, -23% in public buses.
- **Action plan**: short-term measures + long-term scenarios with economic and health co-benefits.
- **Support to the Ministry**: stronger governance and skills development.



Integrated approach



CLIMATE

GHG inventories, mitigation scenarios, adaptation to climate risks



AIR QUALITY

Emission inventories, air quality modelling, monitoring strategies, health impact assessment

One integrated framework to support evidence-based decisions and resilient urban development

Key outputs



Emission inventories and baseline assessments



Air quality and climate modelling & scenarios



Early warning and emergency response mechanism



Capacity building and knowledge transfer



Action plan and policy recommendations





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Operational deployments and international cooperation projects driving urban resilience, low-carbon strategies, and climate adaptation.





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Wuhan Urban Master Plan: Designing Climate Responsive and Healthy Urban Ventilation Corridors

Wuhan Planning & Design Institute (WPDI) – Technical cooperation (ongoing)



TERRITORIAL CHALLENGE

- High air pollution and greenhouse gas emissions.
- Adapt to climate extremes and strengthen urban resilience.



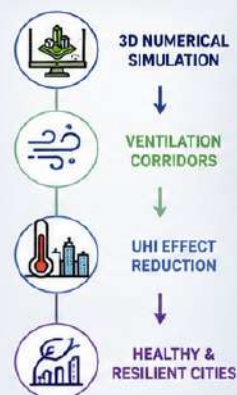
PROJECT – ONGOING

- Quantitative 3D numerical simulation of local wind environments in urban planning.
- Assessment of ventilation corridors and urban heat island (UHI) effect.
- Scientific support for climate-responsive and healthy urban design.



EXPECTED BENEFITS

- Better dispersion of air pollution and improved outdoor comfort.
- Reduction of the Urban Heat Island (UHI) effect.
- Lower cooling demand and building energy savings.
- Data-driven urban planning for healthier and more resilient cities.



OUR APPROACH



CLIMATE

GHG inventories, mitigation scenarios, adaptation to climate risks



AIR QUALITY

Emission inventories, air quality modelling, monitoring strategies, health impact assessment

One integrated framework to support evidence-based decisions and resilient urban development

KEY OUTPUTS



3D wind environment simulation & analysis



Ventilation corridors assessment



Urban heat island diagnostics



Climate-responsive urban design guidance



Strategic planning recommendations





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Air quality and climate: Hanoi, Vietnam (2026–2028 – ongoing)

FASEP “Hanoi Breathe” – French Treasury / City of Hanoi



TERRITORIAL CHALLENGE

- Rapid urban growth and air pollution episodes
- Need for integrated air quality, climate action and urban resilience



PROJECT – ONGOING

- High-resolution emissions inventory
- Air quality modelling and forecasting
- Urban digital twin for scenario assessment
- Evaluation of mitigation measures
- Capacity building for Hanoi authorities



EXPECTED BENEFITS

- ✓ Better decisions for cleaner air and climate action
- ✓ Support for evidence-based urban planning
- ✓ Stronger institutional capacities
- ✓ Replicable framework for other cities



KEY OUTPUTS



High-resolution emissions inventory



Air quality modelling & forecasting system



Urban heat island assessment



Environmental digital twin



Capacity building and knowledge transfer



Policy recommendations for action





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Indonesia: National air quality forecasting capacity

BMKG – French-Indonesian technical cooperation (2017–2018)



TERRITORIAL CHALLENGE

- Frequent **air pollution** episodes linked to urban emissions and **biomass burning**.
- Need for **national forecasting capabilities** supporting environmental and climate policies.



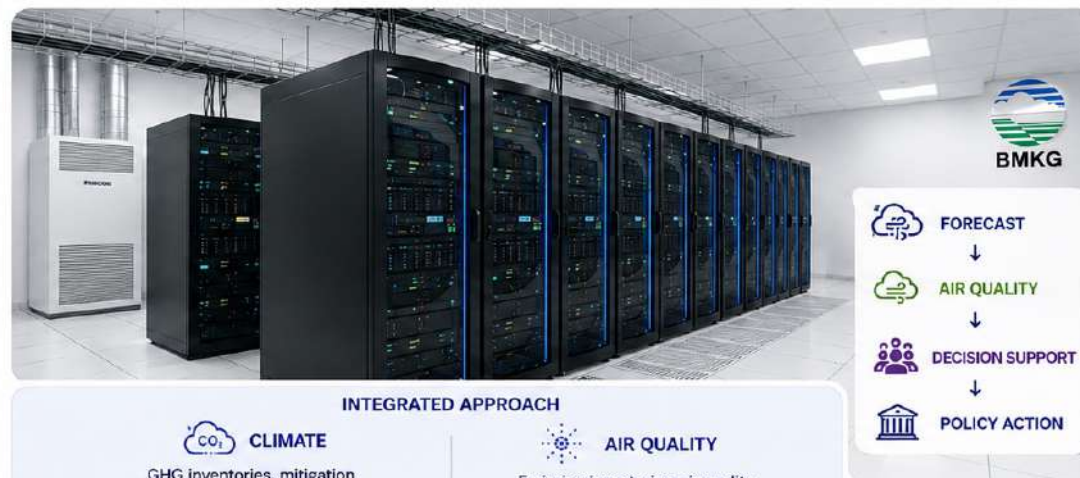
PROJECT (2017–2018)

- Deployment of an **operational air quality forecasting system**.
- Integration on **BMKG high-performance computing infrastructure**.
- Scientific **training and technology transfer**.
- Development of **national forecasting capabilities**.



EXPECTED BENEFITS

- **73-hour** automated forecasts at **15 km / 1 h** resolution.
- Detection of **urban, industrial and biomass-burning** pollution events.
- **Autonomous operational capability** within BMKG.
- Better information for **decision support** and **policy action**.



INTEGRATED APPROACH



CLIMATE

GHG inventories, mitigation scenarios, adaptation to climate risks



AIR QUALITY

Emission inventories, air quality modelling, monitoring strategies, health impact assessment

One integrated framework to support evidence-based decisions and resilient air quality management



KEY OUTPUTS



Forecasting platform deployment



High-performance computing integration



Scientific training and capacity building



Operational forecasting procedures



Technology transfer to BMKG teams

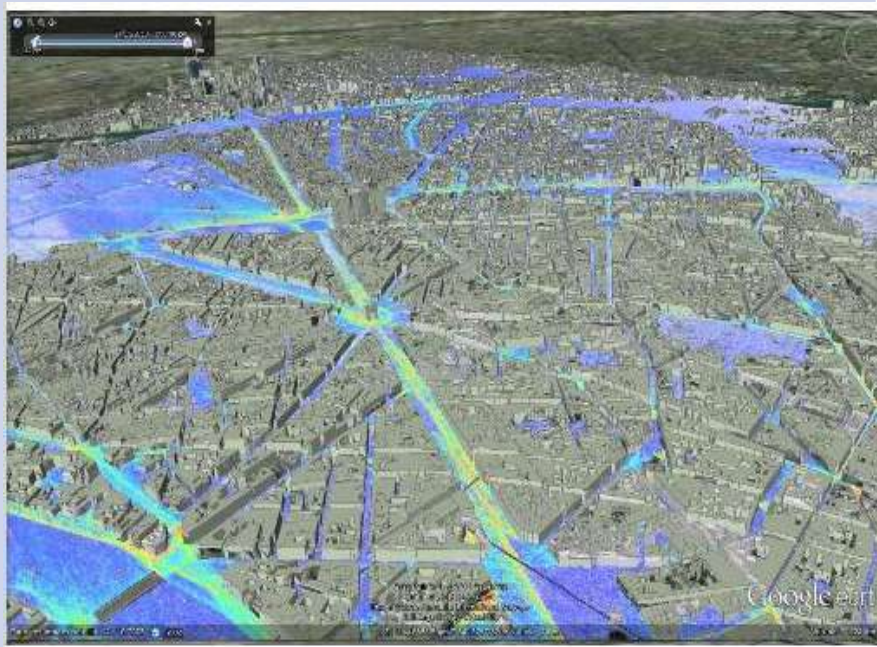


National operational air quality forecasts



Applications

VISION 360 CITY – AIRCITY



[Link](#)

VISION 360 INDUTRY - DK'AIR



[Link](#)



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Thank you

for your attention.

We look forward to your **questions** and **exchange**.

shaping
resourceful
cities with



Questions?



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Francesco COMITO

Area Manager – Asia Pacific Countries
CESI S.p.A.

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Wide Area Monitoring System (WAMS) for Energy Connectivity and Integration European examples

CESI Consulting
Inspired with innovation



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Why Europe Needs WAMS

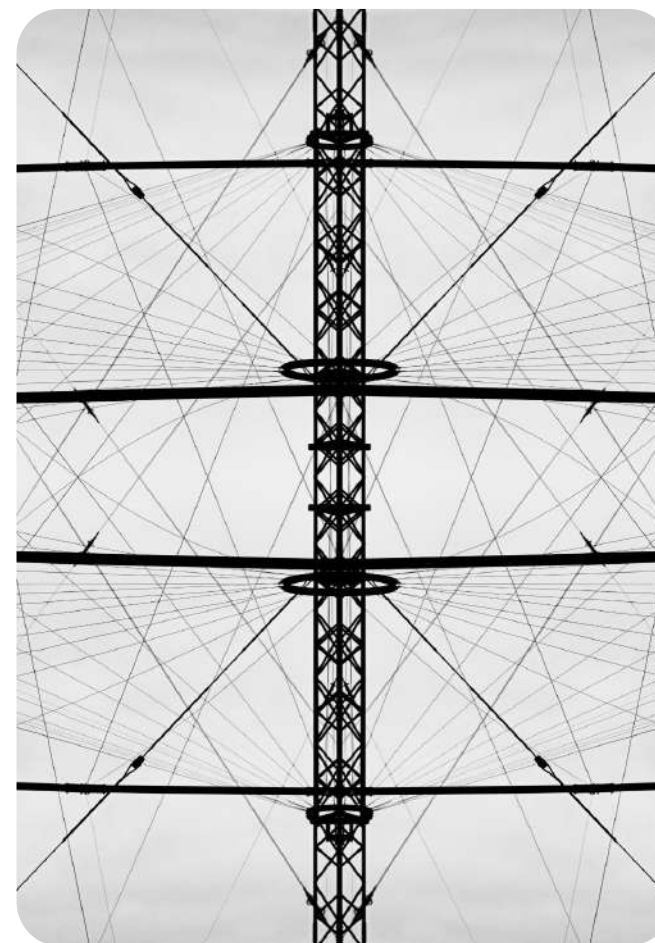
Europe's grid complexity increases due to decentralization and variable renewable energy integration, requiring dynamic system visibility.

Needs for advanced measurement systems:

- High system complexity and Decentralization:
- Large geographical extension of transmission networks
- Inter-area dynamic phenomena
- Increasing concern of system's dynamic security

Limitation of traditional SCADA system: traditional SCADA systems lack high sampling rates and time synchronization, missing critical dynamic phenomena in the grid.

Wide Area Measurement System (WAMS) with PMU technology have been developed to obtain Real-Time Situational Awareness





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WAMS - Introduction

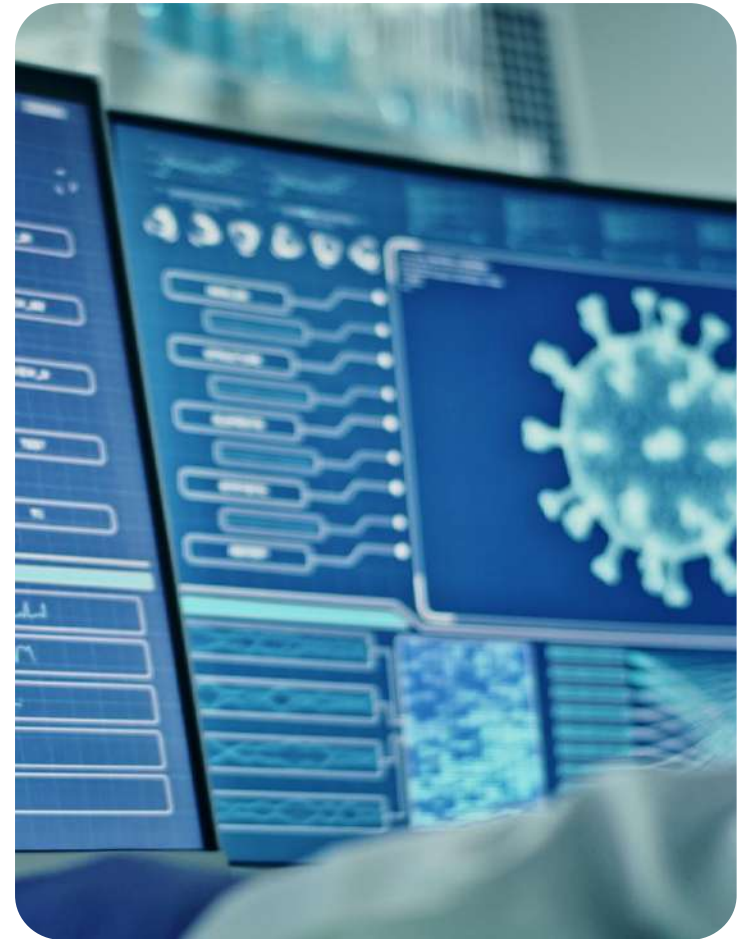
A Wide Area Measurement System (WAMS) consists of advanced measurement technology, information tools and operational infrastructure.

WAMS facilitate the understanding and management of the increasingly complex behavior exhibited by large power systems.

WAMS is expressly designed to enhance the operator's real-time situational awareness that is necessary for safe and reliable grid operation.

The best way to monitor the Power System Dynamics.

The main objective is to Increase the Situational Awareness.





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Synchrophasors and PMUs

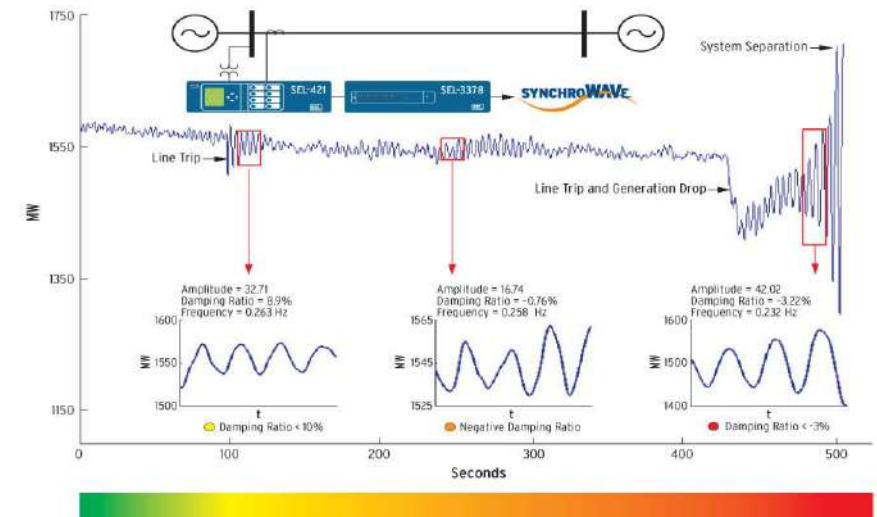
- Synchrophasors are time-synchronized numbers that represent both the **magnitude** and **phase angle** of the sine waves found in electricity and are time-synchronized for accuracy.
- They are measured by high-speed monitors called Phasor Measurement Units (PMUs) that are 100 times faster than SCADA.
- Samples are taken 10 to 60 (or more) per second compared with SCADA that is 1 each 2 or 4 seconds.
- PMU measurements record grid conditions with great accuracy and offer insight into **grid stability** or **grid stress**.

Synchrophasor technology is used for:

- real-time operations
- off-line engineering analyses



Improve grid reliability and efficiency
and to have lower operating costs





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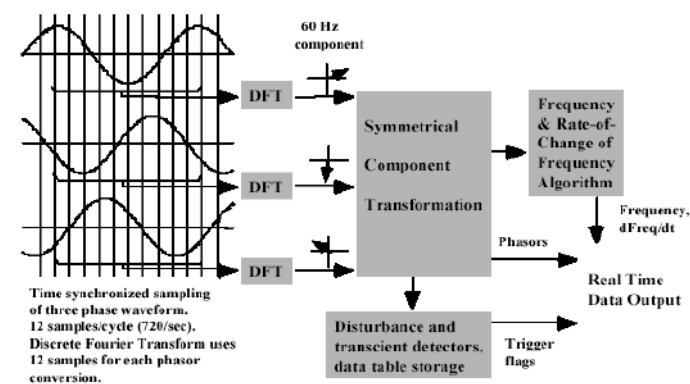
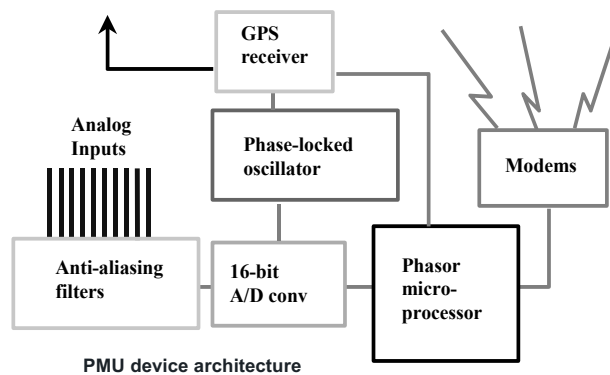
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PMU Technology

- **PMU technology main features**
 - GPS time synchronisation (according IEEE 1344 till 2005 then IEEE C37.118)
 - High sampling rate (50-60 Hz)
 - High speed telecommunication connection
 - Calculation of module and angle of voltages and currents
- **PMU devices only can collect accurate and synchronized measure over large (interconnected) power systems**





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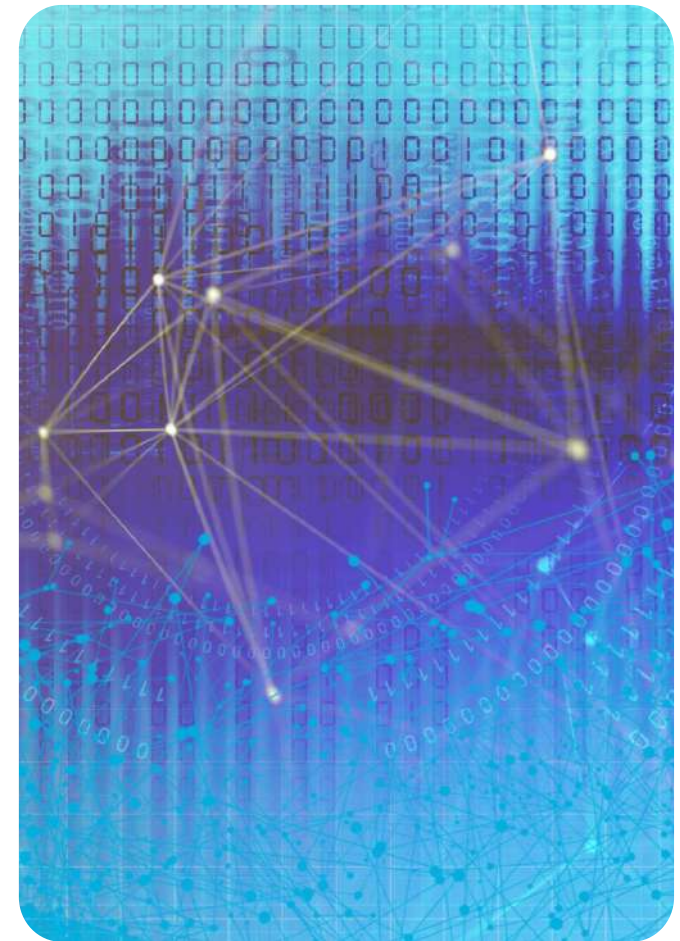
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Digitalization Architecture

- **Phasor Measurement Units (PMUs)**
PMUs provide time-synchronized measurements of voltage and phase angle using GPS signals for real-time comparison across the grid.
- **High-speed Communication Network**
Data from PMUs is transmitted through a reliable, low-latency network to central facilities via Phasor Data Concentrators.
- **Data Analytics and Visualization**
Advanced analytics tools extract insights like frequency trends and oscillations, enabling real-time system visualization and decision-making.
- **User Interfaces and Control Applications**
Intuitive user interfaces present analyzed data clearly to operators, supporting monitoring, control, and grid optimization.





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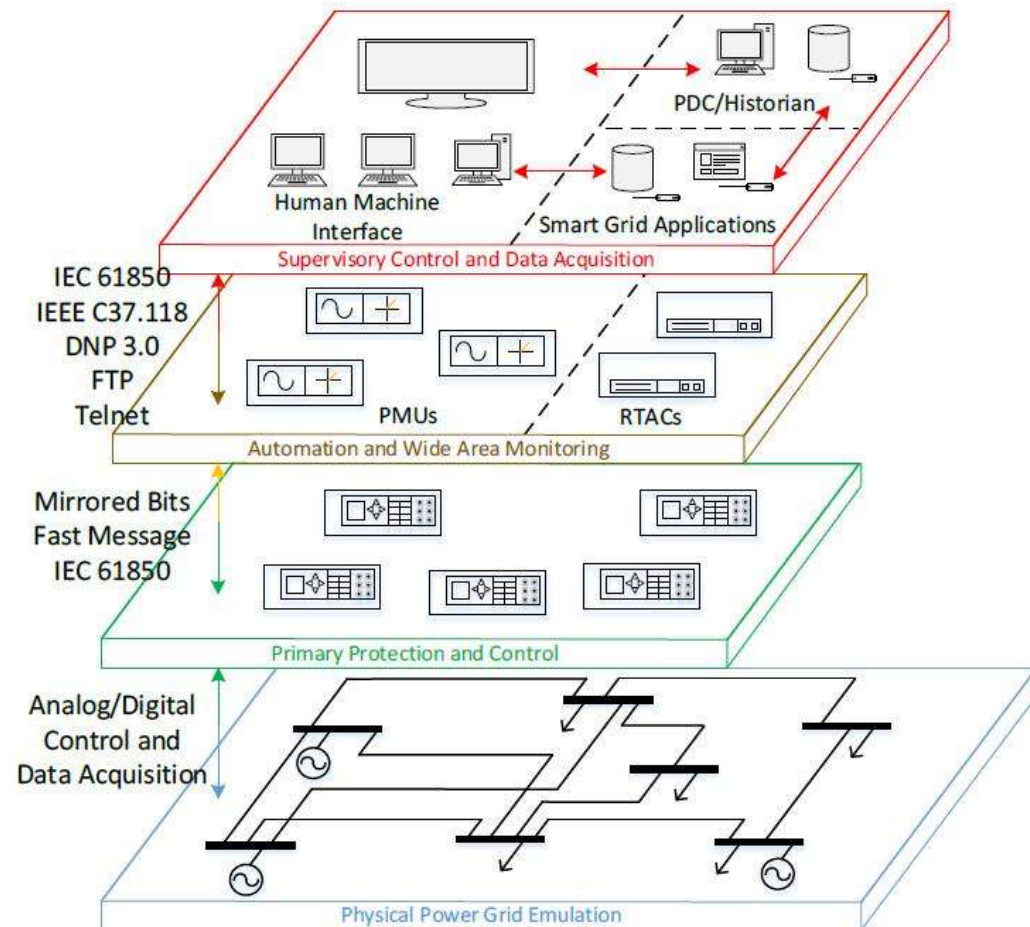
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Smart Grids Applications

- Upgrade Information System
- Communications Infrastructure for Transmission Grid
- Metering Data Acquisition System
- Geographic Information Systems (GIS)
- Substation Automation System
- Fault locator system (FLS)
- Dynamic Thermal Circuit Rating (DTCR)
- Operation Management Improvement
- Oscillation Detection
- Phase angle monitoring
- Frequency Event detection
- Voltage stability monitoring
- Event Management, Alarm, Restoration
- General Event Detection
- Islanding detection
- Wide area awareness/visibility
- Loss of synchronism mitigation
- Backup and integration for SCADA system





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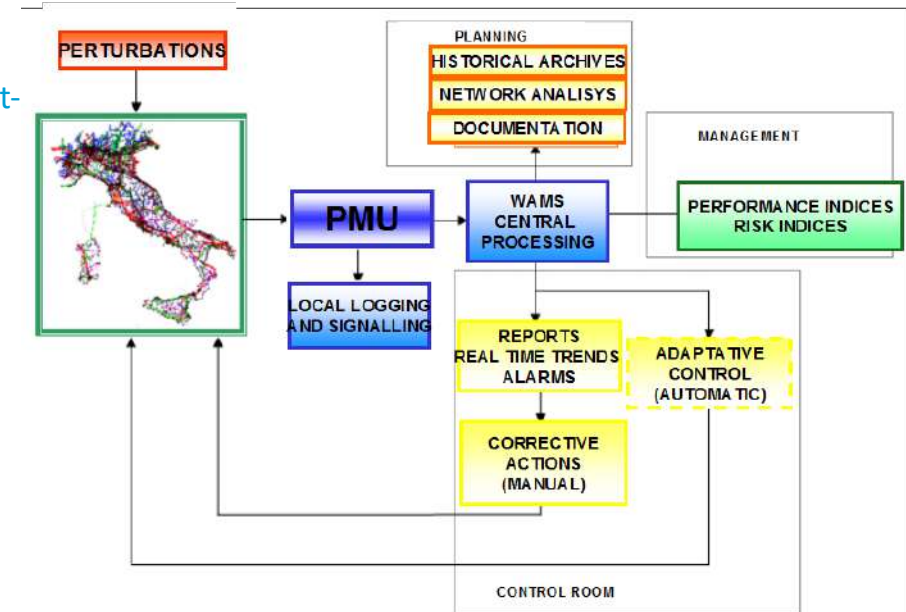
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EUROPE - Italian WAMS experience – “System characteristics”

- Planned to improve system security after **2003 blackout**.
- Aimed to provide the control room operators with **advanced monitoring tools** and, in perspective, **automatic corrective controls**, both phenomenon and event-based, linked with a SPS.
- In service since **2005 with 30 PMUs**.
- Up to **150 PMU devices**, their number is in continuous growing.
- PMU locations have been selected in order to **maximise the added value of the measurements**
- Connection with the neighboring countries** for comprehensive control of the interconnected power network and in-depth monitoring of the power import towards the Italian system.





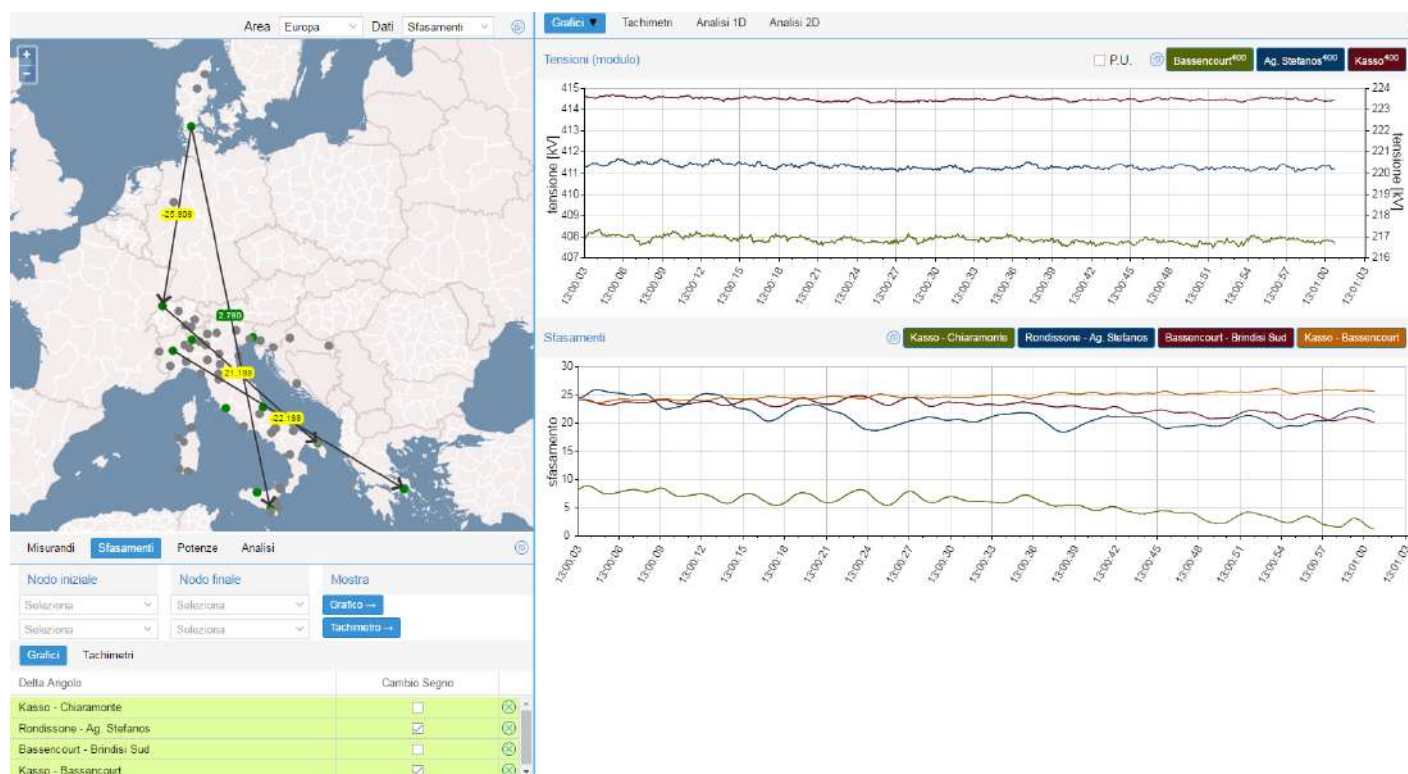
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EUROPEAN WEB WAMS – Home Page





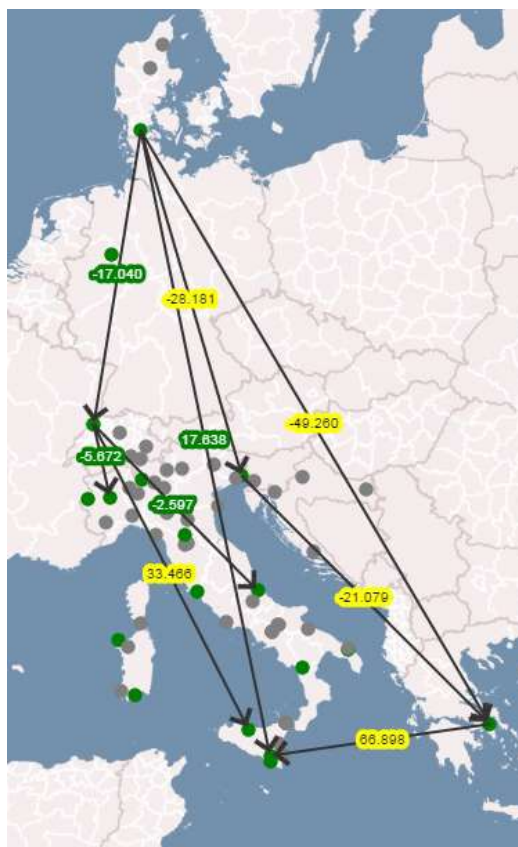
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WEB WAMS – Real Time Angle Differences





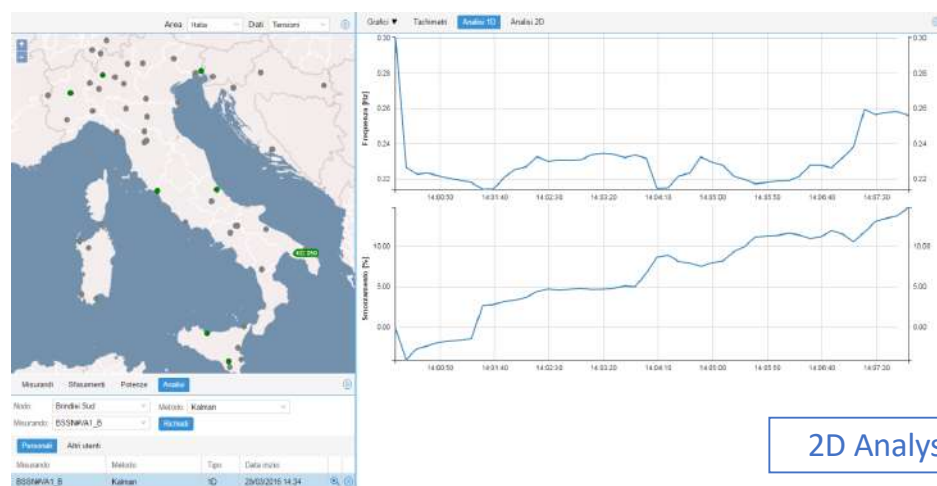
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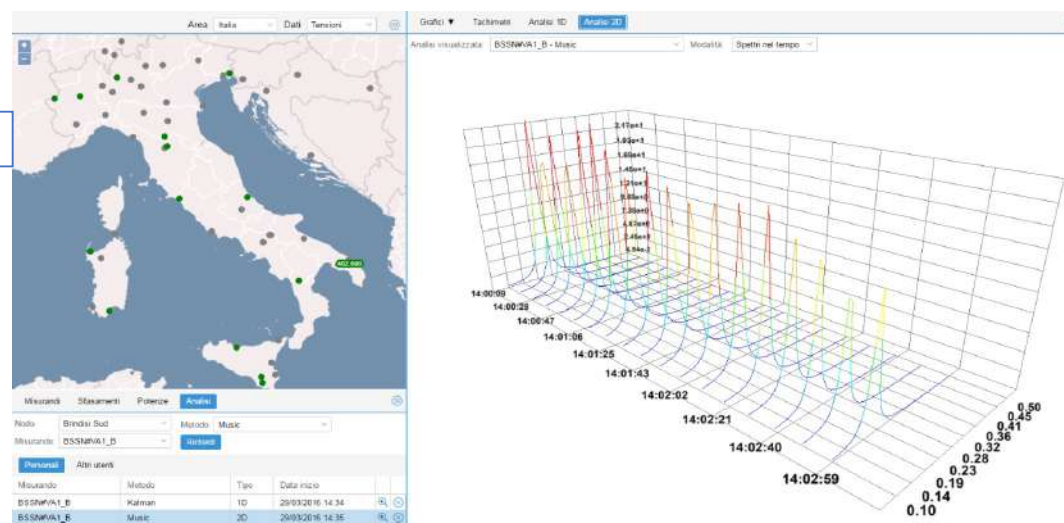
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WEB WAMS – Real Time Analysis



2D Analysis





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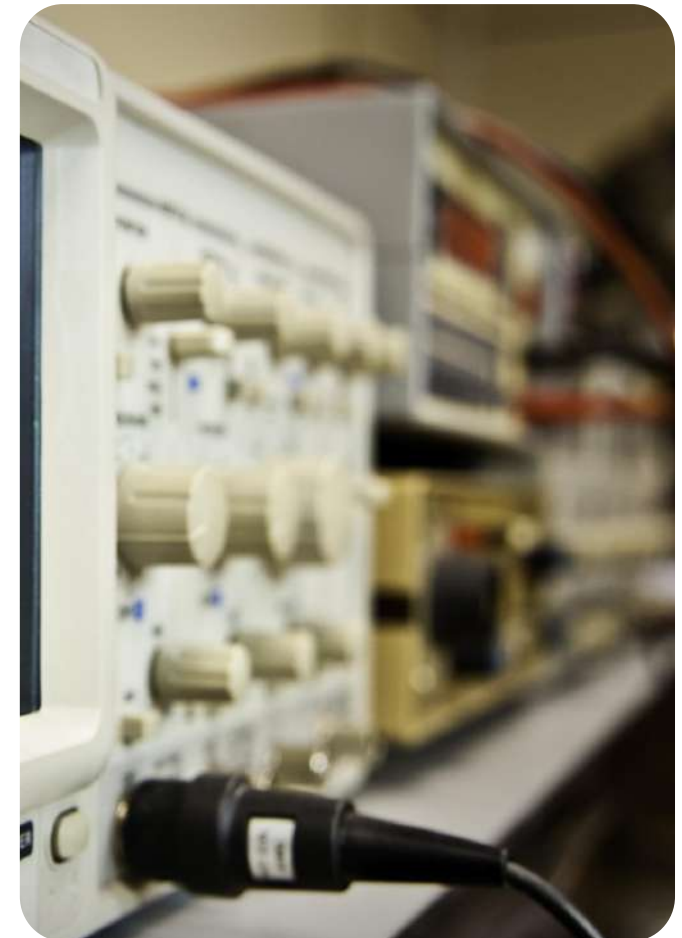
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Inter-area Oscillation Case

- **Inter-area Oscillations**
Oscillations occur when power is transferred between regions with differing electrical characteristics, causing angle differences
- **WAMS Real-Time Detection**
WAMS uses synchronized measurements from multiple locations to detect oscillations and assess their damping in real time.
- **Early Warning and Intervention**
WAMS provides early warnings allowing operators to adjust generation or tune stabilizers to prevent instability
- **Digitalization Enhancing Stability**
Digital tools like WAMS transform power system management from reactive to proactive, ensuring reliable energy integration.





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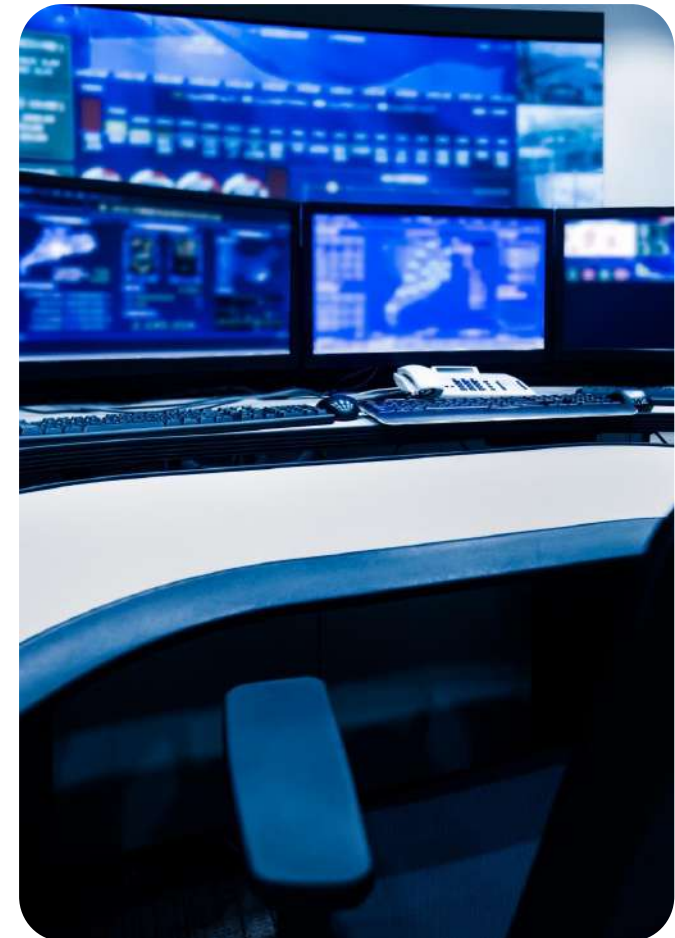
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Operational Benefits

- **Enhanced Situational Awareness**
WAMS provides real-time, high-resolution data that improves operators' understanding of dynamic grid conditions.
- **Early Event Detection**
Subtle changes in frequency or phase angle are detected early to prevent outages and cascading failures.
- **Advanced System Analysis**
WAMS supports post-event reconstruction and statistical evaluations to improve planning and operations.
- **Improved Coordination**
Synchronized data sharing enhances collaboration between different regional control areas for grid reliability





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Support to Integration

- **Cross-Border Energy Monitoring**
WAMS enables synchronized measurement of power flows across borders, ensuring efficient and secure energy transfers.
- **Renewable Energy Integration**
WAMS provides real-time data to manage the variability of wind and solar power, enhancing grid stability
- **Advanced Grid Applications**
Dynamic line rating and state estimation optimize transmission capacity for better infrastructure utilization
- **Coordinated Control Strategies**
Unified system views enable operators to implement strategies improving performance across multiple regions





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Continuous Improvement

- **Post-Event Analysis**
WAMS enables detailed post-event analysis to study disturbances and improve operational procedures.
- **Statistical System Monitoring**
Long-term statistical analysis of system parameters helps identify patterns and variations in operation
- **Model Validation and Planning**
WAMS data supports model validation to ensure accurate simulations for planning and control development
- **Data-Driven Continuous Improvement**
Continuous refinement of operations and planning using insights from WAMS enhances grid resilience and efficiency





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Key Takeaway

- **WAMS Enables Digitalization**
WAMS transforms energy connectivity into true system integration through digitalization.
- **Real-Time Visibility and Control**
Synchronized measurements and advanced analytics provide real-time insights for system stability
- **Supports Cross-Border Coordination**
WAMS enhances grid resilience and renewable integration across interconnected European networks
- **Practical Benefits Demonstrated**
The Italian experience shows WAMS delivers practical and achievable improvements in grid operation





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THANK YOU!

Francesco COMITO

Area Manager – Asia Pacific Countries

CESI S.p.A.

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Alain DARDY

APAC Regional Director
Energy Pool

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European Examples of How Digitalization Can Support Energy Connectivity and Integration



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ENERGY POOL, SMART ENERGY MANAGER

A GLOBAL AND INDEPENDENT PLAYER



15 years of experience in flexibility management and energy markets



7 000 assets operated by our operations centers
8 GW capacity managed



TRUSTED PARTNER of numerous energy players

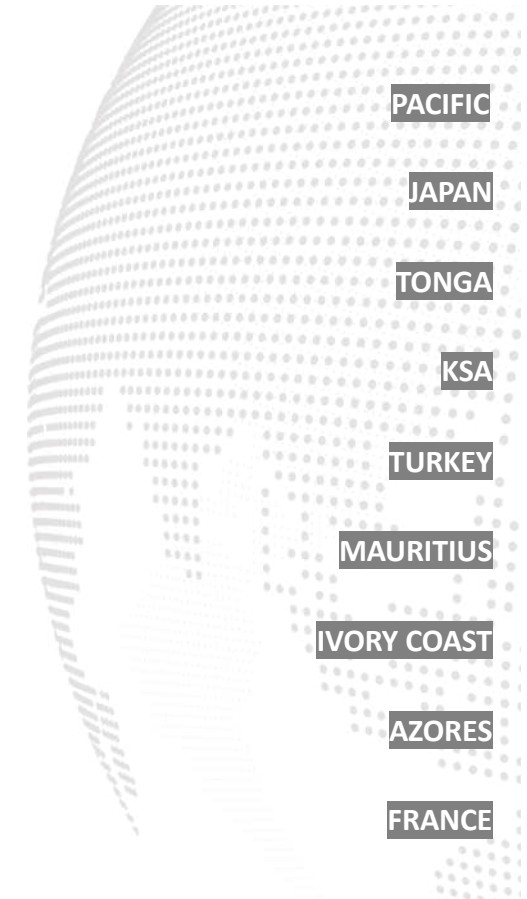


>300 employees
In **15 countries**



> 2 MILLIONS of tons of CO₂ savings per year

Our Mission : Guarantee access to a low CO₂, reliable and affordable energy to people worldwide





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WHY DIGITALIZATION ON ISLANDS IS CHALLENGING?

Island grids concentrate all power system complexity into a small system.

The challenge is not adding renewables — it is making the system capable of managing them.

The goal is to have a resilient and cost-optimized, sustainable system.



Challenging environmental conditions: impact on infrastructure, equipment longevity



Unpredictable weather: impact on demand and production forecasting



Logistics: transport materials and fuel, availability of qualified personnel, system maintenance



High dependency on fossil fuel: high costs, environmental impact, noise pollution



THESE **ARE CHALLENGES AND COSTS**
THAT CAN BE MITIGATED BY
AN **ADVANCED ENERGY MANAGEMENT SYSTEM**





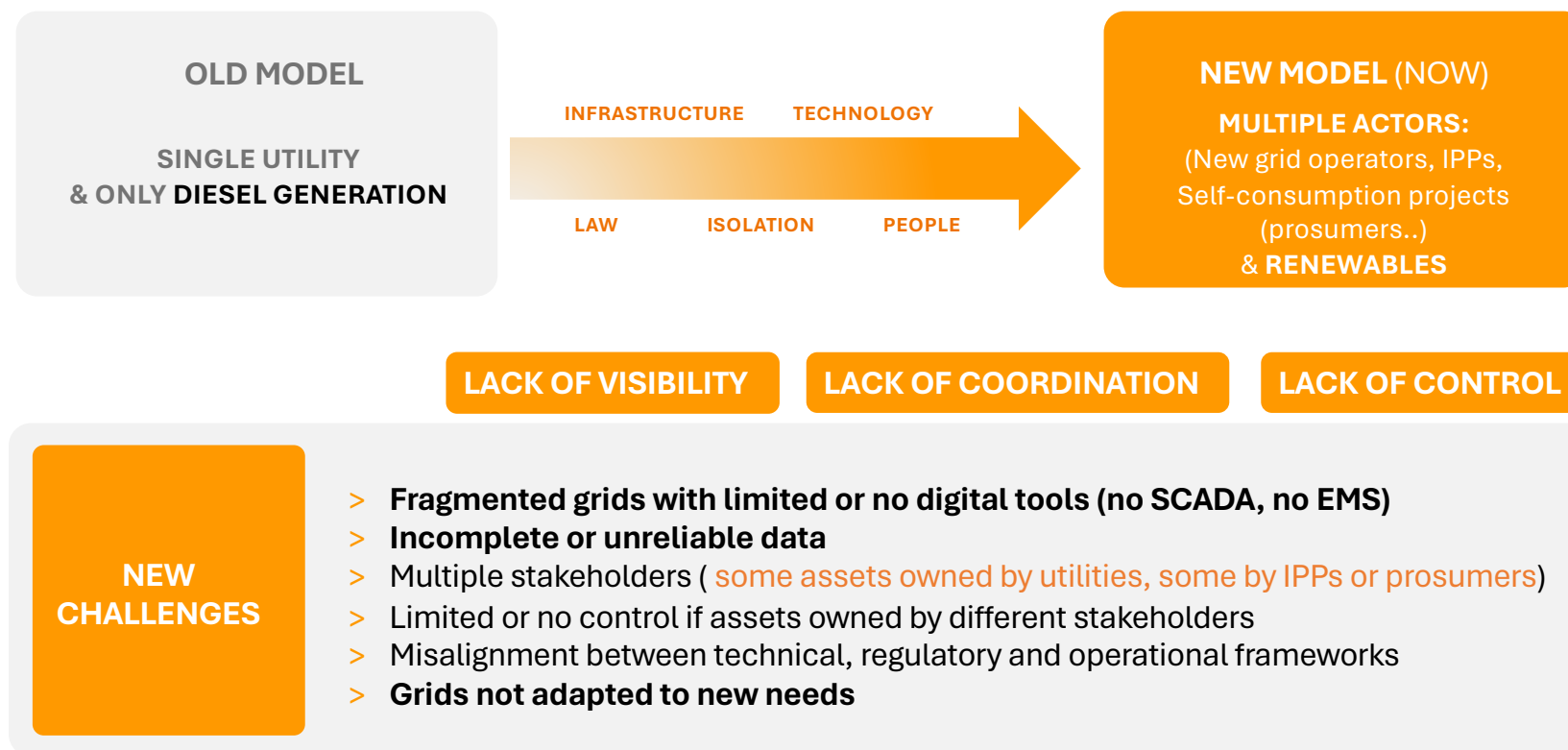
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DIGITALIZATION AS A TRANSFORMATION JOURNEY: KEY INSIGHTS





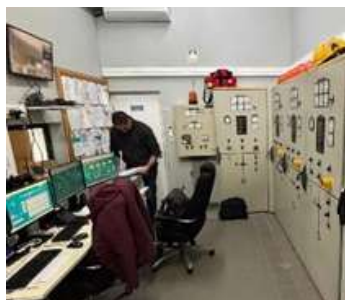
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KEY INSIGHTS: CASE STUDY OF A EUROPEAN ISLAND



EU island case: Different assets that can be coordinated and optimized by an EMS



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KEY INSIGHTS: CASE STUDY OF AN EU ISLAND

A case study of a European island utility, already hybrid.

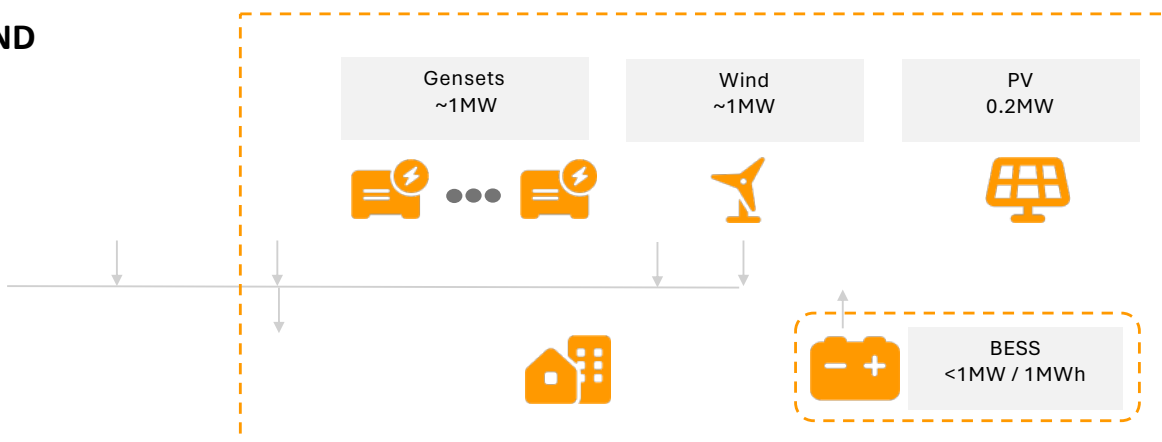
Diesel gensets + PV+ Wind (no BESS)

Energy Pool's study demonstrated the benefits of an EMS in different scenarios, both with and without a BESS.

- On-site audit
- Concrete recommendations
- Grid simulations



You don't need BESS to benefit from EMS and reduce your operational costs (i.e. reduce diesel use)



Upgrades	RE Penetration	Fuel savings
Today	20%	0
With EMS	45%	350k€/year
With EMS+BESS	90%	>800k€/year

26 Days/month 100% RE with an advanced EMS



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KEY INSIGHTS: CASE STUDY OF A PACIFIC ISLAND



~200,000 inhabitants



100 MW peak demand



300 km of lines
24 substations



A STRUCTURAL CHANGE

Emergence of IPPs

EDT no longer as both producer and neutral system operator

TEP becomes the responsible for grid balancing

THAT BRINGS NEW CHALLENGES FOR TEP

- > **Fragmented assets** & limited visibility (no control on IPPs' PV+BESS)
- > **Lack of centralized control** over generation assets
- > **SCADA**: manual and complex operations, real-time data only
- > **Risk of future congestions** (generation concentrated on one side of island)
- > **Lack of forecasting & centralized reserve management** (storage needed for stability)
- > Need advanced, tailor-made solutions & experienced partners for strategic support
- > **Grid code**: complex & misaligned with TSO/IPP's needs



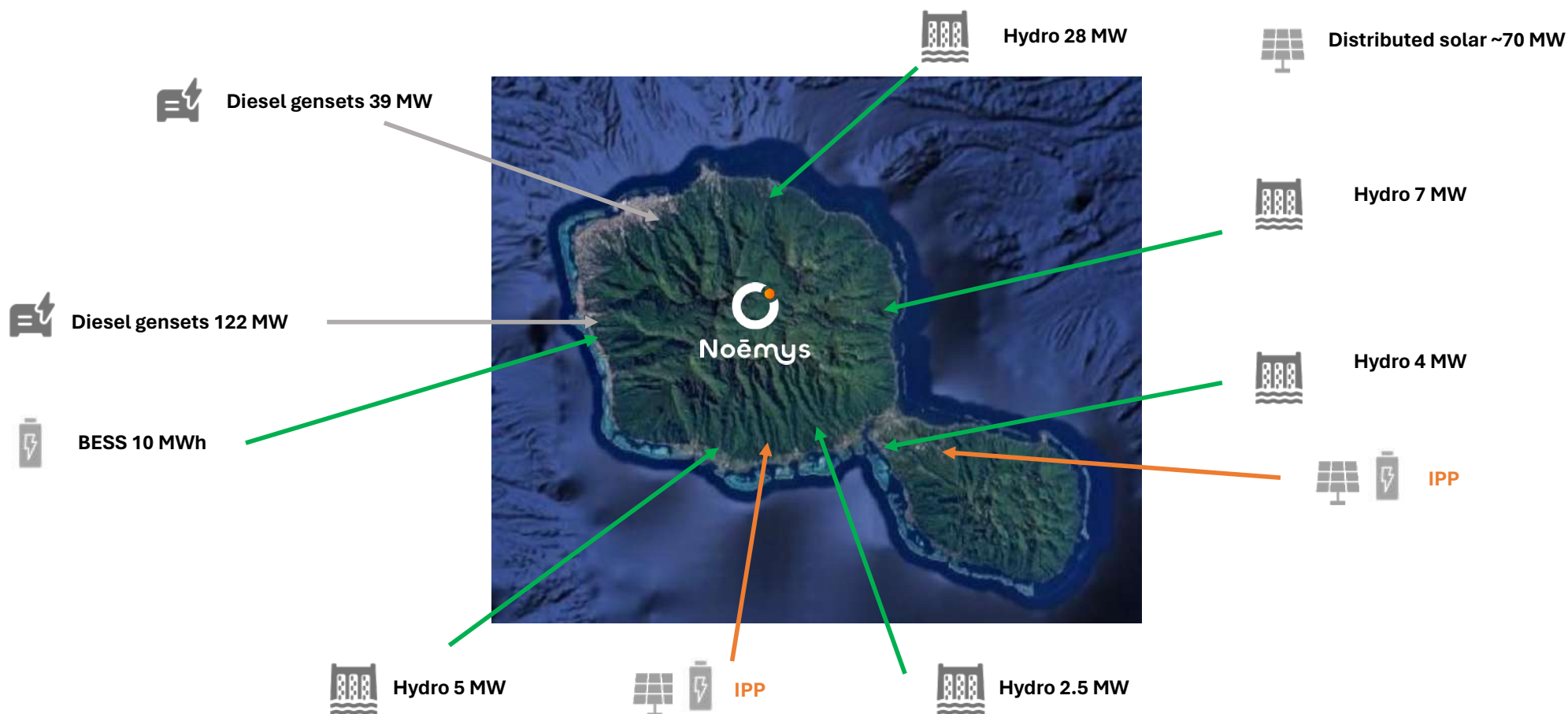
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KEY INSIGHTS: CASE STUDY OF A PACIFIC ISLAND





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KEY INSIGHTS: CASE STUDY OF A PACIFIC ISLAND



Pacific island case

2 IPPs in Tahiti, first agrivoltaics projects:
PV + BESS, exporting to the Tahitian grid





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BEFORE

ONE SINGLE UTILITY - EDT



Responsible for **production & distribution**,
balance supply/ demand

TSO - TEP



Measurement and verification only



BALANCE SUPPLY/DEMAND

Ensured by EDT mostly with diesel and hydro



SOFTWARE TOOLS

SCADA



MICROGRID MANAGEMENT

Reactive mode, real-time monitoring and control



PEOPLE (*operational dispatch*)

Diesel operations mode only, robust but
« easy » black start procedures



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NOW

MULTIPLE UTILITIES / LOCAL OPERATORS

SPL Te Uira Api No Te Mau Motu, EPIC Te Ito Rau No Moorea Maiao, CODIM...



Responsible for **production & distribution, balance in the grid**

TSO - TEP



Responsible for **measurement and verification, + balance in the grid in Tahiti**



BALANCE SUPPLY/DEMAND

Operators' responsibility (with BESS/diesel gensets)



SOFTWARE TOOLS

Need of advanced solutions: SCADA+ EMS



MICROGRID MANAGEMENT

Forward-looking mode: forecasting consumption, generation and weather to optimize the use of renewables and provide grid stability



PEOPLE (*operational dispatch*)

Need of new skills improvement: hybrid management



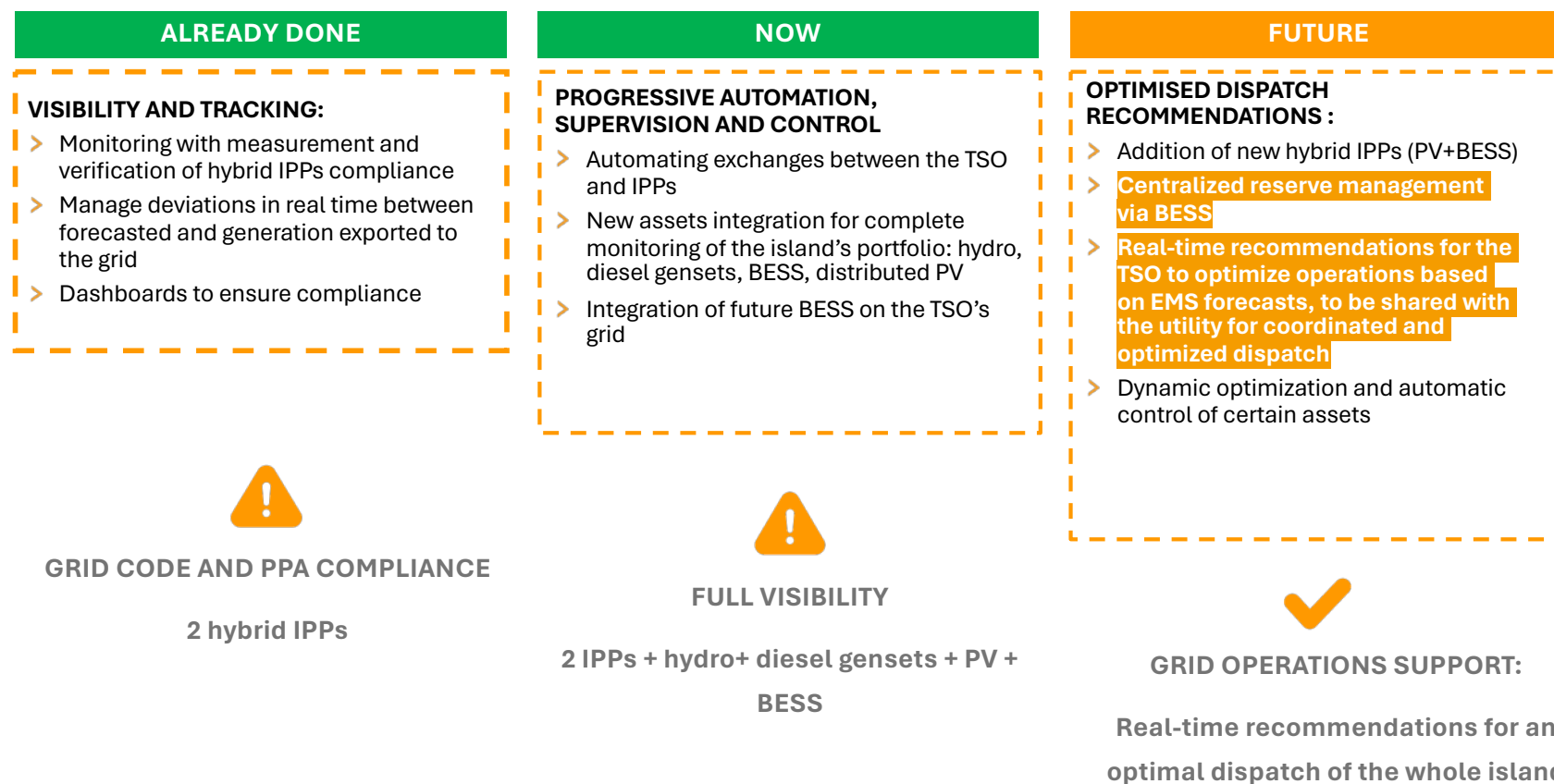
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KEY INSIGHTS: CASE STUDY OF A PACIFIC ISLAND





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CONCLUSION

- + Start with a holistic understanding of the technical, operational, and human landscape.
- + Deploy **flexible, scalable** platforms that can evolve with changing needs and market structures.
- + Build local capacity so operators can own and sustain their transformation journey.

SMART GRIDS ARE NOT ONLY ABOUT TECHNOLOGY - THEY ARE ALSO ABOUT BUILDING SYSTEMS THAT CAN LEARN, ADAPT AND EVOLVE TOGETHER WITH THE PEOPLE WHO OPERATE IT.



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Alain DARDY

APAC Regional Director
Energy Pool

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Jamila AMODEO

Senior Energy Specialist

Asian Development Bank

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Building Intelligent Energy Systems for Regional Integration: Lessons from Europe's Digital Energy Strategy for the Pan Asia Power Grid Initiative

8 June 2026 | 2:00 – 3:30 p.m. (GMT +8)

Jamila Amodeo
Senior Energy Specialist (Smart Energy Systems)
Energy Sector Office, Sectors Department 1
Asian Development Bank
jamodeo@adb.org



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ADB's Regional Energy and Digital Initiatives

Pan-Asia Power Grid - \$50 billion mobilized by 2035

- National and subregional grid interconnections, storage, and grid digitalization
- Investments in cross-border infrastructure to unlock renewable energy at scale
- Technical assistance to align regulations, standards, and conduct feasibility studies

Asia-Pacific Digital Highway - \$20 billion mobilized by 2035

- Digital corridors, data infrastructure, AI-ready economies:
 - Investments in connected infrastructure for terrestrial and subsea fiber networks, satellite links, regional data centers
- Policy and regulatory support for cybersecurity risk management, digital and AI readiness skills program



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ADB Energy Policy - Strategic Objectives



- **Energy security and resilience**
- **Universal energy access** (reliable, affordable energy for all)
- **Low-carbon transition** (including nuclear energy, methane emissions and critical minerals)
- **Environmental sustainability**



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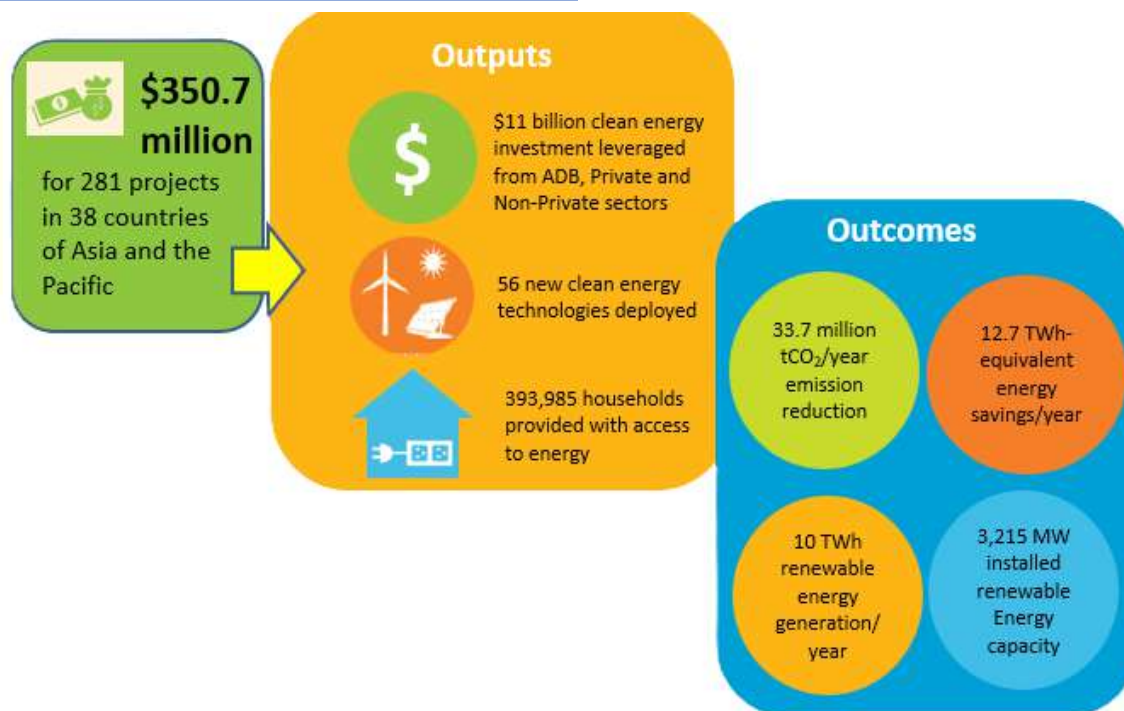
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Clean Energy Financing Partnership Facility (CEFPF)

Achievements as of February 2026



The CEFPF was established in 2007 to provide financing to Developing Member Countries and help improve energy security and transition to low-carbon use through cost-effective investments in clean energy technologies, which result in greenhouse gas mitigation. By promoting the use of clean energy, CEFPF helps decrease the impact of climate change.

Aligned with ADB Strategy 2030 and the ADB Energy Policy, it gives priority to the following:

- Energy Efficiency
- Access to Energy
- Renewable Energy and Smart Grid
- Low Carbon Development
- Promotion of Gender Equality
- Private Sector Participation
- Cross-sectoral Support Innovative smart energy and digitalization technologies
- Catalyze public and private capital to accelerate the transition from carbon intensive to clean energy



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ADB Energy Projects with Digital Solutions

Technology / Digital solution	Applicability
SCADA / grid automation / control centers	Real-time grid monitoring, automated control, fault detection, dispatch, substation automation, and system reliability
Advanced Metering Infrastructure, smart meters & data management	Loss reduction, billing accuracy, commercial operations, customer metering, energy auditing, and demand-side management
Smart grids / digital grid modernization	Modernizing power networks to integrate renewables, improve reliability, and support distributed energy resources
Forecasting, predictive analytics, and optimization tools	Renewable energy forecasting, demand forecasting, grid planning, asset performance monitoring, and energy optimization
Energy management systems/ DER management systems	Managing distributed generation, optimizing grid operations, integrating solar/battery systems, and supporting smart distribution networks



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ADB Energy Projects with Digital Solutions

Technology / Digital solution	Applicability
IoT, sensors, and remote monitoring	Remote asset monitoring, smart sensors, leak detection, equipment monitoring, & operational visibility
Data analytics platforms, dashboards, databases, and knowledge platforms	Evidence-based planning, performance tracking, clean energy investment pipelines, and monitoring/reporting systems
Explicit AI / machine learning / AI-enabled applications	AI-based microgrids, AI-enhanced distribution grids, predictive maintenance, AI-enabled energy management, carbon estimation, and BESS planning
Digital customer, billing, payment, market, or portal platforms	Customer portals, digital billing, prepaid solar payments, emissions trading platforms, power market platforms
Cybersecurity and digital resilience	Protecting grid systems, SCADA, AMI, control centers, data platforms, & data recovery architecture
GIS / geospatial systems	Energy access planning, asset mapping, off-grid planning, methane leakage mapping, and infrastructure resilience
Digital Twins	Emerging use for energy system planning and resilience, clean energy knowledge-solutions TA



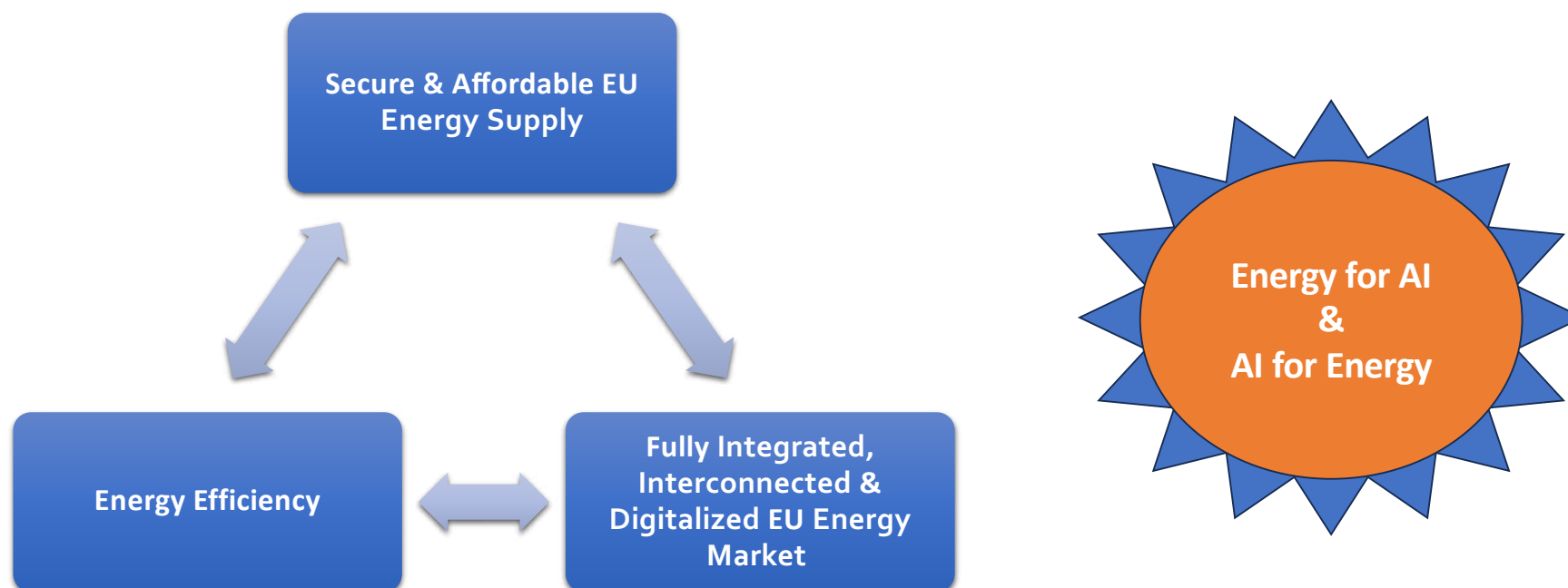
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European Green Deal Principles





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EU Energy Reform Evolution to Regional, Digital, and AI-Enabled Grids

EU Energy Reform Policy

Key Milestones Towards Regional Grid

Third Energy Package (2009)- From national monopolies to coordinated European grids

- Unbundling of Transmission System Operators (TSOs/DSOs)
- Creation of ENTSO-E

Agency for the Cooperation of Energy Regulators (ACER) established

- Oversight of cross-border grid issues & Dispute resolution between national regulators

Clean Energy for All Europeans Package (2019)

- Formal regional cooperation obligations
- Establishment of Regional Coordination Centers (RCCs)

Revised TEN-E Regulation (EU) 2022/869 (trans-European Energy Infrastructure)

- Priority and fast-tracking for cross-border Projects of Common Interest (PCIs)
- Enables **hybrid** offshore and meshed grids

Electricity Market Design Reform (2023–2024) & EU Grid Action Plan (2023)

- Stronger regional price signals
- Better integration of flexibility and long-term contracts
- Long term planning of networks and enhanced data access

Regulation 2024/1366 supplementing Regulation (EU) 2019/943 of the European Parliament and of the Council (2024)

- Establishing a network code on sector-specific rules for cybersecurity aspects of cross-border electricity flows

EU Digitalization of Energy Action Plan & AI Roadmap (2024–2026)

- **Common European Energy Data Space (CEEDS)**
- Cross-border data interoperability and governance



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Common European Energy Data Space (CEEDS)

Initial Setup of CEEDS



Source: EnTEC – Common European Energy Data Space, 2023

The **EU Digitalization of the Energy System Action Plan** - a strategic European Commission framework designed to make the energy grid smarter, more flexible, and decentralized.

Priority high-level use cases using smart meters and Automated Metering Infrastructure (AMI):

1. Flexibility
2. Smart Charging of Electric Vehicles
3. Optimized Buildings' Energy Use

Increased investments in digital energy infrastructure:

Creation of a digital twin of the electricity grid in collaboration with ENTSO-E and EU Distribution System Operators (DSO) Association

Regulatory oversight: ACER and National Regulatory Authorities collaboration to set common smart indicators and objectives

Source: Smart Energy Management Webinar 26.03.2024 Cristiana Marchitelli DG ENER. Competitiveness, Digitalization, R&I



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Continental Europe Synchronous Area (CESA)



Size:

- Spans across 24 EU countries
- Connects 36 countries
- Supplies over 400 million customers

Goals:

- Grid Synchronization (50 Hz frequency)
- Market Integration
- Energy Transition

Managed by:

- The European Network of Transmission System Operators for Electricity (ENTSO-E) in collaboration with
- Continental/ National Transmission System Operators (TSOs)



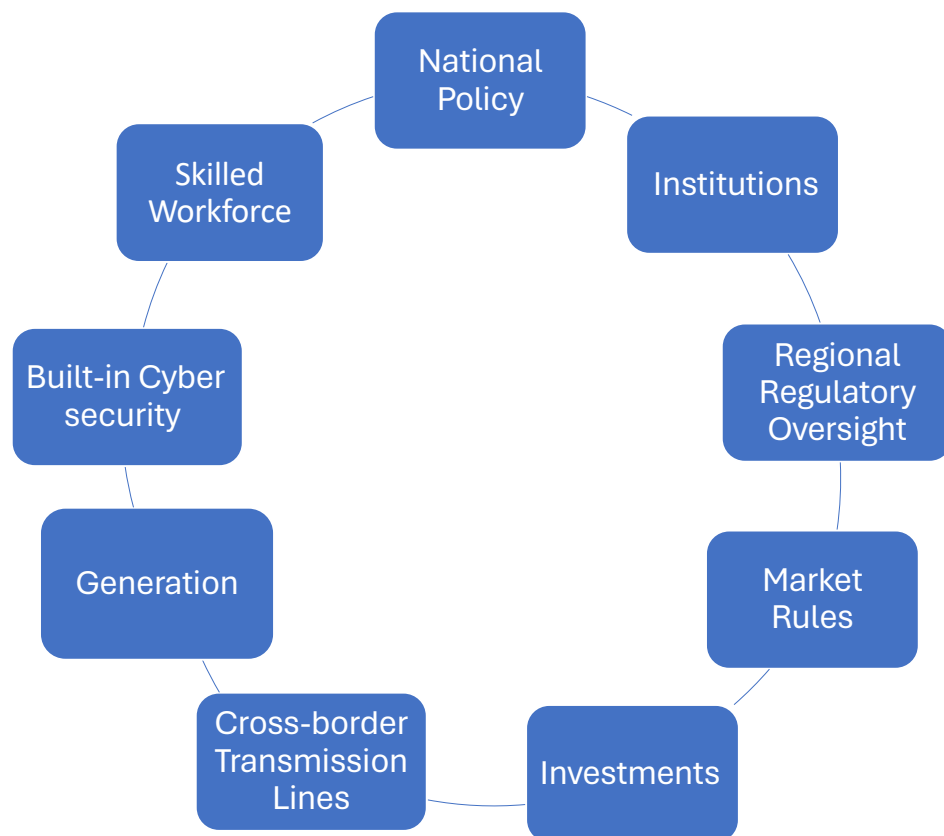
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Key Components of Intelligent Energy Systems for Regional Integration





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Thank you!

Jamila Amodeo
Asian Development Bank
jamodeo@adb.org



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Yves BARTHELEMY

Digital Technology Specialist
Asian Development Bank

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Earth Observation in Energy Operations ESA-ADB partnership in action

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European Space Agency

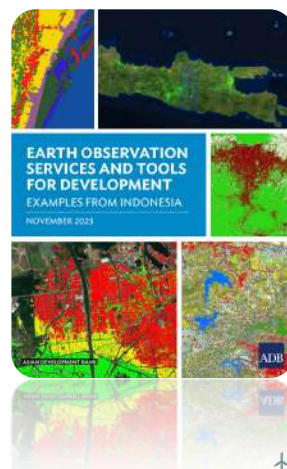
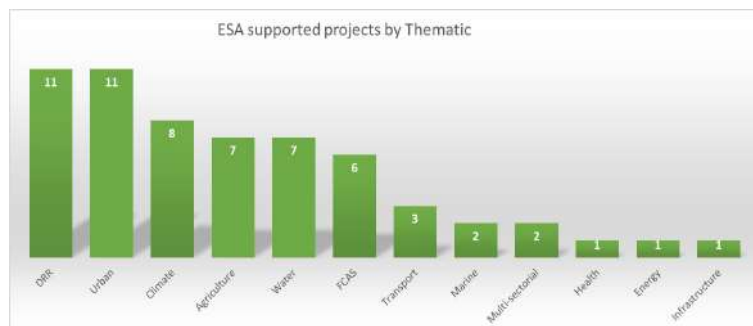
ESA-ADB Partnership

- Mainstreaming Earth Observation (EO) technologies into ADB operational processes and development finance

- Collaborations initiated in 2010



- More than 50 projects supported
- Engagements in 30 countries
- Multi-sectoral



April 2026, ADB, Manila

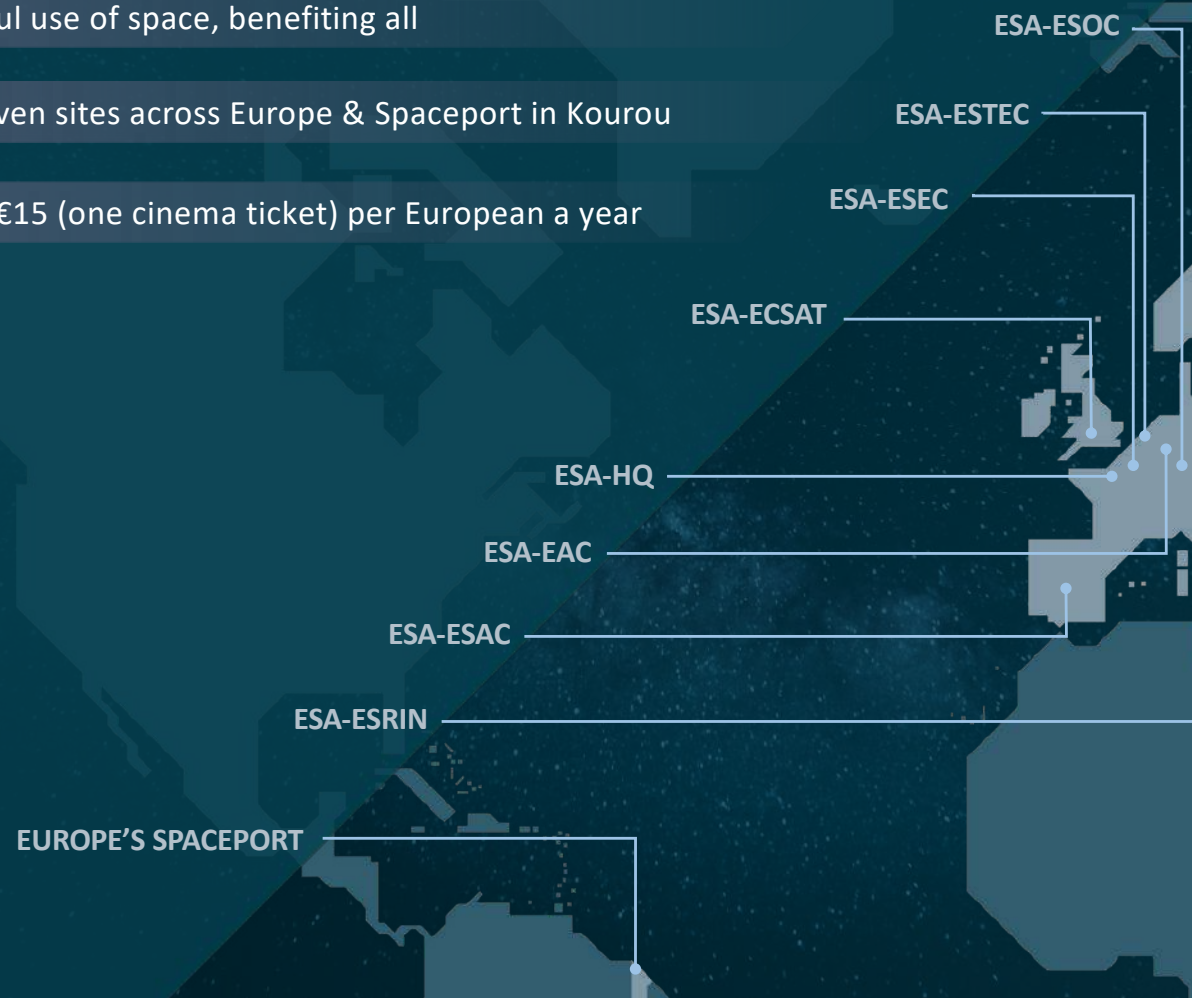


WHO 23 Member States, 2500+ staff members and total workforce of 6000+

WHY For the peaceful use of space, benefiting all

WHERE HQ in Paris, seven sites across Europe & Spaceport in Kourou

BUDGET €8.3 billion = ~€15 (one cinema ticket) per European a year



Partnership

23 Member States

☆ Austria	☆ Luxembourg
☆ Belgium	☆ Netherlands
Czech Republic	☆ Norway
☆ Denmark	Poland
Estonia	☆ Portugal
☆ Finland	Romania
☆ France	☆ Spain
☆ Germany	Slovenia
Greece	☆ Sweden
Hungary	☆ Switzerland
☆ Ireland	☆ United Kingdom
☆ Italy	

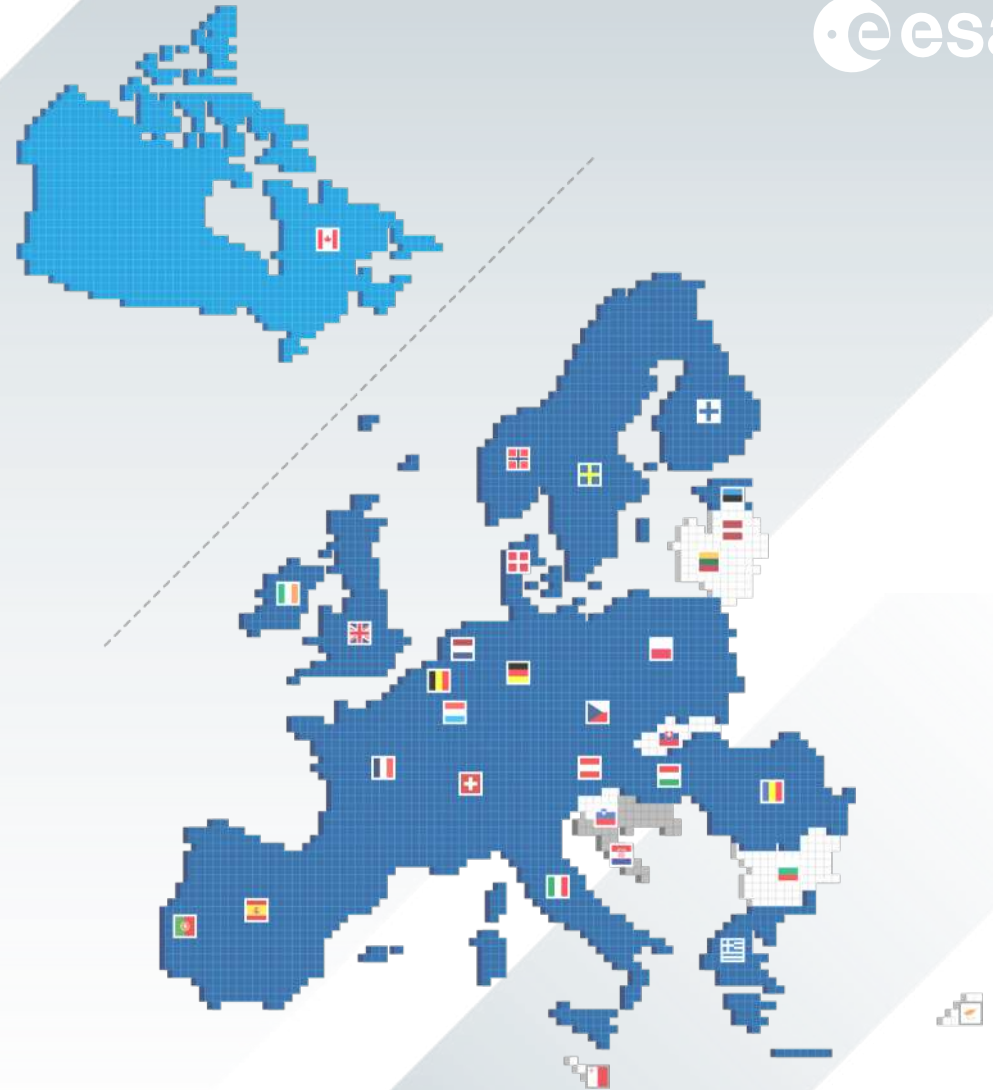
3 Associate Members

Slovakia, Latvia, Lithuania

Cooperation Agreements

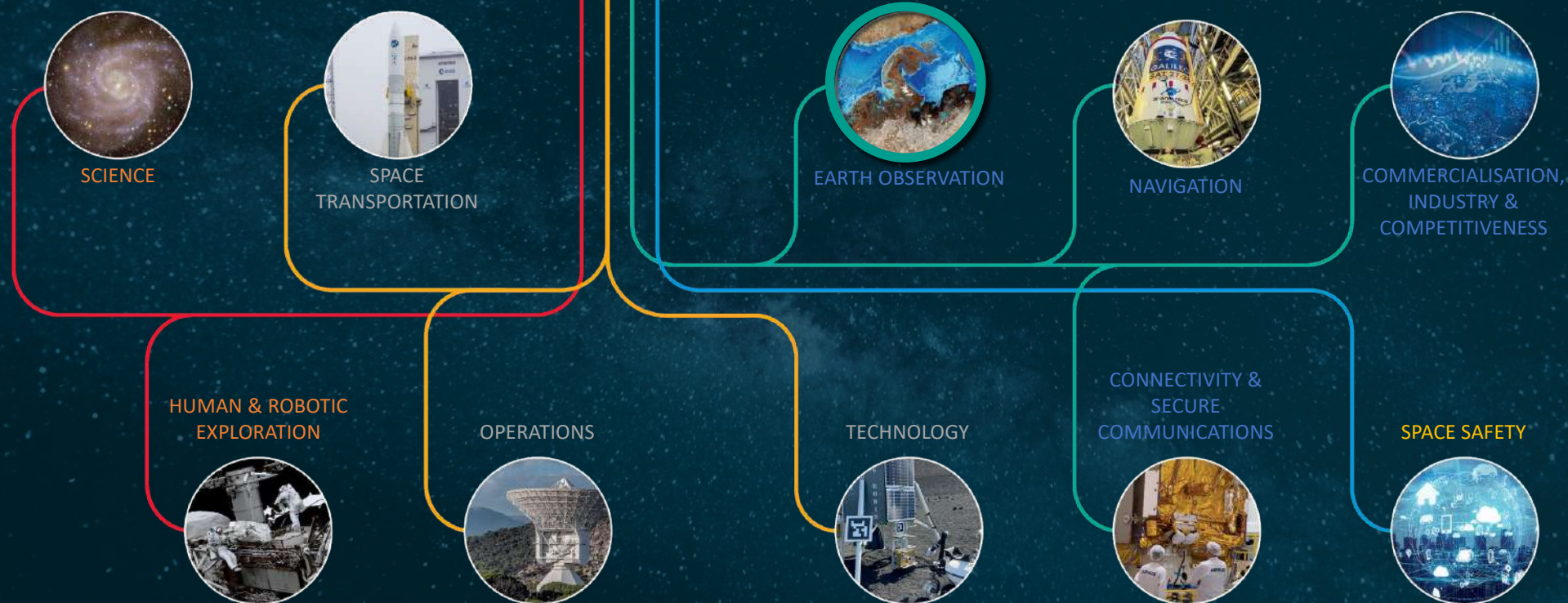
4 other European States + Canada ☆

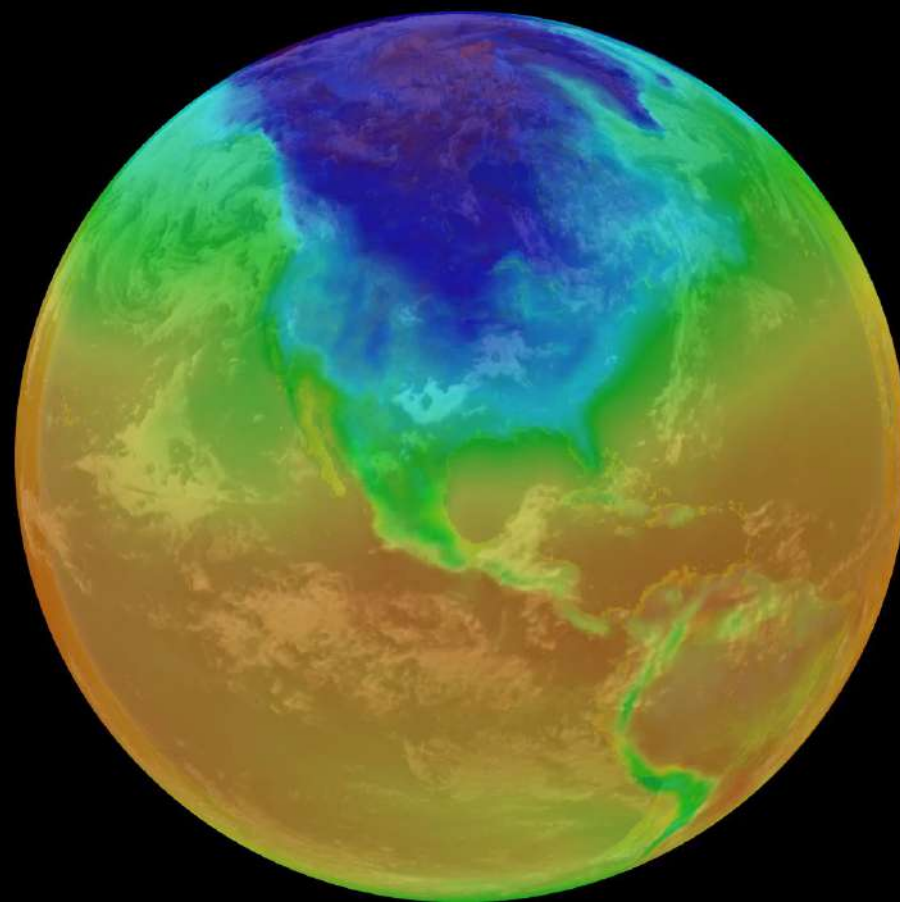
☆ ADB Member Countries (17)



INSIDE ESA

Four pillars. One ESA.







PROGRAMME OF THE
EUROPEAN UNION



Copernicus Sentinels: Operational Monitoring



sentinel-1

→ RADAR VISION



sentinel-2

→ COLOUR VISION



sentinel-3

→ A BIGGER PICTURE



sentinel-4

→ EUROPEAN AIR MONITORING



sentinel-5p | sentinel-5

→ GLOBAL AIR MONITORING



sentinel-6

→ SURFING THE SEAS



300 TB

satellite data
distributed per day



full, free & open
data policy



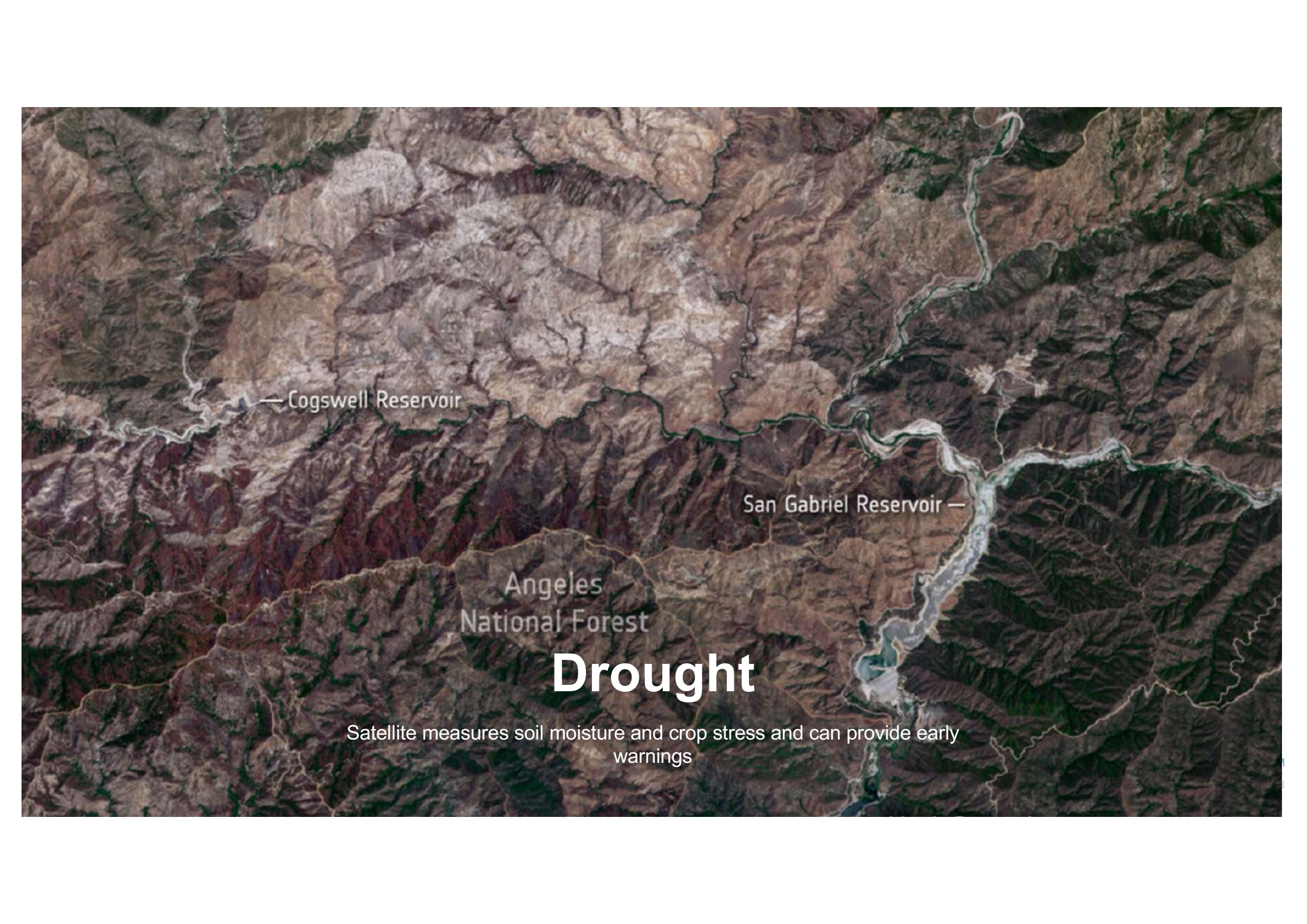
→ THE EUROPEAN SPACE AGENCY

A satellite image of Cambodia showing extensive flooding. The image displays a large area of land with a grid-like pattern, likely agricultural fields, which are mostly submerged in floodwater. The floodwater appears as a light green color, contrasting with the darker green of the land. A winding river or canal is visible on the left side of the image. The word "Cambodia" is written in white text in the upper left quadrant.

Cambodia

Floods

Satellite see through clouds and darkness to map floodwater and
predict future flood patterns
Cambodia, Sentinel 2

A satellite image of a mountainous region, likely the Angeles National Forest in California. The terrain is rugged with brown and tan hues, indicating dry conditions. Two reservoirs are visible: Cogswell Reservoir on the left and San Gabriel Reservoir on the right. The San Gabriel Reservoir is a large, winding body of water. The text 'Angeles National Forest' is centered in the lower half of the image.

— Cogswell Reservoir

San Gabriel Reservoir —

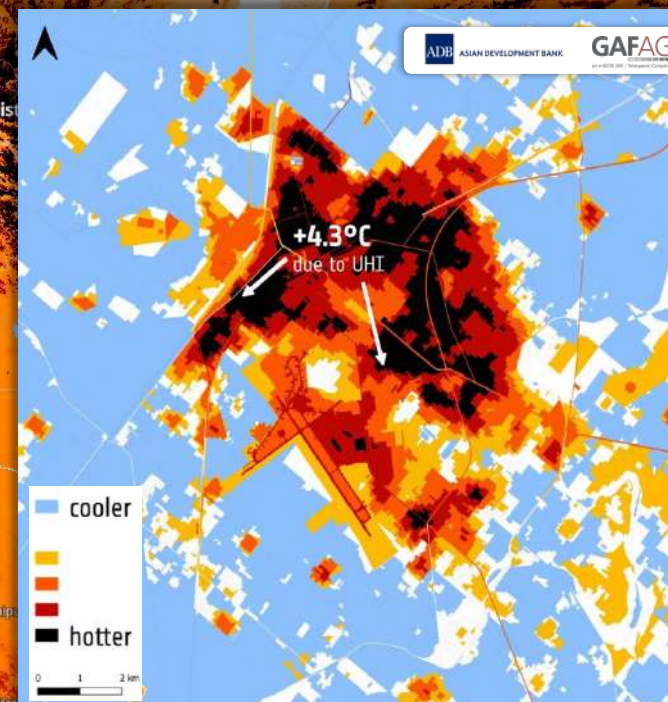
Angeles
National Forest

Drought

Satellite measures soil moisture and crop stress and can provide early warnings

Heat

Satellite tracks surface temperatures to show if extreme heat is becoming more frequent or intense



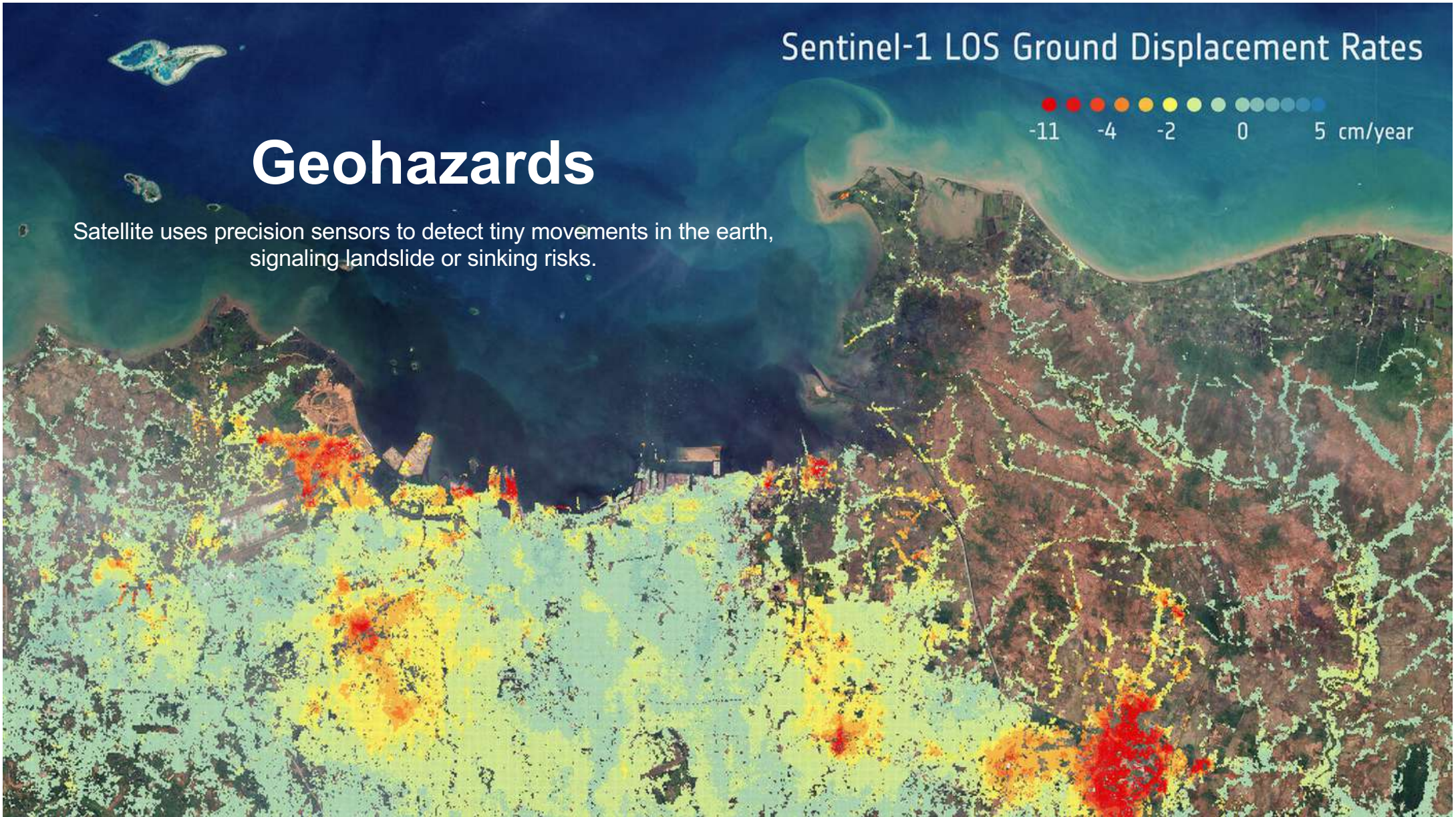
Surface Urban Heat Island Intensity, Sargodha, Pakistan, July 2021

Sentinel-3 LST

Geohazards

Satellite uses precision sensors to detect tiny movements in the earth, signaling landslide or sinking risks.

Sentinel-1 LOS Ground Displacement Rates



Demand

Population
Urban Expansion
Economic Activity
Predictive Urban Growth

Estimated Construction Time

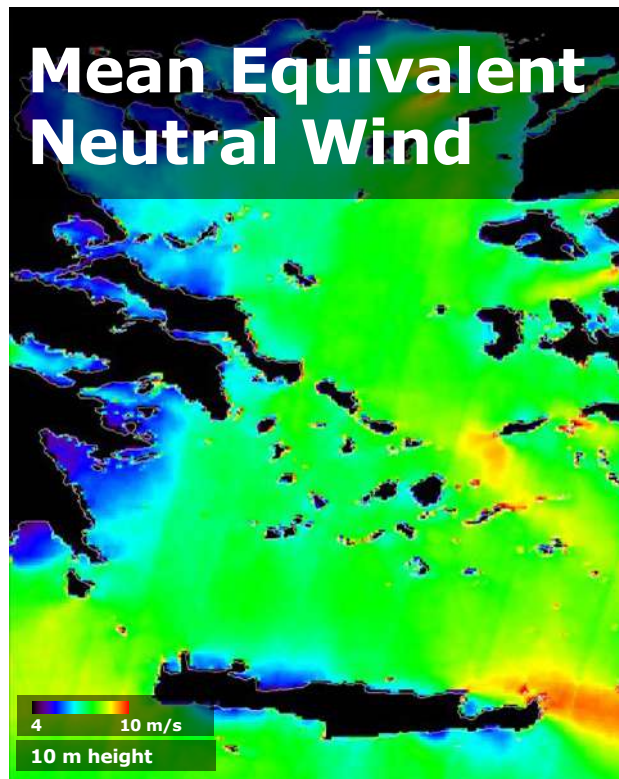


Clean Energy: Resource Assessment

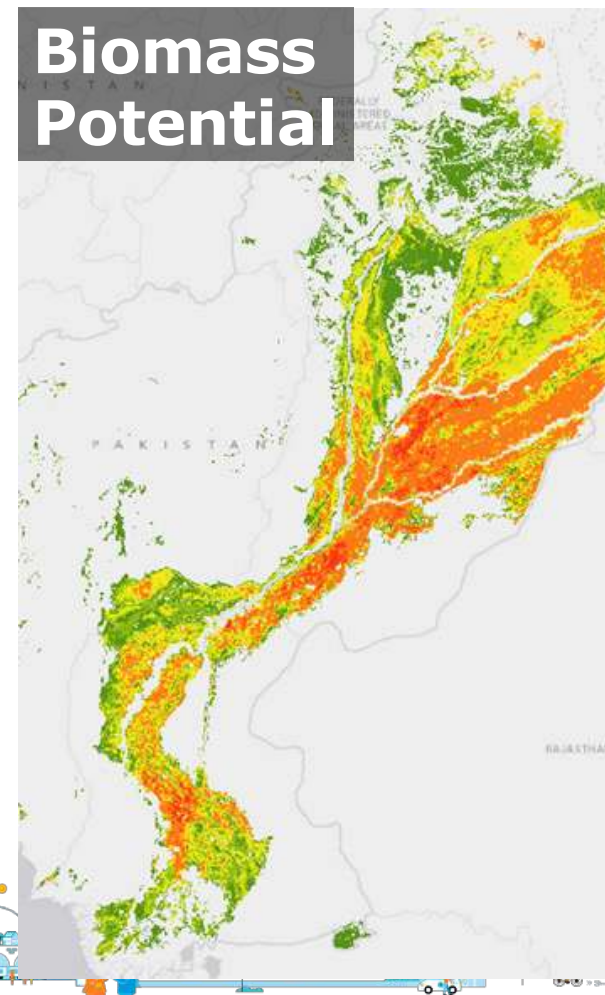
Solar Irradiance



Mean Equivalent Neutral Wind



Biomass Potential



Snow Water Equivalent



Example: EO feeding into:



Earth Observation Products for Renewable Energy

	Marine	Wind	Hydro	Solar	Biomass	Storage	Electrification
Wave/current/tide resource data	●	●					
Offshore wind speed and direction resource data	●	●					
Snow cover extent			●	●			
General land cover type and change			●	●	●	●	●
Digital Elevation Models		●	●	●		●	●
Soil moisture, precipitation			●		●		
Infrastructure and ground stability indicators (displacement rates, etc.)			●			●	●
River and lake parameters			●				
Solar irradiance				●			
Land surface temperature				●	●		
Atmospheric composition (aerosols)				●			
NRT parameters as input to mesoscale modelling/forecasting	●	●	●	●	●		
Basic mapping (proxies of electricity demand)							●

• Main data sources:

- ESA/Copernicus missions (30 years)
- National missions in Europe/Canada, including smallsats
- Meteorological satellites (1981 onwards)



Earth observation and Project cycle



- Designing
- Implementing
- Monitoring
- Evaluating the project impact
- Planning ahead

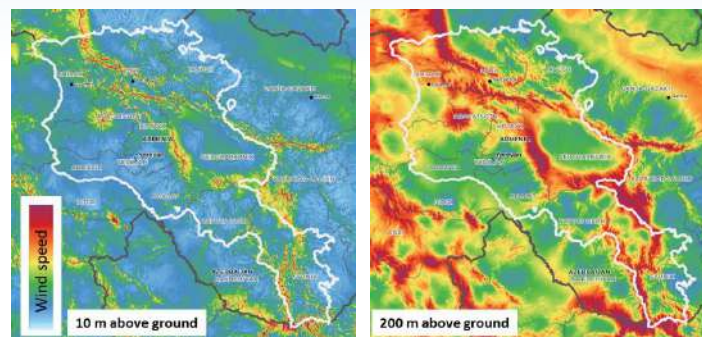
Earth observation and Geospatial Information used at all project cycle phase



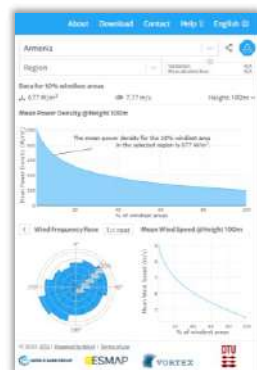
Use Case: Updating the National Wind Atlas Armenia

- TA-6959 ARM: Viability Assessment for Potential Wind Power Electricity Generation Projects:
 - Feasibility study
 - Existing data is not always suitable (e.g. mismatch in hub-height)
 - Good scalability

Existing information



Existing layers (globalwindatlas.info) and other information

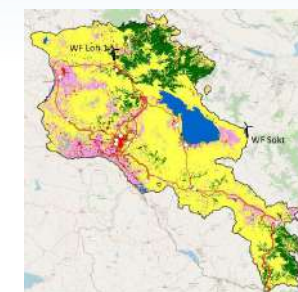


- Improved simulated average horizontal wind speed for standard heights
- Power density for standard heights
- Selection and ranking of sites based on available infrastructure (grid, access routes), no-go areas and wind potential

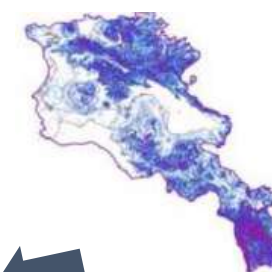
Complementary EO-based information



Elevation



Land Cover



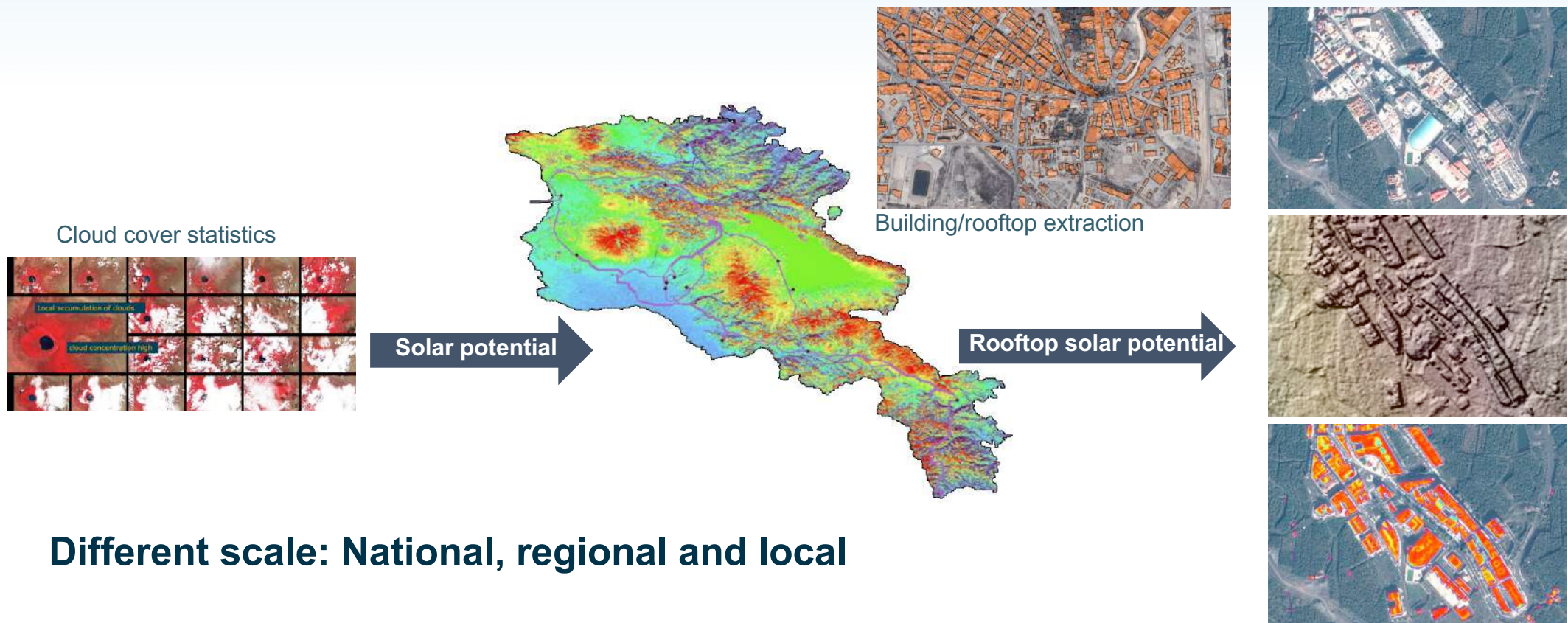
Slope



Vegetation height

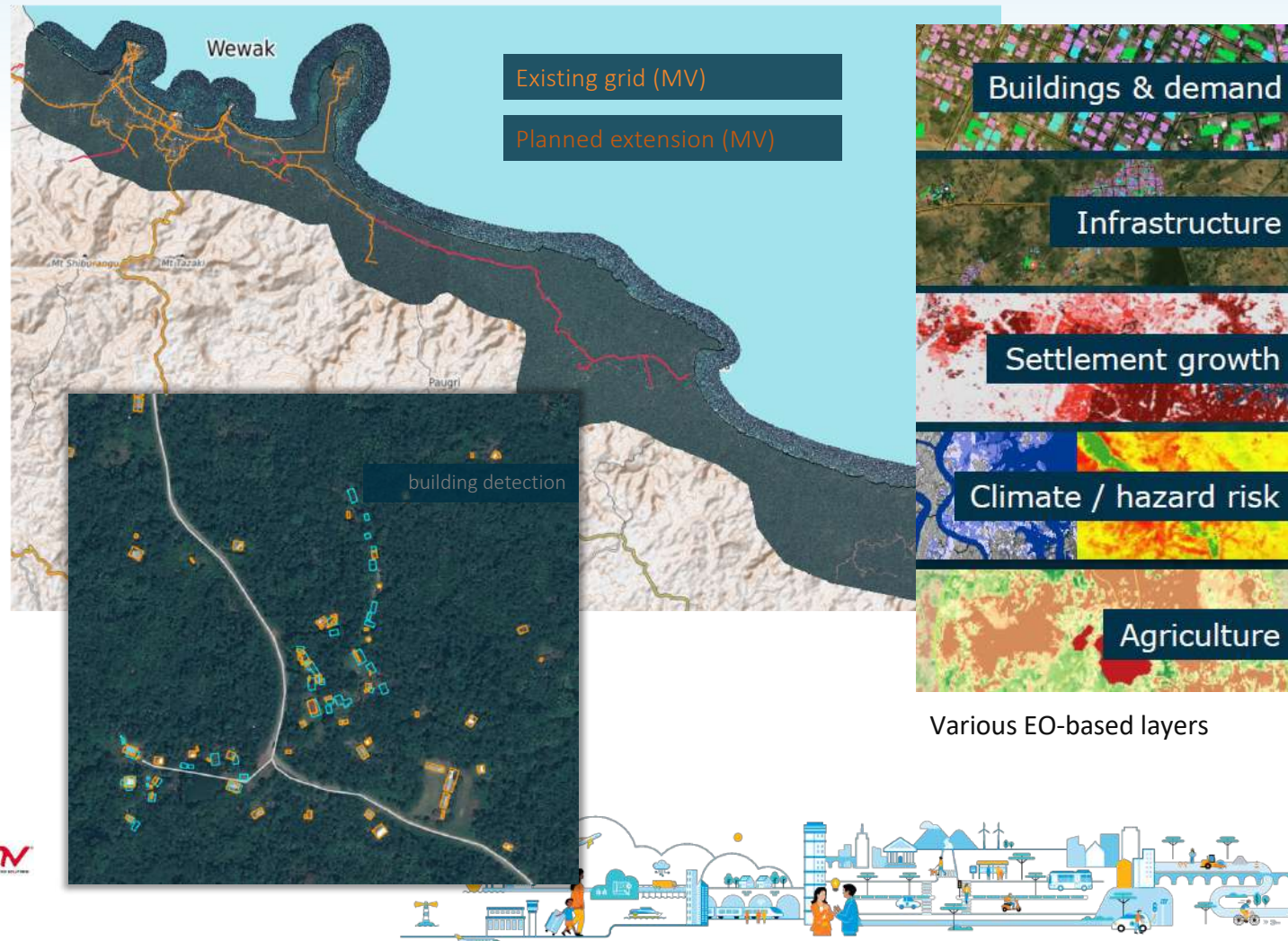


Use Case: Rooftop Solar Potential, Armenia

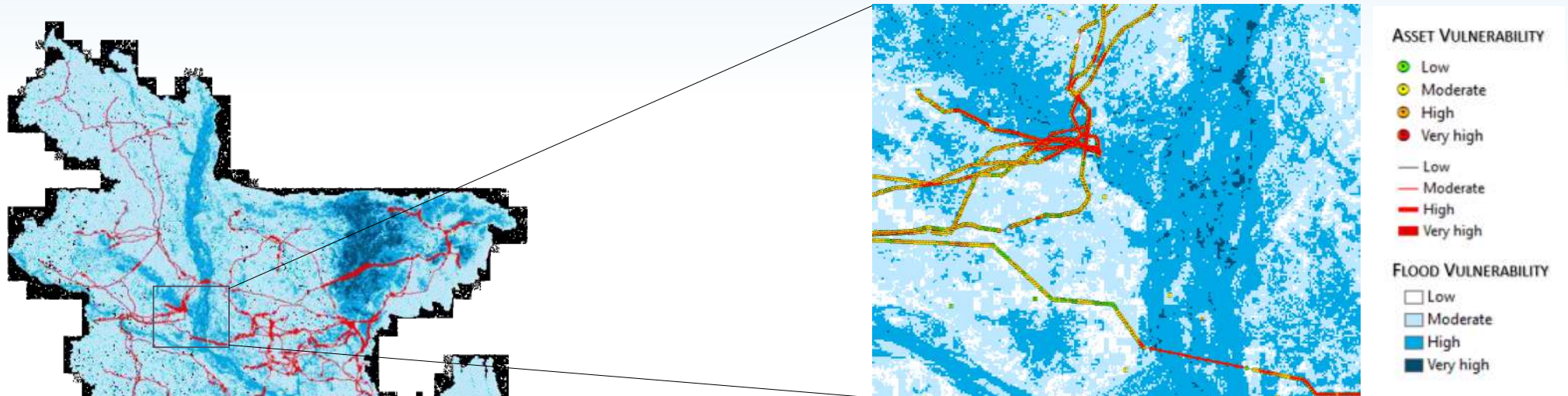


Use Case: Energy Demand Assessment (Mini-Grids), Papua New Guinea

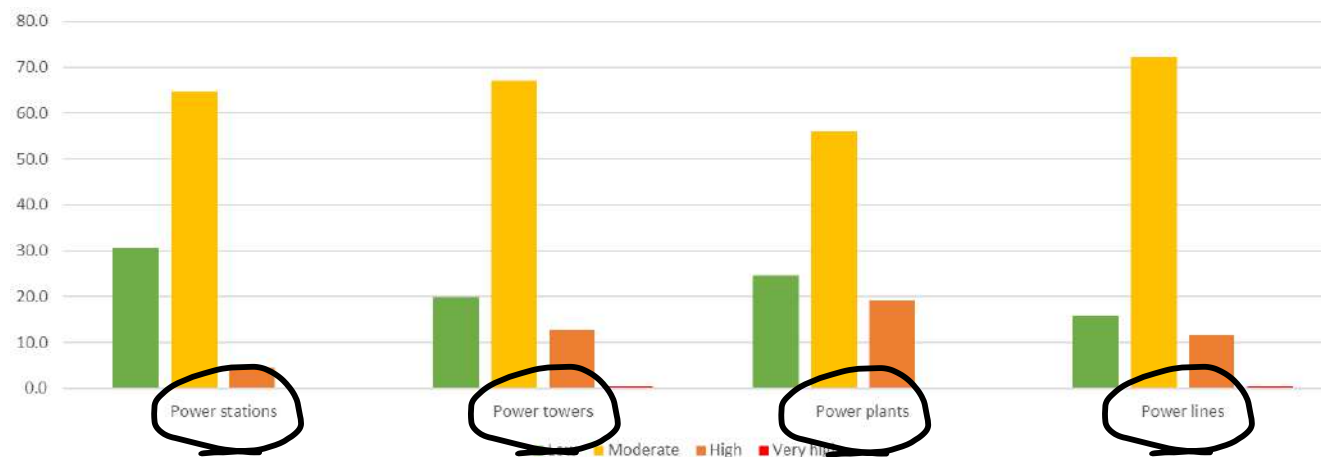
- ADB: Power Sector Development Investment Program (47356-001) & Development Project (47356-002)
 - Setting: Six provincial diesel mini-grids to be replaced/extended by hydro/photovoltaic
 - Key question: Where can existing mini-grids be extended for maximum impact, i.e. connecting additional households?
 - Based on demand assessment



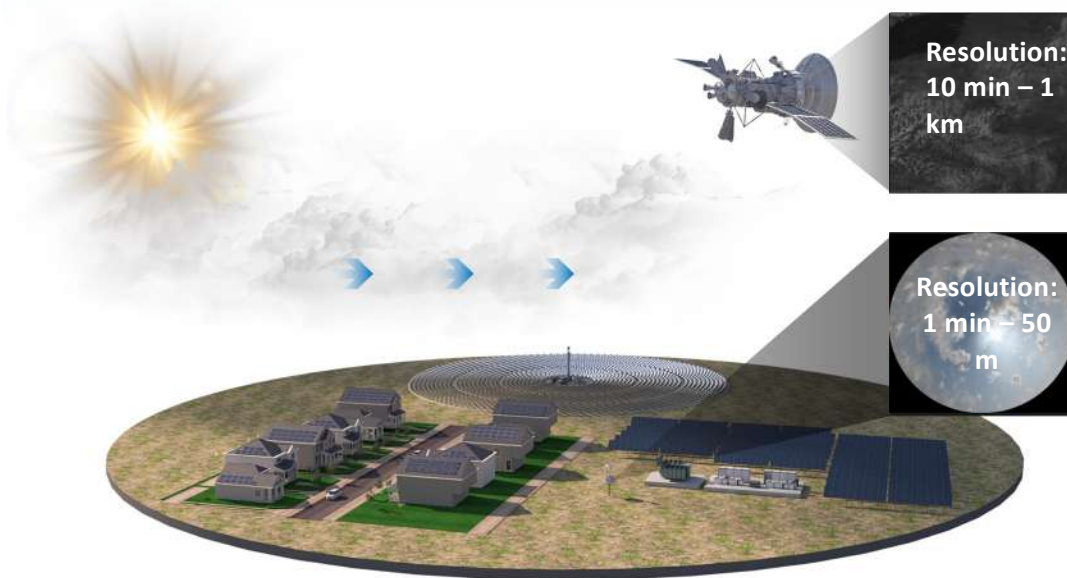
Use Case: Energy Network exposed to Flooding, Bangladesh



Various EO-based layers



Future Development: Solar forecasting with Earth observation

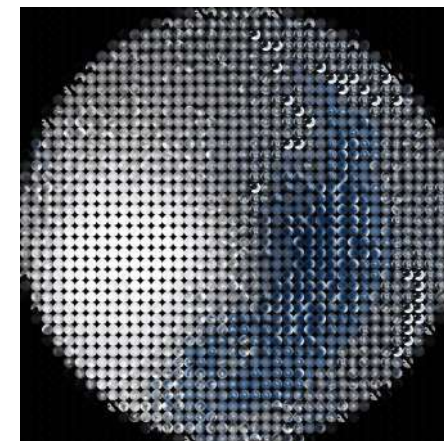
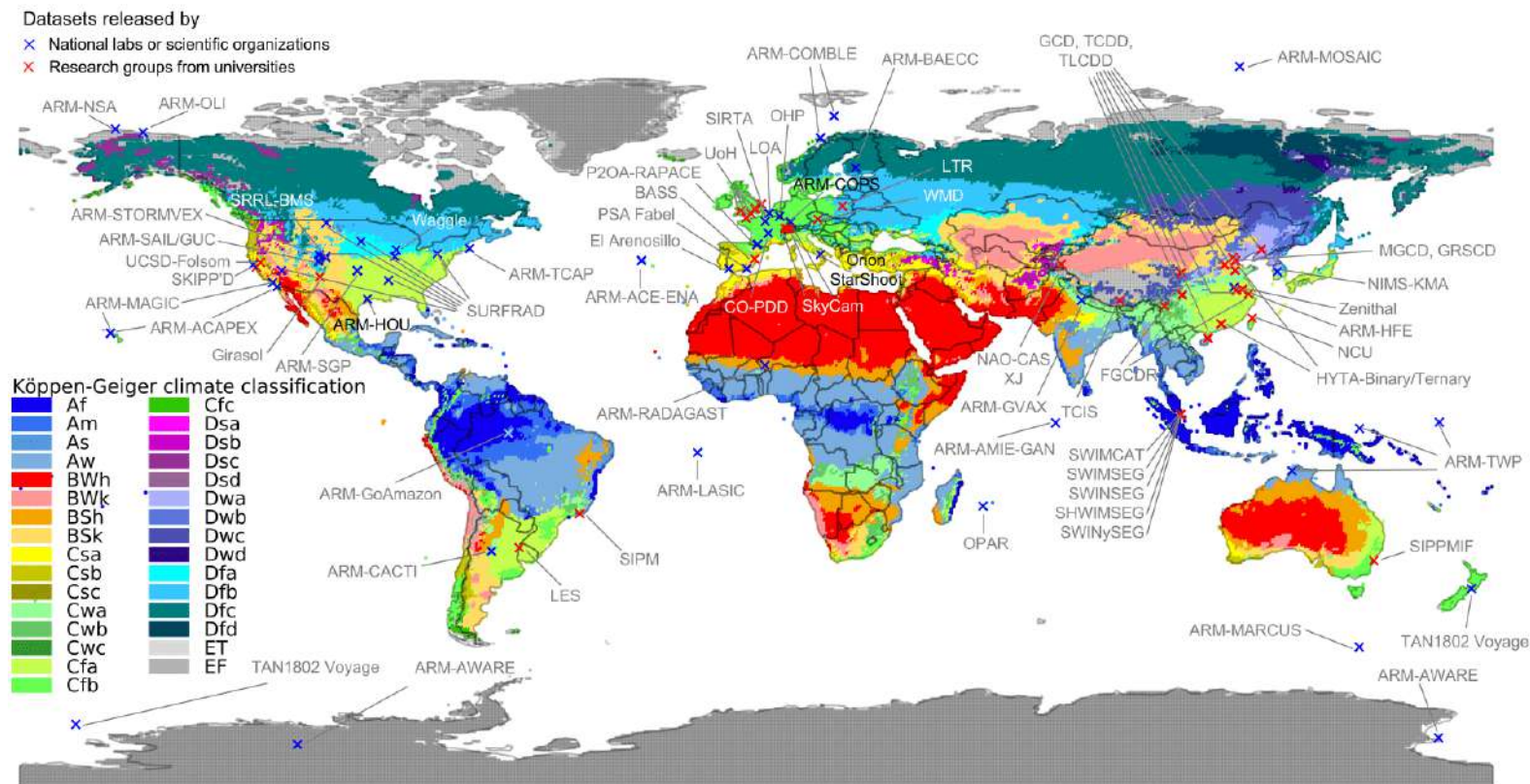


Credit: Professor Pierre Pinson - Inaugural Lecture at Imperial College London

Finer temporal and spatial resolution.
Improved Solar Energy forecasting



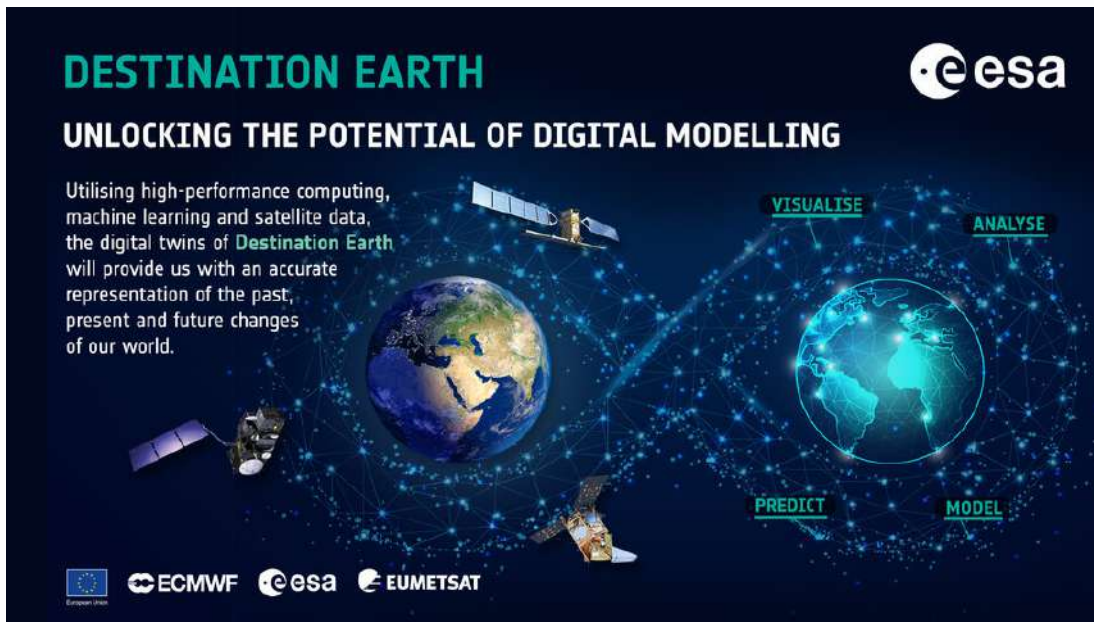
Future developments: SolarBench



Dataset from Hong Kong University.
Asia Pacific users will be able apply the resulting models to forecast the energy production from local solar assets and share their own data for improving forecast.



Digital Twin for Energy



DESTINATION EARTH

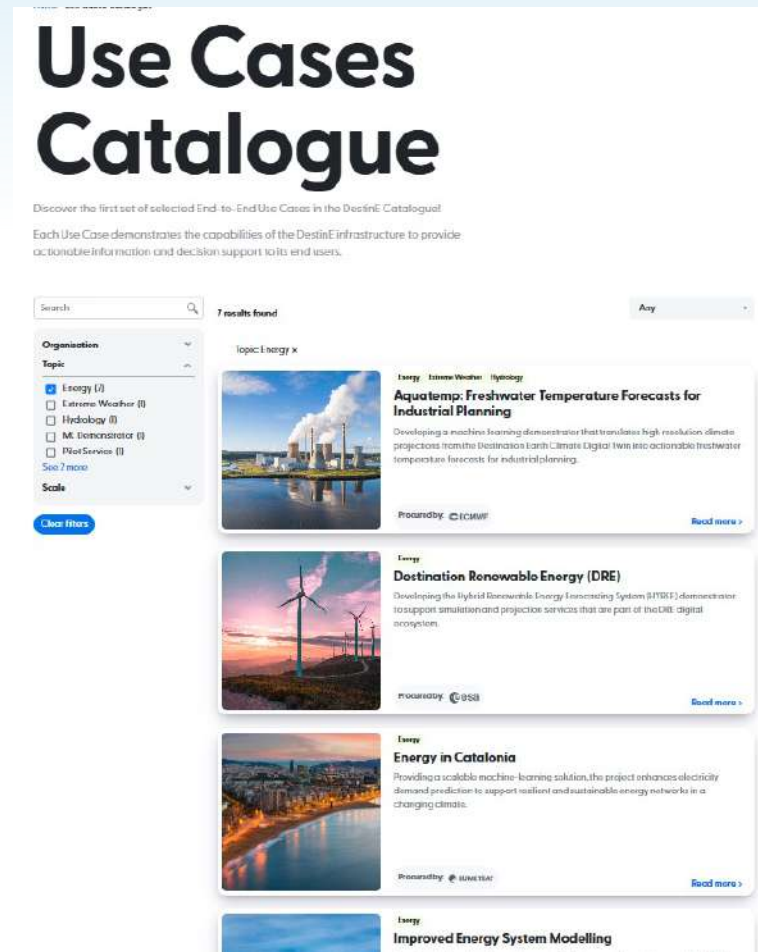
UNLOCKING THE POTENTIAL OF DIGITAL MODELLING

Utilising high-performance computing, machine learning and satellite data, the digital twins of **Destination Earth** will provide us with an accurate representation of the past, present and future changes of our world.

Visualise **Analyse** **Predict** **Model**

Logos: European Union, ECMWF, ESA, EUMETSAT

https://destination-earth.eu/use-cases/?_topic=energy



Use Cases Catalogue

Discover the first set of selected End-to-End Use Cases in the DestinE Catalogue

Each Use Case demonstrates the capabilities of the DestinE infrastructure to provide actionable information and decision support to its end users.

Search: 7 results found

Organisation: Topic: Any

Energy (1) ☒ Extreme Weather (1) ☐ Hydrology (1) ☐ ML Demonstrator (1) ☐ Pilot Service (1) See 7 more

Clear filters

topic: energy x

- AquaTemp: Freshwater Temperature Forecasts for Industrial Planning**
Developing a machine learning demonstrator that translates high resolution climate projections from the Destination Earth Climate Digital Twin into actionable freshwater temperature forecasts for industrial planning.
Promoted by: ECMWF Read more >
- Destination Renewable Energy (DRE)**
Developing the Hybrid Renewable Energy Forecasting System (HREFS) demonstrator to support simulation and projection services that are part of the DestinE digital ecosystem.
Promoted by: ESA Read more >
- Energy in Catalonia**
Providing a scalable machine-learning solution, the project enhances electricity demand prediction to support resilient and sustainable energy networks in a changing climate.
Promoted by: EUMETSAT Read more >
- Improved Energy System Modelling**





ASIA CLEAN ENERGY FORUM 2026

Beyond Transition: Building Secure, Resilient, Inclusive, and Intelligent Energy Systems

8-11 June | ADB Headquarters, Metro Manila, Philippines



THANK YOU!

Yves BARTHELEMY

Digital Technology Specialist
Asian Development Bank

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ASIA CLEAN ENERGY FORUM 2026

Beyond Transition: Building Secure, Resilient, Inclusive, and Intelligent Energy Systems

8-11 June | ADB Headquarters, Metro Manila, Philippines



Closing Remarks

Ludivine HALBRECQ

Alternate Director for Belgium, France, Israel, Italy,
Portugal, Spain, and Switzerland

Asian Development Bank

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ASIA CLEAN ENERGY FORUM 2026

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EUROPEAN EXAMPLES OF HOW DIGITALIZATION CAN SUPPORT ENERGY CONNECTIVITY AND INTEGRATION

8 June 2026 | 2–3:30 p.m. (GMT+8)



JAIMES KOLANTHARAJ
Asian Development Bank
Principal Energy Specialist
[Moderator]



BERTRAND FURNO
Asian Development Bank
Executive Director



LUDIVINE HALBRECQ
Asian Development Bank
Alternate Director



JAMILA AMODEO
Asian Development Bank
Senior Energy Specialist



STANISLAS VERLEY
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