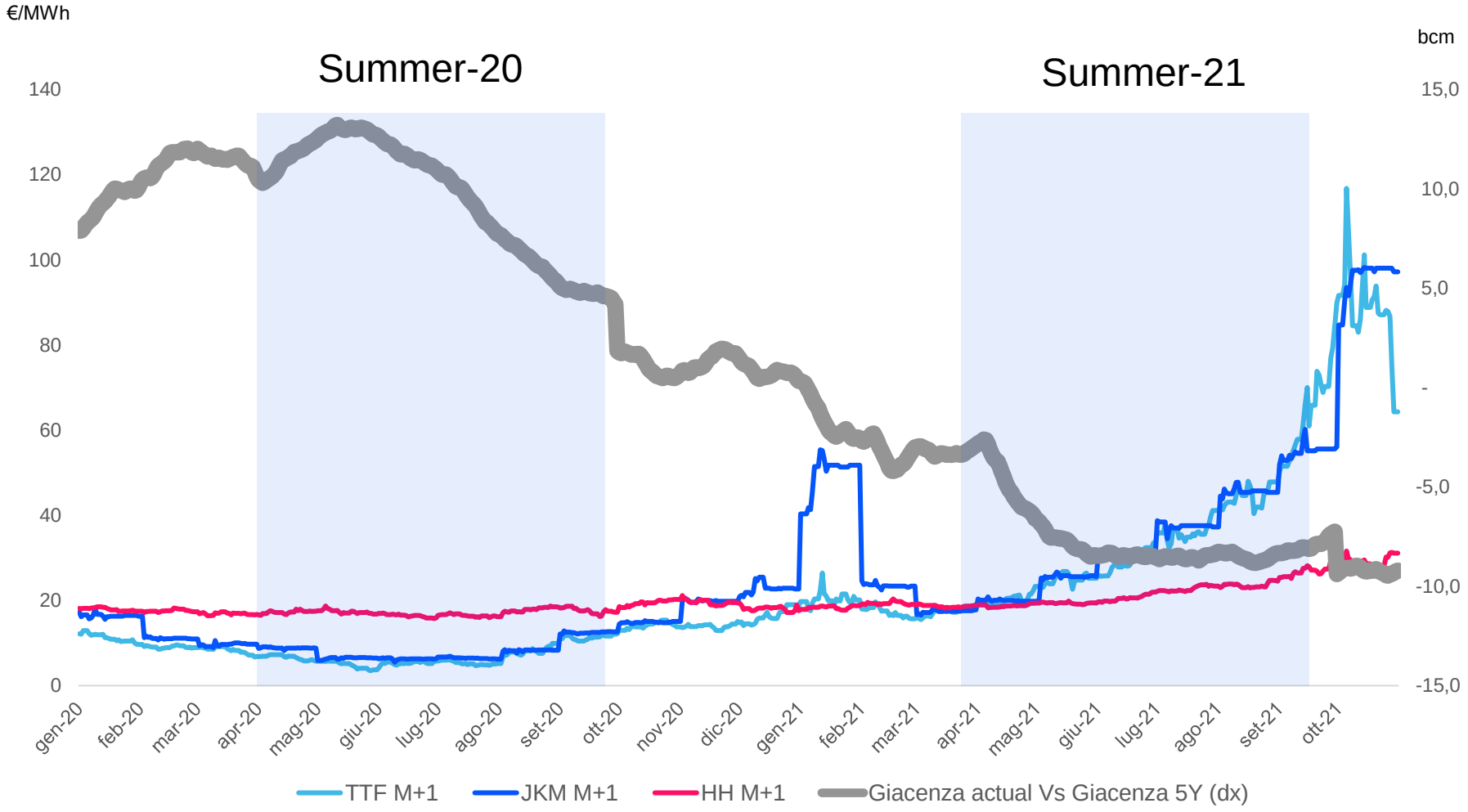
Stoccaggio in NWE

Relazione tra prezzi e livello di riempimento

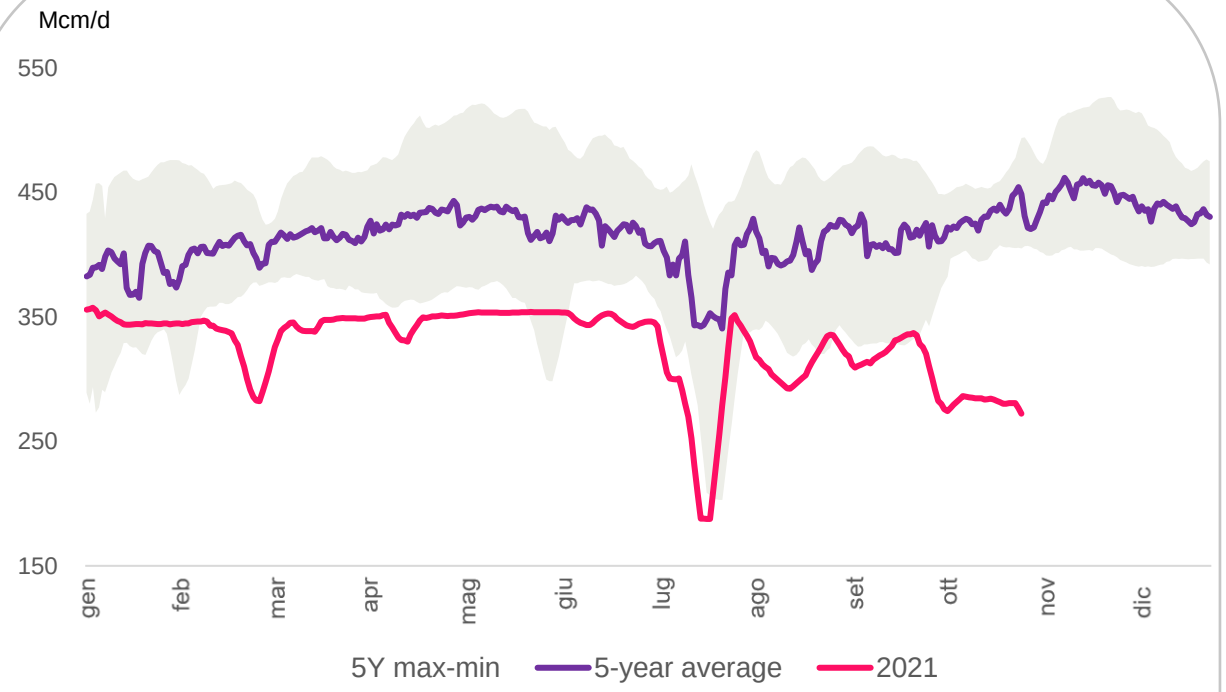


- Correlazione EU – Asia
- Livello attuale degli stoccaggi NWE su valori minimi
- Prezzi gas elevati scontano rischi su supply invernale

Riduzione offerta in EU

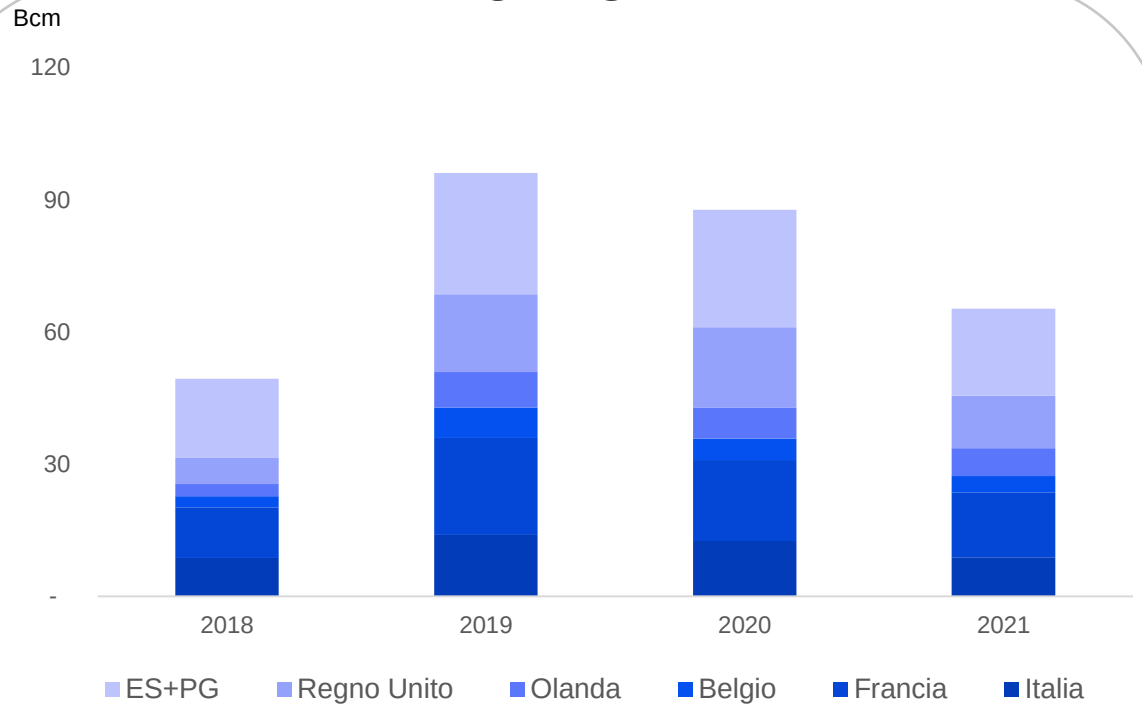
Focus su Import Russo e LNG

Import EU da Russia



- Terminati e non rinnovati contratti russi LT (trasporto e fornitura)
- Ritardi per le messa in esercizio di NS2

EU LNG

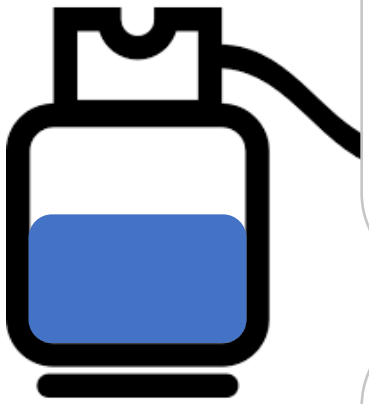


- Decremento su tutti i principali hub europei
- Asia a premio rende le rotte europee meno convenienti

Stoccaggio in NWE

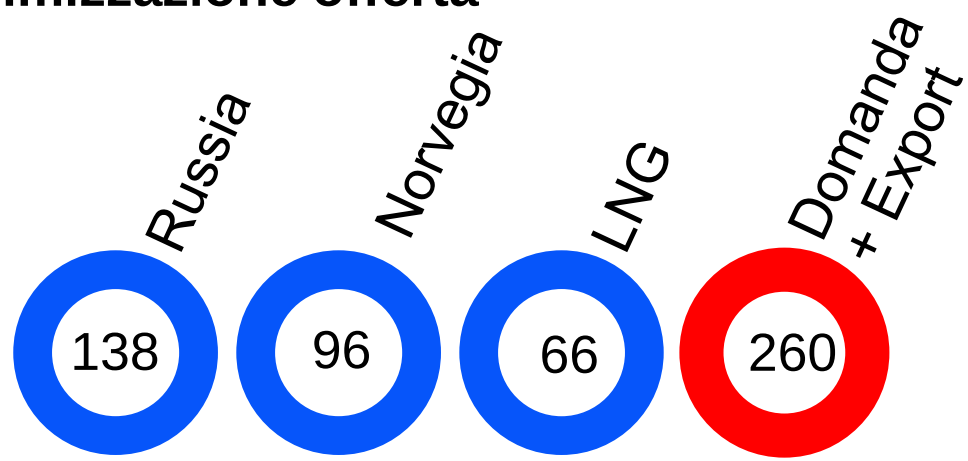
Due scenari per il prossimo inverno

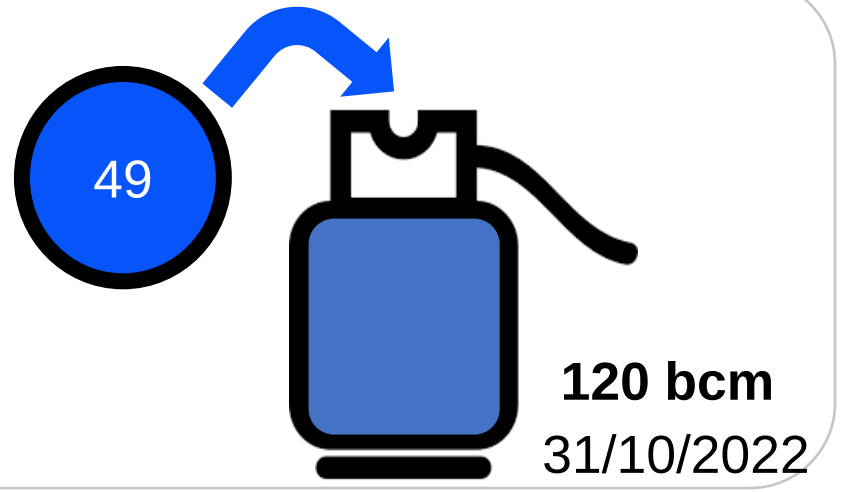
MAX
54 bcm



40 bcm
01/11/2021

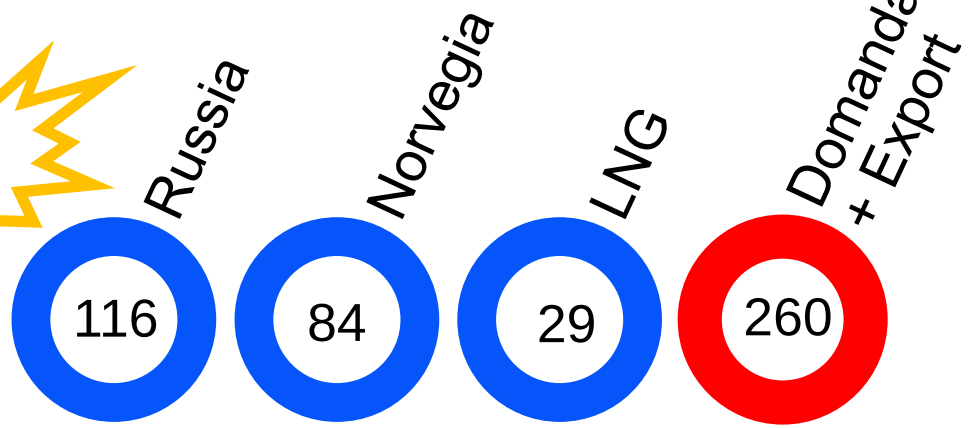
1- Massimizzazione offerta

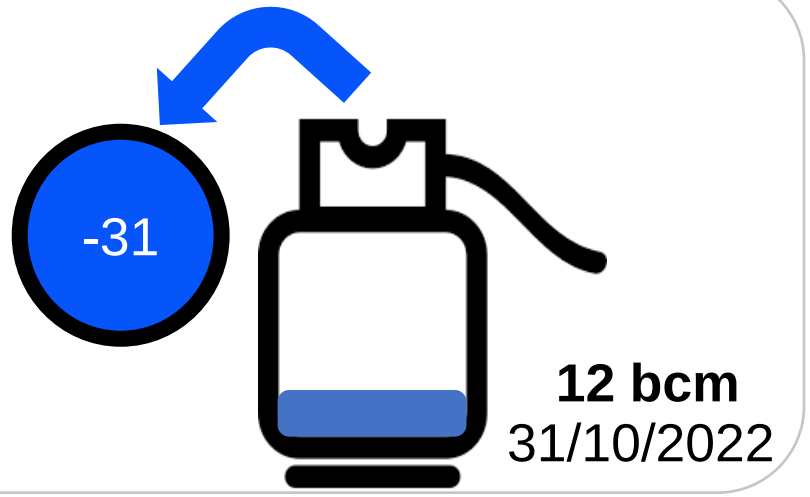




120 bcm
31/10/2022

2- As is

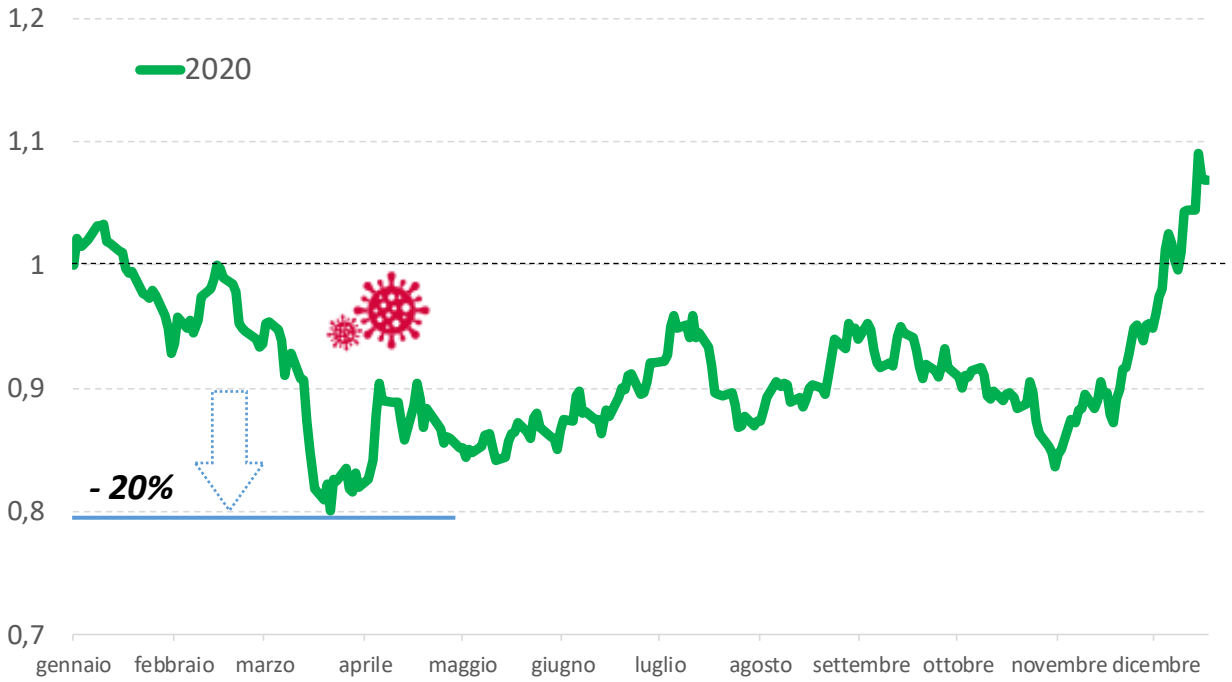




12 bcm
31/10/2022

Mercato Power Italia

I rischi del mercato: volatilità Forward



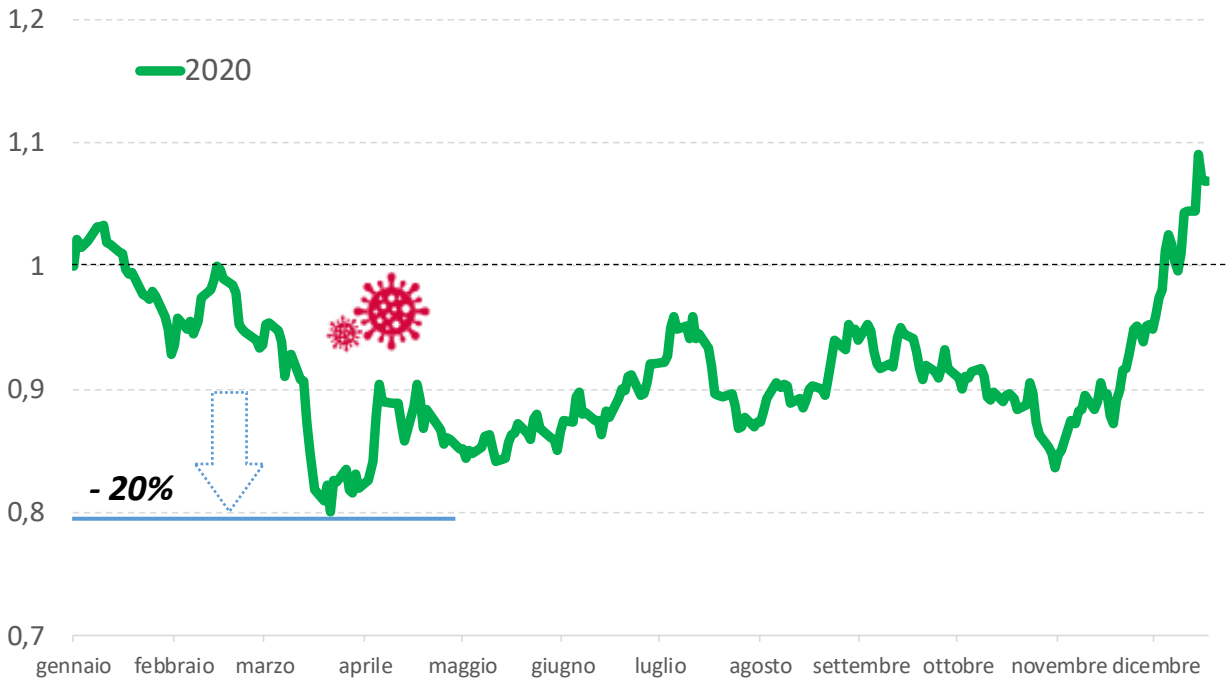
VS

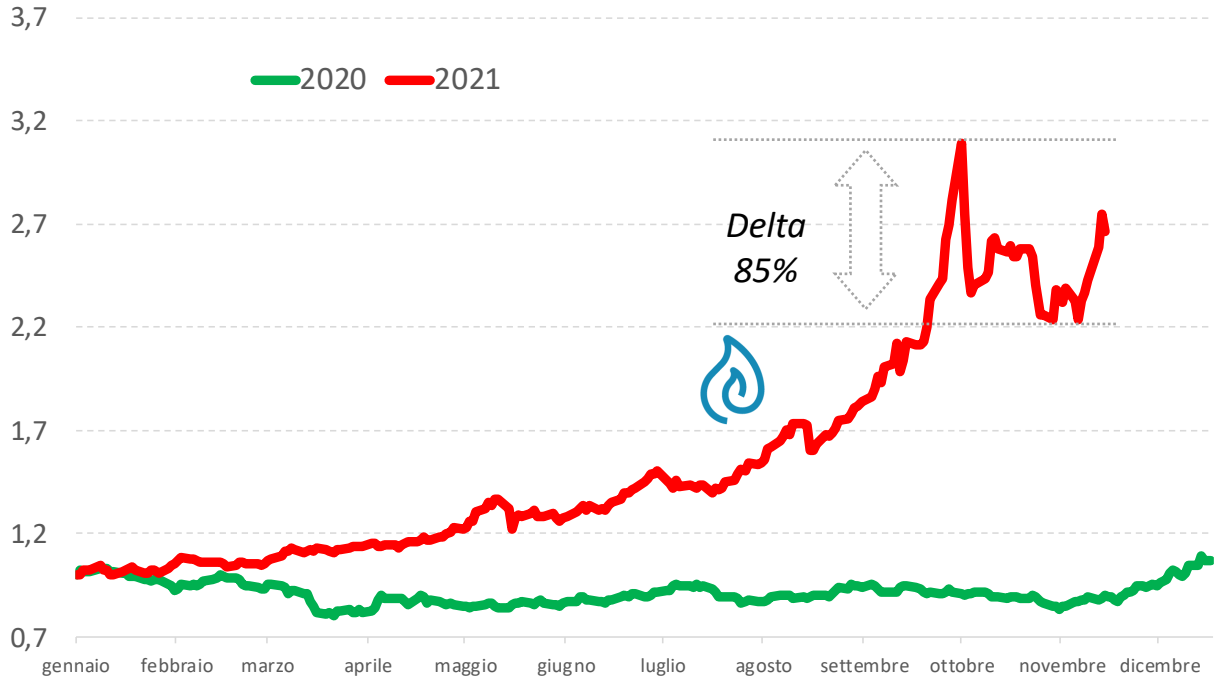
Correlazione Power/Gas

~ 85%

Mercato Power Italia

I rischi del mercato: volatilità Forward





VS

Correlazione Power/Gas

~ 85%

Correlazione Power/Gas

~ 96%

Mercato Power Italia

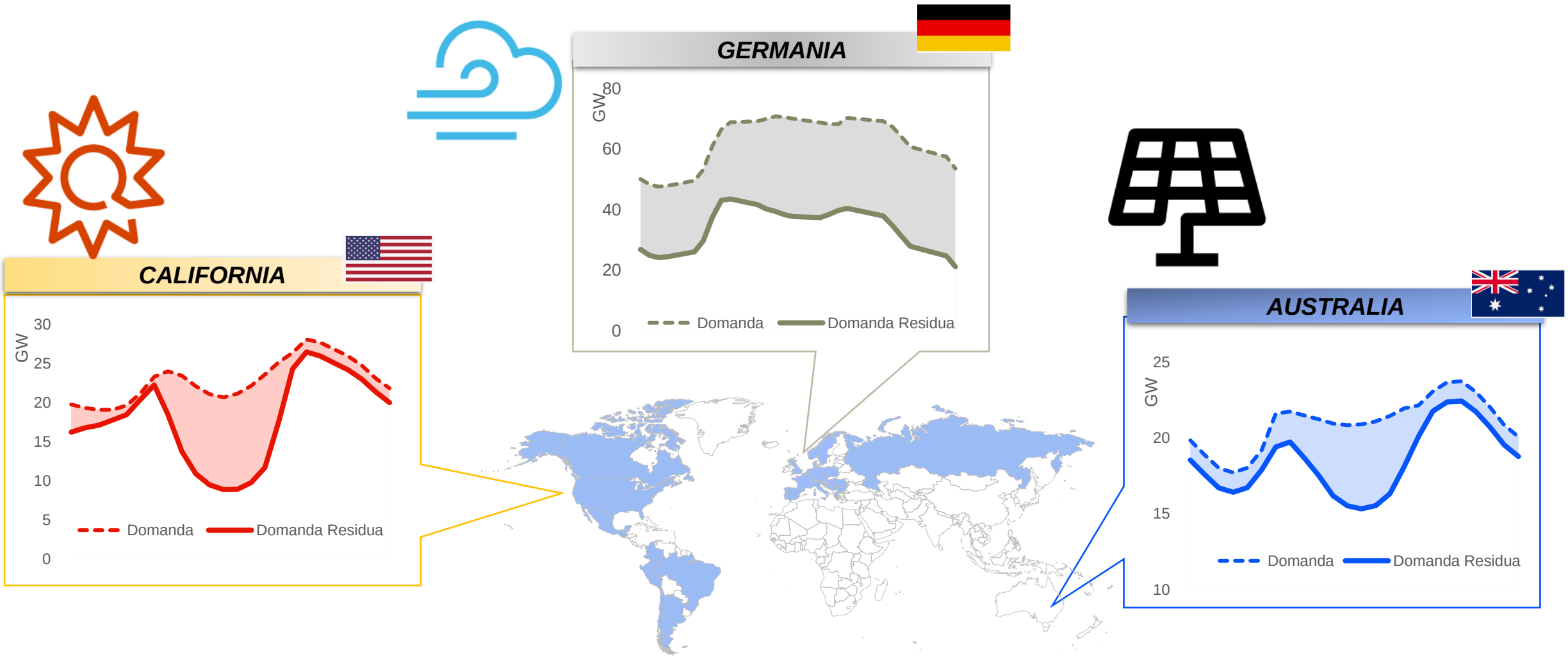
Scenari Futuri

- **Riduzione 55 % di emissioni CO2 entro il 2030**
- **Produzione da FER @ 40%**
- **Introduzione ETS per trasporti ed edifici**

- **Riduzione 45 % di emissioni CO2 entro il 2030. Zero emissioni nel 2050**
- **Presentazione progetti decarbonizzazione entro 2022**
- **Inizio processo di dismissione impianti a carbone**

Mercato Power Italia

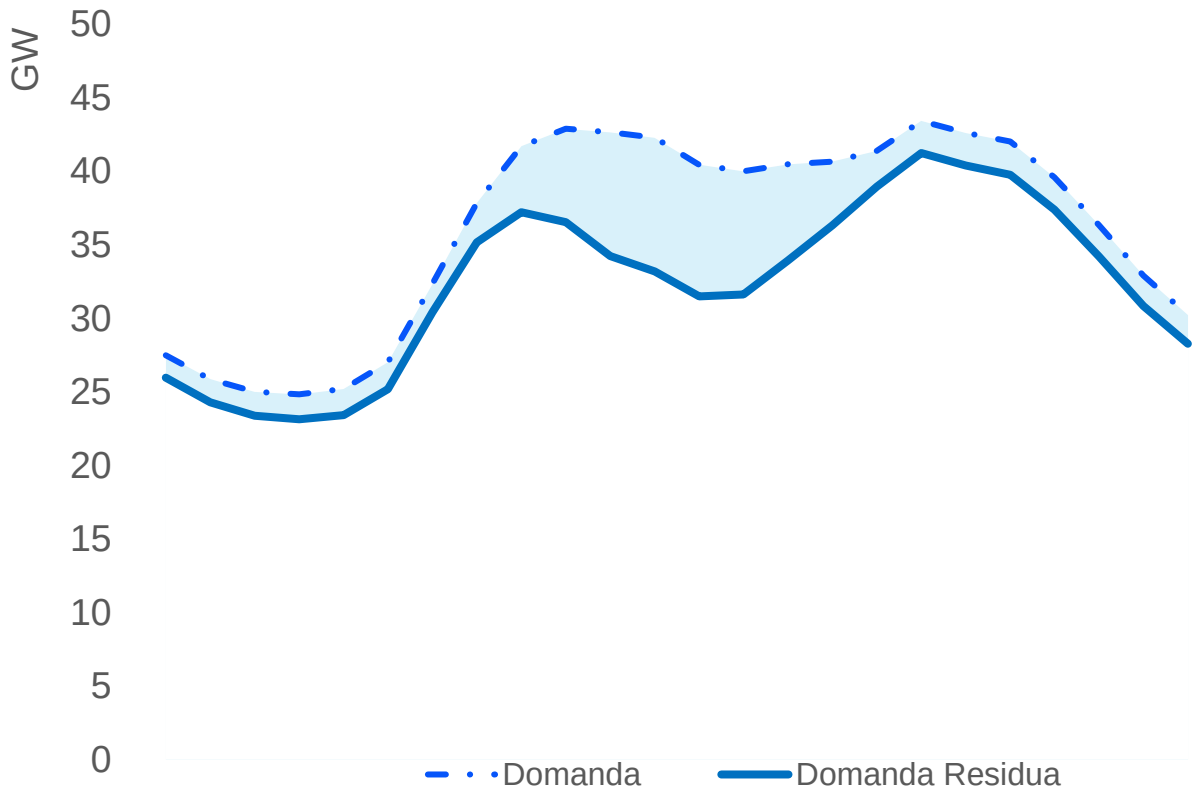
Il nuovo assetto della domanda fisica – Worldwide



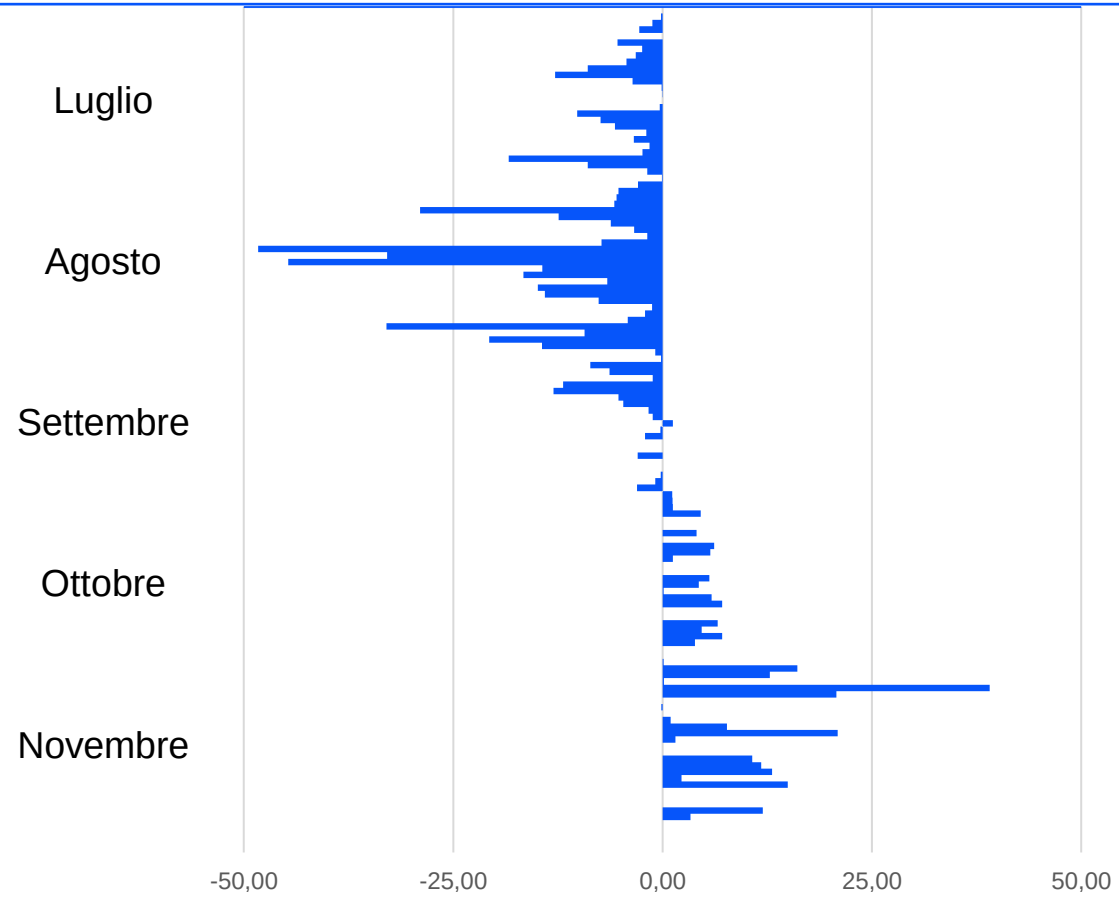
Mercato Power Italia

Il nuovo assetto della domanda fisica - Italia

Domanda Netta Italia



Differenziale Prezzo Giornaliero NORD - SUD



Mercati Power & Gas

Next Key drivers

Enel Webinar | 2 Dicembre 2021

Tecnologie esponenziali e Big Unstructured Data per il mondo delle rinnovabili

TechBricks
Disruptive Technology Builders

Manuele Monti, *Ph.D.*
CEO TechBricks

TechBricks
Disruptive Technology Builders

TECH LAB

Sviluppo e prototipazione rapida tecnologie esponenziali proprietarie

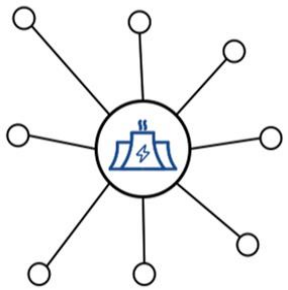
CORPORATE INNOVATION

Innovation hub e punto di accesso per know-how e gestione dell'innovazione

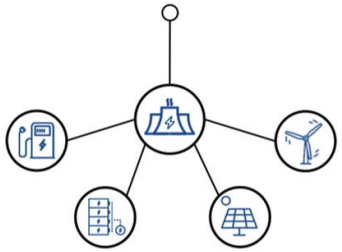
STARTUP STUDIO

Catena di montaggio per startup e soluzione in Energia, Sostenibilità, Smart cities

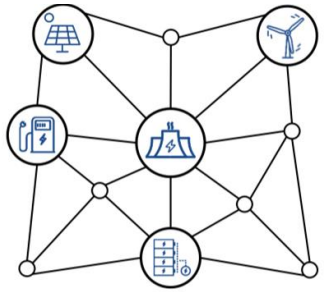
NUOVI SISTEMI ENERGETICI



PASSATO
Reti tradizionali
Centralizzate



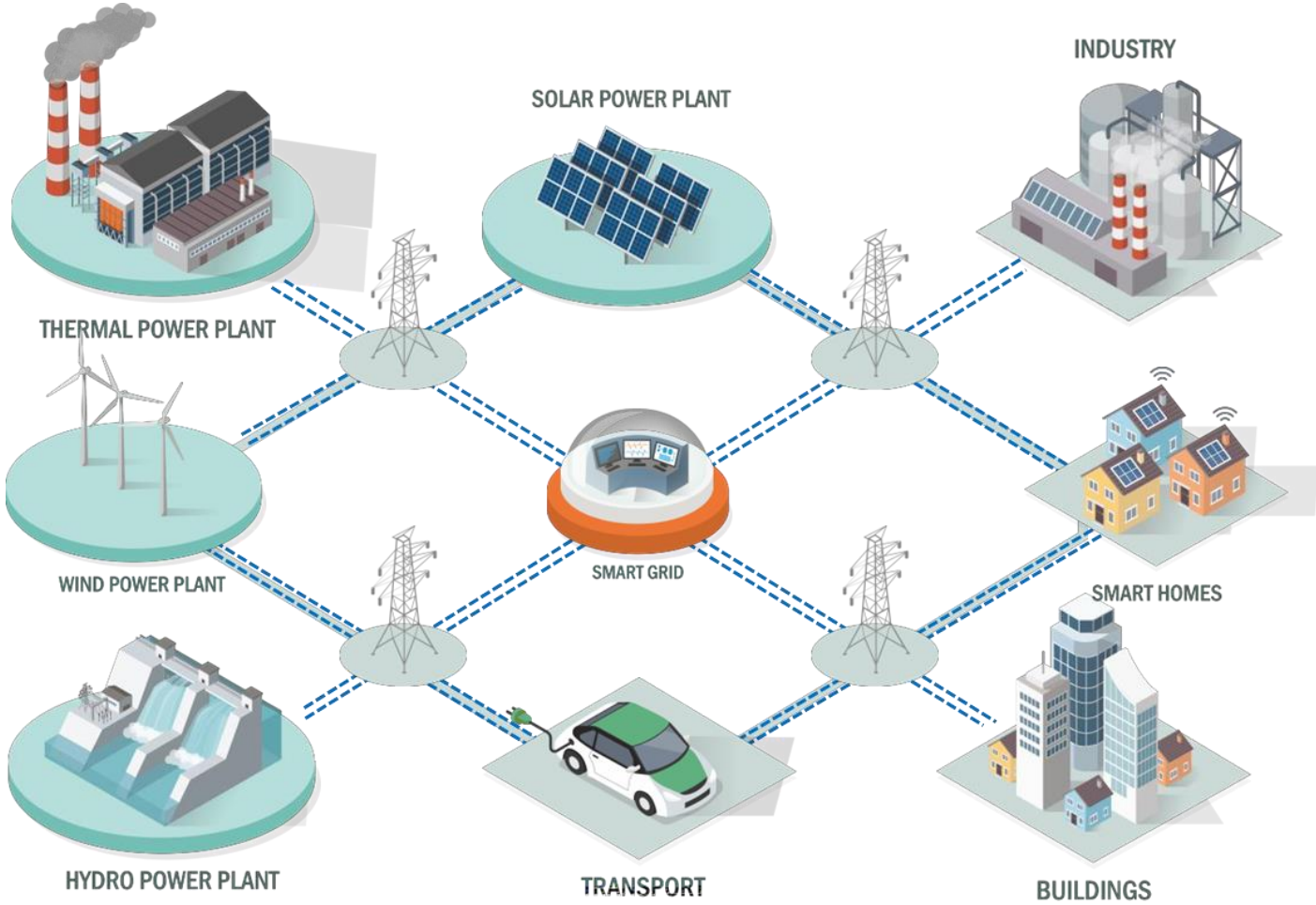
IERI
Reti (poco) smart



OGGI
Reti smart e
interconnesse

DOMANI

Reti smart decentralizzate e auto bilancianti



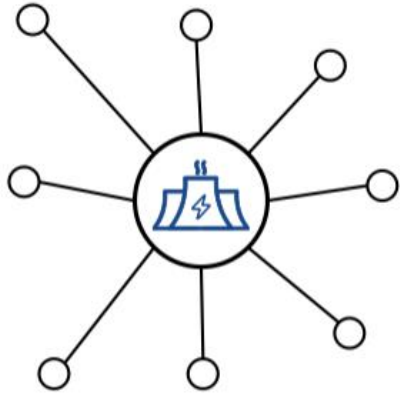
ENERGY SYSTEMS VISION

VS

ENERGY TRADING EVOLUTION

IERI

Traditional grids

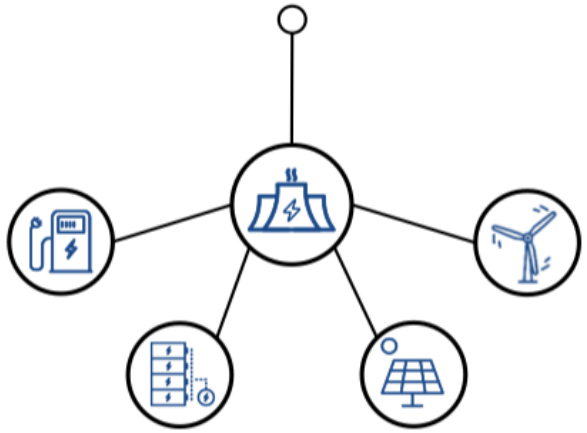


Mercati liberalizzati

- Static Hedging
- Asset Backed Trading
- Long Term Energy & Risk Mgmt
- Cross-commodity Optimization (CSS, Cracks)

OGGI

Smart Grids

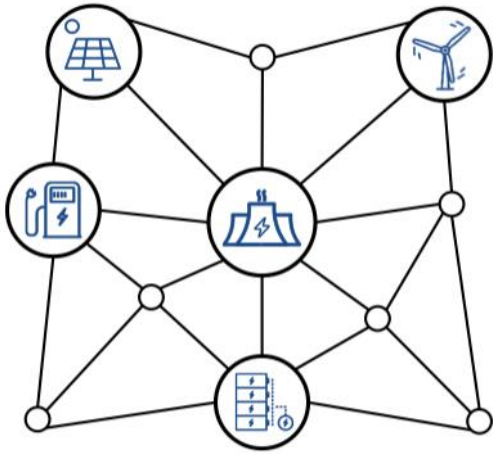


Mercati smart e interconnessi

- Dynamic Hedging
- Virtual Asset Backed Trading (VPP, Virtual Refineries/Storages)
- Short time Energy Trading & Risk Mgmt
- Flexibility management (smart demand/ dispatch)

DOMANI

Decentralized
Self Balanced Smart grids



Mercati tempo reale e decentralizzati

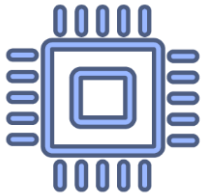
- Hyper liquidity
- Real time Energy Trading & Risk Mgmt (X-bid)
- Smart Assets interconnection
- Microtransactions
- Micro flexibility mgmt (domestic storage, EVs, Prosumers)

Opportunità: flessibilità dalle smart grids

>280 GW entro 2040

>300 B€ risparmio in investimenti di rete

KEY ENABLING TECHNOLOGIES



Cloud and Computing

- NextGen ETRM / CTRM
- Cloud computing
- HPC cluster
- Quantum computing

Big Data and IoT

- Electric network live data
- Gas logistic data
- Prosumers data
- Predictive Maintenance

Alternative Big Unstructured Data

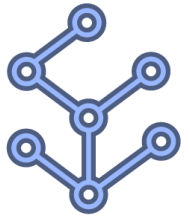
- Sensors and Radars
- Lidars
- Satellite Images (SatEO)
- Drone Images
- News and social feed

Artificial Intelligence

- Machine Learning
- Natural Language Processing
- Image recognition
- Speech Recognition

Others

- AR / VR
- Quantum Computing



Blockchain & DLTs

- Peer to peer trading
- Smart contracts
- Trade finance (automation)
- Post trade processing
- Notarization
- Asset digitization

Solutions
Data Value Chain

ALPHAEDGE

DATA PROVIDERS

GME Gestore Mercati Energetici · Bloomberg · Terna · REFINITIV

STRUCTURED DATA

Historical and live Timeseries:
- TSO data
- Market data
- Loads
- Meteo Data

METEO

IOT

UNSTRUCTURED DATA

IoT, Satellites, LIDAR, Microwave sensors:
- SatEO
- Earth orography
- Radiation
- Illuminance
- Clouds
- Precipitation

SENSORS

SATELLITES

COMPUTING VISION*

BIG UNSTRUCTURED DATABASE

Data cleaning, structuring & visualization

AI PROPRIATARY *

RISK VALUATION*

FORECASTING*

PORTFOLIO OPTIMIZATION*

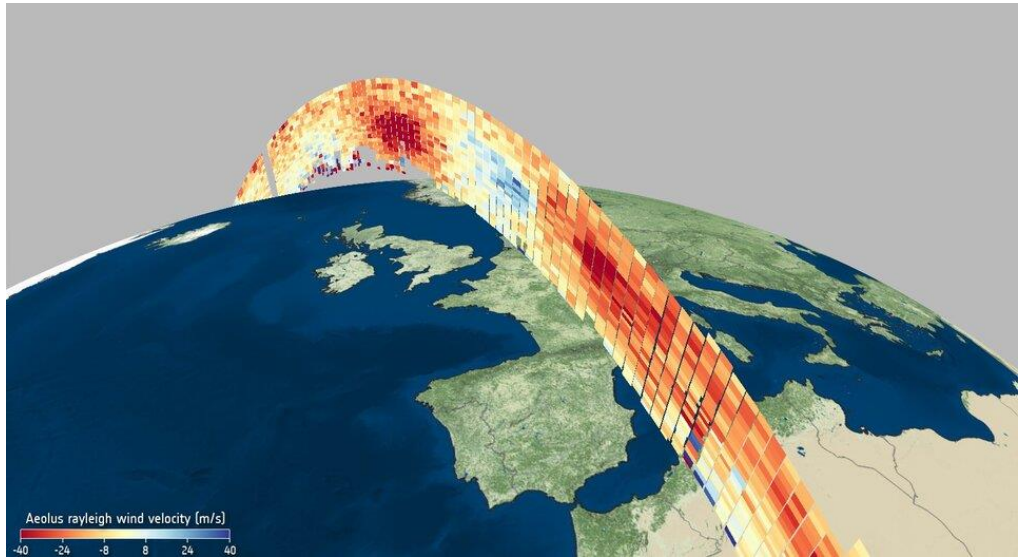
Renewable Energy assets wizard

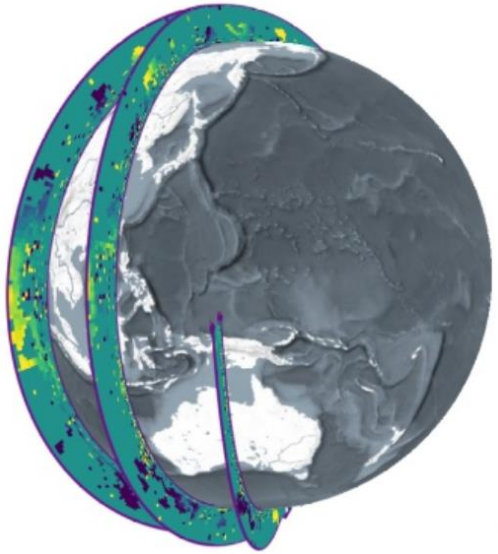
Alpha Edge SaaS

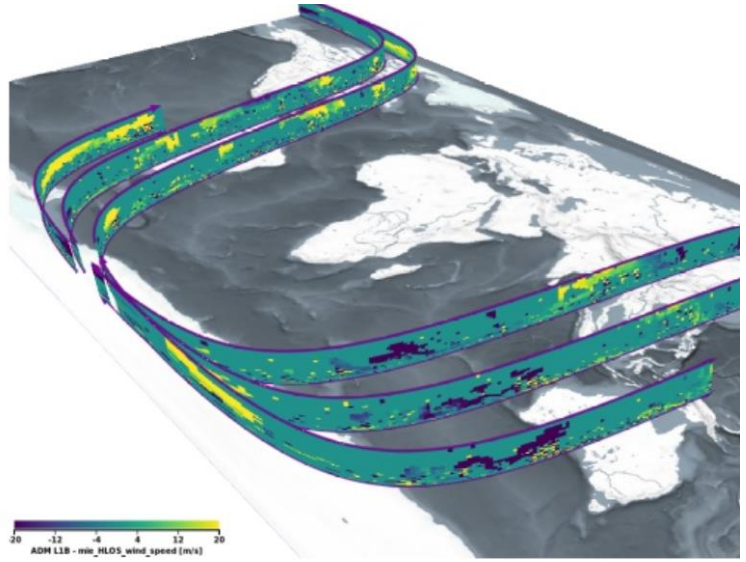
APPLICATIONS
Energy Management
Risk Management
Asset Management
Flexibility Management

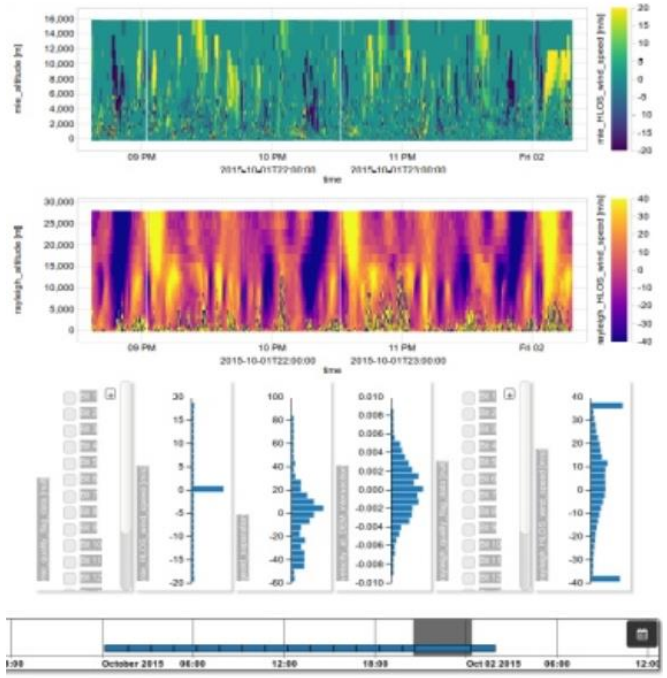
*Proprietary models in published in over **13** international journals with a total impact factor of **79.786** points

Applicazione
Asset EOLICI





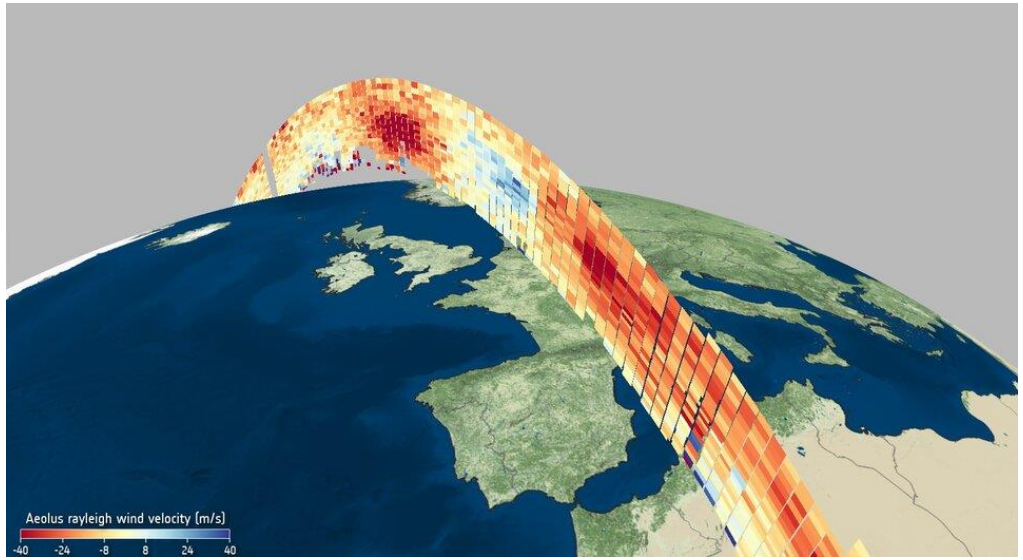


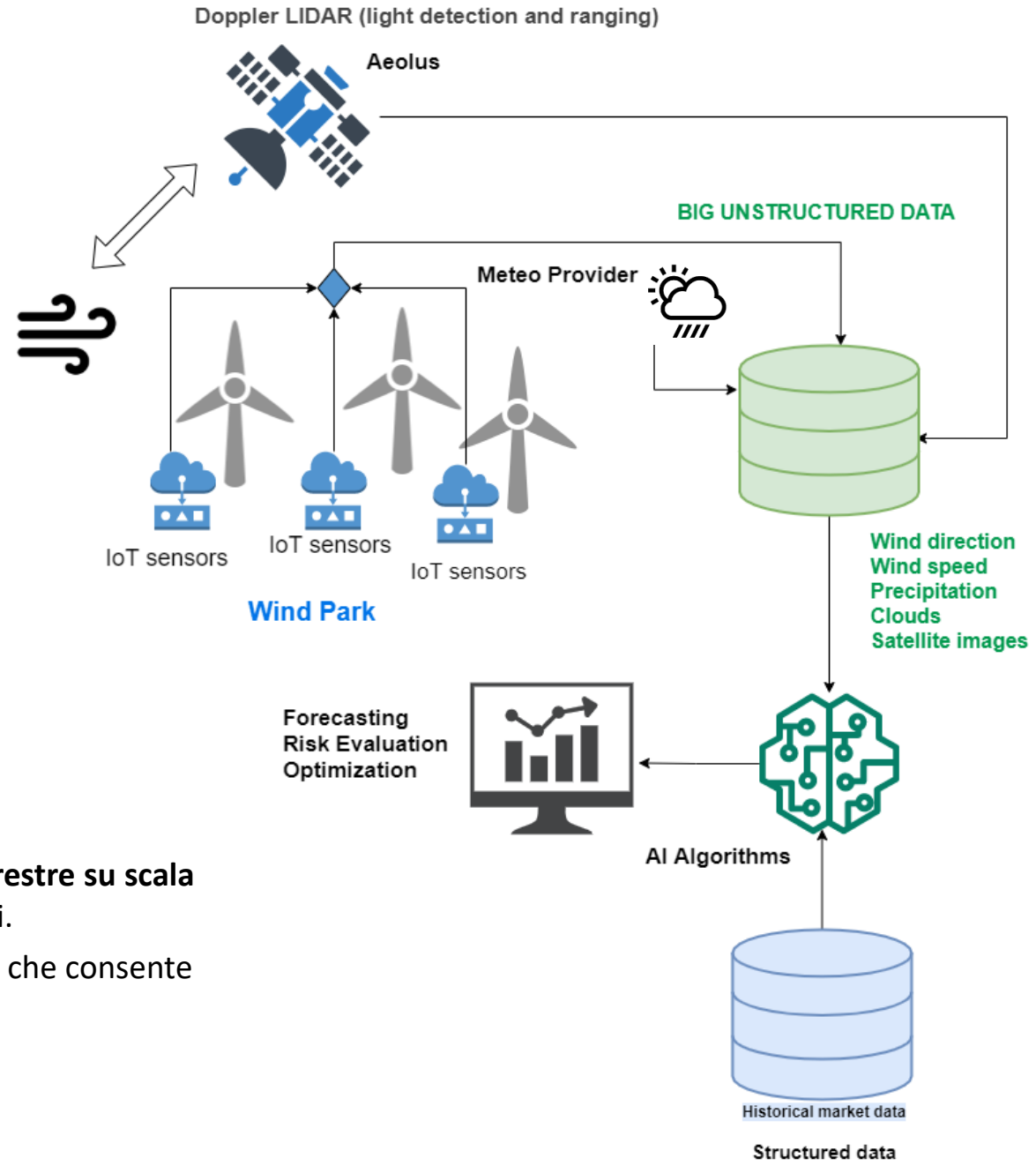


Aeolus (lancio missione Aug-2018)

- ✓ Aeolus è la prima missione satellitare ad acquisire **profili del vento terrestre su scala globale** per migliorare le previsioni meteorologiche e i modelli climatici.
- ✓ Il satellite Aeolus utilizza tecnologia **Active Doppler Wind Lidars** (DWL) che consente rilevazioni dei profili del vento in presenza di nuvole e aeroso
- ✓ 3h di ritardo (Near real time forecasting)
- ✓ Rilevazioni dalla superficie fino a 30km di altezza

Applicazione
Asset EOLICI





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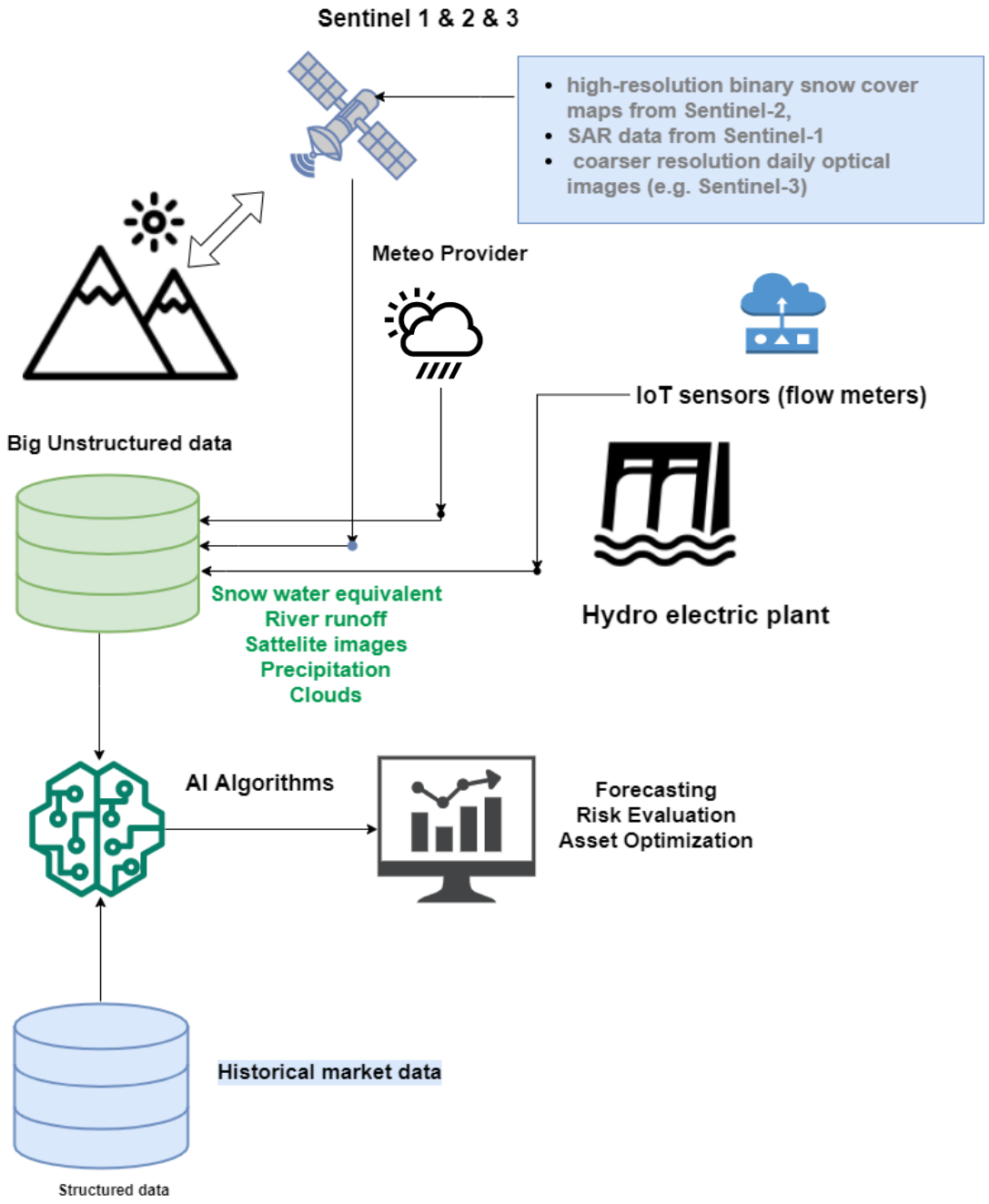
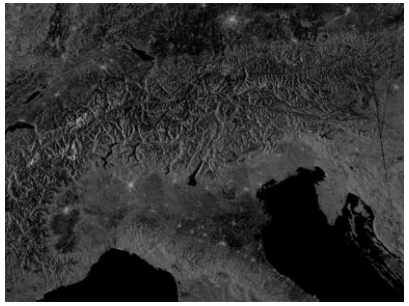
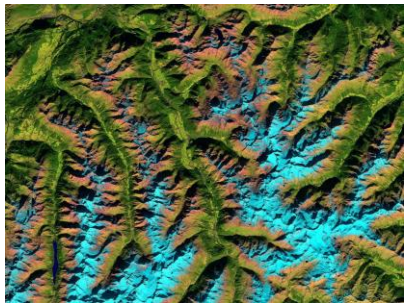


Applicazione
Asset IDROELETTRICI



Sentinel-1
Una costellazione di due satelliti identici per immagini radar nella stessa orbita, che fornisce **immagini della superficie terrestre per tutte le stagioni, giorno e notte** e in condizioni di **copertura nuvolosa** attraverso la strumentazione **SAR** (Radar a apertura sintetica).

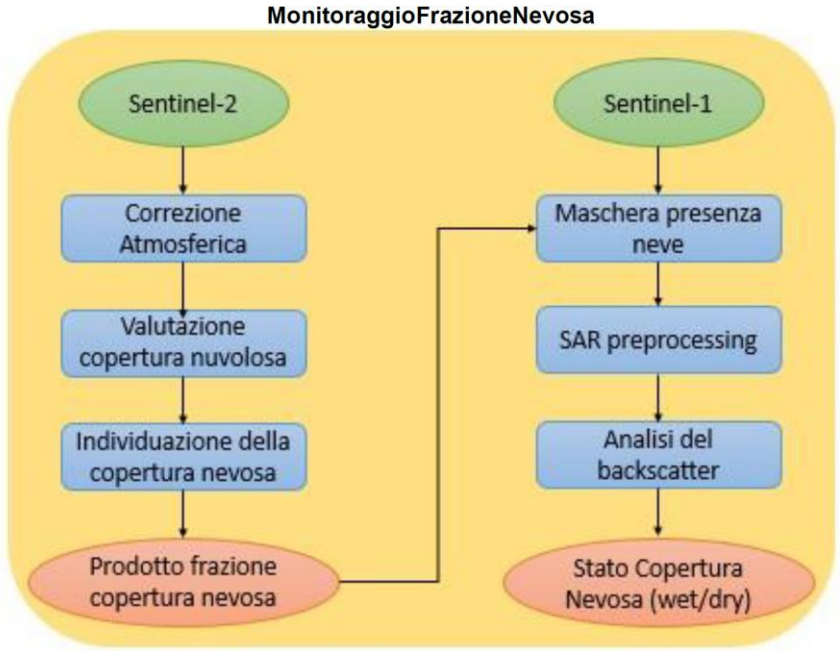


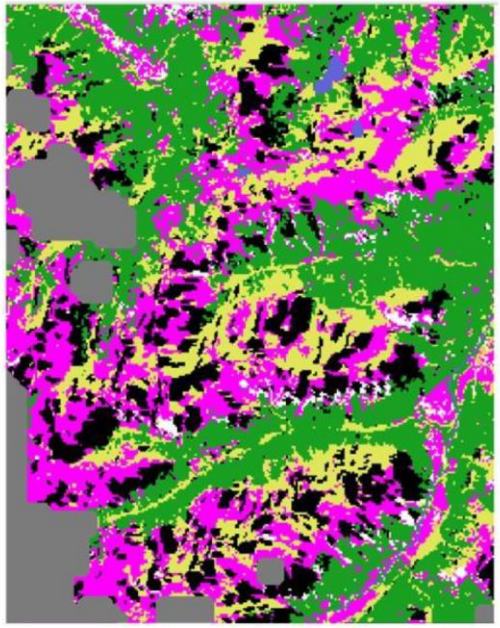
Sentinel-2
Una costellazione di due satelliti identici nella stessa orbita, Copernicus Sentinel-2 visualizza **aree terrestri e costiere ad alta risoluzione spaziale** nel dominio ottico attraverso la Multi Spectral Instruments (**MSI**).

Sentinel-3
Una missione oceanica e terrestre composta da satelliti versatili che offrono un ampio range di strumentazione e la continuità dei dati per i satelliti ERS, ENVISAT e SPOT:

- Ocean and Land Colour Instrument (OLCI)
- Sea and Land Surface Temperature Radiometer (SLSTR)
- SAR Radar Altimeter (SRAL)
- MicroWave Radiometer (MWR)
- Precise Orbit Determination (POD) instruments.

Applicazione
Asset IDROELETTRICI

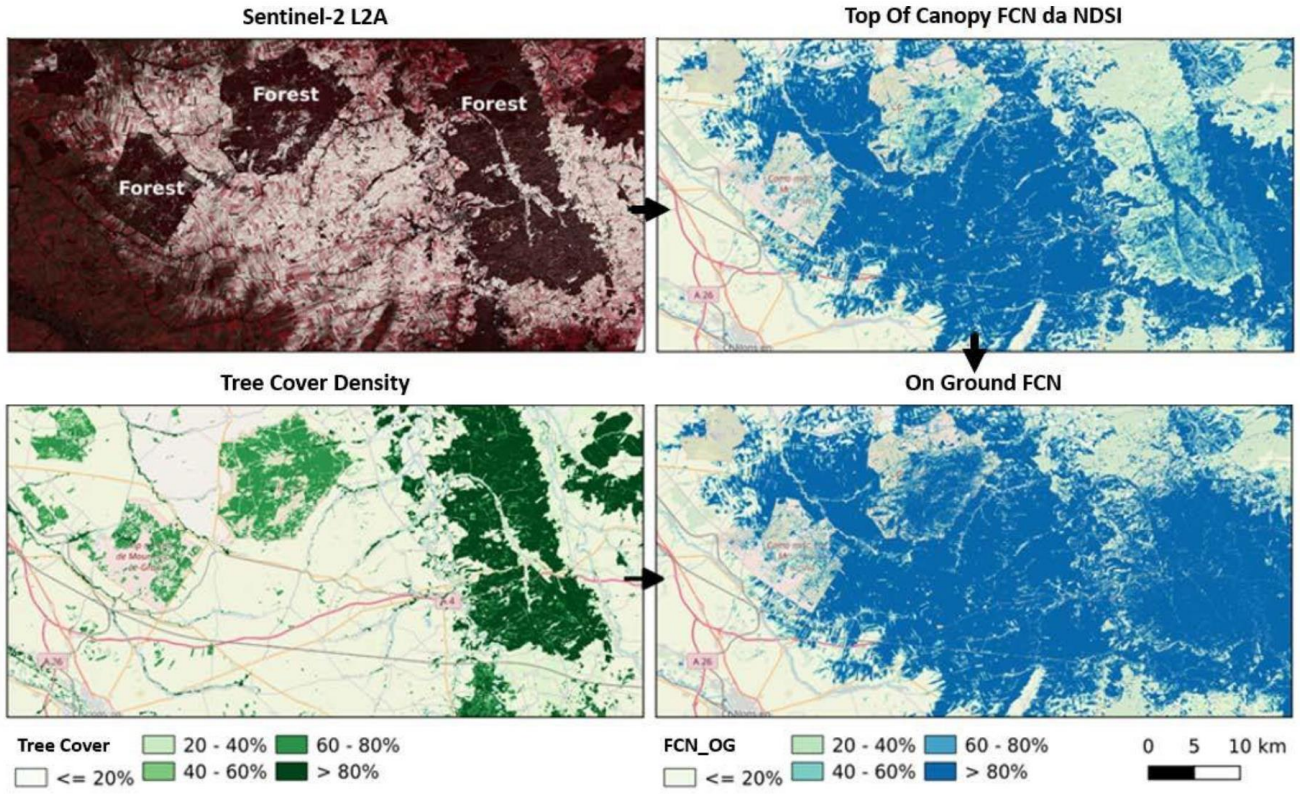




Refs:
[Sentinel Hub EO Browser]
[Data types]
[Courtesy DataMeteo]

Snow Water Equivalent (SWE) Forecast - Sentinel 1&2

- Risoluzione 20m e copertura 250Km
- S1 – osservazione condizioni neve asciutta o bagnata (SWE)
- Info Manto nevoso (frazione su area forestale e a terra)
- Info Stato della neve (asciutta/bagnata e densità - res. 60m)



European Union

esa

About Copernicus Sentinel-1...

WHAT?

The first in the Copernicus Sentinel series, **a constellation of two identical radar imagery satellites in the same orbit**, providing an all-weather, day-and-night supply of images of Earth's surface

WHEN?

Sentinel-1A was launched on 3 April 2014 and Sentinel-1B on 25 April 2016.
Both were taken into orbit on a Soyuz rocket, from Europe's Spaceport in French Guiana

WHERE?

Designed and built by a consortium of around 60 companies led by **Thales Alenia Space** and **Airbus Defence and Space**

APPLICATIONS

Main applications include:
• Monitoring sea ice and icebergs • monitoring of land ice (glaciers, ice sheets, ice caps) • river and lake ice monitoring • oil spills and ships • marine winds & waves • land-use change, agriculture, deforestation • land deformation • and support to emergency management such as floods and earthquakes

DATA AND USERS

As of end 2020, about **6 million** products have been generated and made available for download, culminating a total of 10 Petabytes. More than **30 million** Sentinel-1 product downloads have been made by users, representing nearly **40 Petabytes**. Data are exploited by various users: Copernicus Services, public institutions, scientists, commercial companies

BENEFITS

Services relate to:
• Monitoring of Arctic sea-ice extent • routine sea-ice mapping • maritime surveillance (oil spill monitoring, ship detection, illegal fisheries) • monitoring land-surface for motion risks including subsidence, landslides • understanding of Earth processes (earthquakes, volcanoes) • monitoring of infrastructure • mapping for forest, water and soil management • and mapping to support humanitarian aid and crisis situations

WHAT'S NEXT?

Continuity over the coming years will be ensured by the launch of additional satellites (Sentinel-1C and Sentinel-1D). Furthermore, **a new generation of Sentinel-1 satellites is being prepared,** to take up the relay from the first generation

DATA ACCESS

https://scihub.copernicus.eu/

opernicus
Europe's eyes on Earth

European Union

esa

About Copernicus Sentinel-2...

WHAT?

A constellation of **two identical satellites in the same orbit**, Copernicus Sentinel-2 images land and coastal areas at high spatial resolution in the optical domain

WHERE?

Designed and built by a group of around **60 companies** led by **Airbus Defence** and Space for the space segment and **Thales Alenia Space** for the ground segment

WHICH?

Main applications include agriculture; land ecosystems monitoring; forests management; inland and coastal water quality monitoring; disasters mapping and civil security

WHO?

Services include **CLMS** (Copernicus Land Monitoring Service); **CMEMS** (Copernicus Marine Environment Monitoring Service); **CEMS** (Copernicus Emergency Management Service) and Copernicus Security Service; among others

WHEN?

Sentinel-2A was launched on 23 June 2015; Sentinel-2B on 7 March 2017, both on a Vega rocket from Kourou, French Guiana

DATA AND USERS

As of July 2020, about **20 million products** have been generated and made available for download, culminating a total of 10 Petabytes

DATA ACCESS

https://scihub.copernicus.eu

WHATS NEXT?

Continuity over the coming years will be ensured by the **launch of additional satellites** (Sentinel-2C and Sentinel-2D). Furthermore, a new generation of Sentinel-2 satellites is being prepared, to take up the relay from the first generation

opernicus
Europe's eyes on Earth

Aeolus in Brief

What?

Aeolus is ESA's youngest Earth Explorer and the first satellite mission to acquire profiles of Earth's winds on a global scale and vertical distribution of aerosol and clouds

Why?

Aeolus's near-real time observations improve the accuracy of numerical weather prediction and advance our understanding of atmosphere dynamics and processes, relevant to climate variability

A helping hand

During the COVID-19 pandemic, Aeolus measurements proved crucial to fill the gap in weather observations created by the grounding of commercial airplane fleets

Tropical success

Aeolus data have made a big difference to weather prediction over parts of the world where there is a lack of other wind observations, such as tropical regions

Assimilation

Four of Europe's biggest meteorological services have already assimilated Aeolus data into their forecasts: the European Centre for Medium-Range Weather Forecasts, Germany's Deutscher Wetterdienst, Météo-France and the UK's Meteorological Office

When?

It was launched on a Vega rocket on 22 August 2018, from Europe's Spaceport in Kourou, French Guiana. It orbits at an altitude of 320 km

Where?

It was built by Airbus in Stevenage, UK, with the ALADIN instrument developed by Airbus engineers in Toulouse, France and its laser transmitters by Leonardo SpA in Florence and Pomezia, Italy

Innovation

The satellite carries the unique Atmospheric LAser Doppler INstrument (ALADIN), the first Doppler wind lidar in space

Public release

Aeolus data went public in May 2020, and are now being distributed in near real-time through ESA's Aeolus Online Dissemination Centre as well as EUMETCast, and WMO's Global Telecommunication System (GTS)

Beyond weather prediction

Aeolus data have proven their wider application in air quality and climate related studies, when they helped scientists track smoke from wildfires in the atmosphere and investigate the Quasi-Biennial Oscillation over the Tropical belt

For more information visit:

https://earth.esa.int/eogateway/missions/aeolus

Data Access

https://earth.esa.int/eogateway/missions/aeolus/data

TECHBRICKS CORPORATE INNOVATION MODEL

MANUTENZIONE & SUPPORTO

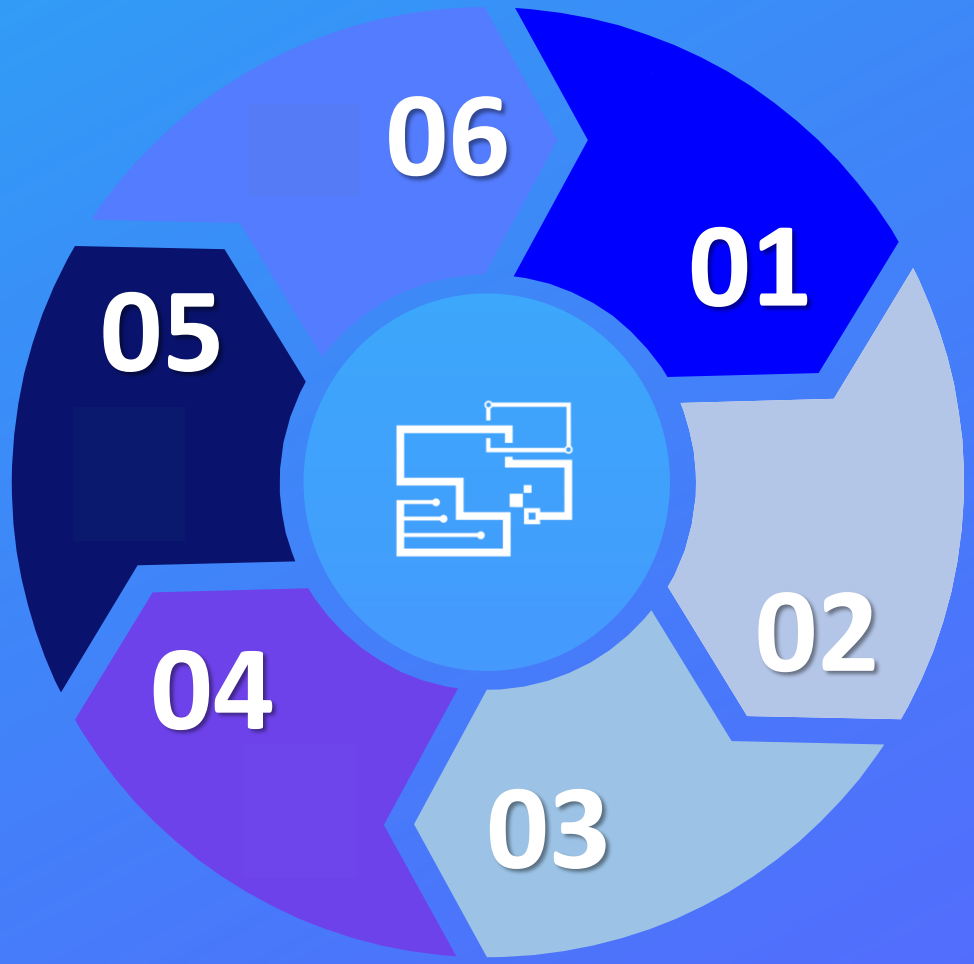
- Post produzione
- Supporto & manutenzione
- Scale up
- SaaS / White labeling

PRODUZIONE/ GO TO MARKET

- Integrazione tecnologica
- Strutturazione team
- Avviamento Produzione o Go-to-market
- Change Management

MVP, PoC e validazione

Sviluppiamo prototipi e MVP tecnologici per validazione Tecnico-economica Proof of Concept / Proof of Value (PoC/PoV)



DESIGN THINKING

Identifichiamo Servizi e prodotti disegnando soluzioni innovative

INNOVATION STRATEGY

Consideriamo le possibili strade di innovazione:

- Open Innovation
- Call 4 ideas, Hackathons/Challenges
- Sprint (venture building) programs

TECH ANALYSIS

- Scouting attivo di soluzioni tecnologiche
- *Off the shelf* tech analysis
- Analisi ‘Make or Buy’
- Tech Decision matrix & Due Diligence

Contatti

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Aeolus Data

- **Level 1B:** Preliminary HLOS (Horizontal Line of Sight) wind observations for Rayleigh and Mie receivers. Standard atmospheric correction (Rayleigh channel), receiver response and bias correction applied.
- **Level 2A**: Scientific aerosol/cloud profile product for users. Geo-located consolidated backscatter and extinction profiles, backscatter-to-extinction ratio per observation, scene classification. Furthermore, attenuated backscatter on measurement level. Product generated by PDGS.
- AUX MRC, AUX RRC products (Mie/Rayleigh response calibration).
- AUX ISR products (Instrument Spectral Registration).
- AUX ZWC (Zero-Wind Calibration).
- AUX_MET products (meteorological information).
- **Level 2B: Scientific wind product for users.** Geo-located consolidated HLOS wind observation with actual atmospheric correction applied to Rayleigh channel.
- **Level 2C:** Aeolus assisted wind fields resulting from NWP (Numerical Weather Prediction) assimilation processing. Data co-located time and space with Aeolus wind observations. Product generated by ECMWF.

- Ref: https://aeolus.services/

Big Data and IoT

Piattaforme IoT permettono di processare i dati generate da milioni di di sorgenti IoT distribuite in tempo reale per ottimizzare produzione e consumi, e condurre attività di Energy Management e asset Management

Courtesy of Siemens