enel x

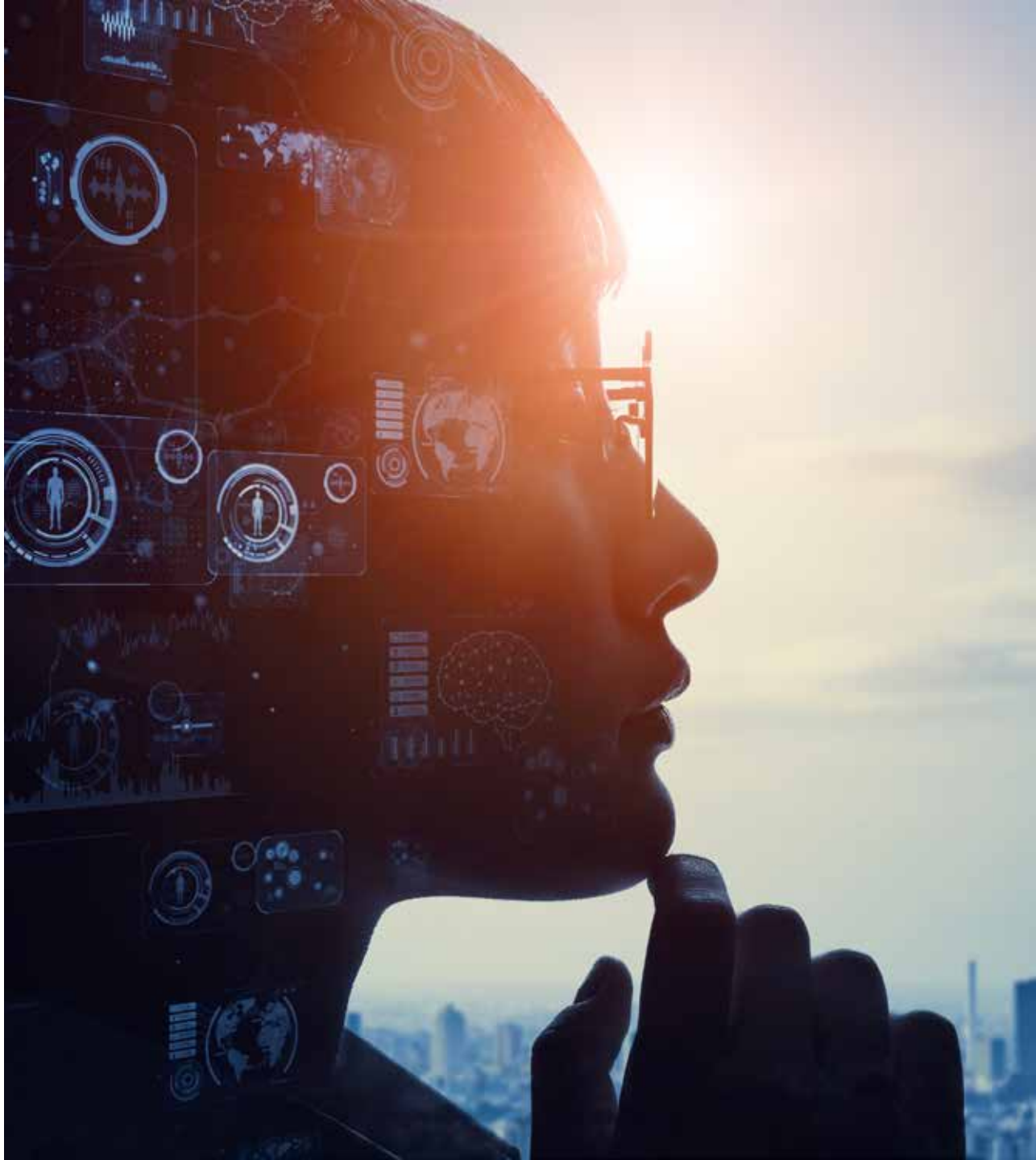
Demand Response and Flexibility Solutions

Flexibility

In an ever-changing and complex energy market, companies must constantly face new challenges:

- Regulatory changes
- Market trend alterations
- Technical engineering challenges
- Disruptive new technology
- Volatility in the energy price
- Multiple supply contracts in the market
- Compliance with environmental policies
- Unforeseeable climatic events

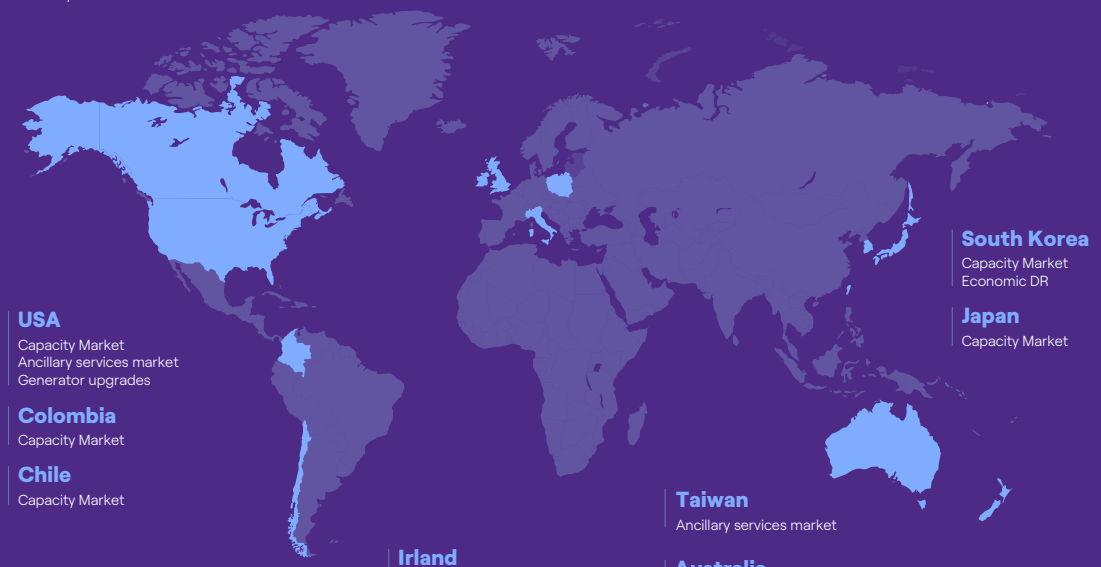
Enel X simplifies this complex ecosystem and makes the energy assets of businesses across industrial and commercial sectors remunerative, making use of its experience and expertise.



Where we are and what we offer around the globe

Discover how to make your energy assets remunerative, contributing to the decarbonization of the planet.

Geographical area where the Flexibility solutions are available



Canada
Capacity Market
Ancillary services market

UK
Capacity Market
Ancillary services market
GEO

Poland
Capacity Market

South Korea
Capacity Market
Economic DR

Japan
Capacity Market

USA
Capacity Market
Ancillary services market
Generator upgrades

Colombia
Capacity Market

Chile
Capacity Market

Taiwan
Ancillary services market

Irland
Capacity Market
Ancillary services market

Australia
Capacity Market
Ancillary services market
Flexible solutions
Generator upgrades

New Zealand
Economic DR
Ancillary services market

Italy
GEO
Ancillary services market
Interruptibility

Demand Response

What is Demand Response?

The Demand Response (DR) programs are management measures used by power companies (utilities and grid operators) to guide electricity users to adjust their electricity consumption habits. It is done by reducing peak demand or shifting it to off-peak periods by providing incentives such as price or tariff reductions. This is a common practice in the electricity industry worldwide to suppress peak demand, similar to buying insurance for power supply and unrelated to power rationing. We refer to these energy or energy use that can be adjusted with flexibility "power flexibility" or "flexible energy use".

Demand Response are used by power companies to improve grid stability, increase the efficiency of the electric infrastructure, while permitting the integration of renewable energies in the grid. These programs pay commercial and industrial customers to modulate their energy consumption when the electric grid is under stress.

Enel X, via its **virtual platform,** manages the world's largest network of flexible energy load enabling companies to actively participate in the energy market. Many companies have begun tackling energy costs by participating in DR programs, mainly because they make it possible to generate a new revenue stream **without the need to make any type of investment.**

In exchange for modulating their energy consumption on request, the companies that participate in these programs receive **remuneration related to their agreement to modulate** in addition to being able to receive additional remuneration based on the quantity of flexible energy made available to the grid.

For example companies can be compensated based on the **actual amount of energy reduced** during dispatches. Payment amounts vary depending on the program rates offered by the utility or grid operator sponsor. Enel X works with the customer to ensure that they receive the maximum financial benefits for their participation. The DR programs offer however a range of advantages that is much wider than only the economic aspect. In fact, another advantage very appreciated by commercial and industrial companies is that they receive advanced notification in the case of imminent brown-outs or black-outs. Whether it is an **advanced notification** of 10 or 30 minutes (the amount of time depends on the program), companies are able to use this time to prepare the measures necessary to **better protect their production activities and their machinery.**

The DR service also contributes towards making the grid more stable and helps keep **electricity prices affordable** while offering a **greener and more sustainable** alternative with respect to the construction of new power plants in the community and promoting the integration of renewable energy in the grid.

How we manage the flexibility services

In order to manage flexibility services, Enel X state-of-the-art Network Operations Center ("**The NOC**"), was established in 2011 in Dublin's "Silicon Docks" as our advanced grid monitoring hub. It is a true control center for the Demand Response services. Here is where all energy dispatches are actioned, monitored and managed. Through the **NOC** we operate the largest portfolio of flexible energy assets across the world, to reduce global carbon emission and promote national grid stability in all the countries where we operate.

We currently manage more than **9 GW*** demand Response in **14 countries,** and stream data from **more than 15,000 enterprise sites globally.** The power load managed by the NOC is distributed across **more than 75 Demand Response programs** that vary substantially in dynamic and regulatory terms. At the NOC, we receive dispatching orders from more than **30 energy transmission operators.** Requests are sent from the NOC, ensuring an active response from each site that we manage, which guarantees the stability of the energy grid.

In Taiwan, we also have a local NOC, that provides support needed by customers in a timely manner, and provide assistance when customers respond to a dispatch event. In addition, we provide customers with a clear, easy-to-understand and easy-to-use platform, for customers to be in full control of the facility's energy consumption, dispatch performance and load conditions. This allows customers to focus on the main business of the company with peace of mind.

Demand Response Programs in Taiwan

Day-ahead Ancillary Services in the Energy Trading Platform

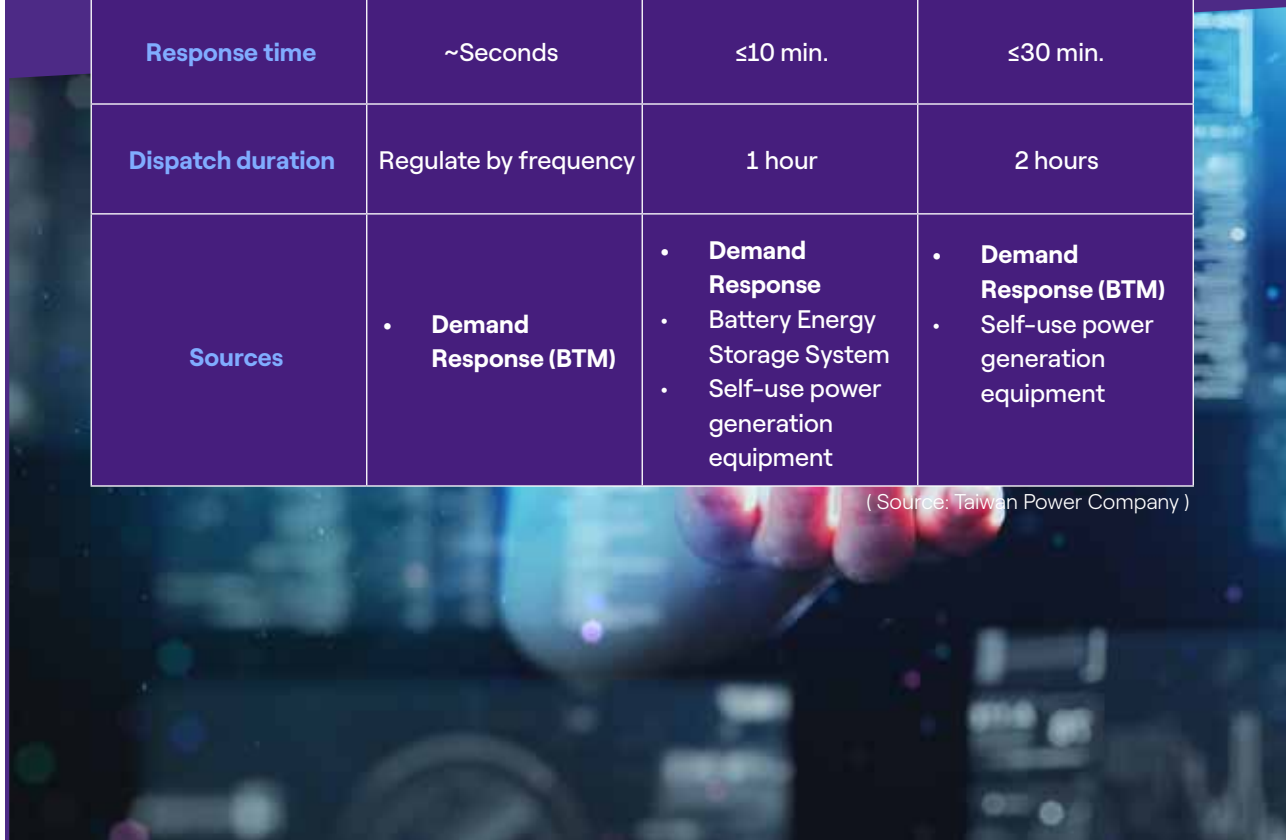
Currently, in Taiwan Power Company's Energy Trading Platform, the programs can be divided into two major categories. **Ancillary service** programs are typically created to handle issues such as generator outages, instantons load increase, or load prediction errors. It can be divided into **Spinning Reserve** program, in which the participants need to respond to the event within 10 minutes after the dispatch notification is been sent, and **Supplemental Reserve** program, in which the response needs to be completed within 30 minutes after the dispatch notification is been sent.

Frequency Reserve programs are to help resolve grid frequency issues, which occur when the grid encounters short-term imbalances between supply and demand. Usually, participant sites of regulation reserve programs are equipped with hardware that automatically detects the system frequency, quickly responds, and automatically increases or curtails load within a few seconds from the grid until the frequency is restored.

Product Specs in the Day-ahead Ancillary Services Market

Categories / Spec	Frequency reserve	Spinning reserve	Supplemental reserve
Response time	~Seconds	≤10 min.	≤30 min.
Dispatch duration	Regulate by frequency	1 hour	2 hours
Sources	• **Demand Response (BTM)**	• **Demand Response** • Battery Energy Storage System • Self-use power generation equipment	• **Demand Response (BTM)** • Self-use power generation equipment

(Source: Taiwan Power Company)



*** Update July 2025**

Who can participate in the Demand Response programs?

Enel X develops tailored energy management plants for businesses operating in various sectors, including: manufacturing (food and beverages, petrochemicals, construction, automotive, fabrics) commercial, agricultural, data centers, real estate, education, healthcare, IT, mining, public services, refrigeration and transport.

If you meet any of the following conditions, you are a good candidate for to participate in Taiwan Power Company's (Taipower) Demand Response Ancillary Service programs through us:

- Major energy users with a contracted capacity of over 5,000kW with Taipower.
- Owns equipment that is able to participate in reducing the energy load by 100kW or more. Significant benefits will be seen if able to curtail more than 100kW.
- Owns a generator.
- Businesses that expect to increase the bottom line.
- Businesses with energy-saving needs
- Businesses that aim to adopt circular economy and sustainable operating models.

How does a Demand Response program work?

Most companies have inherent power flexibility, which can be harnessed by making temporary adjustments to electricity use, or by switching from grid power to a backup generator or battery storage unit, with little to no impact on operations. Harnessing the flexibility of energy assets through grid services, like DR, can be a competitive advantage for companies to unlock a new source of income, and for the community around them benefiting from improved grid stability. There are 3 steps to participation: 1. Implementation, 2. Reaction,
3. Restoration of ordinary operation.

How does
a Demand Response
program work?

01

Implementation

Definition of a tailor-made strategy for optimizing energy management

Enel X will work with each customer to identify tailor-made plans for reducing the consumption of non-essential energy without affecting key activities for businesses, comfort, or product quality. It's our job to create a strategy that delivers maximum value with the minimum operational impact on the commercial activities of customers.

Energy reduction measures are customized for each unique facility and can include turning off lighting, air conditioning, pumps, and other non-essential equipment and/or performing maintenance during dispatch.

Many facilities find that energy-intensive processes can simply be shifted by a few hours to facilitate dispatch participation in the ancillary service market in the Energy Trading Platform. In some geographic areas, facilities may participate by switching to backup generation, thereby reducing demand on the grid. Enel X works with each customer to create a customized participation strategy that best suits them.

How does
a Demand Response
program work?

02

Reaction

Installation of metering

Enel X installs first of all the necessary metering devices at the customer's facility. For example, we install a small gateway device at each of our customer facilities in order to establish communication with our Network Operations Center (NOC). This connection ensures that we can monitor energy consumption levels in real-time during DR dispatches and beyond, and also allows our customers to access their data and the valuable tools on our energy management software platform.

Receive and acknowledge dispatch notification

When the utility or grid operator (Taiwan Power Company in Taiwan) anticipates the need for support, it dispatches a signal to Enel X. Enel X will then send customers a notification via phone/email/SMS informing them about the start and duration of the dispatch. Once they acknowledge the notification, they're ready to respond.

Implement the energy management plan

At the start of the dispatch, the customer's facility will reduce its electricity usage according to their pre-determined energy reduction plan. Energy reductions can be managed manually on-site or conducted automatically by Enel X with the click of a button. Enel X offers cloud-based applications that allows customers to log in and see their dispatch performance in real time, to ensure they are meeting their reduction target.

How does
a Demand Response
program work?

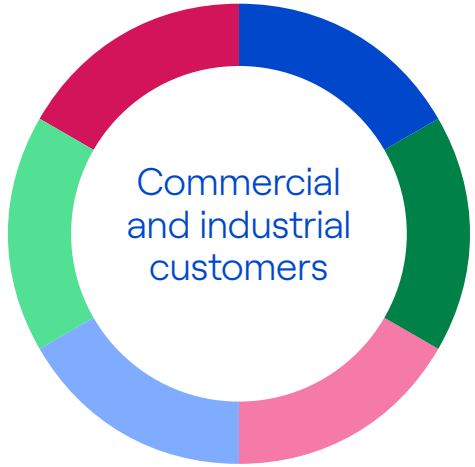
03

Restoration of ordinary operation

Return to normal operations

Once the DR dispatch is over, customers receive a notification that they are now clear to return to normal operations. Enel X remains in contact with customers before, during and after dispatch to ensure that they are hitting their reduction targets and ensuring the highest level of financial payments.

What are the **benefits** of participating in Demand Response programs?



- Access to a new revenue source
- Cost reduction
- Improved resilience
- Improvement in sustainability
- Management of risks
- Improved transparency

Access to a new revenue source

In exchange for availability to modulate the energy consumption, commercial and industrial energy users participating to DR programs receive a payment. DR programs enable companies' active participation in the energy markets, transforming electricity costs into an opportunity to receive a new stream of revenue.

Cost reduction

Thanks to an energy management plan developed together with Enel X team of experts, customers can reduce their energy demand on the grid and spot opportunities to better manage energy costs.

Improved resilience

Participating in DR provides advance notice of unstable grid conditions (i.e. blackouts and brownouts), so clients can react and protect their equipment and machines in time, avoiding greater risks for their business operations.

Improvement in sustainability

Participating in DR enables the integration of renewable energy sources in the energy mix and reduces the need for fossil fuels to supply electricity.

Management of risks

Participating in DR programs helps manage exposure to grid imbalances, protecting sensitive equipment and being prepared to activate alternative production/business schedules ensuring a seamless transition and protection of the site against unscheduled power interruptions.

Improved transparency

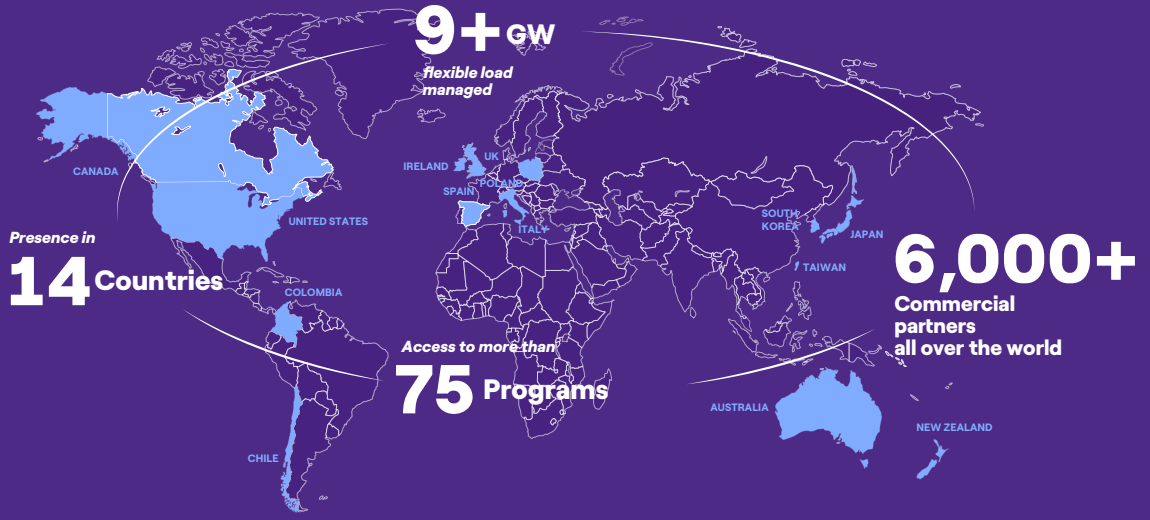
Thanks to advanced technology, Enel X makes it possible for companies to have full visibility of their energy use and understand the impact that energy use has on its costs; which helps customers identify additional areas of saving and access new sources of revenue.

Why do companies select Enel X for flexibility energy solutions?

Enel X is the world's leading Demand Response aggregator, with a flexible load of 9+ GW and unparalleled expertise in making customer energy assets remunerative in increasingly complex energy markets.

- Part of Enel Group, with more than **60 years** of experience in the energy sector.
- It is present in **14 countries**, and offers customers access.
  to more than **75 demand response programs** world-wide.
- It has earned the trust of more than **6,000** commercial customers.
- Streaming data from **more than 15,000** enterprise sites on a global level.
- **Network Operations Center** with customer support 24x7.
- More than **€ 200 million** invested in new technologies.
- More than **3,000** employees in offices all over the world.

Enel X global presence



We are the world's leading Demand Response, with unparalled expertise in the terms of making customers' energy assets remunerative in increasingly complex energy markets.

Part of Enel Group with more than **60** years of experience in the energy sector

real-time data more than **15,000** enterprise sites

Network Operations Center with customer assistance 24x7

more than **€ 200 M** invested in new technologies

3,000+ employees in offices all over the world

Enel X
About us

Enel X is a company of the Enel Group created to help companies, cities and consumers use energy in an efficient and remunerative way, while contributing to global decarbonization.
As a leader in the sustainable transition, Enel X accelerates electrification and decarbonization practices thanks to the development of innovative products and digital solutions. The company is a world leader in advanced energy solutions. It manages 9+ GW of Demand Response on a global level, 113 MW Battery Energy Storage installed capacity* all over the world, and is a leader in electric mobility, with more than 30,100 public charging points worldwide.

Enel X Taiwan
Enel X Taiwan is the first local entrant to participate in Taiwan Power Company's (TPC) day-ahead energy market. And is now a qualified trader with the largest customer portfolio and largest capacity aggregated in the Energy Trading Platform. Enel X Taiwan has a diverse customer portfolio across multiple sectors, which includes manufacturing, industrial materials processing, cold storage, logistics and storage, hospitals and healthcare, retail, hotels and resorts, battery swapping stations and more.

We are also a **renewable energy retailer** and offer **battery storage solutions** for businesses to meet the **Major Energy Consumer obligations** while maximizing the value. In addition to the opportunity to monetize the energy assets and the consumption loads of commercial and industrial customers with the Flexibility solutions. Enel X has the ability to increase the economic returns of multiple energy assets thanks to its Virtual Power Plant (VPP) platform.

*BTM

Our approach is to optimize our clients' energy portfolio in an integrated fashion, maximizing our clients' competitive advantage by constantly scouting for competitive energy prices, reducing companies' costs and risk exposure, extracting the full advantage of market specific trends and regulatory framework, while achieving sustainability goals. We have unparalleled expertise and are uniquely positioned to monetize our customers' energy assets in increasingly complex energy markets. Our solutions are designed around our clients' needs and tailored to suit their business priorities.

To discover more about our Flexibility solutions, visit our website at enelx.com/tw

Success deals

Gogoro and Enel X Taiwan

Gogoro wanted to innovate the way electricity is used at its 2,500+ battery swapping stations around Taiwan to support the power grid.

In 2022, Gogoro and Enel X's Virtual Power Plant(VPP) pilot in Taiwan demonstrated that **the Gogoro Network could safely pause charging if there was a grid imbalance or provide energy back to the grid as demand required**. Once the demand subsides, Enel X's VPP sends a signal to the Gogoro Network to safely restore grid consumption. The Gogoro Network performed these services without causing any interruptions to Gogoro Network battery swapping customers, demonstrating that the network is an ideal resource to support Taiwan's energy transition.

The commercial deployment of 2,500 Gogoro battery swapping stations across 1,000 locations in Enel X's Virtual Power Plant was announced in 2023. It is the first commercial deployment of this technology in the world.

Integrating Gogoro Network battery swapping energy into the Enel X VPP in Taiwan has the same effect as bringing new energy generation online to meet energy demand. While helps stablize the grid and supports Taiwan's renewable energy transition, Gogoro's participation also generates a new revenue stream for the company.

Taipei 101 and Enel X Taiwan

Taipei 101 was looking to improve its already impressive sustainability credentials by innovating the way it uses electricity.

Being one of the world's 50 Most Influential Tall Buildings[1], the skyscraper joined Enel X Taiwan's Virtual Power Plant(VPP) to support the grid by being flexible when grid power is used, and making secondary use of existing assets.

Whenever there is an electricity supply-demand imbalance, Enel X's VPP will intelligently adjust Taipei 101's energy use to offer the capacity to balance the electricity grid.

Aggregating commercial and industrial flexible energy loads throughout Taiwan is a quicker, cheaper and greener way to support the grid than activating traditional coal or gas peaking plants, or building new resources.

The participation allows Taipei 101 to improve the building's sustainability and carbon reduction initiatives, while supporting the rapid uptake of renewable power in Taiwan.

1 CTBUH, The 50 Most Influential Tall Buildings of the Last 50 Years, October 28, 2019.

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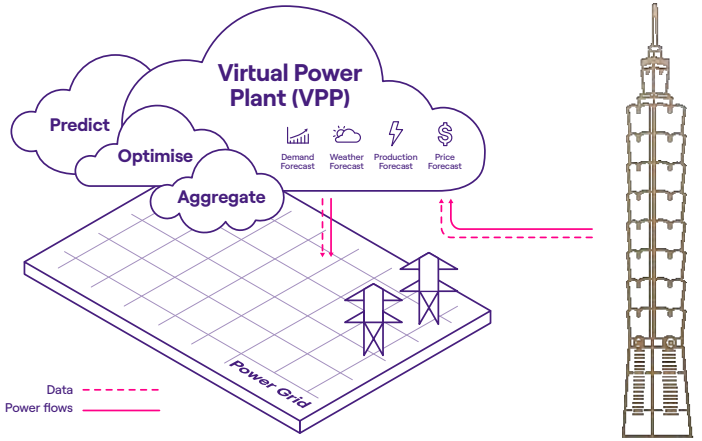
TAIPEI 101



Enel X and Micron collaborate to advance Taiwan's energy transition

Enel X Taiwan announced it is collaborating with Micron Technology, Inc. to support Taiwan's renewable energy transition. Leveraging Enel X's leading commercial and industrial (C&I) Virtual Power Plant (VPP). Micron will participate in Taipower's Energy Trading Platform to enhance local grid resilience, setting an new standard for the semiconductor and related industries in Taiwan.

This collaboration underscores Micron's commitment to sustainable operations as the company will leverage its flexible demand resources, starting with its Taoyuan Linkou fabrication plant in the Hwa Ya Technology Park, to participate in the Energy Trading Platform via Enel X's VPP when the grid is under strain.

In the future, when unexpected load increases or generator outages cause imbalances in energy supply and demand, Micron will be able to temporarily reduce power demand from the grid equivalent to the average daily consumption of 2,550 households within 30 minutes.

Far Eastern Memorial Hospital (FEMH) and Enel X Taiwan

Hospitals are major electricity consumers, power fluctuations impact hospital safety, and electricity pricing fluctuations are closely related to hospital expenses. Medical institutions, serving as guardians of public health, are also critical bases for sustainable development. Using electricity intelligently and sustainably while enhancing electricity safety is crucial for medical institutions.

FEMH, a medical center-level teaching hospital, apart from developing core medical expertise, nurturing outstanding talents, and innovating in research and development to fulfill its social responsibility, the hospital also pays close attention to issues related to sustainable operations. Therefore, FEMH responds to the energy management challenges by joining Enel X Taiwan's Virtual Power Plant.

Hospitals usually have backup power equipment such as generators that are immediately activated during power outages to supply vital life support systems for patients and ensure the safe operation of sensitive equipment. Backup power equipment is often seen as cost-consuming equipment. By joining a VPP, backup power equipment can act as demand response resources, offering a different function during idle times and becoming a robust backup to stabilize the power grid.

By providing demand flexibility to support the grid balance, the hospital not only helps accelerate the energy transition but can also cultivate talent, activate backup power mechanisms to enhance electricity safety and unlock a new revenue stream all at the same time.

> **Joining the Virtual Power Plant allows us to unceasingly achieve our commitment and mission to social sustainability.**
>
> **Chang Shu-Wen,** Far Eastern Memorial Hospital Vice President

Enel Group
About our group

The Enel Group is leading the energy transformation. Enel is a multinational power company and a leading integrated player in the global power and renewables markets.

Enel is the largest private renewable player and the biggest retail operator by customer base.

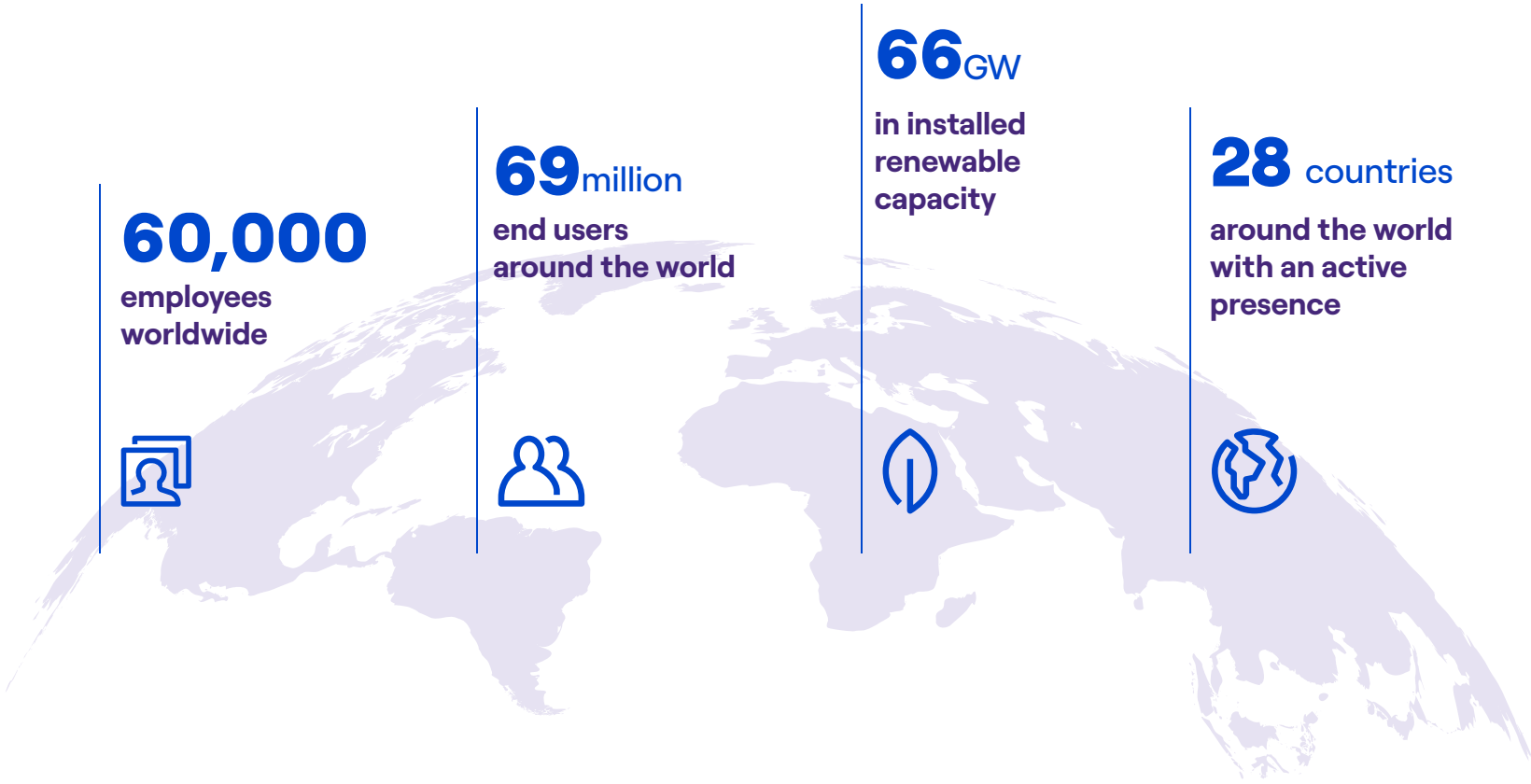
Enel is located in 28 countries, producing energy with aroound 91 GW of total capacity, and more than 66 GW of renewable capacity..

60,000
employees worldwide

69 million
end users around the world

66 GW
in installed renewable capacity

28 countries
around the world with an active presence



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