



JST *France*

THE QUALITY CONNECTION

**RENEWABLE ENERGIES &
INFRASTRUCTURES**

A 3D illustration of a green landscape with several white wind turbines and stylized green trees. The scene is set against a light blue sky. A semi-transparent green rectangular box is centered over the image, containing the text.

RENEWABLE ENERGIES & INFRASTRUCTURES

DEFINITION ISSUES & ADVANTAGES

Definition :

Renewable energies, such as solar, wind, hydroelectric or biomass, are sources of energy that regenerate naturally and sustainably, unlike fossil fuels which turn out themselves and have a more significant environmental impact.

The relationship between these renewable energies and the infrastructure optimization is very important. Indeed, in order to use these energy sources in an efficient way, it is necessary to design and adjust the infrastructures (such as power plants, distribution networks, or even energy storage systems). This leads to maximize their performance while minimizing costs and environmental impact.

The optimization of infrastructures helps to :

- Manage the variability of renewable energies, which often depend on weather conditions (wind, sun).
- Improve storage capacity to ensure stable power even when production is low.
- Integrate these sources into the existing electricity grid in a smart way, while using technologies such as demand management or smart grids.
- Reduce energy losses during transmission and distribution.

The infrastructure optimization is key to get the most out of renewable energy, making its use more efficient, reliable and sustainable.

This also leads to the energy transition towards a more environmentally friendly system.



Issues :

Ecological transition and reduction of greenhouse gas emissions :

One of the major challenges is to reduce our depending on, which are fossil fuels, responsible for climate change. Renewable energies, such as solar, wind or biomass, make it possible to produce clean energy, thus contributing to the fight against global warming.

Integration in the electrical network :

Renewable energy sources are often intermittent (the sun does not always shine; the wind does not blow constantly). Consequently, it is therefore necessary to develop solutions to store this energy. If we manage it efficiently, it will ensure a stable and reliable supply.

Initial costs and investments :

The implementation of renewable infrastructures requires significant investments. However, in the long term, these costs tend to decrease; the exploitation of these resources is often less expensive than traditional energies.

Accessibility and decentralization :

Renewable energies allow local energy production, which can improve access to electricity in rural or isolated areas, thus promoting economic and social development.

Environmental and social impact :

It is essential to minimize the impact on biodiversity and on ecosystems when installing renewable infrastructures. It is also necessary to ensure that the energy transition is fair, taking into consideration the social issues and involving local communities.

Technological Innovation :

Research and development of new technologies, such as energy storage or smart grids, are crucial to optimize the use of renewable energies.

In short summary, the integration of renewable energies into our infrastructures is an essential lever for a more sustainable future. But it must be supported by technical, economic and social challenges that must be handled carefully.





RENEWABLE ENERGIES & INFRASTRUCTURES

Advantages :

Environmentally friendly :

Renewable energies, such as solar, wind or geothermal energy, produce either little or no greenhouse gases, which contributes to fight against climate change and preserve the quality of our planet.

Long-term cost reduction :

Although the initial investment is high, operating and maintenance costs are generally lower, which results in long-term savings.

Energy Independence :

By using local and renewable energy sources, infrastructure becomes less dependent on fossil fuel imports, thus enhancing its energy security.

Creating jobs :

The development of these energies stimulates the local economy by creating many jobs in the manufacturing, installation and maintenance of equipment.

Flexibility and resilience :


Infrastructures powered by them can be more flexible and resilient facing the market price fluctuations or geopolitical crises.

Improvement of the quality of life :

By reducing pollution and promoting sustainable development, these energies contribute to a healthier environment for all.

**The integration of renewable energies in infrastructures
is a beneficial approach for the environment, the economy, and society.**





RENEWABLE ENERGIES & INFRASTRUCTURES APPLICATIONS TYPES

Application types :

Connected energy management systems (EMS)

These are technological solutions designed to monitor, control and optimize energy consumption in a building, a company or an electrical network.

Thanks to their connectivity, they can collect data in real time, analyze this information and automatically adjust the equipment to improve energy efficiency.

In practice, a connected EMS can for example regulate the temperature, lighting or consumption of machines according to needs, while minimizing energy waste.

This allows not only money savings; it helps to reduce the environmental impact, while using sensors and connected interfaces to ensure efficient management.

These systems are often integrated into smart grids for more comprehensive and efficient energy management.

These apps help to make interiors more connected and functional, while providing greater peace of mind.



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Application types :

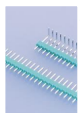
Smart Grids

Smart grids are modern and innovative power networks that use advanced technologies in order to manage the distribution and consumption of electricity in a more efficient, reliable and sustainable way. Unlike traditional networks, they integrate sensors, communication systems and intelligent software to monitor in real-time production, transmission and energy consumption.

The main goal of smart grids is to optimize the use of energy resources, particularly by integrating more renewable energies such as solar and wind, while allowing consumers to be more active in their consumption management. For example, they can adjust the distribution based on demand or quickly detect anomalies to avoid on power cuts outages.

In short, a smart grid is an intelligent electrical network that facilitates more efficient, sustainable and interactive energy management. This will benefit both suppliers, consumers and the environment.

This connectivity facilitates communication between the different components of the electrical network, allowing a dynamic and balanced distribution of renewable energy, while integrating decentralized sources.



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Application types :

Energy storage infrastructures

Energy storage infrastructures are systems designed to store energy that will be released if necessary.

They play an essential role in energy management, particularly to balance production and consumption, especially with the rise of renewable energy sources such as solar and wind, which can be intermittent.

There are several types of energy storage infrastructures :

The batteries : like lithium-ion batteries, which store electricity in chemical form. They are widely used for their speed of deployment and efficiency.

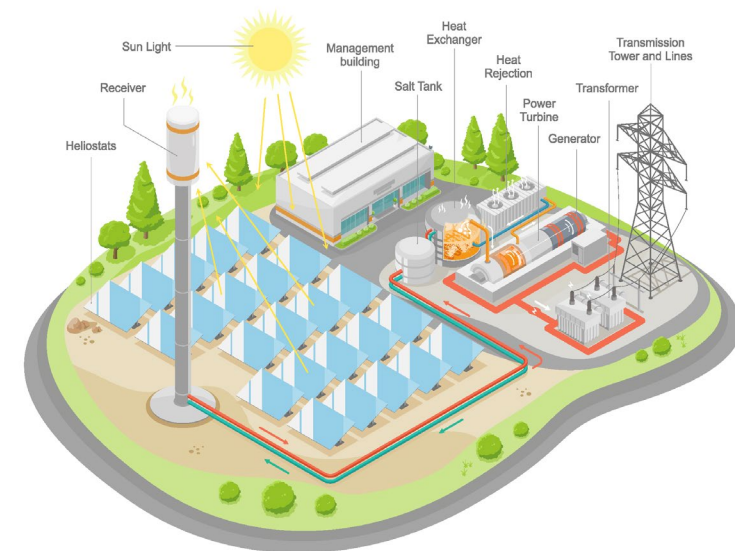
The pumped-storage stations : they use excess energy to raise water in an elevated tank. When energy is needed, the water does down to turn a turbine and produce electricity.

Thermal storage systems : they store heat or cold for later use, particularly in heating or air conditioning.

Flywheels : they store energy in the form of high-speed mechanical rotation.

These infrastructures enable to ensure the stability of the electricity grid, to manage consumption peaks, and maximize the use of renewable energies.

They are therefore the key for an efficient and sustainable energy transition.



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Application types :

Remote monitoring and maintenance systems

Remote monitoring and maintenance systems are technologies that allow monitoring and maintaining equipment or infrastructure without any physical presence on site.

Monitoring consists in tracking the machines status, devices or systems in real-time by collecting data such as temperature, performance, and component wear. This allows a quick detection of any potential problem or anomaly.

Remote maintenance, however, allows intervention on this equipment to carry out repairs, adjustments. Updates are possible directly via a computer connection. This often avoids trips; this reduces costs and allows faster intervention.

These systems offer proactive, efficient and often preventive equipment management, which contributes to improving its lifespan, performance and reducing downtime.



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Application types :

Control and automation applications

Control and automation applications are tools or systems designed to manage, regulate and automate processes or machines, often in industrial, domestic or technological environments.

The purpose of control applications is to monitor a system in real-time, analyze its performance, and adjust its parameters so that it functions optimally.
For example, a thermostat that regulates the house temperature or the engine speed control system.

Automation applications, however, go further. They allow tasks to be performed automatically without constant human intervention.
This can include programming complex processes, managing workflows, or coordinating multiple systems to achieve a specific goal.
For example, an automated production line in a factory or an intelligent lighting management system in a house.

**These systems aim to make them more efficient, safe and reliable,
while reducing the need of direct human intervention.**



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RENEWABLE ENERGIES & INFRASTRUCTURES

Application types :

Integration of electric vehicles

They ensure the reduction of the carbon footprint.

By using energy sources such as solar, wind or hydraulic power to charge electric vehicles, we limit the use of fossil fuels, responsible for the majority of greenhouse gas emissions.

They contribute to the transition towards cleaner and sustainable energy.

Renewable energies are inexhaustible on a human scale; which guarantees a stable and environmentally friendly source of energy to power our vehicles.

Integrating them into the charging process promotes energy independence.

By producing their own energy, for example via solar panels at home, users can reduce their costs and their dependence on traditional electricity grids.

This is all part of a global approach to fight against pollution and preserve the planet, by making our transport modes more environmentally friendly.



Integrating renewable energy into electric vehicles is an essential step towards a more sustainable, cleaner and more responsible future.



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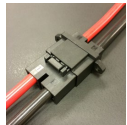
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Connected Energy Management

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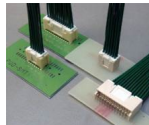


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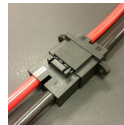


Energy storage

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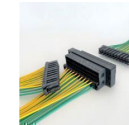


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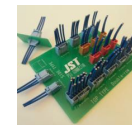


Control & Automation

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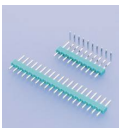


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Smart Grid

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Monitoring & Maintenance

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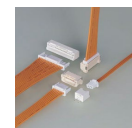


Electric vehicles

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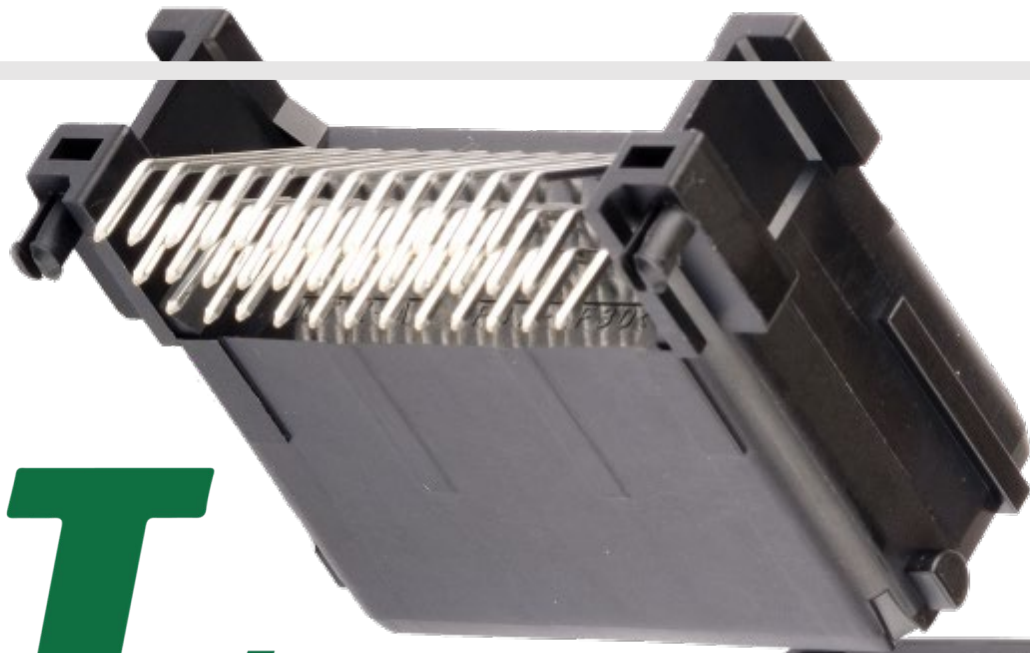


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