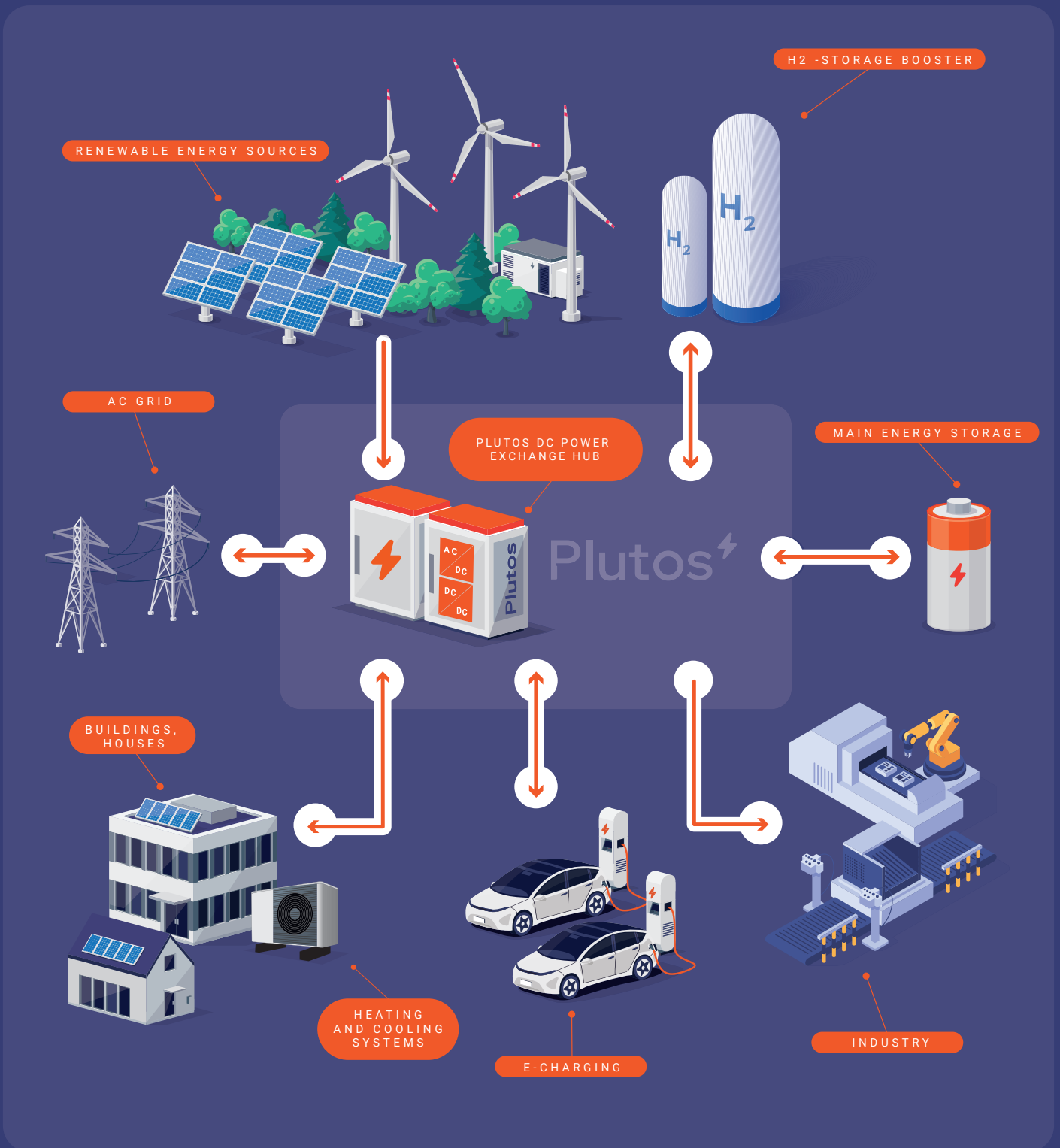


Plutos[⚡]

Energy Management System for Microgrids



www.plutos.energy

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PLUTOS® - A DIRECT CURRENT POWER SUPPLY EXTENSION FOR BUILDINGS AND INDUSTRY – A COST & ENVIRONMENT SOLUTION?

Over 125 years ago, direct current technology in power supply was replaced by three-phase technology with the invention of the generator. Even then, direct current was already supplied by batteries. This decisive change made it possible to build larger coal-based power stations far away from consumers and to transmit the electrical power to city centers with low losses. Today's electricity grids were then built and optimized on this basis, allowing the country to be supplied with different feed-in points and different voltage levels, optimizing the "electricity transport costs". Now we focus on local regenerative Energy sources which will favorize DC grids and local high-power solutions by new technologies!

The basic Problem

The electricity grids were - and still are - designed for smaller average consumption values of approximate 6...8 kW to the end consumer. Extensive authorizations are required for higher power needs, whereby the supply might be sourced at higher voltage levels. In these cases, the impact on the overall grid must be approved individually. The problem of grid stabilization is at the forefront here, as the limits of an increasing feed-in will lead to significant control problems in the long term, resulting in potential blackouts.

Impact on increasing renewables

Renewable energy sources (RES) such as solar roofs or farms, biomass plants and wind farms therefore suffer from individual authorization procedures to avoid local overload times and instabilities in the overall power distribution system. This is difficult to balance while the sales of energy contribute with further regulations. Result: Consumers contribute with own renewable energy technology, expenses or subsidies, while the kWh-price for all participants gets just moving in one direction. If demand continues to rise, this will definitely lead to an unpredictable end!

A hybrid micro-grid, PLUTOS®, as solution

The aim of the product PLUTOS® is to stop this development and find a cost-effective solution for both consumer and grid operator. It also aims to support the environmental concept. Furthermore, this product supports private initiative in energy procurement. It so far engages on personal responsibility as to be the most economical and cost-efficient solution. Although political obstacles in this respect are slowly being removed in the EU- countries, they are not always sufficient to make private investment towards own responsibility attractive. This is also still supported by keeping energy sovereignty in the hands of market supplier, which today regulates electricity supply and prices from renewable sources in their favor. Today's solar technology feed-ins support the supply in the AC grids with regulated low prices!

A booster of DC grids

However, there is a welcome development that is now helping to reduce costs for consumers. Prices of components as batteries and solar panels have significantly dropped in recent months, even halving them, making it possible to realize cost-effective energy supply solutions with direct current grids.

It gets possible to provide the consumer with a battery storage system large enough to supply households, buildings or businesses with direct current and utilize their own renewable energy themselves. With the right design, the battery can supply the entire demand of a business, a building or even just a household for one, two or even several days, depending on the layout.

A further improvement

With a bi-directional converter between the AC and the described DC extension, both grids can be coupled in order to supply the storage system of the DC grid via the AC grid in an emergency mode in case of shortage of RES. If you remain connected to the three-phase system as back-up, there is in all cases a secure supply for the building from the grid.

Increase of power as USP of the system

The main advantage of such hybrid grids is that the DC grid can be designed for much higher power levels than the assigned power of the connected AC grid. This technology avoids the need for new acceptance procedures in case the power in the DC grid is increased, as the AC grid is not affected. The power rating in this grid can be adapted to the consumers via a redesign or extension of the storage unit, some power electronics and the connected own RE sources.

The efficiency and cost evidence of energy

It gets even better: the available energy in the DC grid can also be designed in such a way that it is directly sufficient for the required e-mobility, machines and air conditioning units. This improves the efficiency for the consumer while direct quick charging for e-cars can be provided from 100% RES, so at zero cost.

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A special energy management system (EMS) now allows energy to be brought in between the grids with a view to additional factors such as weather forecasts, electricity price trends and consumer behavior. Additional loads caused by night-time charging processes for e-mobility supply will be eliminated if the DC grid is managed correctly, making a consistent energy transition possible in the first place.

A happy AC grid supplier

PLUTOS® supports the stabilization of the public grid which, with the right precautions in RES, can be relieved by about the power consumed in the DC grid. Further it can be relieved from dynamic load changes which are absorbed in the DC grid if the storage system is designed correctly. These are caused, for example, by large consumers such as heat pumps or work machines.

Due to these important contributions of power shifts, the operator can benefit as the private investments in a DC grid result in less power on the 400V AC distribution grid. Expansions in this part of the grid shall be considerably reduced while full electrification is assured by the micro grid. As a consequence, lower investment is needed within the public grids.

If the PLUTOS DC technology is sufficiently widespread, economic benefits can be expected for both the investing consumer (businesses, house builders, etc.) and the grid operator, while at the same time supporting CO2 reduction for each installation.

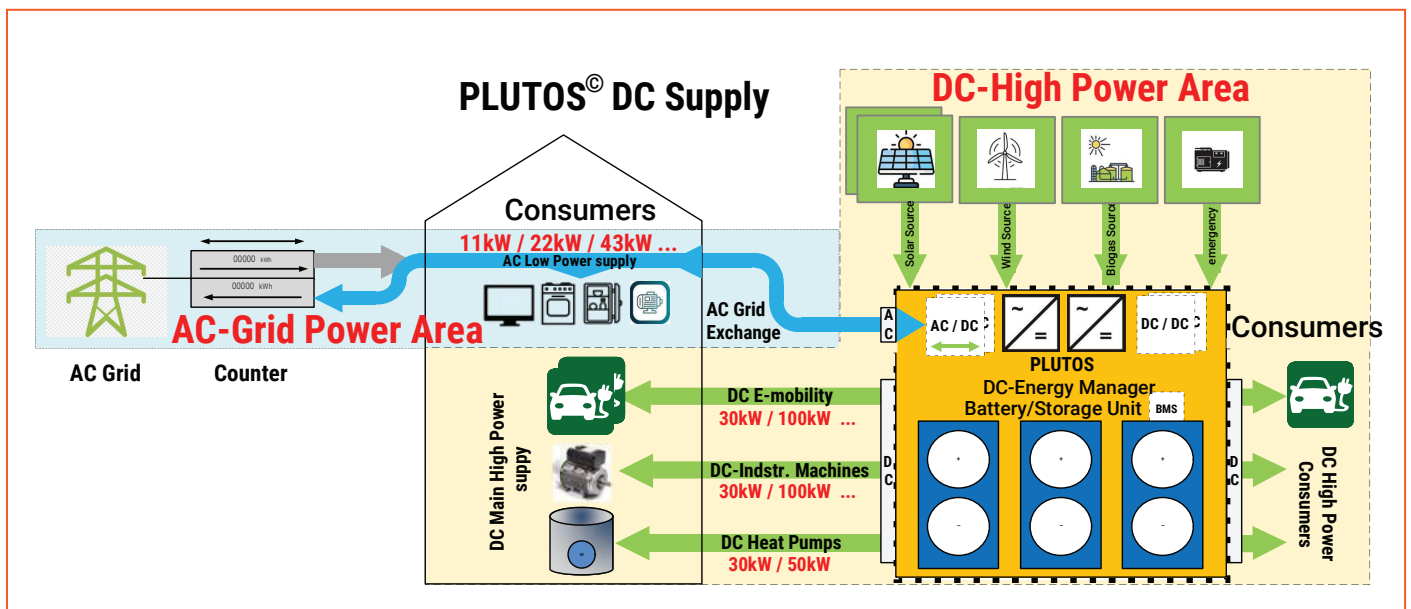
A stepwise development of the PLUTOS® grid

The PLUTOS is based on a modular technology as to allow an original design to be adapted to higher power values. Expansions can be made gradually, e.g. by further expanding panels, storage units and other RE-sources. This gradually increases energy self-sufficiency and stretches the financial requirements over time.

Stepwise, the CO2 footprint will also decrease and in many cases will be reduced to zero.

To summarize

The PLUTOS® power grid of the end user will lead to lower energy costs, will avoid problems in the event of grid failures and will operate much higher power levels in its own DC grid than are normally made available to it via the AC grid. A dedicated DC grid also promotes e-mobility, as fast charging (e.g. 20 minutes) can be carried out directly from the DC grid. However, business, commercial and administrative buildings in particular benefit from these advantages, with operational safety and the valuation of properties also having a positive impact on their balance sheet.



The PLUTOS® product was developed with this in mind and to utilize these advantages, latest information can be found at www.plutos.energy.

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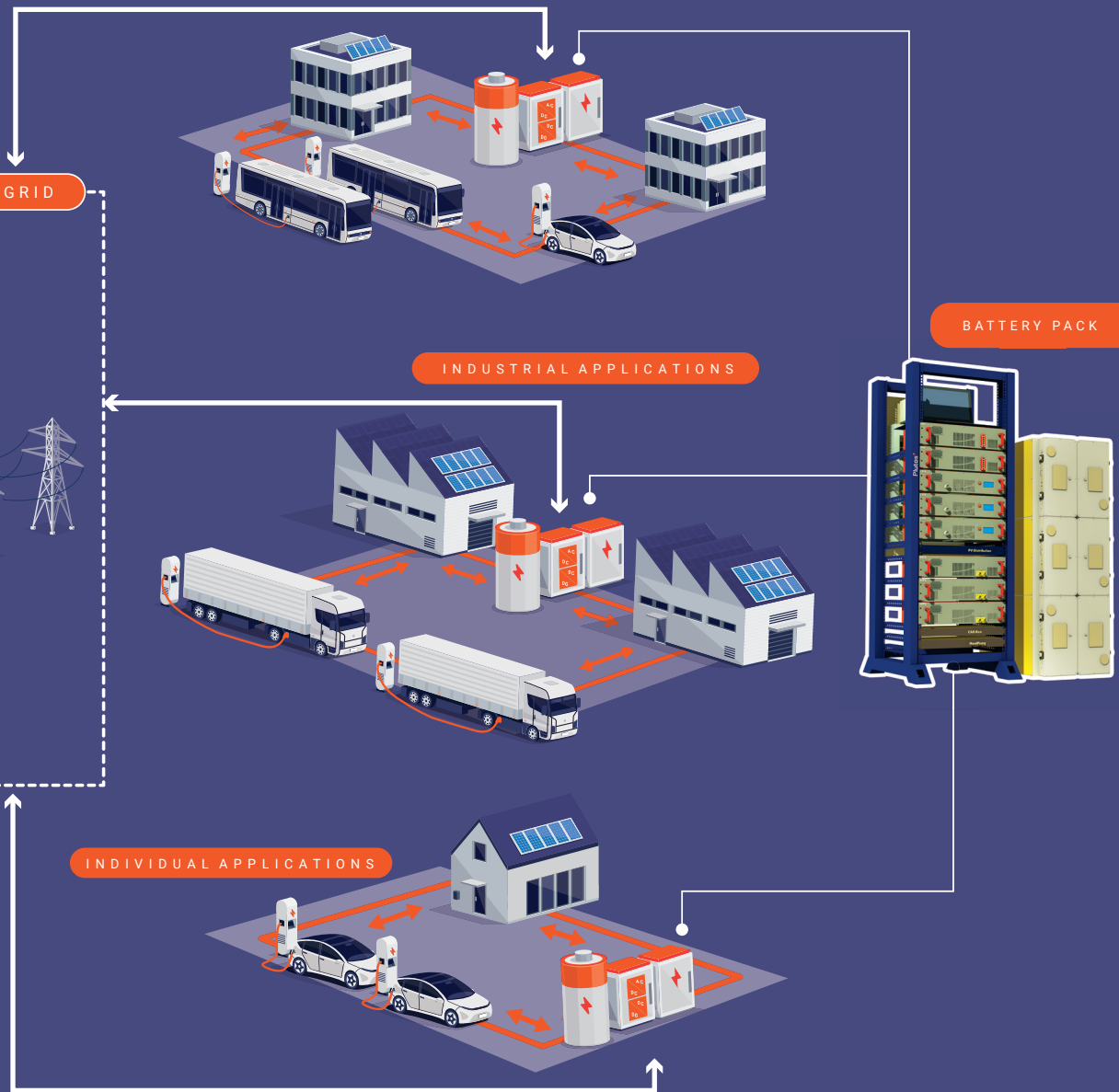
PUBLICCHARGING INFRASTRUCTURE

AC GRID

INDUSTRIAL APPLICATIONS

BATTERY PACK

INDIVIDUAL APPLICATIONS



— ENERGY FROM THE GRID /
ENERGY RETURNED TO THE GRID

— ENERGY FROM THE PLUTOS® GRID

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