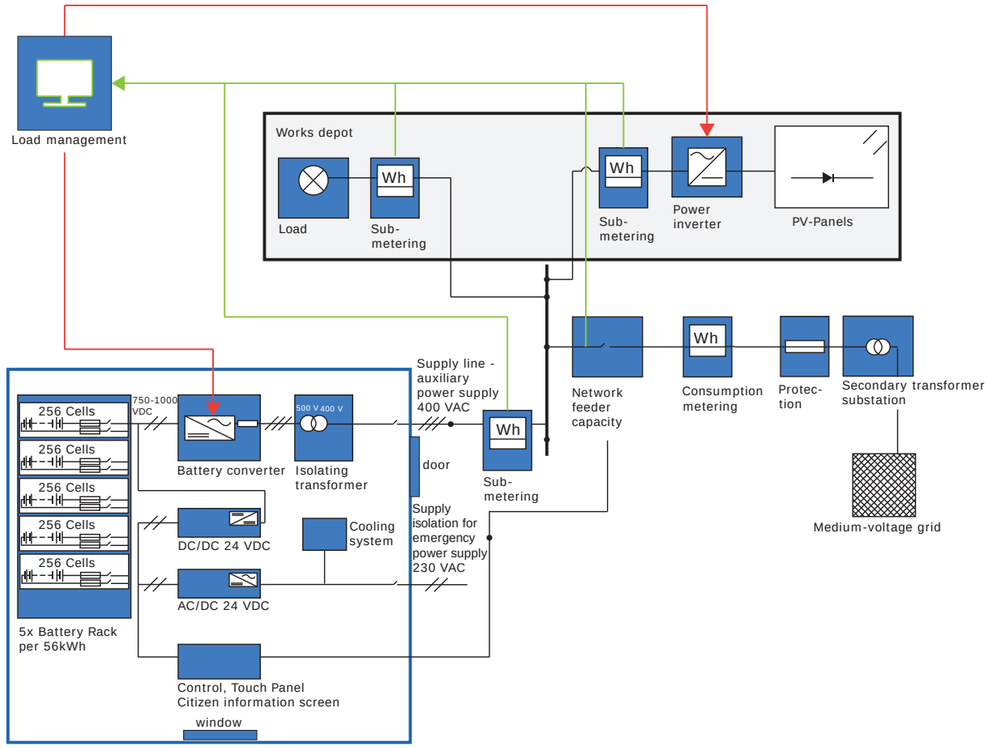
Model project - Energy storage systems: Full system block diagram



Key technical data

Battery system

Rated DC power	100 kW charging/ discharging
Nominal voltage	920 V
Nominal capacity	5 x 60 Ah 5 Racks parallel
Nominal energy	280 kWh
Max charging / discharging current	5 x 90 A
Ambient temperature	23 °C ± 5°C
Life expectancy	6000 cycles, @ DOD 80% by calendar: 20 years
Battery Management System (BMS)	Monitoring: Voltage per cell, Temperature per 2 cells, Current per rack, Cell-Balancing

Battery cells

Operational voltage	3.0 – 4.12 V
Cell construction	prismatic
Cell chemistry	Li-Manganese oxide (LMO)

Battery converter

Rated power	100 kW charging/ discharging
Nominal apparent power	120 kVA cos φ>0.8ind/cap
AC operating voltage	400 VAC
Grid frequency	50 Hz
Grid structure	IT isolating transformer
4 Quadrant Operation	Off- and On-Grid

Three phase isolating transformer

Capacity	160 kVA
Secondary current	216.5 A
Primary voltage	3AC400V

Container

Container type	40 foot sea container, High-Cube-model (SC 40HC)
Classification	according to ISO 6346
Frame	Steel profile, painted
Exterior walls / roof	Trapezoidal sheet steel / profiled sheet
Paint	Weather-resistant
Climate control	Battery room, Inverter, Control
Exterior dimensions (LxWxH)	12.192 x 2.438 x 2.896m

Conformity

VDE-AR-N-4105, FNN from June 2014, TAB, EN 50091-2, EN 55022 B

Certifications Licenses

UL 1642, UN 38.3, EUCAR, EN 50178, EN 61140, IEC 60364-4-41, IEC 62133, IEC 61439, IEC 60947 EN 50272-1, EN 50272-2

Interfaces

TCP/IP (Ethernet), CAN

Safety

Protection class IP20, lightning protection, fire alarm system, German noise prevention code, EMC

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RRC power solutions

RRC Energy Storage Key Elements for the New Energy Economy

Repositioning of energy generation, sourcing and services

The changing energy market requires a more professional and efficient positioning at all value creation levels in order to maximize market potential. Among other factors, the focus is on implementation of the energy transition, increasing financing pressure (resources, ROI, etc.), demographic changes, the transformation of Industry (4.0), guaranteeing the fiscal feasibility and profitability of energy generation, sourcing and services.

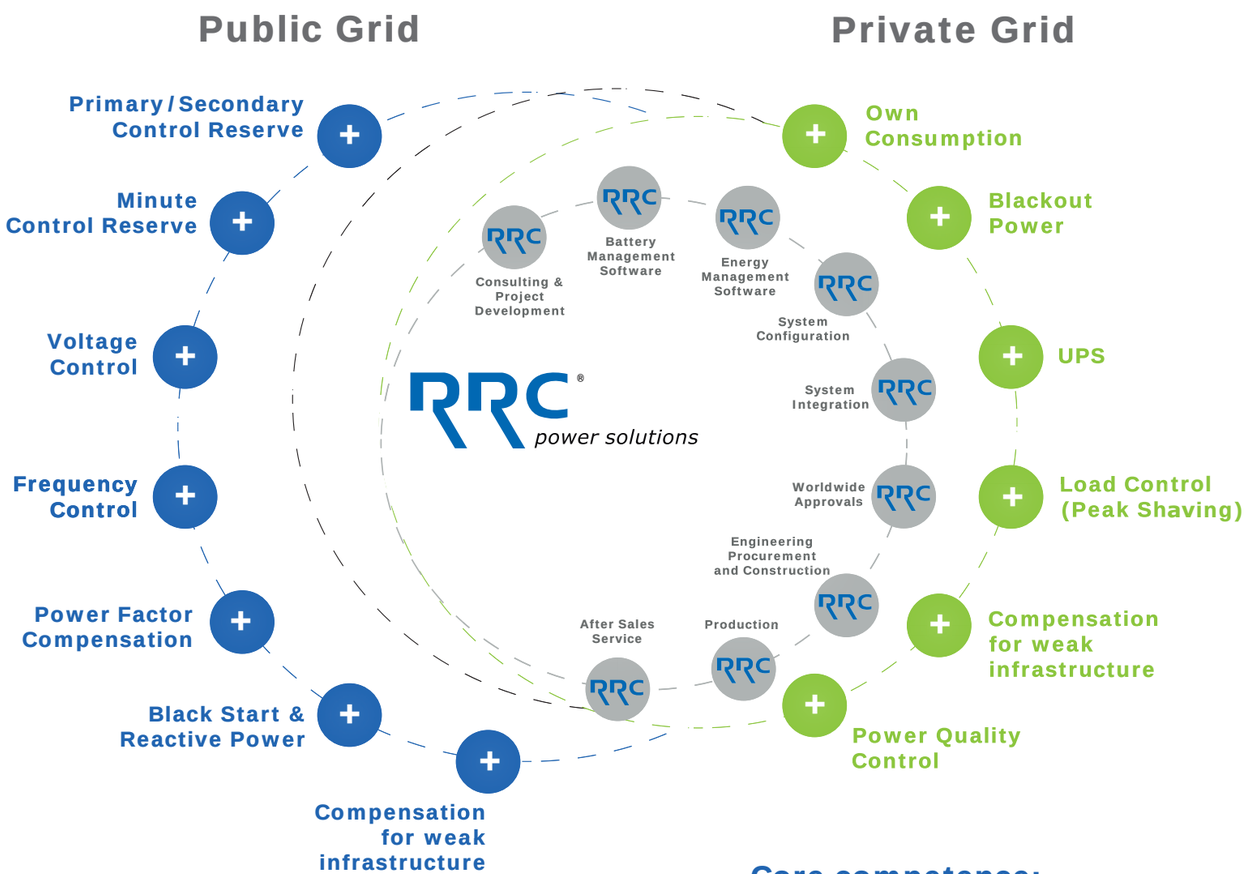
Energy storage systems

- are a key element of a modern, sustainable energy supply, and thus contribute to the realization of the energy transition. They improve supply reliability,
- make possible the transition from fossil fuels to renewable, fluctuating energy sources,
- transfer energy generation from renewable sources to a controllable, variable, and reliable means of energy procurement, and therefore reduce grid load,
- significantly increase internal energy use from renewable sources,
- enable the reduction, even avoidance, and at least postponement of grid development,
- contribute to a better utilization of capacity generation and grid infrastructure, despite increasing energy demand and growth in peak load,
- ensure increased supply reliability in situations where the grid infrastructure is weak,
- take into account tasks such as reactive current compensation, emergency and UPS supply, and decentralized integration of renewable sources,
- open the door to participation in network system solutions and the standard energy market
- are significant key elements towards the development of an intelligent grid infrastructure (Smart Grid): they integrate decentralized generation, procurement from the upstream network, and combine load management into a single, communicating system,
- are scalable to all applications (from 50kWh/50 KW to several MWh/MW),
- can be of modular design, and virtually interconnected
- offer a significant potential for long-term optimization of energy costs,
- **are custom-tailored by RRC to your specific applications.**

RRC offers the solution

- custom-tailored energy storage system
- a complete concept from a single source
- relevant core competence
- project modeling of a large-scale unit.

Our Products and Services



Core competence: Energy Storage

RRC has developed and produced intelligent battery and charging systems since 1989. These are used in industrial and medical applications worldwide, and wherever high operational reliability is demanded. Our portfolio includes modular, scalable energy storage systems for the power industry and large-scale consumers. Well-known business customers place their trust in products from RRC.

The RRC Turn-Key-Solution

- based on long-standing employee experience in the areas of energy economics and technology, renewable energy, system development and realization, business management, production and installation, as well as operational management of large-scale systems.
- includes the following services:
  - Analysis of the supply situation, identification of saving potentials,
  - Integration of local energy sources such as renewables, cogeneration plants, etc.,
  - Scaling, design, delivery, installation and operation of energy storage systems,
  - Load management including Smart Grid,
  - Maintenance, service and battery recycling, procurement,
  - Support for licensing procedures, worldwide homologation.

Model project - Energy storage system

A photovoltaic system with 360 kWp capacity, installed on the roof of a factory, produces around 330 MWh/yr of solar energy. The entire facility, with fire department, garages, woodworking shop, metal-working shop and administration has an annual demand of 300 MWh/yr, with a base load of 20 kW and peak load of approximately 130 kW. Thus, the entire facility's energy consumption is balanced with solar power. During winter, in transitional periods in spring and fall, and at night, the facility is supplied with energy by the local utility.
The 280 kWh / 100 kW energy storage system, tailored specifically to the current usage and generation requirements, should increase mid-year on-site generation usage to at least 60%, and ideally reach 100% during summer operation. PV systems and energy storage systems, taken as a unified Power Pack, offer greater total energy supply and profitability.

The energy storage system is of modular construction, and can be expanded in multiple steps. This means that when additional generation sources come online, such as a cogeneration plant or wind turbine, the storage system can be modified accordingly. As a further example, charging stations for electric vehicles can also be added to the system.

With the assistance of the superimposed management system, a virtual power plant is established at the facility. This plant covers the demand of the connected users, stabilizes the network, and compensates for load peaks and reactive currents. It is directly connected to the upstream 20kV grid via transformer.