



Marco Basili, EPMV DATA Centers & Infrastructure - Global Segment Manager – Data Center, July, 2016

BU Medium Voltage Products

Data Centers & Infrastructure Segment

Medium Voltage Products

Data Center & Infrastructure Segment

- Speaker name Marco Basili
- Speaker title Medium Voltage Business Unit
Data Centers and Infrastructures
Global Segment Manager
- Company name ABB
- Location Rome, Italy

Medium Voltage Products

Full range of offering to make a better electric world

Medium voltage product portfolio



Distribution automation

- Relion® relay family
- Grid automation
- DA Solutions
- SPACOM portfolio
- Software tools and accessories



Apparatus

- Indoor apparatus
- Current limiters
- Ultrafast eart. switch
- Vacuum interruptors
- Sensors
- Inst. transformers
- Outdoor portfolio



Primary switchgear

- Air insulated PSWG
- Gas insulated PSWG
- Railway portfolio



Secondary switchgear

- Air insulated SSWG
- Ring main units



Modular systems

- Metal housing
- Concrete housing
- GRP housing
- eHouses
- Product packaging



Service

- Product life cycle serv.
- Life extension
- Replacement and retrofit
- Asset management
- Spare parts

Enabling a stronger, smarter, greener power network

Medium Voltage Products

Data Center & Infrastructure Segment

Data centers & Infrastructures represent an exciting growth area in our industry

Airport



Road & Tunnel



Data Centers



Arenas & Large Events



Ports



Passengers Buildings



Buildings



Hospitals



Availability, Reliability, Flexibility & Safety.

Medium Voltage Products

Data Center & Infrastructure Segment

Agenda

- 1 **Definitions:** What is a DtC, definitions, classification, drivers, trend
- 1 **Market:** Subsegment, Global Approach
- 1 **Product Strategy:** Main components, applications, MV product strategy
- 1 **Service**



Datacentre

Market trends, Global approach, Value proposition

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Data Center Segment - Sub segments



Enterprise/financial

- This includes a large group of private and **publicly traded companies** in a variety of industries such as **oil and gas** plastics, retail store chains, and power, gas and water **utilities**, but also **Bank, Insurances, Corporation**, large **Utilities** or **Telecom** company that for such reason need to build an own data centers.

Colocation/Commercial

- Many small- and medium-size businesses do not want or cannot afford their own **IT infrastructure** such as data centers and so they outsource their IT needs to colocation companies. These companies provide **IT services**, from web hosting, to enterprise IT hosting, to other businesses. This segment of the data center market is clearly focused on revenues from IT; for them the data centers are the primary business offering.

Hyperscale/Cloud

- Normally Companies such as **Google, Amazon, eBay, Facebook** and others debuted with the Internet boom approximately 15 years ago. Although these companies rely on data centers as their primary assets, their revenue stream varies from advertising to online shopping. They are innovative in their way of building data centers, providing IT services and serving customers including Cloud.

Different Customers = Different requirements

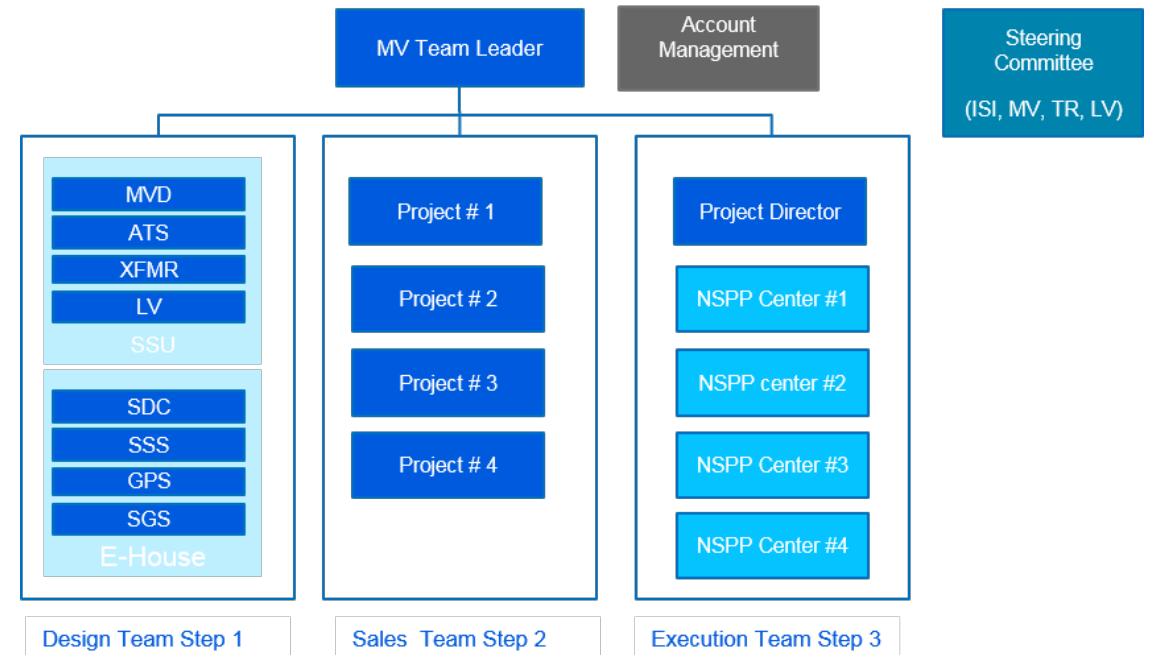
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Data Center Segment

Global approach for a Global projects

- DESIGN
 - Technical solution definition
 - Standardization of technical solution
- SALES
 - Proposing standardized, agreed and shared solution
 - Sales approach by country but following Global directives
- EXECUTION
 - Unique project manager director
 - Using standardized solution to optimise Delivery and performances
 - Project management excellence
 - Post order Global Service organization

Capture Team maximise our success



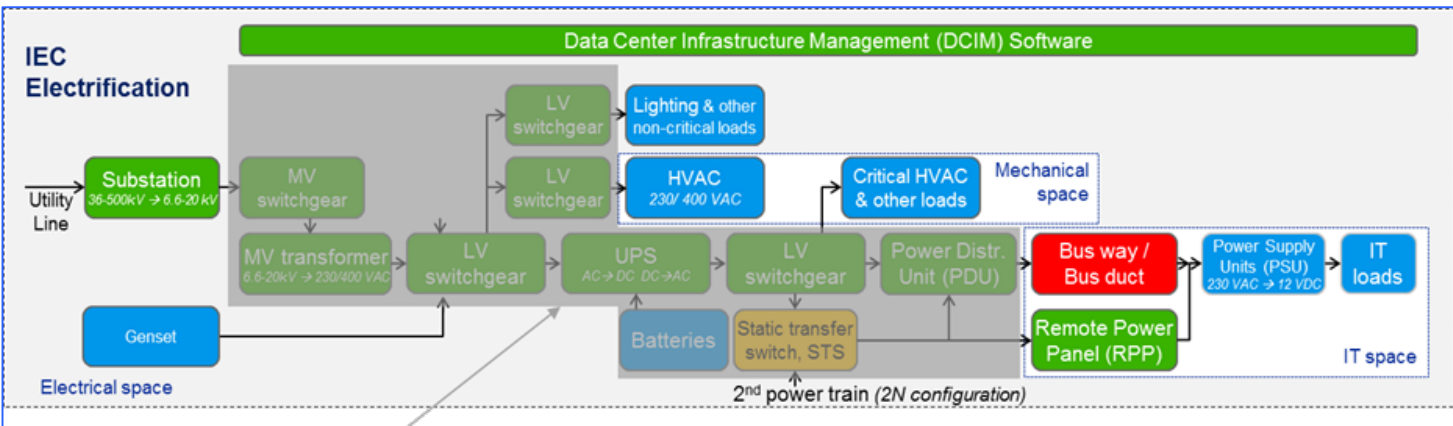
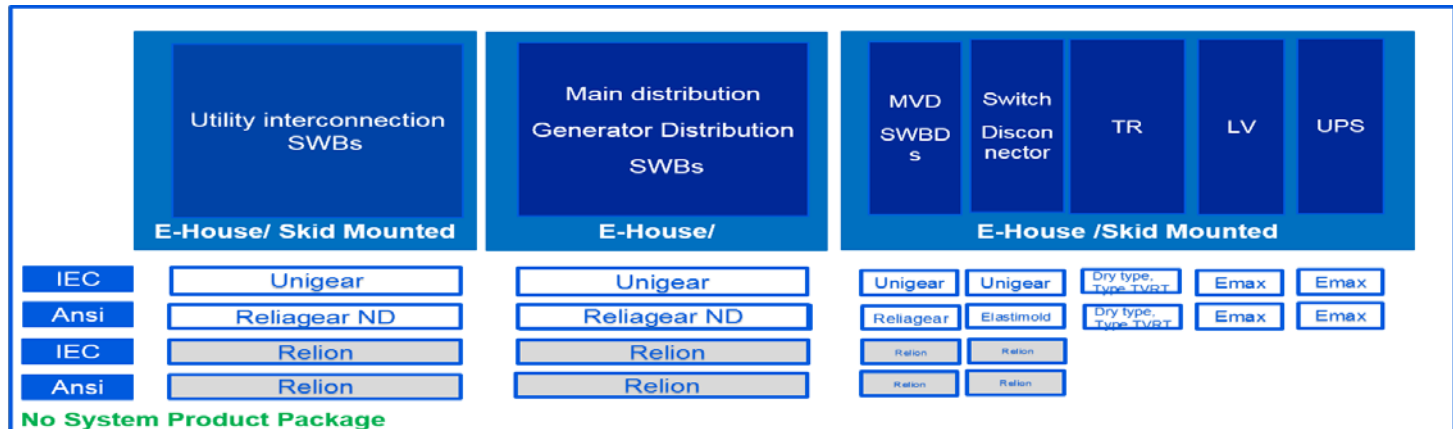
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Data Center Segment

Business Model for Large and Prefabricated DtC

- **Risk Mitigation :**
Transfer of risk from client to ABB for coordinating design interface of all elements in the package to form a optimised single product solution.
- **Reduced Client Resources :**
ABB being responsible for scope of works described above, reduces client manpower to engineer and manage the project.
- **Predictable Delivery & Cost Schedule :**
As majority of works is performed off site, client is insulated from local labour shortages, environmental & industrial relations factors
- **Reduced Site Resources :**
Comprehensive FAT can be performed before delivery reducing site commissioning requirements
- **Simplified Commercial Agreement :**
Single contract for the entire package, reducing requirements for multiple commercial agreements.
- **Single Project Manager :**

Packaging means ONE ABB



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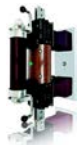
Data Center Segment : Complete Portfolio for different application



Added Value

Safety & reliability

Base proposal

 IS Limiter	 Digital & Eco-efficient SWG	 NSPP & CSS
 Relion	 UFES	 Service
 MV AIS	 MV GIS	 E-House & Skid Mounted

EPMV's complete portfolio For Data Centers

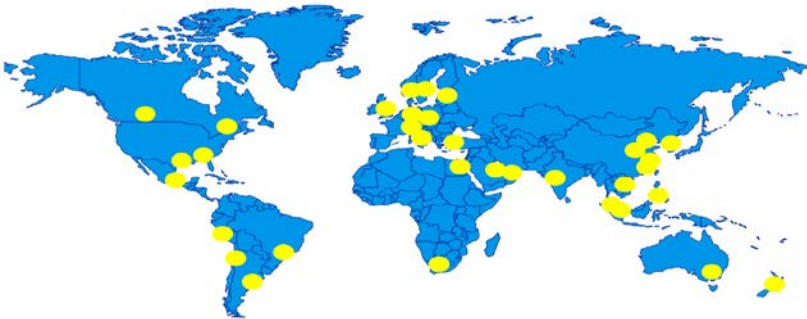
Electrification Products

Data Centers Segment- Global Footprint & Coverage

Modular Systems Capabilities

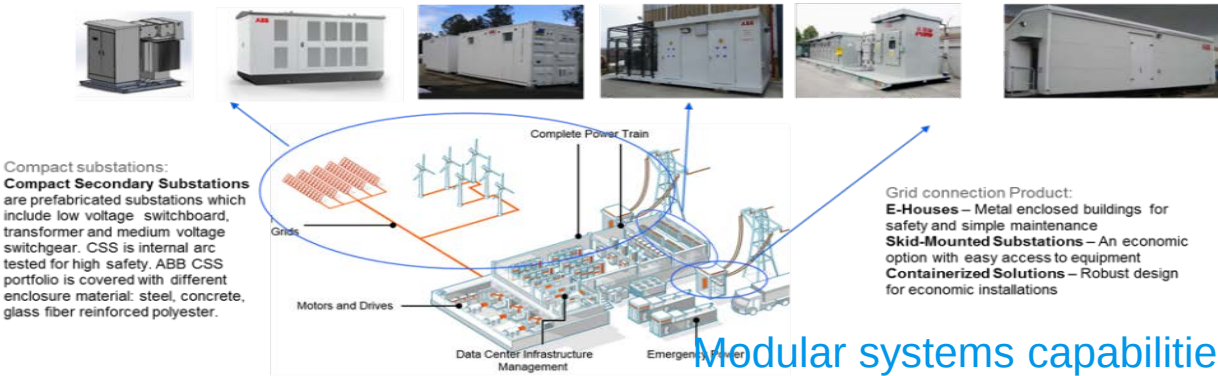
- ❑ Coordination between Medium Voltage, Transformer, Low Voltage Systems, UPS & Drives Business Units to provide a multiple product element offering
- ❑ 12 Functional E-House & Skid units operating globally
- ❑ 30 Functional Product Packaging units operating globally
- ❑ Global Site Services for installation supervision & equipment commissioning
- ❑ This global footprint is strategically mapped to service major EPC's and End Users in target market segments.
- ❑ In addition to fixed operating units, Modular Systems has a GET (Global Engineering Team) function, which provides additional resource for Project Management, Engineering & SCM on major projects
- ❑ Global Site Services for installation supervision & equipment commissioning

Market Country	Type 1	Type 2
North America	US	US 2 US
China	CNABB	CNDMX
India	IN	IN
Singapore	SG	AU
Indonesia	SG	AU
malaysia	SG	AU
Nordics	DE	CZ
UK	DE	CZ
Benelux	DE	CZ
Germany	DE	CZ



Selected Centers of excellence

Global Footprint & Coverage





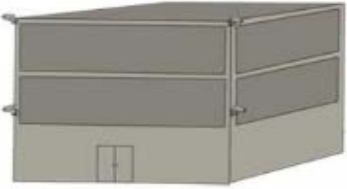
Datacentre

What is a DtC, definitions, classification, drivers, trend

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Data Center – What is it?

A PLACE THAT HOUSES **A LOT** OF COMPUTERS (SERVERS) OFTEN LOOKS LIKE A WAREHOUSE



TENS OF THOUSANDS OF SERVERS!!

THESE SERVERS ARE VERY POWERFUL... TO SAVE SPACE THEY ARE MADE THINNER AND ARE STACKED IN RACKS



↓

BECAUSE THEY ARE SO POWERFUL THEY USE A LOT OF POWER AND COOLING TO MAKE SURE THEY DON'T OVERHEAT



Q: WHEN WOULD THE AVERAGE PERSON EVER USE A DATA CENTER?

A: PROBABLY EVERYDAY!



THAT'S OVER 40 SERVERS IN **ONE** RACK! AND THAT IS EQUAL TO OVER-TWO HOUSEHOLDS OF POWER!



FIBER AND COPPER CABLING



CONNECT ALL OF IT TOGETHER



ANY TIME YOU USE THE **INTERNET YOU ARE ACCESSING A DATA CENTER SOMEWHERE...**

AND THAT IS SOMETIMES KNOWN AS "CLOUD COMPUTING"



DATA CENTERS NEED TO BE UP 24/7 TO MAKE SURE **YOU ALWAYS HAVE ACCESS TO THE COMPANY'S SITE.**

GENERATORS, SAFE LOCATIONS, SECURITY, AND DUAL COOLING UNITS HELP PROTECT FROM HAVING AN OUTAGE.

Q: WHY WOULD I WANT TO ACCESS A COMPANY'S SITE?

A: BECAUSE SHARING PICTURES ON SOCIAL MEDIA IS FUN! AND CHECKING YOUR MAIL KEEPS YOU CONNECTED!

(THOSE ARE JUST A COUPLE OF EXAMPLES)



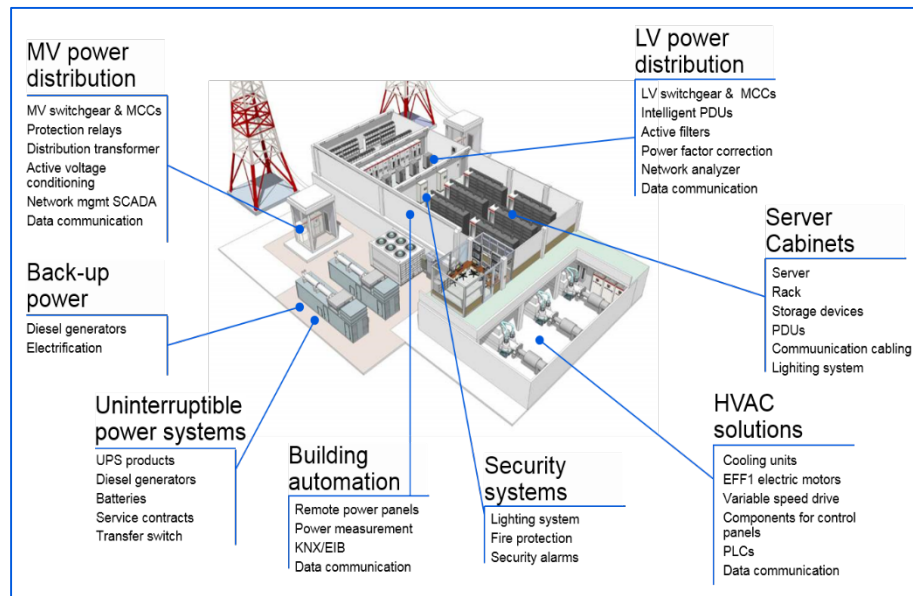
SEE! I TOLD YOU WE ARE PRETTY IMPORTANT!

Vital and security sensitive infrastructure needing reliable cooling and power 365/24/7

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Data Centers Segment

Definitions



- A data center is a facility housing computer systems and associated components. Includes redundant or backup power supplies and communications, as well as environmental controls (e.g., air conditioning, fire suppression) and security devices.
- Some may be small buildings of 200 m², others the size of 15 soccer fields (about 140.000 m²). Some require 500 kW of power, others 100 MW
- For most small businesses, the cloud is a more cost-effective option than a data center.

Vital and security sensitive infrastructure needing reliable cooling and power 365/24/7

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Data Centers Segment

Business continuity is a must

- Availability & Reliability
- Reduction of footprint
- Reduction of project execution time
- Scalability
- Safety
- Flexibility
- Security
- Energy Efficiency
- Concurrent maintainability

Data center performance metrics:

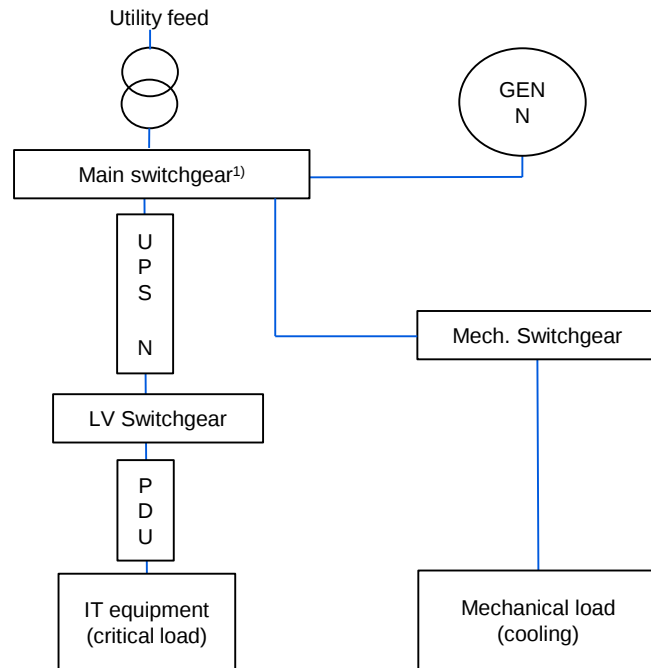
- PUE (Power Usage Effectiveness)
- WUE (Water Usage Effectiveness)
- ERE (Energy Reuse Effectiveness)
- CUE (Carbon Usage Effectiveness)
- DCiE (Data Center Infrastructure Efficiency)
- CADE (Corp. Average Data Center Efficiency)

We need to understand this in order to provide value to our customers

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Data Centers Segment – Typical power Distribution desings

Tier I design N – Very fault sensitive



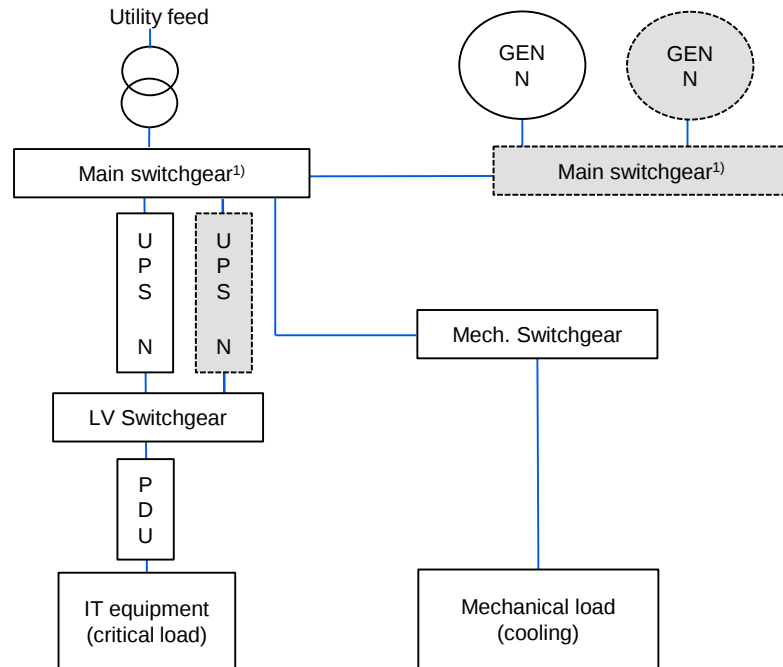
1) In large installations MV

We can help our customers build more reliable Data Centers

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Data Centers Segment – Typical power Distribution desings

Tier II design N +1 – More Fault Tolerant



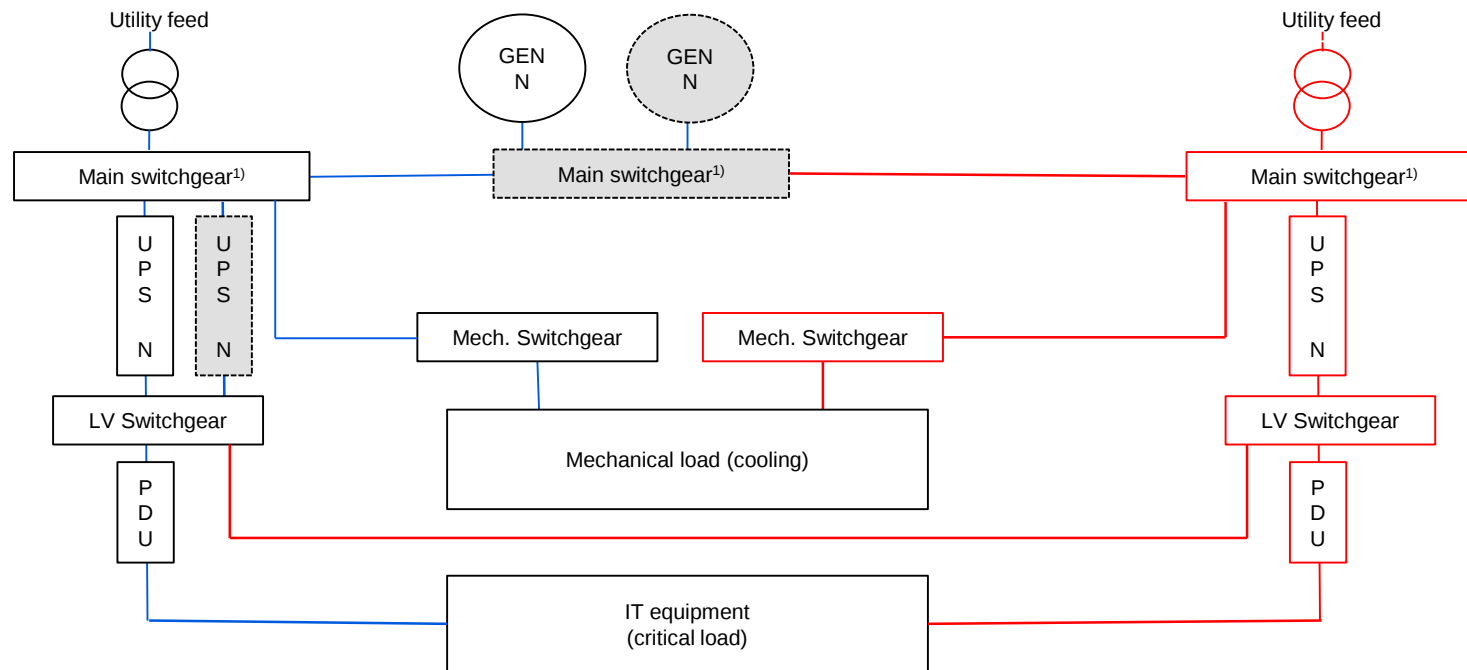
1) In large installations MV

We can help our customers build more reliable Data Centers

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Data Centers Segment – Typical power Distribution desings

Tier III Active Passive design: No UPS in the passive Path – Availability 99.98%



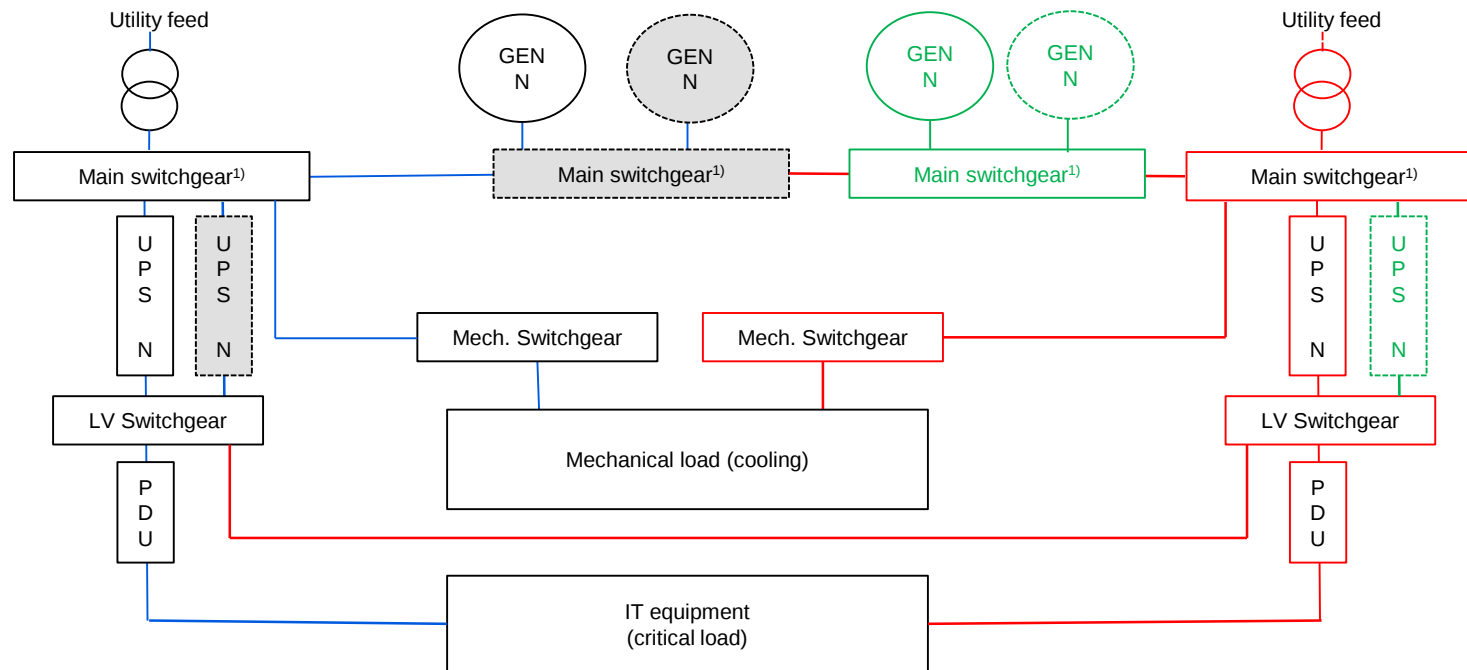
1) In large installations MV

We can help our customers build more reliable Data Centers

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Data Centers Segment – Typical power Distribution desings

Tier III Dual Powered HVAC & fault tolerant Infrastructure Path – Availability 99.99%



1) In large installations MV

Key elements

- Implement system redundancy
- Ensure the condition of the system components
- Identify single points of failure
- Use certified partners to perform service on critical components
- Ensure availability of critical spare parts
- Create disaster recovery plan

We can help our customers build more reliable Data Centers

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Data Center Segment

Drivers generating demand for Data Services

Internet Applications

- Entertainment: music downloads, video-on-demand, on-line gaming, social networks
- E-commerce
- Mobile internet services
- VoIP communications / telephony

Regulations / Government

- Long term storage requirements for financial information, e-mail (Sarbanes Oxley)
- Increased website hosting for public information, online reports

Business IT

- Financial services- digital transactions / on-line banking
- Retail- real time inventories, supply chain management
- Healthcare- electronic medical records
- Transportation employing GPS and real time RFID tracking
- Insurance database need growing, etc.

Disaster recovery

- Need for duplicate data sets / backup driving demand for redundant data center

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Data Centers Segment

New trend

POWER MANAGEMENT

Data centers are emphasizing power management solutions such as DCIM as well as ensuring efficient and environmentally friendly solutions that help companies reduce OPEX associated with energy consumption.

Organizations are rethinking their PUE strategies, which is the ratio of total energy consumption of the facilities and the energy consumption of IT equipment. Companies are trying to match the efficiency to an average of 1.5; therefore, they are investing in integrated refrigerating and power supply solutions.



GREEN DATA CENTERS

Green data centers use practices to achieve greater equipment efficiency, reduced environmental pollution, savings, and positive images for the company. In addition, project developers are slowly implementing environmentally friendly air conditioning systems and increasing the percentage of consumed energy generated with renewable sources.



HIGH-DENSITY DATA CENTERS

High-density data centers use high-performance data center equipment. This equipment is smaller in size, consumes less power, and delivers high-performance results, which increases the overall efficiency of the data center facility. Consequently, enterprises are adopting high-density data centers to benefit from lower operational costs and also lower equipment maintenance costs.



CONTAINERIZED DATA CENTERS

Containerized Data Center is the latest development in the Global Data Center market. Data center service providers are providing data center facilities which are housed in containers.

Containerized data centers can meet the expansion requirements of enterprises at a faster pace than traditional data centers.



Prefabricated and Modularized to save cost and time on site

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Data Centers Segment



AVAILABILITY:

power supply is essential to supply IT system and facilities equipment. A lack of power supply can cause data loss that will turn in a loss of money



FLEXIBILITY:

Modular systems and scalable solutions allow a better fit to actual and future power requirements, with benefic effects on efficiency and power availability as well.



EFFICIENCY:

the great power installed in Data Center impose efforts to maximize the efficiency in order to hold down costs and pollution.



SAFETY:

people protection, fire protection, access control are some of the protection system adopted in data center infrastructure in order to avoid injuries, blackout or data loss



EASE OF MAINTENANCE AND OPERATIONS:

maintenance and good management system are fundamental to ensure reliable operations to critical power systems



MODULARIZATION:

To be fast during execution process, reducing time of installation, wiring and on site test is the must for Data Centers provider

Prefabricated Modules, E-House, Skid solution is MV answer to all above key points

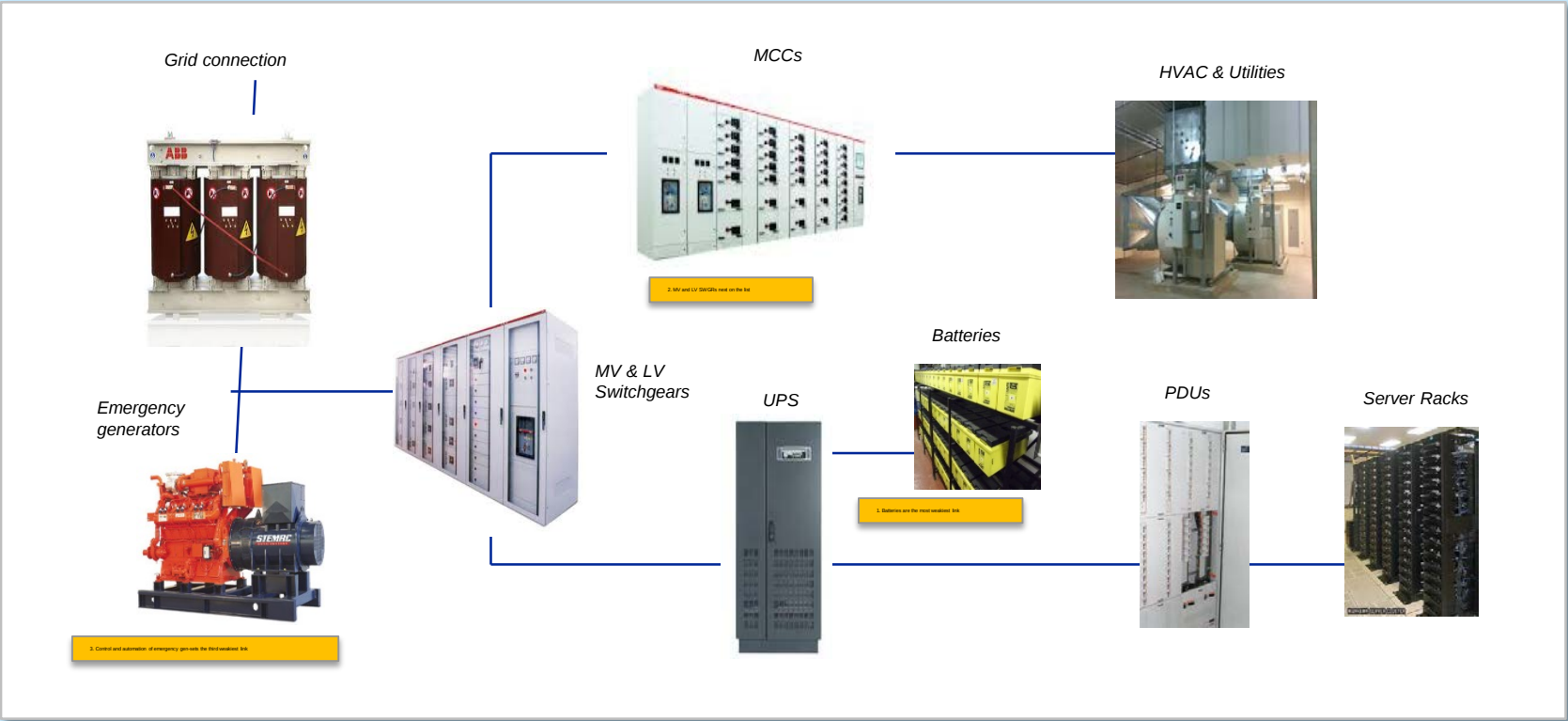
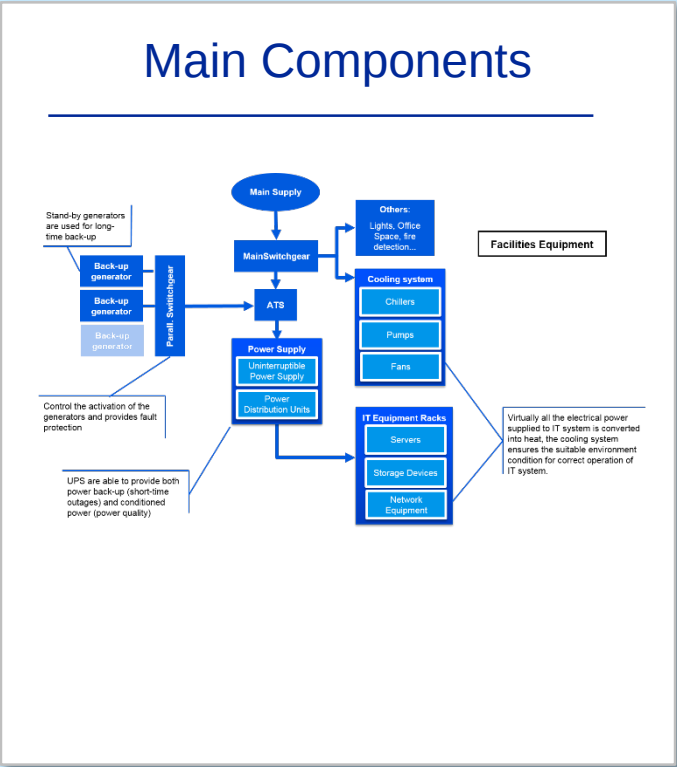


Datacentre

Main components, applications, MV product strategy

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Data Centers Segment



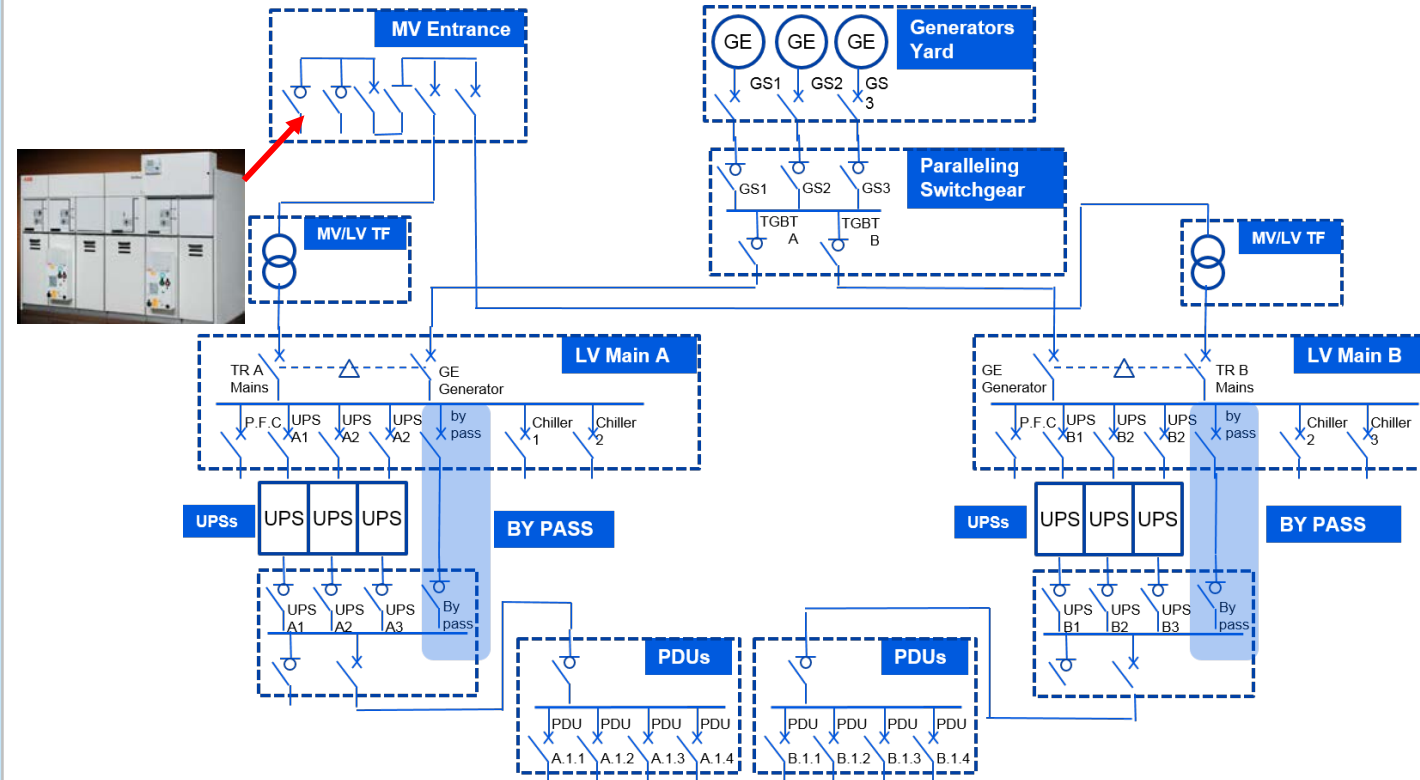
We can help our customers to build and maintain more reliable data centers

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Data Centers Segment

Typical Single Line Diagramm with LV distribution

- MV scope of supply is limited to a small Switchboard (typical AIS Secondary Distribution)
- Package with LV could be an option.
- Oems strategy could be an alternative

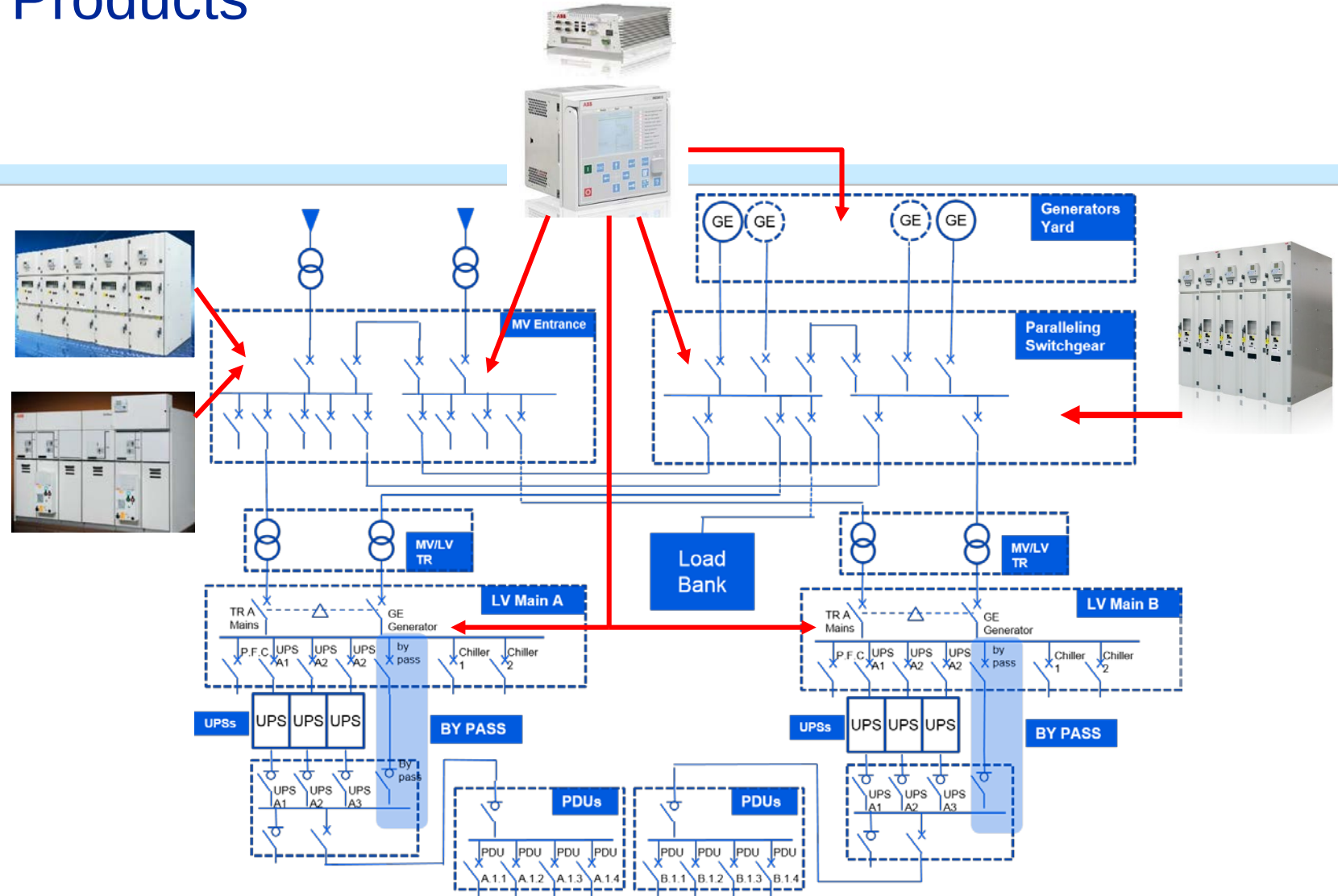


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Data Centers Segment

Typical Single Line Diagramm with MV Gen Set

- GIS and/or AIS Primary Distribution is required
- Protection system is high demanding
- COM600 could be used for interface to DCiM



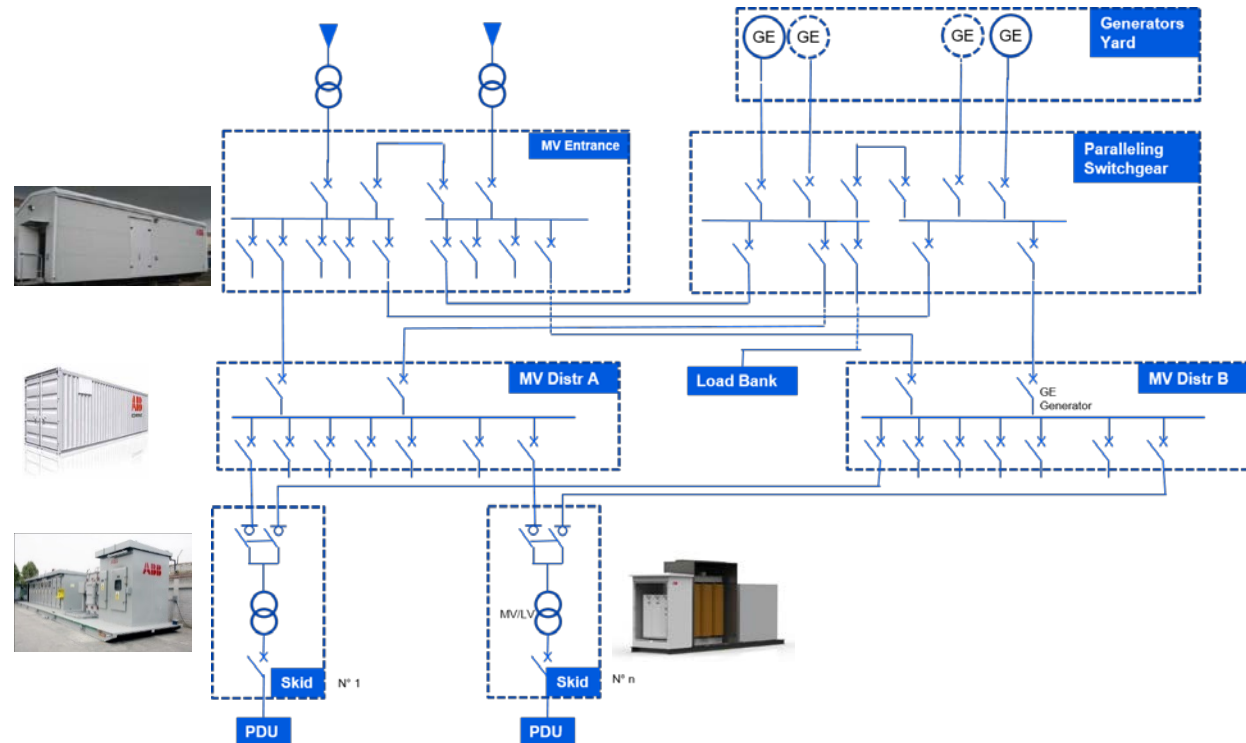
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Data Centers Segment

MV Distribution with Prefabricated modules

- In large scale of Data Centers MV distribution makes lot of sense enabling the cost reduction of copper (one of most important value in DC)
- Prefabricated solution enables High cost reduction in installation, wiring and test on site
- Use of MV /LV Busduct and Busway is preferred.

**MV scope is most important
in Electrification**



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Data Centers Segment

E- House



E-Houses –

Metal enclosed buildings for safety, simple maintenance and Engineering, installation and on site Testing cost reduction

Skid-Mounted substations



Skid-Mounted Substations

A Prefabricated and economic option with easy access to equipment, normally include Medium Voltage Section, transformer and Low Voltage.

Skid mounted substation enables a huge reduction of Installation time , wiring and testing activities on site.

Compact Secondary Substation



Compact substations:

Compact Secondary Substations are prefabricated substations which include low voltage switchboard, transformer and medium voltage switchgear. CSS is internal arc tested for high safety. ABB CSS portfolio is covered with different enclosure material: steel, concrete, glass fiber reinforced polyester.

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Data Centers Segment

UniGear Digital



UniGear Digital

UniGear Digital is based on the well-experienced market leading design of UniGear and makes full use of ABB's RELION communication protocol IEC 61850, combined with the advantages of sensor technology. All this leads to substantial benefits for the user:

- Flexibility - changing loads are managed in the software without changing hardware
- Efficiency - less losses, lower cost of operation
- Increased reliability and safety

Motor Control Centers



UniGear MCC

up to 12 kV, 50 kA

Designed for the highest degree of safety and reliability, the UniGear MCC provides for maximum ease of use. All operations and maintenance actions are made from the front of the panel, which is equipped with mechanical safety interlocks between vacuum contactor and earthing switch

- Slim and compact panel only 400 mm wide
- Wide range of applications
- Fused vacuum contactor with magnetic actuator
- Fitted with safety interlocks and visible earthing connection

Gas Insulated Switchgear



ZX Family

up to 42 kV, 40 kA

GIS provides ultimate protection to MV electrical distribution

- All "live" parts are completely protected from external influences like humidity, dust and vermin
- Provides safest operating conditions over extended lifetime while minimizing maintenance
- Saving space in particular at higher voltage levels
- Easy "plug & play" installation

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Data Centers Segment

Air Insulated Secondary Switchgear



UniSec

UniSec indoor Air-Insulated switchgear for Medium Voltage secondary distribution up to 24kV.

UniSec metal-enclosed air-insulated switchgear is based on a highly flexible, modular concept with fewer parts and standardized solutions that can be readily configured to meet the specific needs of each application. This approach reduces training and maintenance requirements, ensures fast installation and facilitates future expansion to meet changing needs. UniSec offers highest level of safety with different solutions in terms of Internal Arc classification and Safety Interlocks.

Gas Insulated Secondary Switchgear



SafeRing / Safeplus

is a SF6 insulated ring main unit / Compact switchgear platform for the secondary distribution network up to 40,5kV.

Together, SafeRing/ SafePlus provides a complete, flexible and compact switchgear system solution. It is a completely sealed system with a stainless steel tank containing all the live parts and switching functions. This ensures a high level of reliability as well as personnel safety and a virtually maintenance-free system.

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Data Center Segment

Relion®



Relion®

Numerical relays are based on the use of microprocessors.

A big difference between conventional electromechanical and static relays is how the relays are wired. Electromechanical and static relays have fixed wiring and the setting is manual. Numeric relays, on the other hand, are programmable relays where the characteristics and behavior can be programmed. Most numerical relays are also multifunctional.

- IEC61850 Native technology enables GOOSE communication
- Self-checking facility
- Low burden relays improve accuracy
- Adaptive relaying schemes
- Permit storage of historical data
- Time stamping
- Complete wide of protection functions for Feeders, Transformers, Busbars, Generators & Motors etc.

COM600



COM600

Web server functionality providing access to substation processes, operations and relays via a web browser (web HMI)

Substation Automation function and its features enabled by default

Process visualization based on web HMI

Alarms and events

IEC 61850-based integration to ABB or third party relays

Remote relay parameter setting using SPA protocol or IEC 61850

Relay disturbance record upload

Operational and user security

BU Medium Voltage Products

Data Center Segment

IS Limiter



IS-Limiter

IS-Limiter, the ultra fast solution for handling a short circuit current

The worlds fastest limiting and switching device, detect and limit a short circuit current during it's first currents rise, so that the maximum short circuit current will never be reached.

In case of a short-circuit-fault this fast-acting switching device triggers a small charge to open the main conductor, which is designed to carry high operating currents in normal condition. The short circuit current commutates to a parallel fuse with high breaking capacity, which limits the short-circuit current during the first rise within extremely short times.

The Is-Limiter is a unique solution to limit short circuit currents up to 210kA rms while handle operation currents up to 4000A. The wide range of application up to 40.5kV involves from power supply application, industry applications through special applications such as platforms, IPP's or applications with ultra fast switching requirements.

Considering the IS-Limiter on the early engineering phase of a new project or including on the extension of an existing system, the Is-Limiter is able to create a technical and economical benefit to our clients.

UFES



Ultra-Fast Earthing Switch UFES - active internal arc protection for switchgear

innovative arc flash mitigation in less than 4 ms: the highest possible level of arc flash protection for personnel and equipment, maintenance of secure power supply and the reduction of production stoppages.

The occurrence of an arc fault, the most serious fault within a switchgear system, is mostly associated with extremely high thermal and mechanical stresses in the area concerned. A new, active arc fault protection system is based on the know-how gained from decades of experience with the ABB vacuum interrupter and IS-limiter technology. This latest arc fault mitigation technology now effectively helps to avoid these negative effects if a fault should occur.

The Ultra-Fast Earthing Switch of type UFESTM is a combination of devices consisting of an electronic unit and the corresponding primary switching elements which initiate a 3-phase short-circuit to earth in the event of a fault. The extremely short switching time of the primary switching element in conjunction with the rapid and reliable detection of the fault, ensures that an arc fault is extinguished almost immediately after it arises (Extinguishing time < 4 ms after detection).

The UFES electronics is available in 2 designs. In this portfolio, the electronic detection and tripping unit (DTU) type QRU1 provides an expandable complete solution with internal light and current detection, which is able to protect small protection areas without any additional devices.

On the other hand, the electronic tripping unit (TU) type QRU100 uses only external detection units for monitoring of the protected area. In this context, the TU suits ideally for the connection to the ABB arc protection system type REA. Compatible and accordingly tested interfaces are available for this purpose.



Datacentre Service

EP Service

Equipment and needs

Equipment

- MV breakers, switchgear, relays
- LV breakers, switchgear
- ATS



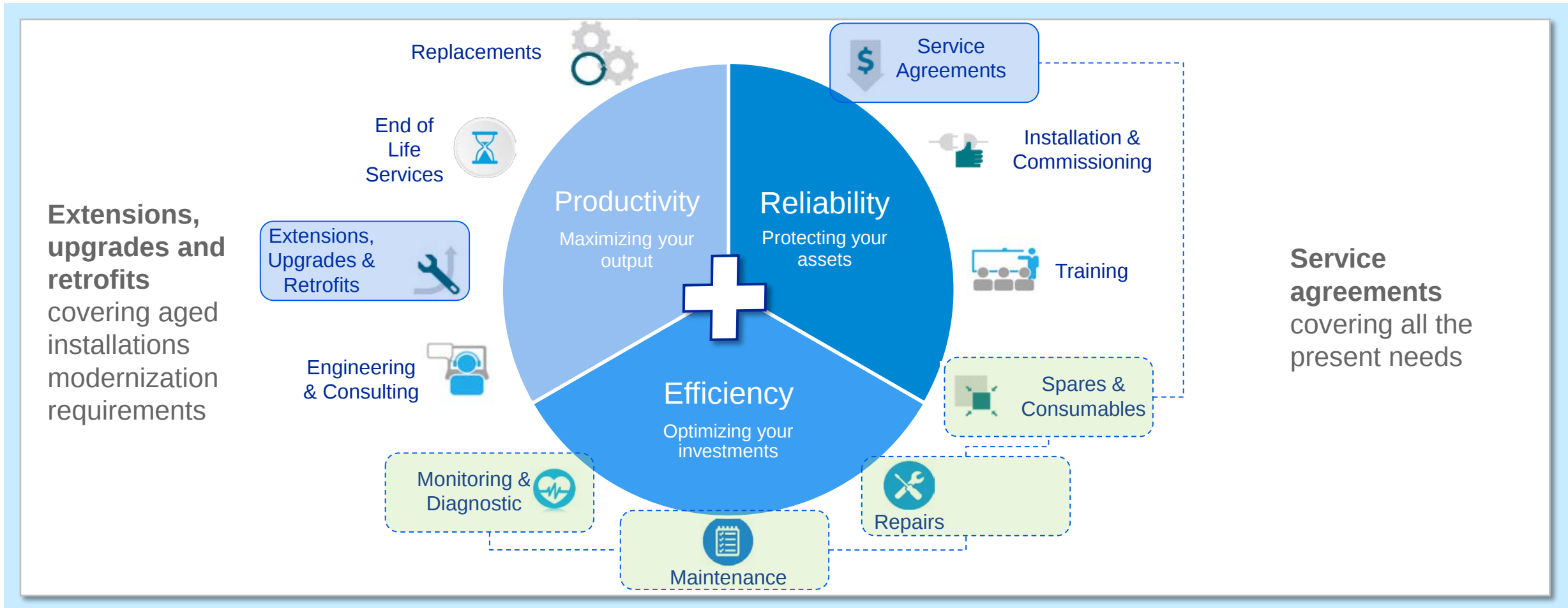
Needs

- Minimize the risk of power outages
- Maximize equipment availability
- Keep the electrical system updated



EP Service

Ready-to-use service offering



EP Service

Power Care

Power Care	Entry Level	Level 1	Level 2	Level 3	
Skills Development Services	Product Training List	Product Training	Application Training	Coaching Services	 Repairs
Emergency Maintenance Services	Single Point of Contact	Technical Support with agreed response time	Call-out Support with agreed response time	Spare Parts Assessment and Management	 Spares & Consumables
Diagnosis & Condition Assessment	Documentation of Installed Base and Preliminary Survey	Asset Condition and Risk Assessment	Asset Monitoring	Remote Asset Monitoring	 Monitoring & Diagnostic
Self-Maintenance Services	Installed Base Life Cycle Status Report	Manuals and Instructions On-line	On-Line Support for Self-maintenance	File Storage	
Delivered Maintenance Services	Periodic Technical Assessment	Protection and Control Engineering Services	Switching Apparatus Engineering Services	Full Switchgear Engineering Services	 Maintenance

Power Care is available for HV, MV, LV and TR equipment

EP Service

Power Care

Single frame

- Electrification equipment service requirements under a single frame agreement.
- All assets managed in one place called Power Care portal ([demo](#)).
- Easy and quick access to installation details and service activities tracking.

Global coverage

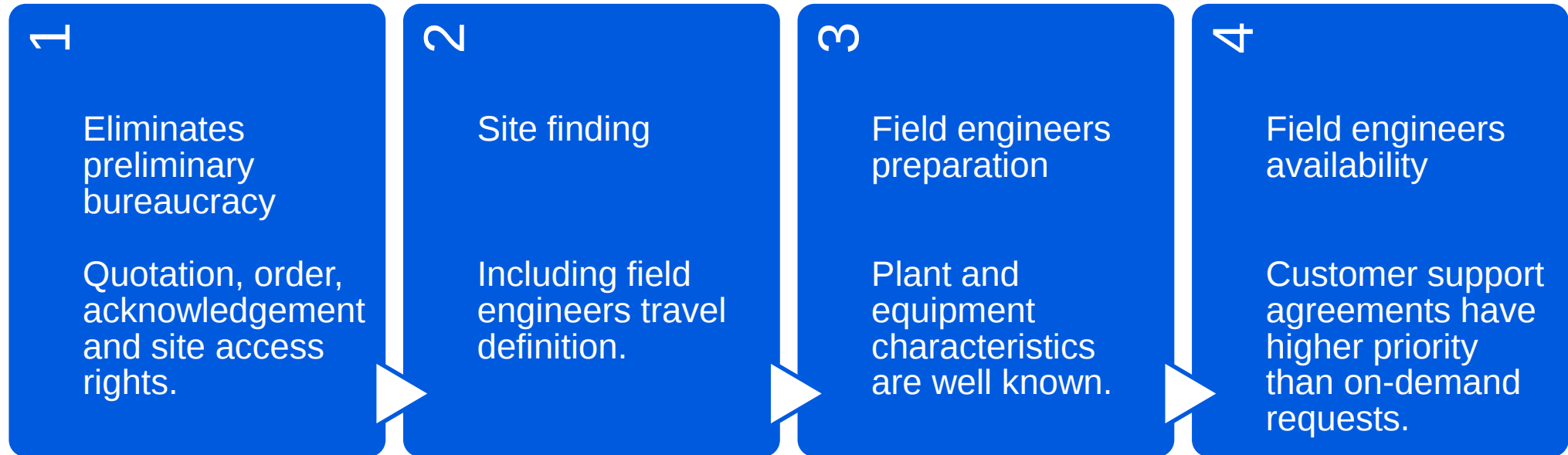
- ABB provides services through its units' network all over the world:
 - EPMV → 50 units
 - EPES → 38 units
 - EPPC → 23 units

Effectiveness

- Multi year agreement.
- Yearly budget easy to plan.
- Convenient.

EP Service

Power Care



Power Care agreement support faster response times

EP Service

Extensions, upgrades and retrofits

Retrofit solutions

LV retrofit
example



MV retrofit
example



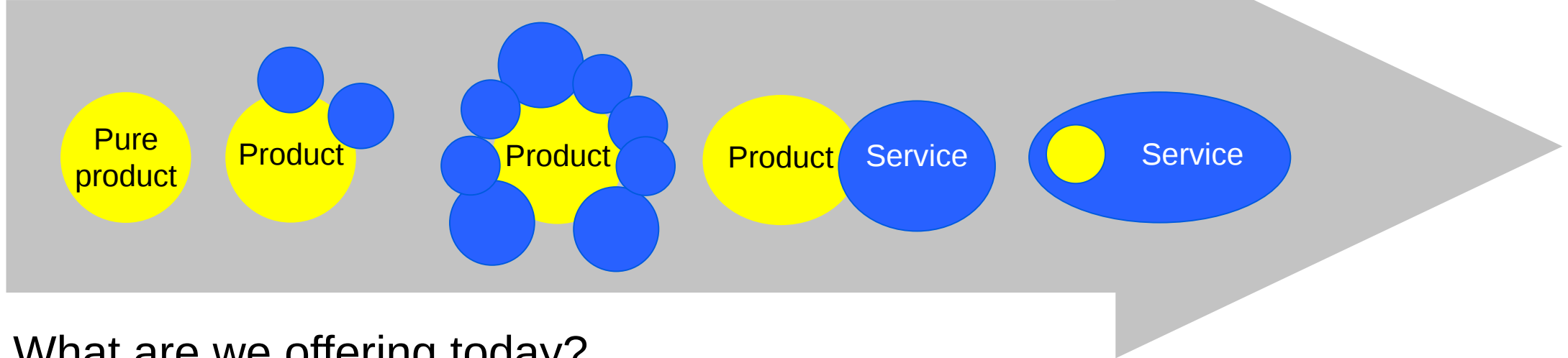
Breakers retrofitting solutions provide several advantages:

- Strong fault risk reduction
- Improved operator protection, upgrade of plant protection and reliability based on last generation circuit breakers
- Life-time extension
- Maximized up-time
- Limited capital investment and maintenance and repair cost reduction
- Monitoring & Diagnostic integration – remote cloud services

EP Service

Needs vs offering

What are the datacenter customers looking for?



What are we offering today?

Service as new-equipment business enabler

EP Service

Actions proposal

Short-term

Add Power Care basic unpriced offer to all new quotations.

Further develop the quotations in case of customer interest.

Medium-term

Add EP Service offering proposal to ABB datacenter documentation and webpages.

Set bilateral meetings ABB-datacenter owners to explore their wish to move from **pure** products to **servitized** products.

Long-term

Offer servitized products only.

Sign global Power Care support agreements.

Power and productivity
for a better world™

