BU Medium Voltage Products
Data Centers & Infrastructure Segment
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<th><strong>Speaker name</strong></th>
<th>Marco Basili</th>
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<td>Global Segment Manager</td>
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<td><strong>Company name</strong></td>
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Medium Voltage Products
Full range of offering to make a better electric world

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.
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Data Center & Infrastructure Segment

Agenda

1. **Definitions**: What is a DtC, definitions, classification, drivers, trend
2. **Market**: Subsegment, Global Approach
3. **Product Strategy**: Main components, applications, MV product strategy
4. **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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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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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 an 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**: Business Model for Large and Prefabricated DtC.
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Data Center Segment: Complete Portfolio for different applications

- Added Value
- Safety & Reliability
- Base Proposal

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

Selected Centers of excellence

### 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

Global Footprint & Coverage
Datacentre
What is a DtC, definitions, classification, drivers, trend
Data Center – What is it?

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

Tier I design N – Very fault sensitive

We can help our customers build more reliable Data Centers

1) In large installations MV
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Data Centers Segment – Typical power Distribution designs

We can help our customers build more reliable Data Centers

Tier II design N +1 – More Fault Tolerant

1) In large installations MV
BU Medium Voltage Products
Data Centers Segment – Typical power Distribution designs

We can help our customers build more reliable Data Centers

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

Utility feed

Main switchgear

LV Switchgear

Mech. Switchgear

Mechanical load (cooling)

IT equipment (critical load)

Utility feed

Main switchgear

LV Switchgear

Mech. Switchgear

1) In large installations MV
We can help our customers build more reliable Data Centers
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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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 Modularizated to safe cost and time on site
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**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.

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

**EASE OF MAINTENANCE AND OPERATIONS:**
maintenance and good management system are fundamental to ensure reliable operations to critical power systems.

**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.

**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.

**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

Main Components

Grid connection
MCCs
HVAC & Utilities

MV & LV Switchgears
UPS

Batteries
PDUs
Server Racks

Emergency generators

1. Batteries are the most weakest link
2. MV & LV SWGRs next on the list
3. Control and automation of emergency gen-sets the third weakest link

We can help our customers to build and maintain more reliable data centers
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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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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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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 preffered.
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- **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.

- **E-Houses:**
  Metal enclosed buildings for safety, simple maintenance and Engineering, installation and on site Testing cost reduction.

- **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.
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
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Data Centers Segment

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.

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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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
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
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.

IS-Limiter

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

The world’s 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.
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

Extensions, upgrades and retrofits covering aged installations modernization requirements

Productivity
Maximizing your output

Reliability
Protecting your assets

Efficiency
Optimizing your investments

Service agreements covering all the present needs

- Extensions, Upgrades & Retrofits
- Engineering & Consulting
- Monitoring & Diagnostic
- Repairs
- Maintenance
- Service Agreements
- Installation & Commissioning
- Training
- Spares & Consumables
- End of Life Services

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October 6, 2016
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# EP Service

## Power Care

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<td>Protection and Control Engineering Services</td>
<td>Switching Apparatus Engineering Services</td>
<td>Full Switchgear Engineering Services</td>
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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

1. Eliminates preliminary bureaucracy
   Quotation, order, acknowledgement and site access rights.

2. Site finding
   Including field engineers travel definition.

3. Field engineers preparation
   Plant and equipment characteristics are well known.

4. Field engineers availability
   Customer support agreements have higher priority than on-demand requests.

Power Care agreement support faster response times
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™