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DATA CENTER SOLUTION DAY 2023 | JAKARTA | 19 OCTOBER 2023

# Global data center trends and the landscape for Indonesia and medium-voltage solutions for Indonesia market



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# Global data center trends and the landscape for Indonesia

Kent Chow, Data Center Segment Leader for the AMEA Region, Electrification

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# Global data center trends and the landscape for Indonesia

Presenter



## **Kent Chow**

Data Center Segment Leader for the AMEA Region.

Focus on enabling data center customers to realize scalable, energy efficient and sustainable infrastructure in a mission-critical environment.

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# Agenda

1. Introduction
2. Key Trends
3. Setting the stage
4. Data center market buyer trend
5. Prefabricated Electrification Solution for data center
6. Medium Voltage solutions for Indonesia market

# Data center portfolio

## Low Voltage Power Distribution

- LV Switchgear
- LV Switchboards
- Electronic relays & controls
- LV Power and lighting panels
- Meter, monitoring & signaling
- Busway
- Arc flash protection
- LV MCC
- Low voltage breakers

## White space electrical solutions

- Power Distribution Units (PDUs)
- Remote Power Panels (RPPs)

## Critical Power

- Uninterruptible Power Supplies (UPS)
- Static transfer switches (STS)
- Automatic Transfer Switches (ATS)

## Installation Products

- Cable tray
- Cable and wire management
- Grounding and bonding systems
- Mechanical and compression wire termination
- Fittings

## Cooling system components

- Variable frequency drives
- Variable speed drives
- High efficiency motors
- Enclosed switches
- PLC automation

## Medium Voltage Primary & Secondary Distribution

- Air insulated MV switchgear
- Gas insulated MV switchgear
- Protection relays
- Protection & safety
- Control systems
- Paralleling switchgear (PSG)

## ABB Ability Digital Data Center Operations

- Data Center Automation
- DCA Edge Solution
- Electrical power management system
- Energy and Asset management
- Smart building solutions
- Condition monitoring

## Medium Voltage Substations

- AIS & GIS switchgear
- Control systems
- Prefabricated modular data center solutions (eHouses & skids)
- Outdoor breakers

## Alternate power sources

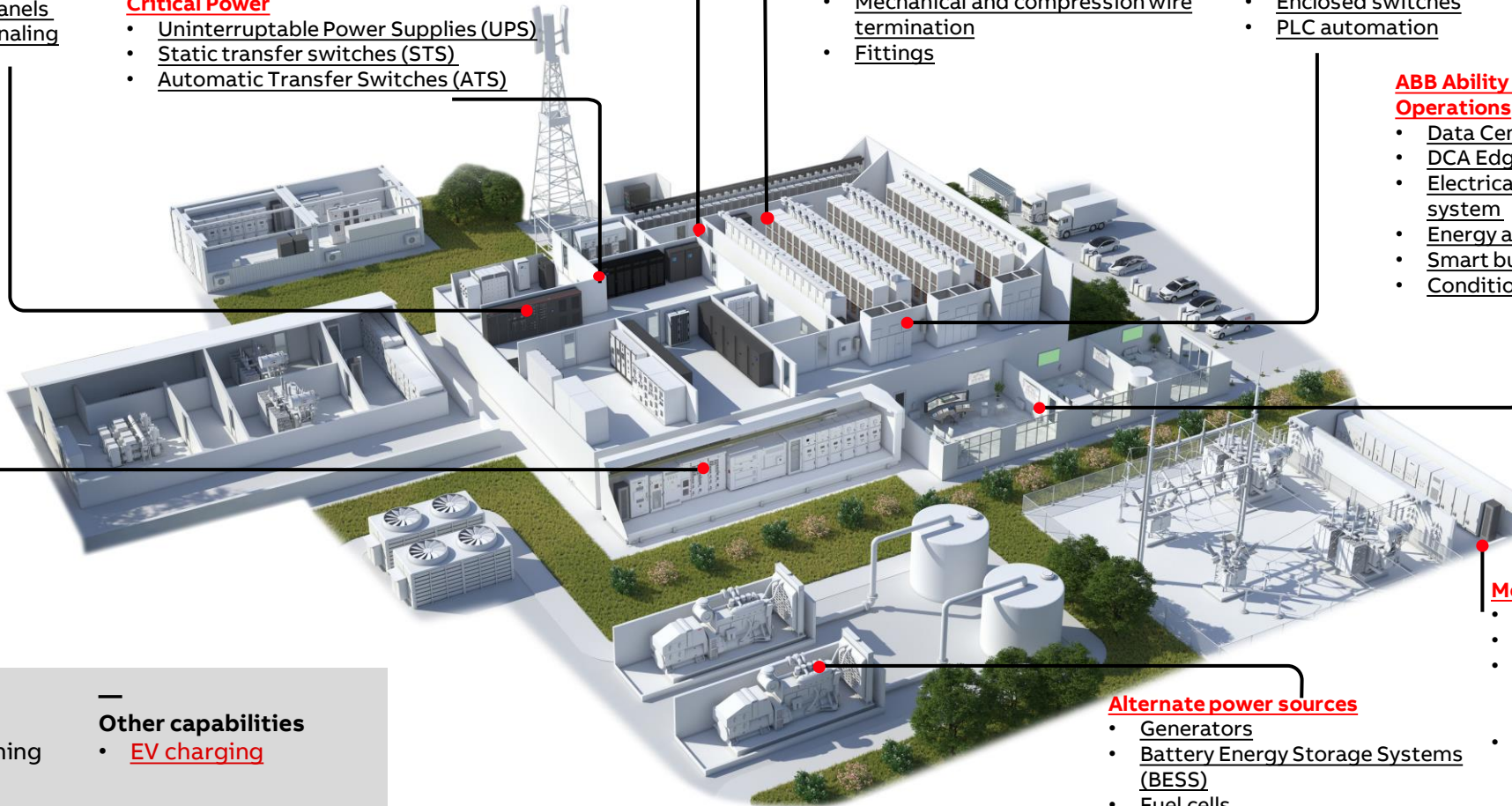
- Generators
- Battery Energy Storage Systems (BESS)
- Fuel cells
- Microgrids
- Solar power solutions
- Wind power solutions

## Service & support

- Installation & commissioning
- Consulting services (engineering studies)
- Retrofits and upgrades
- Digital upgrades

## Other capabilities

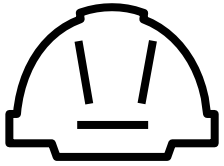
- EV charging



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# ABB's solutions

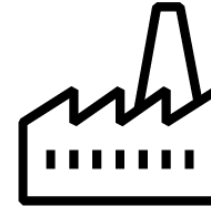
Our value propositions



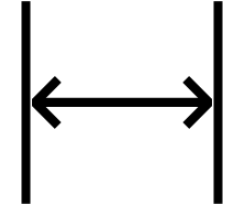
Improve safety and security



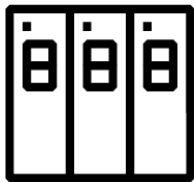
Cost effective: cost savings in electrical infrastructure



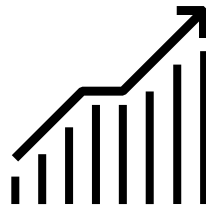
Factory tested and easy to install



Space savings with selected products



Modularity, flexibility and scalable solutions



Enhance TCO and asset intensity as the key to profitability and growth



Connectivity and digital



Local service centers

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# Hyperscale data center

World's largest internet company

## Singapore

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### Customer Brief

An American multinational technology company focusing on artificial intelligence, online advertising, search engine technology, cloud computing, computer software, quantum computing, e-commerce, and consumer electronics

**ABB Singapore supplies** 66 kV HV GIS SWGR and Power Trafo, 22 KV Unigear GIS MV SWGR ( 50 cubs), 400 V MNS-R LV SWGR (257 cubs), 2.85 MVA Dry Trafo (22units) with Service level agreement (SLA) with 2-hour response time (on site)

### Customer benefits:

- Consistence design and operational practices across Asia Pacific with proven installed based
- Comprehensive service level agreement (SLA) covering full electrification scope



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# Colocation provider

Multiple sites across Australia

## Australia

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### Customer Brief

An ASX200-listed technology company enabling business transformation through innovative data centre outsourcing solutions, connectivity services and infrastructure management software. As Australia's leading independent data centre operator with a nationwide network of Tier III and Tier IV facilities, the data center provides enterprise-class colocation services to local and international organizations.

**ABB Australia** supplies High Voltage, Medium Voltage Switchgear, Transformers, Low Voltage Switchgear, Bust-duct and Controls with ABB Abilities Automation.

### Customer benefits

- Strategic partnership with ABB to achieve deep supply chain collaboration meeting tight project schedule
- Reduced risk with improved engineering coordination and project execution





# Telco Data Centre

Deploying leading digital technologies

## Malaysia

### Customer Brief

A national connectivity and digital infrastructure provider and the country leading integrated telco; offering a comprehensive suite of communication services and solutions in fixed (telephony and broadband), mobility, content, WiFi, ICT, Cloud and smart services.

**ABB Malaysia** supplies Low Voltage MNS Switchgears, Iso Trans & Intelligent PDUs solution

### Customer benefits

- Energy consumption cut by at least 15 percent
- Reduction in operating cost
- Improved reliability, flexibility, efficiency and safety



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# Asia's digital diet

Our region in numbers

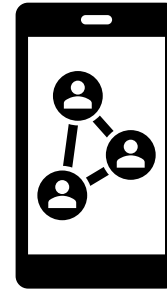
**~4.3bn**

Current APAC population



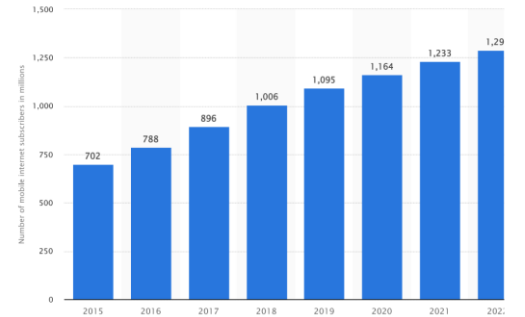
**96%**

Mobile network coverage in APAC



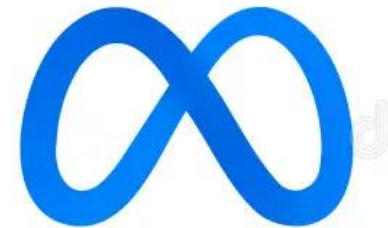
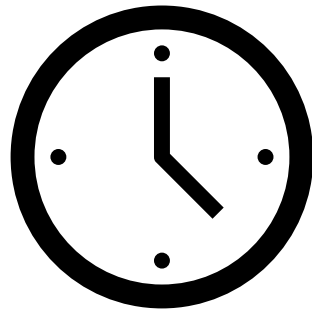
**1.29bn**

Mobile internet users in APAC



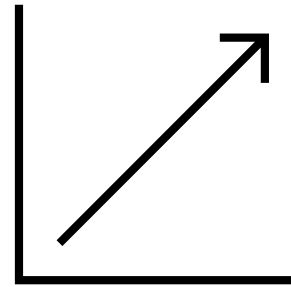
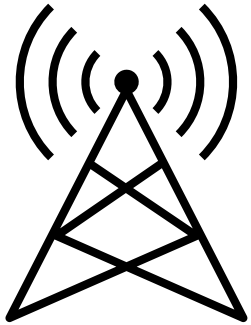
**~ 6 hours**

Average time spent daily on online media



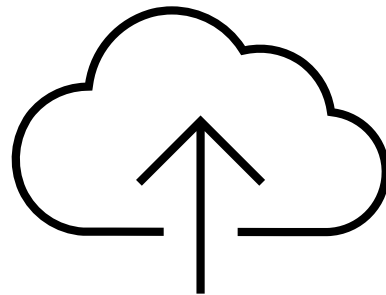
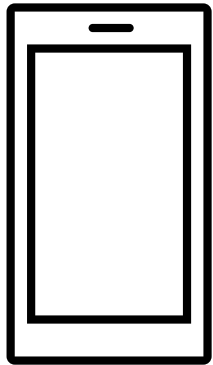
Leading mobile apps based on number of downloads

# Smart phones driving data center growth



APAC's telco networks have developed faster and more evenly than the data center market. Most countries in the region have relatively good networks

Smart phones and apps: key driver in data center and cloud growth



Smart phone use is high across mature, emerging and frontier markets

Data center market now growing to match the proliferation of smart phones in every country

# Data center market forces

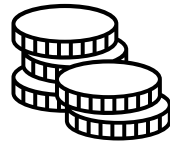
## Legislation & compliance

- Government
- Policy
- Enforcement



## Colocation & consolidation

- Supply / demand
- New tech correlated to size and cost



## Growth of cloud

- Availability zone
- Hyperscale builds different
- Speed to market



## Efficiency & sustainability

- PUE < 1.3
- Higher operating temperature
- Clean energy



## Increasing rack density

- AI, big data, IOT, etc mean higher density deployment
- Infrastructure changes



## Edge / modular data centers

- Reduce latency
- Fast deployment time



## Emerging markets

- Big significant growth
- Open to international engagement

# Data Center power requirements

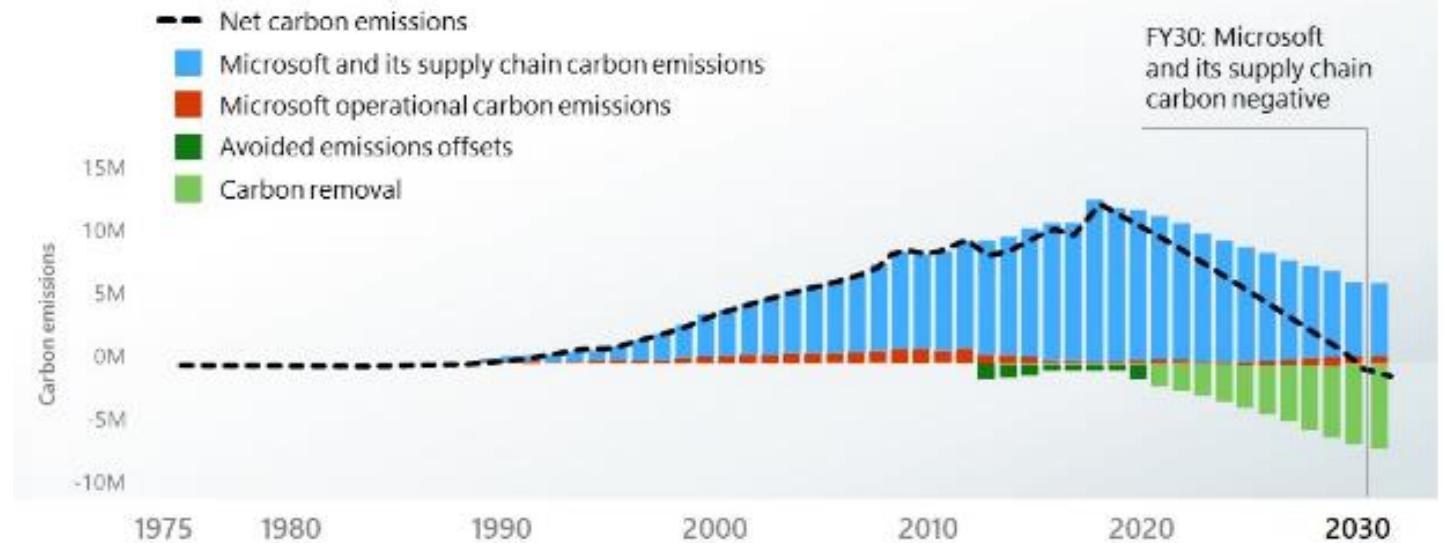
## Global Key trends

### Sustainability

- Sustainability targets set by hyperscale data centers
- New technologies and investments
- Alternative sources of energy

### Microsoft's pathway to carbon negative by 2030

Annual carbon emissions



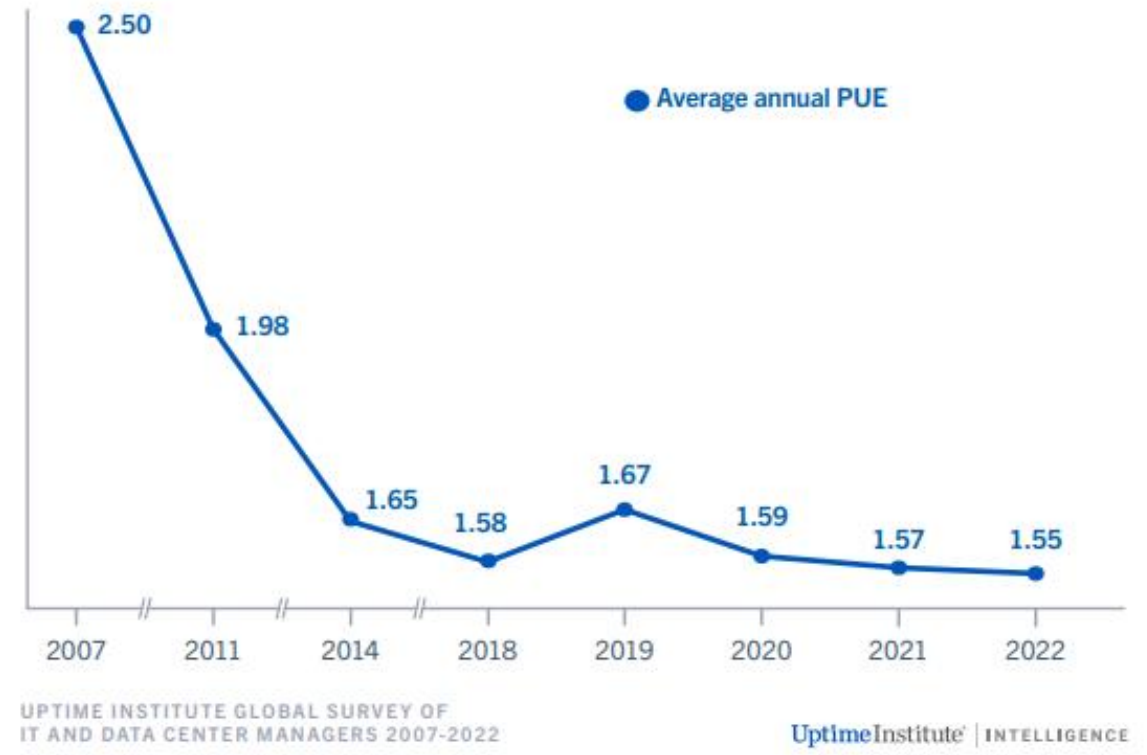
# Data Center power requirements

## Global Key trends

### Energy efficiency

- Actions are already taken by data centers to improve energy efficiency
- Further actions are needed to improve energy efficiency

What is the average annual PUE for your largest data center? (n=669)



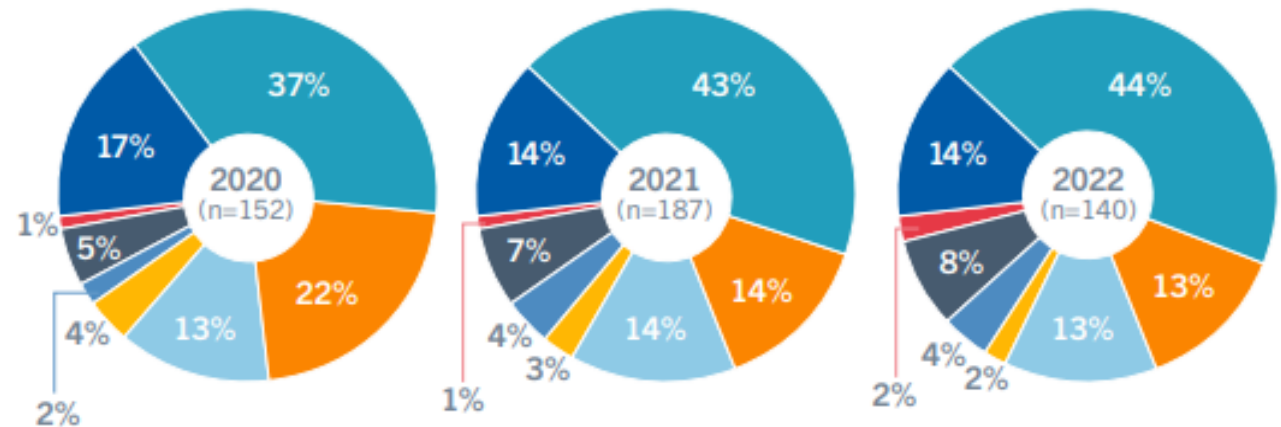
# Data Center power requirements

## Global Key trends

### Uptime & reliability

- Still main priority for data centers
- Maximize reliability with minimum investment
- Use of new technologies

What was the primary cause of your organization's most recent impactful incident or outage?



(All figures rounded)

UPTIME INSTITUTE GLOBAL SURVEY OF  
IT AND DATA CENTER MANAGERS 2020-2022

UptimeInstitute® | INTELLIGENCE



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# Setting the stage - APAC

Strong growth potential in APAC, particularly in underserved and large domestic markets

Key Markets	Australia	Japan	Singapore	India	Indonesia	Philippines	Malaysia
Estimated Installed Capacity (MW)	~900	1100+	1000+	700+	100+	~100	~100
Key Drivers	<ul style="list-style-type: none"> <li>Politically Stable</li> <li>Power availability</li> <li>Government led outsourcing</li> </ul>	<ul style="list-style-type: none"> <li>Large domestic demand</li> </ul>	<ul style="list-style-type: none"> <li>Robust connectivity</li> <li>International demand</li> <li>Geopolitical Stability</li> </ul>	<ul style="list-style-type: none"> <li>High growth market</li> <li>Large domestic demand</li> <li>Underserved</li> </ul>	<ul style="list-style-type: none"> <li>High growth market</li> <li>Large domestic demand</li> <li>Underserved</li> </ul>	<ul style="list-style-type: none"> <li>High growth market</li> <li>Large domestic demand</li> <li>Underserved</li> </ul>	<ul style="list-style-type: none"> <li>High growth market</li> <li>Large domestic demand</li> <li>Underserved</li> </ul>
Keys Issues	<ul style="list-style-type: none"> <li>Short term supply overhang</li> <li>Availability of suitable land plots</li> </ul>	<ul style="list-style-type: none"> <li>Environmental risk (Seismic)</li> <li>Limited power in Tokyo</li> </ul>	<ul style="list-style-type: none"> <li>Authority approvals</li> <li>Access to renewable power</li> </ul>	<ul style="list-style-type: none"> <li>Project execution risk</li> <li>Clear land title</li> <li>JV partners</li> </ul>	<ul style="list-style-type: none"> <li>Permits and construction delivery</li> <li>Environmental risk (Flood)</li> <li>JV partners</li> </ul>	<ul style="list-style-type: none"> <li>Environmental risk (Volcano, earthquakes etc)</li> <li>Project execution risk</li> </ul>	<ul style="list-style-type: none"> <li>Government Policy</li> </ul>

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# Setting the stage - APAC

Where are the opportunities

## Mature Markets

- Rapid data center growth placing pressure on sustainable energy sourcing
- Growth coming from cloud and hyperscale demand providing opportunity for wholesale operators
- Retail operators have opportunity as connectivity hubs and will increasingly rely on partners to mop up enterprise demand

## Emerging Markets

- Opportunities for both retail and wholesale colocation but risk enterprise will jump straight to cloud
- Emerging markets have the opportunity to act as hubs for challenged frontier markets and pick up extra demand

## Frontier Markets

- Local data privacy and national data sovereignty laws mandate data center construction in country
- Politics, infrastructure, social, culture or economic challenge will drive local partnering

## Edge Markets

- Will adopt new data center for factors that are rugged, low capacity, easily deployed and hyperconverged

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# Setting the stage - Indonesia

Strong growth potential in Indonesia : Underserved and large domestic markets

## Indonesia

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### Emerging markets

- Large domestic population with high digital usage; Demand / supply imbalance
- Foreign operators recognized that need for local partners to secure land and develop
- Hyperscale and potential Edge data center markets
- High margins for newer builds at international standards




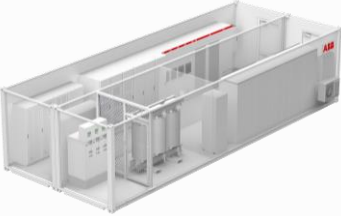
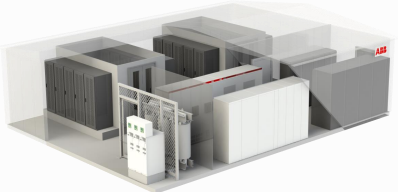


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# Data center market buyer trend

Products	Skid	CSS	EcoFlex	eHouse
<ul style="list-style-type: none"> <li>✓ Indoor installation</li> <li>✓ Designed for field installation</li> <li>✓ Wide component selection</li> <li>✓ Simplified vendor management</li> </ul>	<ul style="list-style-type: none"> <li>✓ Indoor/outdoor installation</li> <li>✓ Frame mounted equipment</li> <li>✓ Factory tested and prewired ensuring fast installation</li> </ul>	<ul style="list-style-type: none"> <li>✓ Outdoor installation</li> <li>✓ Fast delivery and set up on site</li> <li>✓ Internal arc and type tested</li> <li>✓ Naturally cooled</li> </ul>	<ul style="list-style-type: none"> <li>✓ Outdoor installation</li> <li>✓ Predesigned and predefined solution for fast deployment</li> <li>✓ Robust outdoor installation with standard dimensions</li> <li>✓ Minimal site-works required</li> </ul>	<ul style="list-style-type: none"> <li>✓ Outdoor installation</li> <li>✓ Highly customizable tailor-made solution</li> <li>✓ Factory-built and tested modules to shorten installation and commissioning</li> </ul>
<div style="border: 1px solid black; padding: 5px; display: inline-block;">ALL</div>	<div style="display: flex; gap: 10px;"> <div style="border: 1px solid black; padding: 5px; display: inline-block;">LV</div> <div style="border: 1px solid black; padding: 5px; display: inline-block;">MV</div> <div style="border: 1px solid black; padding: 5px; display: inline-block;">TR</div> <div style="border: 1px solid black; padding: 5px; display: inline-block;">UPS</div> </div>	<div style="display: flex; gap: 10px;"> <div style="border: 1px solid black; padding: 5px; display: inline-block;">LV</div> <div style="border: 1px solid black; padding: 5px; display: inline-block;">MV</div> <div style="border: 1px solid black; padding: 5px; display: inline-block;">TR</div> </div>	<div style="display: flex; gap: 10px;"> <div style="border: 1px solid black; padding: 5px; display: inline-block;">LV</div> <div style="border: 1px solid black; padding: 5px; display: inline-block;">MV</div> <div style="border: 1px solid black; padding: 5px; display: inline-block;">TR</div> <div style="border: 1px solid black; padding: 5px; display: inline-block;">UPS</div> </div>	<div style="display: flex; gap: 10px;"> <div style="border: 1px solid black; padding: 5px; display: inline-block;">LV</div> <div style="border: 1px solid black; padding: 5px; display: inline-block;">MV</div> <div style="border: 1px solid black; padding: 5px; display: inline-block;">TR</div> <div style="border: 1px solid black; padding: 5px; display: inline-block;">UPS</div> <div style="border: 1px solid black; padding: 5px; display: inline-block;">IT</div> </div>
				

# Product packages

One stop shop – to simplify your project execution



## Solution highlights

The Packaged Solution is offering a pre-engineered package with electrical and auxiliary equipment to be installed on-site with traditional construction methods

- Coordinated product delivery with one set of terms and conditions
- Single contract, harmonized payments and warranty
- Virtual factory tours and acceptance tests
- Online troubleshoot and technical support possibilities

Transformer rating  
Acc. spec

MV rating  
Acc. spec

Application cat.  
**Primary/  
Secondary**

Predefined **product packages** to speed up design phase

**Eco efficient portfolio** to support sustainability goals

**Reduced project risks** and simplified project management



Solutions are covering **wide voltage range, standards and technologies** around the world

**Traditional** building methods and equipment installation on site

Thanks to ABB's local presence and global coverage, easy **replicability globally**



# Skid – Indoor or outdoor units

Fast and economical plug and play solution for distribution



## Solution highlights

The Skid is a frame mounted, compact solution for electrical distribution and auxiliary equipment, and is ready to operate in the field with minimum installation, commissioning and start up time

- Secondary distribution units and primary line up's
- Frame mounted for fast and convenient transportation and installation
- With split units can build up large installations with minimal on-site labor requirement

Transformer rating  
typical up to  
7.5 MVA

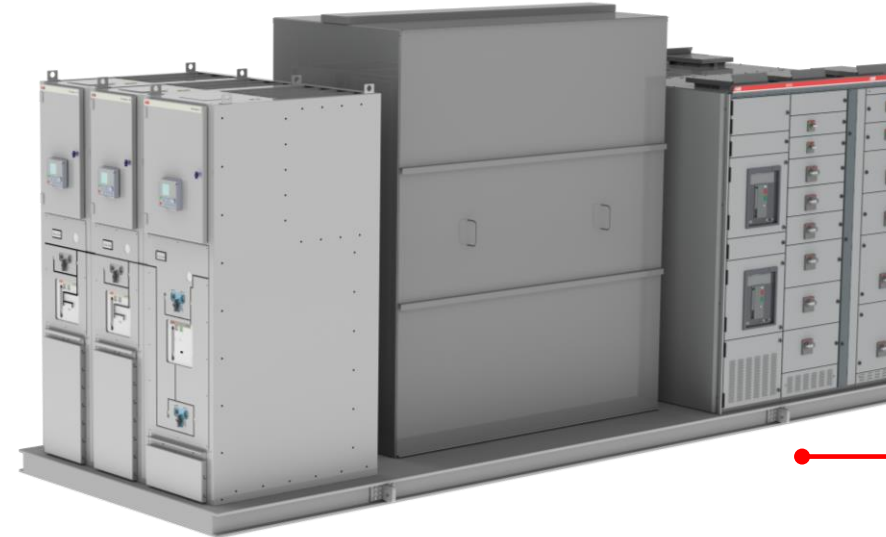
MV rating  
Up to 40.5 kV

Application cat.  
**Primary/  
Secondary**

**Indoor and outdoor units**  
that significantly speed up  
installation time

**Optimized footprint**  
and easily accessible  
equipment

Economical solution that is  
**factory assembled and tested**



Equipment can be grouped,  
and different purposed skids  
can be **easily lined up** onsite

**High safety** and  
type tested  
solution

**Naturally cooled** to  
increase reliability and  
reduce risk of failure



# UniPack CSS – Compact Secondary Substation

Continuous operations with modular, plug and play solution



## Solution highlights

Compact secondary substations are typically installed in locations accessible to the public and should ensure protection for all people according to specified service conditions.

- Fully type tested according to IEC62271-202, including IAC – AB
- Optimized and compact footprint
- Fully assembled and delivered from factory to site, including transformer
- Outdoor installation, naturally cooled
- Suitable for urban environments - different enclosure materials

Transformer rating  
Up to 3.5  
MVA

MV rating  
Up to 40.5 kV

Application cat.  
Secondary

**Plug and Play –**  
40% faster installation  
and start-up time

Footprint reduction and  
optimized design- **30%  
smaller footprint**

Continuous Operation due to  
**fully type tested solution**, that  
ensures highest safety



**30% less project  
management in  
execution**

**Fully modular  
solution**, easy and  
fast delivery and  
installation

**Naturally cooled** to  
increase reliability and  
reduce risk of failure

# EcoFlex - Predesigned and predefined solution

Safe, type-tested and robust in design



## Solution highlights

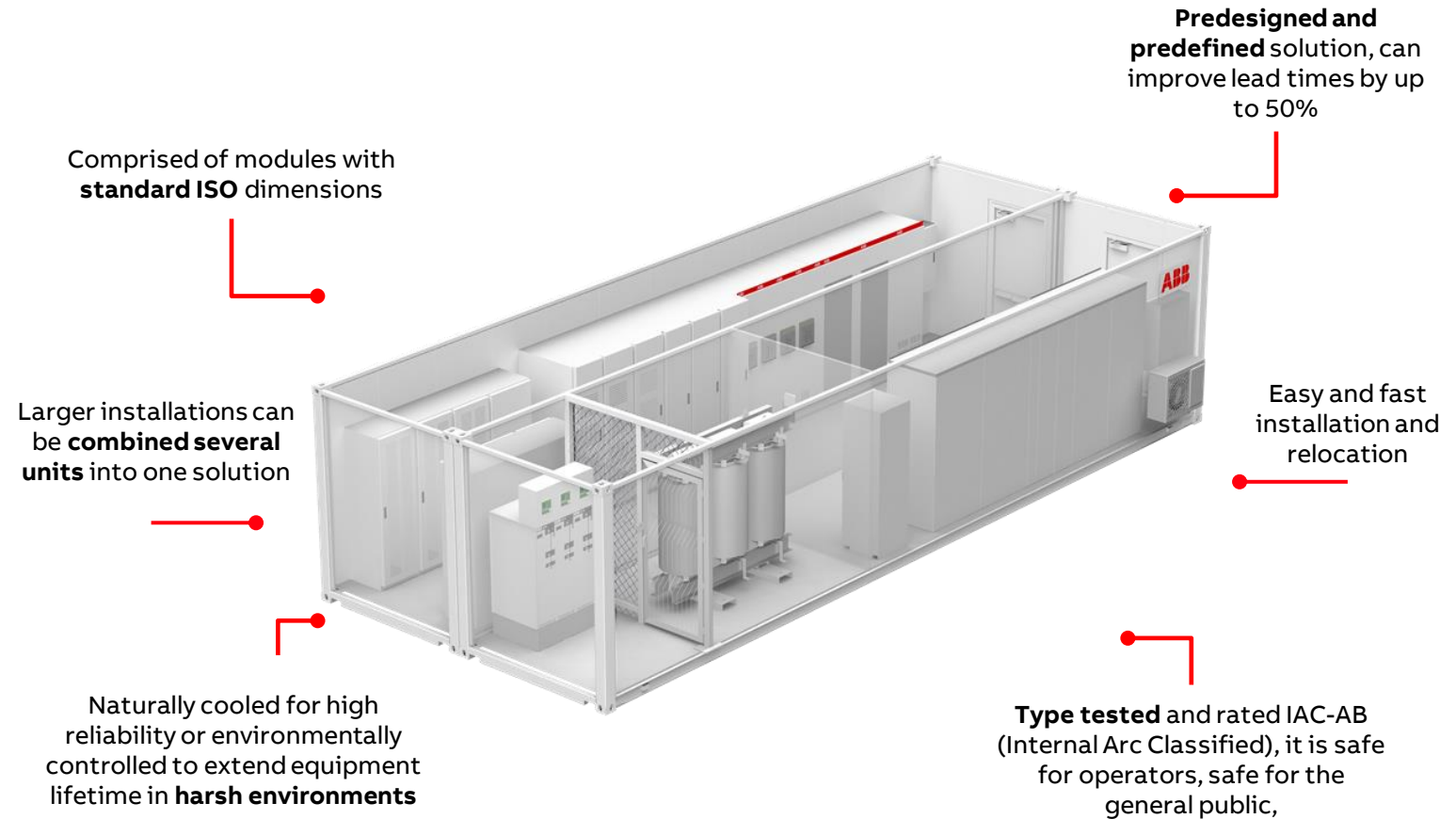
The EcoFlex is a family of productized modular eHouses designed to accommodate a range of application.

- Plug and play solution with standard ISO dimensions
- Predesigned and predefined modular solution for fast deployment
- Robust design, suitable for harsh environment
- Fully assembled and routine tested in the factory

Transformer rating  
Up to 4 MVA

MV rating  
Up to 40.5 kV

Application cat.  
**Secondary**



# eHouse

Tailor made eHouse for customer specified solution and configuration

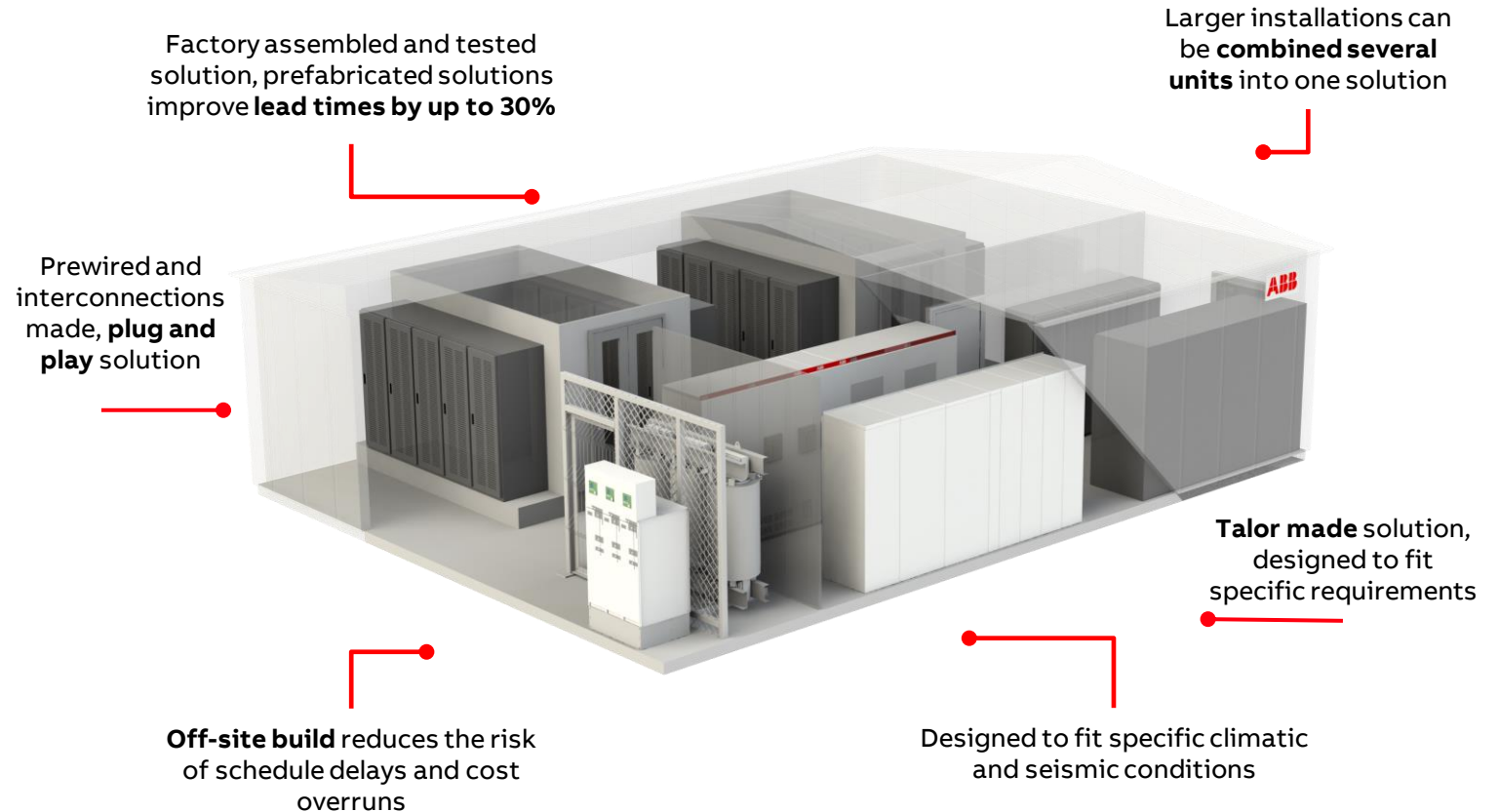


## Solution highlights

eHouse is custom made solutions that considers special requirements to accommodate a wide range of applications

- Plug and play solutions for fast installation
- Tailor made, to best fit the purpose
- Flexible and robust design
- Reduces site works and requires less construction workers

Transformer rating Acc. spec	MV rating Acc. spec	Application cat. <b>Primary/ Secondary</b>
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# Market drivers causing the need for...

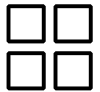
## Speed and scalability



Growing demand requires improved speed of deployment – cutting data center lead times from several years to 18 months or less



To meet the speeds required many data centers are leveraging modular, prefabricated and pretested solutions



“Pay as you grow” - The need for speed and a fast return on investment drive the need for scalable and / or modular solutions



Availability of skilled construction personnel and tradespersons to meet the growing demand of the industry

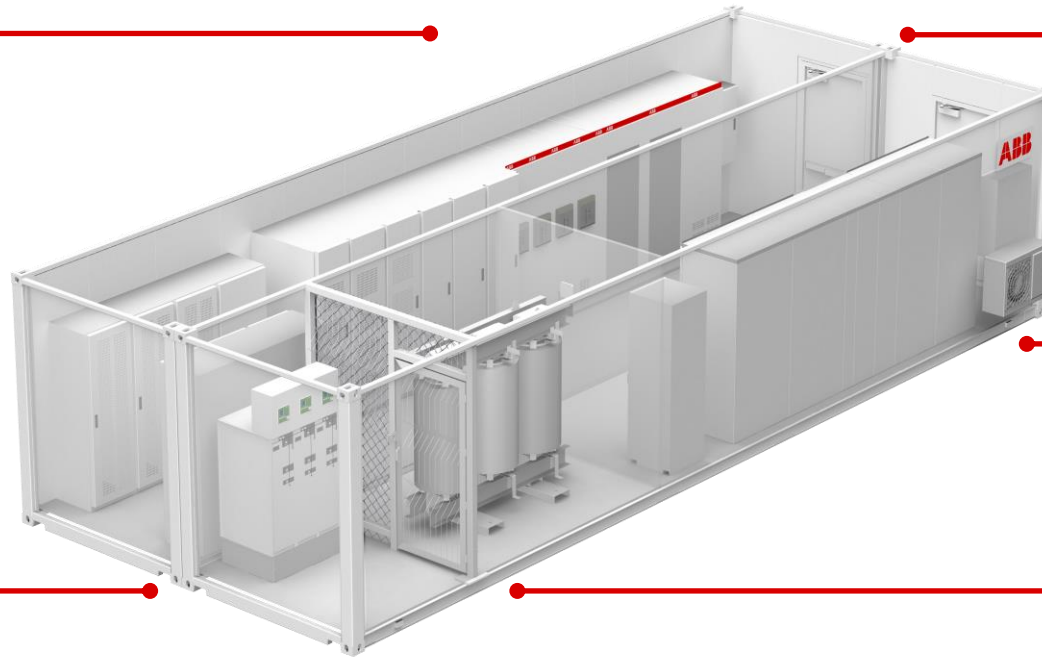


# Prefabricated Electrification Solution for data center

Prefabricated & pre-engineered integrated solutions

Prefabricated solutions are integrated and tested before leaving the factory – reducing the installation & commissioning manpower requirements

Simplified site installation with majority of works completed offsite



Prefabricated solutions improve lead times by up to 30%

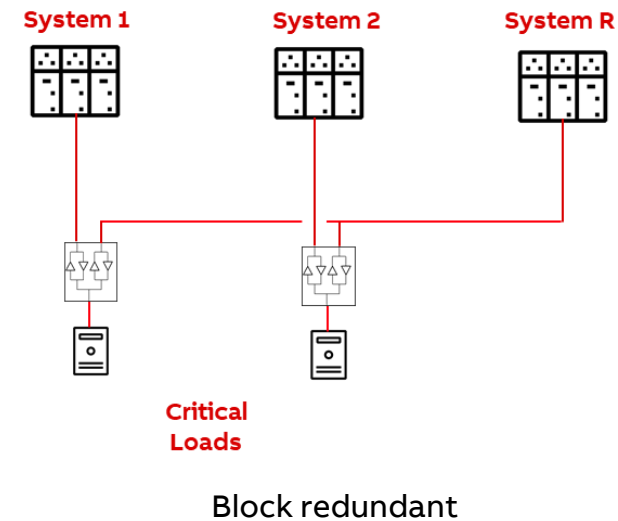
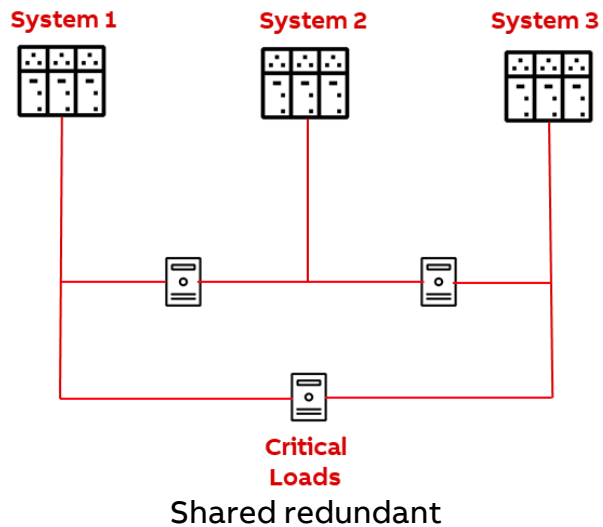
Prefabricated, pre-engineered solutions can improve lead times by up to 50%

Reduce risk of schedule delays and cost overruns

# Prefabricated Electrification Solution for data center - PowerFlex

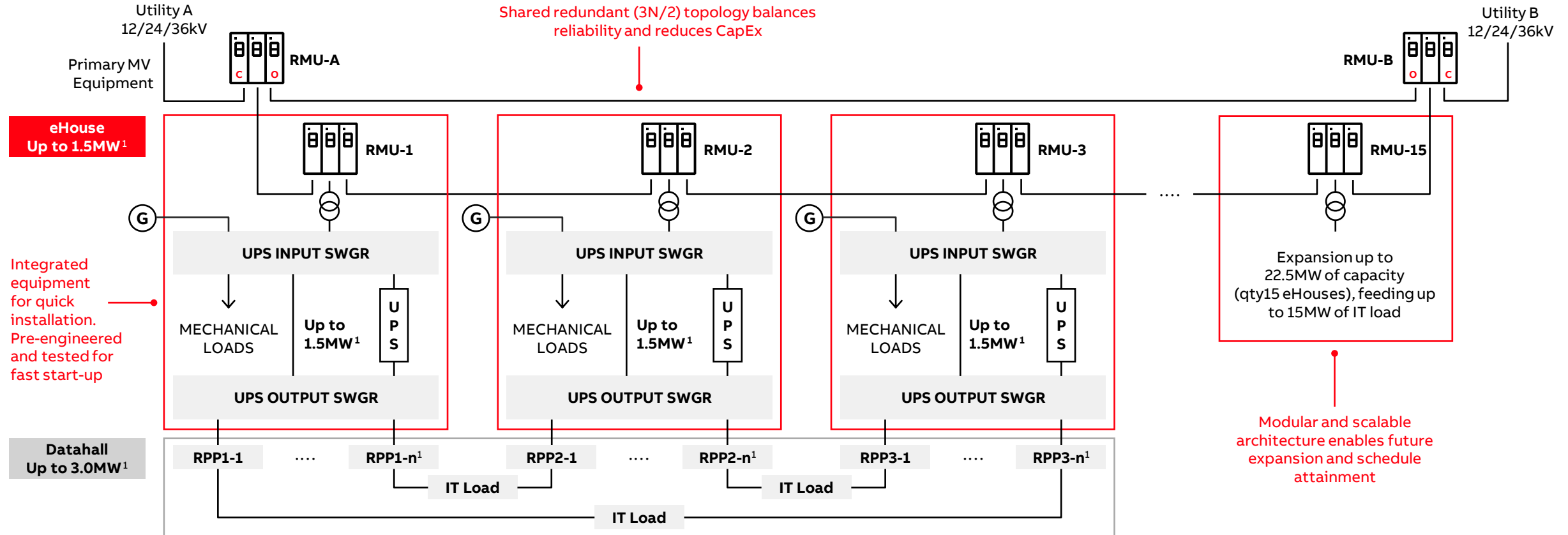
## What is PowerFlex ?

- Design philosophy developed for data center applications, which provides shared redundancy across critical loads.
- The SLD philosophy is then transposed into equipment selections covering three separate execution models ; supply of a product package, modularized skid, modularized eHouse
- There are two main design approaches, shared redundant & block redundant



# PowerFlex Design Platform

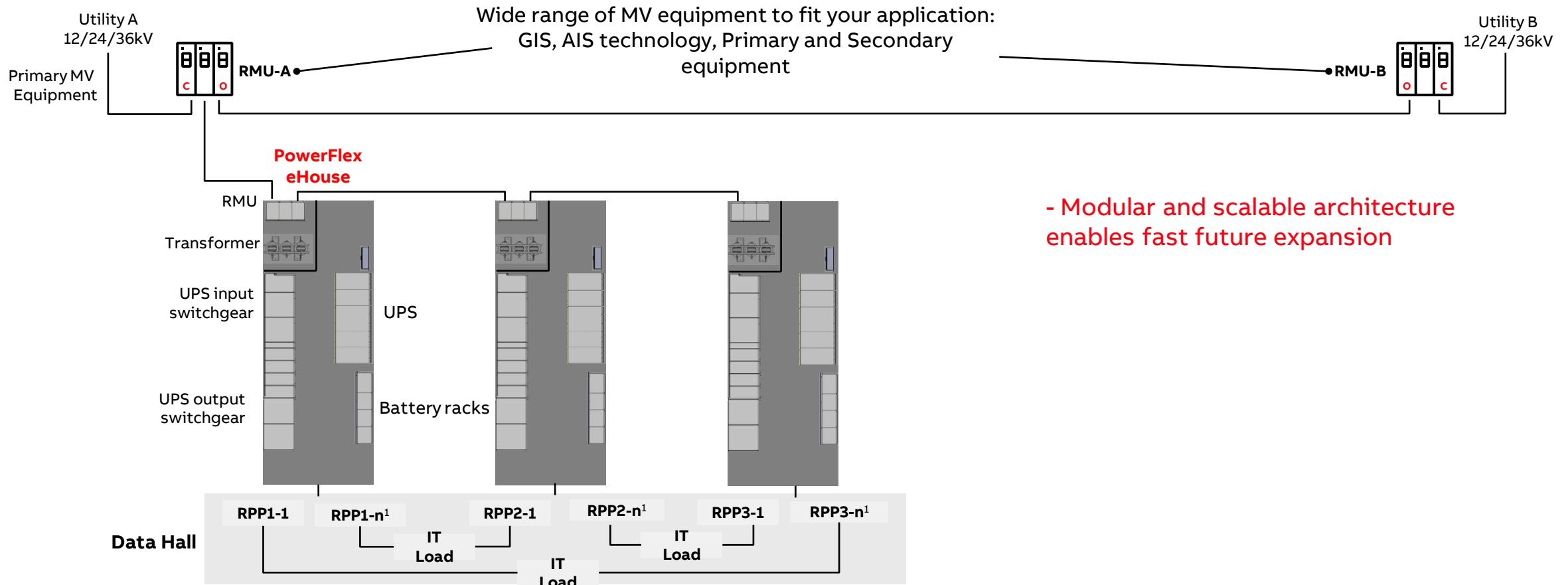
## Shared Redundant up to 1.5MW IEC





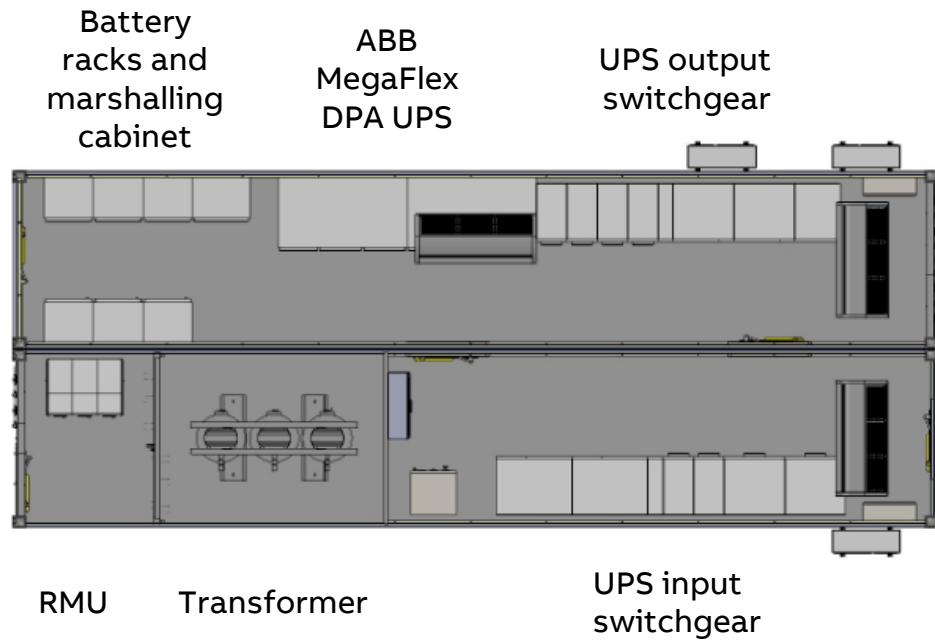
# PowerFlex design platform

eHouse example – shared redundant 3N/2



# PowerFlex Design Platform

Prefabricated & pre-engineered integrated solutions (Shared redundant 1.5MW example)



## Solution Features

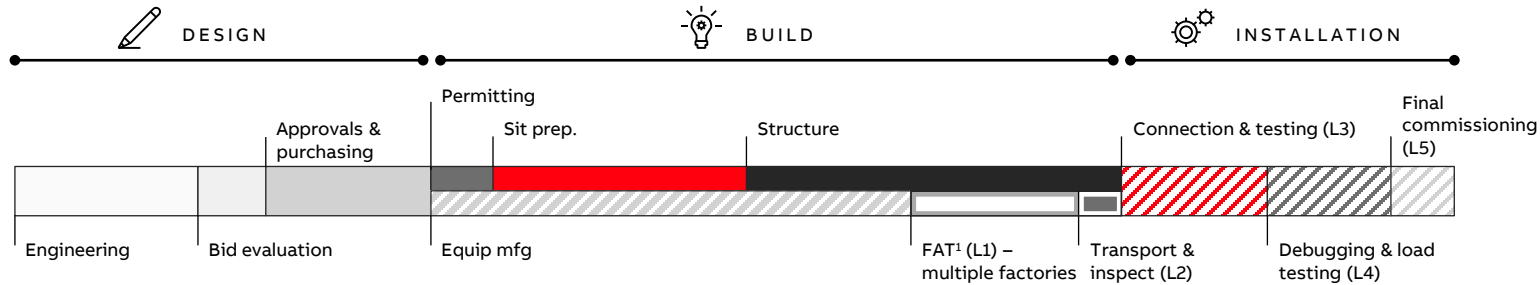
- Integral HVAC system
- Medium voltage Ring Main Unit (RMU) & transformer in an area isolated from the Low Voltage equipment
- All power & control cabling connections completed within the building
- Fully type tested switchgear solutions for arc fault containment
- Standard building dimensions allowing for scalable growth within the facility
- Suitable for indoor & outdoor installation

# Improve speed to deployment with prefabricated solutions

## Power module

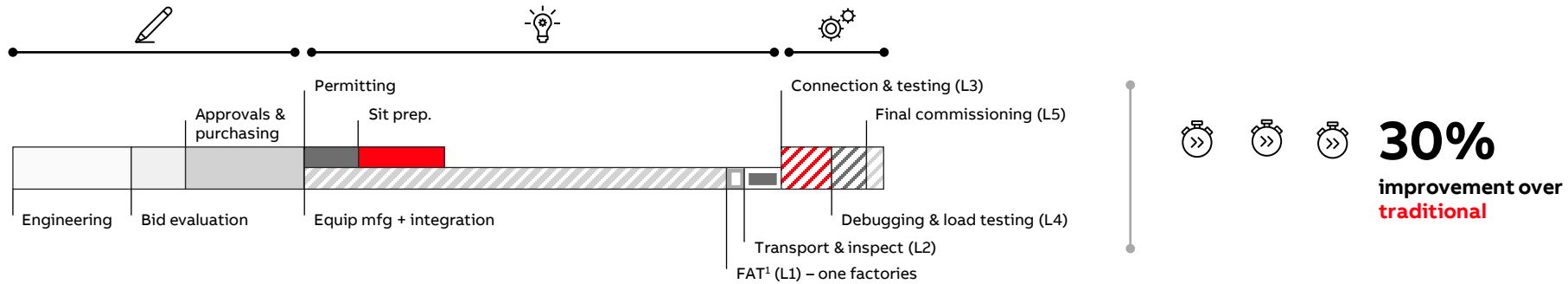
1

Traditional on-site build "stick built"



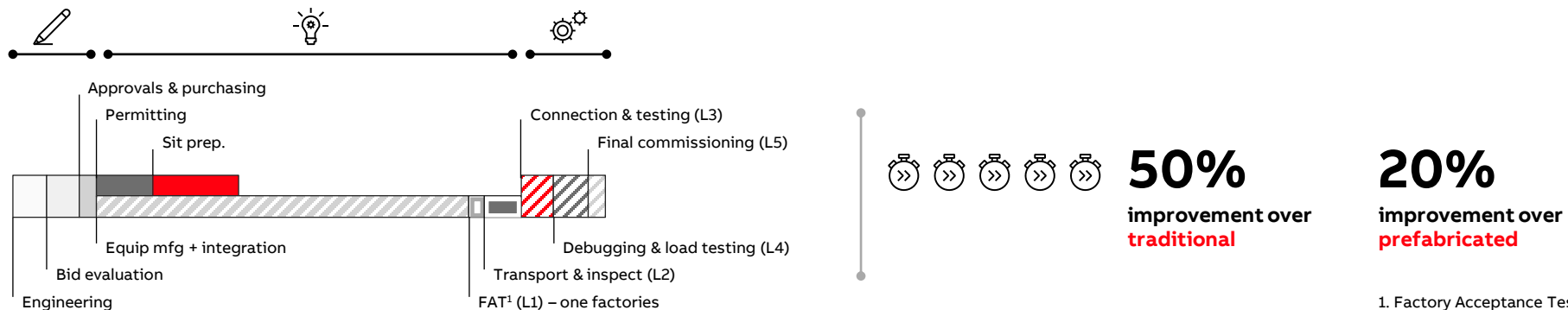
2

Prefabricated off-site eHouse or skid



3

Predesigned, prefabricated off-site eHouse or skid



1. Factory Acceptance Testing

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# Agenda

1. Introduction
2. Key Trends
3. Setting the stage
4. Data center market buyer trend
5. Prefabricated Electrification Solution for data center
6. Medium Voltage solutions for Indonesia market



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DATA CENTER SOLUTION DAY 2023 | JAKARTA | 19 OCTOBER 2023

# Medium-voltage solutions for Indonesia market

Riris Tobing, Product Marketing Director, Electrification Distribution Solutions, Indonesia

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# Medium Voltage Solution for Indonesia Market

Presenter

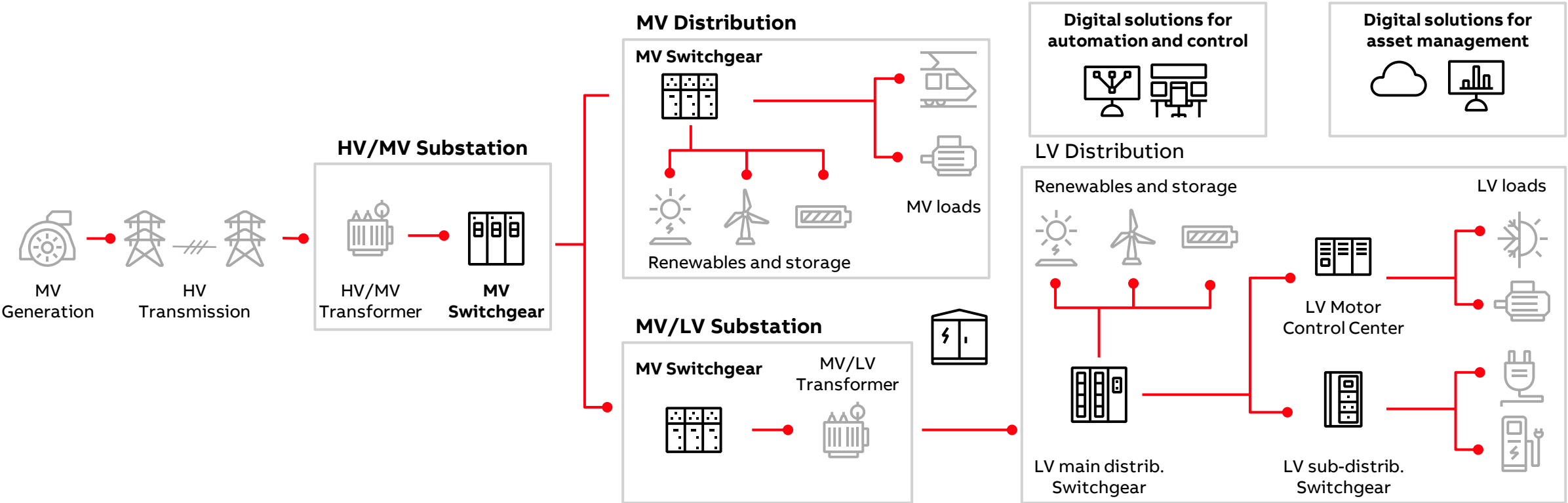


**Riris Tobing**

Product Marketing Director  
Electrification Distribution Solutions, Indonesia

# Distribution Solutions

## Safe, Smart and Sustainable Energy Distribution



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# MV Air-Insulated Switchgear

Product and solution offerings



# Unigear - MV Air Insulated Switchgear for Primary Distribution

## Product Overview

### Unigear

#### Description

Unigear is air-insulated switchgear for primary distribution. UniGear is used to distribute electric power in a variety of demanding applications

#### Key features

- Designed & Tested acc. to latest IEC 62271-200, GOST (RU) & GB (CN) Stds
- Internal arc classification IAC AFLR
- Classified LSC-2B, PM
- Fitted with safety interlocks
- Panels are available as a single busbar, double busbar, back-to-back or double level solution



#### Ratings

Rated Voltage	up to 40kV
Rated Current	up to 4000A*1
Rated short-time withstand current & IAC	up to 63kA*2
Rated Frequency	50Hz / 60Hz

1) For 40kV max 3150A

2) For 40kV max 31.5kA

Safe conditions for all applications

# Unigear - MV Air Insulated Switchgear for Primary Distribution

Single busbar

**UniGear ZS1**



**UniGear 550**



**UniGear 500R**



**UniGear MCC**



**UniGear ZS2**



**UniGear ZS3.2**



## The AIS standard up to 24kV

- Up to 24 kV
- Up to 4 000 A
- Up to 50 kA/3s
- VD4, VM1, HD4, VSC, NALF
- Design: LSC-2B, PM
- Available in Digital version

## 17.5 kV narrow design (550mm)

- Up to 17.5 kV
- Up to 1 250 A
- Up to 31.5 kA/3s
- Vmax
- Design: LSC-2B, PM
- Available in Digital version

## 17.5 kV narrow design (500mm)

- Up to 17.5 kV
- Up to 2 000 A
- Up to 31.5 kA/3s
- Vmax
- Design: LSC-2A, PM
- Available in Digital version

## Motor control center up to 12 kV

- Up to 12 kV
- Up to 400 A
- Up to 50 kA/3s
- VSC
- Design: LSC-2A, PM
- Available in Digital version

## Standard product up to 36 kV

- Up to 36 kV
- Up to 3 150 A
- Up to 31.5 kA/3s
- VD4, HD4
- Design: LSC-2B, PM

## Standard product up to 46 kV

- Up to 40.5/46 kV
- Up to 3 150 A
- Up to 31.5 kA/3s
- VD4, HD4
- Design: LSC-2B, PM

# UniSec - MV Air Insulated Switchgear for Secondary Distribution

## Product Overview

### UniSec

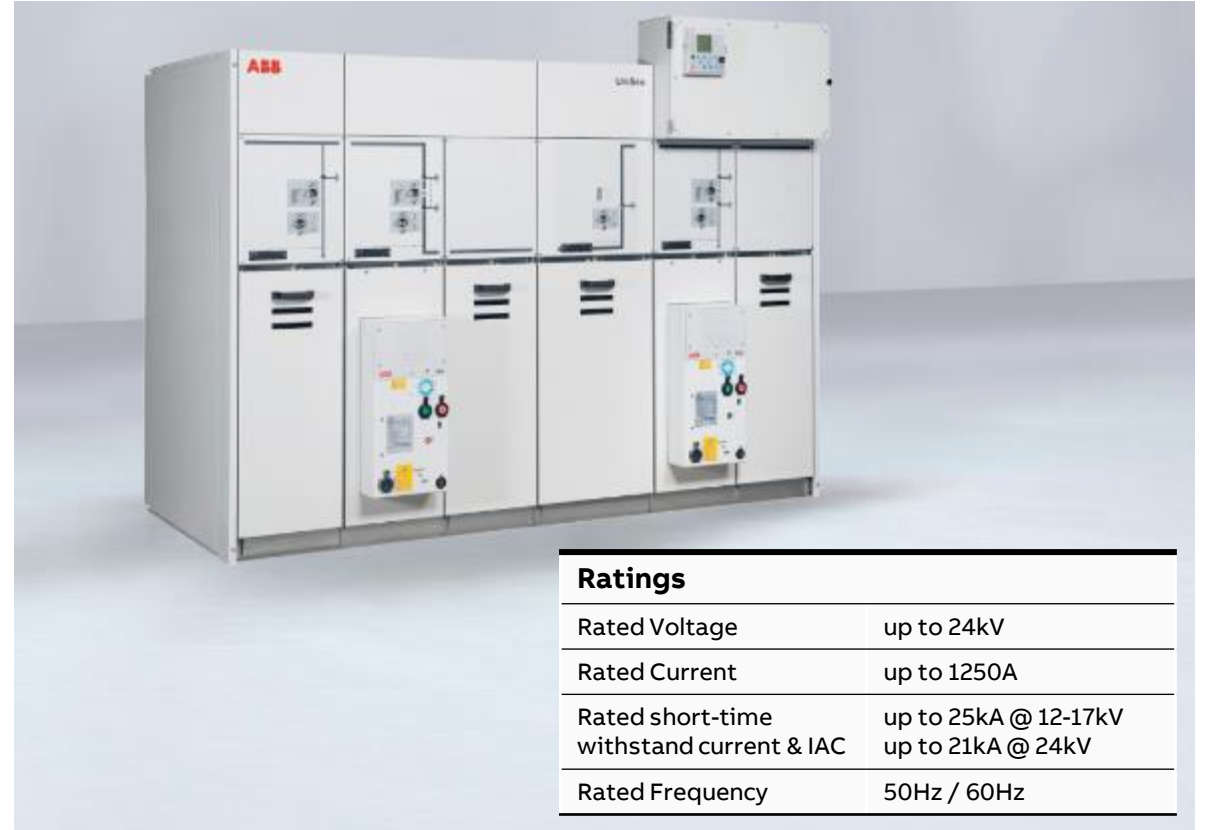
#### Description

UniSec 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.

#### Key features

- Designed & Tested acc. to latest IEC 62271-200, GOST (RU) & GB (CN) Stds
- Internal arc proof IAC AF/AFL/AFLR with different gas exhausting variants
- Loss of Service Continuity LSC2B/ LSC2A/LSC2 solutions available
- Partition Metallic PM Classification
- Load Break Switch, Vacuum Contactor, Vacuum and SF6 Circuit Breakers
- Anti-Seismic and Marine version available

Safe conditions for all applications



#### Ratings

Rated Voltage	up to 24kV
Rated Current	up to 1250A
Rated short-time withstand current & IAC	up to 25kA @ 12-17kV up to 21kA @ 24kV
Rated Frequency	50Hz / 60Hz

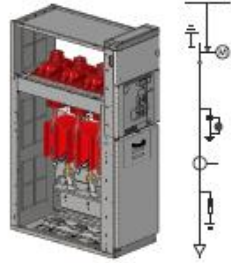
# UniSec - MV Air Insulated Switchgear for Secondary Distribution

Values - Productivity and Flexibility

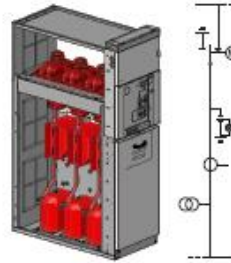
## Broad portfolio

### Units with switch-disconnector

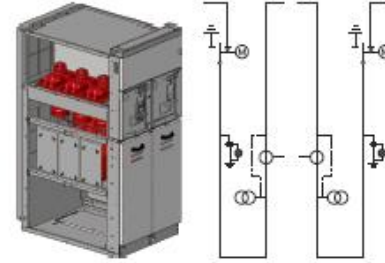
**SDC**  
Incoming/outgoing



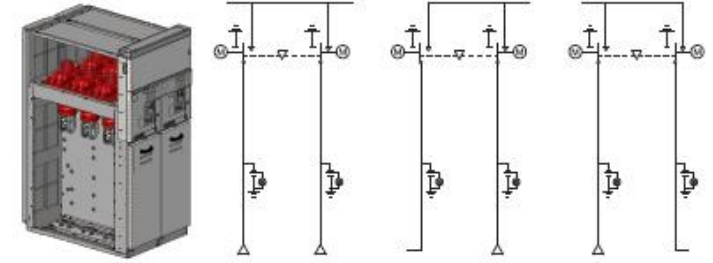
**SDS**  
Coupler



**SDM**  
Coupler with measure

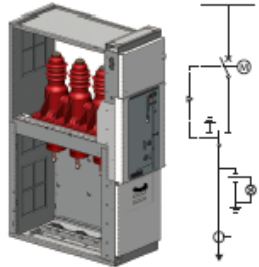


**SDD**  
Double switch-disconnector



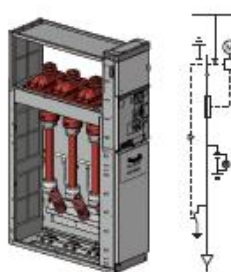
### Unit with circuit-breaker and disconnector integrated

**HBC**  
Incoming/outgoing

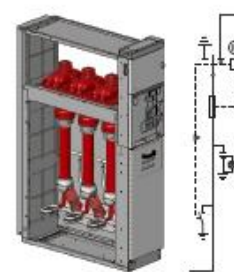


### Units with switch-disconnector and fuses

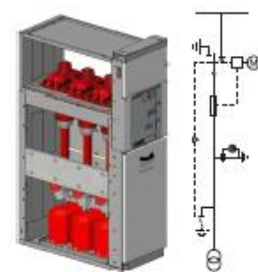
**SFC**  
Outgoing



**SFS**  
Coupler

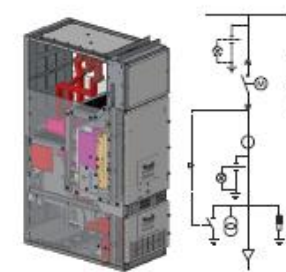


**SFV**  
Measure

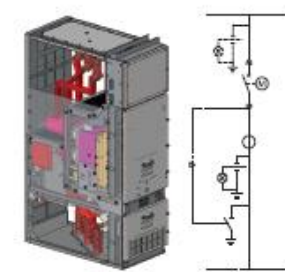


### Units with withdrawable circuit-breaker or contactor

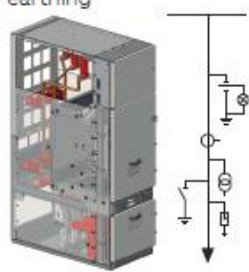
**WBC**  
Incoming/outgoing



**WBS**  
Coupler



**BME**  
Busbars metering & earthing

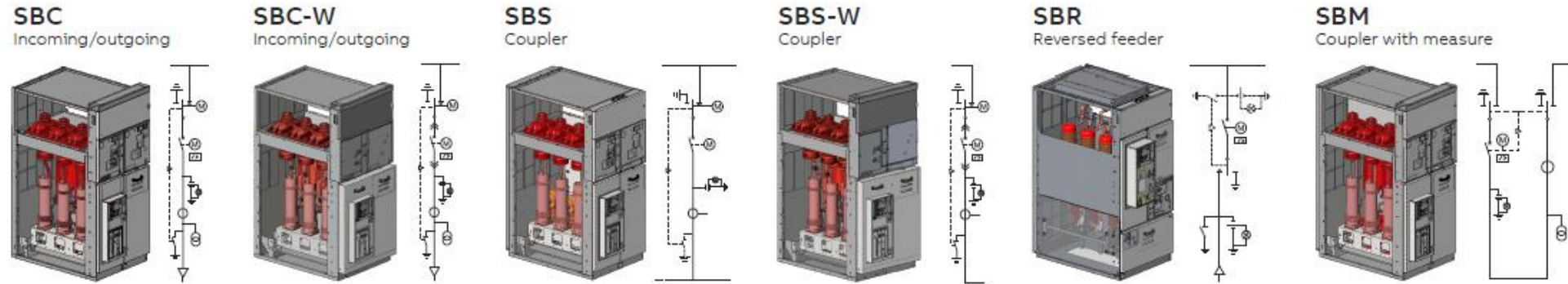


# UniSec - MV Air Insulated Switchgear for Secondary Distribution

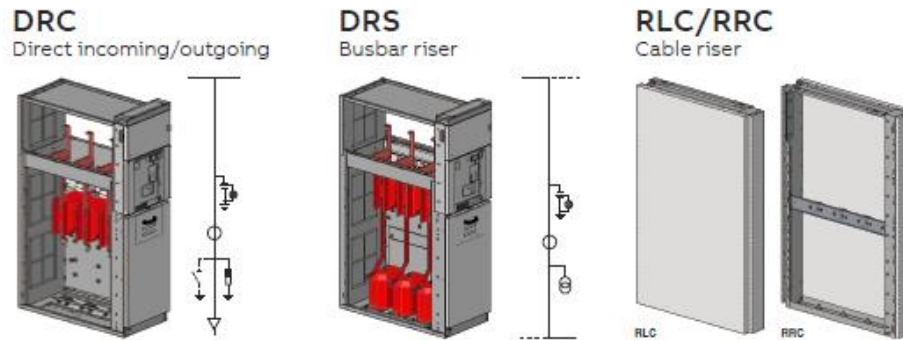
Values - Productivity and Flexibility

## Broad portfolio

Units with switch-disconnector and removable or withdrawable circuit-breaker



Other Units



# UniSec - MV Air Insulated Switchgear for Secondary Distribution

AIS design: Flexible for various switching devices

## High flexibility - Modular AIS design

### AIS design offers high flexibility

- Choose from various switching devices
- Vacuum or SF<sub>6</sub> as per customer preference
- Fixed, removable or withdrawable devices

### Many options also on other components

- Current transformers (CTs), type DIN and ring
- Voltage transformers (VTs), type DIN

### – Digital offering

- Current and Voltage sensors
- Protection relays



Vacuum Circuit Breakers



SF<sub>6</sub> Circuit Breakers



SF<sub>6</sub> Load-Break Switch / fuse



Hybrid Vacuum CB and Disconnector



Conventional Instr. transformers



Non-conventional Current and Voltage sensors



Protection relays

# Fault Current Limiter

## I<sub>s</sub>-limiter: The world's fastest switching device



	FC-Protector	I <sub>s</sub> -limiter
Application	Indoor & Outdoor	Indoor
Application type	Standard	Standard & Complex
Ratings	7.2 kV ... 17.5 kV ... 3150 A ... 63 kA <sub>RMS</sub>	0.75 kV ... 40.5 kV ... 5000 A ... 210 kA <sub>RMS</sub>
Tripping criteria	Magnitude	Magnitude & rate of rise
Selectivity	On request	Yes
Availability in switchgear	Yes (AIS)	Yes (AIS)

The I<sub>s</sub>-limiter is a fast operating switch that limits the short circuit current to a level that circuit-breakers and busbar can withstand therefore protecting them from damage (0.6 ms operating time)

Reduces substation cost

Solves short-circuit problems in new substations and substation extensions

Optimum solution for interconnection of switchgears and substations

Reliability and function proofed in thousands of installations

Worldwide in service

The peak short-circuit current will never be reached

The short-circuit current is limited at the very first current rise

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# MV Gas-insulated Switchgear

Product and solution offerings



# MV Primary Gas-insulated Switchgear

## Portfolio of SF6 Gas insulation Switchgear



		Single busbar	Single busbar	Single busbar	Single busbar	Double busbar
		up to	up to	up to	up to	up to
		25 kA	31.5 kA	31.5 kA	40 kA	40 kA
		1250 A	2500 A	2500 A	3150 A	3150 A
Voltage	BIL level					
12 kV	75 kV	<b>ZX0</b>	<b>ZX0.2</b>	<b>ZX1.2</b>	<b>ZX2</b>	<b>ZX2</b>
24 kV	125 kV					
36 kV	170 kV					
40 kV	185 kV					

# GIS Technology

## Flexible and save space

Up to 70% footprint reduction can be achieved by choosing GIS over AIS

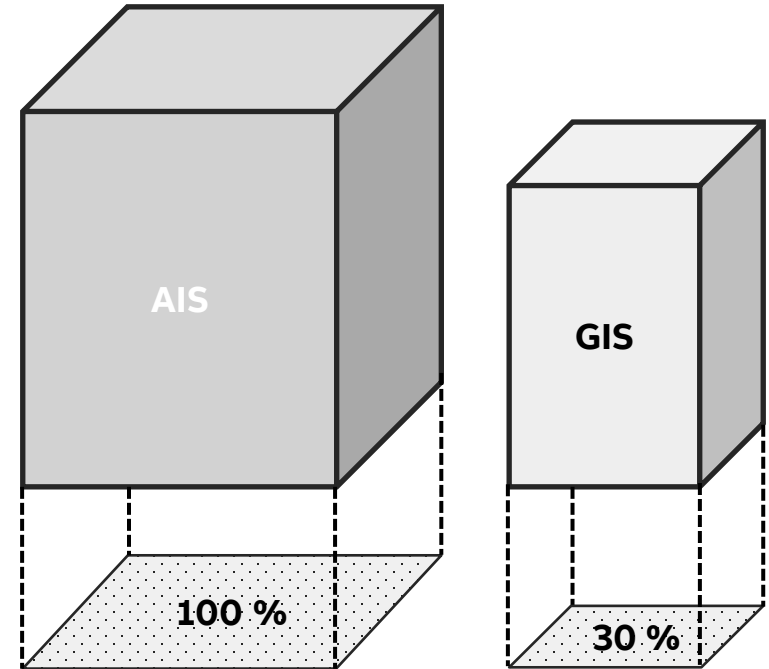
Cost efficient solution with respect to Life Cycle Cost

Cost saving for real estate

Long maintenance intervals

Less civil work

Less outages



Footprint compression of 36kV ABB AIS and GIS

# GIS Technology

Safer, more reliable and cost competitive solutions

## Safety

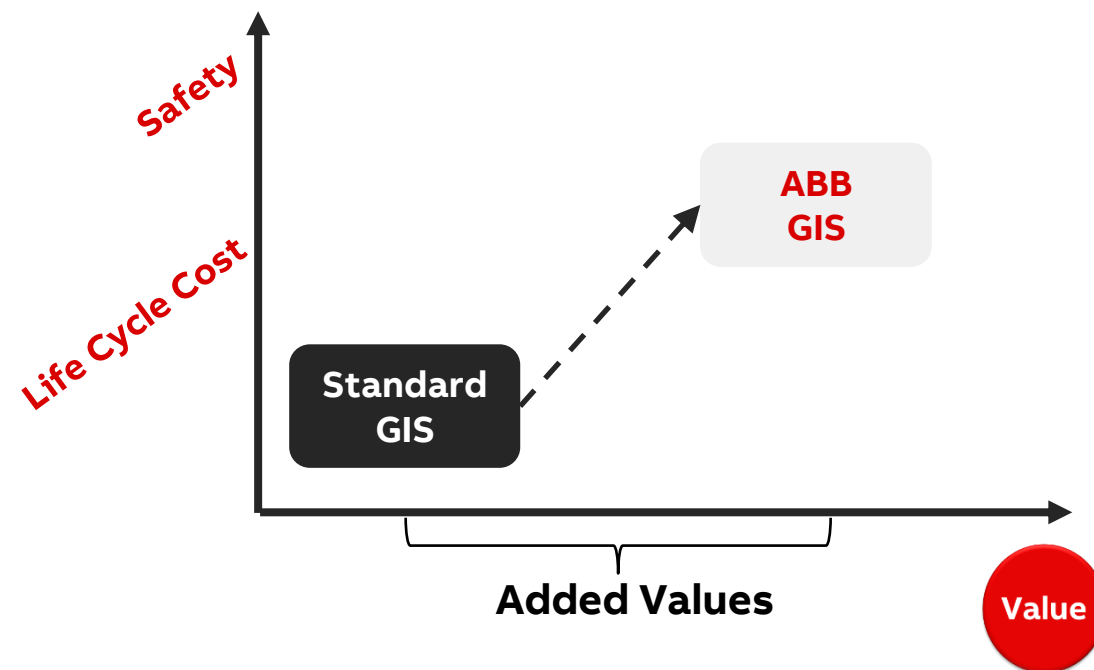
- Internal arc classified switchgear
- Plug-in type technology components
- No gas works on site
- Fail safe interlocks prevent malfunction
- Gas pressure permanently monitored by density sensors

## Life Cycle Cost

- Maintenance free live parts
- Service openings for on site access
- Maximum compact design is achieved

## Reliability

- ABB's proven VD4 vacuum circuit breaker technology
- Stainless steel gas compartments



# MV Secondary Gas-insulated Switchgear

## Portfolio of SF6 Gas insulation Switchgear

SafeRing 12-24kV



The standard RMU  
up to 24kV

- Up to 24 kV
- Up to 630 A
- Up to 21 kA/3s
- SF<sub>6</sub> insulation

SafePlus 12-24kV



Compact switchgear  
up to 24kV

- Up to 24 kV
- Up to 630 A
- Up to 25 kA/3s
- SF<sub>6</sub> insulation

SafeRing 36/40.5kV



The standard RMU  
up to 40.5kV

- Up to 40.5 kV
- Up to 630 A
- Up to 16 kA/3s
- SF<sub>6</sub> insulation

SafePlus 36/40.5 kV



Compact switchgear  
up to 40.5kV

- Up to 40.5 kV
- Up to 630 A
- Up to 20 kA/3s
- SF<sub>6</sub> insulation

SafeRing/Plus Air



The Air version  
up to 12kV

- Up to 12 kV
- Up to 630 A
- Up to 20 kA/3s
- Dry air insulation

SafeRing/Plus AirPlus



The AirPlus™ version  
up to 24kV

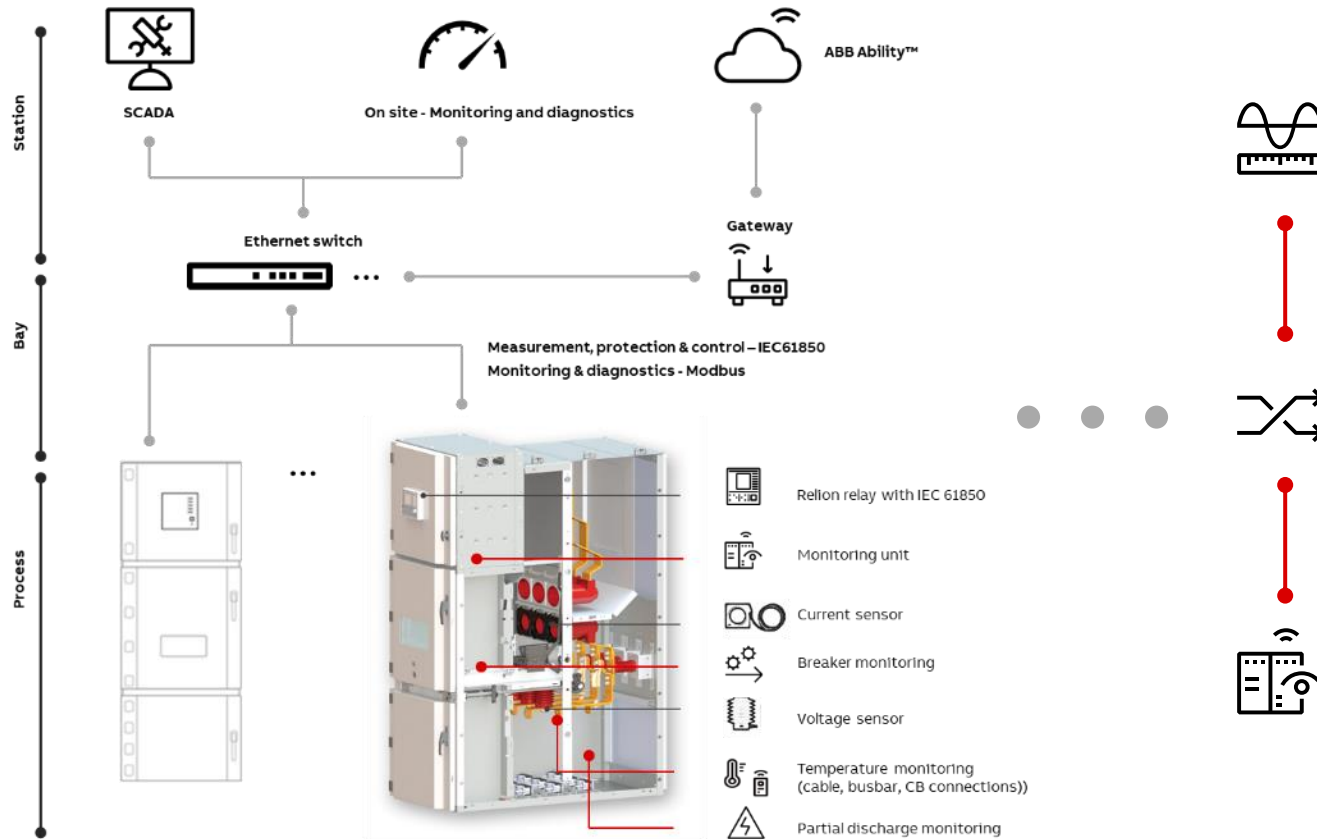
- Up to 24kV
- Up to 630 A
- Up to 16 kA/3s
- AirPlus™ insulation

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# Digital Switchgear

Product and solution offerings

# Digital Switchgear



## Electronic current/voltage sensors

Its linear characteristic and wide dynamic range outperform conventional instrument transformers, fitting into the needs of varying load

## IEC 61850 digital bus

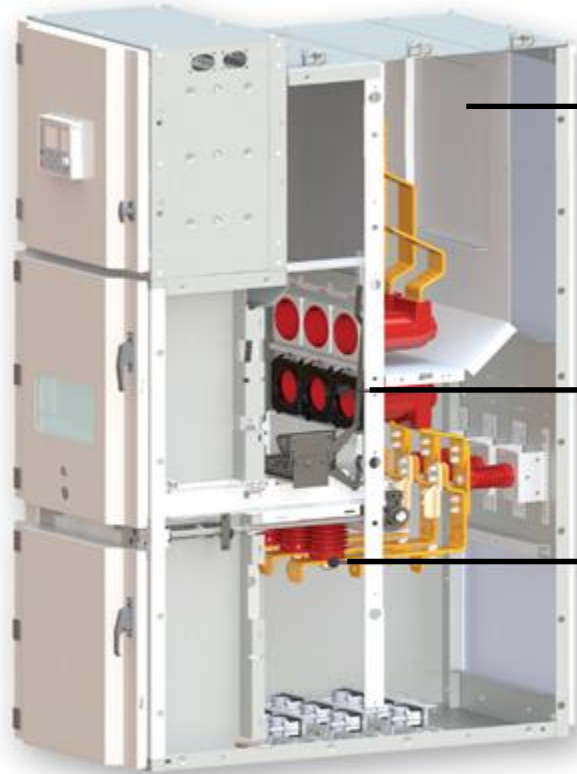
IEC 61850 GOOSE (Generic Object-Oriented Substation Event) and SV (Sample Values) on the station/process bus for a fast and reliable data/information exchange.

## Online condition monitoring & diagnostics

Allows secure access to condition and operational data. Data analysis on-site ensure optimal switchgear operation and minimized maintenance costs

# Digital Switchgear

Replacing traditional designs with digital technologies



## Sensing and knowing

### Condition monitoring



Temperature



Partial discharge



Utilization

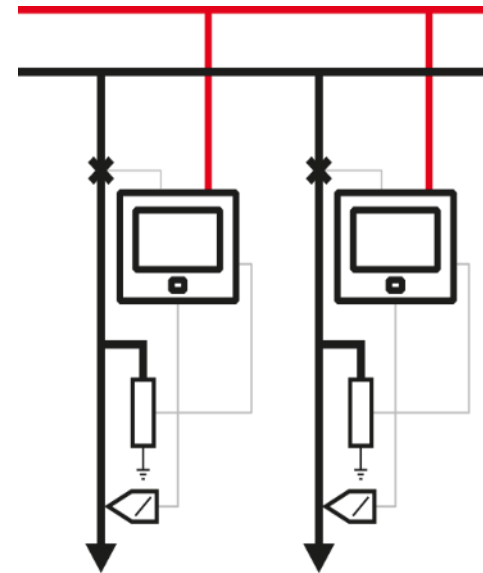
### Current sensors



### Voltage sensors



## Simplifying



## Protection and control



RE\_600 series



SSC600



ZEE600

**ABB**