

JAKARTA, OCTOBER 19, 2023 | DISTRIBUTION SOLUTIONS

Data Center Electrification

Compact Secondary Substation (CSS)



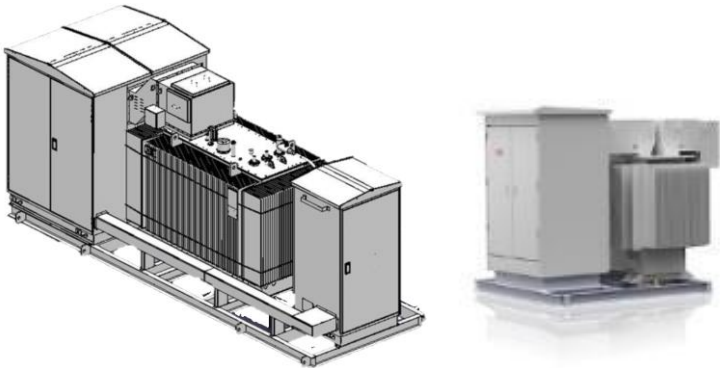
Data Centers

UniPack Compact Secondary Substation (CSS)

Product Portfolio

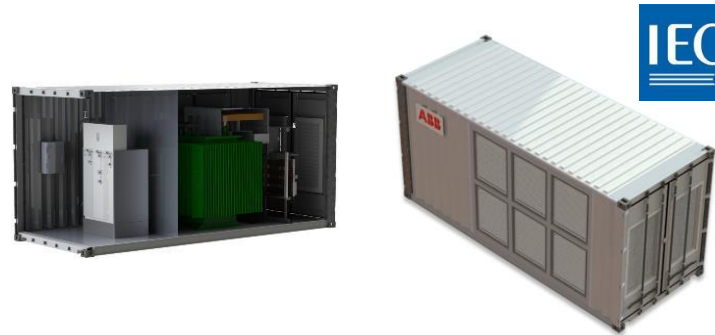
Several designs to fit requested requirements

Prefabricated Skid units



- Small single structure to large multiple structure skid solutions
- Designed for central and string inverter types
- IAC classified
- Open air cooling for maximal efficiency of transformer

EcoFlex



- Standard ISO transportation dimension & certification
- Optimized for simple economical transport (Sea, Rail, Road)
- Robust and relocatable
- Modular can be combined/joined
- Accommodates a variety of switchgear types which can be Arc-Proof
- Type tested per IEC62271-202 for safety of personnel and general public (single module solution)

UniPack CSS



- Type tested per IEC62271-202 for safety of personnel and general public
- Electrical segregation between compartments
- Oil containment features
- Steel or GRP enclosure material for harsh environment

Data Centers

UniPack-S

Technical parameters for a typical data center application

Parameter	Value
Max transformer power	Up to 3500KVA (oil or dry type)
Max rated voltage	40.5kV
Short circuit withstand current of internal earthing network	20kA/1s
Max overall dimensions (LxWxH)	5212 X 2250 X 3038 mm
Transformer compartment IP protection degree	IP23D (Optional IP35 or 45)
MV/LV compartment IP protection degree	IP43 (Optional 54)
CSS enclosure thermal class	K10 / K15 depending on IP class
MV compartment	ABB SafePlus
LV compartment	ABB low voltage switchboard or direct connection to Transformer Main breaker: Air circuit breaker
Max rated current of LV panel	Up to 5000A
Rated short circuit withstand capacity of LV switchboard	Up to 66kA/1s

Data Center Integrated Solutions

Portfolio - Compact Secondary Substation (CSS)

Scope

CSS is an arc tested assembly comprising an enclosure protecting against foreign objects and water containing medium voltage (MV) switchgear, distribution transformers, low voltage (LV) switchboards, connections and auxiliary equipment to supply low voltage energy from medium voltage systems. These substations are typically installed in locations accessible to the public and ensure protection for all people according to specified service conditions.

Technical description

Switchgear voltage level up to 40.5 kV

Typical ratings (kVA):
Up to 3500

Secondary voltage:
380V to 800V

Trafo type:
Dry/oil

Protection degree:
IP 44/23D (IP 54/45 optionally) (MV
SWGR/trafo)

Applicable standards:
IEC, GB, AS, ANSI, CSA, and more

Picture



Values

Single piece delivery – all critical equipment installed in factory environment and pre-tested
Oil collectoin pit- ensures environmental safety
Enclosed solution – All equipment enclosed to controlled environment
Internally arc tested – for public and service personnel safety
Pre-engineered products – faster project engineering time and industrialized solution

Outdoor non walk-in with limited environmental controls

Data Center Integrated Solutions

Portfolio - Ecoflex Containerized Solution

Scope

Ecoflex is robust in design and construction utilizing design concepts proven in the harshest of environmental conditions. EcoFlex is ideal for remote locations, harsh environments, temporary or permanent power installations and applications requiring fast supply and installation.

The EcoFlex container is designed to be easily and economically transported via traditional methods. Also, due to its modularity, it is easily installed at site as pre-tested complete modules.

Technical description

Switchgear voltage level up to 40.5kV

Typical Tx ratings (kVA):
Up to 4000

Secondary voltage:
from 380V to 800 V

Trafo type: Oil/dry

Protection degree:
IP 43/54 (MV SWGR/trafo)

Applicable standards:
IEC, GB, AS, GOST, ANSI, CSA

Standard dimensions (mm):
6058 x 2438 x 2986

Picture



Values

Compact design and configured for ease of transportation as per ISO/1161

- Minimized site work requirements
- Secure via lockable doors
- Configurations with: MV air-insulated switchgear (AIS) and gas-insulated switchgear (GIS)
- Oil-filled transformers; Dry-type transformers
- LV switchgear
- UPS; Battery racks
- Fire suppression system
- Remote terminal unit (RTU)

Outdoor Walk-in Construction

Internal Component Installation

Overall Layout



MV Compartment



Transformer compartment



LV & Aux Compartment

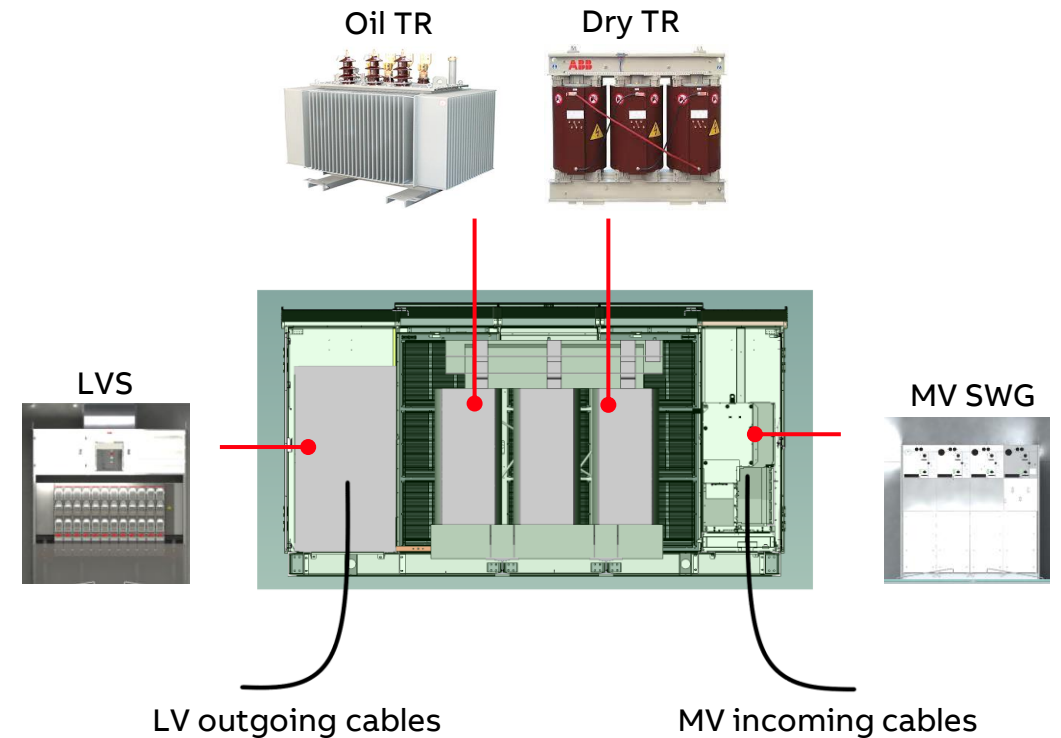


Data Centers

UniPack Mercury

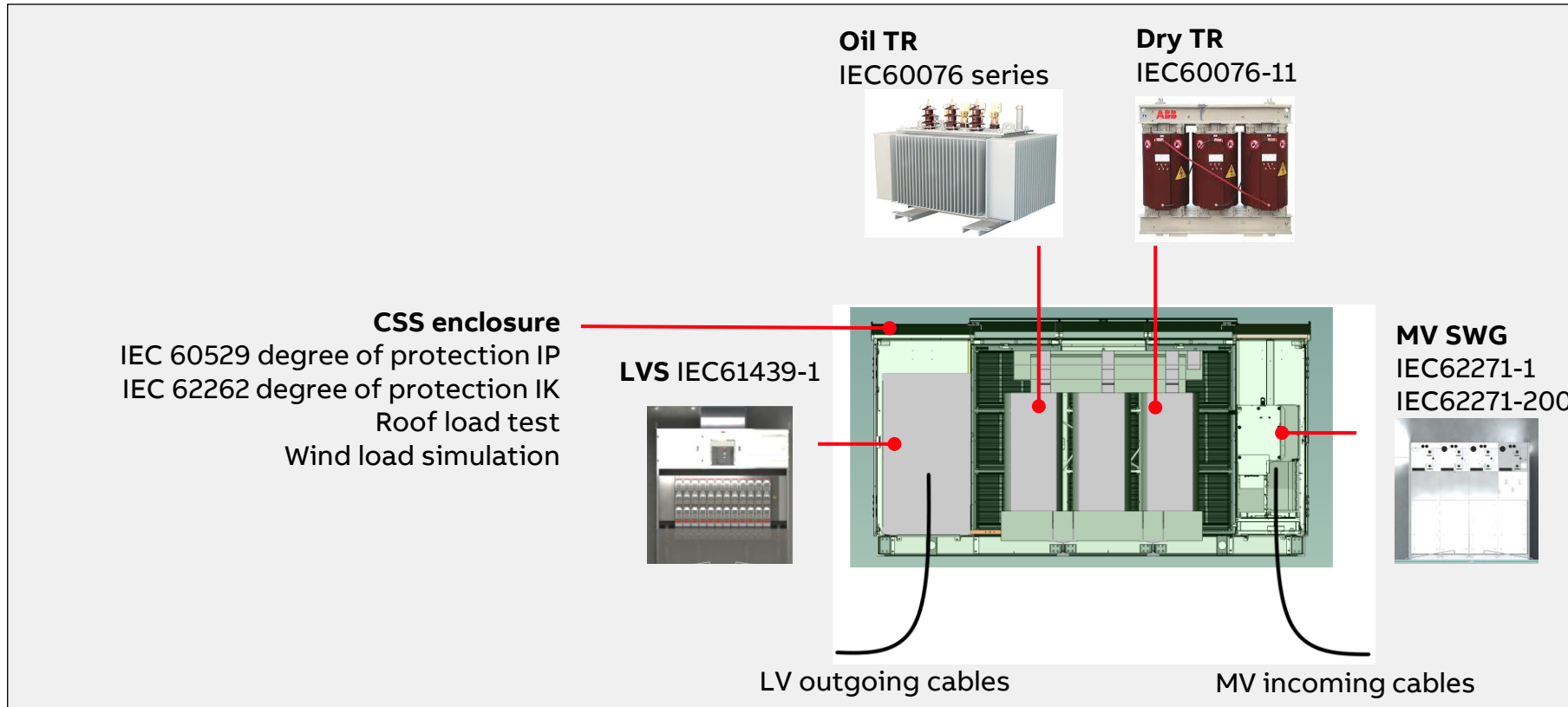
Main equipment

- Designed and manufactured to install dry or oil transformers up to 3.5 MVA
 - In case of oil transformer there is integrated oil pit in TR compartment
- Designed to accommodate medium voltage secondary switchgear up to 40.5 kV
 - ABB gas insulated secondary switchgear (SafeRing/SafePlus)
 - ABB ecoGIS secondary switchgear (SafeRing Air, AirPlus)
- Low voltage switchboard dimensioned according to transformer ratings
 - Breaker (ACB) capable of disconnecting the transformer and LV busbar
- Designed for continuous operation
- Remote control and monitoring of CSS and internal components
- Compartment design to ensure safety and segregated access areas



Data Center Integrated Solutions

Portfolio - IEC 62271-202 and equipment specific standards



CSS as package solution

IEC62271-202 High-voltage / low voltage
Prefabricated Substation

Temperature rise tests
Internal arc fault tests
Dielectric tests
EMC test
Annex BB Sound level test

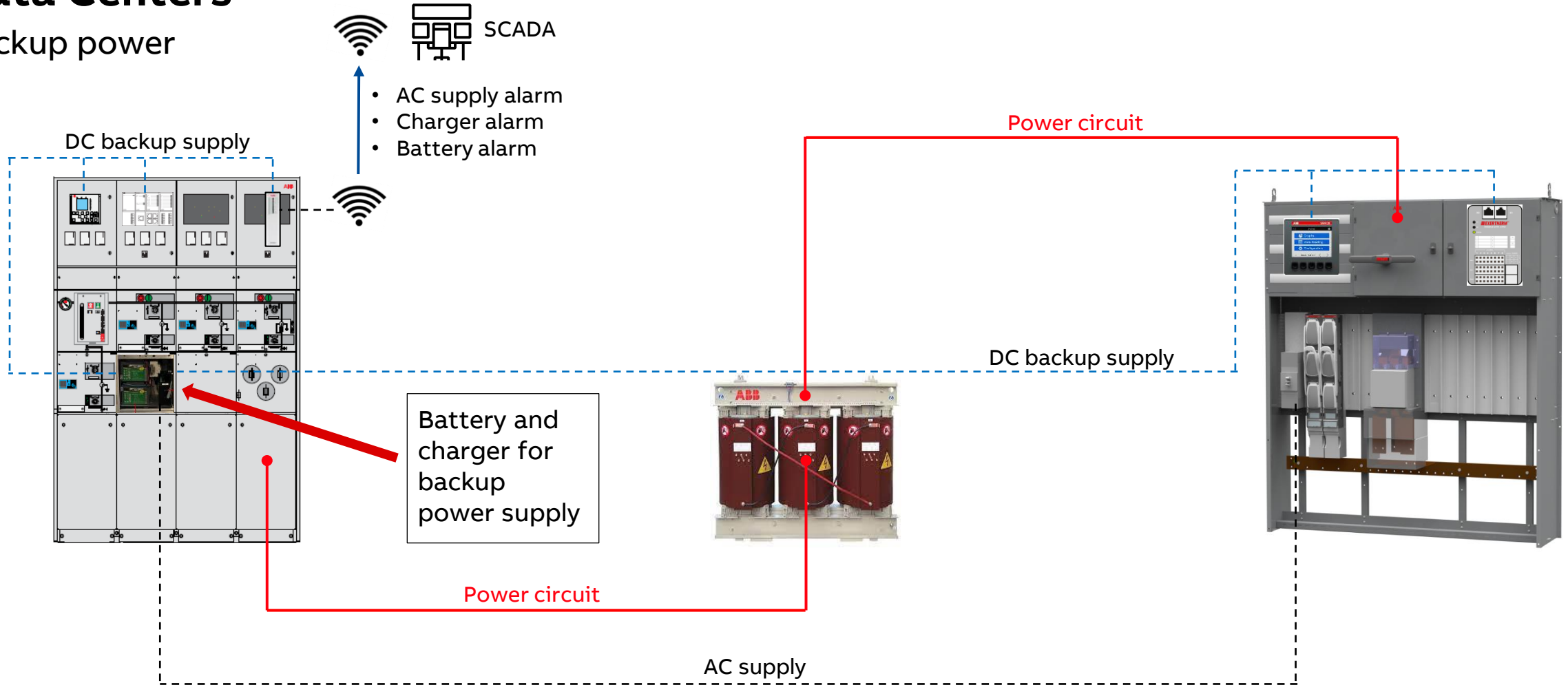
This part of IEC 62271 specifies the:
service conditions –

- Rated characteristics,
- General structural requirements
- Test methods of HV/LV cable Connections

CSS are installed in locations accessible to public and particular attention to protection of persons.

Data Centers

Backup power



Data Centers

Control and monitoring functional packages

Function

1 - Temperature Monitoring

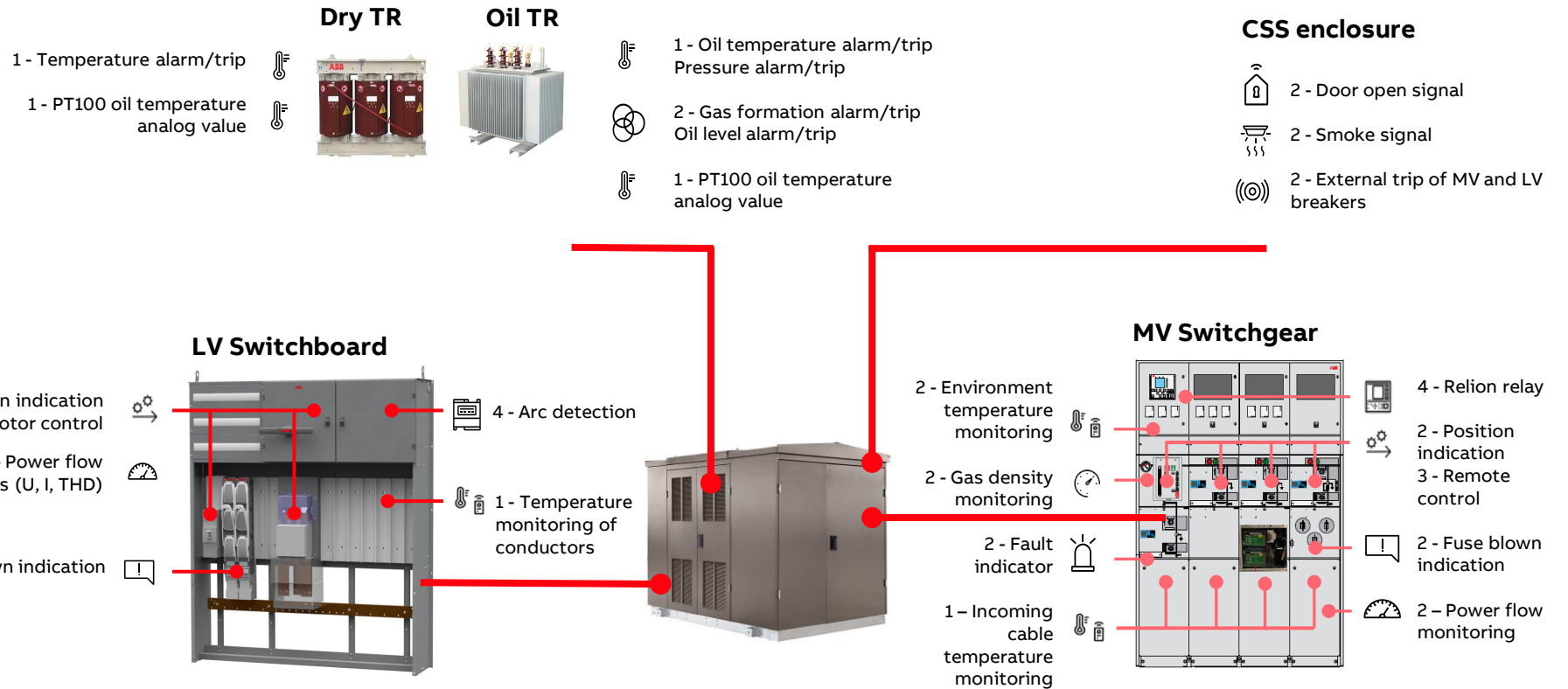
2 - Status Monitoring

3 - Control Package

4 - Protection Package

Including:

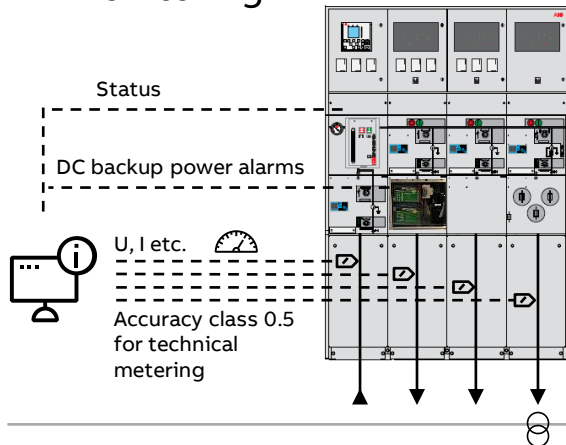
- Event recorder
- DC Backup power with long lifetime



CSS Digital Status Monitoring

MV Switchgear

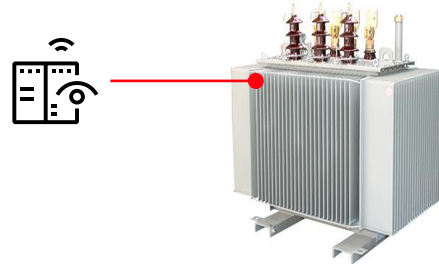
- Status of breakers, switch disconnectors
- Gas monitoring
- Fault indication
- Power flow monitoring
- DC backup power health monitoring



Transformer

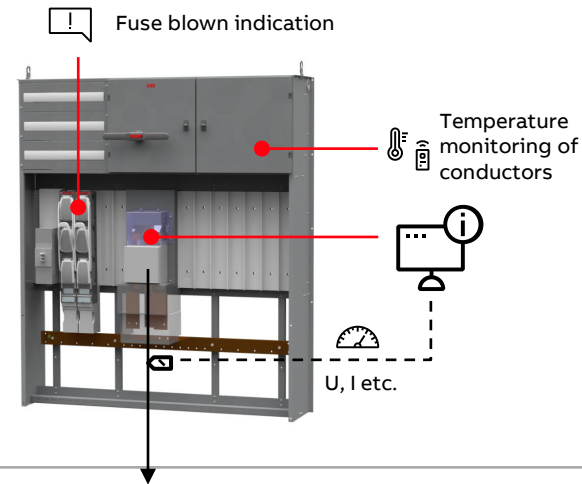
Alarm signal

- Oil overpressure
- Gas formation
- Low oil level



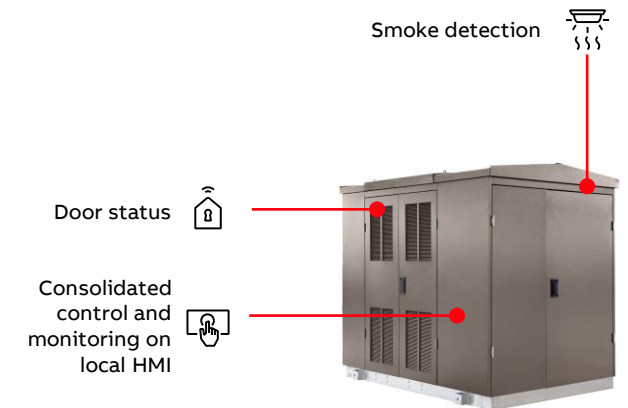
LV Switchboard

- Status of breakers, switch disconnectors
- Power flow monitoring (U, I, THD)
- Insulation monitoring



CSS

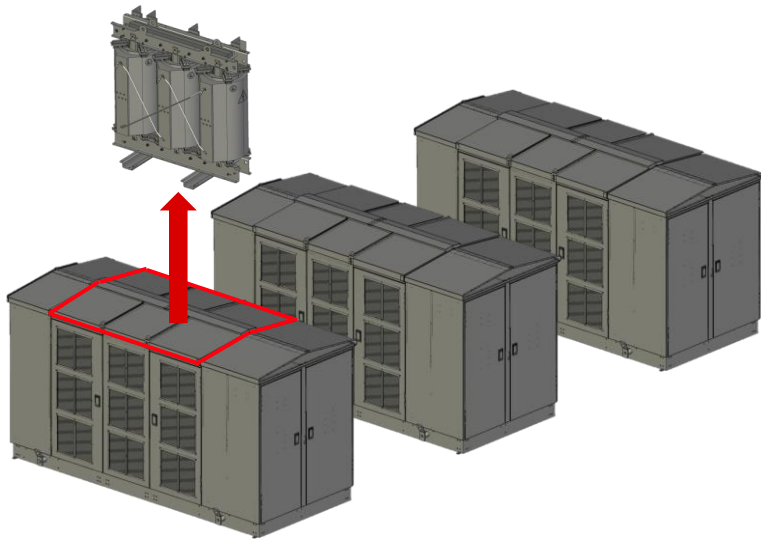
- Door position
- Smoke detection
- External trip signal detection



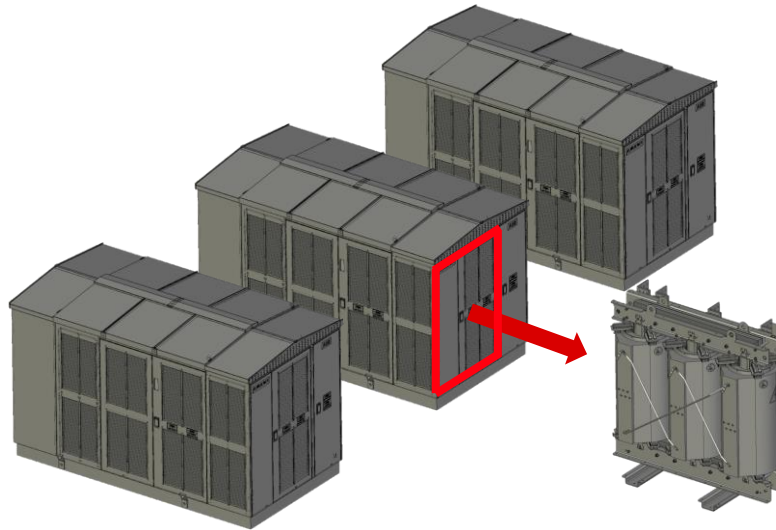
Data Centers

Transformer replacement

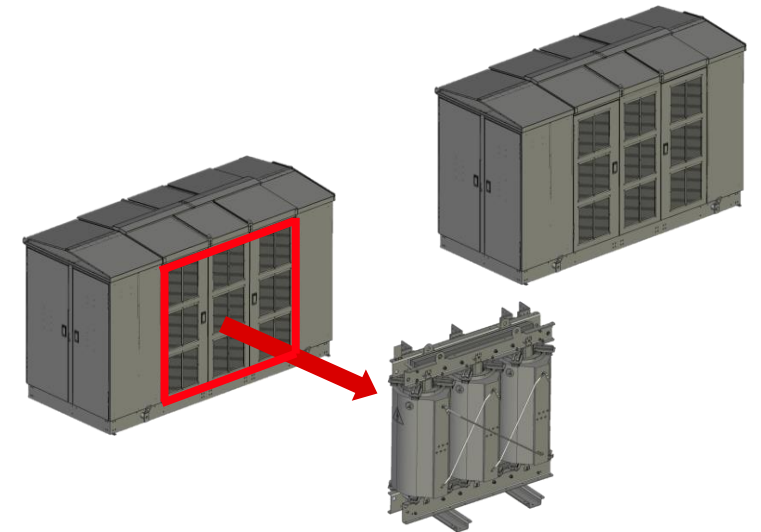
TR replacement through the roof



TR replacement through the door



TR replacement through the door



Data Centers

Suitability to an area subjected to a fire hazard

Safety

CSS enclosure material is nonflammable and self extinguishing

Dry transformer is F1 fire class:

- Comply to IEC 60076-11 Ed.2 2018-08 paragraph 12.3
- suitability to install in places subject to a fire hazard
- restricted flammability, minimized emission of toxic substances and opaque smoke
- Transformer do not contribute significantly to the thermal energy of an external fire

CSS for Datacenter



Data Centers

Internal Arc Classification (IAC)

Safety

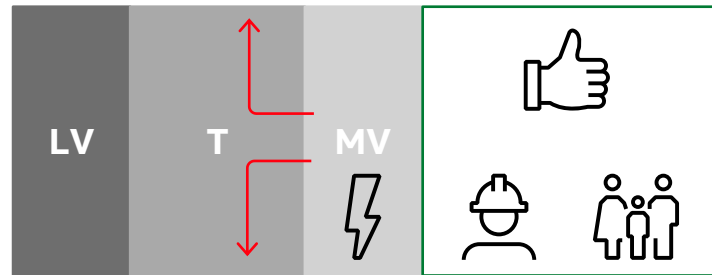
Internal arc classified substation

- According to IEC62271-202
- IAC-AB 20kA/1 sec
- Protection to both operators and general public

Internal arc proof

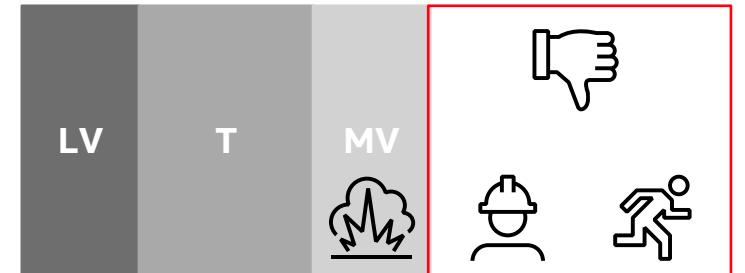


Gases directed



Gases directed

Non-arc proof



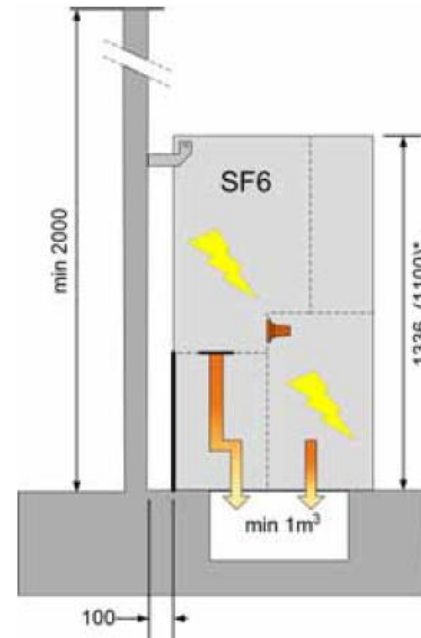
Data Centers

Internal Arc Classification (IAC)

Safety

- Arc proof MV switchgear inside CSS does not mean that CSS is arc tested
- Compact substation needs to be tested with medium voltage switchgear due to following cases:
 - Overpressure inside CSS
 - Overpressure on RMU covers
 - Hot gases routing inside substation
- Important to manage hot gases for safety

Arc proof SWG



Non-arc proof CSS



Data Center Integrated Solutions

Portfolio – Glass Reinforced Polystyrene (GRP)



- Low thermal conductivity
- Tolerates quick and big temperature fluctuations
- Internal temperature close to constant
- Minimal impact from solar radiation
- Insulation between the layers
- Certified for 120 min fire rating

New UniPack-G housing has next features to provide high safety and additional values to existing CSS offering:

- Internal arc fault type tested.
- Increased corrosion resistance
 - Longer lifetime and suitable for harsh environments.
- Lightweight
 - Easy to transport for long distances
 - Easy to relocate with no heavy cranes or other expensive handling equipment needed.
- Material will not dampen radio waves
 - An ideal enclosure for smart grid substations without having a need to install vulnerable external antennas for reliable remote communication.
- Double layer design
 - Providing extra strong mechanical strength with high impact resistance and very low thermal conductivity making it suitable simultaneously for warm and cold climate, with minimal impact from ambient temperature.

Design Features

Steel enclosure

Design feature

- Double layer door
 - Provides strength and robustness to doors and design
- No corner elements
 - Allows efficient space utilization in equipment compartments
- Double roof (optional)
 - Reduce solar irradiation inside CSS, prevents water dripping on equipment
- Different roof slope
 - For snowy or heavy rain areas

Safety and environment

- 3 pin locking
 - Increased safety to prevent unauthorized entry to CSS
- Oil pit
 - Prevents oil leakages to the environment
- Type tested

Better lifetime

- Zinc coated plates in foundation
 - Thicker zinc layer is needed for corrosion protection at ground level due to higher soil humidity
- Optimized ventilation
 - Efficient air flow and better cooling which increase transformer life time
 - Stainless steel hinges for High resistance to corrosion






Maintenance

- Compartmented roof
 - Possibility to work in compartments while keeping other station parts stays in operation
- Wide door opening
 - Provides more space for maintenance and service activities
- Limited number of moving parts
 - Increase reliability and allows to optimize stock

Service Support





Availability - Start-up and maintenance services for operational efficiency and rapid response



	1-Installation and commissioning A great investment in long-term trouble-free equipment operation.
	2-Training The best way to ensure user staff has the needed skills.
	3-Spares and consumables All original and genuine spare parts, upgrade kits and service boxes.
	4-Maintenance Preventive, risk-based and predictive maintenance services to keep running the production.
	5-Repairs Workshop and <u>on site</u> repairs by our service engineers to get equipment ready to restart as soon as possible.

Reliability - Life cycle services for extended life-time and improved performance



	6-Engineering and consulting Product application recommendations, customized switchgear solutions, health and environmental best practices.	7.1-Panels extensions Expansion of any kind of switchgear with either original legacy equipment or panels of active lines.
	7-Extensions, upgrades and retrofits Enhance existing equipment with the latest technology.	7.2-Safety upgrades Achieve maximum safety integrating arc fault protection systems and remote breakers racking solutions.
	8-End of life services Equipment decommissioning and disposal, with special care of SF6 gas.	7.3.1-Breakers retrofits Replacement of any old circuit breaker with modern equipment.
	9-Replacements Replacing older equipment can dramatically increase performance and reduce costs.	7.3.2-Relays retrofits Integration of advanced protection and communications capabilities with full functions compatibility.

Values to Customers

Simple and quick installation

Units are pre-designed, pre-tested and assembled at the factory, and shipped in one piece so it is simple to drop in place and connect cables. Open-air design allows easy access to equipment for quick installation procedures.

Pre-engineered products

Simple and modular concept with pre-engineered designs to be combined to meet project requirements. Pre-engineered units shorten design time, eliminating design errors.

One piece delivery

The electrical equipment are integrated in a base frame maximizing factory verification test hence minimizing site works

Efficient cooling

Open-air design with natural air cooling allows maximum transformer cooling. There is no need to consider derating due to limited ventilation.

No exposed live parts

Although it is an open-air design, there are no exposed live parts. All live parts are covered to ensure safety against electrical shock.

Type tested

All electrical equipment contained within the SSU are type tested according to their relevant standards, ensuring quality of subcomponents.

Easy access

Open-air design provides easy access for visual inspection of equipment. Trained personnel can open covered parts for service.

ABB Ability™

ABB Ability provides predictive maintenance and remote management through, smart sensing and communication, internet-based management, data historian and connected asset lifecycle management.

Homologation

Electrical equipment conforms to local regulations.





Data Centers

Case studies

Case study

Powering crypto mining

Location: Sweden

Installed base: UniPack-S CSS



Challenge:

- Tight requirements to comply with customer site layout and footprint
- Monitoring, remote control and integration solution into customer system
- Modular solution also for next phases



Solution:

- Reliable, pre-fabricated, customized solutions for grid integration
- Fully type tested product to guarantee safety and reliability
- Expansion capabilities with modular solution
- A total of 11 containerized substations including:
 - Dry transformers
 - Secondary MV switchgear SafeRing AirPlus™
 - LVS3 with low-voltage breakers



Outcome:

- Fast delivery
- Ability to meet client demands
- Maintain profitable business operations



Case study

Powering a cryptocurrency data center

Location: Australia

Installed base: UniPack-S CSS



Challenge:

- Robust and reliable electrical power supply of cryptocurrency data center
- Fast delivery
- Ability to expand in line with future developments



Outcome:

- CSS integrated in customer SCADA providing monitoring for both low- and medium-voltage side
- Layout is standardized for next phases of the projects
- Small footprint compared to a traditional solution with very short installation time on site



Solution:

- UniPack-S Mercury35 compact secondary substation with additional monitoring and control compartment
- Remote control, status and fault monitoring with SCADA integration
- Dry type transformer
- Fully type tested solution allowing safe operation for service personnel



Case study

Powering a cryptocurrency data center

Location: Estonia

Installed base: UniPack-S CSS



Challenge:

- Fast delivery time
- Customer required a scalable, modular solution



Outcome:

- Project finalized within a short delivery period



Solution:

- Standard unit with quick delivery
- 12 units of Mercury 16 with 1250kVA transformer
- UniPack low-voltage switchboard for power distribution with fuse switch protection for outgoing cables



Case study

Powering a Colo data center

Location: EU

Installed base: UniPack-S CSS



Challenge:

- Robust and reliable electrical power supply of Colo data center
- Fast delivery and easy installation.
- Ability to expand in line with future developments



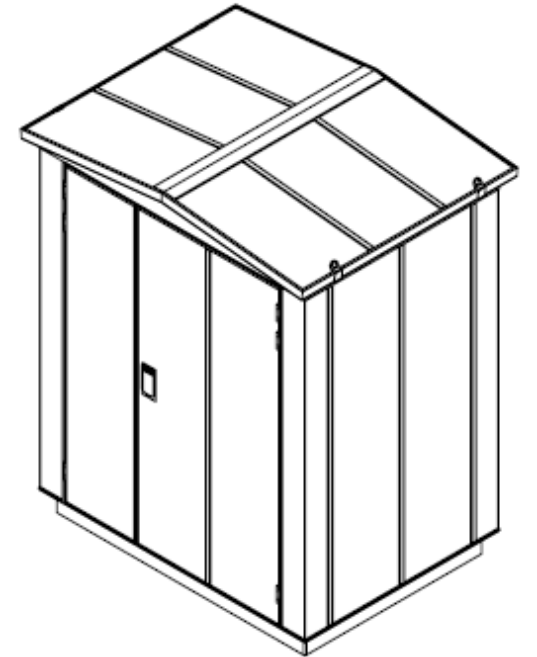
Outcome:

- CSS easily integrated in customer designed system
- Layout is standardized for next phases of the projects
- Small footprint compared to a traditional solution with very short installation time on site



Solution:

- UniPack-S Antares 2x3 compact secondary substation with additional equipment in order to safely and reliably monitor and service the RMU.
- Having a walk-in solution for RMU maintenance and operation. Provides shelter in even harsh weather condition for operation.
- Our GRP design provides the optimal conditions for the best possible operating condition for the RMU
- Flexible Steel foundation allows easy installation and fast cabling



Case study

Colo in Europe

Standard solution

Modular solution with 2500 kVA net power
CSS concept integrated in overall DtC design

Benefits:

- Small footprint, fast delivery,
- Outdoor solution reducing Capex for building & site installation
- Improved PUE
- No fire hazard
 - steel enclosure
 - F1 rated Dry type transformer



MV RMU 24 kV
2800 Dry type transformer
No Lo Voltage, but direct cable connection

CSS Solutions for Data Centers

Value proposition vs Standalone products

Data Center

Value proposition CSS vs. Standalone products (MV switchgear, transformers, LV cabinet)



Low cost of ownership

- CSS reduce project management, installation and commissioning cost

Scope of works with CSS		Scope of works with standalone components	
CSS foundation	●	MV Foundation	●
		TR foundation	●
		LV foundation	●
Incoming MV and LV cables	●	MV cable MV SWG-TR	●
		LV cable TR-LVS	●
		Incoming MV and LV cables	●
PRJ Mngmt CSS	●	PRJ Mngmt MV SWG	●
		PRJ Mngmt TR	●
		PRJ Mngmt LVS	●
		PRJ Mngmt Cable supplier	●
Test at factory	●	Test at site	●
Transportation of one unit	●	Transportation of components	●

Data Center

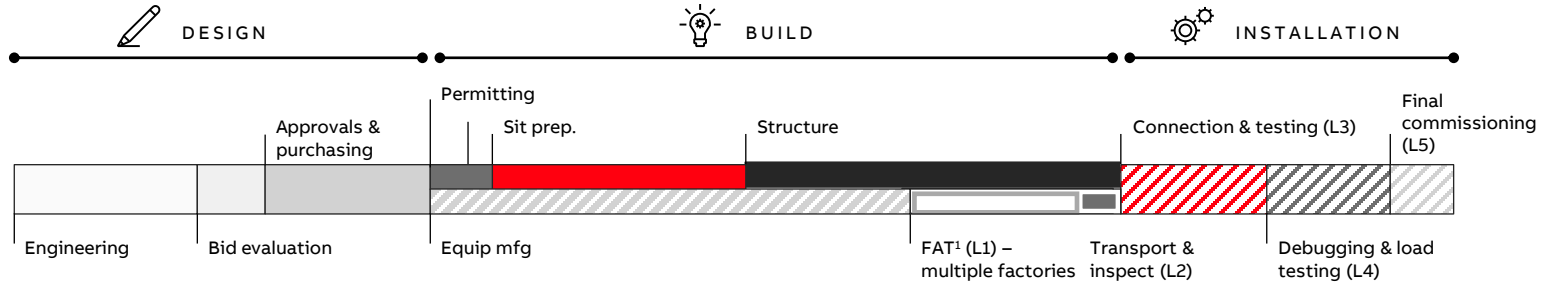
Value proposition CSS vs. Standalone products (MV switchgear, transformers, LV cabinet)



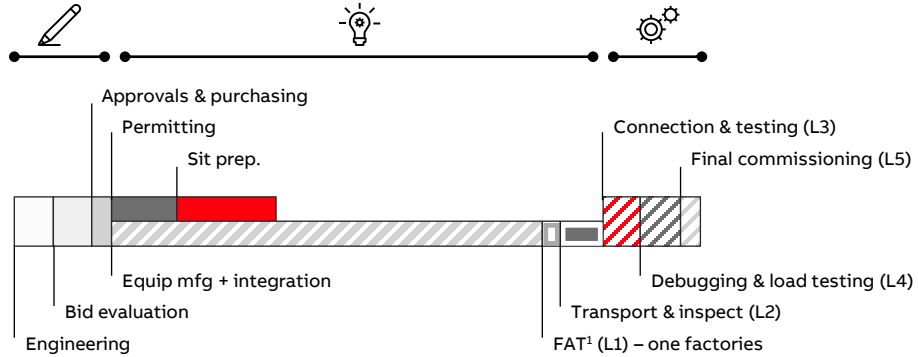
Fast delivery

CSS is delivered as one piece; pretested unit with premade internal interconnections

1
Traditional on-site build “stick built”



2
Predesigned, prefabricated off-site eHouse or skid



50%
improvement over
traditional

Data Centers

CSS Value Proposition Vs. Standalone products (MV switchgear, transformers, LV cabinet)



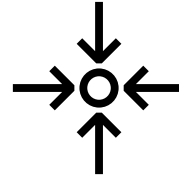
Low Cost of ownership

Reduction in project management, installation and commissioning



Fast delivery

CSS is delivered as one piece; pretested unit with premade internal interconnections



Space saving

CSS footprint is approximately 30% smaller than eHouse



Safe

Internal Arc tested to guarantee safety for Operation personnel and Public

ABB