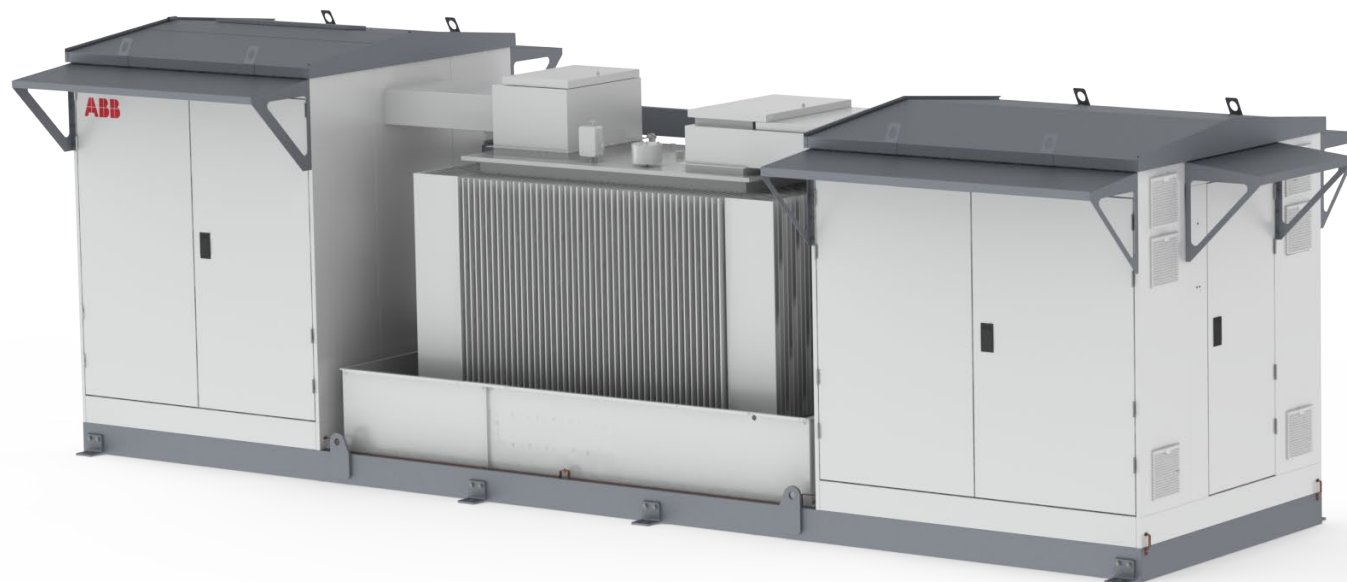


EXTERNAL



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PRODUCT OVERVIEW

# SSU Secondary Skid Unit

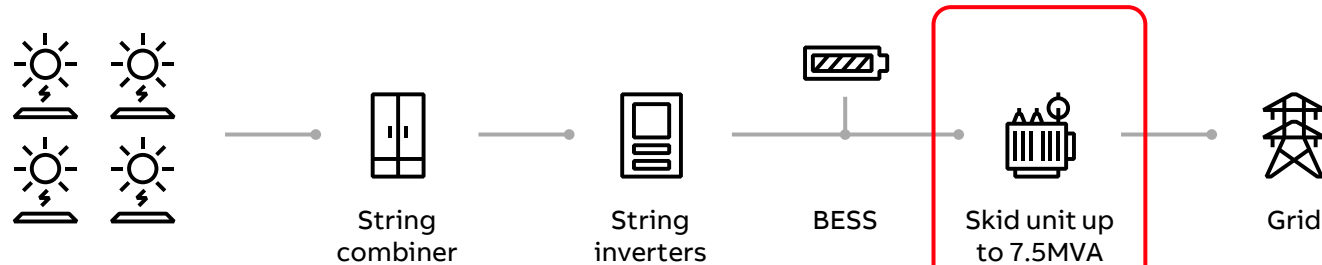
In line with IEC62271-212



# SSU Secondary Skid Unit

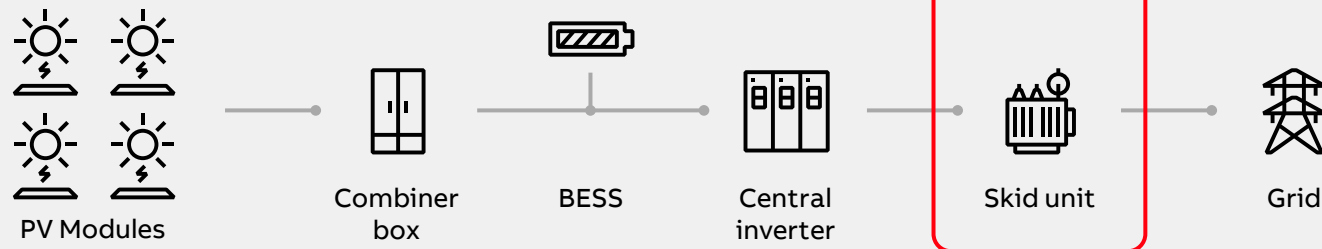
## Typical topology

### Large scale with string inverters



- Large scale of plant
- Ground mounted PV often with tracker systems
- No public access
- Step up with industrial look skid unit up to 7.5MVA

### Large scale with central inverter



- Large scale of plant
- Ground mounted PV often with tracker systems
- No public access
- Step up with industrial look skid unit up to 7.5MVA with central inverter

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# SSU Secondary Skid Unit

Typical customer requirements from step up solar skid

## Customer requirements

- High reliability and safety
- Designed and tested according to IEC standards
- Reduced downtime – continuity of service and stable supply
- Space savings – compact dimensions
- Flexible solution – configurable per MV grid parameters
- Safe and easy for operators in existing networks and systems
- Optimized life cycle cost – reduced maintenance and easy installation
- Quick delivery time
- Low environmental impact



# SSU Secondary Skid Unit

## Main concept

### Main highlights

#### Standard:

- Inline with IEC 62271-212

#### MV:

- SafeRing up to 40.5 kV (up to 20 kA)

#### Transformer:

- Oil hermetically sealed up to 7500 kVA

#### Low voltage switchgear:

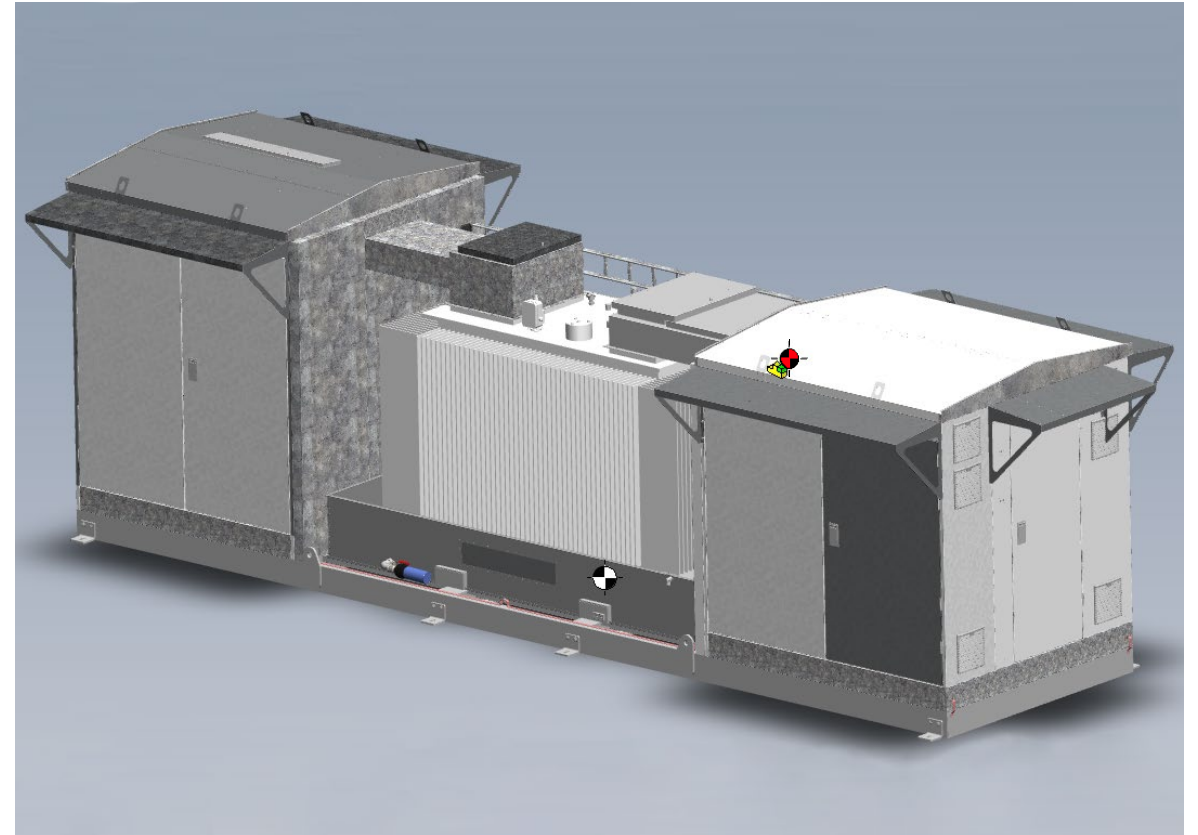
- UniPack LVS4 sized to 2800 A
- Nr. of string inverters at 800 V
  - 185 kVA – up to 40 PC
  - 250 kVA – up to 30 PC

#### Low voltage connection:

- Busduct
- Oil containment bund
- Anti-rodent and watertight cable inlets

#### Transportation:

- Flat rack ISO container or truck



# SSU Secondary Skid Unit

## Standards

### Prefabricated skid unit

In line with IEC 62271-212 Compact Equipment Assembly for Distribution Substation (CEADS)

IEC 60529 Degree of protection provided by an enclosure (IP code)

IEC 62262 Degree of protection against external mechanical impacts (IK code)

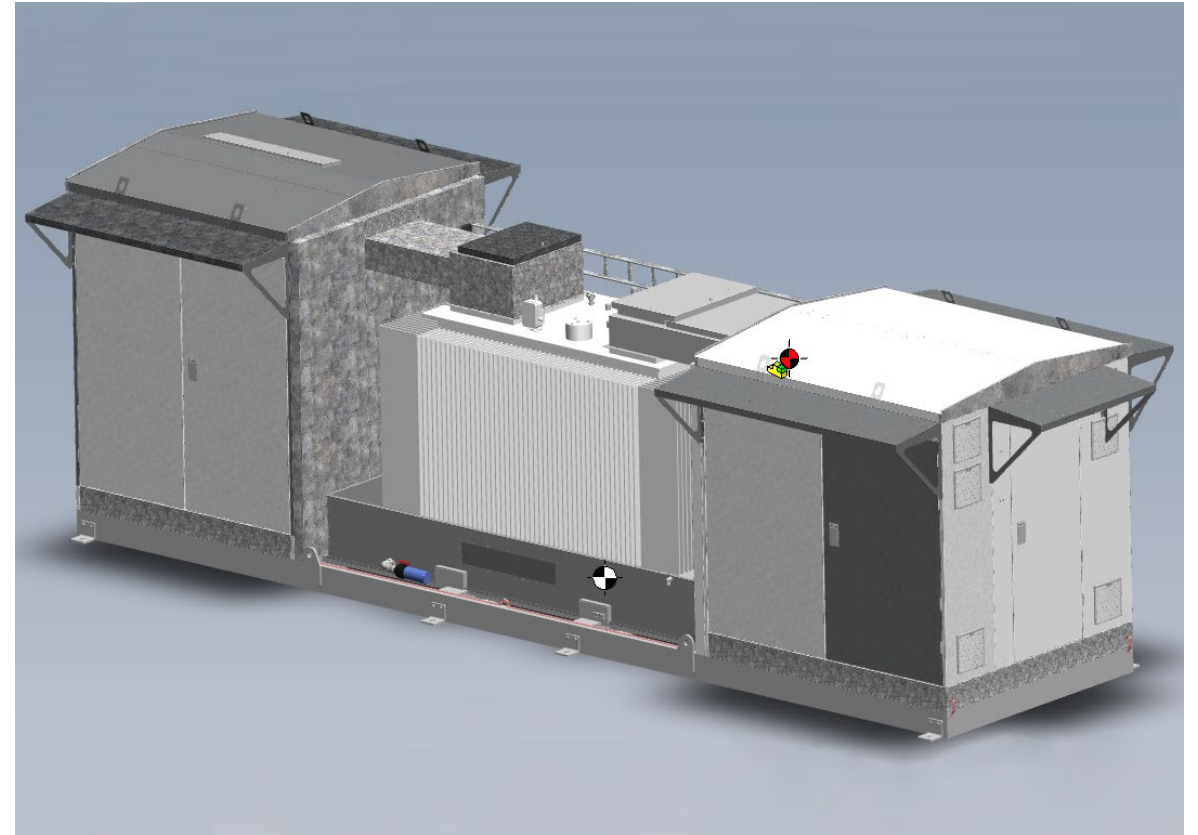
IEC 60721 Classification of environmental conditions

### Main components

IEC 62271-162271-200 High-voltage switchgear and controlgear

IEC 61439-1 Low-voltage switchgear and controlgear

IEC 60076 Transformer



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# SSU Secondary Skid Unit

## Customer benefits



### 1. High safety

- Internal arc fault tested
- Key interlock for safe operation



### 2. Reliability

- Pre-engineered product reduce a risk of failure



### 3. Maximal efficiency

- Open air cooling for maximal efficiency of transformer



### 4. Easy and fast installation, commissioning

- Factory assembled and tested product



### 5. Eco-friendly

- Transformer oil pit
- Low global warming potential MV SWG as an option



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# SSU Secondary Skid Unit

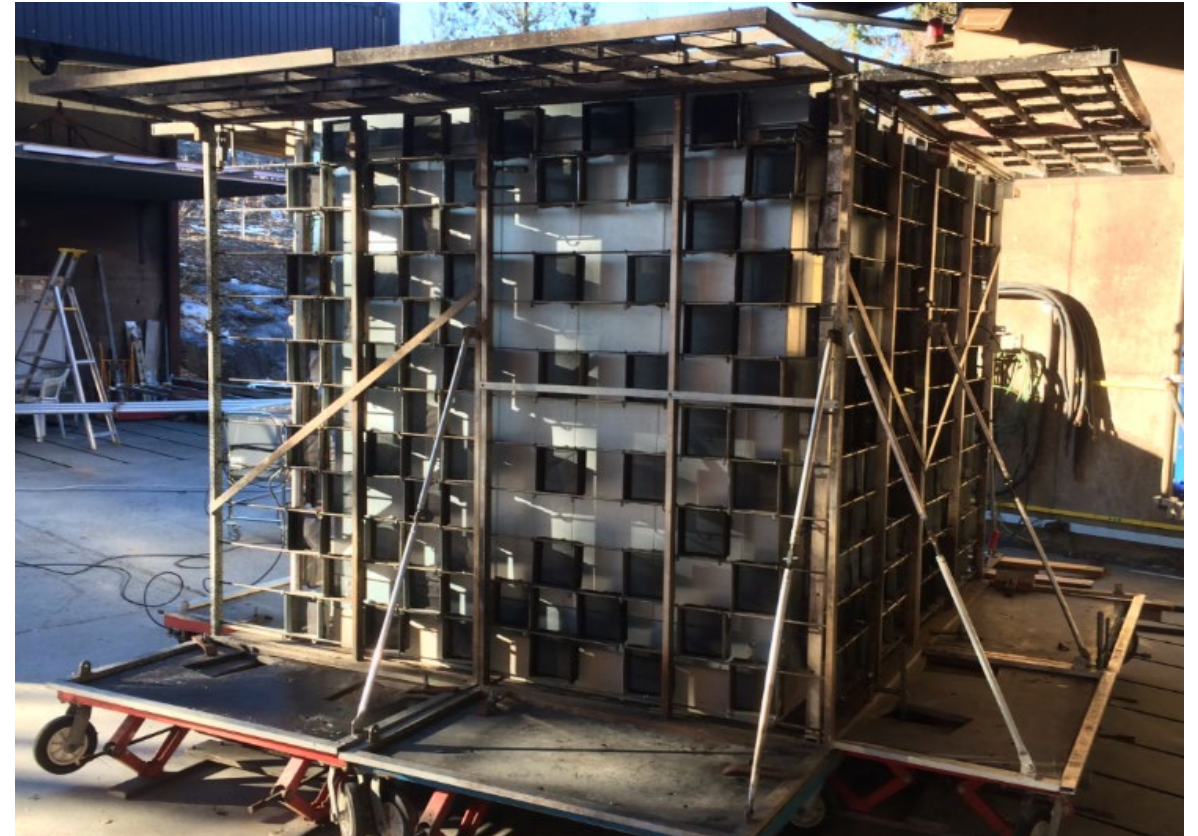
## Internal Arc Classification (IAC)

### Internal arc classified substation

- Prescribed criteria for protection of persons are met in the event of an internal arc and demonstrated by appropriate tests

### Internal arc classification IAC-A

- Protection to operators during normal operation on the HV side of the skid



# SSU Secondary Skid Unit

## Internal Arc Classification (IAC)

### Safety

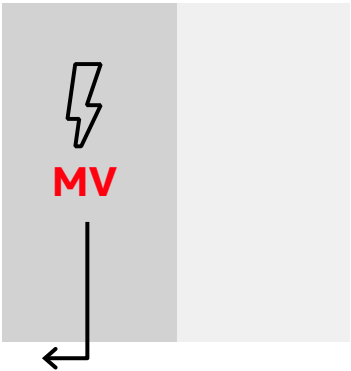
Internal arc classified Safe-Ring / Safe-Plus 12/24/36 in outdoor enclosure

- According to IEC62271-200 transferable to 212
- IAC-A 20kA 1 sec per IEC62271-212
- Protection of operation personnel
- Small footprint

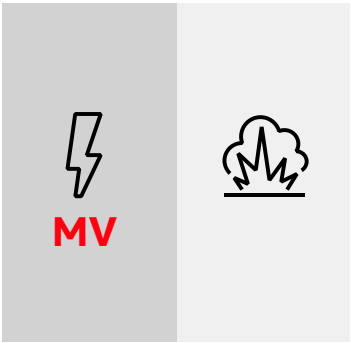
### Internal arc proof



Gases directed



### Non-arc proof





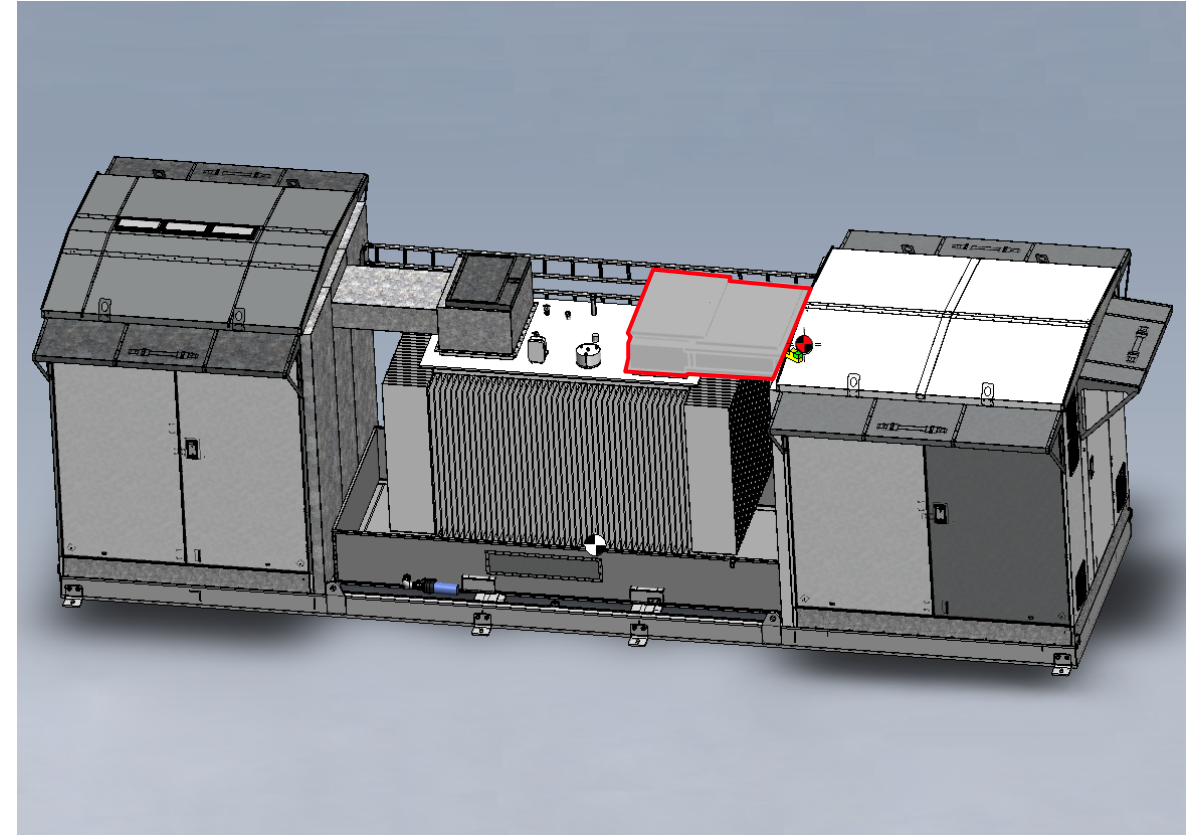
# SSU Secondary Skid Unit

## Reliability

Reduced risk of failure thanks to several type tests performed considering worst-case condition:

### Test done:

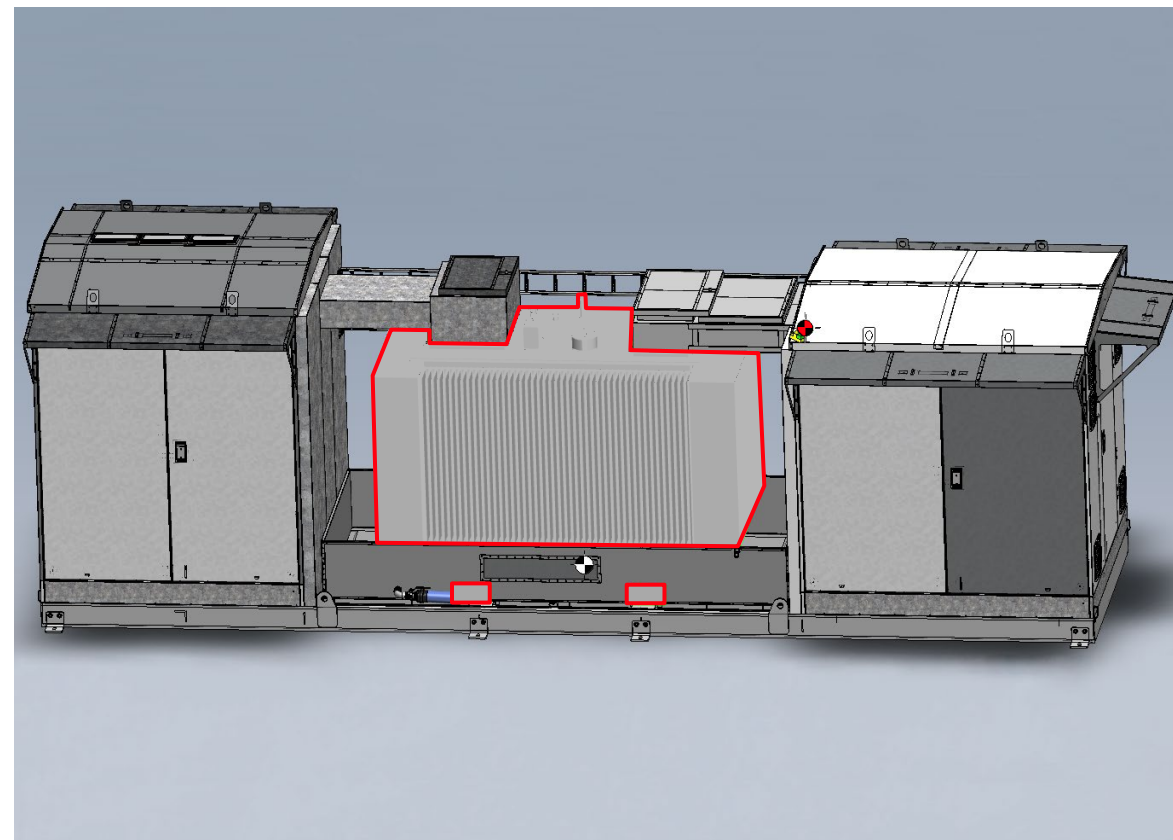
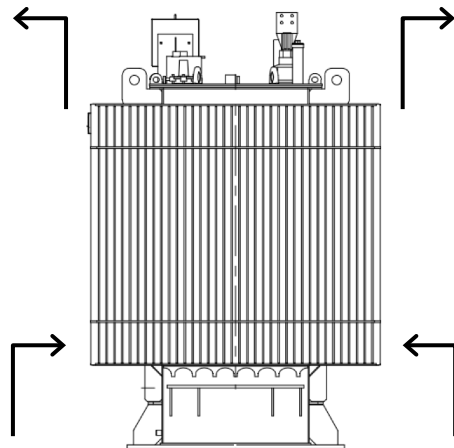
- Heat run of LV power circuit and a busduct @ 2800A reduce a risk of overheating of LV parts during peak power generation
- Dielectric
- Short Time Current
- IP, IK
- Internal arc
- Seismic simulation per IEEE693 moderate seismic level as standard
- Seismic simulation per IEEE693 high seismic level as an option



# SSU Secondary Skid Unit

## Maximum efficiency

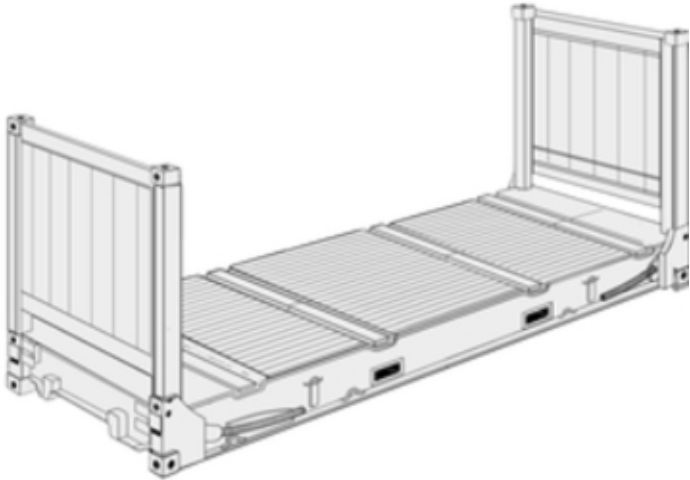
- Maximum efficiency during peak power generation thanks to free air cooling of transformer
- Engineered for efficient cooling in order to extend the life of the equipment
- No derating due to enclosure
- Less risk of overheating



# SSU Secondary Skid Unit

## Fast installation

- Compact and easily transportable using standard transportation equipment – flat rack container or truck
- On site assembly is minimized
- Pre-engineered products reduce commissioning time at site while reducing risks
- Complete factory-delivered solution with only external connection to be done at site, resulting in significantly reduced installation time

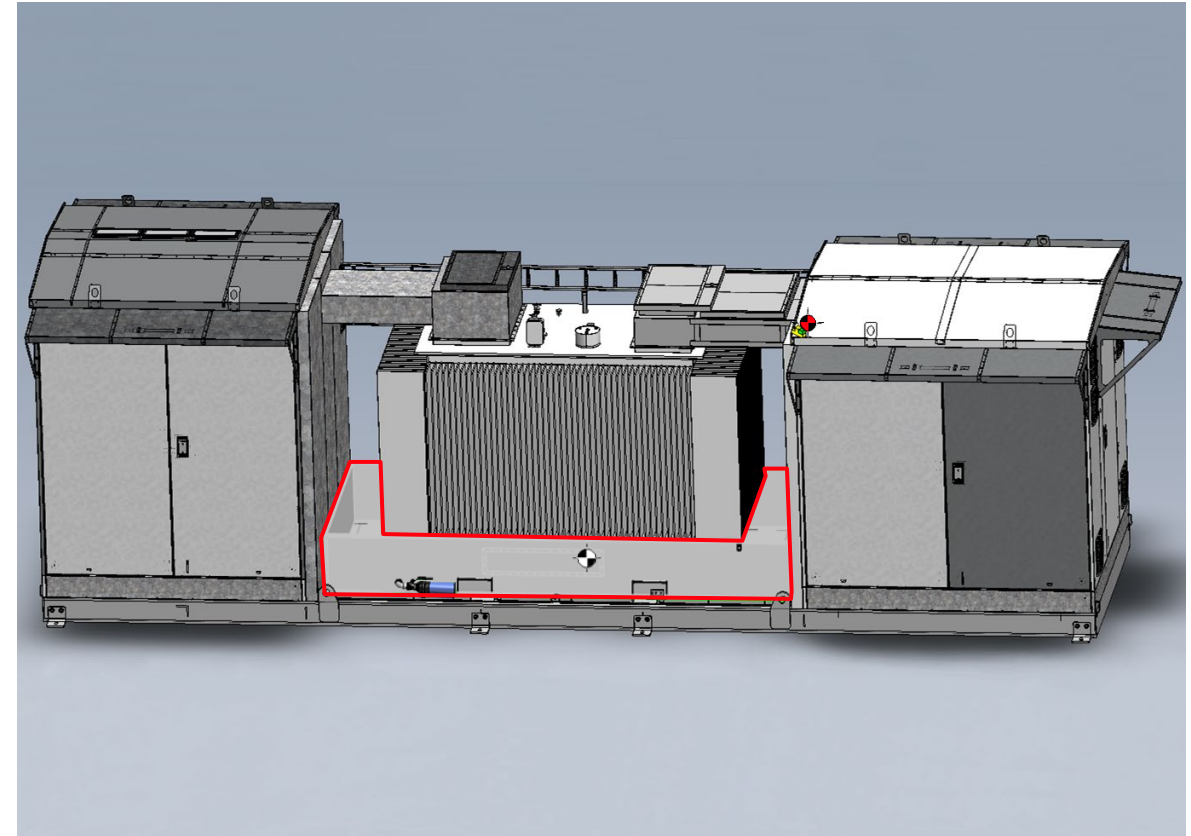




# SSU Secondary Skid Unit

## Eco-friendly

- Transformer oil containment bund to minimize a risk of pollution
- Low global warming potential MV switchgear available as an option
- Renewable transformer oil available as an option – biodegradable and non-toxic on both soil and water





# SSU Secondary Skid Unit

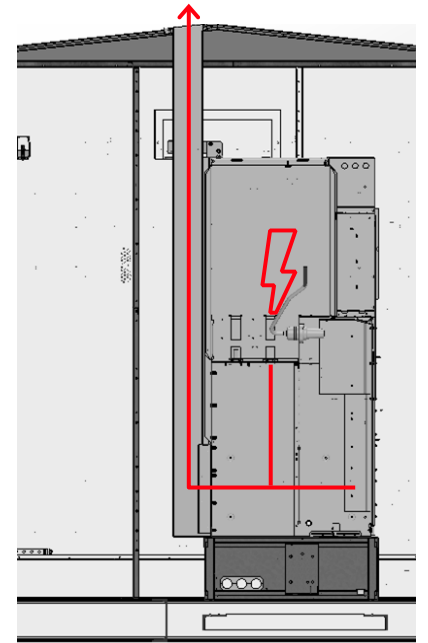
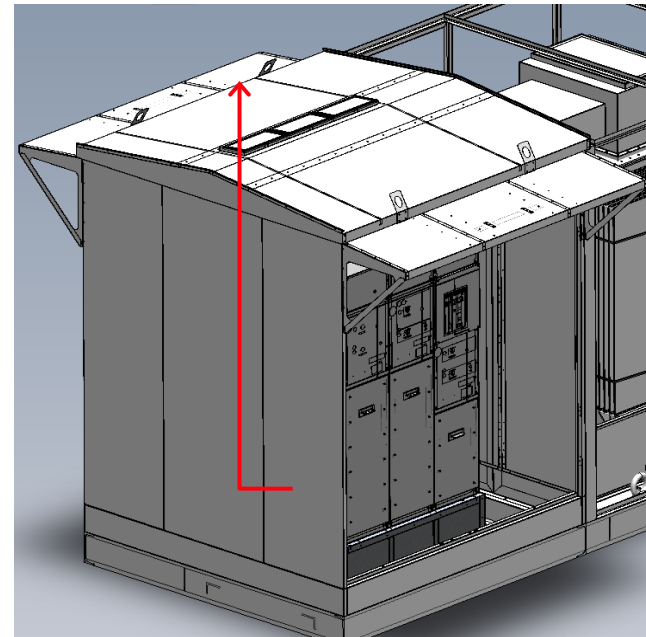
Features

# SSU Secondary Skid Unit

## Medium voltage side

- Provision for secondary medium voltage switchgear per IEC62271-200:
  - SafeRing / SafePlus up to 3bay
  - SafeRing / SafePlus36 up to 3bay
  - SafeRing / SafePlusAir – SF6 free up to 3bay
  - SafeRingAirplus – SF6 free up to 3bay
- Internal arc gas release is arranged through the roof with a base frame and a chimney

Internal arc gas release





# SSU Secondary Skid Unit

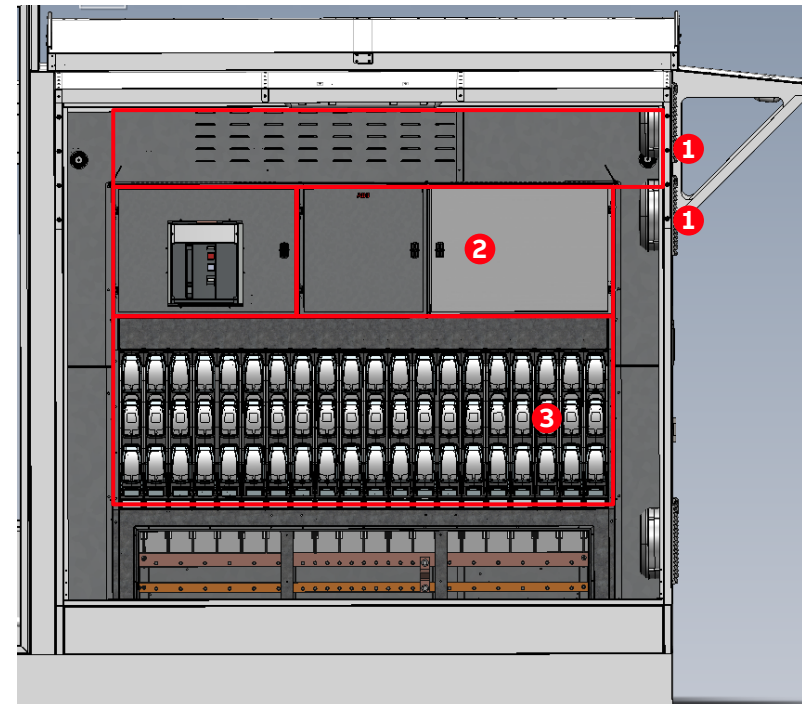
Low voltage side

## Advantages

- Small footprint
- Reliable
  - Tested per IEC61439-1
  - Redundant cooling fans for low risk of failure

## Available configuration LVS4:

- 800 VAC
- Main incomer with ACBs 3P fixed
- Inverter connection with a Fuse switch disconnectors up to 2800 A per LVS
- Inverter connection with a breaker up to 2400 A per LVS



- 1.** Cooling fans  
Part of LV cabin
- 2.** Auxiliary  
compartments
- 3.** Fuse switch  
disconnectors for  
inverter connection

# SSU Secondary Skid Unit

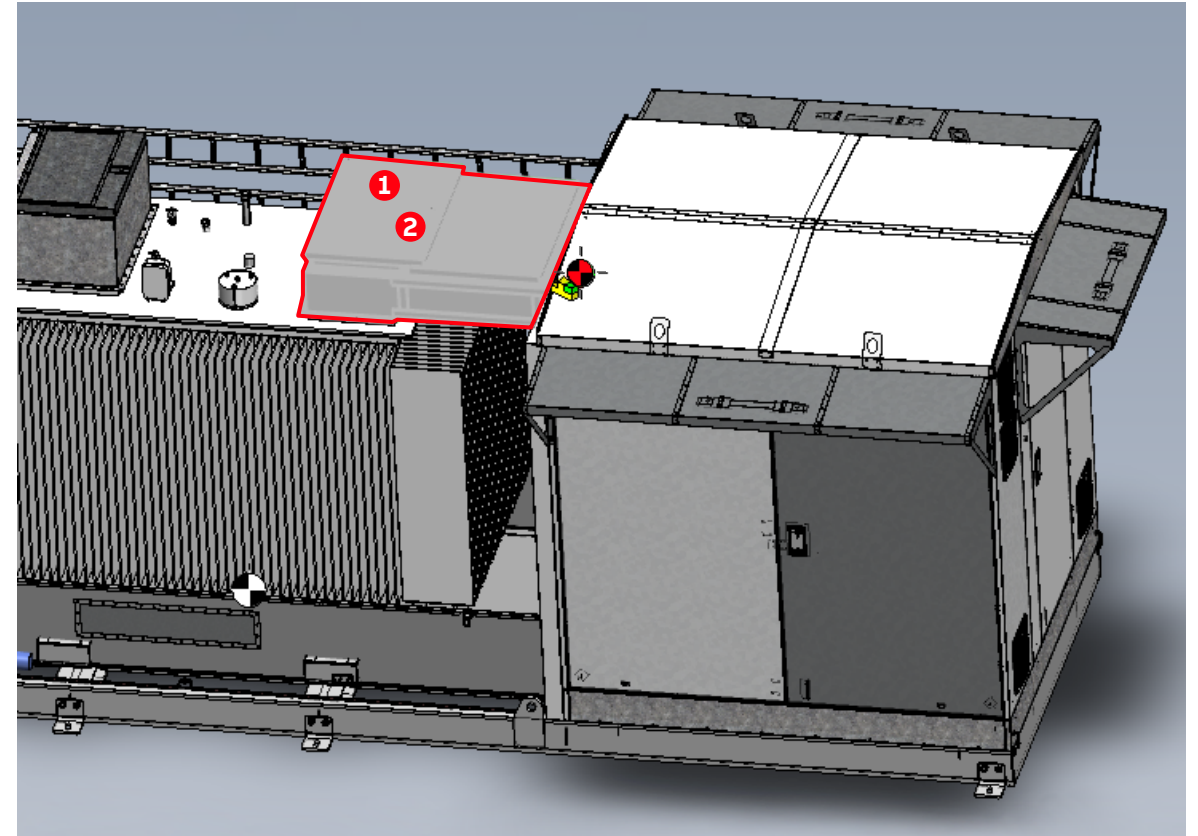
Low voltage side

## Advantages

- Busduct connection is rated to 2800 A @ 35°C ambient
- LV busduct and LV switchboard are heat run tested in the lab
- 2 LV winding busducts are segregated by metallic partition
- Busbar is contained in outdoor enclosure
  - IP55
  - IK10
- Design of busduct may need to be accommodated to different TR

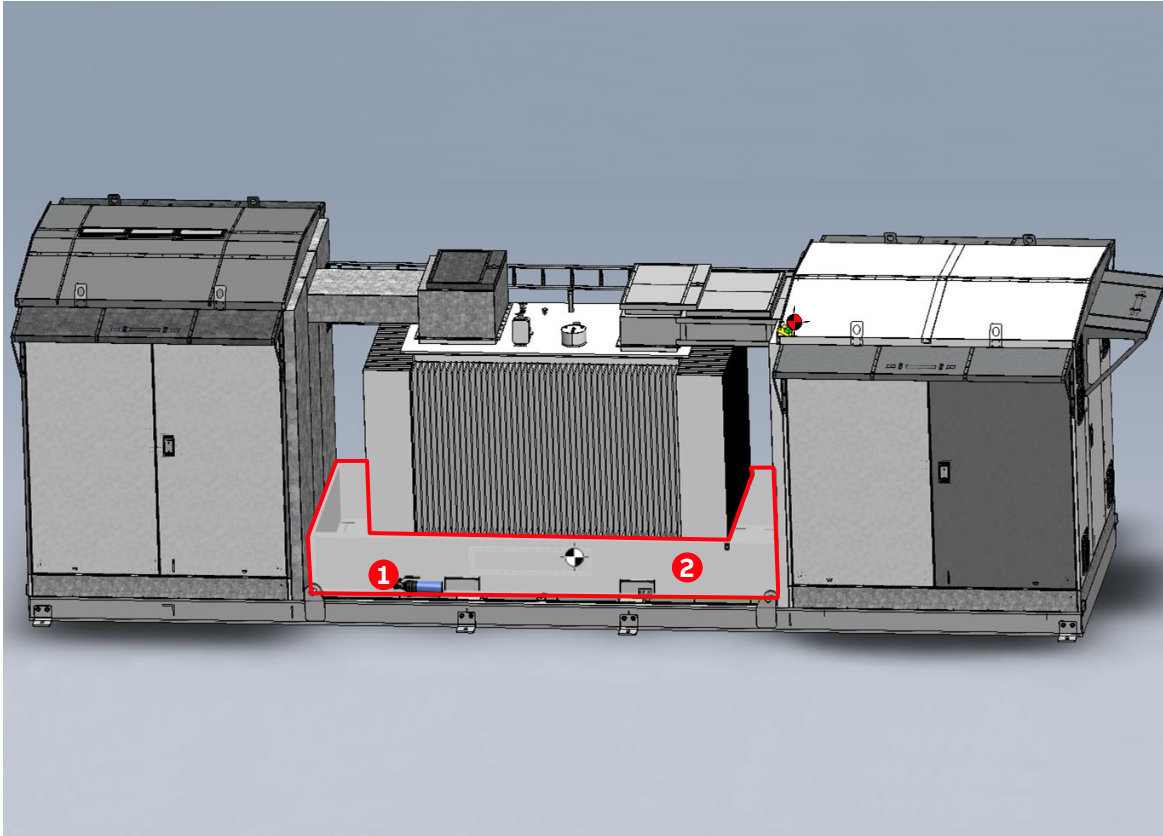
**1.** LV connection – copper busduct

**2.** Ronis key interlock



# SSU Secondary Skid Unit

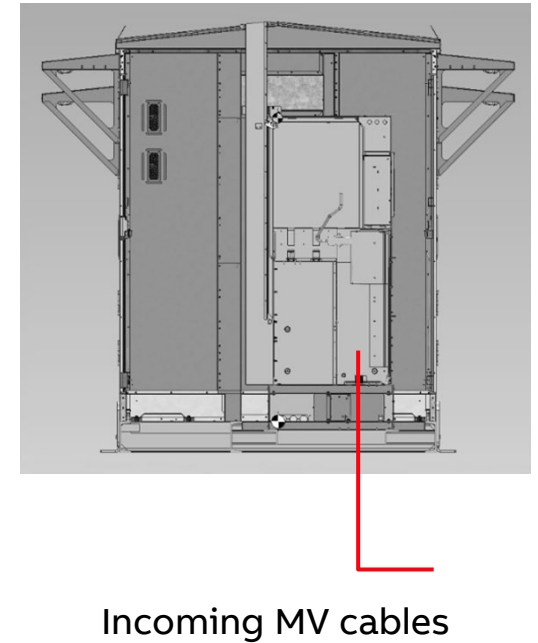
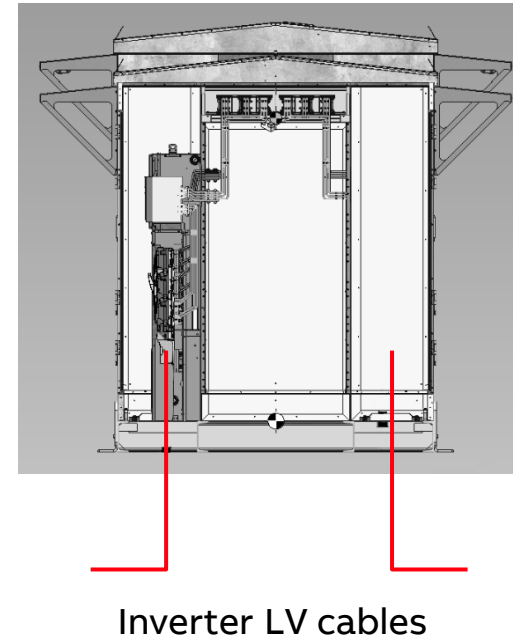
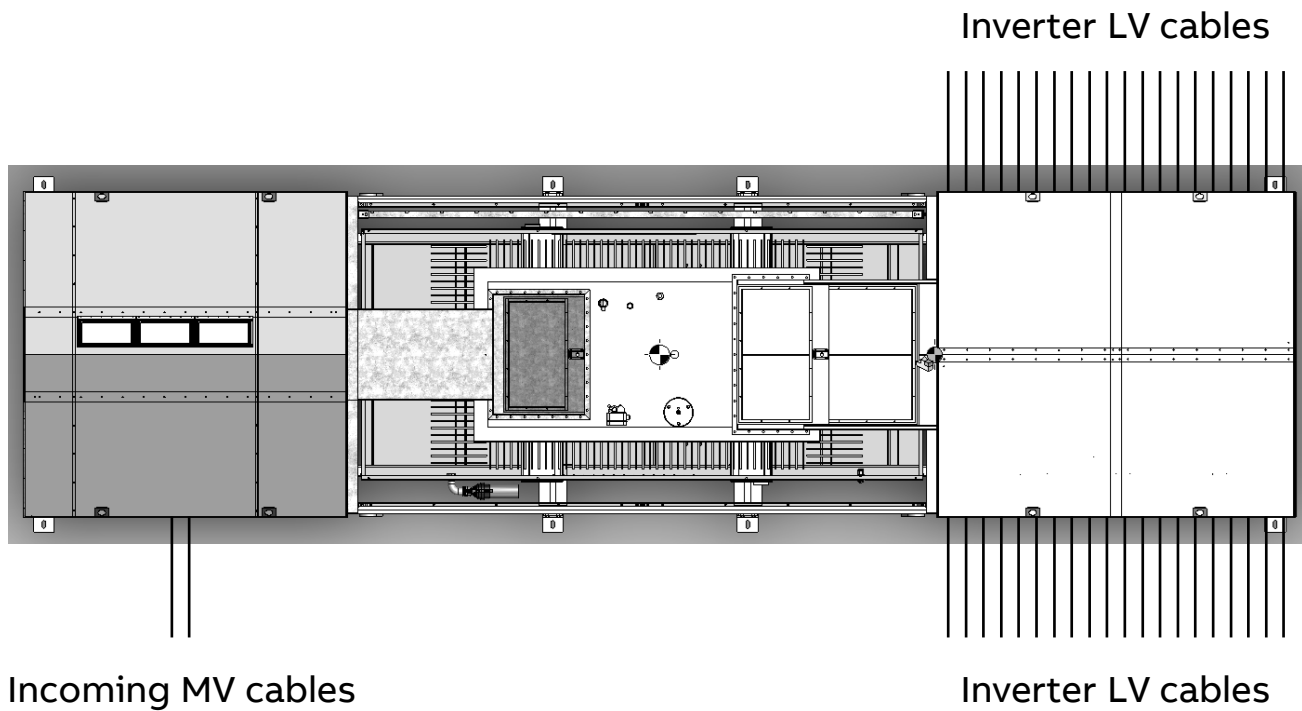
Oil containment bund



- 1. Oil/water separator to release the rainwater during normal service
- 2. Oil containment bund to reduce a risk of pollution in case of oil leakage

# SSU Secondary Skid Unit

## Cable layout



# SSU Secondary Skid Unit

## Automation and monitoring

### Medium voltage

- Status monitoring
- Remote operation
- SF6 level alarm
- Event recorder
- Oscillography
- MV bushing temperature monitoring

### Transformer

- Gas formation alarm
- Low oil level alarm
- Overpressure alarm
- Overtemperature alarm
- Oil temperature analog value with PT100

### Low voltage

- Power values, U, I, THD
- Main breaker control
- Electronic fuse status monitoring
- Insulation monitoring alarm and trip
- UPS health monitoring

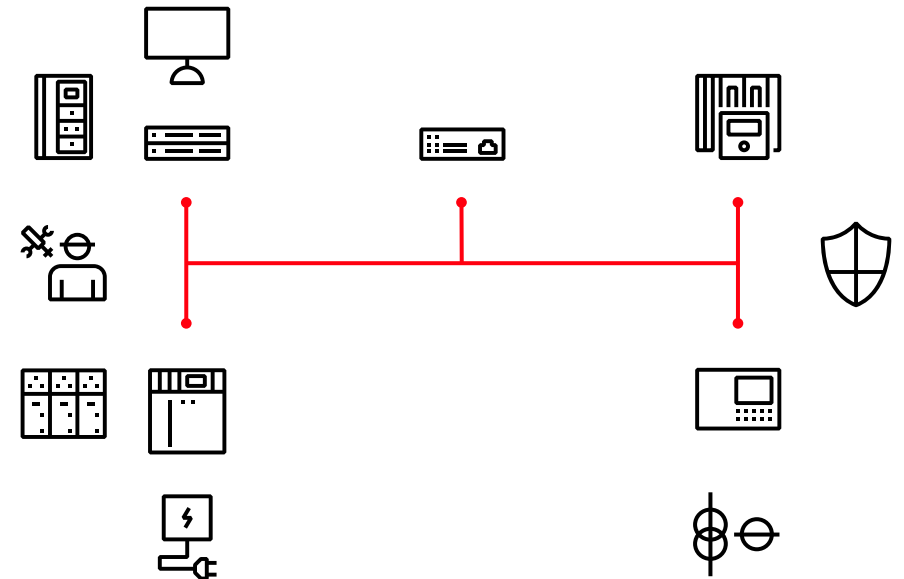
### Skid cabin enclosure

- Door open status
- Smoke detection inside the cabins
- LV cooling fan failure signal

### Connection towards customer

#### DMS using:

- Modbus TCP
- IEC 60870-5-104/-101
- IEC 61850



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# SSU Secondary Skid Unit

Pre-engineered skid unit variants



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# SSU Secondary Skid Unit

Pre-engineered skid unit variants

**There are 3 pre-engineered skid unit variants available**

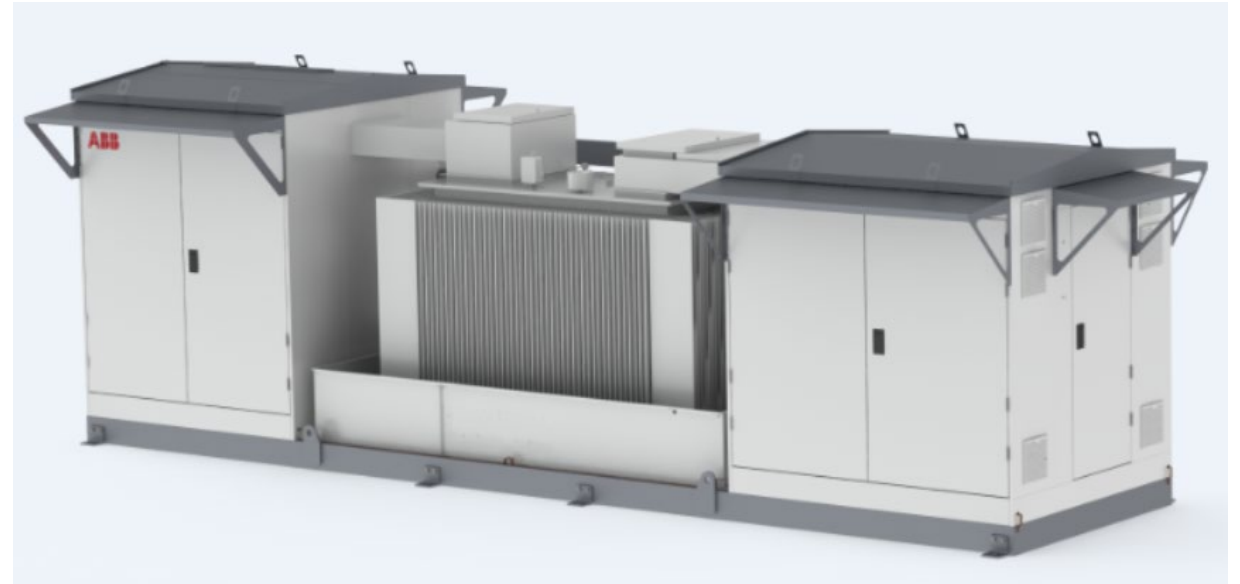
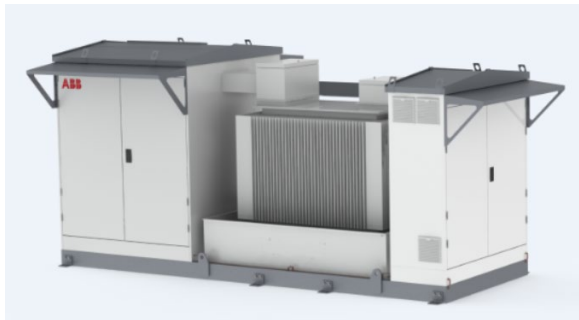
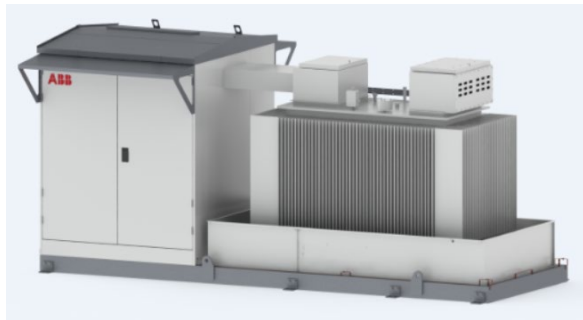
**7500kVA for string inverters**

- 40x185 kVA string inverters
- 30x250 kVA string inverters

**3750kVA for string inverters**

- 20x185 kVA string inverters
- 15x250 kVA string inverters

**6000kVA prepared for central inverter**



**ABB**