PROJECT DOCUMENTATION

Extreme Light Infrastructure ERIC (ELI ERIC) - 312.55 kWp

Prepared by: Miroslav Kohoutek, Ing. Michal Přinosil

In Prague 09/2023

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BIC: KOMBCZPPXXX

Registration and certification
Company Registr. No.: 15268462
VAT Id: CZ15268462
Registered at Municipal Court
in Prague, Sec. C 1247

ISO 9001:2009
ISO 14001:2005

Extreme Light Infrastructure ERIC (ELI ERIC) photovoltaic power plant – 312.55 kWp

TECHNICAL REPORT

BASIC PROJECT DATA

Location	:	Za Radnicí 835, 252 41 Dolní Břežany, parcel no. st. 1096
Cadastral area	:	Dolní Břežany [628794]
Region	:	Central Bohemia
Investor/builder	:	Extreme Light Infrastructure ERIC (ELI ERIC), Za Radnicí 835, 252 41 Dolní Břežany
Designer	:	Ing. Ivan Menhard
DC LV network	:	2 DC 1000 V, IT
AC LV network	:	3+PEN, ~ 50Hz, 400/230V/ TN-C-S
Premises in terms of electric shock	:	Indoor - normal, outdoor - hazardous
External influences affecting electrical equipment	:	According to the protocol on the determination of external influences
GPS	:	49.9616692N, 14.4547086E
Altitude	:	338 m above sea level

Basic protection - Protection against dangerous contact with live parts of electrical equipment up to 1000 V:

by position, insulation, covering and barriers in accordance with ČSN 33 2000–4-41 ed.3 and ČSN EN 61140 ed.3

Fault protection - Protection against dangerous contact with non-live parts of electrical equipment:

Up to 1500 V, DC IT system – insulation according to ČSN 33 2000-4-41 ed.3, Art. 413.2

Up to 1000 V, TN-C-S alternating current system with automatic disconnection from the source, according to ČSN 33 2000-4-41 ed.3, Art. 413.1.3, additional insulation, or protective bonding.

Supplementary protection by supplementary protective bonding according to ČSN 33 2000-4-41 ed.3 art. 415.2.

In the distribution system, protection is provided in accordance with PNE 33 0000-1, 6th edition.

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Change sheet:

Date	Version	Description of changes	Author

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LIST OF DOCUMENTATION

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00	Title page
00	Technical report
Drawing section	
01	Situation
02	Wider context 1:1000
03	Panel layout
04	Single-pole diagram
Appendices	
01	Data sheets

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PROJECT PURPOSE

The project documentation addresses the installation of a photovoltaic power plant, including connection to the existing electrical installation of the building. The power plant will be built on the roof of the Extreme Light Infrastructure ERIC (ELI ERIC) building on plot no. 1096 in Dolní Břežany, cadastral area Dolní Břežany.

The power plant will consist of a total of 665 photovoltaic panels with a capacity of 470 Wp, forming a single unit. The total installed capacity of the photovoltaic system is 312.55 kWp.

The main switch for connecting the RFVE is 3 x 630 A.

TECHNICAL DATA OF THE PROJECT DOCUMENTATION

These are listed in the

- technical report
- the wiring diagram (drawing section)
- attachments (data sheets) for individual components

ENERGY BALANCE

- Installed DC power: $_{PDC}$ = 312.55 kWp (+/- 0.5 kWp)
- AC output power: $_{PAC}$ = 330 kVA

SCOPE OF THE PROJECT

The project involves the installation of photovoltaic panels, connecting the panels to inverters, and then connecting them via an RFVE switchboard to an RH switchboard. The project includes data connections between individual elements and connection to remote monitoring via a web application.

The project does not address existing or newly installed lightning protection for the building, as lightning protection will be dealt with separately in a separate project documentation.

TECHNICAL DESCRIPTION

Types of environment and protection

a) Indoor areas - classification of external influences: AA5, AB5, AC1, AD1, AE1, AF1, AG1, AH1, AK1, AL1, AM1, AN1, AP1, AQ1, BA5, BC2, BD3, BE1, CA1, CB1
All classes of external influences have the characteristics required for the selection and installation of equipment – normal spaces

b) Outdoor areas – classification of external influences:
AA7, AB7, AC1, AD2, AE1, AF1, AG1, AH1, AK1, AM1, AL1, AN3, AP1, AQ2, BA5, BC3, BD3, BE1, CA1, CB1
Class AD3 – hazardous, AB8 – hazardous

Areas at risk of electric shock according to ČSN 33 2000-4-41 ed.3:

Affected areas inside the building – <u>normal</u> areas Outdoor areas – <u>hazardous</u> areas

The design of the electrical installation must comply with the specified classes of external influences according to ČSN 33 2000-4-41 ed.3, ČSN 33 2000-5-51 ed.3, and other related valid ČSN standards.

The specified classes of external influences must be verified before the equipment is put into operation. If the nature of the rooms or spaces changes, it must be checked whether the electrical equipment complies with the changed conditions.

PV protection zone

Act No. 458/2000 Coll., on the conditions for doing business and the exercise of state administration in the energy sectors and on amendments to certain acts (the Energy Act), defines **a** so-called **protection zone (OP)** in Section 46(7): "The protection zone of an electricity generation facility is a continuous area defined by vertical planes at a perpendicular distance

e) *<u>1 m from the outer face of the perimeter wall of the building</u>* on which the electricity generation facility is located, for electricity generation facilities connected to a distribution system with a voltage of up to 1 kV inclusive and an installed capacity of more than 10 kW. Details are provided in drawing 02 Situation.

Installation description

The photovoltaic power plant consists of 665 monocrystalline photovoltaic panels with a nominal output of 470 Wp. In total, the PV power plant consists of six inverters, which will be connected to the corresponding number of strings formed by PV panels, see the PV power plant stringing table.

The PV strings will be connected to six three-phase 50 kW inverters.

The PV panels will be attached to an aluminum roof structure. All metal elements located on the roof will be interconnected and grounded in accordance with the requirements of ČSN 33 2000-4-41 and ČSN 33 2000-5-54 in their current valid edition (at HOP).

The voltage in the DC branches (strings) during operation depends mainly on the intensity of the incident radiation and the temperature, with a maximum voltage of 1000 V DC.

String parameters:

Inverter	MPPT 1 input A	MPPT 1 input B	MPPT 2 input A	MPPT 2 input B	MPPT 3	MPPT 4	SUM
1	20	20	20	20	20	11	111
2	20	20	20	20	20	11	111
3	20	20	20	20	20	11	111
4	20	20	20	20	20	11	111
5	20	20	20	20	20	11	111
6	20	20	20	20	20	10	110
					Total number of panels		665

The panels will be connected to the RDC switchboards using flexible conductors with a cross-section ^{of} 6 $^{mm^2}$(SLR 6 – S804PV-S or equivalent).

A total of 6x RDCs will be installed, in which fuse disconnectors for individual strings and T1+T2 1100 V DC surge arresters will be installed.

The inverters will be connected with a CYKY-J 4 x 25 $^{mm^2}$RFVE cable. The RFVE will be connected

to the main RH switchboard with a 2x (4x NYY 1x150) cable with a route length of approx. 40 m.

The RFVE switchboard will contain AC components – AC circuit breakers 80B/3 – 6 pcs, 6B/1 – 1 pc, 2B/1 – 1 pc power circuit breaker, type AE, 3-pole, 50kA, 630A – 1 pc with AE trigger set to 500A, all Schrack, network analyzer as network protection and electricity meter for measuring electricity generated by the PLA33DL photovoltaic system, Wago test terminal block, 3 pcs of current measuring transformers with 600/5A conversion, accuracy class 0.5S, 10VA. Furthermore, AC T1+T2 surge arresters.

The commercial metering switchboard will also be equipped with an IP 20 service socket (1x 16A) and supplemented with HDO 0, 30, 60% control. PV power regulation is controlled by an HDO signal fed into the AXY RTU cabinet.

The RH switchboards will be modified for PV connection – equipped with additional material.
Furthermore, the necessary installation modifications will be made.

The AC route from the roof from RFVE to RH will be routed through a gutter on the roof and then connected to the existing risers from the ventilation cabling and then in the switchboard through the existing common route to RH. In the case of all penetrations, the required fire resistance will be maintained and will always be sealed with a fire barrier with sufficient resistance to the spread of fire in accordance with the conditions of the Fire and Rescue Service or PBŘ. The DC route will run along the roof of the building and on to the PV panels. The RFVE and RDC will be located on the roof together with the inverters.

Note: Before the actual installation of the PV technology, the space will be modified by the investor as a separate fire section or according to the requirements of the Fire Department.

A STOP button (Central STOP) will be led out of the RFVE switchboard and located in accordance with the requirements of the Fire and Rescue Service or PBŘ, e.g. (next to the entrance to the building or to the switchboard).

Note: Modifications related to the installation of the dispatch control system (DCS) will be carried out in the switchboard room in accordance with the updated connection agreement and PPDS.

The actual control of the active and reactive power of the inverters (P-Q regulation) will be implemented using a smartlogger compatible with PV inverter technology.
The connection to the DS will be existing according to the SOP conditions.

Photovoltaic panels: (or alternative product)

Parameters	
Type	Monocrystalline panel with an output of 470 Wp
Nominal voltage	35.05 V
Nominal current	13.41 A
Nominal open-circuit voltage	42.38 V
Rated short-circuit current	14.15 A
Dimensions	1903 x 1134 x 30 mm
Weight	24.2 kg
Efficiency	21.78

Construction

Self-supporting aluminum structures will be used on the flat roof (grassed area).

The total roof load is not covered by this project and will be verified by a static calculation, as will the size of the additional load, particularly in relation to the wind area.

The maximum weight of the panels + structure + ballast tiles is 35 kg/m^2 .

RFVE location

The technology for the PV system will be located together with the RFVE on the roof near the PV panels. A connection will be made from the roof to the RH, which is located on the ground floor.

- Short circuit = 25 kA,
- Ujm = 3 x 230 V AC (TN-C-S), 2 DC 1000V IT
- Protection by automatic disconnection from the source
- The switchboard doors will be marked with signs:
- CAUTION, ELECTRICAL EQUIPMENT
- CAUTION, VOLTAGE PRESENT ON BOTH SIDES
- MAIN SWITCH, SWITCH OFF IN CASE OF DANGER
- SURGE PROTECTION

Cable label:

Cable no.	Cable type	From	Where to
DC part			
W1.1(a)	SLR 6	String 1	RDC
W1.1(a)	SLR 6	RDC	INV1
…	…	…	…
…	…	…	…
W1.6 (a)	SLR 6	String 36	RDC
W1.6 (a)	SLR 6	RDC	INV6

AC part			
WS1.1-WS1.6	CYKY 4x25	INV1- INV6	RFVE
WS	PRAFlaDur-J 2x1.5 RE P60-R	RFVE	STOP
WLH	2x (4x NYY 1x150)	RFVE	RH

Surge protection

Both the AC and DC sides will be protected by surge arresters.

The structure for mounting PV panels and photovoltaic panels must also be located in the protective area of the building's external lightning protection system to prevent direct lightning strikes, or the lightning protection system must be modified, including the connection to the grounding conductors. A sufficient distance S according to ČSN 62305-3 ed.2 must be maintained between the lightning protection system and the photovoltaic panels. If this distance cannot be maintained, the lightning rod must be conductively connected to the photovoltaic panel structure at these points. In all other

cases, direct conductive connection between the lightning conductor and the metal structures of the photovoltaic panels must be prevented.

To equalize potentials, the metal structures of the photovoltaic panels must be grounded. It is recommended that the grounding leads to the grounding electrode be routed outside the building as directly as possible to the grounding electrode.

After the installation of the photovoltaic panels is complete, the building's lightning rod system will be inspected.

Voltage converters (or alternative product)

The following converters will be used to convert direct current to alternating current:

Parameters	
Type	Huawei SUN2000-50KTL-M3
Nominal AC output power	50 kW
Maximum output current	79.8 A
Maximum input voltage/current DC	1100 V / (30.0 A / 20.0 A)
Type	Huawei SUN2000-50KTL-M3
Nominal AC output power	50 kW
Maximum output current	79.8 A
Maximum input voltage/current DC	1100 V / (30.0 A / 20.0 A)
Weight	49 kg
Dimensions	640 x 530 x 270 mm
DC inputs	8 pairs of MC4
EURO efficiency for 20 kW converter	98
Ambient temperature range	-25 to +60 °C
Permissible air humidity	0–100%
Standby mode	< 5.5 W
Minimum protection	IP66
Time since market launch	More than 10 years

The designed inverters ensure disconnection from the grid if the voltage is outside the required values. Or if the frequency is outside the required range. These values are in accordance with PPDS ČEZ Distribuce, a.s.

Dispatching control system

The project addresses the regulation of active power in photovoltaic power plants using a cabinet for the ČEZ distributor's information transfer interface. The cabinet is designated AXY. This cabinet (AXY01) will be supplemented with an RTU for ČEZ's DŘS. The project also includes cable connections for terminals for the future addition of a switchboard for reactive power control.

The connection requirements will be specified in consultation with the relevant regional technician from the Control Systems and RTU team at ČEZ.

The connection of the DŘT, including internal equipment, will be in accordance with the conditions of ČEZ Distribuce, a.s.

This is a subcontract for the control systems supplier (e.g., Dribo).

Furthermore, an ANM control cabinet will be installed in the LV substation (transformer station). The backup

ANM power supply will be installed in steel-zinc switchboards mounted on plaster according to ČEZ specifications. If required, access can be secured using a special locking system according to the distributor's requirements.

The ANM cabinet will supply the AXY cabinet with 24 VDC direct current.

Last but not least, a new communication cable will be laid between the AXY switchboard and RFVE for inverter control, including the installation of smartloggers and data communication.

Proposed functional status

The PV power plant will be controlled using the AXY cabinet and the inverter control element (according to the tendered technology).

Control inputs from the AXY cabinet will be introduced into the REG. Commands will be routed from the XYW terminal block and terminals 4 to 8 for active power and 9 to 14 for reactive power, and will terminate at the XYW2 terminal block on terminals 4 to 8 for active power and 9 to 14 for reactive power.

These are control inputs (commands):

f299P1 – 0% of rated power (terminal XYW:5) f299P2 – 30% of

rated power (terminal XYW:6) f299P3 – 60% of rated power

(terminal XYW:7) f299P4 – 100% rated power (terminal XYW:8)

f299QL5 – cosφ = 0.95 inductive (terminal XYW:10) f299QL3 –

cosφ = 0.97 inductive (terminal XYW:11) f299Q0 – cosφ = 1

(terminal XYW:12)

f299QC5 – cosφ = 0.97 capacitive (terminal XYW:13) f299QC5 –

cosφ = 0.95 capacitive (terminal XYW:14)

Commands for regulating active power 0% - 100% will be transmitted via communication directly to the smartlogger used to control active power.

Based on the issued command, the smartlogger will send back information about the fulfillment of the given command.

This involves the following signaling:

H299P1 – 0% of rated power (terminal XYH:7) H299P2 – 30% of

rated power (terminal XYH:8) H299P3 – 60% of rated power

(terminal XYH:9) H299P4 – 100% of rated power (terminal

XYH:10)

The following signals are used:

H299Q0 – cosϕ = 1 (basic operating state (terminal XYH:27)

H299QL3 – setting of inductive power factor value 0.97 (terminal XYH:26)

H299QC3 – setting the capacitive power factor value to 0.97 (terminal XYH:28) H299QL5 – setting of inductive power factor value 0.95 (terminal XYH:25) H299QC5 – setting of capacitive power factor value 0.95 (terminal XYH:29)

Fault signaling:

H8311L – loss of control voltage (terminal XYH:15) h34ts – H851T – MTN circuit breaker tripped (terminal XYH:14)

H931IF – internal rectifier fault + reduced voltage (terminal XYH:13) 4DR – AXY cabinet door open (terminal XYH:12)

ANM switchboard – The ZD24-2 backup power supply, e.g. from the manufacturer Dribo, spol. s r.o., is used to power protections, remote monitoring and control cabinets, control voltages for switches and disconnectors, etc. The backup voltage is 24V DC.

The ZD24-2 power supply uses 230V AC voltage from the building's own consumption for its own power supply.

The output voltage of the ZD24-2 24V DC power supply is taken from two 12V 42Ah gel batteries, which are recharged by an internal D4M power supply. The capacity of the batteries also determines the length of time for which the backup power supply is able to keep all DTS devices in operation in the event of a power failure (230V AC).

The backup power supply includes protection of individual outputs for powering connected devices and signaling of power supply fault conditions (power failure, battery capacity drop, ground connection at 24V DC).

The D4M power supply performs the following functions:

- optimally charges two 24V 42Ah Panasonic batteries (temperature compensation of charging voltage)
- supplies a 24V DC signaling voltage, which is galvanically isolated from the battery voltage
- checks and tests the condition of the battery (capacity - under load) and the 230V supply voltage. Status (fault) reports are sent to the RD

All components of the ZD24-1 power supply are located in a cabinet measuring 400 x 600 x 300 mm (W x H x D).

Note: if required by the distributor in the SOP, the power must be adjusted according to PPDS

Breakdown point

The breakdown point of the PV installation is the main circuit breaker QF1 equipped with a motor drive and a trip coil located in the RFVE, which is controlled by network protection, STOP FVE buttons, and controlled by DI/DO relays. The protection will disconnect the PV system from the grid in the event of voltage and frequency deviations according to the conditions specified in the connection statement, or in the event of a voltage drop in one of the phases in the grid.

Confirmation of the protection settings will be included in the inspection report.

Setting of breakdown point protection – according to the distributor's requirements in the SOP based on TPP No. 4122140725:

Function	Setting range	Requirements according to TPP No. 4122140725	
Overvoltage 3rd degree U>>	1.00 – 1.30 Un	1.2 Un	0.1 s
Overvoltage 2nd degree U>>	1.00 – 1.30 Un	1.15 Un	5.0 s
Overvoltage 1st degree U>	1.00 – 1.30 Un	1.11 Un	60 s
Undervoltage 1st degree U<	0.10 – 1.00 Un	0.7 Un	2.7 s
Undervoltage 2nd stage U<<	0.10 – 1.00 Un	0.45 Un	0.2 s
Overfrequency f>	50 – 52 Hz	51.5 Hz	100 ms
Underfrequency f<	47.5 – 50 Hz	47.5 Hz	100 ms
Reactive power/undervoltage	0.70 – 1.00 Un	0.85 Un	according to Appendix No. 2 of the contract

Note: Any changes to the settings will be made according to the distributor's requirements in accordance with PPDS and recorded in the inspection report and as-built documentation.

Phasing point

The phasing of the inverters used to the grid takes place automatically when the AC side is supplied with the corresponding values.

Measuring point

Must comply with ČSN EN 60439-1, ČSN ISO 3864 and the "Requirements for the location, design and connection of measuring equipment at electricity producers" in the current version.

The measurement of the generated electrical energy will take place in the RFVE switchboard.

A 230 V backup power supply from ANM will be connected to the RE. Details will be included in the implementation documentation (actual design) according to the distributor's requirements in the SOP.

Note: modifications to commercial metering will be made (by the supplier) according to the distributor's requirements.

AC cable routes:

Power will be transferred from the RFVE to the RH via a trough on the roof and then connected to the existing risers from the ventilation cabling and then in the switchboard via the existing common route to the RH.

Cable storage in buildings and in the air

Cables will be laid in electrical installation rails, on clips and UV-resistant protective tubes, or in cable ducts or (steel sheet) troughs. Troughs will be used primarily where fire resistance/non-combustibility is required according to the PBŘ opinion.

Cables designed to prevent the spread of flame will be used in preference - these are not fire safety devices

safety equipment, there is no requirement for cables with functional integrity.

The overall design of the cable distribution system must comply with ČSN 33 2000-5-52 ed.2 and the color coding of conductors with ČSN 33 0165 ed.2. Individual cables will be marked with cable labels at the ends and at designated points along the route (designation number, cable type, from-to, length). Cable distribution shall be carried out in accordance with ČSN 33 2000-5-52 ed.2 NA.4.5.10.3 so that cables of different voltages or different current systems are stored separately in groups, separated by larger gaps and in such a way that they do not hinder or prevent maintenance, repairs, and replacements of individual parts of the PV system's technological equipment or other parts of the electrical installation.

Cable bending

When laying cables in buildings or in the ground, the minimum bending radius must be maintained. For all-plastic cables of the AYKY and CYKY type, this is equal to 15 times the outer diameter of the cable (15 d).

Protection against dangerous contact with non-live parts of electrical equipment in IT systems according to ČSN 33 2000 – 4-41, Art. 413.2 (protection in case of failure)

All live parts must be isolated from earth or connected to earth with sufficiently high impedance. This connection can be either at the zero or neutral point of the network, or at an artificial zero point. The artificial zero point can be directly connected to earth if the resulting impedance to earth is sufficiently high at the network frequency. If there is no neutral or midpoint, the line conductor may be grounded through a high impedance.

Non-live parts must be grounded individually, in groups, or together.

Protection against dangerous contact with non-live parts of electrical equipment in the TN-C-S system according to ČSN 33 2000 – 4-41 ed.3, Art. 413.1.3 (protection in case of failure).

All non-live parts must be connected to the grounded point of the network via PEN conductors or PE conductors, which must be grounded at each relevant transformer.

The grounding point of the network is the center (node) of the source winding.

PEN conductors in a TN-C network or PE conductors in a TN-C-S network must be grounded either with a separate grounding electrode or connected to the grounding system, except for the source node, also in the following locations

- at connection boxes (e.g., main house boxes) if they are more than 100 m away from the nearest grounding point
- in the internal distribution system at secondary switchboards, if they are more than 100 m away from the nearest earthing point and at the end of branches longer than 200 m.

Individual grounding of the PEN conductor in a TN-C network or the PE conductor in a TN-C-S network must be suitably spaced and have a grounding resistance of no more than 15 Ω; however, it is not necessary to lay grounding strips with a total length of more than 20 m or other equivalent grounding devices.

At the end of the network lines and branches and at the source node, the grounding resistance shall not exceed 5 Ω; however, it is not necessary to install grounding strips with a total length greater than 50 m or other equivalent grounding devices.

The PE conductor is grounded in the main distribution board of the building.

Conditions of ČSN 33 2000-7-712 ed.2:

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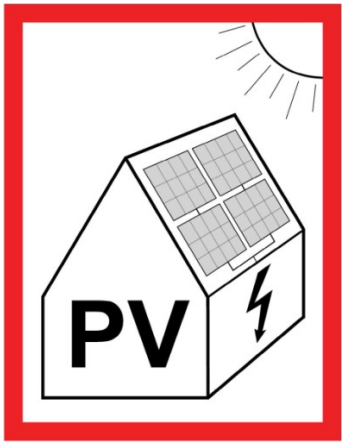
712.514.101: The symbol shown in Figure 712.514.101 (see below) must be firmly affixed:

– at the beginning of the electrical installation;

– at the point of electricity metering, if it is distant from the beginning of the electrical installation;

– on consumer equipment or a switchboard to which the power supply from the converter is connected.



712.514.102 Each access point to a live part on the DC side, such as a switchboard and junction box, must have a permanent label warning that the live part may still be energized after disconnection, e.g., with the text "Solar DC – Live parts may remain energized after disconnection."

712.514.103 All converters must be marked to indicate that they must be disconnected from both the DC side and the AC side before any maintenance is performed.

712.521.101 Cables on the DC side must be selected and installed to minimize the risk of ground faults and short circuits. The cable(s) must not be placed directly on the roof surface.

712.521.102 To minimize voltage induction due to lightning, the area of all loops must be as small as possible, especially for PV string cables. DC cables and equipotential bonding conductors shall be routed together.

712.534.101 General
If the PV system is installed inside an LPS-protected area, all power and control cables or routes of the PV system must be separated from all parts of the LPS.

712.511.101 PV modules must comply with the requirements of the relevant electrical equipment standards, e.g. EN 61730-1, EN 61215, or EN 61646.

712.511.102 Converters must comply with, for example, EN 62109-1 and EN 62109-2.

712.514.102 Each access point to live parts on the DC side, such as a switchboard and junction box, must have a permanent label warning that live parts may still be energized after disconnection, e.g., with the text "Solar DC – Live parts may remain energized after disconnection."

GENERALLY

When operating and working on electrical equipment, the relevant provisions of ČSN EN

50110-1 ed.3 and the following standards relating to installation work must be observed:
ČSN 33 2000 part 1 ed. 2 - Low-voltage electrical installations – part 1: Basic principles, determination of basic characteristics, definitions
ČSN 33 2000 part 4-41 ed.3 - Low-voltage electrical installations – part 4-41: Protection against electric shock
ČSN 33 2000-4-443 ed.3 Protection against atmospheric or switching overvoltage
ČSN 33 2000-7-712 ed.2 - Electrical installations in buildings - Part 7-712: Single-purpose equipment and equipment in special buildings - Solar photovoltaic (PV) power systems
ČSN 33 2000 part 5-54 ed.3 - Low-voltage electrical installations - Part 5-54: Earthing and protective conductors
ČSN 33 2000 part 6 - Low-voltage electrical installations - Part 6: Inspection
ČSN 33 2000 part 5-52 – Electrical regulations – Electrical equipment – part 5-54: Selection of systems and construction of lines – current edition
ČSN 33 2000-5-51 (33 2000) Selection and construction of electrical equipment. General regulations ČSN EN 62 305 Lightning protection
ČSN 33 1310 ed.2 Safety requirements for electrical installations and appliances intended for use by persons without electrical qualifications
ČSN EN 61140 ed.3 (33 0500) Protection against electric shock – Common aspects for installation and equipment
ČSN 73 0810 Fire safety of buildings – common provisions Decree of the Ministry of the Interior 246/2001 on fire prevention

Before commissioning, an initial inspection of the installed electrical equipment must be carried out. After commissioning, the operator must carry out regular inspections in accordance with ČSN 33 1500.

The materials used must comply with the applicable Act No. 22/1997 Coll. or 90/2016 Coll. Sections 12 and 13 on technical requirements for products.

TRANSPORT ROUTES FOR THE DELIVERY OF MATERIALS AND BUILDING MATERIALS

Existing roads will be used to transport building materials. Materials will be transported by conventional means of transport.

WORK SAFETY

All applicable safety regulations must be observed during construction. Particular attention must be paid to fall protection, especially the need for lighting of the excavation at night. The relevant provisions of Act No. 262/2006 Coll. (Labor Code), Act No. 309/2006 Coll. (on ensuring further conditions for safety and health protection at work), as amended, and electrical regulations – in particular ČSN EN 50110-1 ed. 3 – must be observed.

The equipment may be operated by persons without electrical engineering qualifications in accordance with §3 of Decree No. 50/1978 Coll. of the Czech Office for Safety and Health at Work – familiarization in accordance with the operating instructions. Only workers with the appropriate qualifications may operate the devices in switchboards and perform all maintenance work on electrical equipment:

§ 3 Familiarization of personnel - operation of low-voltage electrical equipment with IP 20 protection and higher
§ 5 knowledgeable workers (and above) - operation of MV and LV electrical equipment with IP 1x protection and lower
- operation of medium voltage electrical equipment
- work on electrical equipment

These persons must demonstrate knowledge of local operating and safety regulations, fire safety measures, first aid for electrical accidents, and knowledge of the procedure and method for reporting faults on the equipment entrusted to them.

During construction, before commissioning, the electrical equipment will be inspected, individually tested, and an initial inspection will be performed. Individual tests will be performed as part of the installation, during which the mechanical and electrical functions of the individual devices will be tested. During the individual tests, initial inspections of the electrical equipment will also be performed. Periodic inspections of electrical equipment must be carried out within the specified time limits.

When performing construction and installation work, the relevant provisions of the following standards must be observed: ČSN EN 50110-1 ed.3, Decree No. 601/2006 Coll. on occupational safety and technical equipment during construction work, as amended.

Escape routes must be maintained in accordance with ČSN 73 0804 (MAX 100 M IN ONE DIRECTION).

Seal penetrations through fire-separating structures in accordance with ČSN 73 0810 - use a certified system, e.g. Hilti, Intumex, Promat, etc.

Before being put into operation, electrical equipment must be equipped with safety signs and labels prescribed for such equipment by the relevant equipment or product standards. In addition to the usual warning signs, signs saying "Beware of reverse current!" and "Electrical source!" must also be placed in a visible location.

When maintaining the PV power plant, it is necessary to comply with the provisions of this PD, the relevant standards, and the manufacturer's instructions for the specific equipment.

Recommendation:

- equip the substation with a CO_2 or powder fire extinguisher, min. 6 kg

- Install safety signs in the substation: ČSN EN ISO 7010 + amendments A1-A7 and according to NV 375/2017, in particular:

1) Warning - danger of electricity

2) No unauthorized entry

3) No open flames

4) Do not extinguish with water or foam extinguishers