Risk report
Electrodistribution North AD

Varna, March 2020

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Content

1. Introduction

This report is an update of the report from the year 2015. This report has been elaborated based on interviews and physical inspections of selected premises. The selection has been done based on insured values split among the insured locations and also with consideration to deliver the representative picture of the company risks together with PML assessment.

During the visit we inspected the following sites:

- Substation Varna East, Varna
- Substation Čajka, Varna
- Central dispatching Varna

This risk report was elaborated with the kind help of Electrodistribution North AD representatives from grid management, maintenance, dispatching, health and safety and other departments.

2. Basic information about the company

ENERGO-PRO was established in the Czech Republic in 1994. The company's main scope of activities is in the field of management, construction, operation, maintenance and rehabilitation of hydroelectric power plants and electricity networks, as well as electricity trading.

In the end of June 2012 ENERGO-PRO purchased the business of the German company E.ON in Bulgaria and thus acquired companies, holding licenses for the following activities in the energy sector:

- Distribution of electricity (Electrodistribution North AD);
- Electricity supply (ENERGO-PRO Sales AD);
- Electricity trading and coordinator of standard balancing group (ENERGO-PRO Energy Services EAD).

ENERGO-PRO Varna EAD has three subsidiary companies – Electrodistribution North AD, ENERGO-PRO Sales AD and ENERGO-PRO Energy Services EAD.

The license territory of Electrodistribution North AD and ENERGO-PRO Sales AD is nearly 30,000 square kilometres and covers 9 administrative regions in Northeastern Bulgaria - Varna, Veliko Tarnovo, Gabrovo, Dobrich, Razgrad, Ruse, Silistra, Targovishte and Shumen.

ENERGO-PRO Energy Services EAD sells electric power at freely negotiated prices, and is one of the leading traders on the liberalized market. The company has long standing experience and is among the first traders registered on the Bulgarian electricity market. In the beginning of July 2012 the company's license to trade in electricity was supplemented with the rights and obligations of the business “coordinator of standard balancing group”.

2.1. Historical and planned changes

Since the year 2016 until the year 2019 it has been invested about 19.7 million BGN from which at 2019 it was 11.26 million BGN. The main investments were to electric metering programs, improvement and optimization of electric network and building the low voltage and middle voltage objects. For the years 2020 - 2023 EP plans to invest 45 million BGN in each year from which the most investments will be allocated to the low and medium voltage rehabilitations and extensions.

3. Underwriters summary

In our assessment, the condition and maintenance of the substations is average to upper average.

We assess the operation as average to upper average. There is sophisticated control system under installation for the distribution network operated from three dispatching centers. EP has complete overview about the distribution net and its condition.

3.1. Insured values

3.1.1. Overall insurance values

№	Type of assets	SUM INSURED /in BGN/
1.	**Buildings and structures incl. adjacent infrastructure (including but not limited to fences, roads, pavements, pipelines, etc.):**	
1.1.	Substations, Node stations and Transformer posts	175,583,271
1.2.	Administrative, residential and holiday homes. Auxiliary buildings.	66,136,660
	Buildings and structures - TOTAL:	**241,719,931**
2.	**Machinery and equipment:**	
2.1.	Machinery and equipment Substations, Node stations and TP substations	513,818,048
2.2.	Others	136,634,206
	Machinery and equipment - TOTAL:	**650,452,254**
3.	**Electrodistribution grid:**	
3.1.	Air distribution grid High voltage	2,724,471
3.2.	Underground cable distribution network High voltage	9,344,956
3.3.	Air distribution grid Medium voltage	529,110,875
3.4.	Underground cable distribution network Medium voltage	103,466,971
3.5.	Air distribution grid Low voltage, incl. street lighting	592,436,480
3.6.	Underground cable distribution network Low voltage	178,216,613
	Electrodistribution grid - TOTAL:	**1,415,300,366**
4.	**Inventory (office equipment, furniture and others):**	1,098,708
5.	**Stock:**	11,788,138
6.	**Electronic equipment:**	335,669
7.	**Acquisition costs, incl. unfinished construction works**	7,244,164
	TOTAL AMOUNT for № 1, 2, 3, 4, 5, 6 и 7:	**2,327,939,230**

3.1.2. Insured values and activities at places of insurance

The split of insured values for all individual high voltage substations was not available during the survey. After discussion with Energo-Pro representatives, we have identified as a PML location the substation Varna South where one of the biggest insured values are allocated. To compare we add also Chaika substation values which was the previous PML location. The change is a result from the review of the insured values done by Energo-Pro.

Insured sums (rounded) are as follows:

Chaika substation		
The value of immovable property	BGN	574,000
The value of movable property	BGN	4,165,000
Electrodistribution grid	BGN	12,700 – not included in PML
The value of stock	BGN	---
A brief description of operated activities		High voltage substation

Varna south substation		
The value of immovable property	BGN	568,000
The value of movable property	BGN	5,541,000
Electro distribution grid	BGN	6,800 – not included in PML
The value of stock	BGN	---
A brief description of operated activities		High voltage substation

4. Exposure to risks

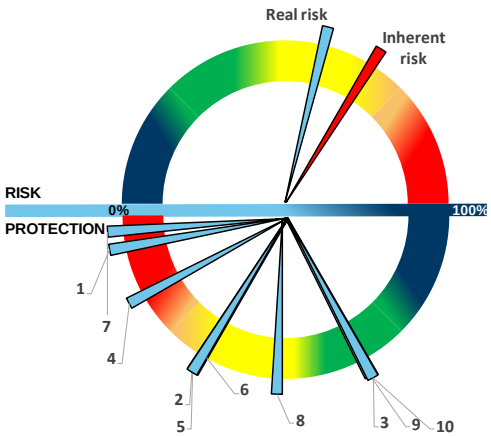
Risk potential	
Inherent risk – pure risk assessed without implemented protection	**Real risk –** risk on the assessed place of insurance / cooperation including implementation of protection
High	Total loss could happen from more causes.
Elevated	High losses from more causes, total loss is not excluded.
Average	Middle size or higher loss could occur, total loss is not excluded but has lower probability.
Low	Lower or middle losses could happen. Total loss is not excluded, but coincidence of lower probable event must happen.

Protection	
Excellent	Protections and risk management are higher than legislation rules. Proactive risk assessment. Best practice implementation.

Good	No gaps are identified, all legislation rules are fulfilled. Potential for improvement exist to the level of best practise.
Average	Smaller gaps, or higher potential for improvement are identified.
Poor	Bigger gaps were identified or the certain component is not installed.

4.1. Assets

Fire

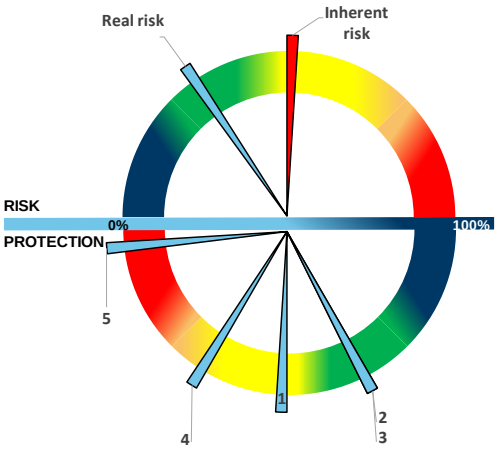


1. Extinguish system
2. Fire sections
3. Construction
4. Fire brigade
5. Fire detection
6. Fire water
7. Smoke and heat ventilation
8. HW permit
9. Workplace care
10. Prevention, training, etc.

The risk of fire in this type of operation is most likely from high voltage appliances, as electricity is generally the most frequent cause.

From a fire perspective, the risk lies mostly in the substations, especially in respect of the switchgears and transformers. On the distribution network, transformers are mostly located outside the buildings. 110 kV, 20 kV and 10 kV parts are located within the buildings. In urban areas also transformers are located within the building like in Čajka substation. Only in three locations are the 100 kV part enclosed and insulated by SF6. Those are Čajka, Trakata and Bjala. The switches in the visited substation were mostly SF6 or vacuum insulated.

Flood



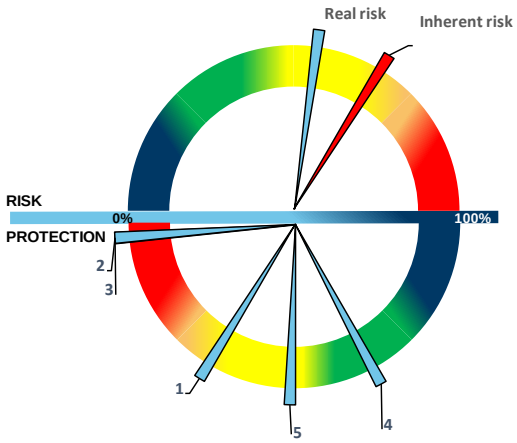
1. Material vulnerability
2. Storage method
3. Construction
4. Anti-flooding measures
5. Detection

Visited substations were located on elevated positions with remote risk of flood. The substations with possible flood risk are.

- Substation Devnya (it should be close to the Varna's lake)
- Substation Asparuchovo (it is on an island under Asparuchov Bridge), Varna
- Substation Sinkevitsa next to the river.

Smoke detection is installed on some locations but do not cover all the spaces. Alarm is local. Only one automatic fixed extinguishing system is installed in Čajka substation. This system extinguishes the transformers by nitrogen.

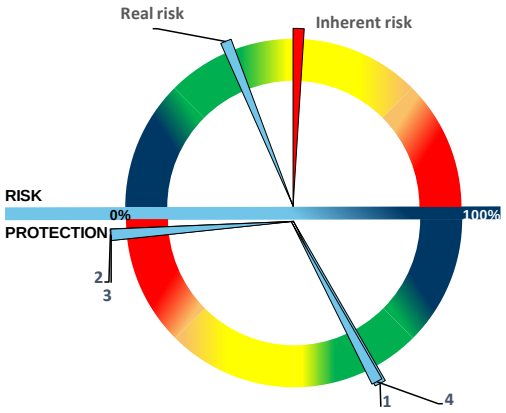
Theft, vandalism



1. Mechanical measures
2. Shift organization
3. Security
4. Electrical safety signalling
5. CCTV

Physical guarding of the substations is not implemented. Substations are also without permanent occupation. Mechanical protection is on basic level. Burglary detections are mostly installed together with CCTV.

Explosion

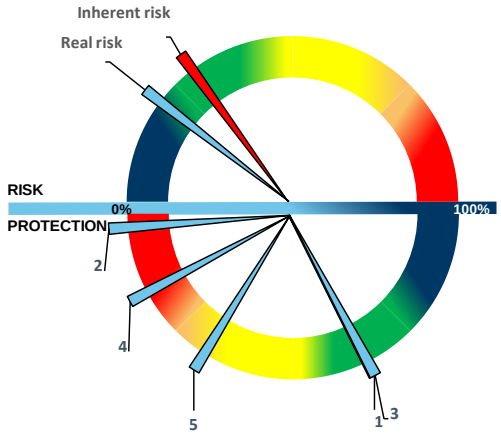


1. Construction
2. Explosion precautions
3. ATEX.
4. Workplace care

High voltage components can explode especially in the case of a short circuit or voltage overload. Where many appliances such as circuit breakers and transformers also contain insulation oil, such an explosion could be accompanied by a spread of fire.

In the case of transformers, an explosion could also be caused by the gases in the oil, especially if the oil is not tested regularly. ATEX implementation is not obligatory for such a type of appliances.

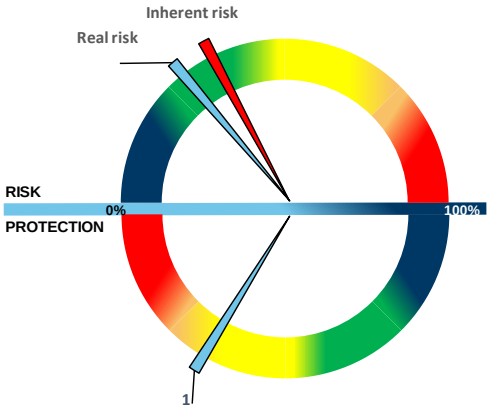
Dangerous leak



1. Fire safety measures
2. Detection
3. Maintenance
4. Fire brigade
5. Emergency planning

Environmental accidents, or accidental pollution, could particularly be caused by oil leaks from transformers. During our visit we observed transformers only with emergency pits designed with enough capacity to catch more than the volume of oil in one transformer. We assess the risk of environmental pollution as low.

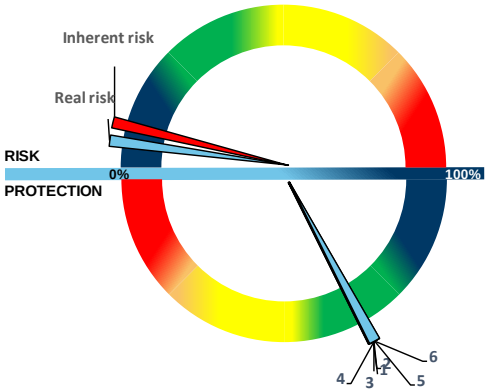
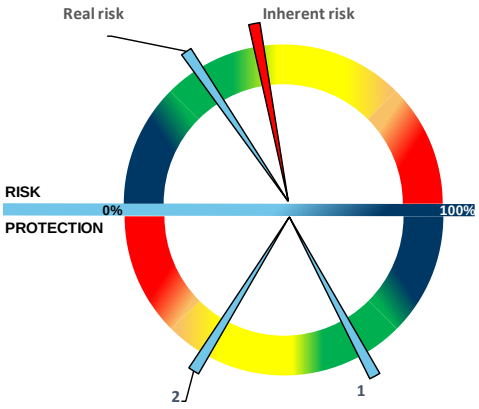
Surrounding



1. Business continuity plan / Disaster recovery planning

Substations are mostly located within own areas. Mutual influence with other appliances is limited.

4.2. Business interruption

Machinery breakdown	Business interruption
	
1. Maintenance 2. Machinery backup / cooperation 3. Spare parts 4. Maintenance - qualification 5. SLA / Service-level agreement 6. Training of the staff	1. Replaceability of operations / location / cooperation 2. Business continuity plan / Disaster recovery planning
Most of the technical equipment of the substations is backed up or the substation itself could be backed up. The capacity and design of distribution network allows it except some corner and/or border substations where the backup possibility and/or capacity is not enough. This could impact only very limited part of customers. Electrodistribution North AD has storage of significant spare parts in the middle of supplied area.	The design of distribution network is quite robust. Shorter electricity delivery could happen in the case of total damage of the one of the high voltage substations. We do not expect the longer business interruption except the case when NEC interrupts the electricity delivery or significant disaster like hurricane, heavy snow, icing and/or earthquake will hit the significant part of whole distribution network.

<u>Natural peril risks:</u>
Natural perils were assessed by SwissRe CatNet tool. We did the assessment for Razgrad which is nearly in the middle of the EP distribution area. The elevated risk is the Earthquake which is on the number 5 from the 10 points scale with the pseudo spectral acceleration of 0.27-0.41. Other types of risks are not assessed as elevated, but could not be excluded. Typical natural risks for the distribution network are the windstorm/hurricane, heavy snow and the icing.

4.3. Liability

Specific losses could occur based on electricity delivery contracts and Bulgarian national law. During the survey we had no chance to assess this risk in deeper manner.

5. Estimation of maximum loss

5.1. Damage scenario and estimate

There could be many scenarios of major loss in the distribution net. Overground grid is quite sensitive on natural perils like windstorm, icing or earthquake. It is very difficult to assess the losses caused by this type of perils. Depending on SwissRe CatNet tool assessment and terrain relief we could expect elevated risk of earthquake. Possible flood risk was identified on:

- Substation Devnya (it should be close to the Varna's lake)
- Substation Asparuchovo (it is on an island under Asparuchov Bridge), Varna
- Substation Sinkevitsa next to the river.

During our survey we assessed two possible scenarios:

1) From the local point of view and focusing on the individual substations, the representative scenario of PML could be the fire and/or the explosion of individual transformer, which could easily spread to other transformers because of the lack of fire separation. This could also cause major business interruption of the substation and also business interruption for local distribution. Assessing the replacement values we see the PML scenario on Varna South substation, which is situated in Varna. All facilities of the substation including transformers are installed within the building. As the representative scenario of PML we see the fire or explosion of the transformer and the fire spread on whole substation. For the PML assessment we expect the 100% damage of installed technology, what is 5,541,000 BGN and 90% damage of the building value, what is 511,200 BGN. Because the substation is surrounded with the private houses, there should be also the damage of surrounded property considered. Surrounded property is not considered for the present assessment of PML. The business interruption is not considered in this scenario, because we expect, that Electrodistribution North is able to substitute the distribution from another substation. The PML assessed for Varna South substation is 6,052,200 BGN.

2) From the global point of view it is very hard to assess the maximum loss on distribution net caused by natural perils. So, the PML is represented by maximum limit of liability offered by insurer, what is currently 40 000 000 BGN.

5.2. Loss definition

5.2.1. PML – Possible Maximum Loss

The biggest damage (to property and damage caused by business interruption when covered by an insurance policy) that can be expected because of one fire (or other hazards, if it is a limiting factor) provided a combination of the most unfavorable circumstances.
Factors that affect the amount of damage are: effective separation of fire complexes; Lack of flammable material; construction materials of buildings; Time of full recovery.

5.2.2. EML – Estimated Maximum Loss

The biggest real damage (to property and damage caused by business interruption when covered by an insurance policy) that can be expected as a consequence of one fire (or other danger, if it is a limiting factor), when internal and external protective measures capable of reducing the extent of the damage are operational.

5.2.3. Fire complex

It is defined as a set of buildings whose distance is shorter than the safety fire distance. We consider the fire safety distances at least 10 m or longer than the height of higher neighboring building, with a maximum of 20 m. The safety distance is increasing to at least 20 m in the case of storage of flammables and at least 30 m in the case of objects with the possibility of explosion.
Minimal safety distances are:

- The height of higher building
- 30 m from possible explosion focus
- 20 m from storage of flammables
- 10 m in other cases

6. Object description

6.1. Location

Visited sites within Varna are situated in the urban area surrounded mostly by living houses. Sites are accessible via standard routes also for fire trucks.

6.2. Activity description

General distribution network information:
The main business activity of the company is maintenance and development of the electricity distribution grid. EP distribution activities in Bulgaria consist of mostly medium (10 or 20 kV) and low voltage (0.4 kV) distribution grid in north east Bulgaria. Also, high voltage (110 kV) lines are present within the EP grid as transmission lines. About 54 km of high voltage grid is present from which about 43 km (Zvezditsa) are overhead. The electricity to the EP distribution network comes from state owned high voltage network owned by NEC (the state distribution company). Detailed numbers are mentioned in the chart below.

The transmission, distribution and electricity supply is provided for an area of over 29,000 sq. km in Northeast Bulgaria.

- Total length of the distribution grid (medium, low voltage) – 43,026 km
- Annual amount of the electricity supply – 6.082 TWh (2019)
- Number of employees - 1,671

The company supplies electricity to more than 1 million households and 146,651 small business customers and provides related services in the regulated market.

The distribution network is split into 3 main regions:

- Varna, Dobrich, Silistra
- Russe, Razgrad
- Gorna Oryahovitsa, Gabrovo, Shumen, Targovishte

Above mentioned regions are controlled from three control rooms – Varna, Russe, Gornya Oryahovitsa. Control rooms are technically substitutable, but the personnel has knowledge only for the district they operate. So in the case of losing one of the control rooms personnel has to move to other location. In the case of losing of the control room, there is no necessity to stop the operation of the network, just the visibility and control ability is limited. Now the new SCADA system is in the final phase of installation, but still not 100% available. The date of full ability is not known.

Table 1: Distribution network basic numbers 2020

	Gabrovo	Gorna Oriachovitsa	Razgrad	Ruse	Targovište	Šumen	Varna	Dobrič	Silistra	Total
Clients nmr.	95 044	179 821	78 713	145 301	85 398	113 694	332 127	117 192	80 767	1 228 057
Middle voltage Over Head OHTL km.	1 285	2 624	1 154	1 496	1 465	1 648	1 927	1 724	1 155	14 478
Middle voltage Under Ground UGTL cabel km.	423	610	191	355	175	259	1 131	417	159	3 719
Total lenght	1 708	3 234	1 345	1 850	1 640	1 907	3 057	2 141	1 313	18 197
Low voltage OHTL km	1 418	2 904	1 576	1 257	1 572	2 384	3 524	2 662	1 562	18 859
Low voltage UGTL km	396	837	332	409	306	489	1906	898,8	396	5 970
Подстанции/Substations 110/20, 10 kV	2	4	3	5	0	0	11	2	0	27
Трансформатори / Transformers 110/20, 10 kV	2	8	5	11	0	0	15	3	0	44
Трафопостове / Substations (10 or 20/04 kV) nm.	1 079	1 926	634	1185	744	1 174	2 133	1 086	658	10 619
Трансформатори / Transformers (10 or 20/04 kV) nm.	1 078	2 162	778	1645	854	1 517	2 827	1 157	754	12 772

Table 2: Number of substations within EP distribution network 2020

	Gabrovo	Gorna Oriachovitsa	Razgrad	Ruse	Targovište	Šumen	Varna	Dobrič	Silistra
Подстанции/Substations 110/20, 10 kV	2	4	3	5	0	0	11	2	0
Трафопостове / Substations (10 or 20/04 kV) nm.	1 079	1 926	634	1185	744	1 174	2 133	1 086	658

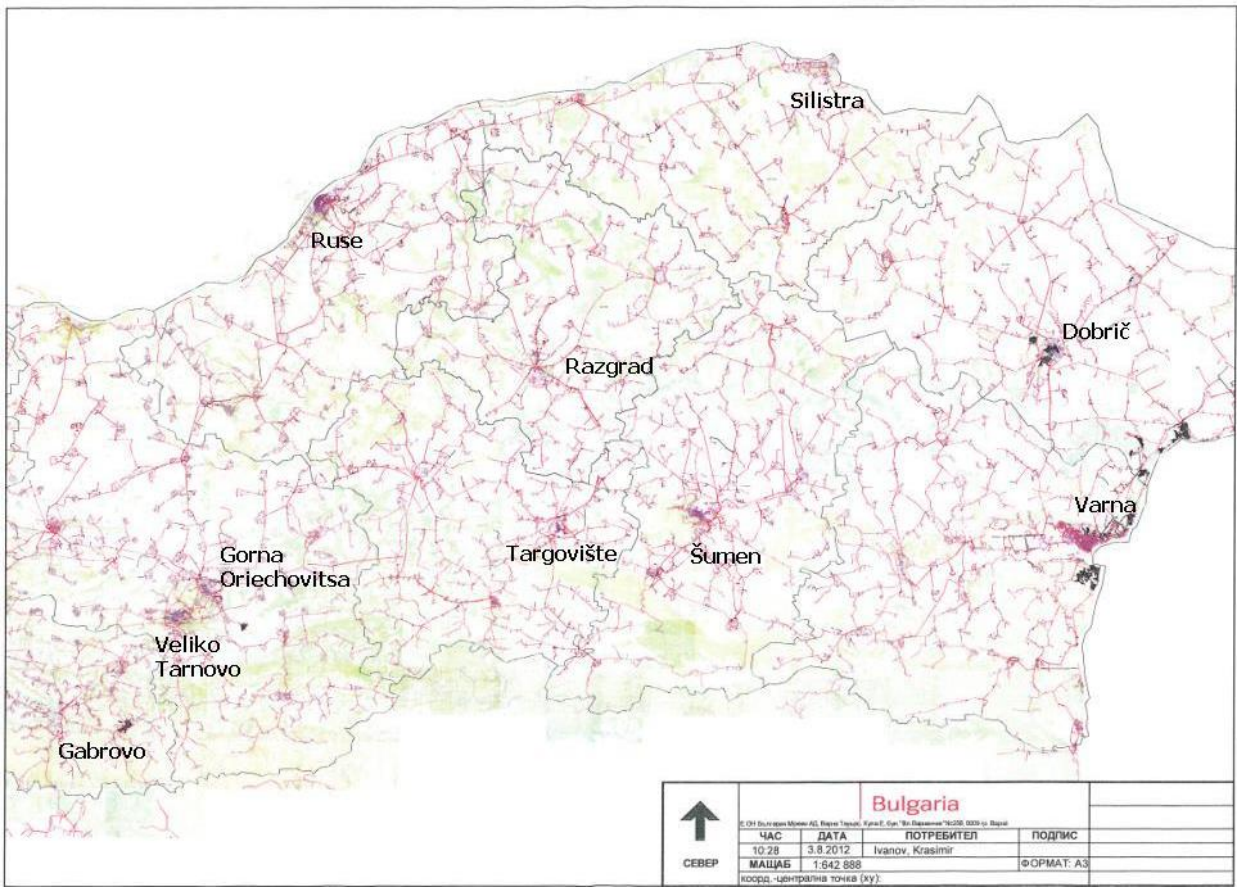
In our assessment the physical condition of substations and distribution network we assess as average.

Table 3: Transformer age and supplier statistics 2020

Date of installation	Number
up to 5 years	1304
up to 5 years in other (not own) TP	125
from 5 to 10 years	878
from 10 to 15 years	240
from 15 to 20 years	341
from 20 to 25 years	331
from 25 to 30 years	1095
over 30 years	8583
TOTAL:	12897

Provider	Number
Bulgaria	8050
Serbia	1521
Italy	13
Korea	144
Germany	27
Romania	24
Slovakia	54
Oyhers	17
N/a	3047

Figure 1: EP distribution area



Visited substations:

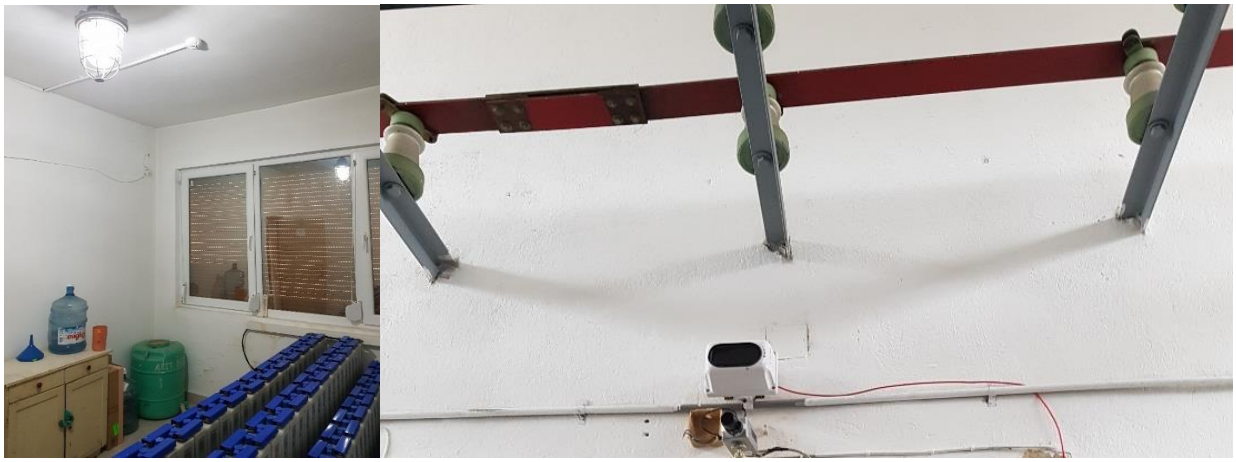
Varna East is dedicated for the Levski quarter, Izgrev quarter, Čajka qauter and Varna center. Three 110 kV lines are connected into this substation. Two transformers 110/10 kV are installed with the output of 40 and 50 MVA. 40 MVA transformer is produced by Elprom in 1982. 50 MVA transformer is SGB, produced in 2014. Distance between transformers is cca 20 m. Both transformers are equipped with the tank pit filled with crushed stone. Elprom transformer is planned to be changed next year. 10 kV part is equipped with vacuum insulated switches.

During the summer one transformer is enough to provide the service. 110 kV part is outdoor installation, 10 kV part is indoor installation. Substation is remotely controlled from the central dispatching in Varna. In the year 2019 it has been about 2.5 million BGN invested for renovation of high voltage part complete renovation.

Figure 2: 110 kV part

The electrical backup for basic manipulation and control system is assured by batteries. Battery room has permanent ventilation. All indoor technical spaces are equipped with automatic smoke detection with alarm routed to the central dispatching in Varna.

Figure 3: Fire detection in batteries room and middle voltage part



Čajka substation in Varna has been built in 1994. This substation is fully enclosed in the building. Two 40 MVA transformers are installed each in its individual chamber. Bulgarian transformers Elprom are installed with 25 t of oil each. Each transformer has inside automatic gas extinguishing system called Sergi based on nitrogen agent (150 kg/each). It is planned to change the transformers in the year 2021. 110 kV part is enclosed type with SF_6 filling, produced by ABB. 10 kV part is in standard design with oil insulated switches. In the year 2021 it is planned to replace them with vacuum ones. Manipulation is electrical with backup

batteries. This substation is with remote control from Varna dispatching. Automatic fire detection is not installed.

Figure 4: 110 kV enclosed part

Varna south (visited in the year 2015, no significant changes happen until the year 2020) substation is located near the harbor. This substation is practically in one area with high voltage laboratory in Devnja street. Complete reconstruction of 10 kV part was done in 2013. Thus substation supplies southern industrial zone, city center and the harbor. Two transformers 110/20/10 kV, SGB with output of 50 MVA each are installed since 2012. Manipulation is remotely controlled from central dispatching. 110 kV and also 10 kV part are indoor. Manipulation with switches is electrical with backup by batteries. New type of gel batteries is installed. The substation is with remote control from the central dispatching as the most of the substations in the system. Local control system is also installed connected to central system.

Figure 4: Varna South building

6.3. Sources of operation

6.3.1. Raw materials

Raw materials / materials / Use	Not applicable.
Main suppliers	---
Amount / package	---
Impact on the operation/ backup	---
Stock	---

6.3.2. Electricity

All systems described are designed to distribute electricity at low to high voltage levels. Most of the substation have electrical manipulation system with backup batteries. Dispatching centers in Gorna Oryahovitsa, Russe and Varna are equipped with diesel generators with automatic start. Those generators are periodically tested each week. All distribution substations are connected to state owned NEC transmission grid.

6.3.3. Heating

Source	Visited places are heated electrically mostly via direct heaters or air condition.
Parameters	
Impact on the operation/ backup	

6.3.4. Steam

Source	Not applicable.
Parameters	---
Impact on the operation/ backup	---

6.3.5. Cooling

Source	Local air conditions
Parameters	---
Impact on the operation/ backup	---

6.3.6. Pressure air

Source	Air pressure air is not used for substation control movements. Those movements are mostly performed electrically or manually.
Parameters	---
Impact on the operation/ backup	---

6.3.7. Technical gases

Source	Not used.
Parameters	---
Use	---
Storage	---

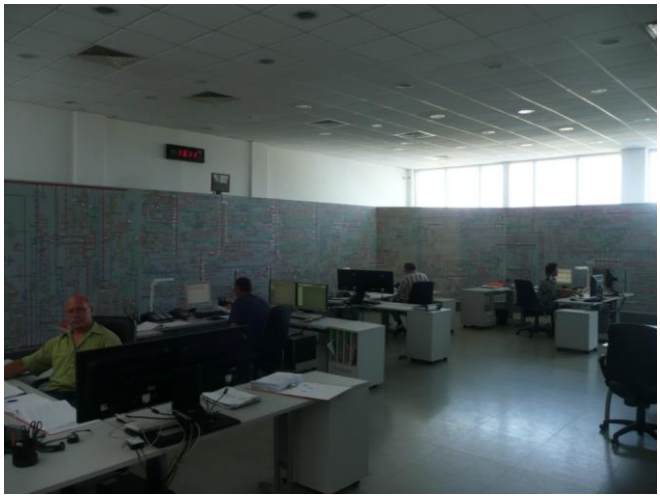
6.3.8. Water

Source	Water systems is installed in the substations just for hygiene reasons.
Parameters	
Impact on the operation/ backup	
Waste water	

6.3.9. Control systems / servers

The distribution is controlled from three independent dispatching centers located in Gorna Oryahovitsa, Russe and Varna. These dispatching centers are substitutable in terms of technology and connectivity, dispatchers however have knowledge only for the district they operate. In the case of losing one of the dispatchings, it is not necessary to switch off the network. Dispatchings are permanently manned. The control system is mostly based on Schneider Monitor Pro 7.2. platform, or Siemens platform or ABB platform (older systems), but at the time of the survey the new SCADA system was under installation. The operator has complete visualization of individual substation current status. Also CCTV cameras installed in most medium to low voltage substations help the operator to see current status. Operators can remotely manipulate with the substation premises in the case of necessity or can send the field operators to solve the problems.

Picture 1: Gorna Oryahovitsa control room



Except the dispatching EP has also servers ensuring the other processes within the company like meter reading, telemetry, file storage, emails, other important business processes and IT services.

Primary data center is in Sofia, co-located in EQUINIX data center, providing high-quality co-location services. EP infrastructure is located in a separate cage with 12 racks in it. Secondary server room is

located in Varna. There are two other server locations (rooms) for telemetry services which are located in Varna and Gorna Oryahovitsa. All of them are with separated physical access.
Full backup of central server is in place. Most of the infrastructure and servers is virtualised (using VMware hypervisor) and backups are performed using Veeam product. For telemetry core servers there are two central servers on two different locations (distance > 150 km). Each system and server has different schedule, but mostly weekly full backup and daily/hourly incremental (archive logs, delta) backup is provided.

To recover the servers after significant failure takes from few hours to 48 hours for some systems with bigger storage data.

Above mentioned information was received from the IT manager of EP. Physical visit of the server rooms were not possible at the time of the survey.

6.4. Storage

6.4.1. Raw materials and product storage

EP has a central storage of spare parts. We did not visit this storage. In visited locations, there are no significant storages.

6.4.2. Chemicals

No significant volumes of chemicals are stored in the visited areas. Quite significant volumes of oil are present inside the transformers. The volumes are about 25 - 40 t/transformer. Transformers are installed with emergency pits mostly of concrete construction. Those pits are filled by crushed stone. There is no possibility to control the fullness of the pits.

6.5. Layout and construction

Substations are mostly designed with 110 kV part as open air with steel or concrete constructions of the poles. In some locations are the 110 kV parts enclosed within the building. This is valid mostly for city substations. Medium and low voltage parts are located inside the building. Control rooms are located inside the building, which are made from bricks or concrete.

6.5.1. Building age and maintenance

See the chapter 6.2. All visited substations are well maintained in terms of the technology. Building maintenance is slightly below average, but EP has an investment plan for 2020 and 2021 to improve this situation.

6.5.2. Fire sections

Fire separations in open air high voltage parts are made by the distance, which is about 20 – 30 meters between the transformer. High voltage and middle voltage parts within the substations located in the buildings are mostly without effective fire separations.

6.6. Security

No physical guarding is organized on visited places. All visited substations are equipped with motion detectors with signal routed to the central dispatching.

Mechanical security is assured with fencing, locked door and closed windows. Mechanical security is only on basic level, but EP has no significant bad experience with burglaries.

7. Organization and management

7.1. Certified management systems

ISO 9001 and OHSAS 18001 are implemented and certified.

7.2. Employees

EP Bulgaria has about 1,600 employees. Periodical theoretical and also practical trainings are provided based on Bulgarian standards. Substations are mostly not permanently manned and are remotely controlled from dispatching with periodical technicians visits. Field operators are located within the distribution areas able to do the action after dispatching command.

7.3. Fire prevention

Fire risk	Fire risk categorization of the substation is based on Bulgarian national standard and is rated F5V.
How is fire prevention managed	EP has a central manager responsible for occupational health and safety and fire prevention with fire prevention specialist (inspectors) on the district levels, together 8 persons. Periodical fire prevention inspections are provided with period and scope based on Bulgarian national standard.
Smoking policy	Smoking is prohibited inside the substations, dedicated places for smoking are present.
Training	Periodical theoretical and practical training is provided also in cooperation with state professional fire brigades. Two practical trainings per year are provided.
Hot works management	Procedures for hot works providing are prescribed by Bulgarian national standard. Hot works are provided based on written permit, where approval and precautions are prescribed by the local maintenance manager. Following watch is organized for next 3 hours after finishing the works.
Other	EP Bulgaria has written rules of fire prevention.

7.4. Maintenance

Preventive maintenance and inspection system is implemented with periods based on Bulgarian national standard and periodical, physical condition monitoring of the distribution parts. Visual condition monitoring is provided annually. Periods and scope of the monitoring are prescribed within the appliances catalogues. Monthly are the substations (MV/LV) inspected. Based on the inspections results the annual maintenance plan is elaborated. For high voltage substations annual transformer oil testing is provided. Periodical infra-red thermography is provided. Results are analyzed and trends from the year 2011 are tracked. The annual maintenance budget for next years is about 5-9 million BGN.

The maintenance system we assess as average to above average.

7.5. Emergency planning

Quite extensive ratio of emergency plans are elaborated based on EP representative information. Those plans include the solutions of technical and also natural perils. During the survey we had no chance to see those plans.

8. Safety devices

8.1. Fire water

No fire water hydrant or basins were installed in visited locations. According the information obtained from the EP representatives, this is common condition also in another substation. In some substations public fire water hydrants are close to the station, but without an overview about their state and water delivery quality.

8.2. Fire detection

Automatic smoke detection was installed on below mentioned substations:

- Substation “Varna South 110/20/10kV”
- Substation “Varna East 110/10/10kV”
- Substation “Trakata 110/20kV”
- Substation “Byala 110/20kV”
- Substation “Slatina 110/20kV”

Point and/or beam detectors are installed with alarm routed mostly to the district dispatching.

8.3. Other detection

Type of detection	NOT INSTALLED
Signalization	
Coverage	
Connected systems	

8.4. Fixed fire extinguishing systems

Type	Not installed.	Revision	---
Coverage	---	Supplier	---
Description	---		

8.5. Smoke and heat ventilation

Type	No emergency ventilation is installed.	Revision	---
Coverage	---	Supplier	---
Description	---		

8.6. Explosion precautions

Type	NOT INSTALLED	Revision	
Coverage			
Description			

8.7. Portable extinguishers

Type	CO2, powder	Revision	Periodical revisions are provided once a year
Description	Portable extinguishers are installed on each substation.		

8.8. Fire brigade

Company does not have its own fire brigade. Practical trainings are provided with municipal fire brigades. Professional fire brigades are located in bigger cities, so we can expect that the fire brigade could take the action. We don’t know exactly the level of the professional fire brigade equipment.

9. Abbreviations, terminology and definitions

9.1. Abbreviations and terminology

BLEVE	-	Boiling Liquid Expanding Vapour Explosion does not necessarily have to be a flammable substance.
EMS	-	environmental management system, mostly according to ISO 14000 series, can also be according to EMAS
EPS	-	electric fire alarms etc.
EZS	-	electrical safety signaling
HZS	-	fire brigade
IPPC	-	Integrated Pollution Prevention and Control No. 76/2002 Coll. and following
LPS	-	Lightning Protection System, lightning protection system
OHSMS	-	Occupational Safety Management System, mostly according to OHSAS 18000 standards
OZO	-	qualified person in the field of fire protection according to Act. No. 133/1985 Coll.
PCO	-	centralized protection desk
PPC	-	alarm reception center, formerly PCO
PZH	-	prevention of major accidents
PZTS	-	alarm and emergency center, formerly EZS
QMS	-	quality management system, mostly ISO 9000, in automotive industry or its suppliers an alternative e.g. ISO TS 16949 may be used
VCE	-	Vapour Cloud Explosion (explosion of cloud of flammable vapors)

The hazardous properties of substances (section 5.4.2.) and their designations or abbreviations are defined in Appendix II to Directive 67/548 / EEC. (*E - Explosive, O - Oxidizing, F + - Extremely flammable, F - Highly flammable, T + - Very toxic, T - Toxic, Xn – Harmful to health, C – Corrosive, Xi – Irritating, N – Dangerous for environment)*

10. Appendices

No specific appendices.