

ANNEX 06 ESMP

INTRODUCTION

PROJECT DESCRIPTION

Project objective is development of green technology for mitigation of harmful environmental impact of high voltage power transformer failures in operation and existing hazardous practice in insulation condition maintenance. The main idea of **GreenCleans** project is to introduce new technology for the removal of elemental sulphur from mineral transformer oils using low temperature reagent based technology and to change hazardous practice of oil regeneration with reactivating adsorbents which blow off toxic emissions (dioxins) and produce elemental sulphur which can induce power transformer failure. Once elemental sulphur is created and contaminates transformer oil, most of currently applied technologies can't remove elemental sulphur, which is being created during processing. Newly developed technology – **GreenCleans** with previously patented technology will solve the problem of elemental sulphur in transformer oils. This technology will comprise insulating oil treatments on laboratory and pilot scale (TRL4), followed by demonstration of developed technology in operational environment using batch of 3 tons of transformer oil in power station in Serbia (Power station Kolubara A Veliki Crljeni). This will be done using INT mobile plant with operational license in order to achieve TRL 7. Previously patented technology (RS 53510) will be included in on-site demonstration in order to demonstrate integrative solution for mineral transformer oil treatment - 3PINT. Project results will contribute to green and sustainable power delivery and will thus provide benefits for the environment and society. Mitigation of power transformers failures and reduction of air pollution, caused by currently applied oil regeneration processes with reactivating adsorbents will be available by the development of **GreenCleans** and utilization of 3PINT. Reduction of waste oil generation, pollution of the environment and power transformers carbon footprint will bring strong positive impact on citizen's health, huge savings on the costs of capital equipment, avoiding economic and societal losses of undelivered electricity. **GreenCleans** as newly developed low-temperature technology will mitigate risks of power transformer failures in accordance with best environmental practice.

Laboratory, pilot scale and large scale oil treatment during **GreenCleans** implementation and demonstration in on-site operational environment will be performed using mineral transformer oil in service, reagent A and new/innovative reagent B (developed in the project), existing equipment and lower working temperatures and reaction times than those applied in background patented and licensed technology.

Introduction of this Research & Development & Demonstration project in industry practice in compliance with best environmental practice will achieve minimization of investment and operational costs, waste generation and improve power transformers carbon footprint.

Laboratory and pilot scale research will be performed in Institute Nikola Tesla, Belgrade. On-site demonstration in operational environment will take place in Thermal power plant (TPP) - Kolubara A, Veliki Crljeni using existing INT mobile plant and transformer oil available in power plant as input material for treatment. There is no transport of transformer oil outside of the location of TPP Kolubara. Agreement with TPP Kolubara A will be issued before start of the project, based on existing letter of intent, obtained from Power System of Serbia during the preparation of project proposal (No. 2460530-1203-650989/1-2022 from October 5th 2022.).

Technology is oriented to fully cleanup transformer oil from the elemental sulphur with generation of waste in minor amount, 4 -10 mass% in total mass balance. Waste generated in the laboratory during lab and pilot scale treatment and generated waste streams after on-site treatment will be separately managed according to: Standard ISO 14001, SRO's 1 Waste Management plan and SRO's 1 Instruction for Waste Management. It will be handed over to the authorized operator in accordance with Law on Waste Management by SRO 1. Health, environment, safety and societal impacts of the INT mobile plant owned by SRO 1, which will be used as demonstration and confirmation of new technology, are addressed for a previously patented technology approved for on-site operation in the documentation: Study on the Environmental Impact Assessment SPU-2013-INT01 (performed for location of Power plant Kolubara A Veliki Crljeni), license no. 1540 and Waste management plan, from August 2022.

SENSITIVE RECEPTORS

There are no sensitive receptors within INT laboratory and industrial site of Power plant Kolubara A and there are no harmful emissions which could result in adverse effects.

The statement is described below addressed to each potential sensitive receptor:

- **Population** – No influence. Laboratory investigation and pilot scale operation will be implemented in SRO1 Specialized laboratory for oil testing, which has accreditation according to SRPS ISO/IEC 17025. Urban areas are far away from operation site for new technology demonstration, TPP Kolubara.
- **Health and Safety** – No influence; In all three project execution stages/project activities (laboratory, pilot, on-site) researchers are trained in occupational health and safety, familiar with precautionary measures specified in Safety data sheet of chemicals and have personal protective equipment. Laboratory is accredited according to SRPS ISO/IEC 17025 and SRO 1 is certified according to Standards ISO 14001 and ISO 45001.
- **Geology and soil** - No influence. All research and demonstration activities will be performed in building of SRO 1 and Industrial site, TPP Kolubara; During all three stages of project execution (laboratory, pilot, on-site) leaks and spills will be prevented by regular checking of equipment, application of accident collection vessels (vane) and adsorbent for collecting potential leaks will be placed at working site.
- **Climatic characteristics** - No influence.
- **Seismology** - No influence.
- **Air quality** - No influence. Experiments and new technology do not require a usage of highly volatile chemicals and do not produce any air emissions. Moreover, emissions in air for all three project activities will be checked (laboratory, pilot and on-site during standard procedure) to verify absence of emission and to confirm that there is no influence on air quality.
- **Waste Generated** - Waste generated during laboratory investigation, pilot scale operation and demonstration on-site will be separately collected, marked and temporarily stored at defined places according to the SRO's Instruction for waste management, SRO's Waste Management plan and Standard ISO 14001.
Generated waste volume - laboratory investigation: spent reagent (07 07 07*) – 0.00025 t, used adsorbent (15 02 02*) - 0.00025 t, used chemicals (16 03 05*) – 0.002 t; pilot scale operation: spent reagent (07 07 07*) – 0.001 t, used adsorbent (15 02 02*) – 0.001 t, demonstration in operational environmental: spent reagent (07 07 07*) – 0.15 t, used adsorbent (15 02 02*) – 0.15 t, solid waste (15 01 06) – 0.2 t. Generated waste will be handed over to authorized operator (Contract No. 04/1684-23 from 18.04.2023) in accordance with Law on Waste Management.
- **Water resources** - No influence. There is no generation of waste water. There are no water resources in proximity of operating site.
- **Soil** - No influence. In all three project execution stages/project activities (laboratory, pilot, on-site) risk from leaks and spills are very low. Oil for demonstration in operational environmental will be available on-site, therefore there is no need for oil transportation. Leaks and spills during demonstration will be prevented by regular preventive checking of equipment; protective foils and collection vessels (vanes) and adsorbent for spills collection will be placed at working site.
- **Flora and Fauna** - No influence since there is no air, water and soil emissions and contaminations. In all three project execution stages/project activities (laboratory, pilot, on-site) activities are performed in laboratory and industrial environments, which do not contain protected areas.
- **Noise** – No influence. Noise in laboratory and pilot plant could come only from pumps and mixing devices with level is much below the maximum level described in regulations. Noise level on mobile industrial plant was monitored during previous operation and detected noise level is below the limits.
- **Cultural heritage** - No influence. Project will not have influence on cultural heritage since all activities will be done in building of Institute and industrial site.

POTENTIAL IMPACT AND IMPACT ASSESSMENT

Potential impact and impact assessment could be summarized as following:

- **Potential Impacts on the Air quality** – No impact. Emissions in air for all three project activities will be checked (laboratory, pilot and on-site) to verify absence of emission and to confirm that there is no influence on air quality.

- **Potential Impacts on water (water protection and drainage) and soil** - There is no generation of waste water. There are no water resources close to operation site. In all three project execution stages/project activities (laboratory, pilot, on-site) leaks and spills will be prevented by preventive checking of equipment; application of protective foils, collection vessels (vane) and adsorbent for spills collection will be placed at working site.
- **Impact of generated waste streams** – Generated waste in all project activities (laboratory investigation, pilot scale operation and demonstration on-site) will be separately collected, marked and handed over to authorized operator in accordance with Law on waste management.
- **Potential impacts on workers and community health and safety** – Preventive measures are prescribed. In all three project execution stages/project activities (laboratory, pilot, on-site) researchers are trained in occupational health and safety, they are familiar with precautionary measures specified in Safety data sheet of chemicals and have personal protective equipment (PPE). SRO 1 Laboratory is accredited according to SRPS ISO/IEC 17025 and SRO 1 is certified according to Standards ISO 14001 and ISO 45001.
- **Potential socio-economic impacts** – No impact.

Project identification: **GreenCleans**

ESMP Prepared by (date, name, signature): **18.04.2023, dr Jelena Lukic**

I MITIGATION PLAN

Phase	Issue	Mitigating Measure	Cost of Mitigation (If Substantial)	Responsibility *	Supervision observation and comments (to be filled out during supervision)
Laboratory investigations and pilot scale	Use of chemicals	<ul style="list-style-type: none"> • Researchers are informed about the dangerous chemicals used in the workplace and the related risks of injury at work; trained and familiar with the precautions identified for specific chemicals in material safety data sheets (MSDS); • Safety data sheets will be available at the point of use; • Chemicals are stored correctly in safety storage cabinet; • Researchers will adequately use personal protective equipment (PPE); • Occupational safety and health equipment will be available at the workplace; <p>SRO 1 is certified according to the Standard ISO 14001 and ISO 45001.</p>	Minor	Grant recipient	

Phase	Issue	Mitigating Measure	Cost of Mitigation (If Substantial)	Responsibility *	Supervision observation and comments (to be filled out during supervision)
	Handling of testing equipment and measurement implementation	<ul style="list-style-type: none"> • Researchers are trained and familiar with working procedures and manuals; • Researchers are qualified for appropriate equipment usage; • Devices used during testing are regularly inspected, cleaned, maintained and calibrated in accordance with standard operating procedures and records will be kept; • Instructions for the use of equipment will be available on the place of use. <p>SR O 1 Laboratory is accredited according to Standard SRPS ISO/IEC 17025.</p>	Minor	Grant recipient	
	Waste management plan implementation	<ul style="list-style-type: none"> • All generated waste will be separately collected, marked, and temporarily stored at designated locations in accordance with the SRO's 1 internal documents Waste Management Plan and Instructions for waste management; • The waste will be handed over to the authorized operator; • All documents and records will be maintained in accordance with the Law on the Waste Management. <p>SRO 1 is certified according to the Standard ISO 14001.</p>	Minor	Contractor /Grant recipient	

Phase	Issue	Mitigating Measure	Cost of Mitigation (If Substantial)	Responsibility *	Supervision observation and comments (to be filled out during supervision)
	Health and Safety	<ul style="list-style-type: none"> • Researchers are acquainted with legal requirements of health and safety issues by responsible person for safety and health at work; • Researchers are trained for occupational health and safety, fire hazards response by responsible person, in accordance to the existing procedures; fire extinguishers are available in working place; certain number of researchers is trained for first aid; • Researchers will use PPE and will follow the prescribed procedures; • Working environment conditions (i.e. microclimate, noise, lighting, air quality) in the specific laboratory will be measured and recorded. <p>SRO1 is certified according to the Standard ISO 45001.</p>	Minor	Contractor /Grant recipient	
	Potential Environmental impacts	<ul style="list-style-type: none"> • No leaks in the surrounding regions is ensured and chemicals are stored correctly in safety storage cabinet; 	None	Grant recipient	
Demonstration in operational environment (on-site)	Health and Safety	<ul style="list-style-type: none"> • Working area will be properly marked; • Researchers working at mobile unit are trained for all process activities in the field, health and safety and certain number for first aid; • First aid kit is available at working site; • Researchers will use personal protective equipment (PPE) and will follow the prescribed procedures; 	Minor	Grant recipient	
	Noise, emissions	<ul style="list-style-type: none"> • Working environment condition (noise, emissions and EMF measurements) in operational environment will be measured and recorded. 	1200 €	Contractor /Grant recipient	

Phase	Issue	Mitigating Measure	Cost of Mitigation (If Substantial)	Responsibility *	Supervision observation and comments (to be filled out during supervision)
	Contamination of soil	<ul style="list-style-type: none"> Spill prevention vessels (vanes), protective foils and adsorbent for oil spills will be placed on site; Testing of soil (baseline and at the end of demonstration in operational environment) will be performed and recorded. 	1300 €	Contractor /Grant recipient	
	Waste management plan implementation	<ul style="list-style-type: none"> All generated waste will be separately collected, marked, and temporarily stored at designated locations in accordance with the SRO 1 Waste Management plan and Instructions for waste management; The waste will be handed over to the authorized operator by SRO 1; All documents and records will be maintained in accordance with the Law on Waste Management. <p>SRO 1 has accreditation according to the Standard ISO 14001.</p>	1500 €	Contractor /Grant recipient	
	Use of chemicals	<ul style="list-style-type: none"> Researchers are informed about the dangerous chemicals used in the workplace and the risk of injury at work, trained and familiar with the precautions identified for specific chemicals in material safety data sheets (MSDS); Safety data sheets will be available at the point of use; Researchers will adequately use personal protective equipment (PPE); Occupational safety and health equipment and first aid kit will be available at the workplace; SRO 1 is certified according to the Standard ISO 14001 and ISO 45001. 	Minor	Grant recipient	

* Items indicated to be the responsibility of the contractor shall be specified in the bid documents

II MONITORING PLAN

Phase	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored/ type of monitoring equipment?	When is the parameter to be monitored- frequency of measurement or continuous?	Monitoring Cost What is the cost of equipment or contractor charges to perform monitoring?	Responsibility	Supervision observation and comments (to be filled out during supervision with reference to adequate measuring reports)
Laboratory investigations	Microclimate, lighting	Laboratory	Check temperature and light to ensure they are within required limits.	Once during laboratory investigations.	None	Grant recipient	
	Use of testing equipment and measurement implementation	Laboratory	By using existing Procedures, User guidelines and Standard methods and their availability at working site.	During laboratory investigations, periodically.	None	Grant recipient	
	Waste management plan implementation	Laboratory	Supervision of SRO 1 Waste management plan implementation (waste collection, separation, labeling and final disposal)	Daily, during laboratory investigation.	Minor	Grant recipient	
	Use of chemicals	Laboratory	Visual inspection related to use of PPE at working site and availability of MSDS and storage of chemicals and used chemicals	During laboratory investigations, periodically.	None	Grant recipient	

Phase	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored/ type of monitoring equipment?	When is the parameter to be monitored- frequency of measurement or continuous?	Monitoring Cost What is the cost of equipment or contractor charges to perform monitoring?	Responsibility	Supervision observation and comments (to be filled out during supervision with reference to adequate measuring reports)
Pilot scale	Noise	Laboratory	Check sound levels to ensure it is within legal limits	Once, during pilot scale operation	None	Grant recipient	
	Use of testing equipment	Laboratory	By using existing Procedures, User guidelines.	During laboratory investigations, periodically.	None	Grant recipient	
	Waste management plan implementation	Laboratory	Supervision of waste collection, separation and labeling.	During laboratory investigation, periodically	None	Grant recipient	
Demonstration in operational environment (on-site)	Use of chemicals	Laboratory	Visual inspection related to use of PPE at working site and availability of MSDS.	During laboratory investigations, periodically.	None	Grant recipient	
	Noise	On site	Check of sound level to ensure that it is within required limits.	Once during demonstration in operational environment	300 €	Contractor	
	Emissions in air	On site	Check of defined parameters in air with records to ensure that there is no influence on air quality	Baseline, during and after demonstration in operational environment	900 €	Contractor	

Phase	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored/ type of monitoring equipment?	When is the parameter to be monitored- frequency of measurement or continuous?	Monitoring Cost What is the cost of equipment or contractor charges to perform monitoring?	Responsibility	Supervision observation and comments (to be filled out during supervision with reference to adequate measuring reports)
	Electromagnet field measurements (EMF)	On site	EMF measurements recorded to ensure they are within required limits for research purposes	During demonstration in operational environment	None	Grant recipient	
	Leaks, spills	On site	Visual inspection of work site to ensure that spill prevention vessels (vane), protective foil and adsorbent for oil spills are placed adequately on site	During demonstration in operational environment, daily.	None	Grant recipient	
	Soil	On site	Testing of defined parameters in soil with records to ensure that there is no soil contamination.	Two times, Baseline and after demonstration in operational environment.	1300 €	Contractor	
	Waste management	On site	Supervision of waste collection, separation, waste labeling and handing over to the authorized operator by SRO 1 (contract with operator)	Daily, during demonstration in operational environment.	Minor	Grant recipient	

III. PUBLIC CONSULTATION DETAILS AND MINUTES OF MEETING FOR THE ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

In a separate document provide details on:

1. Manner in which notification of the consultation was announced: media(s) used, date(s), description or copy of the announcement
2. Date(s) consultation(s) was (were) held
3. Location(s) consultation(s) was (were) held
4. Who was specifically invited (Name, Organization or Occupation, Telephone/Fax/e-mail number/address (home and/or office)?)
5. List of Attendees (Name, organization or occupation, contact details)
6. Meeting Agenda
7. Summary Meeting Minutes (Comments, Questions and Response by Presenters)
8. List of decisions reached, and any actions agreed upon with schedules and deadlines and responsibilities.

ESMP reviewed and approved by Environmental and Social Expert:

Date

Name

Title

Signature