Annex D. Case Studies

SO 6.1. distribution - Upgrading of transformer stations of E.ON Distributie - 105731

1. Brief project description

The general objective is to increase the security of taking over the electricity produced from renewable resources by reducing the number of interruptions, decreasing the amount of undelivered electricity and the reduction of the maintenance costs of the E.ON Romania electricity distribution network.

The specific objective is Modernization of Hirlau, Pascani and Gorban transformer stations belonging to E.ON Distributie Romania to increase safety taking over the electricity produced from renewable resources.

Expected results:

- 1/ 3 modernized 110/20 kV transformer substations: Station 110/20 kV Hirlau, Pascani 110/20 kV substation, and 110/20 kV Gorban substation
- 2/ 1 Functional Project Implementation Unit
- 3/ 1 design and execution contract for construction and modernization works signed
- 4/ 1 technical project elaborated

Main activities:

In accordance with the EDRO strategy and taking into account the data resulted from analysis of the situation of electricity producers in renewable sources connected in the three substations, at the level of the three 110/20 kV transformer substations the following types of works are carried out:
- modernization of equipment from 110 kV cells;
- modernization of 20 kV cells located in the connection room;
- modernization of internal services, direct current and alternating current;
- integration in SCADA of the modernized installations;
- modernization of terminal boxes;
- grounding installation restoration;
- modernization of exterior lighting installation and lightning protection installation.

Project justification

Modernization of the 100/20 kV stations Hirlau, Pascani and Gorban of the company E.ON Distributie Romania, stations where they charge manufacturers of RES energy and which ensures its delivery in SEN meets the needs identified at national level regarding the operation in conditions of safety, security and efficiency of distribution networks.

The actions proposed in this project are in line with the directions of action established in the Energy Strategy of Romania for the period 2007- 2020 updated, thus contributing to the achievement of the objectives set out in the Energy Strategy on Energy Security and lasting development.

E.ON Distributie Romania S.A. (ERDO), the first integrated distributor of natural gas and electricity in Romania, ensures energy distribution electric in the six counties in the Moldova area: Bacau, Botosani, Iasi, Neamt, Suceava and Vaslui. The main activity of the company is electricity distribution at the parameters required by its suppliers and customers, in accordance with the Performance Standard for electricity distribution service and performance indicators.

The proposed investment is a component of the EDRO Network Development Strategy, based on the objectives of the Perspective Plan of the development of the electrical distribution network of E.ON Distributie Romania SA. In accordance with the provisions of H.G. no.2139 of 2004, the normal operation duration of the equipment from the power transformation stations should have between 16 and 24 years old, while the electrical equipment in most stations are in operation for over 30 years.

The analysis of the company's main performance indicators as well as the forecast of the future demand on the profile market reveals the potential of its development, which, however, cannot be achieved in the current conditions due to the following needs identified at the infrastructure level:

1/ To ensure a high level of quality of services and investments to ensure compliance mandatory performance standards for electricity distribution operators;

2/ To streamline the company's costs in order to ensure a high level of competitiveness on the market;

3/ To create a modern infrastructure, able to take over and deliver in SEN the energy produced from renewable sources;

4/ To ensure operating conditions with minimal impact on the environment, in accordance with the principles of development durable;

5/ To ensure a safe working environment for the company's employees.

Progress of project implementation:

The project started on 01.01.2018 and was extended until 31 May 2021. Until the cut-off date of the most recent progress report (31.12.2020) two transformation stations (Hîrlău and Pașcani) out of the three covered by the project were fully modernized and started to function.

2. Reason for selecting the case (criteria, significance of the selected case)

This project is the most advanced among the 4 energy distribution projects contracted under the Specific Objective 6.1. of the LIOP PA 6.

3. Methodology for case study

The case study was drafted based on the desk review of the relevant project documents (e.g. financing contract, initial progress report and project CBA), project details from LIOP databases (SMIS, internal MA LIOP reporting) and on the primary data collected from the individual interview with project manager, as well as from the interviews with the MA LIOP staff.

4. Budget

Total project budget: 16,838,862.75 lei
Total eligible budget: 12,804,627.05 lei
Total contribution of the beneficiary: 1,024,370.17 lei
Total non-eligible costs: 4,034,235.70 lei

5. Effectiveness of the intervention

Internal and external factors which are contributing to achieving the desired results

The project started effectively in early 2019 and it went on well in the first stage, but the pandemic broke and things slowed down because the contractor's, builder's or equipment supplier's personnel were most probably reduced, and they could not deliver services and equipment in time. The beneficiary got an extension of the financing agreement and an addendum for an extension of the project implementation time (the project was supposed to be finalized at the end of November – beginning of December 2020, and due to the addendum it was extended by 31 May 2021). The implementation was cumbersome, the investment involves large equipment for transforming 110 - 120 kilovolts, switches, separators, current transformers etc. These are expensive equipment that require experts at all stages, from building to installing and integration in the SCADA system that the beneficiary only partially had, and they should do tests, trials, verifications and upgrades to ensure that the equipment is operational at the end of the project. Related to the constructions component, there was one builder only, a company that provides all the services which explains why the project progressed slower. The equipment suppliers were dependant from the builder's capacity to deliver on time. On the reimbursement part, submitting the requests and liaising with the DRIs went smoothly, the collaboration was good. However, the SMIS seems to me fairly muddled, which in the beneficiary's opinion should be simplified.

Difficulties faced in implementation

The beneficiary encountered several difficulties in implementation. For example, in the procurement procedure the European regulations require the access of providers from outside the European Union. The beneficiary got a 5% penalty for not mentioning 'or equivalent" in the specifications. According to the auditors the beneficiary was not open enough to allow all international entities to participate in the tender.

The beneficiary considers that the implementation path as slow because they had a first SCADA project covering 30 something substations, and sometime in 2017 – early 2018, they thought up these projects that are currently under implementation. The beneficiary carried out the feasibility studies (FSs) for their projects which was a non-eligible expenditure that took over 4-5 months. So, they started working on these projects sometime in the spring of 2018, and sometime in September they succeeded to complete the FSs, had them approved, got the agreements, permits, and wrote the projects and prepared the proposal documentation in October – November and submitted in December 2018. The beneficiary prepared the feasibility study working together with a specialised consultant.

In addition, the year 2020 was difficult, they had to push the builder hard and to make all the factors

influencing this part of execution and finalisation meet. In the stations the consumers' supply cannot be reduced to zero and the beneficiary had to take care of the safety of the exploitation as well as of their own staff. The cooperation with internal and extern entities complicates the implementation process.

6. Efficiency

The beneficiary considers that renewables energy has a future, therefore the company must improve distribution services, to reduce the discomfort caused by disruptions/outages, to reduce disruption time, and to manage to automate their equipment such as to be able to ensure, to make efficient manoeuvres, so that the clients, producers and consumers to be impacted as little as possible. By modernising the equipment in substations through which the power is delivered directly, the beneficiary considers they can provide quality services, reduce power losses, reduce the number of outages, and increase efficiency. Overall, upgrading the substations involves increased efficiency of beneficiary's human resources and equipment.

7. Sustainability

a/ Financial sustainability

During the investment period, the financial sustainability of the project will be ensured from the following sources: non-reimbursable financial assistance in the amount of 11,524,164.34 lei and the beneficiary's own contribution in the amount of 4,985,825.20 lei.

According to the financial analysis undertaken for this project, this is going to be financially sustainable, because the beneficiary's cumulative net cash flow is positive for each year of the entire reference period considered, which demonstrates the beneficiary's ability to ensure the necessary liquidity for an adequate financing of the project.

For optimum functioning of this investment the company will allocate the necessary personnel who is characterized by professionalism and experience in this sector.

b/ Technical sustainability

The technical sustainability of the investment is guaranteed by the purchase of modern equipment, with a high level of reliability that does not require maintenance costs. These elements create the premises for the efficiency of the company's operational costs and ensuring continuity in energy delivery, contributing to ensuring the long-term sustainability of the investment. The proposed project produces effects after its implementation by improving the SAIFI, SAIDI and ENS indicators, as well as by reducing the technological losses.

8. Conclusions

- The beneficiary is confident that their project would indeed enhance their capacity to integrate newly-built renewable capacities in their region, once the project implementation is finalized.
- An important factor for a successful implementation of the project is the beneficiary's experience with other projects implemented. In case of this beneficiary, in 2018, they completed a SCADA project, there was another project on the development of company's human resources and they are implementing a smart metering project in the Iași area. It appears

that the estimated impact increases when this type of project is combined with smart metering projects in the same region, covering both urban and rural areas.

- Using SCADA automated remote-control system (SCADA) is contributing to increasing the efficiency in terms of reducing operator's intervention time. The SCADA system involves carrying out remote operations without requiring the presence of personnel at the consumer or generator's end. The control operations are carried out from dispatch which monitors the quality of power. This technology does not require personnel at the substation or at the client. Ultimately, it entails a reduction of expenses and a benefit for the energy producers, clients and distributors.
- According to the beneficiary's knowledge and experience over the last years, the number of the entities looking for energy independency grew, more people want to produce photovoltaic energy, so last year the beneficiary had hundreds of requests from potential prosumers. The „Casa Verde" (Green House) programme for photovoltaics generated a wave of requests, but the Ministry and the managers of the programme appear not to be supportive. Bureaucracy is high and for the year 2020 less than a third of the total number of the requests submitted to the Ministry were approved.

SO 6.1. – production Utilization of geothermal energy combined with heating pumps, to produce thermal agent for heating and hot water for Nufărul I Area, Oradea - 115839

1. Brief project description

The general objective is increasing production of energy from renewable sources (geothermal) by modernizing and achieving the production capacities of thermal energy based on geothermal energy in the Nufarul 1 neighborhood of Oradea and the realization of the distribution network to take over the energy produced. The project's purpose is to produce clean energy and increase energy efficiency in the centralized district heating system.

The specific objectives of the project are the followings:
1. Increasing the degree of use of geothermal (renewable) energy from the deposit located in the basement of Oradea Municipality by making an investment in the district heating system in Nufărul 1 Oradea District.
2. Improving the quality of life in Oradea Municipality by annually reducing the greenhouse gases by 9,859 tons of CO2 / year after the implementation of the project.
3. Increasing the capacity of energy production from renewable sources (geothermal) by 12.85MW by modernizing the district heating system in the NufăruI 1 district of Oradea.

Expected results:
1. Geothermal water / heating agent transport pipes made 22 Km
2. A "Nufarul 1" Geothermal Thermal Station built
3. A Drilling Well production Nufarul 1- built
4. 277 "Mini thermal points" installed

Activities:
- Project preparation
- Elaboration of the technical-economic documentation phase of the Feasibility Study (FS)
- Elaboration of the funding request and submission of the project
- Project implementation activity
- Preparation of procurement documentation for the works, development of procedures, concluding the contracts
- Elaboration of the technical project, obtaining Building Permit and execution of works
- Provision of technical assistance services – on site management and technical project verification
- Reception at the end of the works
- Project management and monitoring of public procurement contracts
- Information and publicity within the project
- External audit of the project

- Project monitoring and reimbursement.

Project justification

Energy is an essential element of development at EU level, and the instability of international energy markets and the tendency to monopolize hydrocarbon resources by a small group of owners, has led to a focus of the European policies towards the development of production of energy from renewable resources available in Europe, as well as the implementation of savings and policies towards adequate use of existing resources. At the same time, by transposing the acquis communautaire, Romania has accepted and adopted new laws and standards on environmental quality. The implementation of European directives represents a radical change in national policies and in the way of approaching the issue of environment, change that involves consistent and long-term investment costs. In this context, local authorities become an important actor for approaching and solving environmental problems specific faced by their own communities and for satisfying the needs of the community by providing public services at a higher quality level in this domain.

The implementation of the project contributes to achieving the targets assumed by Romania regarding the provisions of Directive 2009/28 / EC - promoting the use of energy from renewable sources and Directive 2012/27 EU of the European Parliament and of the Council of 25 October 2012 regarding energy efficiency and responds to local conditions according to the directions established at national level through the National Strategy for Sustainable Development 2013 - 2020 - 2030 and the Energy Strategy of Romania 2016 - 2030, with perspective for 2050.

Regarding the local strategic documents, through the Integrated Urban Development Strategy - SIDU, Oradea clearly pursues a policy in the field of energy efficiency, with the prioritization of the portfolio of projects by fields of interventions, the proposed project can be found at the position 225 - in the list of projects in SIDU. This project aims at: Policy VIII. ENERGY EFFICIENCY, Program P25: Growth share of renewable energy use, Specific measure / objective 25.1. Utilizing the energy potential of thermal water resources.

In the context of the existence of the geothermal deposit as a locally available resource with superior use potential, Municipality of Oradea decided to invest, modernize and bring the centralized thermal energy (TE) supply system to a higher quality level, also aiming at improving the public district heating service offered to consumers. Given the fact that the existence and adequate functionality of the ACC system depends on the ACC insurance and the thermal comfort during the cold season for approximately 70% of the city's population, the complete rehabilitation of the city's centralized TE supply system is a strategic option, both by integrating in the component of production of renewable energy sources (in this case geothermal water), by improving and streamlining the way in which energy is managed from the point of view of efficiency as well as by increasing the degree of operational safety of all system components. At the same time, investments aimed at the centralized system will have the effect of reducing losses in reducing fossil fuel consumption and increasing energy efficiency, thus helping to reduce greenhouse gas emissions and pollutants in the atmosphere.

Thermal energy is currently insured to produce ACC from geothermal water from existing boreholes (4797 and 4081) and for heating from the thermal network of SACET.

The object of the present investment is the development of the exploitation of geothermal water from the hydro-geothermal perimeter of Oradea to replace it at a scale as high as possible of conventional TE production - obtained by burning fossil fuels (with emissions into the atmosphere) - with energy geothermal - obtained by extracting the highest possible flows of geothermal water. The technical solution for the simultaneous protection of the air and surface water, in case of increasing the amount of geothermal energy, is the exploitation of geothermal water in "double" system – well production + injection well - which involves extracting water through production wells, directing it in geothermal thermal stations with heat exchangers and, after the heat release of the thermal agent from the secondary circuit, the injection into the field through injection probes.

The novelty element is given by using heat pumps that allow the recovery of additional energy from geothermal water. The TE difference will be covered by a link to the CET, on the M5 line. Thermal energy provided by CET for coverage peak load is TE produced by high efficiency cogeneration. The existing PTs in the neighborhood will be closed, they will be replaced with fully automated modules, installed at the level of the consumers located in the Nufărul I neighborhood (6217 apartments, commercial spaces, kindergarten and high school, old people's care center, approximately 11,870 inhabitants) and will benefit from energy services improved. At the same time, the entire network within the neighborhood will be replaced with a new pre-insulated network. Water transport pipelines geothermal from drilling to / from the geothermal point will also be replaced.

According to the technical solution from Feasibility Study, the proposed investment is an integral part of SACET Oradea, respectively the Geothermal Thermal Station of production of the thermal agent necessary for the preparation of the ACC and of the heating being provided to work in tandem with the new source of energy production through high efficiency cogeneration - CET Oradea, the plant that uses natural gas as fuel, and which was installed through a project financed by SOP Environment 2007-2013.

Thus, the Geothermal Thermal Station (the location where the thermal agent for consumers is produced) is proposed to be connected to the thermal transport M5 from where it will receive energy, for the summer regime, to cover the necessary during the peak period of consumption from the winter season and to be able to take over, also through it, all the necessary energy necessary for the neighborhood in the event some incidents occurred in the geothermal energy supply system.

The realization of the project will contribute significantly to the fulfillment of the objectives specific to the priority axis and to the objectives of the program in general. Thus, reducing the dependence on fossil fuels, environmental protection, diversification of energy production sources, creation of new jobs in the field as well as the active involvement of Oradea but also of the private environment in the use of renewable energy resources. The implementation of this project will contribute through its own indicators to the achievement of the program indicators. Reducing energy production costs will contribute to lowering the energy tariff on the local market (for the energy produced from the geothermal resource - cheaper, part of the common basket to establish PLR for TE) and will contribute to the elimination of local subsidy, thus stimulating local economic development.

Progress of project implementation:

The project is substantially delayed. The financing contract was signed on 17 December 2020. As presented in the Section 5 of this case study, mostly preparatory activities were carried out to the date of the interview (second half of February 2021).

2. Reason for selecting the case (criteria, significance of the selected case)

Under the Specific Objective 6.1. of the LIOP PA 6 there are four projects contracted in the domain of energy production. All have just started the implementation and among these four projects, the one implemented by Municipality of Oradea has the higher budget. Municipality of Oradea is the most experience project beneficiary.

3. Methodology for case study

The case study was drafted based on the desk review of the relevant project documents (e.g. financing contract, initial progress report and project CBA), project details from LIOP databases (SMIS, internal MA LIOP reporting) and on the primary data collected from the group interview with project manager, project technical coordinator and representative of the works supplier company, as well as with the MA LIOP staff.

4. Budget

Total project budget: 86,764,146.71 lei
Total eligible budget: 66,118,312 lei
Total contribution of the beneficiary: 1,322,366.23 lei
Total non-eligible costs: 20,645,834.65 lei

5. Effectiveness of the intervention

The project implementation has recently started. So far, three main activities were implemented including the followings: 1/ a video conference for the start of the project monitoring activity was organized by MA LIOP and DRI Cluj, 2/ a video conference was held to clarify the issues regarding the need to update the value of the project by applying the methodology of Government Decision 379 / 07.05.2020, and 3/ the documentation related to the public procurement procedure for the execution of the works was prepared.

Despite the delays and the fact that the project is an early stage of the project implementation, the project beneficiary has a clear understanding of what is to be done. Thus, according to the beneficiary's representatives, the Municipality makes the investment, at the end of the works the Municipality makes the reception and after this is done the results of the works are handed over to the operator of the heating system. The Municipality cooperated with the operator from the very beginning, from the project idea and is constantly involving the operator in the validation of the project progress. This close cooperation ensures good premises for an effective implementation, continuity to supply the services and for maintaining the investment to run properly until the end of its life cycle.

Difficulties faced in implementation

The beneficiary considers the investment covered by this project as being ambitious. The context is such that instead of having the work done and being in a more advanced stage, for the moment they do not have no contractual partner. Finding such a partner to carry out the works is difficult. There is too

little investment in the heat systems throughout the country and, unfortunately, the projects that were started were not finalized. The beneficiary searched for examples of practices, for example in Iernut. The country lacks companies capable of doing complex works in the energy field, that have the necessary 5-year experience - as required by the procurement legislation - in heat systems or energy supply. The market demand is too low, and this distorts the market and puts the beneficiary in a risk position. Financially these projects are not interesting for a foreign contractor. Consequently, the only possible partners are Romanian, and they are few. But even them, they did not submit bids. They asked for clarifications on the two tenders, they showed interest, requested further clarifications, but they did not submit an offer.

Also, there should be a national approach to geothermal energy. Throughout 2019-2020 period, besides the talks with the ministry, there were calls from other municipalities interested to submit applications, asking questions, not knowing whether to go for such a project (e.g smaller communities from the counties of Arad and Timiș). They were raising questions related to the drilling costs, which are significant: 2 million euros for drilling a hole of 250 m depth. This in a commune that may have a total budget of 4-500,000 euros, to cover the drilling costs from the local budget is problematic. According to the Applicant‘s Guide and to the financing contract, the costs related to the drilling are eligible if, until the end of the project, the beneficiary obtains operating license, not exploration license. Municipality of Oradea accepted this risk because there are about 13,000 people who are running the risk of having problems with the heat supply. A small commune cannot take this risk of going bankrupt as a public administration just because contractually is bound to the action or lack of action of a third party, who in this case may very well be the National Agency for Mineral Resources (ANRM). Perhaps there might be a mechanism that could allow these beneficiaries to get joint insurance policies, a mechanism that could unblock these situations. For the beneficiaries, it is difficult to set up something in this direction. However, it is perceived that at national level some mechanisms of the type could be designed.

Overall, the geothermal component is riskier than the installation of some equipment 100% known that works on fossil fuels. The beneficiary does the drill, assesses what historically is known in terms of properties, where the reserve is; there is geological information, but still the risk exists. This is the most that can be done.

6. Efficiency

The project evaluation took a lot of time, and the evaluation rules changed while this process was ongoing. Part of the costs that were eligible in the beginning have turned to be non-eligible, including the VAT. In addition, there was a State aid issue which was difficult to be dealt with by the beneficiary, which led to getting the financing contract with delays and, eventually, with extra costs for the beneficiary. Currently, there is legislation allowing beneficiaries to update the value of projects for which financing contracts have already been signed. There is a Government decision allowing it and the beneficiary has started negotiating with the MA LIOP in that sense.

7. Sustainability

Regarding the revenues, they will be represented by revenues from the local budget (subsidy) and revenues from the sale of thermal energy. The subsidy from the local budget will decrease compared

to the current level but will not be eliminated because the energy used will continue to be a mix (from CET 1 Oradea and geothermal energy). It should be noted that the proportion of energy from renewable resources respectively geothermal water) will increase. Revenues will increase and expenses will increase in the same measure, throughout the analysis the cash flow being 0. The existence of a regulated price contributes to the sustainability of this project.

The implementation of the project generates savings in terms of operational costs (electricity at pumps and drilling, cold water) because of the reduction of losses in the district heating network and of the reduction of reactive interventions in the network. These savings are equated by the simultaneous reduction of heat revenues and price subsidies because of reducing the amount of thermal energy delivered. The phenomenon is explained by the social and environmental character that most of investments in district heating systems have, respectively the approach according to which the costs are fully recovered only based on the tariffs paid by the population. It is estimated that the subsidies granted by the municipality to cover the difference between the price of production, transport, distribution, and supply of thermal energy delivered to the population and the local price of thermal energy, will be ensured until the end of project implementation. According to the cost-benefit analysis of this project, the cumulative net cash flow is equal to 0 for each year of the project reference period due to the intervention of the local budget through the subsidy mechanism.

Secondly, to ensure the continuity and sustainability of the project from an institutional point of view, the human resources as well as the organizational framework for operating the investment are considered. According to CBA forecasts the municipality of Oradea has the capacity to ensure the operation and maintenance of investment, as well as the human resources necessary for project implementation due to the annual allocation of the amounts necessary to cover the respective expenses.

The human resource that will be made available during the operation of the investment is represented by 7 employees (5 dispatchers and 2 people in the intervention teams). The staff for the operation of the investment will be provided by SC Termoficare Oradea SA and will be trained to carry out successfully the kind of activities required by the implementation of the operations. SC Termoficare Oradea SA is the delegated operator for the management of the service, transport, distribution and supply of thermal energy in a centralized system, in accordance with Contract no. 196/1 / 06.08.2013. The team responsible for the implementation and monitoring of the investment project also includes specialists of the operator, they together with representatives of the engineer (who will be appointed through the public procurement procedure within the project) will monitor and evaluate the quality of the execution during the development of the project, thus ensuring the premises for an efficient operation of the installations since design phase.

The Feasibility Study carried out for this investment is mentioning the entity responsible for the investment, for each component of the investment, their operation and maintenance the responsibility was clearly allocated. Thus, components 1, 2 and 4 will be operated by the operator SACET, SC Termoficare Oradea SA, while the component 3 will be operated by the Municipality of Oradea through SC Termoficare Oradea SA in collaboration with SC Transgex SA.

The municipality of Oradea through SC Termoficare Oradea SA will have the following responsibilities regarding the operation of the investment:

a) will ensure the transport of geothermal energy from the extraction wells to the thermal point and to the thermal mini-points, because the thermal energy obtained to be delivered to the population;

b) will ensure the production of geothermal energy from the geothermal water extracted from the geothermal water deposit at its disposal the city of Oradea;

c) will perform maintenance;

d) will carry out repair works of any kind, as well as investment works that are necessary for the proper functioning of infrastructure so that there are no bottlenecks in providing thermal energy for heating and hot water and the revenues are not affected society;

e) will have a department dedicated to the operation of this investment.

Thirdly, to ensure the project's sustainability from a technical point of view, financial resources will be needed. The financial resources that will be used during the operation period will be allocated by SC Termoficare Oradea SA. In addition, to ensure the sustainability of the investment from a technical and operational point of view, the Municipality of Oradea has made / is making investments in district heating system to reduce the cost of supplying thermal energy. Thus, the Municipality of Oradea has in implementation investments in network rehabilitation through LIOP Priority Axis 7. At the same time, the Municipality of Oradea submitted several projects within axis 3.1B of the ROP to increase the energy efficiency of some subordinated public institutions (County Hospital, Municipal Hospital and 4 educational units). Through these projects, the share of thermal energy resulting from sources will increase renewable share in the total energy produced, this being possible by continuing the program to increase the energy efficiency of buildings in the Municipality of Oradea through the ROP program Axis 3.1.

Municipality of Oradea intends to submit projects for financing in the field of renewable energies and especially geothermal energy including through the Financial Mechanism of the European Economic Area. Through this source of funding was completed in the year 2017 project "Utilization of geothermal energy, for the production of thermal heating agent for consumers of the thermal point PT 902 with the re-injection of thermally used geothermal water in the reservoir "through which a drilling was performed for the reinjection of geothermal wastewater thermal, through this type of project ensuring the sustainability of the geothermal deposit in Oradea and implicitly the sustainability of this project because the investment is dependent on the geothermal deposit in Oradea. At the same time, the Municipality of Oradea will use funds from the local budget for the development of the district heating system and for the increase of the use energy produced from renewable resources.

8. Conclusions

- Dispite the delays in the project implementation which makes any consideration on the project's effectiveness premature, the beneficiary estimates that the project will increase the share of renewable heat in district heating, contributing to the committed targets. However, the beneficiary highlighted significant implementation risks as the viability of the project would be clear only after the finalization of the works will be accomplished.
- The economic factors affect less the production of geothermal energy for district heating, as this is designed to replace existing (fossil) energy source for a largely constant heat demand for residential use, which is therefore not influenced by economic factors.

- While the geothermal potential is known only generally before the well is drilled, the economic potential (whether the actual temperature and pressure of the water allows its economic use for DH) is only fully discovered after the well is finalized. Thus, there is a high risk for beneficiaries to access EU funds and discover at the end that the entire investment is ineligible because the economic potential is not realized.
- Investments in geothermal can have significant spillover effects into providing DH systems with low-cost, clean and renewable energy. The measures can still be funded in the next programming cycle based on lessons learned in the current 2014-2020 OP (mainly the state aid scheme).
- Some investments cannot be conceived if there is no vision and strategy at national level. So far Romania was lacking a coherent strategy on energy in general, and even less so in geothermal, heat energy. If there is no such strategy, beneficiaries will continue to have difficulties to propose good projects, to adapt possible ideas to opportunities and to do projects with robust impact.

SO 6.2. Intelligent energy consumption monitoring system, Antibiotice SA - 109717

1. Brief project description

The general objective was to reduce the specific energy consumption (kgep / 1000 euro) at the level of the company ANTIBIOTICE S.A. on average by 1%, for a period of 5 years after the implementation of the project, as a result of monitoring consumption by implementing an intelligent metering system for energy consumption.

The specific objective of the project was to ensure implementation of a functional intelligent metering system to monitor electricity and gas consumption at the level of ANTIBIOTICE S.A.

Expected results:
1. Project submitted for financing in accordance with the requirements of the Aplicant's Guide
2. An intelligent metering system for energy consumption purchased and implemented
3. A project implemented in accordance with the Financing Agreement
4. An external audit report of the project carried out
5. Information and publicity measures implemented.

Main activities:
- Project kick-off activities
- Implementation activities of the intelligent metering system
- Project management activities
- Project audit activities
- Information and publicity activities of the project.

Project justification

The main problems that justified the implementation of the investment project and the implementation of specific interventions were the followings:

a/ High energy consumption at the level of Antibiotice SA (5,203.17 toe in 2015) - a high level of consumption requires measures to reduce energy consumption on the company's platform with the aim of reducing the impact on the environment. At present within the company the monitoring of electricity consumption is performed by old induction meters with precision class 5, between 20 and 35 years old, with problems in operation (caused by mechanical friction), connected by means of old power transformers (15-35 years), most of them no longer suitable for the energy consumption they measure.

b/ Impossibility of implementing measures to increase energy efficiency - given the lack of effective control of how main equipment, sections and technological processes use resources, the impossibility of identifying energy losses and consumption variations given by the age of the existing energy consumption monitoring equipment. Identifying weaknesses of technological processes or equipment in terms of energy consumption by implementing the system of Smart metering will bring significant energy savings and reduce the impact on the environment associated with high energy consumption energy.

Analyzing the main problems encountered in terms of energy efficiency, there is a need to implement a system of intelligent energy metering and specialized software for obtaining real-time data related to energy consumption and automatic production of reports, analyzes and balance sheets on different consumption contours of the factory.

Thus, following the implementation of the investment project, the network of meters for monitoring the existing energy consumption will be replaced and extended with new ones, with a higher degree of accuracy than the existing ones, which have the capacity to collect and provide accurate data on energy consumption up to the level of cost centers (electric meters) and up to the level of equipment (gas metering natural and electricity for compressed air) and software and hardware components required for collection and processing data in order to provide data for taking optimal energy efficiency measures at the enterprise level.

Progress of project implementation:

The project started on 18 November 2016 and was finalized on 21 December 2018. The investment project did not involve construction works and did not contain elements of infrastructure, involving only procurement activities and installation of equipment that composes an intelligent system for metering energy consumption. The equipment that makes up the intelligent metering system is based on BAT (Best Available Techiques). This technical solution was indicated by a multicriteria analysis. The analysis included in the Feasibility Study envisaged two technical-economic scenarios out of which it was decided on Scenario 2 of implementing an intelligent metering system that includes BAT type equipment with the capacity to monitor energy consumption electricity up to large consumers and natural gas consumption up to consumer level.

2. Reason for selecting the case (criteria, significance of the selected case)

This project was selected among the 14 projects finalized under the Specific Objective 6.2. of the LIOP PA 6. The criteria for selection included the status of the project (longer time from the finalization date) and location (in a less developed region, i.e. North-East Region).

3. Methodology for case study

The case study was drafted based on the desk review of the relevant project documents (e.g. financing contract, initial progress report and project CBA), project details from LIOP databases (SMIS, internal MA LIOP reporting) and on the primary data collected from the individual interview with project manager, as well as from the interviews with the MA LIOP staff.

4. Budget

Total project budget: 1,286,158.30 lei
Total eligible budget: 1,080,805.28 lei
Total contribution of the beneficiary: 173,305.28 lei
Total non-eligible costs: 205,353.02 lei

5. Effectiveness of the intervention

Internal and external factors which are contributing to achieving the desired results

Although the project only covered a certain category of electricity, gas and compressed air meters, the results are very good. Besides monitoring consumption, due to the project investment it is possible to monitor several parameters such as the specific consumption of certain pieces of equipment, which one can compare to other types of equipment and see whether it is necessary to invest in new equipment and do all the maths for cost-effectiveness. On the other hand, the monitoring system includes several alarms that warn the beneficiary's personnel about various events that could be harmful for the operation of the equipment. This is considered very valuable by the beneficiary.

This type of smart metering project is addressed to large companies that are permanently adapting to the market requirements; hence they make constant changes to the plant and consumption, and this should be taken into consideration in other projects. That means that future projects should have as much flexibility as possible built-in from the very beginning in terms of relocating meters from one installation to another. That means flexibility of the monitoring system. It is important that all the meters provided in the project be in operation. The beneficiary relocates certain meters from one supply line to another because on a supply line consumers change. Monitoring consumption allows for taking efficiency improvement actions. Thus, knowing and analysing the consumption the beneficiary can identify efficiency improvement measures and decide what investments are needed, whilst also catching up on other economic aspects. The software is the heart of the monitoring system. Thus, it depends on how the decision makers desires the result, the consumption to be shown and more so to whom. In the beneficiary's case, the system allows the heads of departments and heads of cost centres to automatically receive Excel reports with the hourly consumption on the previous day in figures and graphs. Also, the consumption can be monitored from the start of the month to date, and values of consumption can be compared. It is necessary to involve as many persons as possible in analysing the data recorded by the monitoring system and the beneficiary is fully aware of that and applies it in practice.

Difficulties faced in implementation

In the case of this type of projects, according to the beneficiary it is difficult to invest in a consumption monitoring system and determine all the economic indicators such as capital depreciation rate because it is difficult to determine the consumption savings in percentages. So, for this reason it is difficult to convince the management to invest in a monitoring system (e.g. it costs 100,000 Euros and this investment will be recovered in three years).

The beneficiary appeared to be concerned about not having the possibility to have other projects funded from Structural Instruments in the same domain, especially from the perspective of making better use to the staff who is getting specialised in designing and managing such projects and not being used in an economic manner (not enough workload in this domain for a longer period).

6. Efficiency

The signing of the financing contract is subject to certain laws, there are certain annexes that must be observed in the relation with the MIEP. The beneficiary encountered certain bottlenecks which caused a decrease in the efficiency of project implementation because of the changes in the reporting requirements. Also, the Ministry's staff turnover some had a negative effect on the project's

administration efficiency at the beneficiary's level because quite often the new staff was asking again for documents that were already submitted.

However, the beneficiary appreciated that once the payment request was approved, the payment was processed in a few days, despite that the Applicant Guide indicates that the payment request is first approved and then the money will be disbursed when available. This efficient practice of processing payments contributed to a good cash flow of the project.

7. Sustainability

The financial self-support of the project during the sustainability period is ensured by the company's positive cash flow, the project being financially viable taking into account the investment costs and all the financial resources of the company.

The results of the project are exploited by the company Antibiotice S.A. Intelligent metering system is used to increase energy efficiency at the enterprise level through consumption reduction measures taken based of analysis of the data provided by this system.

Antibiotice SA took all feasible measures to reduce consumption, based on the data provided by the monitoring system, whether it refers to staff awareness measures energy efficiency (non-cost measures), either for measures to make investments in new equipment / machinery, more energy efficient, or improving / bringing to an improved technical condition the existing ones in order to obtain a superior energy performance (investment measures) and an energy-optimized production facility using the investment as efficiently as possible.

To ensure the sustainability of the investment project, the company Antibiotice S.A. established the following maintenance to ensure the operation of the investment on the entire duration of the project (five years from the completion of the project), in accordance with the maintenance plan established in the Feasibility Study. These measures include:

a/ Maintenance of meters for electricity, natural gas and compressed air are ensured annually and include the following minimum operations, according to maintenance manuals and manufacturer specifications:

- annual inspection of the condition of the appliances;

- analysis of indications;

- local interventions (for example: replacement of power batteries, checking the oil level and operating the lubrication of the gas meter mechanism, unlocking meter, purge pressure transducers, etc.);

- cleaning of internal meters and checking mechanisms.

b/ For maintenance of communication systems and computers the following operations are provided annually, in compliance with the manufacturer's recommendations:

- annual inspection of the condition of the appliances;

- local interventions (eg: replacement of UPS batteries, checking moving parts: fans, HDD, etc.);

- dust cleaning.

c/ Software maintenance is ensured through the following annual operations:

- application of patches;

- application of upgrades to later versions.

The average annual maintenance costs are: 39,300 lei with VAT.

The data collected from the monitoring system is used to capitalize on the results of the project and based on the analysis of such data possible improvements are identified that lead to a reduction in the company's specific energy consumption. This action is performed by accessing data on the system server by any staff through a web browser which generates the necessary information through an easily accessible interface, the data being stored for a period of at least two years, for the measurement points. Thus, decision makers have the opportunity to take optimal measures to increase energy efficiency at the enterprise level.

When identifying the possibilities for energy efficiency, two categories of measures were defined:

a/ Measures that do not involve financial resources - these measures are characterized by raising staff awareness of energy savings through online consumption monitoring and taking immediate prevention and correction measures (efficient use of energy throughout the technological process cycle, bringing in parameters of inefficient equipment, optimal loading to obtain a maximum efficiency in specific working conditions); analyze monitored consumption and decision-making to reduce consumption (comparison of operating parameters for the same type and comparison of consumptions at different stages of technological processes); calculation of specific consumptions used as support and consulting in establishing modernization strategies/projects, with better energy efficiency, acquisition of equipment with lower specific consumption.

b/ Measures involving financial resources (investment measures):

- bringing in parameters of superior energy efficiency the existing equipment, inefficient in terms of energy consumption energy, as a result of the analysis of consumption and the comparison of the operating parameters of consumers of the same type and the comparison consumption at different stages of technological processes;

- replacement of existing machinery or equipment with new generation ones, with high energy efficiency, as a result of the analysis specific consumption and taking measures to increase energy savings.

The measures involving financial resources were established through an Investment Plan which includes all the measures to streamline the consumption of electricity and natural gas at the enterprise level, with the related resources allocated. The Investment Plan for the increase of energy efficiency was established following the implementation of the intelligent metering system and the obtaining of consumption data to establish the most efficient measures, as the data is processed, to increase the energy efficiency. The measures are provided from beneficiary’s own sources.

8. Conclusions

- It appears that the beneficiary of project is confident that the installed smart metering systems will contribute to process optimization and inform future purchases of energy-efficient supplies.
- For industrial beneficiaries, a different approach concerning state aid may be needed, to provide large companies with the opportunity to apply, in particular because the cap of the de minimis scheme and hence of the support is just 200,000 EUR, well below the costs of highly sophisticated smart metering systems for industry.
- The introduction of smart metering does not lead to reduced energy consumption as such, but provides adequate and detailed information on consumption, allowing the company to optimize production processes and invest in energy-efficient equipment in priority areas. The follow-up measures to reduce energy consumption are still to be implemented and the beneficiary considers that the smart metering investments have indeed produced valuable information for the optimization of the industrial processes that would be forthcoming.
- For the large companies which are not newly established, it would be good to have access to funds for projects aimed at the digitalisation of power plants. More specifically, these companies have low, medium and high voltage distribution systems with older components that could be replaced with new ones, including a computer-based control system wherefrom one can see all the commuting, make all the switching from the computer, without needing personnel in the stations. However, such projects are expensive, at least 1 million Euros.

SO 6.3. Implementation of intelligent measurement system in Craiova, central area - partially and Sărari - approx. 10,000 consumers from Craiova - 114790

1. Brief project description

The general objective is to ensure implementation of an intelligent electricity metering system for approximately 10,000 domestic and non-domestic consumers small in a homogeneous area of Craiova, to reduce the average energy consumption at the households' level.

The specific objectives of the project are the followings:

1/ To increase by 10,000 the number of users connected to smart power grids by mounting and connecting to the grid of approx. 10,000 smart meters.

2/ To increase the quality of electricity distribution services of Distributie Energie Oltenia S.A. as a result of implementation of MDM (metering data management) system by generating predefined reports.

3/ To modernize/refurbish 7.54 km of low/medium voltage distribution network related to the homogeneous area of the project proposed (including 985 connections adapted to the modernized network), in order to ensure the optimal operating conditions of the intelligent measurement systems.

4/ To reduce the average annual electricity consumption per household from 1.42 Mwh in 2018 to 1.35 Mwh in 2023 in the sustainability period of the project.

5/ The contribution calculated at the level of the homogeneous area of 0.05% to the LIOP indicator, to reduce the average consumption per household from 1.35Mwh / year in 2013 to 1.2Mwh / year in 2023.

Expected results:
1/ 1 subsystem for measuring and transmitting information (including 10,000 smart meters) implemented in the homogeneous area
2/ 1 hardware infrastructure required for the operation of the purchased MDC Application
3/ 1 hardware infrastructure required for the operation of the purchased MDM Application
4/ 1 metered data management subsystem implemented
5/ 1 Data acquisition subsystem from implemented meters
6/ 7.54 km modernized low/medium voltage network, including 985 connections adapted to the modernized infrastructure
7/ 1 project implemented according to the conditions of the financing contract.

Main activities:
The project has the following two activitiy components:
C1- The intelligent measurement system, which includes the following three subcomponents:
C11: Subsystem for measuring and transmitting information / data from meters (includes measuring group, filters, repeaters, data concentrators, data acquisition system from meters)

C12: Counter Data Acquisition / Collection (HES) subsystem, which includes a Software and Services Application also called the HES application, as well as the hardware infrastructure required to operate the HES application
C13: Counter information / data management subsystem, which includes a software and services application, also called a Metering Data Management (MDM Application) and the Hardware Infrastructure required to operate the MDM Application.
C2 - Modernization / refurbishment of the JT / MT network, which includes the following three subcomponents:
C21: Modernization of Transformation Points (PT) - construction part-21 pieces and electrical part 12
C22: Modernization of JT networks (overhead, underground) - 7.4 km of low voltage network will be upgraded (6.86 km overhead network and 0.68 km underground network);
C23: Adaptation of existing connections to the modernized network - 985 connections will be adapted, by executing the following operations: disconnecting connections from the existing network, disassembling the connection, installing the connection, connecting to the modernized network.

Project justification

Justification of the project at national level

European energy policy has at its center a set of various measures, which are intended to achieve an integrated energy market and to ensure security of energy supply and sustainability of the energy sector. Improving energy efficiency is one from the priority elements of Romania's energy strategy for ensuring the energy supply of consumers, development sustainability and competitiveness, saving energy resources and reducing greenhouse gas emissions.

This project is coherent with the following plans and strategies in the field of energy, energy efficiency and sustainable development:

a/ Romania's Energy Strategy for the period 2007-2020 updated for the period 2011 - 2020

The project contributes to achievement of the national strategic objective regarding sustainable development and increasing energy efficiency by improving energy efficiency throughout the chain: sources - production - transport – distribution - consumption. The project is in line with one of the main directions of action of Romania's energy strategy, converging with those of the European Union's energy policy, namely "the transformation of electricity transmission and distribution networks and large-scale implementation of smart metering systems ".

b/ The National Action Plan for Energy Efficiency

European regulations on increasing energy efficiency as a result of the implementation of energy efficiency smart metering systems (Directive 2009/72 / EC) have been transposed into national legislation on energy. The project contributes to the fulfillment of national objective in energy efficiency to reduce primary energy consumption and to ensure alignment with national legislation on energy, by increasing the number of consumers who have smart metering.

Initially, by 2020, 80% of consumers were supposed to have smart metering systems. According to a draft order of ANRE regarding the implementation at national level of intelligent electricity measurement systems and its implementation schedule all consumers will have to be integrated in IMS

(Intelligent Measurement System) by 2026 and by 2020 in each concession area of the distribution service IMS was planned to be installed for at least 30% of the total number of consumers.

The project contributes to the achievement of this national objective, its implementation leading to an increase of approximately 10,000 in number of smart meters installed.

Justification of the project at the level of the beneficiary's level

The beneficiary (Energy Distribution Oltenia - EDO) provides electricity to 1,421,297 customers from 7 counties in the Oltenia region, with a coverage area of approximately 42,134 sq km. The main mission of the company is to provide electricity distribution service to all customers, at the quality parameters established by ANRE and in accordance with the international standards operating on the electricity energy market. The activities of the distribution service include operation, maintenance and development of electrical equipment, in order to distribute electricity from producers to consumers, in safe operating conditions of electrical installations, ensuring quality parameters and reducing maintenance and repair costs.

The proposed investment (i.e IMS) is part of a complex program of EDO called Smart Transformation which aims to implement a medium-term development strategy (5 years) including implementation of intelligent distribution networks, to increase efficiency of resources' management, as well as a better adjustment to possible changes of the internal regulations, including market liberalization.

In the context of the investment strategy described above, developed in accordance with the development objectives of the company, the following needs specific to the homogeneous area were identified:

1/ To align with national regulations on the implementation of intelligent measurement systems

2/ To increase data processing capacity

3/ To ensure the optimal operating conditions of intelligent measurement systems

4/ To ensure operating conditions with minimal impact on the environment, in accordance with the principles of development sustainable

5/ To ensure a safe working environment for the company's employees.

The project addressed these needs by proposing an investment which aimed to implement a system of intelligent measurement and modernization/refurbishment of the energy infrastructure in the homogeneous area, to ensure the optimal functioning of measuring system.

Progress of project implementation:

The project started on 01.01.2018 and was extended until 30.04.2021, due to the restrictions imposed during the COVID-19 alert state that generated difficulties in carrying out the commercial contracts.

2. Reason for selecting the case (criteria, significance of the selected case)

Considering that the overall criteria for the selection of case studies was to cover all energy-related specific objectives of the LIOP and this is the only project contracted under the Specific Objective 6.2., no further criteria for selection were applied.

3. Methodology for case study

- The case study was drafted based on the desk review of the relevant project documents (e.g. financing contract, initial progress report and project CBA), project details from LIOP databases (SMIS, internal MA LIOP reporting) and on the primary data collected from the individual interview with project manager, as well as from the interviews with the MA LIOP staff.

4. Budget

Total project budget: 37,725,264.21 lei
Total eligible costs: 28,190,632.41 lei
Total contribution of the beneficiary: 5,400,632.41 lei
Total non-eligible costs: 9,534,631.80 lei

5. Effectiveness of the intervention

The project is complex, besides smart metering the beneficiary is upgrading the electricity distribution network to receive the signals from the meters which communicate only via the distribution network. In addition to the 10,000 meters installed, a software is also being implemented for the data supplied by the 10,000 meters. The target area is relatively homogenous: the city of Craiova and some smaller adjacent areas. There are over 10,000 smart meters that are currently being installed, there are no implementation problems. There are only two eligible contracts still ongoing the MDM (Metering Data Management) and the MDC (Metering Data Collection) applications having the highest value in the project.

The 10,000 smart meters already installed and sending data and the whole data processing system purchased and scalable can be used in the roll-out. The functionality is the one that matters: to collect, to process and to validate data. So, we purchased the system that manages all data, including the equipment. This initiative relates to others beneficiary has; all the programs are interconnected. The beneficiary also implemented the GIS system, a system of smart measures that collects certain data and processes including among others the workforce management systems (i.e. for the automation of electricians' workflows). The project is integrated in a System Oriented Architecture, in which things run in parallel and the communication of all systems is made more effective and efficient.

Difficulties faced in implementation

There was a particularly important time gap between the moment when the call was launched by the MA and the moment when they get the technical assistance necessary for the evaluation of the projects. This generated most of the delays. The beneficiary submitted the projects, and then waited for the MA to award the technical assistance contract for the consultants required to assess the projects. Nevertheless, ssubmitting an application requires to conduct a feasibility study, to consider market shares, what functionalities are available, to plan additional noneligible expenses that are supposed to be covered by the beneficiary. If it takes more than a year until the contract is signed and starts, everything that was planned gets outdated and basically the whole planning and preparation process must be started all over again.

Concerning the reimbursement, the beneficiary submitted six requests for reimbursement. Each application was followed by a random check of equipment, electric networks and meters that had been installed. The biggest problem during the pandemic was the access to households for the installation of meters. In March-April 2020 the beneficiary access was not granted access. Later, the people understood that if the everybody wears protective equipment and things can go on.

6. Efficiency

This is a long-term investment project for which roll-out is planned until 2028 with approximately half of the clients in the system. The beneficiary expects the implemented system to last for some five more years without problems because the system constantly upgraded to the latest version, as for Windows. There are some concerns for the ground technology of smart meters because communication technology follows certain tendencies, and it takes account of market indicators. For instance, cellular communication is the best, but also the most expensive presently. If the price drops, the respective technology will be preferable in the future. Currently, another technology is being used, the one using electric cables, which is financially accessible. However, the other systems purchased through this project are more advanced and of the future.

Concerning the suppliers, in the tenders launched by the beneficiary with the budgets available in the project, there were no problems. According to the beneficiary, there was a tough competition, for all tenders there were enough competitors, and even if they were few, they were serious and strong.

7. Sustainability

The sustainability of the project and of the results obtained following the implementation of the intelligent measurement system will be ensured from several perspectives:

• Financial sustainability

During the investment period, the financial sustainability of the project will be ensured, according to the project budget, from the following sources: non-reimbursable financial assistance in the amount of 22,830,000.00 lei and own contribution (contribution to eligible expenses + contribution to ineligible expenses) of Oltenia Energy Distribution in the amount of 14,942,691.68 lei.

As it results from the financial analysis of the project, the project is financially sustainable, the cumulative net cash flow (not updated) being positive for each year of the entire reference period considered, which demonstrates the Applicant’s ability to ensure the necessary liquidity for an adequate financing of the project.

• Necessary actions to ensure the continuity of the project - the sustainability of the project will be ensured through the PIU which will follow, for 5 years from the completion of the project implementation, the achievement of the indicators proposed by the Funding Application and by the personnel structure of the Applicant which is characterized by professionalism and experience in this sector. Through the project it is provided the necessary infrastructure for the development of the services offered by the Applicant to its clients; the system implemented by the project must be developed by subsequent investments of the Applicant by adding an Analytics application, which will

allow him to develop a coherent strategy that it can determine the change of the customers' consumption behavior, at the level of individual dwellings.

Technical sustainability

The technical sustainability of the investment is guaranteed by the purchase of modern equipment, with a high level of reliability that does not requires maintenance costs. These elements create the premises for the efficiency of the company's operational costs and create the necessary premises in order to align the company's activity with the national and international requirements.

The proposed project produces effects after its implementation by increasing the number of users connected to smart energy networks.

8. Conclusions

- While the results indicators selected might be suboptimal to capture the energy efficiency gains from smart metering in electricity distribution, the expected increase in electricity consumption in fact renders more urgent the modernization of electricity distribution and the roll-out of smart metering, which supports optimization of grid operations and granular data (real time) on consumption and production by prosumers.
- The Energy Law 123 has been amended and the roll-out deadline was postponed, now extended by 2028 (though it is expected that even by 2028 the roll-out could be as low as 50%, since the law allows significant room for ANRE to decide even beyond that date). Consequently, there is a risk that all smart metering projects such this one implemented in recent years (from LIOP and several pilot projects promoted by ANRE) might not be compatible with the equipment that would be installed by the time of the full roll-out in 2028 or well beyond, as technology changes.
- The outcome indicator (showing electricity consumption per household, with the baseline 2014 and target for 2023) is unlikely to be achieved, mostly because there are other factors apart from energy efficiency which influence the consumption. These include the substitution of electricity for other energy sources (e.g. change of heating source, electromobility) and increased usage of household appliances.
- This is a demonstrative project supporting distribution company to gain experience in the installation and operation of smart metering, which can be further scaled up.
- The beneficiary plans to ensure the smooth integration of this demonstrative project under the full roll-out, which requires compatibility of the equipment installed now (with LIOP funding) with the equipment used for the whole system. The sustainability will decrease if the full roll-out of smart metering is further delayed, because the technological changes could limit the compatibility with technical solutions that would become mainstream by the full roll-out by 2028.

SO 6.4. Increasing the operational energy efficiency at S.C. AMBRO S.A. Suceava by implementing a high efficiency cogeneration installation - 115900

1. Brief project description

The general objective is to increase energy efficiency at the level of AMBRO SA by reducing consumption energy (implicitly reducing the consumption of primary energy resources) and reducing carbon emissions by purchasing, installing and the use of a high efficiency cogeneration plant.

The specific objectives of the project are the followings:

1. To purchase a high efficiency cogeneration unit with gas turbine and recovery boiler steam without additional combustion, within the limit of 19.99 MWt fuel input and in compliance with the restrictions imposed by the applicant's guide. The realization of this indicator, ie the support of a company for a productive investment, contributes to the CO01 indicator (program level indicator).
2. Installation and commissioning of a high efficiency cogeneration capacity of 17,139 MW of which 6,407 MW for electricity production and 10,732 MW for thermal energy production. This specific goal contributes to indicator 2S58 (program level indicator).
3. To improve the global energy efficiency of AMBRO SA by obtaining an annual savings of primary energy of 30,765 MWh (ie a saving of 2,645 thousand toe), a specific objective that contributes to the 2S57 (program level indicator).
4. To reduce the negative impact on the environment (as an effect of energy production in cogeneration) by reduction of CO2 emissions by 6,305,303 tons / year as an effect of cogeneration energy production taking into account the primary energy. This specific objective contributes to indicator 2S118 (program level indicator).
5. To reduce the negative impact on the environment by reducing greenhouse gases, i.e. the estimated annual decrease of greenhouse gases by 12,683 tons of CO2. This specific objective contributes to the CO34 indicator (program level indicator).

Expected results:

1. Purchase of a high cogeneration unit efficiency with gas turbine and steam recovery boiler without additional combustion, within the limit of 19.99 MWt fuel input and with compliance with the restrictions imposed by the applicant's guide. Another result obtained as a result of the realization of OS 1 consists in the construction of the 2 buildings (according to those presented in the feasibility study) that would not have been made without reaching OS 1.

2. Increasing the power installed within AMBRO SA by installing and putting in function of a high-efficiency cogeneration capacity of 17,139 MW of which 6,407 MW for electricity production and 10,732 MW for thermal energy production.

3. Achieving an improvement in the overall energy efficiency of AMBRO SA by obtaining an annual primary energy saving of 30,765 MWh.

4. Reduction of the amount of CO2 emissions by 6,305.303 tons / year as an effect of cogeneration energy production taking into account the primary energy saving.
5. Reduce the negative impact on the environment by reducing the gases with greenhouse gas, ie the estimated annual decrease of greenhouse gases by 12,683 tons of CO2.

Activities:
- Acquisition of the cogeneration unit (gas turbine plus related machinery and equipment)
- Realization of constructions and installations (the 2 buildings in which the gas turbine and the related equipment will be mounted)
- Installation of technological equipment.
- Arrangements for environmental protection and restoration to the initial state
- Realization of the technical project and of the execution details
- Technical assistance from the designer
- Site management
- Construction works and installations related to the site organization
- Training of operating personnel
- Technological tests and trials.

Project justification

In accordance with the “National Action Plan 2016-2020 on climate change”, Romania aims to reduce the amount of CO2 emissions by 20% and support investments aimed at installing new high cogeneration capacities efficiency for industrial consumers. The implementation of this project, it contributes to the achievement of this objective by reducing the amount of CO2 emissions by 6,305,303 tons / year as an effect of cogeneration energy production considering the primary energy saving.

According to the “Energy Strategy of Romania 2016-2030, with the perspective of 2050”, “energy efficiency is one of the least costly reduction of greenhouse gas emissions, reduction of energy poverty and increase of energy security. The EU's energy efficiency target for 2020 is to reduce primary energy consumption by 20% compared to the reference level established in 2007 (MRDPA 2015). For Romania, the target is 19%, corresponding to a primary energy demand of 500 TWh in 2020. By 2030, the EU is aiming for a cumulative reduction of at least 27% in energy consumption. "

The implementation of this project contributes to the achievement of this objective established within the national energy strategy mentioned both by obtaining an annual primary energy saving of 30,765 MWh and by reducing the negative impact on as a result of the reduction of greenhouse gas emissions, ie by the estimated annual decrease of greenhouse gases 12,683 tons of CO2 / year.

The implementation of this project is also part of the "National Action Plan in the field of energy efficiency" which stipulates that "The industrial sector is complex, comprising large energy consuming industries with high energy intensity (steel industry, building materials, chemistry), small energy consuming industries, but with high energy intensities (food and beverages industry, tobacco industry, the wood processing industry, the manufacture of paper and paper products etc.). "

Regarding Romania's energy governance, according to the "Romania's Energy Strategy 2016-2030, with a view to 2050" there is a need to modernize the energy governance system. Increasing the quality of the energy governance system in Romania constitutes the basis for the achievement of all the other strategic objectives ". This goal can be achieved by improving governance corporate efficiency of companies by streamlining, professionalizing and technologically modernizing these companies to be competitive at regional and European level.

Implementation of this project aimed at increasing operational energy efficiency at AMBRO SA by implementing an installation of high efficiency cogeneration contributes to the efficiency, professionalization and technological modernization of AMBRO SA, contributing in this way to increase the quality of the energy governance system in Romania.

As a result of the analysis of the existing situation and the identification of the deficiencies (chapter 2.3 of the Feasibility Study) it appears that AMBRO SA is currently facing deficiencies of energetic nature (respectively the way of supplying electricity and heat) and of economic nature (respectively the cost of energy in the final product). These deficiencies have been identified in the context of the increase in paper production, an increase that implies the need for energy supply efficiently from an energy point of view, optimal from the point of view of economically and safely and continuously.

By implementing this project aimed at installing a newly installed high-efficiency cogeneration plant (cogeneration with gas turbine and steam recovery boiler without additional combustion within the limit of 19.99 MWt fuel input and less of 8MWe output), AMBRO SA intended to produce in the cogeneration system both the technological steam necessary to carry out the activities of production as well as a part of the electricity, the rest of the necessary electricity will be provided from SEN.

The sizing of the cogeneration plant considers on the one hand the requirements that will be stipulated in the specifications according to the requirements the applicant's guide (for priority axis 6, specific objective 6.4) and on the other hand by the forecasted evolution of the application presented in feasibility study.

By making this investment, the aim is to ensure the continuity and safety of the energy supply (electrical and thermal) of AMBRO SA in terms of technical and economic efficiency. As a result of the implementation of the project, the reduction of energy consumption from the National Energy System (SEN) by using electricity and heat in 100% production processes obtained by high efficiency cogeneration.

Basically, the implementation of this investment project will lead to an increase in the efficiency of electricity and heat production required, will improve technological production processes within AMBRO SA and will contribute to the reduction of pollutant emissions for the environment.

Progress of project implementation:

The project is in an advance stage of in implementation (80% pay rate at the end of January 2021) and is planned to be finalized (based on the project extension approved by MA LIOP) on 30 June 2021. Because of the conditions created by the pandemic, the beneficiary had difficulties to bring in foreign experts for decommissioning and commissioning. For this reason, the beneficiary requested an extension of the completion deadline, which was approved for 30 June 2021. Currently, the work is

completed, and decommissioning carried out; after 15 March the beneficiary planned to start the commissioning tests and estimates to finish the project implementation at the end of May.

2. Reason for selecting the case (criteria, significance of the selected case)

Under the Specific Objective 6.4. of the LIOP PA 6 there are two projects contracted. It was selected the larger project, in a more advanced stage of implementation.

3. Methodology for case study

The case study was drafted based on the desk review of the relevant project documents (e.g. financing contract, initial progress report and project CBA), project details from LIOP databases (SMIS, internal MA LIOP reporting) and on the primary data collected from the individual interview with project manager, as well as from the interviews with the MA LIOP staff.

4. Budget

Total project budget: 51,496,635.72 lei
Total eligible budget: 37,416,177.85 lei
Total contribution of the beneficiary: 14,966,471.14 lei
Total non-eligible costs: 14,080,457.87 lei

5. Effectiveness of the intervention

The beneficiary found challenging to find a good supplier. The project was not turnkey in the sense that the same supplier, the same builder, fitter was supposed to do all the work. The potential suppliers from whom the beneficiary had quotations when they carried out the Feasibility Study did not undertake to do building works too. Therefore, the project was developed with separate supply of equipment, installation work, building work and fitting of the external connection. In the end, the awarded equipment supplier was awarded the contract for the building component in partnership with other companies, plus the installation component too. So, the supplier tendered other components in partnership with other companies.

Concerning the process of preparation of the project proposal, this was found a cumbersome process by the beneficiary. For the initial part – the financing application and Feasibility Study – the beneficiary worked with consultants. The feasibility study, with a technical company, and the financing application and the study were submitted with a consultancy specialised in European Funds. The beneficiary carried out the implementation part, including the project management and preparing terms of reference for the bidding. This has been challenging for the beneficiary because of the overload with bureaucratic requirements, even though Order 1594 simplifies and allows more leeway to private companies/private beneficiaries. It also comes with certain restrictions, and the beneficiary must pay great attention to details to avoid penalties. DRI Bacău carried out periodic site visits. The beneficiary also had visits from the Court of Auditors, on financial issues, and from DRI on technical issues. In general, there were no observations, the payments were disbursed very quickly compared to other

experiences beneficiary had with the implementation of EU funded projects (SOPIEC[15]) which were much more difficult.

Difficulties faced in implementation

There was a limitation to 20 megawatts in the thermal chamber which means that the beneficiary was limited to 6.5 kW on the electricity part, according to the Applicant's Guide. It is the same limit applicable to CO2 emissions. For the beneficiary it would have been more relevant and useful if they could generate more. For many years the beneficiary had been contemplating to build a co-generation plant – that was when they managed to get funding.

Another difficulty was that they planned three years for the implementation of the project, but time was lost because of the pandemic. With the addendum to the contract the project timeframe came up to three years, what was initially envisaged, which allowed for the optimum implementation of most activities. The most difficult was to carry out the tests and commission the plant. There were restrictions at the time; experts from Switzerland, Turkey and Italy were supposed to come – it was difficult to bring them all over. Finally, at the beginning of the year the beneficiary managed to overcome this problem and carry out the verifications before commissioning was carried out.

6. Efficiency

The beneficiary managed to implement the project within the budgeted amount. However, the ratio of eligible and non-eligible expenditure has slightly changed. In the award procedure, the beneficiary managed to get a lower price than it was stated in the Feasibility Study, re-allocated some amount of funds from installation to constructions based on notifications, but overall, there are savings for the two components. There may be small differences on constructions between the FS estimates and the final blueprint, they exceeded the budget on one side, and on the other they had even larger savings. The beneficiary exceeded the non-eligible expenditure – overall they planned in this project to replace the connection substation, the supply substation wherefrom the company is supplied by the zonal distributor – EOn and respectively DelGaz – and from there they have all the 6kW branches in the factory and the generator is also connected there. The estimate was below the final cost, but some extras were necessary on top of what was initially planned. The taxes were something extra – they were not envisaged in the initial stage: the ANRE approvals, a new agreement to connect to the gas distributor, and all these took time and came with extra costs. But all these were non-eligible expenses from the start. Overall, considering these rather high non-eligible expenses the beneficiary estimates they will exceed the total budget by 2-3%, but will remain below the budget of eligible expenditure.

7. Sustainability

According to the financial analysis (presented in the Feasibility Study) it appears that both during the project implementation (36 months) as well as in the post-implementation period corresponding to the reference period (17 years) the cumulated net cash flow is positive for each year of analysis. This demonstrates the sustainability of the project both in the implementation period and in the post-

[15] Sectoral Operational Programme "Increasing Economic Competitiveness"

implementation. Therefore, after the financial support will end, the project will be financially self-sustaining without any gaps or bottlenecks.

The ability to operate and maintain this investment after its implementation will be ensured both with the help of net cash flows, positive cash flows generated by the company's production activities (cash flows that will help cover all costs involved in the operation and maintenance of this investment) as well as with the help of AMBRO SA employees who will serve their investment after completion of its implementation.

The activities that will be carried out / continued after the completion of the project consist in ensuring the proper functioning of the entire equipment of high efficiency cogeneration that is the subject of this project, in the maintenance and periodic overhaul of all machinery and equipment which will be purchased through the project. These activities will be performed by AMBRO SA specialists who will operate the investment.

Regarding the possibility to obtain additional funds after the completion of the project, the beneficiary is undertaking efforts to access such funds (if opportunities will occur) but for other investments / types of investments that are not related to the investment that is the subject of this project (respecting the principle that states that double financing cannot be obtained for the same project).

After the completion of the implementation of the project, the machinery and equipment which determine the high cogeneration plant efficiency will be used by AMBRO SA specialists in the location where this project will be effectively implemented.

8. Conclusions

- While the beneficiary is optimistic about the efficiency of the investment, the cogeneration unit is not yet under operation to measure the actual savings. The intervention might be sub-optimal: given the restrictions for eligibility of the project (maximum capacity – 20 MWt, 6.5 MWe), the beneficiary installed a smaller capacity than would have been optimal for its industrial process.
- Industrial cogeneration supported from SO 6.4 could probably have been implemented without the support from ESCO, own resources, commercial loans, but the investment recovery would have been much longer.
- Romania’s policy has been to support high efficiency cogeneration, but current support covers only cogeneration for DH; a new scheme may be introduced to support industrial cogeneration with the condition to deliver a certain share of the electricity to the market (not only for self-consumption). Since the benefit of energy savings is achieved in any cogeneration process, regardless of whether the energy is consumed “in house” or sold to the market, EU financing could continue to support high efficiency cogeneration not covered by other schemes, to avoid as much as possible market distortions.

It should be noted that CO2 emission reduction is estimated based on the characteristics of the equipment, not actually measured, which means the indicator would be automatically reported as achieved once the capacity is installed.

SO 7.1. – Rehabilitation of the district heating in the municipality of Oradea for 2009-2028, phase II - 108460

I. Brief project description

The general objective of the project is to increase energy efficiency increase energy by the development of the centralized DH system (transmission and distribution networks) in Oradea, including the reduction of network losses. The goal is to contribute to increasing the competitiveness and efficiency of the entire centralized DH system. The project is part of a consistent strategy to modernize the DH system and which Oradea has been implementing consistently in recent years. Under the project, investments will be made to rehabilitate 20 km of primary transport networks (40 km of pipeline), which represents roughly a third of the total transport network. The interventions will enhance the energy efficiency of the system and the quality of the public service by reducing heat transport losses, CO2 emissions and rapid detection of leaks for speedy interventions. Losses would be reduced by 370 TJ (26.7% reduction compared to 2015, from 1387 TJ in 2015 to 1017 TJ by the end of the project); the contribution to national heat loss reduction in DH networks is 2.42%. Additional benefits include the reduction of CO2 emissions (by 22,558 t/year); NOx (by 17.09 t/year); SO2 (by 3.98 t/year) and dust (0.56 t/year); the reduction of primary energy (gas) would be 12,766,000 m3 (or 10,277 toe).

Oradea is a medium-sized DH system with about 67,000 connected end-users (households and public buildings; about 70% of the heating in the city is provided by the DH). The municipality had benefitted EU funds in the previous cycle 2007-2013, which focused on the environmental compliance of the heat generation (new gas turbine and heat recovery boiler) and about 17.5 km of priority transport grid. The city has a strong capacity for strategic planning and a consistent road map for improvements in the DH system and energy efficiency. It must be noted that Oradea is considered a success story in the DH sector in Romania: since 2013, the municipality turned around from bankruptcy; modernized the gas- and coal-fired CHP; introduced geothermal energy in the DH network (supplied by a private company, Transgex, while the municipality is currently implementing another geothermal project under LIOP); eliminated tariff subsidies over 2015-2020 by gradual improvements of the service quality without increasing end-user tariffs; and is the only DH system which manages to attract new consumers (including by local regulation, but also consumers are content with the quality of the service). The consistent, long-term strategic approach is also visible in the municipal capacity to attract all financing sources available for its projects (EU, Swiss, Norwegian, but also national budget). The municipality had approved a strategy for 2009-2028, prepared in the SOP Environment 2007-2013, which is still followed through and consists of 3 stages – the first was financed under SOP Environment, the second from LIOP and the third consists of 20 km of network and 43 substations for which a new contract has been signed on LIOP. The overall strategy includes investments estimated at 192 mn EUR includes a new gas turbine, two new hot water boilers, rehabilitation of the T&D network and exploring the new geothermal resources. One third of the money should be directed to the generation facility and two-third to the modernization of the T&D pipes. In 2013-2018, Oradea had invested 104 mn EUR in the DH system (88 mn in EU funds, 6 mn national budget, 6 mn local budget and 4 mn other international grants).

Source: Oradea city hall. LIOP supported interventions in red.

II. Reason for selecting the case

The project is the only finalized intervention under SO 7.1. The city of Oradea recently signed another financing contract for the modernization of the DH system and also has a project on SO 6.1 on geothermal energy as renewable heat source for the DH.

III. Methodology for case study

The data and information collected for this case study consist of:

- Project data (Oradea city hall's application for financing, CBA analysis, latest progress report)
- Project details from LIOP databases (SMIS, internal AM reporting)
- Data collected from the city hall on the project - maps of priority network interventions and list of network sections
- Previous internal World Bank research on district heating in Romania

IV. Budget

The total eligible project cost is estimated at 22.2 mn EUR (of which 18.8 mn EUR financed from EU funds; 2.9 mn EUR national contribution and 4.6 mn EUR contribution from the municipality's budget). Under SO 7.1, financing is 85% EU funds, 13% national budget and 2% local budget.

V. Efficacy of the intervention

The project has been finalized and the municipality reports having achieved the target reduction of losses on the DH network. Procurement comprised 3 separate contracts (design-build for the works, supervision and audit). On the municipality's side, the project had been ready by 2015, but delays in the approval of the guidelines for applicants (which was released only in 2017, following discussions on state aid approvals needed for the entire Axis 7) and the restructuring of the DH operator prompted the municipality to start works on own funding and seek reimbursements after the contract was signed in 2018. While the procurement and approvals went relatively smoothly (because of the well-organized administrative units in the city hall and capacity for strategic planning), the company may face constraints related to the availability of materials, most notably pipes, for the contract that has only recently been signed for the third phase of modernization of the network. The DH operator has also made investments simultaneously at consumer level (distribution network and connections at the level of multi-family buildings), which allowed partly for the correct sizing of the network; however, the disconnect between priorities for thermal insulation of buildings (financed from ROP) and supply and network modernization (financed by LIOP) allowed the municipality to only partially coordinate the two measures (by prioritizing for thermal insulation multi-family apartment buildings connected to DH).

VI. Efficiency

The project is not efficient in CBA terms, including with EU financing, given the fact that the municipality still had subsidized tariffs during the implementation of the project (though the municipality intends to gradually increase the end-user price and eliminate completely the subsidy, with tariffs covering the maintenance and operational costs). DH remains the only viable option in terms of climate and energy efficiency for the city, and the system has good prospects to become economically sustainable if the strategic planning capacity is maintained and the priority projects in the strategy continue to be implemented.

VII. Sustainability

The project is sustainable as the DH investment plan is followed consistently in Oradea and the city manages to connect new consumers. The viability of the DH system will be further reinforced by the enhanced use of renewable energy (geothermal), both from private suppliers (Transgex) and the geothermal well under finalization by the municipality on LIOP financing on SO 6.1.

VIII. Conclusions

The project has been the only intervention finalized so far under SO 7.1. and the municipality of Oradea obtained another funding to speed up the modernization of the DH network. This highlights the superior planning and project implementation capacity of the municipality.

The delays incurred between the finalization of project preparation (2015) and the final signing of the financing contract (2018) suggest there is a need to increase capacity for state aid interpretation at the

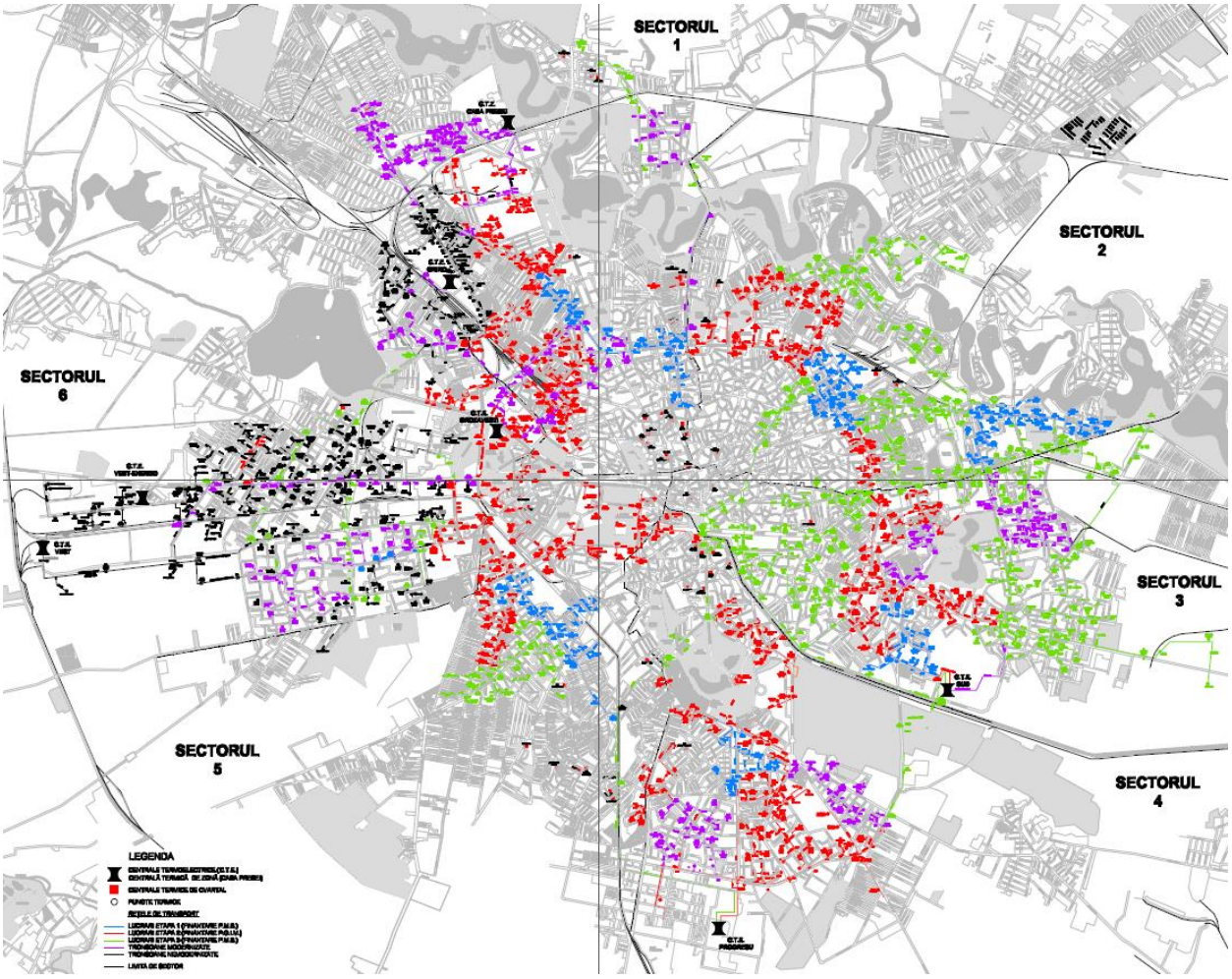
Competition Council to avoid delays in finalizing the guidelines for applicants. As highlighted by the relative success of Oradea's absorption of EU funds, major investments in DH infrastructure need a clear commitment at the municipal level for the continued supply of heat beyond one electoral cycle (an actionable strategy, consistently implemented, and targeted at maintaining the consumers connected to the grid, both by regulation and by improved quality of service).

SO 7.2. – Rehabilitation of the district heating in the municipality of Bucharest - 138142

I. Brief project description

The general objective of the project is to increase energy efficiency by reducing heat losses on transmission networks; to reduce the negative impact of DH pollution to improve the quality of life of the population in Bucharest by 2028 and to comply with environmental commitments in the EU Accession Treaty. The project aims to ensure a sustainable, affordable district heating system by modernizing 212 km of priority transport network (106x2), as illustrated in red in the map below. The network addressed in the project represents sections of pipeline where the modernization is critical, focused on areas around the heat source (large CHPs) and pipelines sections that need to be modernized to ensure the functioning of the DH ring. The ring allows that any part of the city can be supplied from several CHPs.

Bucharest has the largest DH system in the country, which serves about 1.2 million consumers (560,000 apartments); most of the 4000 km of network (1000 km transmission, 3000 km distribution) is obsolete and oversized compared to the residential demand. The heat source is mainly (about 93%) supplied by ELCEN, which has 4 main CHPs and is under the Ministry of Energy; the network (transmission and distribution) belongs to the municipality and is administered by a locally-owned company, Termoenergetica. The LIOP-supported intervention to modernize priority sections of the transmission network would reduce of the heat losses by 7.1%, from 29.8% in 2018 or 1,479,129 Gcal, to 22.7% in 2023 or 1,150,330 Gcal. Since Bucharest has the largest DH system in the country, the project would represent about 58.8% of the total energy efficiency gain if all remaining DH systems were modernized to reach the target of 15% losses. The specific objectives consist of reduction of losses on the network (to 22.7%, 505,086 GCal/year); reduction of CO2 emissions (195,873 t/year); reduction of heat demand from the source (446,015 GCal/year); reduction of NOx (179 t/year); reduction of gas consumption for the heat source (969,670 MWh/year); reduction of water losses (5,876,314 m3/year).



Source: Municipality of Bucharest. LIOP intervention covers transport network sections in red.

The 212 km (106x2) would be split in 25 contracts. The works consist of resizing the grid (replacement of existing pipes with smaller diameter, insulated pipes to reduce losses), including the management of the network. The pipes would be insulated and provided with sensors to detect leaks – this would also ensure faster response in case of damages. The total eligible costs are 278.3 mn EUR without VAT.

II. Reason for selecting the case

The project covers 100% of the SO 7.2.

III. Methodology for case study

The data and information collected for this case study consist of:

- Project data (Bucharest city hall's application for financing, CBA analysis, latest progress report)
- Project details from LIOP databases (SMIS, internal AM reporting)
- Data collected from the city hall on the project - maps of priority network interventions and list of network sections

- Previous internal World Bank research on the Bucharest district heating

IV. Budget

The total eligible project cost is estimated at 278.3 mn EUR (of which 236.6 mn EUR financed from EU funds; 36.2 mn EUR national contribution and 5.6 mn EUR contribution from the municipality's budget). Under SO 7.2, financing is 85% EU funds, 13% national budget and 2% local budget.

V. Efficacy of the intervention

Currently, the project financing contract has only recently been signed and constructions are likely to start in 2022 at the earliest date (given also that the construction season is limited to spring-autumn months to avoid major interruptions in heat supply during the winter). The project has been delayed for several reasons. Initially, the project was expected to cover modernization of 250x2 km of pipelines. The feasibility study, prepared for the original project, had to be redone in 2017 because Jaspers considered that the options that had been analyzed were insufficiently well justified and that the total of 250 km of double pipeline well exceeded the implementation capacity of the municipality (the city hall manages to modernize about 20 km/year, while the major constraint is not so much the available funding as the capacity to contract and implement works). Jaspers supported the city hall's project team during the preparation of the second feasibility study and for the preparation of the project for submission to the LIOP. For the motivation concerning the viability of the support from EU funds, Jaspers also undertook an institutional assessment on the viability of the DH system in Bucharest which highlighted the major dysfunctions in the system, particularly the lack of coordination between various institutions responsible for parts of the DH (the heat source belongs to the Ministry of Energy, while the network to the municipality; the tariffs cover only a third of the total heat costs at end-consumer; the municipality incurred arrears in subsidy to the DH, which caused a chain of arrears to ELCEN, gas suppliers Romgaz and Engie, and tax authorities ANAF). The reorganization of the DH system by merging ELCEN and the DH company RADET, discussed since 2013, did not take place. Additional delays resulted from the state aid interpretations and the notification process to the EC, which in the end followed two separate tracks for the operational subsidy and the financing for the investment. Currently, the municipality awaits the final decision on state aid from the EC. The feasibility study, institutional assessment and CBA required adjustments as the municipality made several significant changes concerning the DH company (it set up two companies, which were contested in court, and finally set up a new company in November 2019, Termoenergetica, which took over operations from RADET, declared bankrupt). The envisaged merger of ELCEN and Termoenergetica (by takeover of ELCEN by the municipality) may require a new green light from the EC during the implementation of the LIOP-supported project. Given the lengthy process of institutional setup, the total costs had to be amended because of legislative changes that had occurred in the meanwhile (e.g. Ordinance 114/2018); and because works undertaken with own municipality funds for other sections of the network identified additional interventions (e.g., the galleries for the underground pipeline needed consolidation that had not been expected at the preparation of the original feasibility study). Though most of the works consist of replacing underground pipes inserted in galleries (with no expropriations required), the access will also likely cause delays in the implementation, as the agreement with owners is a precondition for the beginning of works on each section; small realignments may be envisaged if land access is particularly difficult on some sections.

Given all the delays, the municipality expects to organize the first tenders by mid-2021 (works, supervision, project management support) and hopes to sign the contracts by end-year. It is very unlikely that the full 212 km of network would be finalized by 2023 (considering the implementation capacity which so far was about 20 km/year, and that the works would entail considerable disturbance for traffic on major routes). The project is thus likely to be "phased" (i.e., split in works done by 2023 and works that could be finalized later, for which the municipality would seek financing from the next EU budget cycle). However, the "phasing" decision would be made in the second half of 2023. In the meanwhile, the DH system in Bucharest faces increasing interruptions of supply during winter, which suggests that extending the project beyond 2023 might require a reassessment of the viability of the system and of the commitment of the municipality to ensure the DH remains a going concern.

VI. Efficiency

The project is not efficient in CBA terms, including with EU financing, given the low tariff (though the municipality intends to gradually increase the end-user price). DH would be the only viable option in terms of climate and energy efficiency for the city, and the system could be made economically sustainable if well managed over a longer period (there is significant private interest for a concession of the Bucharest DH, with the condition that the tariff policy would allow recovery of investments and operational costs).

VII. Sustainability

The sustainability of the project (which may be finalized well beyond the 2023 deadline) is questionable in the absence of a clear action plan and policy for sustainable heating in Bucharest. Currently, tariffs are less than a third of the total heating price, which does not allow for the maintenance of the network and investments to catch up with the backlog in modernization.

VIII. Conclusions

The project has been significantly adjusted since the programming in 2013-2014 and the original feasibility study before 2017; major changes in institutional setup, the lack of a consistent policy to revitalize and modernize the DH system led to a deterioration of the quality of supply. Though disconnections in Bucharest are officially low (also because Bucharest has one of the cheapest heat in the country), there is a substantial risk that the system may collapse because of the massive losses of heat and water in the pipelines. Currently, parts of the city (particularly N-E) face long interruptions because of the closure of heat producers close to the area and little prospects for improvements, which may accelerate disconnections that have been so far low (less than 10% since 1990).

The delays so far suggest there is a need to:

- Increase capacity for state aid interpretation, including at municipal level for major projects that require state aid on EU funds, to avoid delays in finalizing the guidelines for applicants
- Ensure the split of works in sections that can be finalized by 2023 and sections that require a longer implementation, to allow for a possible "phasing"
- Major investments in DH infrastructure need a clear commitment at the municipal level for the continued supply of heat beyond one electoral cycle (an actionable strategy, consistently implemented); otherwise, if the quality of the service deteriorates rapidly with little prospects

for improvements, the disconnections may accelerate and render the system unviable. At the same time, the city has expanded with new neighborhoods of multi-family apartment buildings not connected to DH; and the DH would require significant resizing and modernization to match the current patterns of demand. This requires major adjustments to the system without which funding may be poorly prioritized to pipelines that may become stranded assets.

SO 8.1. - OHL 400kV Gutinas-Smardan - Transelectrica

I. Brief project description

The broad objective of the financing on this SO is to improve energy efficiency and security of supply by developing smart distribution, storage and energy transport and by integrating renewable energy production. The project consists of the construction of a 400kV line between Gutinas and Smardan and station works in Gutinas. It specifically increases the capacity of the National Energy System to integrate renewable energy production by:

- strengthening the network, much needed because the development of RES production capacities in SE Romania. It allows the takeover of the electricity produced by wind power plants from Dobrogea

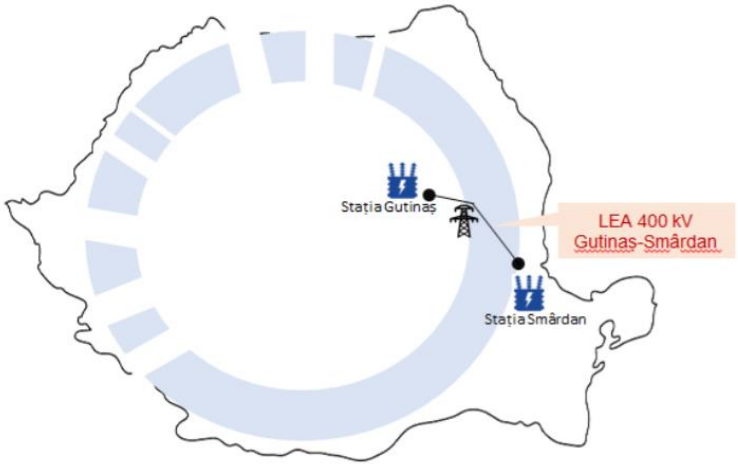
- integrating the renewable energy production from new capacities installed in Dobrogea and Moldova

- increasing security of supply for consumers in Moldova and eliminating network congestions.

The project also contributes to the North-South priority corridor on electricity: “North-south interconnections on electricity in Central, Eastern and Southeastern Europe ("NSI East Electricity"), increasing the Romania-Bulgaria interconnection capacity.

The construction of the line is a priority as after 2010 Dobrogea became a highly congested area with significant new RES capacities (mostly wind; of the total 2500 MW wind capacity installed, 80% are in Dobrogea). At the same time, Moldova is underserved with little electricity generation; and Transilvania is a rapidly developing region with increasing electricity demand. Currently, there is a 400kV line Gutinas-Smardan, which is obsolete (built in 1969) and does no longer meet energy security criteria. Under the project it would be replaced and then the connection would be further strengthened in subsequent projects for the interconnection with Bulgaria.

Under the project, 140 km of line would be built (2 km underground, 138 km OHL), and the connection point in the substation Gutinas. At the finalization of the construction the capacity of the energy system to integrate renewables would increase from 2200 MW (2013) to 3200 MW (2023). The line would cross 25 localities in 3 counties (Bacau, Vrancea, Galati). Originally, the total project value eligible for EU funding was estimated at 23.5 mn EUR, of which 20 mn EUR EU funds (85%).



Source: Transelectrica presentation, available at: https://financialintelligence.ro/wp-content/uploads/2019/04/Adrian-Suta-Transelectrica.pdf

II. Reason for selecting the case

The project covers 100% of the SO 8.1.

III. Methodology for case study

The data and information collected for this case study consist of:

- Project data (Transelectrica's application for financing, CBA analysis, latest progress report)
- Project details from LIOP databases (SMIS, internal AM reporting)
- Interviews (Transelectrica project officers; MA)

IV. Budget

The total eligible project funding is 152,168,390 RON, of which EU contribution would be 129,343,132 RON. The project has only one large works contract which comprises the design and construction; smaller eligible expenditure consists mainly of consultancies (e.g., works supervision). The value of the project has been amended from the original estimates because of expenditure eligibility criteria and increase of costs caused by inflation and legislative changes (such as OUG 114/2018).

V. Efficacy of the intervention

The project faced several delays in implementation and as of March 2021 the main contract for works is under tender (the financial offers were under evaluation). Transelectrica expects to finalize works in 18 months after contracting. The main delays were caused by:

- State aid interpretation. The original guidelines for application issued in 2017 were based on a preliminary assessment of the applicable state aid rules which suggested the support was state aid compatible with the internal market and was excepted from notification to the EC. Following EC clarifications on state aid, the analysis showed that Transelectrica fits under natural monopoly criteria, which led to adjustments (increases) of eligible expenditure and approvals from the Competition Council. The financing contract was signed in October 2018.
- Construction permits and expropriation. While there is legislation allowing for expropriations (a specific Government Decision for Transelectrica's project in 2017), the most difficult land acquisitions were from other state institutions, mainly the Agency for State Domain and the forestry company Romsilva (the latter has 15 plots of land out of the 445 needed by Transelectrica for the line). The construction permitting, which is done by each locality that the project crosses, is not unitary, though there is national legislation (L120) which requires that authorizations should be valid not for a year, but until the project is finalized.
- At this stage, there may be a risk that issues typical for public procurement (e.g. tender contestations) could further delay the project beyond the deadline for construction 2023.

VI. Efficiency

The analysis at this stage can be examined only from the ex ante CBA, as the final costs would be known only after the procurement process is finalized. Based on the ex ante CBA, the project is not

cost-efficient (the investments could not have been recovered from the expected transport tariffs); however, it is justified by broader economic and societal benefits such as increased integration of renewables, increased energy security and interconnectivity. It should be noted that the calculations for the CBA were prepared in 2013, when there was a boom in renewables in Dobrogea, which later subsided following the sharp adjustment in the support scheme in 2013-2014 (green certificates). Many RES capacities obtained the connection permits from Transelectrica, though in the meanwhile the construction of additional wind farms may have been abandoned. At the same time, as of 2021, wind investments would be economically viable without green certificates, but are constrained by the limited connection capacity of Transelectrica. The project would be even more relevant if there will be investments in the Black Sea offshore wind (which have good prospects).

VII. Sustainability

The maintenance of the investment is ensured by the inclusion of the assets in the regulated assets base (RAB) once the construction is finalized and put in operation. The transport tariff approved by ANRE is calculated based on the RAB. It is also very likely that, if the project is finalized, it would be more needed to ensure the connectivity between congested areas with high electricity production capacity and low demand and areas with high demand and low installed electricity generation.

VIII. Conclusions

The project has been designed in 2013, when there was a boom of RES, following a very favorable support scheme with green certificates which encouraged investments in wind and solar power plants. The benefits of the project would be fully realized if the business environment for energy capacities becomes more stable and conducive to new investments, particularly in the Black Sea offshore wind. The investments in RES declined temporarily because of the sharp adjustment of state aid support (green certificates); though in the meanwhile RES technologies became viable without needing state aid, they are currently hampered by other legislative and technical barriers – the latter includes the limited capacity of Transelectrica to connect new RES in highly congested areas such as Dobrogea. Thus, the project remains highly relevant and is likely to be sustainable well beyond the finalization of the LIOP. There are however several risks concerning the possible delays of implementation beyond 2023 (e.g., if there are delays in contracting the works, such as caused by tender contestations). The delays so far suggest there is a need to:

- Increase capacity for state aid interpretation (most importantly at Competition Council), to avoid delays in finalizing the guidelines for applicants
- Streamline the interpretation of various institutions concerning permitting and expropriations. E.g., for a project like Transelectrica's, a round table with representatives from the 25 localities could ensure unitary interpretations of construction permits; a coordination meeting with Romsilva, MEWF (coordinating Romsilva); General Secretariat of the Government (coordinating Transelectrica), Agency for State Domain etc. could help speed up the expropriations, particularly as all state institutions involved are in the central government and preparing the documentation for expropriation requires a government decision.

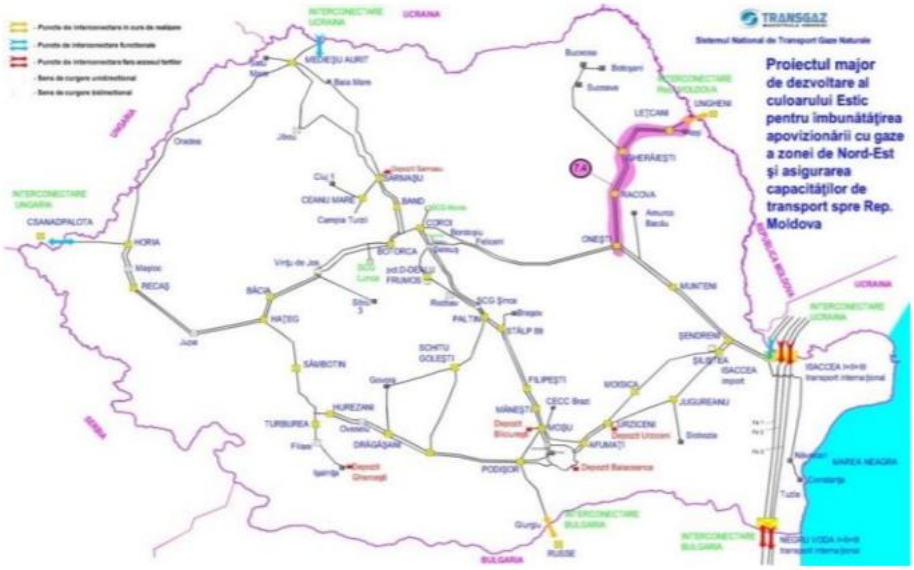
SO 8.2. – Development of the National Transmission Grid in North – East Romania to improve the supply of gas in the region and to ensure transport capacity to the Republic of Moldova - Transgaz

I. Brief project description

The specific objective of the project is to enhance the gas interconnection capacity with the Republic of Moldova. It consists of two sections of pipeline (Onesti-Gheraesti and Gheraesti-Letcani) and two compressor stations in Onesti and Gheraesti, with a capacity of 1.5-2.2 bcm/year. The project has two benefits: it completes the interconnection with the Republic of Moldova (started with the Iasi-Ungheni pipeline finalized in 2014 and the Ungheni-Chisinau pipeline finalized in 2020); and strengthens the gas network in N-E Romania, replacing an existing obsolete pipeline. The components of the project are thus:

- Construction of a new DN 700 gas transmission pipeline, Pn 55 bar, between Oneşti – Gherăeşti, 104.1 km. The route of this pipeline will be parallel mainly to the existing pipelines DN 500 Oneşti – Gherăeşti
- Construction of a new DN 700 gas transmission pipeline, Pn 55 bar, between Gherăești – Lețcani, 61.05 km. This pipeline will replace the existing DN 400 pipeline Gherăești – Iaşi on the Gherăești – Lețcani section
- Construction of a new gas compressor station at Onești with an installed capacity of 9.14 MW, 2 compressors of 4.57 MW each (one active and one backup)
- Construction of a new gas compressor station at Gherăeşti with an installed capacity of 9.14 MW, 2 compressors of 4.57 MW each (one active and one backup).

The estimated value of the project is 174.25 mn EUR.



II. Reason for selecting the case

The project covers 100% of the SO 8.1.

III. Methodology for case study

The data and information collected for this case study consist of:

- Project data (Transgaz's application for financing, CBA analysis, latest progress report)
- Project details from LIOP databases (SMIS, internal AM reporting)
- Transgaz website – TYNDP 2020-2029, project fiche, presentation to stock exchange and report to investors

IV. Budget

The total project cost is estimated at 174.25 mn EUR (of which 44 mn EUR eligible under LIOP, with 38 mn financed from EU funds), detailed as follows:

- Estimated amount for the procurement of materials: 64.95 mn EUR
- Construction of the Onești– Gherăești gas transmission pipeline: 17.32 mn EUR
- Construction of the gas transmission pipeline Gherăești–Lețcani: 15.19 mn EUR
- Onești Compressor Station: 48.46 mn EUR
- Gherăești Compressor Station: 37.06 mn EUR
- Pipeline automation and securing: 8.37 mn EUR
- Other activities (land acquisition, design, technical consultancy, audit and technical assistance): 28.32 mn EUR

V. Efficacy of the intervention

Currently, the project is under construction. Transgaz finalized 5 procurement procedures for the various components of the project (compressors; materials for pipeline; construction; other equipment for compressors and pipelines). There are 14 contracts, of which 13 were signed by end-2020. The contractors are currently executing the works and the project is expected to be finalized in summer 2021 (in December 2020, the physical implementation was 24.18%). Delays in the implementation occurred at the approval of the state aid (similarly to Transelectrica); approval of environment permit and construction permits; and land use (the land had to be temporarily excluded from agricultural use until the finalization of the construction of the underground pipeline). As in the case of Transelectrica, the project was declared a project of national importance by Government Decision, which facilitated the approvals.

The project would increase the interconnection capacity to Moldova from virtually zero at the beginning of the program to a theoretical 1.5 bcm. In reality, the pipeline could be used at half the capacity because, in the absence of storage capacity in the Republic of Moldova, gas would flow only during winter. The use could be however optimized after the finalization in 2021 due to external factors (the availability of gas pipelines transiting Ukraine after the construction of TurkStream which became operational in 2020, which would allow the access of Ukrainian storage capacity). The pipeline would however also compete with the Isaccea Negru Voda for the delivery of gas to the Republic of Moldova. The actual use of the pipeline would also depend on other external factors (e.g. the competitiveness of Romanian gas, the market rules in the Republic of Moldova allowing for effective competition).

VI. Efficiency

The project is not efficient in CBA terms, including with EU financing; however, the benefits of the project are mostly related to energy security in the regional market (the availability of a gas route to the Republic of Moldova given uncertainties on supplies of Russian gas).

VII. Sustainability

The maintenance of the investment is ensured by the inclusion of the assets in the regulated assets base (RAB) once the construction is finalized and put in operation. The transport tariff approved by ANRE is calculated based on the RAB. It is also very likely that, if the project is finalized, it would be more needed to ensure the connectivity between congested areas with high electricity production capacity and low demand and areas with high demand and low installed electricity generation.

VIII. Conclusions

The project has been designed in 2013, when the gas interconnection with the Republic of Moldova had been envisaged as a project in 3 stages (Iasi-Ungheni, Ungheni-Chisinau and the project currently analyzed). The access to the Transbalkan pipeline (controlled by Gazprom) for reverse flow at Isaccea was not envisaged at the time and the EU supported the alternative route. The shift of Russian gas transit away from the Ukrainian route to the newly-built TurkStream may reduce the economic viability of the project and the use of the infrastructure for gas supplies to the Republic of Moldova, but it could also provide additional access to gas from the Black Sea in the future and the use of the Ukrainian storage for the gas purchased during summer from Romania.

The delays so far suggest there is a need to increase capacity for state aid interpretation (most importantly at Competition Council), to avoid delays in finalizing the guidelines for applicants.