

ACTIVITY COMPLETION REPORT

Provision of Assistance in the implementation of District Heating roadmap via training and guidance in the development of heat mapping, CWP.11.AZ

INOGATE Technical Secretariat and Integrated Programme in support of the Baku Initiative and the Eastern Partnership energy objectives

Contract No 2011/278827

A project within the INOGATE Programme

Implemented by:

Ramboll Denmark A/S (lead partner)
EIR Global sprl.
The British Standards Institution
LDK Consultants S.A.
MVV decon GmbH
ICF International
Statistics Denmark
Energy Institute Hrvoje Požar

June 2016

Document title	Provision of Assistance in the implementation of District Heating roadmap via training and guidance in the development of heat mapping, CWP.11.AZ
Document status	Final

	Name	Date
Prepared by	Klaus Fafner, Henrik Steffensen; Farhad Alieyv; Andriy Levkonyuk	17 June 2016
Checked by	Oleksandr Antonenko	20 June 2016
Approved by	Peter Larsen	27 June 2016

This publication has been produced with the assistance of the European Union. The contents of this publication are the sole responsibility of the authors and can in no way be taken to reflect the views of the European Union.

Table of Contents

Abbreviations	1
1 PART 1 – EUROPEAN COMMISSION	2
1.1 Background	2
1.2 Essence of the Activity	2
1.3 Key Findings	2
1.4 Ownership and Benefits of the Activity	3
1.5 Recommendations	3
1.6 Challenges Faced.....	3
2 PART 2 - BENEFICIARIES.....	4
2.1 Background	4
2.2 Essence of the Activity	5
2.3 Key Findings	6
2.4 Ownership and Benefits of the Activity	7
2.5 Recommendations	7
2.6 Challenges Faced.....	8
2.7 Impact	8
Annex 1 - Training materials.....	9

Abbreviations

CO ₂	Carbon dioxide
CWP	Country Work Plan
DH	District Heating
GIS	Geographic Information System
ITS	INOGATE Technical Secretariat
JSC	Joint Stock Company
OJSC	Open Joint Stock Company
TA	Technical Assistance
ToR	Terms of References

1 PART 1 – EUROPEAN COMMISSION

1.1 Background

Assignment Title:	Provision of Assistance in the implementation of District Heating roadmap via training and guidance in the development of heat mapping, CWP.11.AZ
Country and Dates:	Azerbaijan, January 2016 – April 2016
Beneficiary Organisation(s):	Azeristiliktechizat JSC (Azerbaijani Heat Supply Operator)
Beneficiary Organisation's key contact persons – name and e-mail address	Mr Ilham Mirzaliyev, Deputy Chairman of Azeristiliktechizat JSC. ilham.mirzaliyev@azeristiliktechizat.az
Deliverables Produced	Final report and presentations
Expert Team Members	Klaus Fafner, Henrik Steffensen, Andriy Levkonyuk, Farhad Aliyev

1.2 Essence of the Activity

The Technical Assistance (TA) assignment on the implementation of District Heating roadmap via training and guidance in the development of heat mapping was implemented during the period January – April 2016. This activity was fulfilled as a part of the ITS Country Work Plan (CWP) for Azerbaijan and became a logical step of ITS previous cooperation with Azeristiliktechizat JSC on the preparation of Roadmap (strategic whitepaper) on the Development of District Heating in Azerbaijan until 2020, AHEF.116.AZ.

Whereas the previous assistance provided the beneficiary with an effective planning document, the current technical assistance enhanced the capacity of the beneficiary and Azerbaijani decision makers on heat mapping tool that is used in the EU to support strategic decisions for heat master planning with the potential to develop smart cost-effective energy solutions in cities.

The overall objective of this TA was to provide the national heat supply operator, Azeristiliktechizat with guidance and recommendations on the development of heat mapping. The training materials prepared as a part of this assignment (Annex 1) was aimed at developing the capacity of Azeristiliktechizat and national authorities with regards to the area of heat mapping. Important deliverables include the improvement of the capacity of key decision makers as a result of workshops on developing and implementing heat mapping.

1.3 Key Findings

1. Azeristiliktechizat did not have any experience in developing, operating and maintaining heat mapping, including computerised database and geographic information system (GIS).
2. Though Azerbaijani decision makers supported the idea of developing heat mapping for Azeristiliktechiza in general, there were some concerns regarding the possibilities of the actual implementation of such tool as well as a lack of political and administrative willingness for actual implementation of the heat mapping in Azerbaijan.

3. The analysis of the activities of other service providers in Azerbaijan revealed that the national water operator, Azersu OJSC, already created its own GIS system that implies the development of an electronic map of the entire infrastructure of the company. Thus, the successful experience and benefits of implementing the GIS systems in this 'sister' service company can be effectively shared with the beneficiary.
4. Due to the lack of the capacity of the beneficiary's staff, the delivered trainings were mostly devoted to the general aspects of the usage of GIS and databases, but not to the practical 'hands-on' sessions, where participants could try out simple calculations using heat mapping tools.

1.4 Ownership and Benefits of the Activity

The main benefits of the TA assignment for the Beneficiary are:

1. Azerbaijani decision makers and the employees of Azeristiliktechizat JSC enhanced their capacity on the practical implementation of computer programs with mapping tools and learned about the benefits of heat mapping.
2. Barriers against implementing heat mapping were identified, and proposals were made to developing expertise, competencies, networking, and implementation of a pilot project using heat mapping tools.

The Beneficiary took ownership in the following way:

1. The Beneficiary supported ITS recommendations developed within this assignment and started considering the opportunity of implementing heat mapping tool in the future.

1.5 Recommendations

1. Heat mapping is recommended, because it could create a sound basis for identifying bankable district heating projects and attract International financial institutions as well as facilitate the development of the national energy agency.
2. It is recommended to carry out implementation of heat mapping in realistic steps, including implementing a pilot project where heat mapping and heat mapping tools can be tested and developed.
3. The implementation of the heat mapping requires the additional improvement of the knowledge of both decision makers and technical experts on the application of GIS. The beneficiary can learn from the successful experience of implementing GIS system from Azersu OJSC, the national water operator.

1.6 Challenges Faced

The key challenge of the TA was the lack of capacity of the employees of Azeristiliktechizat and Azerbaijani decision makers on the benefits of heat mapping that lead to a wrong perception with regards to a significant resources needed for the development and operation of the tool. However, ITS managed to overcome this challenge through a constructive dialog with decision makers and target groups by explaining benefits of the heat mapping resulting in the improvement of the efficiency of the system, attraction of investments and the reduction of CO₂ emissions.

2 PART 2 - BENEFICIARIES

2.1 Background

Computerized mapping is in general used in Europe to plan for future infrastructures of urban areas, and heat mapping is used for heat master planning with the potential to develop smart cost-effective energy solutions in cities. Heat master planning is - among others - used to identify opportunities for heat supply systems, inclusive new district heating networks, and thereby to set out a long-term vision for the development of district heating in urban areas. The steps in the process include:

- Mapping energy demands, assessing heat density, considering ownership and control of the demands.
- Mapping energy supplies in the specific area, including all kinds of energy sources and their proximity, registering ownership and control of energy sources.
- Mapping existing and planned district heating schemes.
- Mapping possible new development in the specific area.
- Identifying areas of need or priority.
- Identifying potential investment opportunities, e.g. suitable locations for new heat production centres, and routes for potential district heating networks.
- Identifying, screening (or discarding as appropriate) suitable technology options.

Heat master planning is a dynamic process and should be active and continuous from year to year for a city authority in coordination with other urban/state planning bodies and utilities for communal services. Once a heat master plan is developed, it will be clear where the heat sources centres and heat demand areas are located. From the heat map it will be possible to set out initial proposals for developing district heating, inclusive new pipe routes and plant locations, as well as assessment of economic and environmental impacts of their implementation. More general, national/local authorities may consider assigning heat supply zones based on natural gas, district heating, heat pumps, biomass, etc. (future planning of these zones may consider, for example, installing infrastructure to convert properties with primary fuel supply from the natural gas grid to district heating).

The heat map could also be developed for:

- Mapping energy demands, assessing heat density, considering ownership and control of the demands
- District heating network operators and other service utilities to record meter and billing data.
- Assist with invoicing customers and create a repository for recording meter reading.
- Highlight individual properties (customers) that show good or poor performance so that the heat supplier can offer customers with advice on energy efficiency.

- Forecasting heat demand and other key data across the network and across urban zones.
- Integration with e.g. fault location instrumentation - link the fault monitoring system to a GIS network in order to spatially locate any damage to technical components.

Transferred to Azerbaijani conditions, the city planning bodies can in cooperation with national governmental bodies (Ministry of Energy is suggested) as a first step create the basis for optimal exploitation of available heat sources, inclusive surplus industrial heat, cogeneration and renewable energy for district heating in urban areas as the Azerbaijani government has made renewables a priority.

Azerbaijan's national water operator, Azersu OJSC, has already created its own GIS system that implies the development of an electronic map of the entire infrastructure of Azersu. In parallel Azersu has created an ID system with an internal item and address register, in particular numbering of all existing facilities including buildings and blocks, floors, subscribers. The overall objective is to increase of the quality of services to subscribers.

In the same way, the heat mapping can be developed as a useful computer tool for heat supply sector, and especially for the national district heating operator, Azeristiliktechizat. For Azeristiliktechizat, the creation of a heat map database based on GIS implies the development of an electronic map of the infrastructure (selected parts as a first step and the entire infrastructure in the long term). The first steps include:

- A computerized relationship database with operating data and archive data from Azeristiliktechizat collected over the years have to be structured, digitized and integrated into the new computerized system/database.
- Creation of an internal number system for structuring the data in the database, including building and address register of customers, and a register of facilities.
- Selection of computer software suitable for Azerbaijani conditions.
- Selection of a skilled staff to develop, operate and maintain computerized database and GIS.
- As regards structuring the building and address register coordination with the State Committee for Property Affairs has be recommended.

Heat mapping can be regarded as an offshoot of the AHEF.116.AZ assignment, where the ITS has provided assistance to Azeristiliktechizat through development of a strategic whitepaper as well as training undertaken through workshops. Thus, it has become clear that further assistance, including recommendations and guidance on heat mapping, is required for relevant stakeholders in Azerbaijan within the heating sector with regard to the implementation of the strategic whitepaper.

2.2 Essence of the Activity

According to ToR, the overall objectives of this TA assignment was to assist the national heat supply operator, Azeristiliktechizat, with training and guidance in the development of heat mapping which will assist the heating company, via the delivery of spatial intelligence, in the identification of district heating requirements by providing information on major energy consumers, fuel consumption and CO₂ emissions, community heating networks as well as heat density.

The scope of work of ToR consisted of:

- Clearly understand the current (baseline) level of knowledge, experience and capacity to undertake heat mapping;
- Develop realistic and focused training material on heat mapping;
- Provide training in the development of heating mapping;
- Develop as part of the training, a guidance document on heat mapping;
- Provide a Final seminar to present the guidance document on heat mapping.

The specific objective of the TA assignment was to develop the capacity of Azeristiliktechizat with regards to the area of heat mapping. However the initial level of the capacity of decision makers and target groups was rather low that resulted to targeting trainings mostly to the general aspects of the usage of GIS and databases, but not to the practical ‘hands-on’ sessions, where participants could try out simple calculations using heat mapping tools

It should also be mentioned that Azeristiliktechizat had previously evaluated the feasibility of heat mapping and GIS, and did not find it useful under the current circumstances. Azeristiliktechizat did not draw the same conclusion as its ‘sister’ service company Azerbaijan national water operator, Azersu, that now has implemented GIS and mapping for increasing the quality of services to subscribers.

As a part of this TA assignment, the heat mapping tool was also introduced in the Ministry of Energy, because it could be very useful as a tool on the national level: for national authorities and governmental bodies. Furthermore, representatives from Azerbaijan Technical University and International Ecoenergy Academy in Baku were involved in order to evaluate their technical capacity to develop and maintain a heat map database and GIS. All capacity building activities were conducted based on the identified knowledge gaps.

As the current level of knowledge, experience and capacity to undertake heat mapping in general was low, a main task for the ITS was to present basic information about the idea of heat mapping, and the perspectives of heat mapping on a theoretical level. Realistic and focused training material on heat mapping was elaborated as power point presentation taking into account that none in the involved target groups had any personal experience with databases and GIS.

Due to the identified general lack of knowledge the ITS also conducted a number of meetings with constructive dialogues with target groups in Ministry of Energy. The meetings were more policy oriented and targeted the integration of heat mapping into the national energy agenda.

2.3 Key Findings

Azeristiliktechizat did not have any experience in developing, operating and maintaining heat mapping, including computerised database and geographic information system (GIS). The analysis of the capacity of the employees of the beneficiary revealed a very low understanding of the staff on computerised relationship database and GIS, creation of an internal number system for structuring the data in the database and selection of computer software suitable for Azerbaijani conditions.

Though Azerbaijani decision makers supported the idea of developing heat mapping for Azeristiliktechiza in general, there were some concerns regarding the possibilities of the factual implementation of such tool as well as a lack of political and administrative willingness for actual implementation of the heat mapping in Azerbaijan. In order to overcome the identified barrier, ITS closely worked with the involved decision makers and presented the heat mapping rationale, methodology and perspectives for smaller selected groups in Ministry of Energy/national authorities and introduced the concept at the technical university.

At the dialogue meetings, general support to implement heat mapping at national level was observed, but due to lack of support from political and administrative key decision makers the assistance was reduced to, smaller meetings, dialogues and knowledge transfer. The Consultant demonstrated computer programs with mapping tools and downloaded technical data from operating systems via internet to illustrate how the mapping tools were used in practise. But because the Beneficiary/audience lack of capacity to use GIS and databases, it was not possible to arrange practical ‘hands-on’ sessions, where participants could try out simple calculations using heat mapping tools.

To find a small and manageable area where heat mapping could be demonstrated the Consultant proposed Azeristiliktechizat to select a small district heating system as a pilot project in order to make a showcase for both modern technology and the heat mapping concept. In that way the pilot project could be an offshoot of both the roadmap project (AHEF.116.AZ) and of the heat mapping project. However, because Azeristiliktechizat was not ready for such step forward, this proposal was only initiated and never developed further.

2.4 Ownership and Benefits of the Activity

Though the Beneficiary supported ITS recommendations developed within this assignment, ITS experts did not receive any clear information about the timeframe for the development and the implementation of heat mapping tool in Azerbaijan.

Both decision makers and the employees of the beneficiary acknowledged the benefits of the heating mapping. However, due to the lack of capacity on modern technologies and taking into account that the heat mapping tool was a new instrument for decision makers in the MoE and the beneficiary, the beneficiary expressed readiness to implement it only in a middle term-period after getting necessary expertise and enhancing key decision makers.

2.5 Recommendations

Heat mapping is in general recommended, because it can create a sound basis for identifying attractive, bankable projects, which has become relevant because international investors – inclusive International financial institutions - have showed a strong interest in investing in DH in Azerbaijan. Therefore, it is highly recommended to officially introduce the heat mapping on a national level. It is recommended to carry out the implementation in realistic steps, including implementing a pilot project where heat mapping and heat mapping tools can be tested and developed.

2.6 Challenges Faced

The key challenge of the TA was the lack of capacity of the employees of Azeristiliktechizat and Azerbaijani decision makers on the benefits of heat mapping that lead to a wrong perception with regards to a significant resources needed for the development and operation of the tool. However, ITS managed to overcome this challenge through a constructive dialog with decision makers and target groups by explaining benefits of the heat mapping resulting in the improvement of the efficiency of the system, attraction of investments and the reduction of CO₂ emissions.

2.7 Impact

Impact is expected to be followed up through official and unofficial feedback of the training provided as well as national decision makers' willingness to engage in further dialogue with regard to heat mapping and district heating in general.

Annex 1 - Training materials