



Business Consulting Project:
Adoption of energy management system in
industrial sector of Azerbaijan

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Matanat Pashayeva Hasan

Abstract

Azerbaijan, a country rich with oil and gas resources has set a target to increase the contribution of non-oil sectors in the economy to ensure sustainable development in the country. To this end, dedicated strategic roadmaps for the development of individual sectors of the economy with due identification of measures were developed by GoA. Energy efficiency measures across the sectors of the economy were established as one of the top priority to reach resource savings. To this end, the researcher has set a target to explore adoption of energy management systems in the industrial sector of Azerbaijan as a solution to reach mass scale energy efficiency across subsectors of the industry. Existing conditions, barriers and expectations of key stakeholders for adoption of EnMS were defined through the analysis of primary data. It was found out that there is presently very low interest to energy management systems which seems natural where the energy prices are cheap and easily accessible and with no relevant regulation applicable. Considering all the mentioned factors, government intervention is seen as necessary for regulating, incentivizing and supporting the market to reaching expected targets. Adoption of energy management system within this study is considered in demand side of industrial sectors of Azerbaijan.

The researcher has studied policy pathway of the European countries where the significant improvement has been achieved on mass voluntary adoption of energy management systems not only across the energy intensive sectors but also small and medium size enterprises. Studies shows positive correlation among the existence of energy management program and commitment of incumbent organizations to energy efficiency. Moreover, there is positive correlation between design and characteristics of policy (ADEME, Energy Efficiency Policies in EU). But the level of yielded commitment varies across countries and is not positively correlated with only high impact measures, due to various need to stimulate separate drivers across countries (ADEME, Energy Efficiency Policies in EU). It was also found out that mandatory policy packages generate commitments but only voluntary agreements enhance high commitment. The role of competent energy managers in the adoption of energy management systems by the industrial organizations should be emphasized as well. The required skills for energy managers are not only technical, but also managerial.

Moreover, primary data derived through the interviews and survey were analyzed within this study and found out energy management is either partially being implemented by the local enterprises or not implemented. Energy management system is new management system in the country and could be attractive for the local organizations for adoption if only they receive relevant support and incentives. Low interest to energy management systems by the industrial enterprises is associated with cheap energy prices, lack of relevant regulation in the country. Referring primary and secondary data and considering efforts taken by the Government of Azerbaijan so far and their main challenges in this road in terms of adopting energy management programs, the researcher has proposed policy packages including prescriptive, economic and information components as per the expectations of the target audience and

giving them option to select one. The proposed policy packages are designed for both large industrial organizations and small and medium size organizations. Here, the will of the Government and incumbents is reflected in one package which will yield high commitments and high contribution of industrial incumbents, and accordingly generate win-win scenario.

Moreover, energy consumption trend, growth rate were reviewed and underlying reasons for fluctuations were explained during 2008-2017 years. Accordingly, the activity based value added of industrial subsectors, as well as energy intensity of the industrial subsectors were reviewed by the researcher. It was found out that mining sector of Azerbaijan is the most energy efficient sector which includes the amount of oil and gas production as well. But the basic metal subsector of industry is the most energy intensive sector among the concerned industries within this study. Change factor analysis was made to find out underlying reason for change in final energy consumption during the period of 2008-2017 and found out that activity effect was the key reason of change in energy demand. Energy efficiency indicator of industrial subsectors were compared with the developed countries relevant indicators and found out the there is significant energy saving opportunity in chemical and petrochemical industry of Azerbaijan. Based on this finding the researcher proposes adoption of energy management systems in chemical and petrochemical industry of Azerbaijan. The findings from the analysis were used to formulate relevant policy recommendations for facilitating adoption of energy management systems in industrial subsectors of Azerbaijan.

Key words. Energy management, adoption of energy management, energy management program, energy efficiency in energy intensive industrial sectors, ISO 50001 standard.

List of Abbreviations

ADB	Asian Development Bank
EBRD	European Bank for Reconstruction and Development
IEA	International Energy Agency
GoA	Government of Azerbaijan
GDP	Gross Domestic Product
EE	Energy efficiency
EnMS	Energy management systems
EnMP	Energy Management Program
SWOT	Strength, Weaknesses, Opportunities and Threats
PPP	Purchasing Power Parity
USD	US dollar

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1. Introduction

1.1 Rationale

Azerbaijan, one of the countries with rich oil and natural gas resources, and an oil and gas exporting country, has increased its attention to development of non-oil sectors with special focus on industrial and agricultural sectors. Economy of Azerbaijan Republic is highly dependent from the oil revenues (<https://www.stat.gov.az/source/industry/>, n.d.).

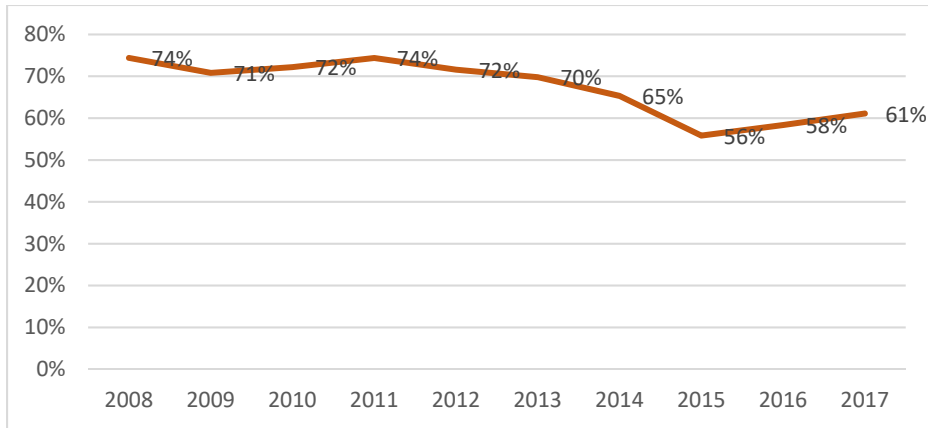


Figure 1-1 Proportion of oil and gas products in aggregated industrial output in Azerbaijan in 2008-2017 years, in percentage.

The domestic economy of Azerbaijan seriously suffered from the sudden economic crises in 2008 followed with decline in oil prices from 147 USD per barrel to 37 USD per barrel (<https://marketrealist.com/2015/01/world-economic-growth-impacts-crude-oil-prices/>, n.d.). As a result, the growth rate went negative in all the industrial sectors of Azerbaijan as could be seen from the below Figures 1-2.

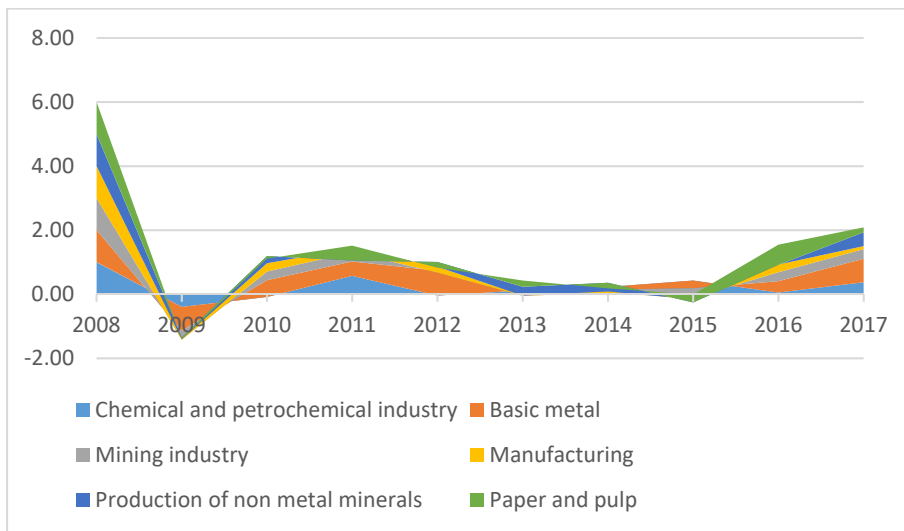


Figure 1-2. Growth rate in industrial output for 2008-2017 years

Therefore, Azerbaijan started to pursue dedicated policy to increase share of non-oil industry and agriculture in overall economy after this economic crises since 2009 years. Key objective is to reduce dependence of the economy from oil and gas revenues and ensure sustainable development in the country. The Government of Azerbaijan (GoAz) committedly pursued relevant state policies to incentivize development of industrial sectors with attraction of foreign investors to the local industrial sectors. In this context, the relevant state programs for the development of industrial sectors have been prepared for the near term. Organizational industrial zones had been established and special privileges were granted to the residents of these industrial parks (www.scip.az, n.d.).

GoA certainly realizes that abundancy in oil and gas resources that Azerbaijan is blessed with is not for ever as with overall oil and gas resources in the world. Several studies were performed based on the forecast made with Hubbert Curve developed by King Hubbert on the depletion of oil and gas resources which shall reach its peak 2030 years and be depleted since 2050 years. This assumption has been studied for several years and plausibility is being observed since its development (Kaku, 2011).

Azerbaijan economy was again hit with the sudden drop in oil prices in 2015 year which had serious consequences followed with strong devaluation of local currency.

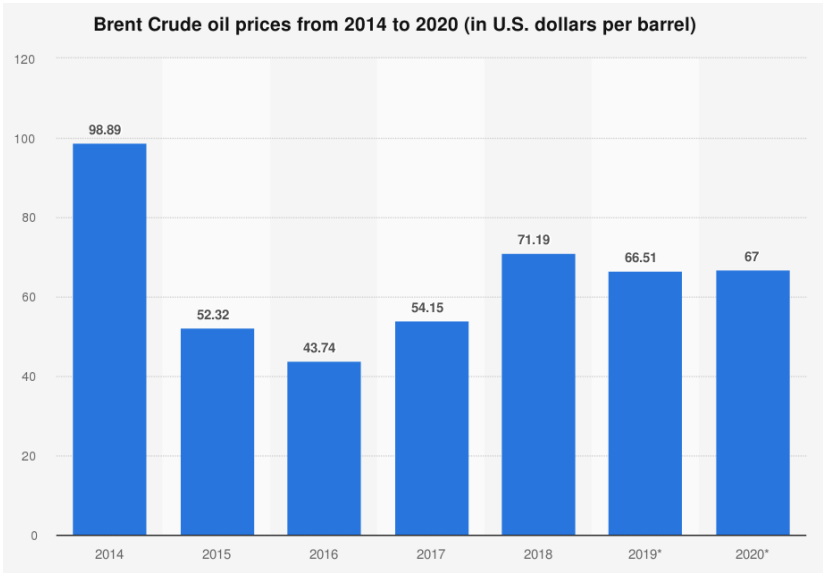


Figure 1-3. Brent Crude oil prices from 2014 to 2020 (in US dollars per barrel).

Source. <https://www.statista.com/statistics/409404/forecast-for-uk-brent-crude-oil-prices/>

GoA had to devalue local currency by two times during 2015 (https://www.cbar.az/currency/rates, n.d.) and on the other hand, had to take immediate actions to restore the economy. Following the state programs, separate strategic roadmaps have been enacted to ensure the development of dedicated industrial sectors with due identification of inherent issues and strategic targets for up to 2025 (https://president.az/articles/21953, n.d.). One of the strategic roadmaps was dedicated to heavy industry

and machine building sectors of Azerbaijan. The key challenges identified in the heavy and machine building sectors as per this roadmap are: poor and or lack of competitiveness in the regional markets, low productivity and efficiency, and lower access to financing respectively. Accordingly, GoAz has set three key strategic targets for the sectors, which are: 1. Optimal utilization of existing assets, 2. Building and upgrading competitiveness of sectors, and 3. Ensure access to financial sources for the sectors and study and implementation of international collaborations in the sectors. Moreover, the strategic roadmaps identify action plans and measures for achieving the established strategic targets. The first strategic target sets following priorities to achieve objectives among others during the near term future: increasing productivity, efficiency in the sectors and achievement of optimal efficiency in energy use in the given sectors. Hence, the following measures were defined for implementation in the given sectors in order to achieve objectives of the first strategic target: optimization of energy balance, correlation of supply and demand, incentivize energy use during off peak hours, identification of discounted energy tariffs, to guide energy consumers for efficient use of energy, to assign different tariffs in heavy industry especially in metallurgy (Economy, 2016).

To this end, adoption of energy managements systems is proposed as a key solution to achieve objectives of the first strategic target during the short term period for energy intensive industrial sectors. Industrial sectors of Azerbaijan is particularly energy intensive, as they take in average 51.2 % share in the energy purpose final energy consumption of the country during the period of 2008-2017, see Figure 1-1.

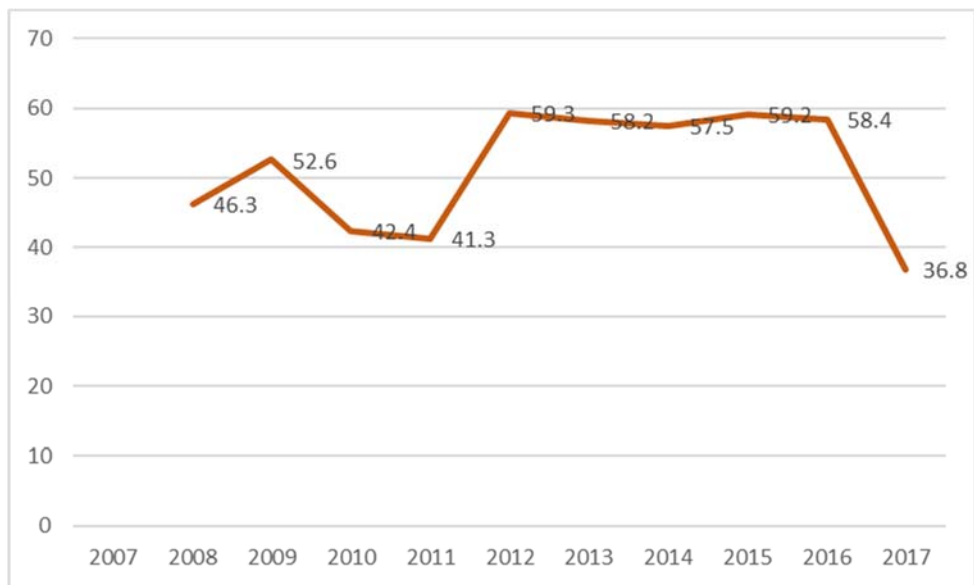


Figure 1-4. Proportion of energy use final energy consumption in industrial sectors of Azerbaijan, %, 2008-2017

The main reason of conducting the study on the adoption of energy management in energy intensive industrial sector of Azerbaijan is researcher`s personnel interest to energy management systems as a concept in industrial settings which is the most complex one, and to energy management profession in future career planning. The last but not the least, is researcher`s ambition as management consultant to

grow energy managers considering government's emerging interest to capacity building in these areas, which shall provide enormous opportunities in the country.

1.2 Research Scope

This research studies the most effective policy path to achieve attraction and adoption of energy intensive industrial sectors in Azerbaijan and considers adoption of energy management systems in demand side of the industrial sector of Azerbaijan. Boundaries of industrial sector is defined according to the International Standard Industrial Classification of all Economic Activities (ISIC), see Annex 11 (IEA, Energy Efficiency Indicators: Fundamentals on Statistics, 2014). Non energy use across the subsectors of industry is excluded from this study. Main focus is given following sub-sectors and later grouped as per the methodology of International Energy Agency to better manage the available data. Input data is taken as per the following subsectors which are chemical and petrochemical [ISIC 20 and 21], basic metal (iron and steel) [ISIC 241 and 2431] and non ferrous metal [ISIC 242 and 2432], mining [ISIC 07 and 08], production of machinery [ISIC 25, 26, 27 and 28], equipment and transport equipment [ISIC 29 and 30], production of non-metallic minerals [ISIC 23] and paper and pulp [ISIC 17 and 18], food and tobacco [ISIC 10, 11 and 12], wood and wood products [ISIC 16], textile and leather [13, 14 and 15] and other [22, 31, 32] industrial sectors, see Annex 9. Construction subsector is excluded for the purposes of this study.

1.3 Problem Statement

Energy management and energy efficiency has been topic of thousands of research works globally and were studied from the multitude perspectives all over the world. It has already been accepted as effective tool for achieving energy efficiency not only large energy intensive industrial sectors but also for small and medium size enterprises as well (Energies, March 2017, 2nd edition). Today, a serious dilemma is put before the Government of Azerbaijan in terms of choosing either adoption of energy management systems or energy audits as a treatment of energy efficiency in the various sectors, particularly in the industrial sector, which is the main energy intensive sector (Hasanov, 2019). The research objective of this paper is to study energy efficiency policy of GoA, to study existing interest level of voluntary adoption of energy management programs, identify awareness level and actual challenges of energy intensive industrial organizations, to study existing local market energy saving potential and develop effective policy path for the Government of Azerbaijan to make EnMS attractive and supportive for adoption by energy intensive industrial sector of Azerbaijan as a key target priority.

1.4 Research questions

Major research questions for this study are:

What is the effective policy path to energy efficiency in the energy intensive industrial sectors of Azerbaijan?

Minor research questions are:

To what extent the regulatory authorities can facilitate and support adoption of energy management systems?

To what extent government mandatory regulation may reach effective adoption and bring the expected benefits?

What is the energy saving potential of the concerned energy intensive sectors of Azerbaijan?

What are the key factors affecting energy demand in the concerned industrial sectors?

1.5 Research Approach

The research approach to this study has been formulated considering rationale for development of this study, problem statements, research objective, and research questions.

An inductive approach to research will be used in this paper in order to find out the most effective policy pathway, verify existing capacity of regulatory authority, check the energy intensity of the concerned industrial sectors and to find energy saving potential of energy intensive industrial sectors of Azerbaijan and benchmark with developed countries. Quantitative and qualitative data will be used in respective analytical works.

Primary data included the interview with key stakeholders to identify existing policy path of GoA with the aim to retrieve key policy direction led by the GoA today and identify the key challenges in this path. Key stakeholders are the organization which formulate energy policy in the country, accreditation organizations in the country and industrial organizations. The relevant secondary data will be retrieved from the database of national statistical organization, the Institute of Economic Reforms and Scientific Research (<http://ier.az/az/>, n.d.) and International Energy Agency (www.iea.org, n.d.) to perform industry energy consumption trend analysis and growth rate which formulated industry background and context for this study, energy efficiency indicators which shall formulate insight about the energy intensity of the industry, and accordingly outcome of the quantitative analysis shall be benchmarked with developed countries' energy efficiency indicators which will serve to formulate energy saving potential in the concerned local industries. Moreover, survey performed by a global certification organization was referred during the development of paper and outcome of the survey were used in order to confirm and reject the positions throughout the paper. Excel computation and analytics functions were used to facilitate calculations of ratios and rates, and for visualization of the data.

1.6 Outline of this paper

The paper consists of the following chapters:

Chapter 1 provides introduction of the topic, rationale of developing this topic, researcher's motivation to study this topic, identifies problem statement, research objective, research questions and research approach to development of the concept within this study.

Chapter 2 provides theoretical background for developing this study with provision of relevant literature reviews on the following topic: energy management system, industrial energy management program, key challenges in the process, strategic energy management planning, identifies the roles of energy manager and the key competences for this position, key strategic goals to be achieved by the organizations upon adoption of the energy management systems. It also includes framework for the adopting EnMS derived from the relevant literature review.

Chapter 3 establishes research design in order to answer research questions. Exploratory study is involved in this research. Quantitative and qualitative research were performed where the primary data were collected through the interviews and survey based of which capacity, expectations and barriers of the key stakeholders were identified. But the secondary data from the reliable statistical database were involved to test the existing energy saving opportunity of the concerned industries.

Chapter 4 provide summary of the interviews and survey with key stakeholders. Interviews with the relevant officials discloses existing policy path led by GoA, existing level of voluntary interest in the local market to this management systems, requirements, awareness level and key challenges faced by them during the adoption process. With the use of statistical data, energy consumption trend, growth rate and demand elasticity of concerned industries were reviewed energy saving opportunity of the concerned industries were tested and factor analysis of demand in the concerned industries were performed.

Chapter 5 provides discussions and conclusions came from analysis of obtained primary and secondary data made in the above chapters with provision of answers to research questions. Based of which policy pathway is developed and recommended for practical application for the Institute of Scientific Research on Economic Reforms.

2. Theoretical background

2.1 Introduction

In the course of development of this paper, several academic literature and practical guidelines were reviewed in terms of identifying prerequisites, effective plan and guideline for the successful development and adoption of the concept, requirements for and to ensure sufficiency of the existing regulatory basis locally and industrial potential to adopt the process.

The main concept which are studied within the study are:

What is the energy management system? What are the industrial energy management programs? What are the key challenges in the process? What are the key elements of a strategic energy management planning? What is the role of energy manager and what are the key competences for this position? Why organizations choose this management systems to achieve key strategic goals in the organizations?

2.2 What is the energy management system?

Energy management systems is defined as followings in the various literature, and two of them are shown below:

“Energy management system is the management system to establish an energy policy, objectives, energy targets, action plans and processes to achieve the objectives and energy targets” (ISO, Energy Management systems, 2018). This definition identifies a set of coherent elements necessary for the energy management adoption process, stresses importance of setting objectives and targets, building plans and processes to achieve them.

Another definition of energy management according to the VDI 4602:2018 is: “Energy management is forward looking, organized and systematic coordination of the procurement, conversion, storage, distribution and application of energy to meet usage requirements, taking into account ecological and economic objectives” (Group, 2018). This definition highlights importance of tracking, measuring, managing and optimizing use of energy flow within the organizations through accurate planning, organization and systematic coordination of processes within economical constraints and ecologically acceptable norms. Energy management systems considers adoption in the demand side.

2.3 What are the industrial energy management programs?

According to the definition of International Energy Agency, energy management programs are the government led initiatives to promote effective energy management system. Energy management program

elements are the government led initiatives, drivers and support systems that, combined, make up the EnMP and encourage enterprises to adopt effective energy management systems (International Energy Agency, 2012). This definition highlights importance of government interest and role in promotion of energy management programs and establishment of necessary regulation and mechanisms to encourage, engage and support the industrial organizations to adopt energy management systems.

Moreover, the literature highlights positive correlation of success of energy management program with provision of appropriate resources and supporting mechanisms, including assistance, capacity building and training and provision of tools and guidance during the implementation stage and stresses importance of its implementation as a part of broader energy efficiency agreement with the government (International Energy Agency, 2012).

“Energy management programs are effective tools for governments to avoid barriers to energy efficiency improvement and promote the transition towards more sustainable energy use in industry through use of energy managements systems” (International Energy Agency, 2012). Government support for EnMS includes financial incentives (including tax relief, tax rebates), reward programs (labelling and recognition of the organizations and provision of other non-tax privileges), provision of access to necessary information (implementation guidelines, networking, best practices) and technical tools (support to carry out energy audits, providing) (J., June 2011).

Previous experiences shows that widespread uptake of the EnMS is positively correlated with governments led programs which play the role of stimulator, encouragement for the organization to apply for EnMS (Amélie Goldberg, 2011).

If the prices do not reflect cost of product and influences the consumption decision as an externality, government`s intervention become necessary to correct negative impact of such externalities with the use pricing correction decision and regulation (Government intervention and its nature, 2011).

Number of government initiatives are suggested as a correction decision which are information and labelling, standards and regulation and financial and fiscal mechanisms as per Swisher et al (Swisher JN, 1997).

Use of multiple energy policy instruments have been common decision to eliminate barriers to energy efficiency (Council, 2010). To this end, relationship of design and features of policy (policy instrument characteristics), policy package and drivers to make investments (driving forces) are key elements need to be analyzed in assessment of effectiveness of policy packages (IEA, 25 Energy efficiency policy recommendations , 2011). Studies shows that there is no clear correlation between the impact of the measure and its type, in fact both high impact and low impact measures belong to various measure types as could be seen from below table. It is explained with that need to incentivize each driver is different in different countries and sectors. Given that relative impact of different types of measures vary accordingly across the countries (ADEME, Energy Efficiency Policies in the EU).

Type of policy	Policy (below) Driving force (to the right)	Financial	Policy obligation	Knowledge	Commitment	Public and market demands
Prescriptive	Norms/standards		High	Medium		
	Negotiated agreements			High	Medium	Medium
	Obligations/commitments e.g. mandatory energy audits		High	Medium		
Economic	Taxes	High				
	Incentives and subsidies	High		Medium		
	Tradable permits	High	Medium			Medium
Information	Labelling			High		High
	Other information measures			High		Medium

Table 2-1. Relationship between the driving forces and different types of policies

Source: (ADEME, Energy Efficiency Policies in the EU)

2.4 What are the key challenges in the process?

Energy management program should be attractive enough to be able to engage industrial organizations, receive support during implementation process and keep up the momentum until the organizations are ready for certification process (Klaus Carl).

A key challenge is determining the net results and benefits of energy management programs (International Energy Agency, 2012). Identification of energy management program results and the most effective influencing factors, gauging the full impact of the energy management program, weighting the role of factor in success in order to optimize energy policy in future are the most challenging process for the Government.

2.5 What are the key elements of a strategic energy management planning?

Energy management systems has been the part of the development strategy for many world countries for almost several decades and they could achieve serious results in energy saving through application of energy management systems. The evaluations shows that the package of energy management systems contributed not only quantitative results in energy saving, but also on qualitative indicators in change practices to achieve systematic improvements in energy savings and formulated governance of change process in the organization (Amélie Goldberg, 2011).

Strategic planning in the organizations is formulated not only for business goals of the organization. It is also formulated for energy purposes as well. Integrated strategic planning of organization with inclusion of energy strategic planning could be more valuable in terms of company top management direct involvement in its formulation and implementation process, and accordingly for legitimization of the program (Turner, 2013). Objectives, targets, strategies, programs, and action plans are all formulate strategic energy planning. To have simplified approach to its formulation and implementation, it is better to let energy management team formulate it as they see it feasible. Objectives are established based on the energy policy for long term period which could be achieved through establishing short term targets. Targets should be based on all variable and static factors influencing the energy consumption. Targets shall be realistic to achieve during the set time period, measurable and ambitious. It needs to be formulated as S.M.A.R.T.: Specific, Measurable, Appropriate, Realistic and Time bound (Walter Kahlenborn, June 2012).

The plan might be in the form of flow chart which will define program for the next 5 years. As the members of energy management team are usually technical persons, they try to combine each component of strategic planning in one document: objectives, strategies, program, and action items to make it more visual and simple to refer. Strategic energy planning is usually formulated for 5 year term typically, and followings should be taken into account during the formulation process. Involving people from various departments in formulation process, shall make the planning more realistic and identify hurdles on timely basis and commit the people from certain obligation in implementation process (Turner, 2013).

Once it is approved by the top management, it should be protected to avoid any intrusion and making unintended changes. It provides basis for planning of resources and personnel as well. It should cover along with technical issues, funding, communication, education and behavioral modification. It lays strong commitment over the energy management team and provides basis for implementation (Turner, 2013).

2.6 What will be key competencies as a driver to change?

Energy manager plays central role in the energy management program. It should have clear vision on managing energy in the organization and make the change happen successfully. Energy manager is the shaker of the program, and is the one who pushes activities forward to make the things happen (Turner, 2013). Energy management requires more managerial skills rather than technical skills from energy managers (Alison Pugh, 2014). To this end, energy managers usually play the role of change makers in the organizations. It requires intensive working and communication with front line employees, middle managers, be able to manage the situation, inspire, motivate, empower them, identify winners and continue with them, identify employee resistances, other hurdles, successful elimination of them, establish effective and successful communication means, satisfy stakeholders' need in the course of the implementation process, manage input data collection and analysis of them, establish data sharing policy and reporting period, training needs, professional coaches for different levels of employees in the organizations.

Moreover, managing energy is found not only just a technical challenge, but also economic and managerial challenge which require relevant skills to manage it with a minimum of disruption (William H.Mashburn). All activities within the program needs tight controlling, provision of resources, removal of barriers, timely remedy actions. Its functions are effective, productive and long lasting when it aligns personnel from the different structures (Turner, 2013). Positive relationship between the project manager`s competencies, including leadership competence and success of the project were defined as well (Hao Thi, 2010). Therefore, the researcher summarized the key competences for the position of energy manager based on the reviewed literature as followings, see Annex 1.

- Leadership skills
- Communication skills
- Planning skills
- Coaching skills,
- Critical analysis skills
- Expertise in industry
- Motivation and appreciation skills
- Empowering
- Analytical skills
- Resource and time management

2.7 Why organizations choose this management systems to achieve key strategic goals in the organizations?

The following 5 significant reasons that attracts top managements to adopt energy management programs (Turner, 2013):

1. Brings quick and direct economic return (see Annex 2). Energy Management programs reveals all the opportunities of economic return and proposes top management for implementation through prioritizing in terms of investment need and amount of savings. It usually starts with options that require less investment but generate quick results. At later stage the program considers those actions that require moderate level investment. Measures to be taken in terms of old facilities which require high investment should come as result of application of detailed economic analysis in terms of their payback period and generated savings as a result of application of this measure.
2. This is another opportunity for big companies to achieve reduction of product costs and become cost competitive in the market. Energy which is treated as direct product costs is always at the attention of top management. Reduction of direct product costs is always at the direct control area of the top management and sustain competitiveness in regional and global markets.

3. Ensure staying in line with new technologies and processes. Energy technologies and production technologies are always changing followed with increase in productivity and energy savings. Yesterdays` technologies are not new technologies and there should be dedicated personnel in the energy team who follow new technologies development in the world and makes aware of them whole management team.
4. Enhances reliability and stability of energy supply systems of the organizations. Along with energy saving opportunities, providing increased reliability and stability of energy supply systems becomes key responsibility of energy managers. They should have contingency plans to avoid extreme cases in the energy supply systems like as power outage in the grid for short term period and establish long term strategic plans for having independent energy supply sources and other action plan for upgrading reliability and stability of energy supply systems.
5. Volatility of world energy prices have negative impact on planning of energy prices and is at the attention of top management in planning other strategic decision for the organizations. Energy management program should consider the possible changes in energy prices as well.

Adoption of energy management system ensures decrease in costs of energy carriers, ensure optimization of energy use, reduction of environmental pollutants and provision of appropriate content of energy proportional to quality and costs (Hamid Reza Feili, 2012).

Application of energy management systems is treated as a part of change program in the organizations. It is either developed and applied as separate change program and or integrated to overall change program of the organization. Such a program should be weighted in terms of organizational changes with its long lasting effect that these programs are capable to ensure and promote (Stenqvist, 2012-01-01) .

In order to summarize all relevant elements and requirements for the adoption of energy management systems as result of reviewing relevant literature, the following table could be formulated through systemizing whole concept of adopting energy management system.

The process of adoption of EnMS

Upstream Pathway

<p>Prerequisites for effectiveness and success of the program:</p> <p>Availability of energy management government program and regulation.</p> <p>Planning and implementing it as part of Government program with provision of appropriate resources and supporting mechanisms produce are the most effective one, and produce expected outcome.</p>	<p>Key challenges:</p> <p>Government stimulation to make it attractive for industrial organization and providing support during the adoption process.</p> <p>Measure the benefit and net outcome, identify the most influencing factors to effectiveness.</p>
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Downstream pathway

<p>Planning</p> <p>Strategic planning elements:</p> <p>Energy policy, energy objectives, energy targets, action plan and processes</p>	<p>Organizing</p> <p>Tracking, measuring, managing and optimizing energy use</p>	<p>Coordinating</p> <p>Systematic coordination: Energy targets and objectives</p>	<p>Energy manager as a driver of the process, key competencies</p> <p>Leadership skills</p> <p>Communication skills</p> <p>Planning skills</p> <p>Coaching skills,</p> <p>Critical analysis skills</p> <p>Expertise in industry</p> <p>Inspiring, motivating and appreciating, empowering skills</p> <p>Analytical skills</p> <p>Resource and time management</p>
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<p>Benefits:</p> <p>Quick and direct economic return</p> <p>Reduction of product costs</p> <p>Stay in line with new technologies which produce productivity, operational efficiency followed with digitalization of the system.</p> <p>Enhanced reliability and stability in energy supply system.</p>	<p>Barriers</p> <p>Even though so much benefits are guaranteed, energy efficiency investment are not viewed as strategic investment due to achievements in energy efficiency is fragmented across different locations with involvement of different use of energy and technology.</p>	<p>Outcome:</p> <p>Systematic improvement in energy saving, governance of change process and long lasting change.</p>
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Table 2-2. Process of Adopting EnMS.

2.8 Framework for effective adoption of EnMS

Based on the literature review in this chapter, the framework of the key efforts that need to be concentrated for effective adoption of EnMS was developed where the yielded benefit of the adoption process goes back to the government and organization itself, and is illustrated with EnMP to be adopted by the respective Government of the country to cause attraction to EnMS by the industrial organizations in the downstream.

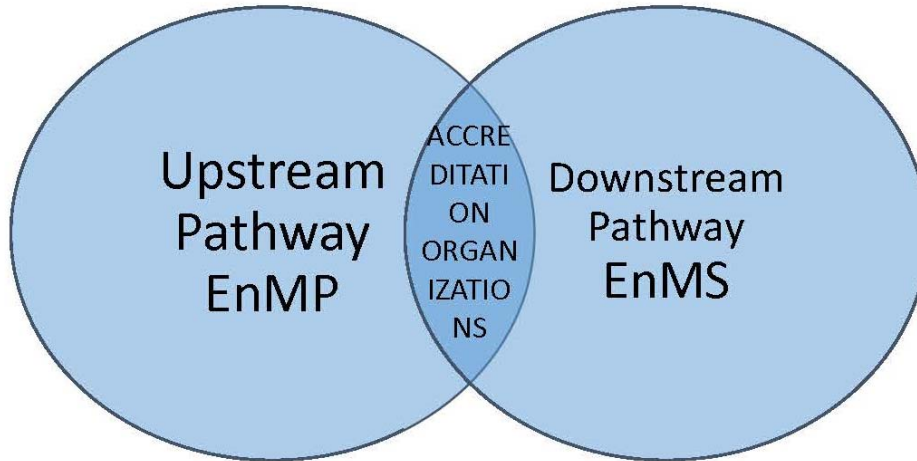
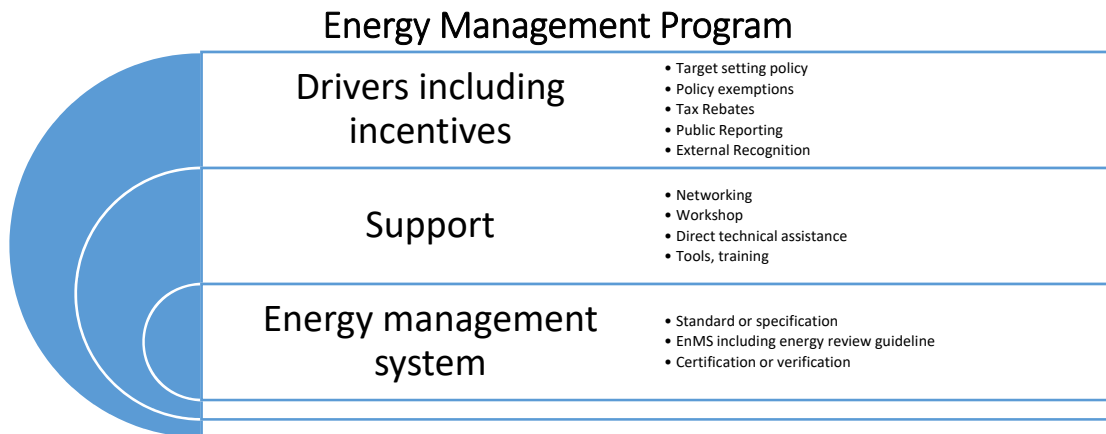


Figure 2-1-1. Framework for effective adoption of EnMS

Upstream pathway considers adoption of energy management program by the GoA, the effective for which is defined to be as followings:



Source. Reinaud Goldberg and Rozite, 2012

In the downstream pathway, following framework is considered to be the most effective to achieve goals and objectives of the adoption process.

EnMS – Energy management System



Source: (Turner, 2013)

3. Methods

This chapter provides methodology employed for development of this study to reach research objectives and answer the research questions established for this study.

3.1 Research strategy

Research strategy is defined as “the general plan how the researcher will go about answering research questions” (Mark Saunders, 2009). And research design always base on research question and guides selection of sources and techniques of gathering data and methods used in answering research questions (Blumberg B., 2011).

Bearing in mind what the research questions and objectives are, we start with determining the research approach. Major research questions is “what is the effective policy path to energy efficiency in the energy intensive industrial sectors of Azerbaijan? And minor research questions are: to what extent the regulatory authorities can facilitate and support adoption of energy management systems? to what extent government mandatory regulation may reach effective adoption and bring the expected benefits? what is the energy saving potential of the concerned energy intensive sectors of Azerbaijan? what are the key factors affecting energy demand in the concerned industrials sector?”

Research performed in this paper for answering these research questions involves explanatory study. Explanatory study shall enhance the researcher`s understanding on the subject topic and provide in-depth insight on the topic through literature research, depth interview, focus group research through survey and case analysis research. This research bases on the primary data collected through the interviews and surveys with key stakeholders. Three category of key stakeholders are involved in collection of primary data. The one who formulates policy, the one who certifies the industrial organizations in the energy management systems and the last one the potential beneficiaries which are the industrial organizations. Key stakeholders are generally listed in the Annex 4 and from them the researcher considered sufficient conduct interview with responsible official in charge for energy efficiency in the Ministry of Energy, with representatives of standardization organizations which have local representative offices in Azerbaijan, Turkish Standards Institution (en.tse.org.tr, n.d.) and Bureau Veritas (group.bureaveritas.com, n.d.) and several industrial organizations. But depth interview with key stakeholders is performed to find out existing situation and on-going policy path pursued by GoA and challenges faced by them in this road and any planning to support the target audience as a facilitation to adoption process. Moreover, existing interest level of local companies to this management system, their barriers in adoption process and capacity building and development need were studied by them. Based of collected primary data, qualitative research were conducted. Intensive secondary qualitative research is performed to find out the best practices and

the most effective and influential tools. This research results were exceptionally valuable for locating the policy strategy for the country which were blended with energy management policy recommendations for the purposes.

Research techniques involved in collection of data for this study is a communicative study. This study engages collection of information through questioning by personal and or impersonal means (Blumberg B., 2011). As a result of using this technique, existing situation in the market including existing policy path, key challenges faced by the policy makers, existing interest level to this management system, and key barriers faced by the industrial organizations were explored and research objective is achieved. Methods used to collect data were in-depth and semi-structured interviews and structured questionnaire. In-depth or semi-structured interviews with the open ended questions were the means of retrieving qualitative data from the interview respondents. Semi-structured interviews is defined with where the interviewer commences with a set of interview themes but is prepared to vary the order in which questions are asked and to ask new questions in the context of the research situation (Mark Saunders, 2009). It facilitates excellent condition to grab the necessary information. There were limited choice in terms of selection of respondents for the interview purposes. To this end, the researcher used her personal relation in establishment of contacts with respondents. The researcher considered this method the most effective to grab the relevant information from the interviewee and lead the interview in the intended direction.

The survey was the second means of retrieving qualitative data for this research purposes. Questionnaire was formulated consisting of set of structured questions where the respondents were expected to answer to standardized questions to identify general pattern. According to the definition provided by Mark Saunders, survey is the research strategy that involves the structured collection of data from a sizeable population (Mark Saunders, 2009). Target audience were energy intensive industrial organizations. Considering sensitivity and hesitation of target audience to respond survey question to disclose any information from their company name, confidentiality of obtained information is promised. 15 companies were contacted with the aim of collecting the necessary information. But only 10 of them answered to survey questions.

The relevant secondary data were retrieved from the database of national statistical organization, the Institute of Scientific Research on Economic Reforms for (<http://ier.az/az/>, n.d.) and International Energy Agency (www.iea.org, n.d.) in order to see the industry energy consumption trend and growth rate to understand background and industry context. While using secondary quantitative data, energy intensity and energy saving potential of concerned industries is tested. Therefore, inductive approach to research is used in this paper in order to test energy intensity of the concerned industrial sectors and to find energy saving opportunity of energy intensive industrial sectors of Azerbaijan. Upon testing energy saving potential, which is avoided gain today for the economy, factor analysis is performed using the statistical data, the key factor having great impact over the industry of Azerbaijan is defined. That's how, the researcher has proved importance of adoption of energy management systems in the energy intensive industrial sector of Azerbaijan.

Inductive approach is the “research approach involving the development of a theory as a result of the observation of empirical data” (Mark Saunders, 2009).

Quantitative and qualitative research were used in this analysis and development of the necessary outcome. Methodology of International Energy Agency is referred in calculation of energy intensity for industrials sector of Azerbaijan (<http://data.iea.org/payment/products/120-energy-efficiency-indicators.aspx>, n.d.). An semi-structured process was used to collect and analyze the qualitative and quantitative data that respond to research questions and meet the objective of this research paper, identify energy efficiency potential of the country and make comparison of countrywide indicators with cross countries energy efficiency indicators. With the benchmarking tools, energy efficiency opportunities in the industrial sectors of Azerbaijan were defined. The researcher finds these the most suitable to achieve the goals and objectives of this research paper. Moreover, survey performed by a global certification organization was referred during the development of paper and outcome of the survey were used in order to confirm and reject the positions throughout the paper.

Qualitative data included the review of relevant sources to identify the successful pathway in application of energy management systems and identify the methodology of identifying energy saving amount for the various industrial purposes. The identified effective policy pathway were aggregated and incorporated in relevant recommendations.

3.2 Research settings

The study is focused on policy management in industrial sector of Azerbaijan. Relevant experience of world countries which could manage the process and achieved huge success, now reaping the benefits of process were studied within the research. Policy development and management in the countries is the most challenging process in terms of time consuming, reliability and effectiveness to bring the expected outcome with minimum disruption. Contribution of industrial sector of Azerbaijan in formulation of GDP is huge, about 46% in average during 2005-2017 years, see Annex 5.

3.3 Data sources

Two types of data were used in this paper: primary data and secondary data.

Primary data is retrieved through the interview and survey with key stakeholders for this project. The interview taken from the executive in the Ministry of Energy, engaged in energy policy formulation of the country. The main objective of this interview was to identify existing policy led by the key energy policy organization of the country, and key challenges in this road. Head of energy efficiency and ecology

department, was the respondent to the interview questions. Face-to-face interview was conducted in order to grab all the relevant information. The researcher took notes from the interview and completed the answers to interview questions, which is given in the Annex 6. Preliminary preparations were made to this interview by the researcher where the questionnaire with open ended questions is developed and were sent to interviewee in advance. In the course of interview, based on the given answers to predetermined questions, additional questions were formulated and asked from the respondent in order to retrieve extended information on the main policy perused by the GoA today .

Moreover, two interviews were conducted with auditors of the international accreditation companies operating and having representative offices in Azerbaijan. Phone contact was made to receive answers to interview questions. Beyond the question 1, other interview questions were formulated in the process of interview and proper notes were taken from the interview and were combined into the interview answers, see Annex 7.

Target audience for survey was energy intensive industrial organizations. The questionnaire consisted of 10 structured questions with fixed design and specified wording of answers. In overall, 30 energy intensive companies were contacted through email, but only 21 of them responded to survey questions. Although this amount of survey might not provide representative information on the condition of local industry given the total number of existing organizations in the country as per the concerned industrial subsectors, the survey answers were referred by the researcher in the course of development of this study in combination with interview answers to asses existing need and driving factors for adopting EnMS.

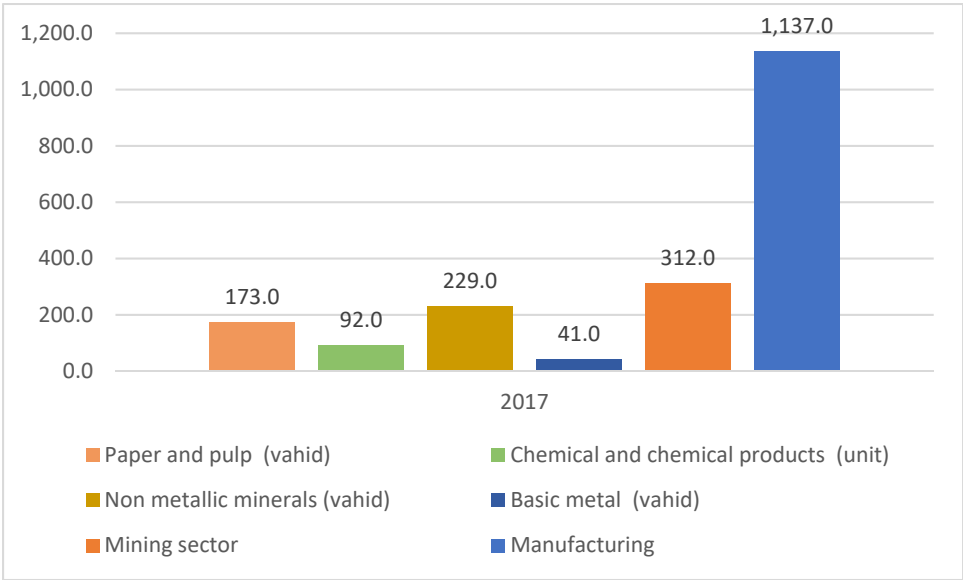


Figure 3-1. Number of industrial enterprises per subsectors in 2017, units

Secondary data, namely activity based energy consumption data used in this study were derived from the national energy balances, but activity based value added data were derived from the national accounts given in the statistical database of the Azerbaijan Government. They are grouped as per 6 industrial subsectors as per the available industrial energy efficiency data retrieved from the database of International Energy Agency, which is a global energy organization engaged in energy issues and having big impact factor in the world (www.iea.org, n.d.). This organization collects main macro level of economic, social data, as well as micro level of data including energy efficiency data for the countries of Organization for Economic Cooperation and Development. Consistency of national data with IEA activity based energy efficiency data is ensured through referring their methodology of compiling the sub-sectoral data. In the course of development of this study, several macro indicators were used which were received from the Institute of Scientific Research for Economic Reforms and database of World Bank (data.worldbank.org, n.d.) as well. This Institute of Scientific Research is engaged in the studies of national economy in Azerbaijan, development of policy proposals on economic issues, and calculation of key economic indicators for the country (<http://ier.az/az/>, n.d.). The worldwide web was the main source to retrieve various quantitative and qualitative secondary data.

Interview

One respondent for this interview was considered sufficient to study existing policy path and future development plans of the key policy making organization in the country. Information received during the interview would serve for formulation of policy background and future policy direction in the energy management systems and to define existing their barriers and constraints in this field.

Interview with executives from the organizations engaged in standardization of energy management systems were also considered sufficient in terms of their market pie and dominant position in the certification of ISO quality management standards. Based on the interview answers, researcher could define existing market interest to this management system, challenges lived by organizations in the adoption process.

Taking into account the key challenges and existing constraints to promotion, formulating extended policy, supporting and facilitating to adoption process of EnMS, the researcher proposed effective pathway for the GoA in combinations with qualitative research performed on the practice of other countries.

Survey

Survey is conducted with industrial organizations using structured questionnaire consisting of 10 questions. Purpose of the conducting survey was to find out existing status in terms of adoption of energy management in the given organization, to find out need for and driving factors (prescriptive, economic and information) to become engaged in energy management system. Questionnaire consisted of 5 multiple choice questions, 3 dichotomous questions and 2 rating scale questions. Survey questions was not designed to

find out relationship between the two or more variables but rather it was designed find out expectations of key stakeholders and to estimate impact factor of important variables on decision making process.

Questions 1-3 were designed to find out existing status in terms of energy management systems.

Question 4 provides assumption of the respondent as a key executive in their organization about the energy saving amount in the organizations. Respondent to this questionnaire are the executive with the technical background and usually supervises technical activities in the target industrial organizations.

Questions 5-6 serves to find out existing barriers in the organizations to apply energy management systems.

Question 7 is designed to find out local interest of industrial organizations to application of renewable technologies.

Question 8 and 10 are designed to extract information on the type of incentives that would drive industrial organization to uptake EnMS.

Question 9 is designed to define resource /capacity /information need for adopting EnMS.

Documents

Along with interview, a lot of documentary sources were used in this research study. Here include guidelines, handbooks, academic articles, training materials, case studies. Guidelines and handbooks were valuable sources in terms of practical application of the energy management systems in the organizations with due sequential order of milestones. The researcher carefully studied these documentary sources bearing in mind that they were prepared for specific purposes and using them in complete aspect for the purposes of this research can lead the researcher to wrong conclusion. Key insights and implications from the separate sources were referenced for the purposes of this study.

3.3 Data Collection and data processing

Primary data collection process for this study was performed during the month of July. Face-to-face interview and phone contact were made with the respondents to facilitate interview process. Since the key purpose of this interview with the key stakeholders was to determine main policy pathway of the government, open ended questions were prepared based on this direction. First contact with the executive at the energy policy formulating organization was made through the email to make respondent familiarized with interview questions beforehand to give him time to get ready for the process and, if necessary, to collect the relevant information and documentary sources for the purposes of this interview. In collection of

data, reliability of data was ensured in terms of not to collect respondent's personal opinion but grab real ongoing progress proved with documents. Researcher was able to see some correspondences in the documents in the premises of the respondent. But unfortunately copy of the documents were not shared with the researcher because of the privacy of the mentioned documents for organization. During the interview process, notes were taken by the researcher on the base of received answers from the respondents. As a result of which the whole progress towards the energy management policy development and formulation by the Government was studied and respondent's answers were documented.

But the direct phone contact was made with the executives from standardization organization in order to collect the necessary information from them. Proper notes from interview were taken and later documented.

In the course of collection of secondary data, two groups of data were collected in order to review trend and growth rate in the concerned industrial sectors. The IEA methodology was referred in collection of main quantitative data to make them manageable and ready for analysis. As per this methodology, sectoral final energy consumption and activity value added were grouped as per International Standard Industrial Classification (ISIC). Although sectoral value added data as per ISIC was available as ready in the statistical database, sectoral final energy consumption data for Azerbaijan were collected basing on the IEA methodology to group the activity based energy consumption data. At the end of the process, final energy consumption data as per industrial sectors and activity based value added of these industrial sectors were collected separately. 6 industrial sectors were defined with the following ISIC;

1. Chemical and petrochemical [20-21]
2. Basic metal [ISIC 24]
3. Mining [ISIC 05-09]
4. Manufacturing [ISIC 10-18, 20-32]
5. Production of non-metallic minerals [ISIC 23]
6. Paper and pulp [ISIC 17-18]

Upon collection of data as per the mentioned methodology, the data were made ready for benchmarking purposes. 2010-2017 year period energy intensity data is provided as ready for the IEA member countries but incomplete data is provided for IEA's non-member countries. Non probability sampling method was used in selection of countries for comparison with Azerbaijan. Here judgmental sampling is used where the development stage of the country is taken as bases. Belgium, Finland, France, Germany, Japan, Korea, US, Poland, Turkey, Belarus. Majority of data for Turkey and Belarus are missing.

Above classification was used throughout this study in relevant data collection, processing and analyzing. 2008-2017 time horizon for the purposes of this study were referred due to availability and in order better see background trend in energy consumption of the concerned industries. That's how, the gross final energy consumption data and value added of the concerned industries were systematized and were made manageable in this study and used in the analysis.

Energy consumption metrics in tone of oil equivalent was mainly used in calculation of energy consumption trend and historical energy consumption growth rate. As the industrial sector is productive sector, value added of these sector was referred in calculation of energy intensity. "Energy intensities (also called energy output ratios) measure energy requirement per unit of a driving economic variable (e.g. GDP, value added, etc.)" (Bhattacharyya, Understanding and Analysing Energy Demand, 2011). Moreover, tonne of oil equivalent was used in calculation of energy input per volume of value added in the concerned industrial sectors. Value added of the concerned industrial sectors in AZN were collected and grouped as per the above classification of sectors. As per the formula of the energy intensity (C.Bhattacharyya S. , Understanding and Analysing Energy Demand, 2011), activity based final energy consumption of correspondent year was divided by the value added of the concerned industrial sector in the same year. Energy intensity was used as energy efficiency metrics in comparison of countrywide data with other countries data for the purpose of finding energy saving opportunity of concerned industrials sectors (Bhattacharyya, Energy Demand Management, 2011). But due to availability of energy intensity data for the IEA member countries in Mega Joule/ USD PPP 2010 in the database of the IEA, industry specific energy data were converted to the mentioned metrics. According to IEA methodology, per value added energy intensity (MJ/USD PPP 2010) is calculated as the ratio between energy consumption and value added (Agency I. E., 2019). Here, industry sector value added are measured with purchasing power parities taking 2010 base year in USD. Value added in USD at the price level and purchasing power parities (PPPs) of the year 2010. Purchasing power parities are the rates of currency conversion that equalize the purchasing power of different currencies (Agency I. E., 2019). Several additional indicators were used for bringing of energy intensity of concerned industrial sectors in Azerbaijan to comparable level with IEA member countries. Price level ratio of PPP conversion factor for Azerbaijan for the period of 2008-2018 was obtained from the database of World Bank (data.worldbank.org, n.d.). Purpose of using PPP values is to eliminate effect of purchasing power/exchange rate relationships in low and medium income countries when compared with the high income countries. First of all, activity based value added were taken and grouped as per IEA methodology. Yearly value added data for the subsectors of industry in AZN were divided by the PPP conversion factor to bring their values to 2010 base year and the calculated amount were in USD PPP 2010.

Activity based final energy consumption in TOE were converted into MJ using the conversion factor which was 41868.

That's how, value addition of concerned industries in Azerbaijan in USD value with 2010 base year was calculated and made ready for comparison with available data for IEA member countries.

Excel computation and visualization functions were used to facilitate calculations of ratios, indicators and rates, and analytical techniques.

As a result of these process, database were brought into usable format to apply the relevant methodology.

3.4 Data Analysis

Following analytical methods are used to analyze energy demand in the concerned industrial sectors: simple descriptive analysis and factor analysis were used in this study in order to understand the change in the energy demand in the concerned industrial sectors. Overall energy demand trend in the past was provided as general description which enabled qualitative characterization of energy demand evolution pattern and any marked changes in demand pattern. Consequently, growth rates, demand elasticities and energy intensities were reviewed as a part of descriptive analysis in the concerned industrial sectors in order to identify underlying factors affecting energy demand in the concerned industrial sectors. The formulas for the mentioned tools of providing descriptive analysis are given in the Annex 3. Annual average growth rate between 2009-2017 years was found using geometric average for the period. Value added elasticity of energy demand was found using annual growth rates of energy consumption and the value added of the concerned industries during the 2008-2017 years. GDP elasticity of energy demand was calculated using the same method (Bhattacharyya, Understanding and Analysing Energy Demand, 2011).

Moreover, proportion of aggregated key energy carriers consumption in the concerned industrial sectors were reviewed separately in order better see evolution in accessibility to the energy carriers in the concerned industries. Their proportion in overall GDP were derived to see their contribution of formulating countrywide GDP. All of these provides insights about the energy demand in the concerned industrial sector and underlying factors affecting energy demand in the concerned industrial sectors.

The main energy efficiency indicators used in this paper for quantitative analysis purposes are the countrywide energy intensity and the industry specific energy intensity based on the relevant methodology used by IEA (<https://www.iea.org/efficiency2018/>, n.d.). The countrywide energy intensity for Azerbaijan was calculated by dividing the total countrywide energy consumption in Mega Joule by the value added of the concerned industrial sectors measured at 2010 purchasing power parities in USD of relevant year.

The industry-specific energy intensity, or energy intensity per added value in relevant industrial sector, was calculated as the ratio of the total volume of industry-specific energy consumption to the added value of relevant industrial sector. The value added in USD at the price level and purchasing power parities of the industrial goods in year 2010 base year was taken as the basis in calculation of added values for other years (IEA, Energy Efficiency Indicators: Fundamentals on Statistics, 2014). The calculated energy intensities per added value in relevant industrial sectors of Azerbaijan were then compared with those indicators of developed countries of Europe, Americas and Pacific for benchmarking purposes.

Moreover, using data provided in the yearly overall energy balances as per energy types consumed in the heavy industry and machine building sectors, it was found out that portion of natural gas and electricity is greater than other types of energy in the concerned industries.

Moreover, researcher analyzed changes in demand in the concerned industrial sectors in terms of affecting factors to them. Changes in economic activity (the activity effect), changes in technological efficiency of energy use at the sector level (the intensity effect) and changes in the economic structure (the structural effect) are the common factors affecting the demand (C.Bhattacharyya S. , 2011). In order to identify the reason of change in energy demand, factor (decomposition) analysis of demand was performed and underlying reasons were explained affecting to change in energy demand during the concerned period. Change in energy demand is analyzed using Laspeyres decomposition method. Changes in the energy demand is usually associated with 3 factors: activity, structural and intensity effect. For activity effect, the changes in the level of activity between 2008-2017 years are considered. Here intensity and share of the sector in value addition is kept unchanged in the initial year values. With activity effect analysis it will be concluded that if the activity would have changed in the given sectors alone, energy demand would have changed by the resultant amount in the concerned industrial sectors.

For the structural effect, structural change which is the share of the value addition of that subsequent subsector within the concerned period is considered. Here values of the activity and intensity are kept unchanged. With this analysis the role of structural effect in the change of energy demand shall be reviewed.

For intensity effect, changes in the energy intensity values within the concerned period is reviewed keeping the other two values unchanged. This suggests that association of change in energy demand with energy intensity measures in the concerned industries during the concerned period.

3.5 Validity and Reliability

Since the credibility of any research paper is of utmost importance and requirement for the quality and rigor of the research must be ensured (Yin, 2009), one of the task before the researcher is to reduce possibility of obtaining wrong data. To this end reliability and validity of research was ensured during the course of development of this paper by the researcher.

3.5.1 Reliability

Research reliability is “the extent to which data collection technique or techniques will yield consistent findings, similar observations would be made or conclusions reached by other researchers or there is transparency in how sense was made from the raw data” (Mark Saunders, 2009).

Qualitative data retrieved through the interview questions were tested through the supported documents which were disclosed during the face to face interview with the respondent, received answers were properly documented. Other quantitative data used in this research were retrieved from multiple sources where the

reliable evidence was provided. All the input quantitative data were retrieved from the reliable sources which is statistical database of GoA and database of International Energy Agency which is the world recognized energy organization. Violation of reliability is excluded for the data retrieved from these sources. Techniques applied throughout in this study is also reliable in terms of referring to academic literature.

3.5.2 Validity

Validity of research is “the extent to which data collection method or methods accurately measure what they were intended to measure” (Mark Saunders, 2009). In order to ensure validity of the data, three types of validity tests were performed as per Yin (Yin, 2009).

Construct Validity

Construct validity is the “extent to which researcher’s measurement questions actually measure the presence of those constructs you intended them to measure” (Mark Saunders, 2009).

Construct validity in this research paper was ensured as followings: explorative qualitative and quantitative study was performed, and as a result of which outcome of the research was determined. The initial concept derived from the literature review on the energy management, energy management program, key challenges in this road, key elements of strategic management planning, role of competent energy manager as a key driving factor, factors that attracts adoption of energy management systems by the industrial organizations is that effective adoption of energy managements systems need to reviewed and developed in two side: upstream side which is the government level, downstream side which is the industry level. Ongoing policy path is studied using the interview with the key stakeholder, extensive literature review is conducted in order to find out effective policy path, and qualitative data from the reliable sources were used to ensure energy efficiency potential of the concerned industrial sector to prove necessity of adoption of energy management systems and to determine key factors affecting the concerned industrial sector of Azerbaijan. That’s how, the construct validity of this research paper was achieved through the carrying out the empirical research.

Internal Validity

Internal validity is the “extent to which findings can be attributed to interventions rather than any flaws in the research design” (Mark Saunders, 2009).

Considering that face to face interview was performed with the key stakeholder within this study by the researcher to derive qualitative data and policy pathway of GoA, and quantitative data was collected, processed and analyzed by the researcher from the reliable sources, any kind of intervention to study is excluded. Therefore, internal validity is not applicable for this study.

External Validity

External validity is the “extent to which the research results from a particular study are generalizable to all relevant contexts” (Mark Saunders, 2009). Determination of effective policy path for the GoA derive from the literature review in the relevant direction in combination with outcome of interview conducted with key stakeholder for policy formulation in the country and energy saving potential of the country could serve as benchmark for other countries where the effective energy pathway and energy saving potential in the concerned industrial sectors are the topic of research. Therefore, findings of the research could be generalized and used for other countries which intend to adopt the energy management systems.

3.6 Challenges encountered in this study

The key challenge in the course of development of this study was related with conducting survey with the industrial organizations. Initial planning was to collect around 30 surveys within this study, but it was impossible due to companies sensitivity and hesitation to disclose any information pertaining their organization. As a result of issue, only 21 survey questionnaire were filled and received by the researcher. Moreover, limited number of web sources provide activity based benchmarking data on the subsectors of industry, and given sources do not provide complete data until the end of 2017, see Annex 12. To this end, the researcher faced a challenge of finding the most recent data on the activity based energy intensity of countries which are at the same development stage with Azerbaijan.

3.7 Ethical issues

Stakeholder`s request not to disclose the disclosed information during the interview to media which might cause some misunderstanding by the public and somehow affect the existing policy pursued by the stakeholder is promised and privacy of information received by the researcher during the interview with the key stakeholder was guaranteed.

3.8 Chapter summary

This chapter presents the research method of performing this study which was inductive study and qualitative and quantitative explorative study. Research strategy comprised of collection of qualitative data through the face-face interviews, survey and study of the available literature to identify the key policy pathway pursued by the GoA and determination of the most effective policy pathway, and analysis of

quantitative data for determining energy efficiency indicators for the concerned industrial sector to demonstrate energy saving opportunity in the concerned industrial sectors. Quantitative data were retrieved from the reliable databases and data were grouped as per the IEA methodology to calculate energy efficiency indicators and were brought to comparable units to benchmark them with ready available IEA energy efficiency data during 2010-2017 years for the IEA member countries. Data analysis were provided to observe energy demand evolution pattern and marked changed to identify underlying factors as a part of descriptive analysis in the concerned industrial sectors in order to identify underlying factors affecting energy demand in the concerned industrials sectors. Energy efficiency indicators were calculated using the methodology provided IEA. Credibility of research paper was ensured in the course of development of this paper. Challenges were outlined as failure to perform survey in required quantity to derive representative information on the target organizations in the concerned industrial sectors, which was aimed to define expectation of industrial organizations to become high committed to EnMS.

4. Data and Findings

As a result of analysis of interview answers with the key stakeholder which pursue the energy efficiency policy, we can summarize the findings as following:

Although the serious efforts were put by the key stakeholder which is Ministry of Energy of GoA to draft the energy efficiency law, applicable for the local conditions, responding to key trends globally on this direction, it has not been adopted yet in spite of fact 2 years have passed since its first drafting. The original draft of which included holding mandatory energy audits once in every three years and employing mandatory energy managers for the organizations with annual 1000 TOE final energy consumption for which industrial organizations were the first target audience, GoA could not decide on adoption of the law until today and even removed mandatory energy auditors and energy managers provisions. It lives challenge in the process of pursuing energy efficiency policy today as it has no capacity for implementation and to support the target audience in practical implementation process. This is also closely associated with that challenges lived by industrial sector today in the country which are seen as barriers to adoption of the policy today as per the given answers to interview questions No 1 and 2 by the policy making executive official. We can summarize barriers as followings in end use side:

- lower profitability of the industrial organizations
- low access to investments
- lower awareness of EnMS
- lack of local capacity

-lower energy prices

Local market is not ready for adoption of EnMS in the country presently. Lack of qualified energy managers, energy auditors, lack of access to energy measuring tools, guidelines, support mechanisms, access to energy efficiency finance are the key challenges faced by the end users in this road today countrywide. Moreover, MoE has lower capacity to develop, initiate and support energy management program which would promote, motivate through incentives and support and facilitate its adoption process as per the given answers to interview questions 4, 5, 6, 7, 8 and 9. The key energy policy making organization is in challenge for making planning on the energy management program and its elements. They look forward presidential approval of law after which they will issue relevant supporting documents in terms of elements of EnMP as per the answer to interview question 12.

As the policy implementation process is time consuming process, GoA intends gradual adoption of energy management program starting with mandatory energy audits as per interview question answer 10. Azerbaijan being one of the developing countries, abundant with oil and gas resources, realize importance of energy management systems in achievement of several benefits for target sectors. To this end, energy efficiency measures has been included into strategic plans of the industrial sector as well.

According to the interview with the members of the standardization organizations that are operating and having representative offices in Azerbaijan, and are engaged in standardization of ISO 50001 in the world and locally, we found the followings:

Energy management systems are the new management systems in the country, awareness of this management systems in the country is very low and accordingly there is very low interest to adoption of this management system in the country. Voluntary engagement level is very low due to several serious barriers existing in the local market. They are: cheap energy prices, accessibility of energy carriers due to oil and gas resources, lower awareness due to lack of promotion. Those companies that provide interest to this management systems are large energy intensive industrial organizations as per the requirement of their key stakeholders as per question 1 and 2. Those companies which provide interest to this management systems lack qualified manager managers and or energy team to lead the process as per the answers given to question 2.

According to the survey result which was hold with industrial organizations, the researcher came to the following points, see Annex 13 where the summery of survey questionnaire answers is provided:

As per the requirements of the valid local legislation and key stakeholders, local industrial organizations implement systematic energy managements system mainly partially and or incomplete aspect as per answers received to survey questions [1, 3]. The summery of valid legislative framework in terms of requirements to implement EnMS is given in the Annex 8. Those that implement EnMS partially and incomplete aspect, see the benefit of EnMS in reduction of energy costs as per the answer [2].

43% of respondents consider that EnMS would bring energy efficiency in the amount of 1-15% but 52% of them consider EnMS would bring 15-30% from now on which is huge amount of saving, if scaled up and managed in country level as per survey answer [4].

Local organizations is in need of skill and knowledge in the relevant field and consider that competent energy manager would be solution to energy efficiency in their organizations with stronger leadership and change management skills, as per answers [5, 6 and 9]. Considering energy manager is the new profession in Azerbaijan, none of local universities grow energy managers in Azerbaijan. Capacity building and capacity development trainings would be solution for growing existing operational personal to energy manager positions. Researcher has studied the local condition and requirements for energy manager position which is given in the Annex 9. Having the competent energy managers with sufficient technical and economical skills be able to locate and prepare feasibility study for the energy efficiency projects, majority of respondents would propose this managements systems to their top managers as per answer to question [8]. Based of this question, it become clear that the second category of respondents value adoption of EnMS in certification and recognition as energy efficient organization in the regional markets as per answer to question [8].

Majority of respondents would be motivated to voluntarily adopt EnMS if only government provides complex support through adopting EnMP that provide financial, technical support, tax rebates and knowledge and skill development as per answer to question [9 and 10].

Almost none of respondents use renewable energy in their organizations which implies low interest in the country to renewable energy sources as clean energy due to availability of cheap energy carriers as per answer to question [7], see energy tariffs for industrial sector of Azerbaijan in the Annex 9.

Based on the summery of the received answers from the key stakeholders SWOT analysis is prepared by the researcher which provides representative information on the introduction of EnMS in industrial organizations which will be referred in development effective policy pathway for the given sector.

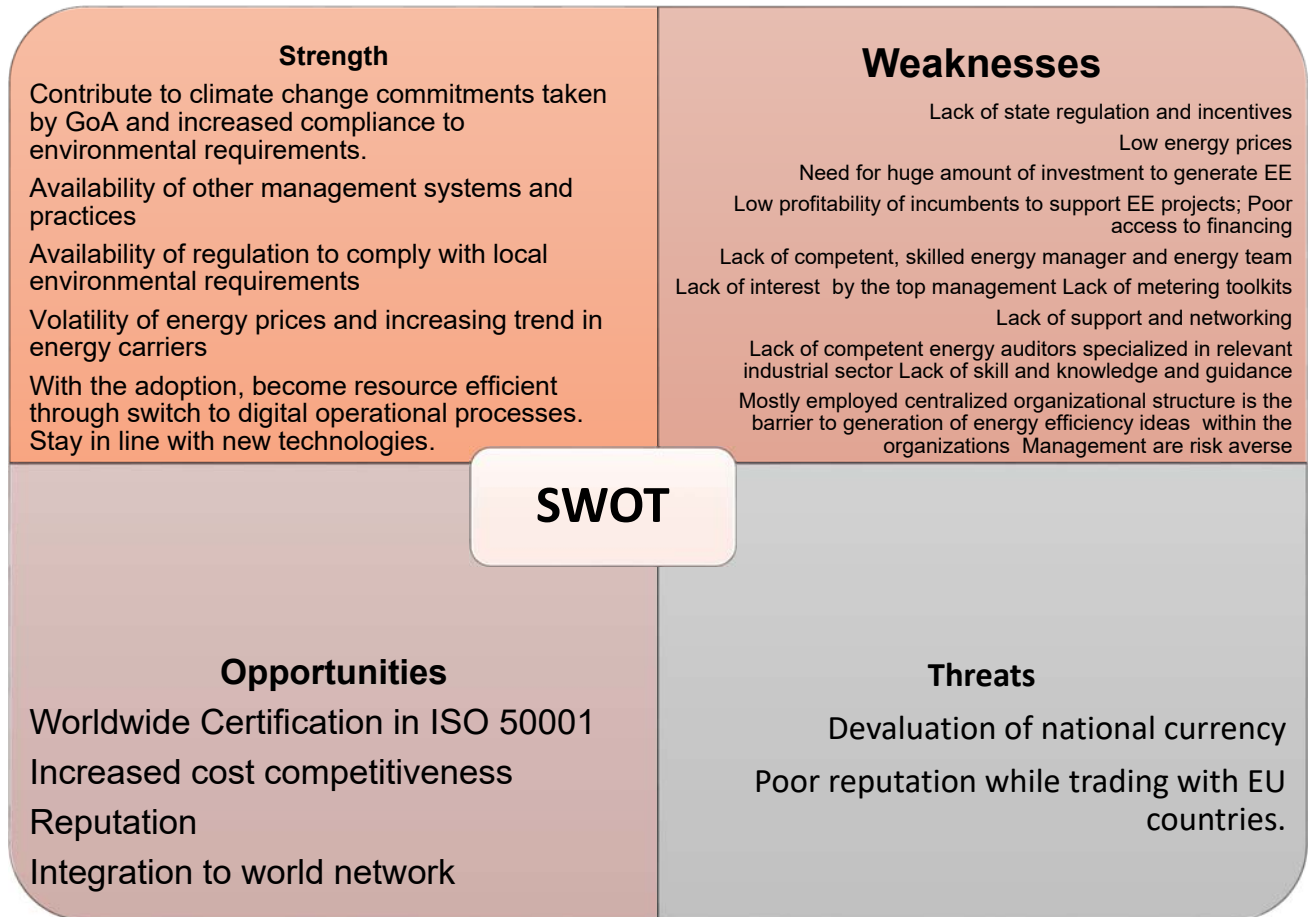


Table 4-1 SWOT analysis of adopting EnMS in the industrial sector of Azerbaijan

Azerbaijan being a developing country, mainly dependent on the oil incomes lived serious economic crises because of sudden drop in oil prices in 2008 mainly associated with fall in demand (https://www.stat.gov.az/source/balance_fuel/, n.d.), see Figure 4-1. Fluctuations in oil prices seriously affected industrial sector of Azerbaijan which proved instability of economy. Shortly after that, GoA took serious action to increase the role of industry in maintain economic growth of the country. A number of large industrial enterprises were built and commissioned during the concerned period among them Sumgait Technological Park, Sumgait Aluminum Plant, Sumgait Carbamide Plant, Norm Cement Plant, Sumgait Plastic Processing plant, ATEF Transformer Plant, and others are energy intensive enterprises (Economy, 2016). Taking into account negative impact of mentioned factors on the separate industrial sectors in Azerbaijan, Government of Azerbaijan (GoAz) issued strategic roadmap to the development of each industrial sectors with due indication of measures to be implemented for the development of each sector. With these action plans, GoA demonstrated strong intention and dedication towards increasing proportion of non-oil industrials sectors in the economy to ensure sustainable economic growth and to avoid negative

impact of oil price fluctuations on local economy. Achievements in energy efficiency and increasing productivity were the among other measures defined by these strategic roadmaps.

To better see the big picture, trend of activity based final energy demand was reviewed during 2008-2017 within this study. It suggests that there was steady increase in energy consumption until 2016, see Figure 4-1. After that year energy consumption declines due to same reason, strong decline in crude oil prices (See Figure 1-1), followed with economic crises in Azerbaijan during 2015-2017 years. Along with strong devaluation of AZN in 2015, key energy carriers- electricity and gas tariffs were increased during the concerned time period (electricity tariff increase since July 15, 2016 and Dec 1, 2016, natural gas tariffs since 1 Dec 2016). Negative impact of the mentioned factors become visible since 2016 year followed with strong decline in energy consumption.

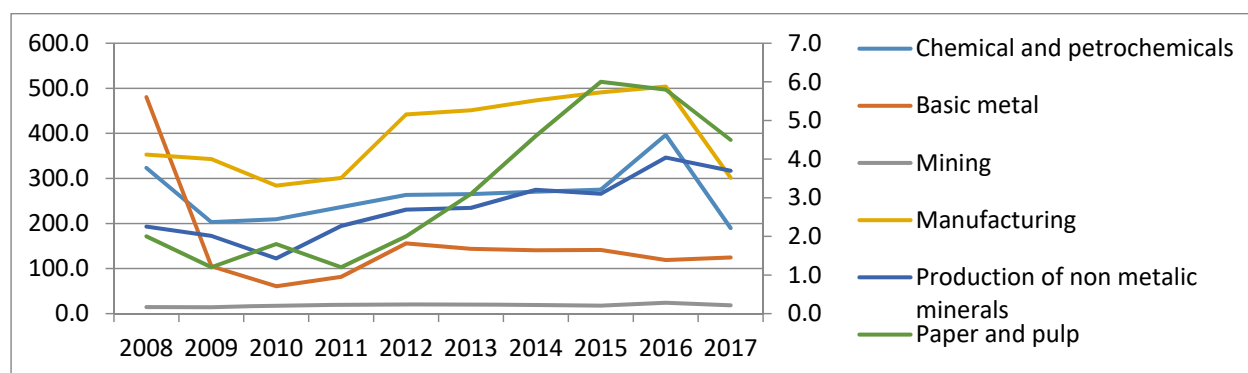


Figure 4-1. Activity based final energy consumption, ktoe

There is steady growth in final energy consumption from 2010 until 2016 as could be seen from Figure 4-2. Among the other sectors, basic metal industrial sector was the most affected one during the 2008-2009 economic crises due to its energy intensity.

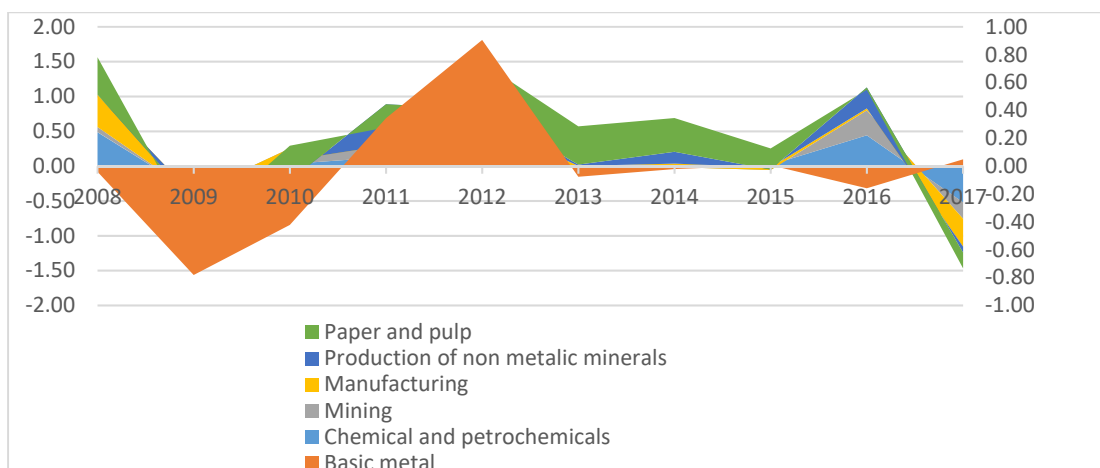


Figure 4-2. Growth rate in activity based final energy consumption.

The activity based final energy consumption are shown in the below graph, Figure 4-3. As seen from the figure, there was a steady increase in the individual energy consumption until end of 2016 year. The decline in energy consumption in consequent years was strongly associated with the economic crises due to strong decline in crude oil prices followed with strong devaluation of AZN in 2015 and increase in tariffs for key energy carriers (<https://www.cbar.az/currency/rates>, n.d.). Each of concerned industrial sectors affected as a result.

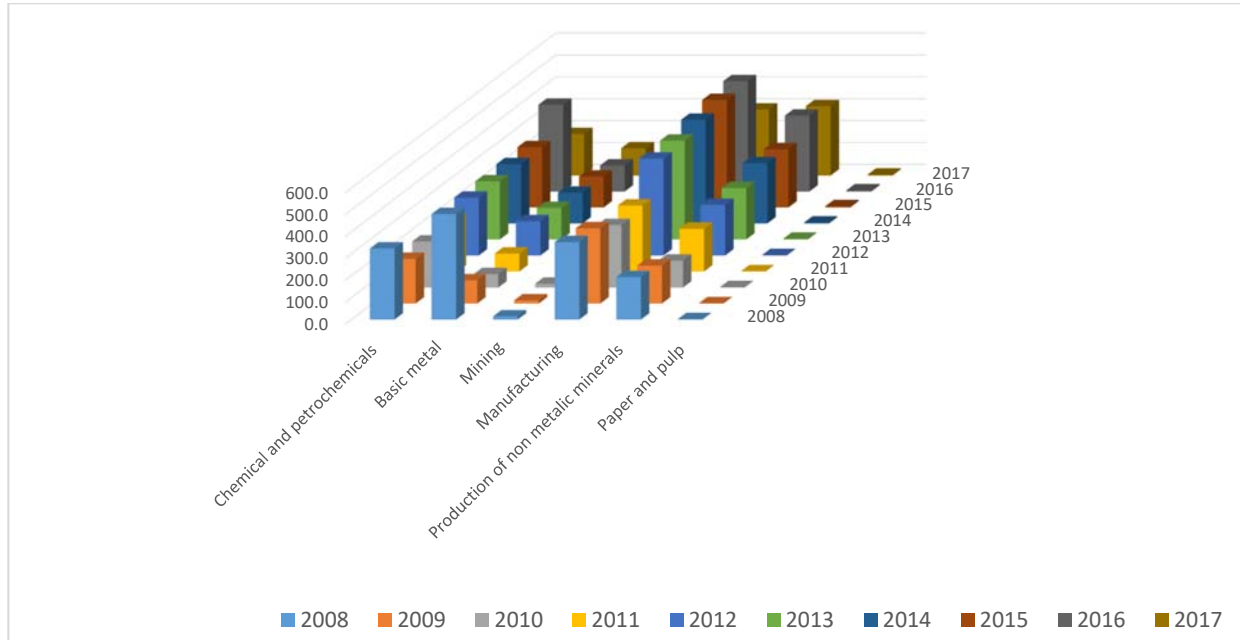


Figure 4-3. Activity based final energy consumption in 2008-2017, ktOE

The final energy consumption in manufacturing, chemical and petrochemical, non-metallic minerals and basic metal industrial sectors had the highest shares. The non-metallic industrial sectors include manufacture of cement, bricks and other materials. The cement production typically features with high energy intensity, although the energy consumption decreased since 2016. As mentioned above, this is strongly related with economy crises in 2015 caused by double devaluation of AZN which accordingly reduced demand for industrial products in the mentioned sector and made industry owners to cease operation of high energy intensity processes at all. Shortly after the devaluation of the local currency, the government issued the strategical roadmaps in December 2016 for the short term development of the industrial sectors during 2016-2020 years as a guide for survival of the industries and to ensure healthy competitiveness of mentioned industries in future through implementation of identified measures.

Despite the steady growth of energy consumption in paper and pulp, manufacturing, non-metallic minerals and mining and petrochemical industrial sectors, which implied stable development of the local sector, there was an instable annual growth of final energy consumption in the basic metal.

It would be valuable to see activity based value added as well. In the below figure value addition of concerned industrial sectors were given, see Figure 4-4.

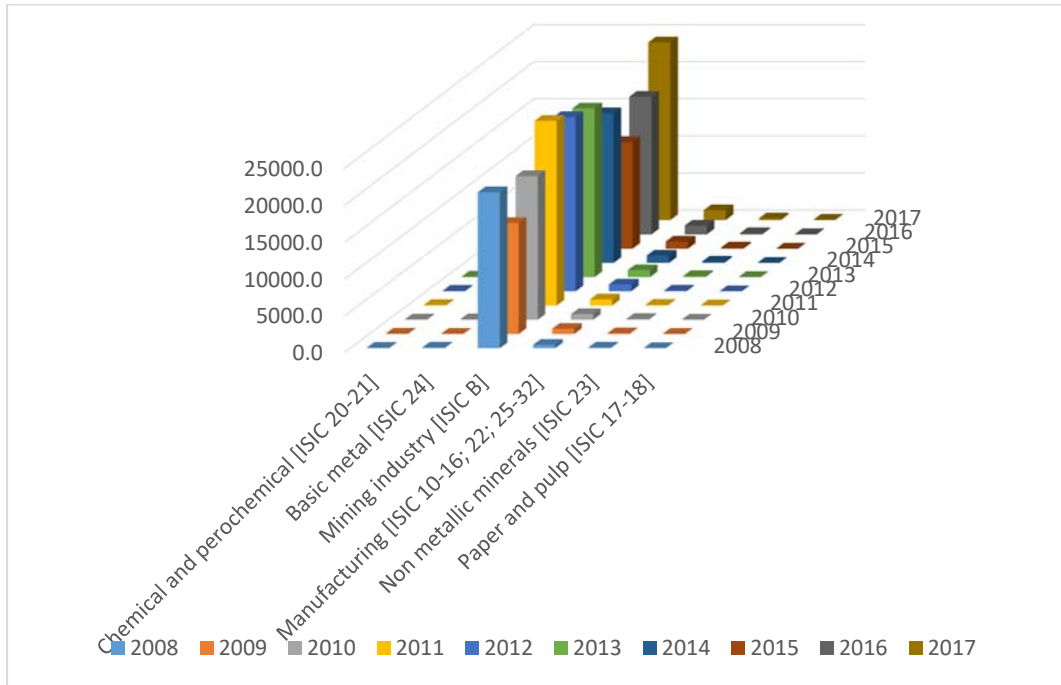


Figure 4-4. Activity based value added during 2008-2017, million AZN

As could be seen from the above chart, value addition of mining industry is significantly larger than other industrial sector which is related with inclusion of oil and gas production as well. Along other trends, energy intensity of subsectors were also reviewed which is given in the below Figure 4-5.

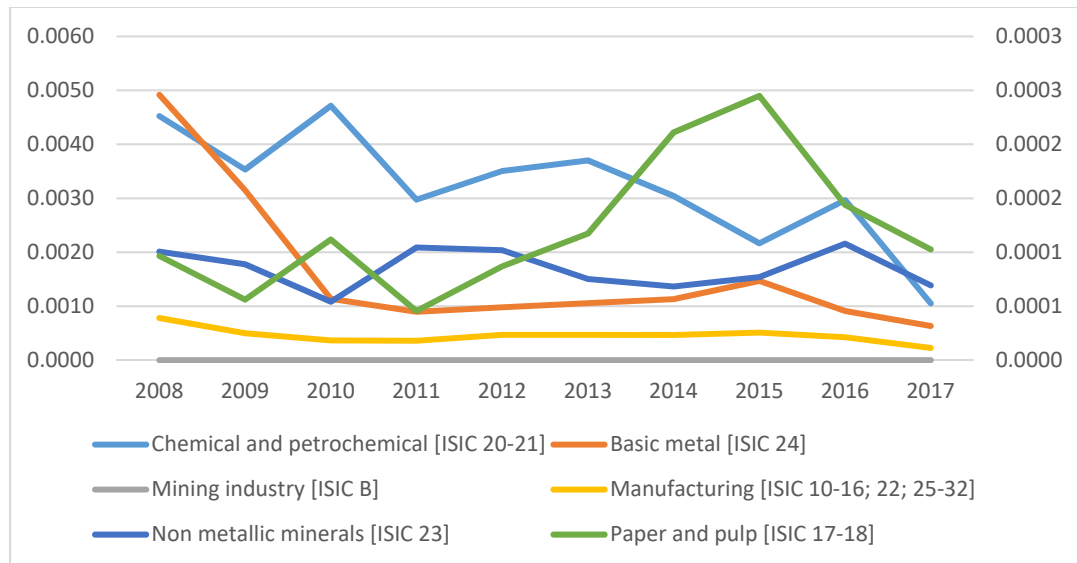


Figure 4-5. Energy intensity per AZN value added in the industrial sectors during 2008-2017, TOE/AZN.

As could be seen from the above figure, chemical and petrochemical, basic metal and non metallic minerals are the most energy intensive industries. After making benchmarking analysis, energy saving opportunities will become obvious in these industries.

Basic metal sector is the most energy intensive sector among the others, mining sector is the least energy intensive industrial sector in Azerbaijan to its high value addition on account of oil and gas production.

Key final energy products mainly consumed in the industrial sectors of Azerbaijan are electricity, natural gas, fuel oil, diesel and other oil products. As could be seen from the below chart, the portion of natural gas and electricity is greater than other types of energy. The review of changes in final energy consumption as per their types shows that the demand for electricity fell from 2008 to 2010 and again increased from 2011 year till the end of period. Nonetheless, the demand for the natural gas was increasing during the whole period. This implies that demand for electricity is substituted with natural gas in the concerned industries which became accessibly during the period in terms processing and heating purposes.

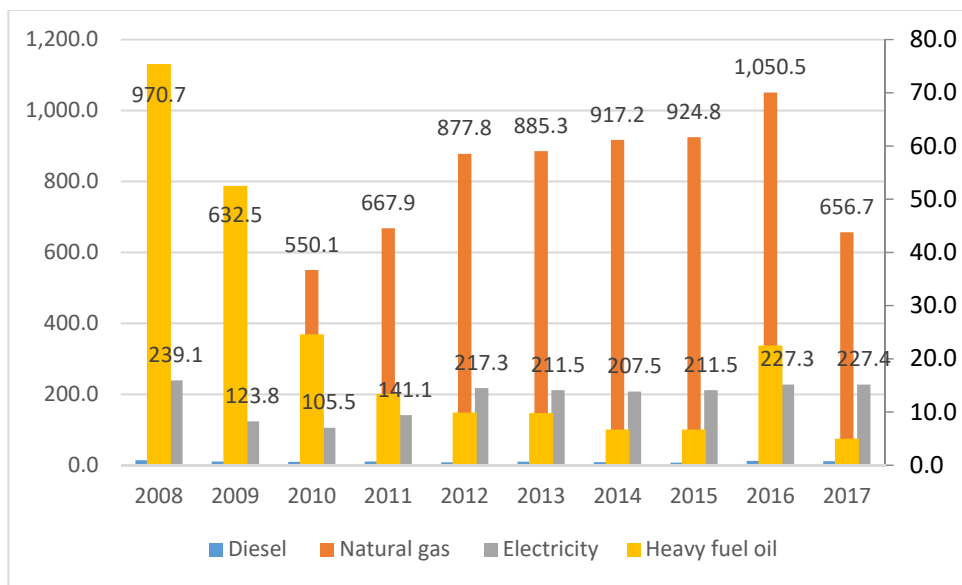


Figure 4-6. Final energy consumption as per types of energy carriers in the concerned industries, ktOE

The substitution of electricity with natural gas is also evident from the below chart, where the proportion of major energy types consumption in the concerned industrial sectors in GDP is given. The weight of natural gas is greater than other energy types in GDP formation. The availability of abundant natural gas deposits in the country combined with low domestic prices fosters the more gas extraction and consumption.

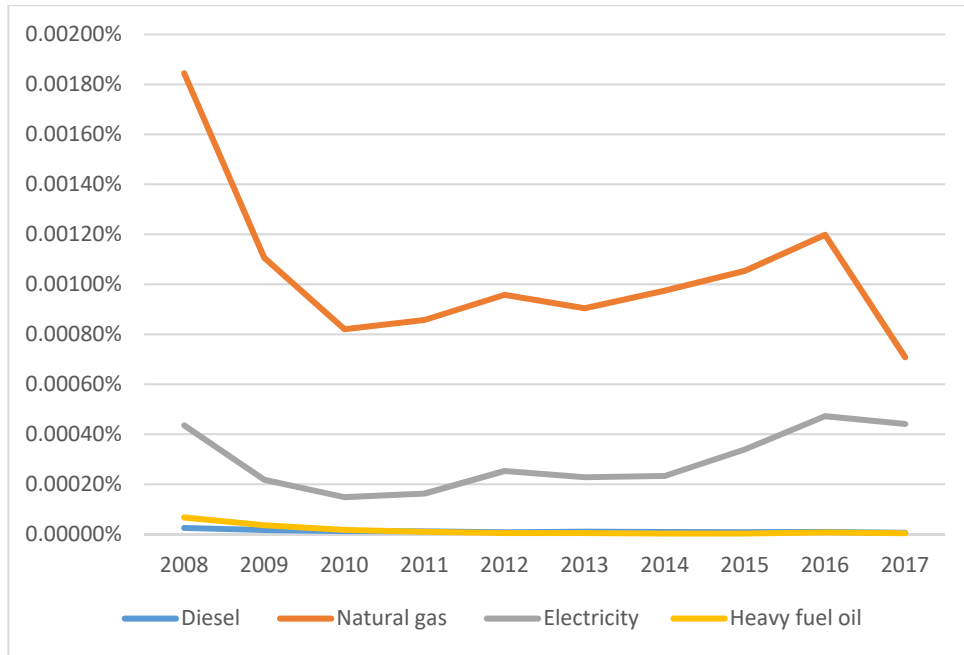


Figure 4-7. Proportion of energy products consumed in the concerned industrial sectors in GDP (2008-2017)

We have also tested the correlation of energy consumption growth rate with growth rate of value added of the concerned industries, and proved that there is no positive relationship between these two variables. As could be seen from the below chart final energy consumption growth rate is not dependent on the growth rate of value added by the concerned sector. This is related with low energy prices in the country.

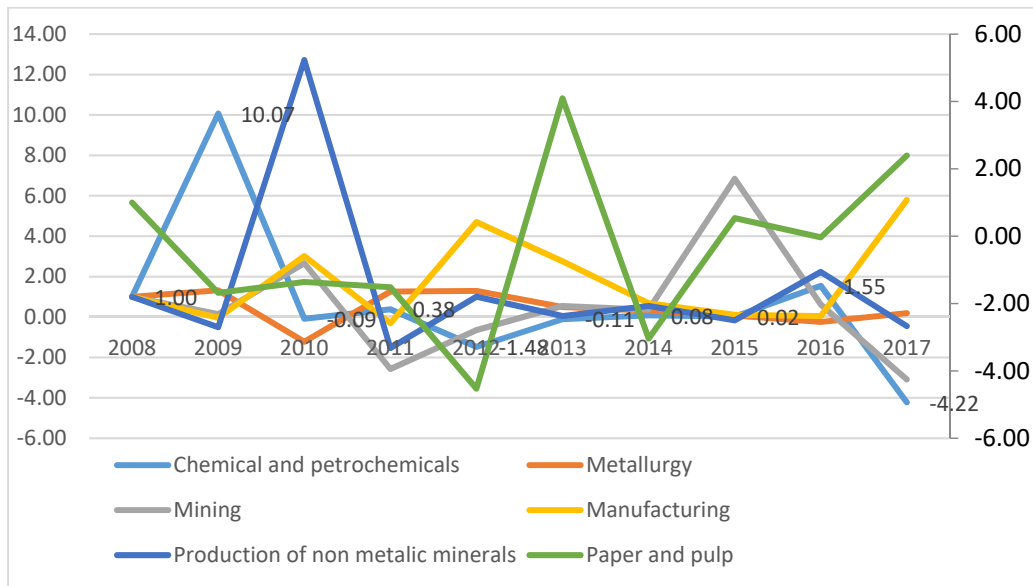


Figure 4-8. Value added elasticity of energy demand

Growth rate of energy use final energy consumption and GDP during 2008-2018 year period were calculated separately and dependence of energy demand from the GDP were reviewed. As could be seen from the above chart energy demand in Azerbaijan is not dependent on the GDP except for 2014 year. This implies to already tested phenomena which is price elasticity of energy demand. Along with strong devaluation of AZN in 2015, main energy tariffs were increased during the concerned time period. Negative impact of the mentioned factors become visible since 2016 year.

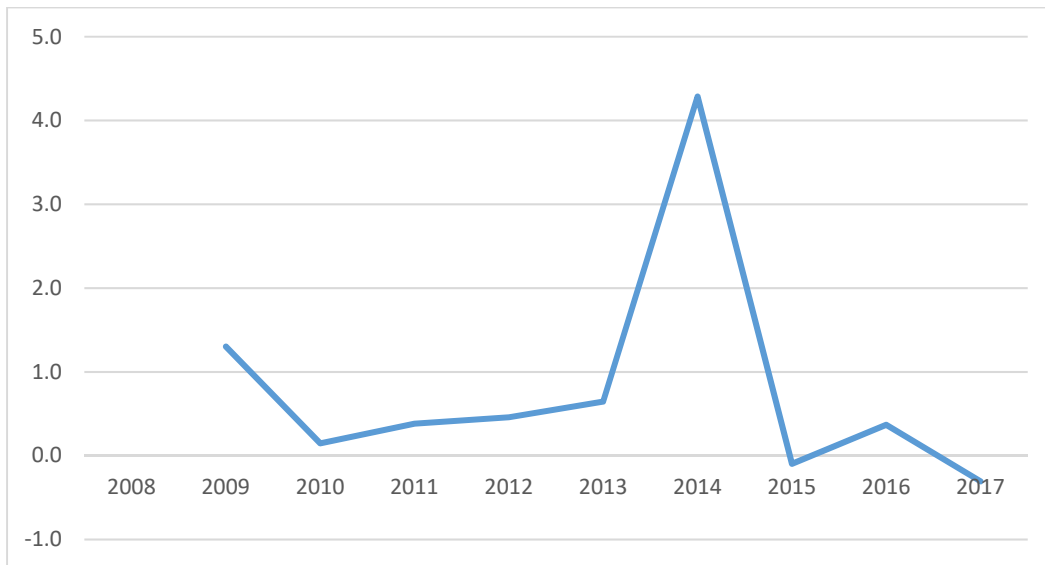


Figure 4-9. GDP elasticity of energy demand

Moreover, the researcher has reviewed the underlying reason for change in the energy demand during the concerned period, 2008-2017 years. The reasons of change in demand were estimated in terms of activity effect, structural effect and intensity effect through performing factor (decomposition) analysis (Bhattacharyya, Understanding and Analysing Energy Demand, 2011). The result of factor (decomposition) analysis is given in the below table as per activities of industry.

	Industrial activities	Activity effect, TOE	Structural effect, TOE	Energy Intensity effect, TOE	Total change explained	Residue, actual	Residue
1	Chemical and petrochemical [ISIC 20-21]	243412.4478	141486.3971	-248109.3837	136789.4612	-133,600.0	-270,389.5
2	Basic metal [ISIC 24]	361469.3661	70391.24277	-418385.6342	13474.97461	-355,800.0	-369,275.0
3	Mining industry [ISIC B]	10985.5386	-5174.00848	1751.433463	7562.963586	3,900.0	-3,663.0
4	Manufacturing [ISIC 10-16; 22; 25-32]	265609.26	236239.3143	-249930.8728	251917.6967	-51,500.0	-303,417.7
5	Non-metallic minerals [ISIC 23]	145295.0345	69518.52204	-60134.96503	154678.5915	123,800.0	-30,878.6
6	Paper and pulp [ISIC 17-18]	1504.868302	414.8605275	126.7123288	2046.441158	2,500.0	453.6
	Total	1028276.511	512876.3282	-974682.7099	566470.1288	-410700	977170.1288

Table 4-2. Results of the factor analysis

As could be seen from the above Table, intensity factor played important role in chemical and petrochemical, basic metal sectors, but activity effect had important role in mining, manufacturing, non-metallic sectors and paper and pulp industrials sector. In overall, activity effect had more role on the energy demand during 2008-2017 years. This is related GoA intension to increase contribution of non-oil industrial sector to overall economy. Serious steps were taken in energy intensity field as well which could be related with mainly implementation of technical efficiency measures, but also switch to more energy efficient processes and product mixes.

Energy intensity of concerned industrial subsectors where the activity based value added with constant 2010 PPP value is given in the below figure 4-10. Energy intensity of chemical and petrochemical, manufacturing basic metal and production of non metallic minerals is more than obvious from the below chart as well.

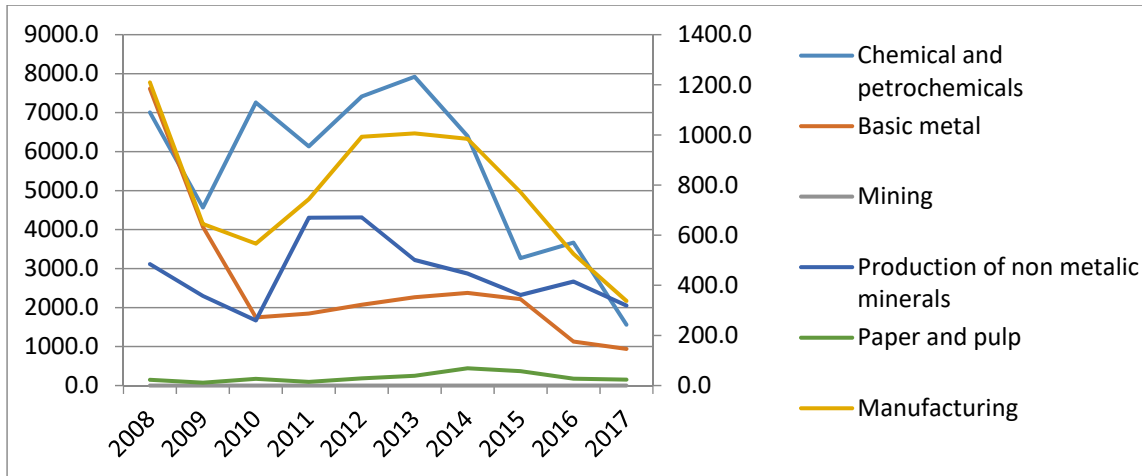


Figure 4-10. Activity based energy intensity, MJ/USD PP2010

Upon having energy intensity data as per industrial activities, it is possible to compare the energy efficiency indicators pertaining to Azerbaijan with other countries subsequent subsector energy efficiency indicators. Due to availability of activity based energy intensity indicators for IEA member countries from 2010 through 2017 years, national activity based energy intensity comparison is also taken for the same time period and compared with other world countries.

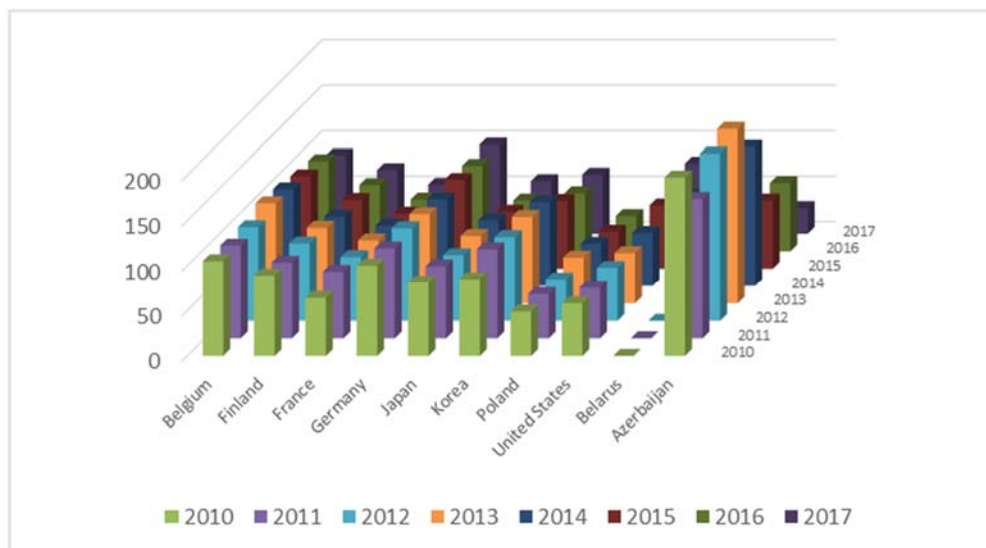


Figure 4-11. Energy intensity in chemical and petrochemical industry, 2010-2017

Comparison is made with Belgium, Finland, France, Germany, Japan, Korea, Poland, US, Belarus and Azerbaijan. Having a glance at above figure where the energy intensity indicator of Azerbaijan is compared with the same indicators for the various world countries for chemical and petrochemical industrial sectors, we observe extremely high energy consumption per unit of value added in this industrial sector in Azerbaijan from 2010 through 2015 years. This is mostly related with cheap energy prices in the country, which does

not stimulate industrial incumbents to take energy efficiency measures at all. But the government has changed its policy on this regard since 2016, started to intervene on this point and made pressures over the industrial sectors to take relevant energy efficiency measures which of course had serious impact in reduction of energy consumption in these sectors, as could be seen from the below figure. Energy intensity seriously dropped since 2016 years related with economic crises started in 2015 years. This is also associated with ceasing operation for those processes that are high energy intensive and do not recover their costs. In the situation where the enterprises do not operate at their full capacity, being operated only non energy intensive processes and manufacturing, does not provide real picture on the energy intensity of the relevant subsector at all. To this end, 2010 -2014 years energy intensity could be taken for benchmarking purposes which shows real picture of energy intensity in the country. According to the comparison of figure pertaining Azerbaijan we found out that there is 50% energy saving opportunity in this subsector of the industry. Adoption of energy management systems in this sector can yield about 50% energy saving.

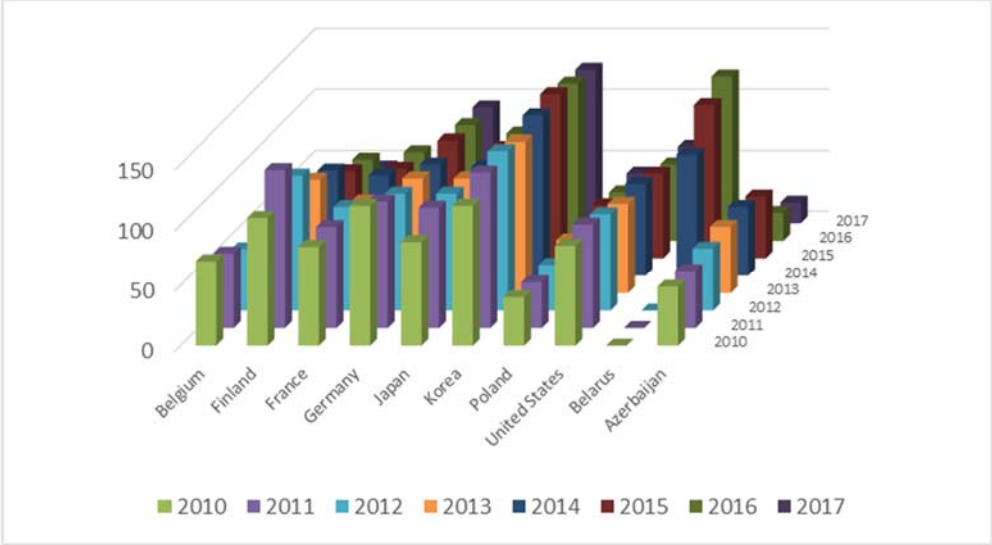


Figure 4-12. Per value added energy intensity of basic metal industry

As could be seen from the above Figure 4-12, where the comparison of energy intensity indicators during 2010-2014 of basic metal subsector in Azerbaijan given, we can conclude that this subsector is quite energy efficient and adoption of energy management systems here will not yield much saving here.

Manufacturing sector of Azerbaijan is also energy efficient due to employment of high energy efficient technologies as could be seen from the figure 4-13.

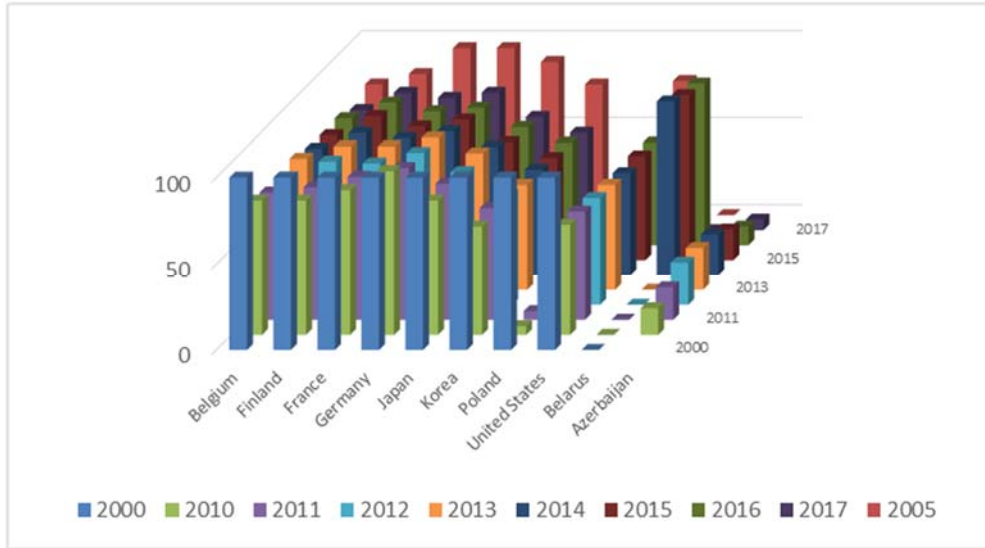


Figure 4-13. Per value added energy intensity of manufacturing sector

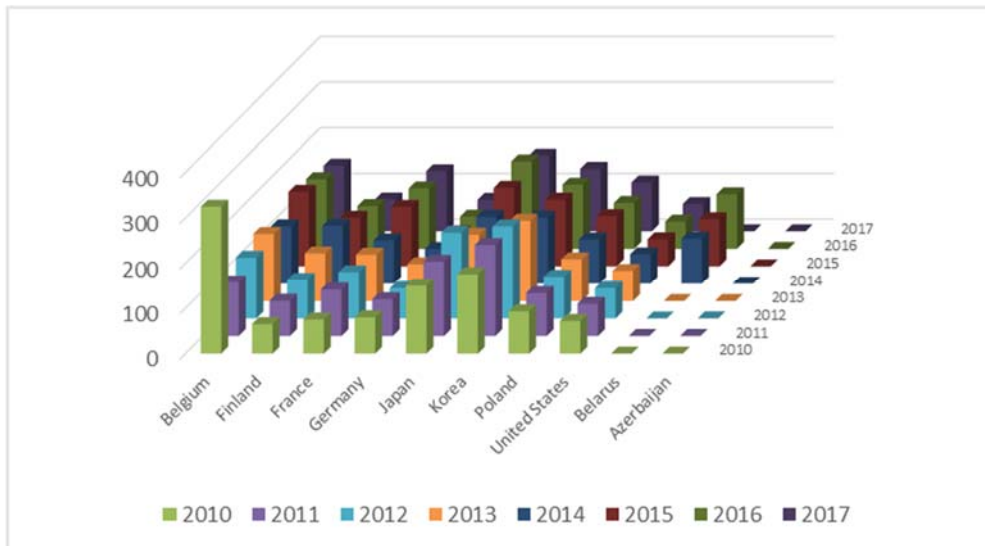


Figure 4-14. Per value added energy intensity of mining sector

As mentioned above, mining sector of Azerbaijan is extremely energy efficient due to inclusion of oil and gas production into the value addition of this subsector.

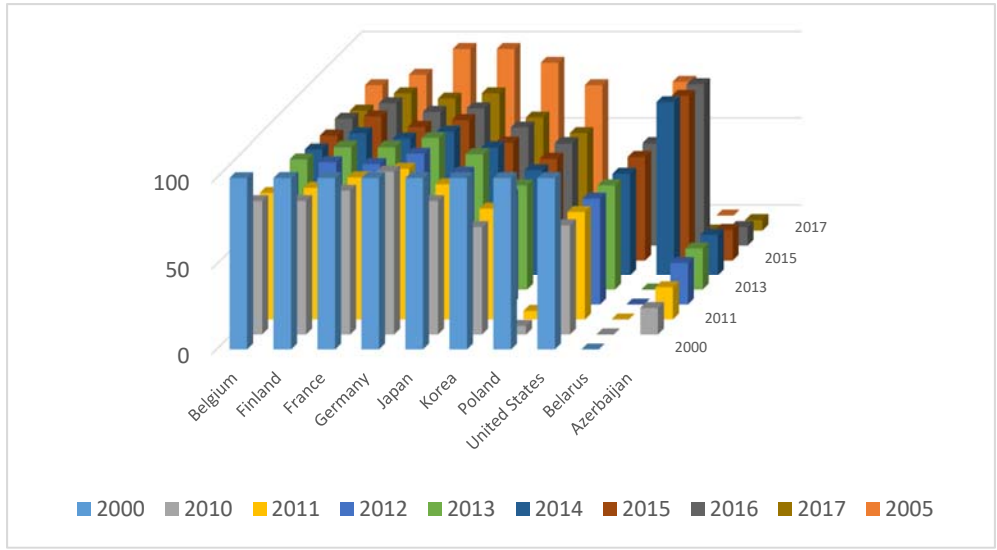


Figure 4-15. Per value added energy intensity in non metallic minerals

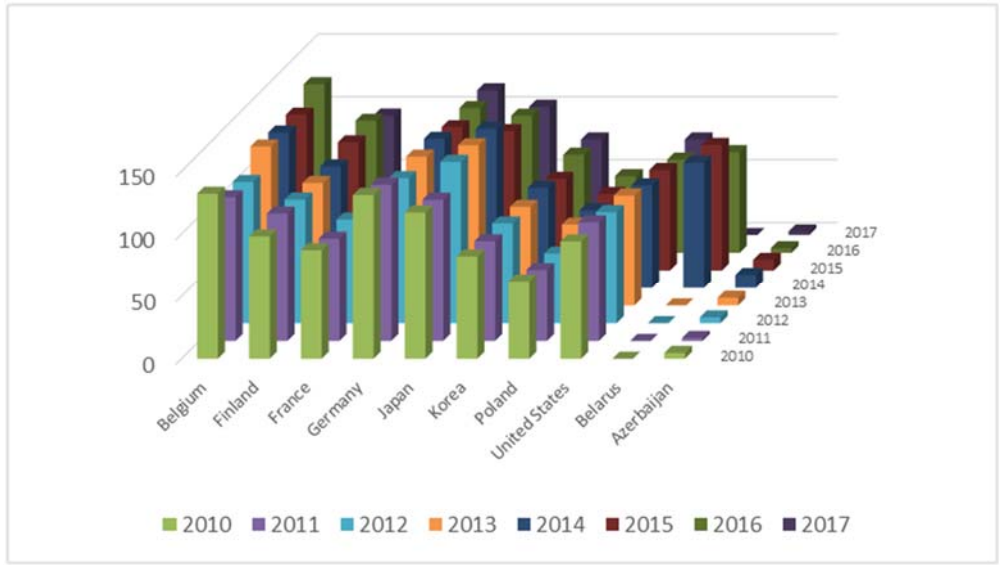


Figure 4-16. Energy intensity of paper and pulp industry

Comparison of energy intensity indicators of paper and pulp and non metallic minerals subsectors with world countries relevant indicators does not show existence of much energy saving opportunity in these subsectors of Azerbaijan.

From the concerned industrial subsectors, it is found that there is significant amount of energy saving opportunity in chemical and petrochemical industry of Azerbaijan. Adoption of energy management system in this industrial subsector can yield about 50% savings of the present final energy consumption.

5. Discussion and Conclusion

5.1 Introduction

This final chapter presents conclusions of the main findings obtained in the Chapter 4 through the analysis of qualitative and quantitative information. Based of which research questions established for this paper is answered in the course of development of this study.

Major research questions for this study are:

What is the effective policy path to energy efficiency in the energy intensive industrial sectors of Azerbaijan?

Minor research questions are:

To what extent the regulatory authorities can facilitate and support adoption of energy management systems?

To what extent government mandatory regulation may reach effective adoption and bring the expected benefits?

What is the energy saving potential of the concerned energy intensive sectors of Azerbaijan?

What are the key factors affecting energy demand in the concerned industrials sector?

Moreover this chapter will discuss implications of this study to theory, practice and indicate limitations of this study including recommendations for future research.

5.2 Summary of Findings and Conclusions

Serious barriers exists to energy efficiency in the local market today. Energy is cheap and accessible due to abundancy oil and gas resources in the country, see Annex 9. Large industrial organizations are state owned enterprises which receive subsidies from the Government due to their low or no profitability (Administration, 06.12.2016). In this context, there is no motivation to voluntary engagement to EnMS as per the interview results with the executives from accreditation organization, see Annex 7. Accordingly, Government intervention is seen as necessary to regulate the process.

EE law has been drafted and submitted to adoption of GoA (Draft Law of Azerbaijan Republic on Efficient Use of Energy Resources and Energy Efficiency, 2018). It is almost at the final stage of its adoption. But due to differences to introduction of EnMS as mandatory between the energy policy making institution which is Ministry of Energy and industry policy making institution which is Ministry of Economy, Ministry of Energy `s related proposals do not find its approval at government level and accordingly causes significant delays in moving forward with development of action plans and measures in this direction. Ministry of Economy is protective towards the industrial organizations operating in the country as being aware of challenges faced by the local industrial sector today, and realize the need for additional investment and additional challenges

to reach energy efficiency in the country in the existing condition of the market. On the other hand, Ministry of Energy bears commitment to make energy efficiency measures be implemented countrywide to reach committed climate change goals and objectives. Ministry of Energy is closely cooperating with international organization in this direction and receive their support in development of national energy efficiency action plans for Azerbaijan.

Bearing in mind existing differences between the key policy making institutions and challenges faced by the industrial organizations after analyzing existing situation in the local market, the concept for adoption of EnMS by GoA should be fostered so that it caused no challenge for industrial incumbents but be supportive and motivating enough to facilitate the transition period and become attractive not only for large energy intensive organizations but also for the SMEs as well. A conceptual model has been worked out by the researcher for introduction of energy management program for the energy intensive organizations in the country which would serve as policy pathway for Azerbaijan, see Annex 14. With this model, the researcher answered the key research question in this paper which is "What is the effective policy path to energy efficiency in the energy intensive industrial sectors of Azerbaijan?". The small survey results, performed by the researcher that discloses preference and need of the incumbents. Furthermore, the review of world countries practices with similar industrial concerns that had applied measures with high impact provides serious ground for the researcher to assume effectiveness of the proposed policy pathway by the researcher in this study. A range of policy measures can produce greater industry energy efficiency gains as per the IEA Efficient World Strategy Outlook (IEA, Energy Efficiency 2018 , 2018). The effective policy pathway proposed by the researcher is as follow:

PRESCRIPTIVE POLICY:

Norms and standards.

1. Adopt Energy Efficiency Law, mandate energy audit for every 4 years interval;
2. Issue normative legal acts by the Cabinet of Ministers stipulating requirement of holding energy audits and employment of energy managers for the organizations with 1000 TOE annual energy consumption; Align Azerishq JSC, key electric utility company into the process where they can perform walk through audits for big industrial organizations free of charge where the scope of audit includes objects of large energy uses: big motors, boiler houses, etc.; Authorize Azerishq JSC energy audit team be equipped with energy saving measurement tools and provide measurements in the areas where the energy saving with approximate quantities are seen.
3. Issue rule of conducting control over the organizations for holding energy audits where the requirements for the competence for internal and external auditors, their certification, the rule of holding energy audits, the rule of certification of energy managers every four year shall be prescribed. Its control shall be implemented by AERA (<http://www.aera.gov.az/az/>, n.d.); Identify minimum competence and capacity

requirements for energy auditors including EE measuring tool kits as well – List of tool kits is given in the Annex 9.

4. Initiate mandatory application of EnMS after 4 year period.

5. Establish minimum energy efficiency standards for the equipment and devices.

Initiate voluntary energy efficiency agreements between small and medium size enterprises and Ministry of Energy. Definition of small and medium size organizations is given in the Annex 10. Within this agreements, GoA shall propose different packages as per preferences of the small and medium size industrial organizations.

Small and medium size industrial organizations



Figure 5-1. Energy Efficiency packages for small and medium size industrial organizations

ECONOMIC:

Prescriptive policies are effective if it is combined with economic/financial incentives.

Energy Efficiency Fund – Establishment of energy efficiency fund and easy accessibility by incumbents will generate expected stimulus to implementing energy efficiency measures.

Tax credits/Tax reduction/Tax on inefficient appliances/Acceleration of Depreciation. Establish mechanisms for application.

Grants /Subsidies/Soft loans. Define level of subsidies and grants for holding energy audits, training and benchmarking activities.

INFORMATION:

Promotion. Promotion of energy efficiency projects, EE fund, external energy audit services, certified energy managers. Promotion of voluntary application of EnMS,

Labelling. Labeling the organizations that holds energy audit services and implements defined energy saving projects as green. Recognize them as environmentally friendly organizations. Work with Ministry of Ecology and exempt them from their periodic inspections.

Networking: Establish network of energy efficiency through use of social media, dedicated websites, provide case studies of other countries in this field. Discuss difficulties and barriers of organizations and provide way how to overcome it. Provide online calculators for energy efficiency.

Technical assistance. Technical assistance could be sought from international donor organizations in the field of supporting organizations with technical, economic and managerial support. Technical support: Provide guideline in tracking, metering energy throughout the organization. Provide technical knowledge how to calculate energy consumption for relevant fields.

Start growing energy managers at the universities at graduate and post graduate level of education.

Economic support: Provide easy guidance how to prepare cost-benefit analysis for projects that need external financing. How to calculate energy efficiency and establish baseline.

Managerial support; Leadership, ownership, team building and team working, and aligning employees around the ENMS. Develop Guidelines and Handbooks for energy auditors, energy managers.

Having all the economic and information support does seems feasible within the short time period for implementation by the Government of Azerbaijan considering existing pace of the key policy making institutions and existing constraints of them in terms of need for capacity building and development. On the other hand knowing that voluntary policies yield high commitments, the researcher proposes offering policy packages for industrial incumbents for optional selection of industrial incumbents as per their needs as immediate action shortly after the adoption of energy efficiency law for the large energy intensive organizations. The whole concept of adopting effective energy management program is given in the Annex 14.

Energy intensive industrial organizations

annual energy consumption > 1000 TOE

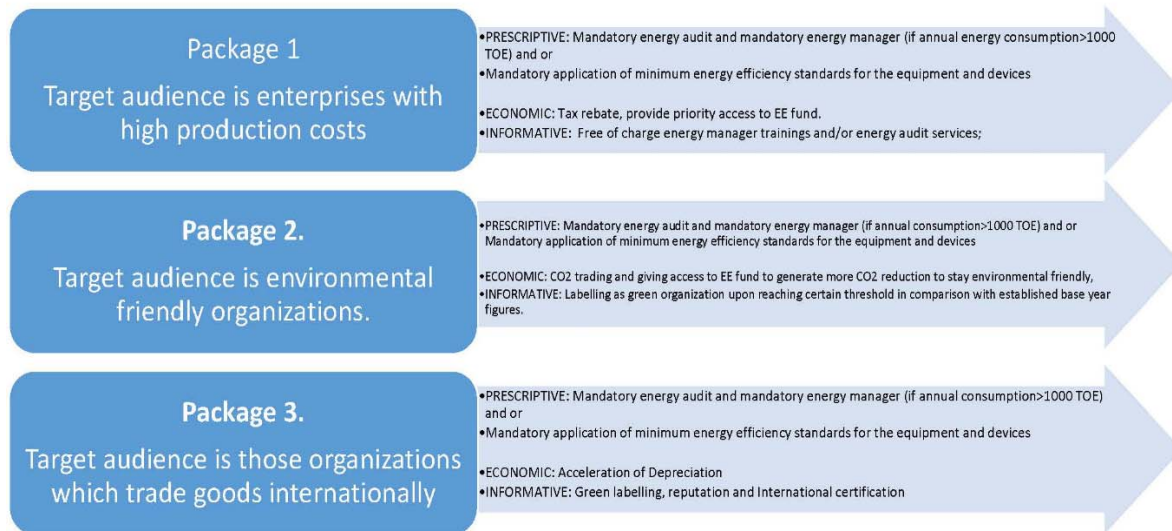


Figure 5-2. Energy efficiency policy packages for energy intensive industrial organizations

The research questions “To what extent the regulatory authorities can facilitate and support to adoption of energy management systems?” is answered with the interview answers [6,7,12] by the executive official of key policy making institution. The key policy making institution is in need for capacity building and development for establishing EnMP with due support and incentives to the whole process. Due to Government commitment in this area, and intensive collaboration with EU Energy Charter, they will receive intensive support to fill this gap and facilitate the whole adoption process.

The research question “To what extent government mandatory regulation may reach effective adoption and bring the expected benefits?” is answered with the interview question [11]. As it become clear from the interviews with the executives of the accreditation companies in Azerbaijan, interest to energy efficiency is very low having the cheap energy prices and accessible energy and with no Government intervention today. Government intervention is paramount to regulate the market and achieve the expected outcome. As per the analysis of IEA, mandatory energy efficiency policies covered over 35% of global industrial energy use (IEA, Energy Efficiency Outlook, Analysis and Outlooks to 2040, 2018). This is where the Azerbaijan has to launch an energy efficiency program to be supported with range of other policies. Mandatory energy audit shall become a bridge to energy management systems in Azerbaijan. It would generate strong commitment before the industrial incumbents, if it is supported with the other polices and if existing gap in terms of capacity building and development is filled in the local market in the relevant field.

The research question "What is the energy saving potential of the concerned energy intensive sectors of Azerbaijan?" is answered through the quantitative analysis of energy saving opportunity of national industrial sectors and be benchmarked with other countries. It become clear that there is significant energy saving opportunity in the chemical and petrochemical industry of Azerbaijan, about 70 kTOE annually.

The research question "What are the key factors affecting energy demand in the concerned industrial sector?" is answered using the Laspeyres decomposition method. As a result of analysis we find out that activity effect had great role in increase of energy demand during the period of 2008-2017 years in the concerned industrial sectors of Azerbaijan. The role of intensity effect worth noting as well in the change of energy demand as well.

5.2 Implications for the theory

This research develops a model of policy pathway for introduction of energy management systems effectively in the industrial sector of Azerbaijan that would achieve significant support and commitment of industrial incumbents and their commitment and contribution into the process. The model provides optional selection of energy efficiency packages as per preference of large, small and medium size industrial organizations considering their preference: cost sensitive, environmental friendly and international trade oriented. Industrial incumbents will become committed to their selection as per their preferences and in this case the level of commitment will be higher than otherwise provided policy pathway. This model could be developed and refined further through more exploratory study in terms of increasing the number of bundled packages on the base of additional research for classification of industrial incumbents.

5.3 Implications for the practice

Based on these findings of this research, implications for practice are summarized as follows;

- Industrial organizations will gain an opportunity to benefit from of this program and stay committed to their obligations.
- Moreover, the process will allow industrial organizations not only decrease energy costs. The process itself shall yield resource efficiency and process improvement.
- The suggested model will serve to enhance the coordination among key policy making institutions as well in terms of introduction of EnMP and achieve support by the GoA.
- Ministry of Energy will be able to establish energy management program based on the proposed conceptual model.
- The proposed concept as whole has great practical importance in terms introduction of energy management policy by the Government of Azerbaijan.

5.4 Future research

The purpose of this study is to define the most effective energy policy pathway for introduction of energy management system in the industrial sector of Azerbaijan. The purpose of this study is to eliminate existing differences between the key policy making institutions in the country for introduction of energy management and propose the most effective policy path that would satisfy expectations of key stakeholders and achieve high commitment of the industrial organizations. The challenges faced throughout the development of this paper and with the aim to eliminate them for future research purposes and upgrade the quality of this research, followings are recommended:

In the light of faced challenges during the primary data collection process with industrial organizations, where the respondents expressed their difficulty for filling the questionnaire due to less knowledge about the EnMS and their hesitation about the sharing any relevant information even the information requested was quite general and not quantitative, Ministry of Energy is recommended to immediately starts promotion of EnMS in the country with the help of relevant guidelines and information brochure and take measures towards the raising awareness towards the EnMS. Here role of dedicated social media is also appreciated.

Moreover, Ministry of Energy is also recommended to facilitate elaboration of benchmarking data for the different industrial activities within the EnMP.

Although collected primary data derived from the key stakeholders through the survey within this study was to identify their key expectations and drivers to adopt EnMS, the primary data about the content of the proposed policy packages which were compiled based on the best world practices, could be studied further with the local industrial incumbents in future.

Moreover, it is recommended to extend the boundaries of this study for future research in terms of identification of the most effective energy saving measures in different industrial sectors of Azerbaijan as well and propose high risky and less risky ones in terms of achieving best results.

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Annex 1. Skill profile for energy project/Program Management

Skill Profile for Energy Project/ Program Management

Table 2. Critical Work Functions and Key Activities – Energy Project/Program Management

Energy Program/Project Management							
Critical Work Functions	Key Activities						
A. Manage people	A1 Provide mentorship & training	A2 Fulfill staffing needs	A3 Coordinate stakeholders (vendors, clients, departments)	A4 Conduct project/ program Support	A5 Perform problem solve/conflict resolution	A6 Supervise, delegate tasks, evaluate performance	A7 Manage third parties
B. Manage budgets	B1 Achieve staffing, resource & equipment management	B2 Manage project schedule	B3 Forecast resource & budget impact	B4 Perform regular program/ project cost analyses	B5 Evaluate effectiveness of project/program	B6 Prepare & manage third party contracts	
C. Develop & implement proposals	C1 Establish scope of work schedule & budget (define exclusions)	C2 Establish project goals, criteria, & deliverables	C3 Identify potential opportunities	C4 Write & present proposals	C5 State professional qualifications for proposal	C6 Coordinate Stakeholders (vendors, clients, departments)	C7 Facilitate project implementation
D. Educate & Train	D1 Vendor education & information exchange about technologies	D2 Pursue professional development/ licensure & certifications	D3 Train clients on installations/ systems	D4 Conduct outreach& advocacy for energy conservation	D5 Mentor direct reports and colleagues	D6 Regularly assess & implement needed training	
E. Direct research, analysis & assessment	E1 Walk through and visually assess sites (facilities/ energy systems)	E2 Perform energy calculations/ modeling	E3 Generate energy conservation measures	E4 Conduct climate analysis	E5 Assess building operations using data logger	E6 Perform utility data analysis	
F. Coordinate external funding & incentives	F1 Research public policy constraints and opportunities	F2 Organize available local & utility rebates & incentives	F3 Coordinate government resources and funding	F4 Leverage tax incentives	F5 Synchronize third party bank financing		
G. Communicate	G1 Track & document work	G2 Perform internal & external Reporting	G3 Facilitate communication among stake holders	G4 Market & promote services and programs (internal & external)	G5 Ensure consistent messaging to clients and the public	G6 Build professional relationships (internal & external)	G7 Manage and document team meetings and actions.
H. Meet regulation policies, codes & standards (internal & external)	H1 Assure quality control	H2 Promote safety awareness	H3 Develop standards & policies as needed	H4 Adhere to professional ethics & company expectations	H5 Promote awareness of regulations, policies, and standards among stakeholders		

Summary of Skill Rankings by Critical Work Function

Skills associated with each critical work function are listed in order of priority, based on the average scores given by the SMEs who participated in the focus group process. Detailed charts of these skill rankings are provided in Appendix A.

Table 3. Skills Rankings by Critical Work Function – Energy Project/Program Management

Critical Work Functions and Associated Skills		
A: Manage People	4. Technology knowledge	13. Metering experience
1. Communication skills: presentation and writing	5. Cost analysis	14. Ability to use and maintain equipment
2. Technical competence	6. Team coordination skills	F: Coordinate External Funding and Incentives
3. Motivate people	7. Strategic thinking	1. Knowledge of funding programs
4. Leadership	8. Resource needs	2. Communication
5. Delegation	9. Creative thinking	3. Rapport with external parties
6. Organizational skills	10. Presentation skills	4. Financial acumen
7. Self-starter, self-motivated	11. Sales ability	5. Spreadsheet skills
8. Time management (prioritize effectively)	12. Stakeholder coordination skills	6. Knowledge of current energy code
9. Conflict resolution	13. Research	7. Math skills
10. Team building skills	14. Interviewing skills (as proposer)	8. Organization skills
11. Ability to provide constructive feedback	D: Educate and Train	9. Negotiation skills
12. Understanding personal work styles	1. Communication	10. Technical writing skills
13. Recognize employees' performance	2. Technical expertise	11. Knowledge of policy context
14. People sense	3. Ability to identify staff skill needs	G: Communicate
15. Strategic thinking	4. Education resources and tools	1. Ability to build and foster relationships
16. Accessibility (open door policy)	5. Presentation	2. Customer outreach
17. Ability to identify staffing and skill gaps	6. Organizational development	3. Listening skills
18. Counsel and advise	7. Track technology trends	4. Technical writing
19. Ability to estimate hours to perform tasks	8. Educational strategies	5. Email skills
B: Manage Budgets	9. Vendor relations	6. Phone skills
1. Excel spreadsheet	10. Provide feedback to employees	7. Presentation skills
2. Technical competencies about the work	11. Coordination skills	8. Negotiation skills
3. Communicating and documenting budgets	12. Multicultural understanding	9. Organizational skills
4. Estimating costs	13. Post-training assessment	H: Meet Regulations, Policies, Codes and Standards (Internal & External)
5. Strategies to stay within budgets	E: Research, Analyze and Assess	1. Knowledge of codes
6. Estimating hours	1. Technical knowledge	2. Knowledge of regulations
7. Matching employee skills to task	2. Analytical skills	3. Knowledge of standards
8. Math skills	3. Building systems technical knowledge	4. Analysis and interpretation
9. Basic accounting skills	4. Specialize software skills	5. Research skills
10. Ability to identify gaps	5. Applied physics	6. Integrate into design/documentation
11. Understanding 3rd party capabilities	6. Math skills	7. Communication
12. Market analysis	7. Spreadsheet skills	8. Negotiation skills
13. Comparative analysis	8. Plan reading/understanding	9. Understanding of industry best practices benchmarking
C: Develop and Implement Proposals	9. Brainstorming skills	10. Presentation skills
1. Technical writing skills	10. Communication	11. Corrective action
2. Systems knowledge	11. Economic analysis (LCCA)	12. Post-mortem training (lessons learned)
3. Concept development	12. Data management skills	

Source. Skill profiles for energy management occupations, Energy project /Program management and commercial building energy analysis. Including: The Use of industry defined skill sets to assess energy curriculum and programs& development and application of Core Skills Analysis Tool (CSAT), June 2014

Annex 2. Energy saving effect on profit

20% Energy Savings Table shows revised profit value										
Original Profit Margin	Energy Cost % of Total Operating Cost									
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1%	1.2%	1.4%	1.6%	1.8%	2.0%	2.2%	2.4%	2.6%	2.9%	3.1%
2%	2.2%	2.4%	2.6%	2.8%	3.0%	3.2%	3.4%	3.7%	3.9%	4.1%
3%	3.2%	3.4%	3.6%	3.8%	4.0%	4.3%	4.5%	4.7%	4.9%	5.1%
5%	5.2%	5.4%	5.6%	5.8%	6.1%	6.3%	6.5%	6.7%	6.9%	7.1%
10%	10.2%	10.4%	10.7%	10.9%	11.1%	11.3%	11.6%	11.8%	12.0%	12.2%
20%	20.2%	20.5%	20.7%	21.0%	21.2%	21.5%	21.7%	22.0%	22.2%	22.4%
30%	30.3%	30.5%	30.8%	31.0%	31.3%	31.6%	31.8%	32.1%	32.4%	32.7%

Table 0-1. Energy Saving Effect on profit. (Turner, 2013)

Annex 3. Formulas for growth rates, energy elasticities and energy intensities

Indicator	Formula	Parameter description
Year-on-year growth rate	$a = (E_{t+1} - E_t)/E_t$	Where a = annual growth in demand, E_{t+1} = energy consumption in year $t + 1$ and E_t = energy demand in year t
Annual average growth rate over a period	$E_{T1} = E_{T0}(1 + a_g)^{(T1 - T0)}$ $a_g = \left(\frac{E_{T1}}{E_{T0}}\right)^{1/(T1 - T0)} - 1$	Where E_{T1} = energy demand in period $T1$ and E_{T0} = energy demand in period $T0$, a_g = annual growth rate
Demand elasticities	$e_t = \frac{(\Delta EC_t/EC_t)}{(\Delta I_t/I_t)}$	Where t is a period given EC is energy consumption I is the driving variable of energy consumption such as GDP, value-added, price, income etc. Δ is the change in the variable
Energy intensity (for a single energy)	$EI_t = \frac{E_t}{I_t}$	EI_t = energy intensity for year t , E_t = energy consumption in year t and I_t = value of the driving variable (say GDP or value added)
Energy intensity in case of aggregated fuels	$EI_t = \frac{\sum_{i=1}^n E_{it}}{I_t}$	Where E_{it} = energy consumption of i th type of fuel in year t

Source: (C.Bhattacharyya S. , Understanding and Analysing Energy Demand, 2011)

Annex 4. Key stakeholders

Key institutions for application of energy management systems in industrial sector of Azerbaijan are:

Ministry of Energy is engaged in preparation of fuel and energy balance for the country, performs supervision over utilization of energy resources efficiently, execution of state programs for perspective development of energy sector in Azerbaijan, pursue energy policy, develops relevant energy laws, policies, regulatory and normative acts, technical designs for energy connections, utilization and, proposes amendments to them as per the prospective progress of the sector, issues licenses for energy producers, promotes development of renewable energy sources, and executes government commitments for climate changes through development of renewable energy sources, energy efficiency and other relevant functions in energy sector.

Presently, Ministry of Energy of Azerbaijan Republic implements a lot of projects with significant importance for the prospective development of energy sector and with the aim to fill the need for and fill the existing gaps in the legislative and normative documents. Existing energy laws, regulatory and normative acts and documents do not meet the present and prospective development of energy sector, do not provide basis for grid connection from renewable energy sources, do not support energy trading relations for households, commercial entities from renewable energy sources, do not support formulation of energy markets and relations of market players and so on. The followings are key works implemented by MoE presently.

Energy Efficiency law has been developed and in the process of approval by relevant government entities. It includes principles of the state policy in the field of the efficient use of energy resources and energy efficiency, the purpose and directions of state policy in the field of efficient use of energy resources and energy efficiency, the public administration and control in the field of the efficient use of energy resources and energy efficiency, the national targets and actions plans, the energy audit, energy management systems and energy manager, the energy services, the billing for the consumed energy and the consumers awareness, the energy efficiency in the power generation, transmission, distribution and supply, the economic and financial mechanisms for the efficient use of energy resources and the promotion of energy efficiency (Draft Law of Azerbaijan Republic on Efficient Use of Energy Resources and Energy Efficiency, 2018).

Law on Renewable energy is under the development as well with due consideration and development of power purchase agreements, connection agreement, renewable energy auction rules and auction caps. Scope of the law includes the legislative framework for the promotion of utilizing renewable energy sources for generating electrical energy; the objectives and targets for the contribution of electric energy from renewable energy sources in gross final consumption of energy; the economic and organizational measures for use the electric energy generated from renewable energy sources and implementing the support schemes; the rules for integrating renewable energy sources into the national electricity market; the rules

for access of renewable energy sources to the national electricity networks, including network connection and network operation; the sources of finance for supporting the electric energy generated from renewable energy sources and the financial-economic mechanism of the support as per Draft Renewable Energy Law (Draft Law of the Republic of Azerbaijan on Generation of electrical Energy from Renewable Energy Sources , 2019). It will consider feed-in tariffs for renewables.

Development of long term energy strategy until 2050 years is on process with due consideration of development of long term energy strategy, identification, analysis and ranking of the strategic options; reporting on selection of strategic options, identification of strategic goals and specific targets

Recently, guideline for energy efficiency has been developed for heavy industry and machine building sectors in close cooperation with Ministry of Energy and Azerishiq JSC, the electricity utility company in Azerbaijan (<http://minenergy.gov.az>, n.d.).

Azerbaijan Energy Regulatory Agency under the Ministry of Energy (AERA) was established on December 22, 2017 as per the Presidential Decree to perform functions of tariff formulation and investment promotion in energy sector, develops energy price policies, analyzes electricity tariffs subject to state regulation¹, performs controls for compliancy with energy rules in energy intensive industrial enterprises, formulates and promotes energy efficiency measures, and promotes electricity generation diversification, and relevant investment promotion, issues the permits for approving the third-party access of new facilities to the electricity grid and natural gas lines (<http://www.aera.gov.az/az/>, n.d.).

Ministry of Economy is engaged in performing economic and industrial policy in the country. It prepares and implements social and economic development programs; proposes and supervises economic reforms, formulates and executes tariff policy, approves investment proposals and promotes export policy, involves in implementation of state investment programs, performs supervision over industrial sector and prepares and implements proposals for development of industry in Azerbaijan and other relevant function (<https://www.economy.gov.az/>, n.d.).

Azerbaijan Standardization Institute, AZSTAND was established on April 17 2017 with the Presidential Decree No.1234 as national standardization body of Azerbaijan Republic (<http://www.azstand.gov.az/>, n.d.). Key functions of the organization are as follows: develop and publish state standards, specifications, field work standards, national classifications and standards catalogues; dissemination of national and international standards, respecting copyrights and control copyrights protection in the territory of Azerbaijan in accordance with ISO POCOSA; Management of the state fund of normative documents on standardization; Development and control execution of annual work plans for standardization considering offers of state bodies, private sector and interests of consumers (<https://www.iso.org>, n.d.). There is no

¹ Electricity tariffs subject to state regulation: generation, wholesale, transmission, retail, and import & export.

locally developed energy management standards due to lack of the relevant state policy on mandatory application of energy management systems, and or incentivized mechanisms for application of energy management systems.

Accreditation of ISO managements standards is being implemented by TSE Turkish Standards Institute, Bureau Veritas having representative offices in Baku, Azerbaijan.

Annex 5. Proportion of aggregated value added of industrial sector in GDP

Values	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total value added of industrial sector, million AZN	23574.0	17510.2	21942.2	28010.7	27040.4	26441.7	24169.4	17912.4	22398.0	28087.2
Gross Domestic Product, million AZN	40137.20	35601.50	42465.00	52082.00	54743.70	58182.00	59014.10	54380.00	60425.20	70337.80
Proportion of gross industrial value added in GDP	59%	49%	52%	54%	49%	45%	41%	33%	37%	40%

**Annex 6. Interview with Alasgar Hasanov,
Head of Energy efficiency and Ecology Department, Ministry of Energy**

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1. What is the present direction of GoA in terms of energy efficiency and efficiency management policy? Where we are now with adoption of energy efficiency law?

Energy efficiency law is in final review process by the Presidential administration presently. We receive some comments from them and try to respond them on timely basis. There were some disagreement with indication of thresholds identified for the mandatory adoption of energy audits and energy managers, to this end, those thresholds are removed from the law but they will certainly be included into the regulatory acts issued by Cabinet of Ministers which will follow upon adoption of the law. MoE will formulate the EnMP shortly after adoption of law. In general, a law adoption process here in Azerbaijan itself is time consuming process as it passes through review of several organizations and we hope that it will be submitted to Presidential signature soon.

2. What are the key challenges in pursuing of energy management policy today? Why so much delay with this law? Is there any serious issues with adoption process?

It should be noted that government is well aware of the today`s challenges lived by the local industrial organizations. They are:

- a. -lower profitability of the industrial organizations
- b. -low access to energy efficiency related investments
- c. -lower awareness of industrial sector
- d. -lack of local capacity
- e. -lower competitiveness of produced industrial products
- f. -lack of promotion, support and incentives by the Government
- g. -lower energy prices

Government on one side does not want to complicate the situation for them as GoA is interested in growth of non oil sector in the country and pursuing dedicated policy for involving foreign investment in Azerbaijan. And on other hand, we realize importance of energy efficiency measures today in order to reap the benefits in the near future. This is somehow challenging situation today but we will overcome it gradually.

3. In the draft energy efficiency law it is indicated the enterprise with annual 1000 ton oil equivalent has to employ mandatory energy managers and hold mandatory energy audits for the enterprises? How did Ministry determine this threshold what criteria does it rely one?

Actually it has been removed from the energy efficiency law but we plan to include this threshold in the regulatory acts to be issued following adoption of energy efficiency laws. This threshold has been developed based on the review of the practice of the world countries advanced in this direction.

4. Do you think that we have energy managers and energy auditors with necessary competencies? How are you going to grow them?

This point is one of the challenges before us. We need to work intensively on this direction. As you know that there are technical specialists in the organizations which is supervised by the technical directors and or chief engineers. They supervise all the technical issues in the organizations and even I would say that some efficiency measure are being implemented by the organizations today but not in systematic manner and limited to current operations like as switching off unnecessary motors and switching off lights, etc . But unfortunately these measures are not forward looking and usually restricted in controlling existing operational activities to avoid unnecessary energy consumption. There is no planned investments for energy management purposes. On the other hand, decisions to be made on medium size and big investments are risk taking activity, feasibility study for the project need to be carried out. Of course, this is one of the priority before us, we plan to work with several institutions including universities as well.

As to energy auditors, the same is applicable for energy auditors as well. Growing and certifying them are the one of the key targets before us.

5. Energy efficiency law shows that you have to attest the energy manager for the mandatory energy management programs for in the industrial organization? Does the Ministry has the already formulated the criteria for attesting energy managers? Does the Ministry has the capacity to lead the process?

Another work to do, which is also the requirement of the energy efficiency law is to attest the energy managers. MOE is going to hold dedicated trainings and at the end of the process, to grant certificates based of which they will be able operate as certified energy managers in the industrial organizations. In the initial stage, this will be recognized within the country, but we will work over the recognition of mentioned certificates in the world countries. Capacity of Ministry of Energy is limited in this direction but we will receive support of local and international organizations.

Have you studied local market in this specialization? Preliminary analysis shows that there is limited capacity locally but market needs to be matured in order to grow. With adoption of energy efficiency law, the process will start.

6. How are you going to verify and track the energy efficiency amount achieved by the target organizations with mandatory energy managers?

There is no worked out mechanisms in this direction yet, but of course, this will be one of the questions need to be covered by MOE in the implementation stage of this law.

7. How are going to make it attractive enough for the target audience for eg., industrials sector of Azerbaijan?

GoA is going to develop EnMP which will drive, incentivize, support the implementation process. Establishment of energy efficiency fund is also in the list but we are reviewing the sources of energy efficiency fund.

8. What do you thing how long the process is going to last from now on? What will be the following step by Ministry of Energy as key energy policy administering authority?

The law is passing its last stage of approval. From now on, the most probably 0.5 year. Upon adoption of the law, required legislation and other regulatory acts shall be developed. We realize that market needs to grow. We also live challenge of dilemma mandatory energy audits and

mandatory energy managers. Since it is the new concept for the local market, we will have to grow together with market until we are ready to apply the whole concept.

9. What is your key priority in adoption of EnMS by industrial organizations for GoA today?

To bring less concern to industrial sectors but achieve maximum output in this field. Maximum support, intensive trainings will facilitate the adoption process.

10. How GoA is going to settle the dilemma of energy management systems or energy audit?

As mentioned above, key challenge before us is to grow the market to adoption process. Serious efforts shall be required to make it done. Local market needs maturing to adoption of the energy management systems in full concept. Until that time mandatory energy audits shall play a role of bridge to energy management and market will become mature in the process of implementing energy audits. To this end, action plans shall be developed and be implemented in step by step.

11. To what extent government mandatory regulation may reach effective adoption and bring the expected benefits?

World countries which were successful in mass implementation of EnMS already passed this pathway and is reaping the benefits of their efforts. We are new beginners in this road and we will grow with the process. Advantages of this management systems will attract attention of industrial organizations quickly which are;

Direct economic return, cost competitiveness, energy security and environmental compliance with reduction of CO2 emissions.

12. And the last question. How are you going to support energy management systems? Do you have any planning on this point?

We continue working with Energy Charter on this direction and is going to develop National Energy Efficiency action plan. We are reviewing various supporting mechanisms. Establishment of energy efficiency fund is among them. Source of fund is being determined. That's all.

Thank you Alasgar muallim!

Annex 7. Interview with Jalal Guliyev, auditor
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1. Do you have clients who express interest to ISO 50001, the energy management systems? Where does this interest come from? Is it a requirement of head office or international clients or company's own interest to adopt EnMS through realizing its benefits.

-There is very low interest to EnMS presently in the country, just 3 of our clients in total expressed interest adoption of EnMS. All three of them are energy intensive organizations. Their interest to this managements systems come from both, the requirement from head office and also voluntary engagement through realizing its benefits.

2. Is any of them already certified? What were their challenges in adoption process.

Yes, one of them is already certified and we even visited them once for holding audit. The process itself is very challenging it requires active work by the organizations. The key challenge the companies face today is associated with lack of technical skills in the relevant field. This management systems require more technical skills and holding intensive measurements and energy audits. Due to lack of technical skills, main challenge arise with calculation of energy saving amount in the identified measures. And we work with clients on this direction.

3. What is the reason of so low interest? Do you carry out any works in the direction of awareness of top managers of this managements systems and their benefits from the engagements. and dissemination of relevant information,

Of course, we promote this EnMS in the companies in the face-to-face meeting, distribute information bulletins on this management systems. The low interest is mostly related with lack of government policy, promotion, incentives and support in this field. We usually explain quick and direct return of this management systems, but majority of top managers found adoption process very challenging. They need more support.

Interview with Gülhan YÜZEREROĞLU, representative executive

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+9945040617111

1. Do you have clients who express interest to ISO 50001, the energy management systems? Where does this interest come from? Is it a requirement of head office or international clients or company's own interest to adopt EnMS through realizing its benefits.

- Interest to this management system has increased recently but not in mass amount. The interest is mainly related with change initiates in the organizations and drag the production costs to down by the companies themselves to become cost competitive. All of them are industrial energy intensive organizations. Thanks,

2. Is any of them already certified? What were their challenges in adoption process.

Yes, in total 2 % of our clients are already certified with EnMS as of today. But we work intensively to our clients to alleviate outstanding issues before them so that they became certified as well. The key challenge arises with tracking of energy flow within the organization. We work with them in this field mainly. This is the common issue that we face in Turkey as well.

3. What is the reason of so low interest? Do you carry out any works in the direction of awareness of top managers of this managements systems and their benefits from the engagements and dissemination of relevant information,

I would say that low interest is mainly associated with low awareness level of the benefits of this management system. We usually hold face to face meetings with our potential clients, provide relevant information. We do whatever is necessary from our side. But certainly there should promotion from the upper level, GoA should intervene and promote this management systems, motivate industrial organizations as a key target audience. At that point we are ready to facilitate adoption process.

4. How do you found quality of assigned energy managers? Are they competent enough to drive the adoption process?

Of course, the employees that are assigned to energy manager position are either too technical and or just managers. The right energy manger should have both skills. This is one of the areas that we see the need for capacity development.

Annex 8. Legal Framework

Adoption of energy managements systems in energy intensive industrial sectors and efficient utilization of energy resources are mainly based on the following legal framework in Azerbaijan:

Law on Utilization of Energy Resources (N94-IQ, May 30, 1996) – The Law determines legal, economic, social and environmental basis for utilization of energy resources and regulates relationships between the legal and physical entities. The main emphasis is given to achievement of maximum output from the utilization of energy resources with minimum human impact on the environment and the maximum mitigating efforts. It forms legal grounding for key directions of state regulations on the utilization of energy resources, application of economic and financial mechanisms for efficient of energy resources, standardization, certification, and normalization of utilization of energy resources, state energy engineering expertise, state counting, accounting and control for utilization of energy resources, international cooperation on utilization of energy resources. Law considers establishment of off-budget Energy Efficiency Fund as well. According the mentioned law, this Fund is established at the cost of obligatory charges contemplated in tariffs and prices of energy resources, fines and payments for squandering and for breach of legislation on utilization of energy resources, revenues gained from Fund's production and financial activities, volunteer contributions by legal and physical persons and other sources and is directed at the implementation of energy efficiency projects.

Law on Energy (N541-IQ, November 24, 1998) – The law provides legal base for pursuing state energy policy and building energy programs, establishment of state`s exclusive rights, control and supervision over the energy sector, efficient use of energy, obligations for protection of environment, safety and health, issuing special permits, insurances, and obligations for damages, compensation for damages, energy contracts and agreements for exploration works, development and production works, delivery, distribution, underground storage, granting rights for fixed assets. The law establishes strong commitment to provision of energy efficiency not only in production processes but also in design, installation and commissioning works of energy units and facilities as well.

With the aim to identifying strategic roadmaps for achieving development in various economical sectors for the next 4 years, the President of Azerbaijan approved several strategic roadmap, among them the followings are considered valuable and provides strong commitments before the relevant stakeholders to energy efficiency and efficient utilization of energy resources. The priorities identified in these strategic roadmaps are the key targets before the relevant state organizations to achieve in the relevant sectors. They are:

Strategic Roadmap for development of heavy metallurgy and machine building sectors in Azerbaijan approved by the Presidential decree of dated 06 December 2016. The strategic roadmap defines global trends in the relevant industries, provides overview and analysis of existing situation in the

mentioned industrial sectors, provides strategic development vision up to 2020 year and 2025 years, and focuses on the key strategic targets with due identification of priorities and measures as per targets for implementation.

Strategic Roadmap for development of utility services (electric and thermal power, water and natural gas) in Azerbaijan approved by the Presidential decree of dated [06 December 2016](#). This strategic roadmap identifies priorities in the upstream and downstream part of the utility sector for the following 4 year period. Reduction of losses in transmission and distribution of utilities, efficient use of generation facilities with main focus to increasing electricity generation from renewable energy sources, upgrading reliability and security of energy supply systems, increasing quality of utilities, application of smart metering devices with the aim to increase accountability and control, use of optimal mechanisms for upgrading efficiency in consumption, differentiation of tariffs considering peak and off hours are the key focus in the roadmap.

Annex 9. Energy Manager Profession

Having skilled and competent energy manager with managerial, technical and economic skills in the organization is the sign of success in the EnMS adoption process. Energy management profession is the new area of specialization in Azerbaijan. It requires energy management skills and competence with helicopter view over the organization. These skills are essential for any energy manager to fulfill his/her role in the organizations properly and perform and manage functions like as energy reviews, energy audits, economic and energy analysis, facility and building management, energy maintenance services, knowledge about the existing and new energy efficient equipment and technologies in the relevant field. Energy management profession should be qualified enough not only to identify energy saving potential but also guarantee energy saving amount for the organizations. This is the risk taking position in the organization and with the requirements for leadership skills and ability to manage whole change processes simultaneously.

Certification from local authorities for this profession is another challenge which could be the function of Ministry of Energy in Azerbaijan case. The new law on energy efficiency which is drafted by MoE and being under approval by the relevant state organizations defines the requirement for hiring energy manager for the enterprises with annual energy consumption over 1000 tonnes of oil equivalent. Presently, Ministry of Energy of Azerbaijan Republic does not provide proper services in capacity building and capacity development of and certification for energy managers. This is the area of development for Ministry of Energy upon adoption of the law on energy efficiency.

Presently, big companies in Azerbaijan employs dedicated technical personnel who takes cares of technical issues with machines and processes, and carry out maintenance of the energy supply systems. Direct and

or indirect supervisors over this staff are either titled as technical director and/or chief engineers. Strong leadership by technical lead positions are vitally required to manage all the processes during the application of energy managements systems.

Private sector participation in delivery of capacity building and capacity development services for growing energy managers is another challenge in the country. MoE should work with private sector on these areas intensively for development of energy manager trainers in the country.

Here cooperation with following local universities should be stressed as well. These three universities provides undergraduate and graduate educations in the relevant fields:

- Azerbaijan University for Oil and Industry (<http://www.asoiu.edu.az/az>, n.d.).
- Azerbaijan Technical University (<http://aztu.edu.az/azp/>, n.d.)
- Azerbaijan Engineering University (<http://www.beu.edu.az/az>, tarixsiz).

It should be noted that education provided by these universities quite enough as background education for growing energy managers and they can further develop themselves to obtain full scale energy manager profession through involvement of additional trainings.

The profession of energy manger is emerging occupancy for the near future in Azerbaijan market followed with adoption of new energy efficiency law and requires dynamic and extensive knowledge and competency in the relevant field. Developing effective working structure for an energy management program is the first task to do for any energy manager.

Energy manager plays central role in the energy management program which requires strong leadership skills, comprehensive knowledge on energy management and strong communications skills. It should have clear vision on managing energy in its company and make the change happen successfully. Energy manager who is the shaker of the program and pushing the activities forward to make the things happen. All activities within the program needs tight controlling, provision of resources, removal of barriers, qualified enough for taking remedy actions. Its functions are effective, productive and long lasting when it aligns personnel from the different structures. Key requirements for this position are as per the (Turner, 2013):

- Establish and maintain energy management plan
- Identify roles and functions at all level
- Build systematic unified energy records reporting systems
- Develop action plans and identify financial sources
- Provide recommendations, corrective actions and remedy measures
- Plan awareness and measure its effectiveness
- Monitor program results, disclose achievements and communicate within and outside the organizations.

As with other change initiatives in the organizations, energy manager should have precautions about the alignment of all personnel around the program objectives will not be possible at the same level. In this case, it is necessary to work intensively with those individuals who shows interests towards implementation of the program. A sort of resistance will come from the people at front level who has direct control over the equipment. In this case, one of the tools to avoid similar reaction of personnel during the implementation period is to align those personnel into the energy management team through motivating them. They should also identify effective working settings, motivation plan for employees, appreciate efforts for fulfillment of program objectives and make them feel-in the process.

Moreover, there will be cases with some divisions which already built strong commitment over the energy consumption and already implements energy saving actions. Taking benefits of their efforts will be unfair and efforts required by the energy manager in this case is to align their work into the energy management programs, make it systematic, appreciate that division publicly for the made efforts so far.

In the planning stage, energy managers are required to define energy saving criteria as per energy use employed in the organization considering place and purpose of lighting use. For eg, all the electricity use >4000 hours a year for lighting need to be replaced for T5 lamps in warehouses and all the motors above 1Hp shall be replaced to energy efficient ones. This will result in standardization of energy saving measures in the organization.

Annex 9: Energy Tariffs valid for industrial sector of Azerbaijan

No	Energy tariffs for energy intensive industrial sector	Applicable tariffs (including VAT)	Remarks
1.0	Electricity		
1.1	Wholesale tariffs	0.057 AZN /kWh	
1.2	Electricity wholesale tariffs for the Enterprises of the Chemical, Aluminum, Steel-molding (mining-ore based) industries and Data Registering, Processing and Transmission Centers connected via 35 and 110 kV direct lines, with stable daily load demand and average monthly consumption for production purposes exceeding 5 GWh.		
1.2.1	Day time (from 08:00 a.m. until 22:00 p.m.)	0.058 AZN /kWh	
1.2.2	Night time (from 22:00 p.m. until 08:00 a.m.)	0.028 AZN /kWh	
1.3	Transit transmission of electricity	0.2 AZN /kWh	
2.0	Natural gas tariffs		
2.1	Non residential sector	200,0 AZN /thousand m ³	Includes all the gas transmission costs
2.2	Transmission of natural gas (per 100 km distance)	0.2	
3.0	Fuel oil		
3.1	Furnace fuel oil	240 AZN/ton	
4.0	Kerosene		
	Wholesales for KO-20 type	508,0 AZN/ton	
5.0	Heat Energy		
5.1	For 1 m ³ heated area	0,25 AZN (on monthly basis)	
5.2	For 1 QCal	30,0 AZN	
6.0	Diesel		

6.1	Wholesale	590,2 AZN /ton	
6.2	Road taxes	23,8 AZN/ton	
7.0	Water		
7.1	Non Residential sector	1,0 AZN /1 m3	
7.2	For Enterprises using water as raw material, water tariffs will be 8 AZN per 1m3 (including wastewater tariffs)	8 AZN/m3	

Collection of rate structure information for all the energy sources for the given organization is one of the first things to do. There might be cases that industrial enterprises are exclusively authorized to receive certain discounted tariff which is not disclosed publicly.

Considering some processes are related with use of water, and/or while making suggestions on energy saving on HVAC systems to convert the equipment from air cooled to evaporative cooled ones, it is necessary to consider water and wastewater tariffs as well. In this process, water and wastewater tariffs and charges of the organizations are also reviewed. There is water meters installed at the organizations based of which organization is charged per unit of consumption. It should be taken into consideration that for the wastewater charge, certain percentage of used water is taken and charged. Considering use of water in the organizations for the purposes like as for irrigation or use of evaporative devices, makeup water for cooling towers, it is possible to install submeters and deduct that amount of usage for wastewater charge purposes.

While making calculations for energy saving opportunities, applicable energy tariffs with VAT shall be referred.

Annex 10. Energy Auditors Tool Box

Followings are the list of tools that are necessary to have while engaged in energy audit services as per the (Turner, 2013).

Tape measures- which is the simple tool that need to carry out basic measurements, like as to check thickness of insulation, dimensions of walls, windows, distances between objects with the purpose to identify length of pipes and location of objects from each other etc.

Lightmeter –measures illumination level in the rooms and facilities. A portable digital lightmeter is the most useful among the similar types of equipment. It identifies excess illumination as a result of which auditors come up with recommendations either to remove certain number of bulbs and or to replace existing inefficient ones with more energy efficient bulbs as a result of which the same amount of lighting will be achieved.

Thermometers – Several types of thermometers are required in order to measure ambient temperature in the office and buildings, and to measure temperature of operating equipment like as motors and of employed processes. Determining process temperatures allows energy auditor evaluate efficiency of process equipment. Commonly used types are an immersion probes, surface temperature probe and radiation shielded probes for measuring true air temperature. Infrared thermometers and thermographic equipment are also available. Moreover, there is also infrared “gun” type thermometers are also valuable to measure surfaces and or steam lines that are located in distant heights.

Humidity sensors are also valuable tools to measure indoor ambient humidity level. Excessive humidification and dehumidification is expensive and is easily measured though the mentioned tools. Humidity sensors are also valuable to check performance of some economizers control operations that make control choices based on dew points, wet bulb, or enthalpy of air, and for cooling tower optimization from wet bulb temperature.

Infrared Cameras - these cameras are used to detect overheated electrical wires, connections, neutrals, circuit breakers, transformers, motors, and other pieces of electrical equipment. It is also valuable to find wet insulation, missing insulation, roof leaks and cold spots. These cameras are also useful for both safety related diagnostics and energy saving diagnostics.

Voltmeter -A digital voltmeter is used to measure operating voltages on electrical equipment, especially when the nameplate of the device is not readable or missing. There is also digital combined volt-ohm-ammeter with a clamp-on feature for measuring currents in conductors, These type of multi-meters is convenient during the audit visits to perform multi measurements with one device. These devices should be true RMS meter, with the greatest accuracy where harmonics might be involved.

Clamp-on Ammeter- is used for measuring current in a wire without making any live electrical connections. The clamp is opened up and put around one insulated conductor, and the meter accordingly reads current

in that conductor. New clamp-on ammeters reads RMS values. This is valuable parameter because of level of harmonics in many facilities. Level of harmonics in a load can be estimated by using non RMS ammeter and using true RMS ammeter to measure the current. If there is five to ten percent difference between the two readings, then it means that there significant harmonic content in a load.

Wattmeter/power Factor meter – Portable hand-held wattmeter and power factor meter is used for determining power consumption and power factor of motors and other inductive devices. The new devices are true RMS meters for greatest accuracy valuable for measurements where the harmonics might be involved.

Combustion Analyzer - portable hand-held devices and used to estimate combustion efficiency of furnaces, boilers, or other fossil fuel burning machines. Electronic digital combustion device perform accurate measurements and readout in percent combustion efficiency.

Airflow measurement devices are used to measure air flow from heating, air conditioning, or ventilating duct, or from other sources of air flow. It identifies any problems with air flow like as combustion air flow to gas heater is correct. Typical air flow measuring devices include a velometer, an anemometer and airflow hood.

Blower Door attachment – is used to measure building or structure tightness. This device is used to detect air leakage rate or number of air changes per hour in the facility. This helps to detect structural or duct leaks that need to be sealed.

Smoke Generator –it is a simple smoke generator which is used to detect air infiltration and leakage around doors, windows, ducts and other structural features.

Safety Equipment – Energy Auditor who visits the site to perform energy audit should wear safety equipment as well. A pair of safety glasses is necessity for manufacturing facilities audit visit. Wearing hearing protectors with helmet in noise areas like as machine halls. Electrical insulation gloves should be used if electrical measurements are carried out. Thermally insulated gloves should be used while taking measurements around boilers and heaters. Breathing masks may also be needed where hazardous fumes exists. Steel toe and steel-shank safety shoes should be used in energy audits in steel workshops where the sharp materials and or hazardous materials are used.

Miniature Data Loggers- miniature data loggers with external sensors can record measurements of current, voltage, apparent power (kVA), pressure and CO₂. They have a microcomputer control chip and memory chip which allows them to record data for periods of time from days to weeks. They can record data during a 24 hours -a -day basis without intervention by an auditor. These data interface with digital computer PC and can transfer data to spreadsheet of users. Collecting audit data with the help of these data loggers gives auditors more accurate and complete data which allows them to generate overall picture of energy consumption.

Vibration analysis gear- this device measures vibration amplitude of the machine being in operation. Taking into account that there is strong correlation between machine condition (condition of bearings, pulley alignment etc.) and energy consumption, it is possible to judge about the machine present health. The device gives real time amplitude readings of vibrating equipment in inch/sec or mm/sec. Checking the vibration amplitude against list of vibration level for that specific equipment, an auditor can judge about the condition of the machine.

Annex 10. Definition of micro, small, medium and large organizations in Azerbaijan

Criteria for micro, small, medium and large entrepreneurial entities

Categories for the size of entrepreneurial entities	With number of employees (person)	Annul revenue (ar) (thousand manats)
Micro	1 - 10	ar ≤ 200
Small	11 - 50	200 < ar ≤ 3 000
Medium	51 - 250	3 000 < ar ≤ 30 000
Large	251 and above	30 000 < ar

Note: Criteria for defining small, medium and large entrepreneurs in Azerbaijan is based on decree of Cabinet of Ministers of Azerbaijan Republic with No.556 of dated 21 December 2018 (www.taxes.gov.az, n.d.).

The minimum time required to introduce an EnMS:

small companies (from 11 up to 50 employees) at one location

- with existing management system: implementation duration approx. 2 to 4 months
- without existing management system: implementation duration approx. 3 to 6 months

medium-sized companies (from 50 to 250 employees) at one location

- with existing management system: duration of implementation approx. 3 to 6 months
- without existing management system: implementation duration approx. 6 to 12 months

Large companies (from 251 employees) at one location

- with existing management system: duration of implementation approx. 4 to 8 months
- without existing management system: duration of implementation approx. 6 to 18 months

If several locations are included, an additional 2-4 months are to be planned (data based on experience).

Annex 11. Definition of Sectors

The table below shows how the boundaries of the four sectors (residential, services, industry and transport) illustrated in Figure 3.4 are defined in this manual for energy efficiency indicators purposes, according to the International Standard Industrial Classification of all Economic Activities (ISIC), Revision 4, where the mapping is possible.

Note that these sectoral definitions may differ slightly from the corresponding definitions used for the IEA energy balances. For example, non-energy use across sectors is excluded for energy efficiency indicators purposes; some transformation processes are included under the Iron and steel sub-sector; several sub-sectors are not covered by this manual but are grouped under "Other".

Table B.1 • Correspondence of sectors to ISIC Revision 4

Sectors	Correspondence to ISIC Rev. 4
Residential	Report fuels consumed by all households including "households with employed persons ISIC Divisions 97 and 98."
Services	Report fuels consumed by business and offices in the public and private sectors. ISIC Divisions 33, 45, 46, 47, 52, 53, 55, 56, 58, 59, 60, 61, 62, 63, 64, 65, 66, 68, 69, 70, 71, 72, 73, 74, 75, 77, 78, 79, 80, 81, 82, 84 (excluding Class 8422), 85, 86, 87, 88, 90, 91, 92, 93, 94, 95, 96 and 99.
Industry	
<i>Iron and steel</i>	ISIC Group 241 and Class 2431. Consumption in coke ovens and blast furnaces, usually part of transformation processes and energy industry own use, are included here for the purpose of energy efficiency indicators.
<i>Chemical and petrochemical</i>	ISIC Divisions 20 and 21.
<i>Non-ferrous metals</i>	ISIC Group 242 and Class 2432.
<i>Non-metallic minerals</i>	ISIC Division 23. Report glass, ceramic, cement and other building materials industries.
<i>Machinery</i>	ISIC Divisions 25, 26, 27 and 28. Report fabricated metal products, machinery and equipment other than transport equipment.
<i>Transport equipment</i>	ISIC Divisions 29 and 30.
<i>Food and tobacco</i>	ISIC Divisions 10, 11 and 12.
<i>Wood and wood products</i>	ISIC Division 16.

Sectors	Correspondence to ISIC Rev. 4
<i>Paper, pulp and print</i>	ISIC Divisions 17 and 18. Includes production of recorded media.
<i>Textile and leather</i>	ISIC Divisions 13, 14 and 15.
<i>Industries not elsewhere specified</i>	ISIC Divisions 22, 31, 32 as well as any manufacturing industry not listed above nor in "Other".
Transport	Report fuels used in all transport activities irrespective of the economic sector in which the activity occurs, with the exception of military use.
<i>Road</i>	
<i>Rail</i>	
<i>Air</i>	ISIC Divisions 51.
<i>Water</i>	ISIC Divisions 50.
Other – not addressed in this manual	
<i>Mining and quarrying</i>	ISIC Divisions 07 and 08 and Group 099.
<i>Construction</i>	ISIC Divisions 41, 42 and 43.
<i>Water supply, sewerage, waste management</i>	ISIC Division 36, 37, 38, 39.
<i>Agriculture/forestry</i>	Report fuels consumed by users classified as agriculture, hunting and forestry by ISIC as follows: ISIC Divisions 01 and 02.
<i>Fishing</i>	Fuels delivered for inland, coastal and deep-sea fishing. Also include energy used in the fishing industry as specified in ISIC Division 03.
<i>Pipeline transport</i>	
<i>Non-specified other sectors</i>	Activities not included elsewhere. This category includes military fuel use for all mobile and stationary consumption (e.g. ships, aircraft, road and energy used in living quarters), regardless of whether the fuel delivered is for the military of that country or for the military of another country.
<i>Non-energy use</i>	Covers all fuels used for non-energy purposes across sectors.

Annex 12: Valuable sources for benchmark data collection.

Energy efficiency portal	www.odyssee-indicators.org https://www.indicators.odyssee-mure.eu/energy-efficiency-database.html
International Energy Agency, energy data	www.iea.org
Database for WB	https://data.worldbank.org/
Database for ADB	https://data.adb.org/
Energy unit converter	https://www.iea.org/statistics/resources/unitconverter/
Database for OECD	https://data.oecd.org/conversion/purchasing-power-parities-ppp.htm#indicator-chart
UN database	http://data.un.org/Explorer.aspx?d=EDATA
WEC measures impact estimator	https://wec-policies.enerdata.net/measure.php
Energy efficiency indicators for world countries	https://wec-indicators.enerdata.net/world.php

Annex 13: The summary of survey questionnaire answers

Summery of Questionnaire with industrial Organizations

No of Questions		1			2				3			
Name of company	Əlaqə No	Təsərfətinizdə enerji menecment tətbiq olunurmu?			Enerji menecmentin tətbiqinin sizin təsərfətə ən vacib faydasını nədə görürsünüz?				Bu gün təsərfətinizdə enerji menecmentin tətbiqi davamlı yerini yetirilirmi? Bunu necə müəyyən edirsiniz yaxud görülmüş işlərin qiymətləndirilməsi yaxud ölçülməsi necə aparılır?			
No	Alt suallar	A) Bəli	B) Xeyr	C) Qismən	A) Enerji xərclərinin azalmasında	B) Daha çox rəqabətə qadir olmaqda	C) Ekoloji tələblər ilə uyğunluq təşkil etməkdə	D) Daha çox şirkətdə dəyişmək təcrübəsini yaşamaqda	A) Bəli	B) Xeyr	C) Qismən	
1	Azerconnect	smammadov5133@ada.edu.az		1		1					1	
2	SCIP	eldaniz.seyfullayev@scip.az			1						1	
3	ARAN OIL	rehimovramazan@gmail.com			1						1	
4	Azerenerji JSC	azerenerji@azerenerji.gov.az	1			1			1			
5	Azercell	rmammadov5132@ada.edu.az		1						1		
6	ASCO	tmirzayev5134@ada.edu.az	1			1			1			
7	Azertexnoline	eldaniz.seyfullayev@scip.az ; resident of SCIP	1				1		1			
8	Agrokimya	eldaniz.seyfullayev@scip.az ; resident of SCIP			1	1					1	
9	MST	eldaniz.seyfullayev@scip.az ; resident of SCIP	1			1			1			
10	STP	eldaniz.seyfullayev@scip.az ; resident of SCIP			1	1					1	
11	Tabaterra	eldaniz.seyfullayev@scip.az ; resident of SCIP			1			1			1	
12	Azerkhalcha	eldaniz.seyfullayev@scip.az ; resident of SCIP		1						1		
13	Azeriqaz	pvazirov2017@ada.edu.az		1		1				1		
14	Azeristiliktajhizat JSC	(012) 379 19 78			1	1					1	
15	DET-AL MMC	994 50 273 13 45; office@detalholding.az			1	1					1	
16	Conform MMC	conform.mmc@gmail.com		1		1				1		
17	AZKRON MMC	(012) 437 17 08		1		1				1		
18	ALORA Group MMC	xanlar.aliyev@alora.az			1		1				1	
19	Baki NMA ASC	Elshad349@gmail.com			1	1					1	
20	Azerkimya IB	rovshen.isgenderov@socar.az		1		1					1	
21	Sardarov mashqayirma	sales@bsardaov.az		1		1					1	
	Total		4	8	9	14	0	2	1	4	8	9

8				9					10				
<p>Verən şəxs kimi siz aşağıdakılardan hansını əsas tutaraq enerji menecmentin tətbiqinin tövsiyyə edərsiniz? (Aşağıda qeyd olunanlardan 1-ni seçmək yaxud 1,2,3, 4 və iqla qeyd edə bilərsiniz (1 ən vacib, 4 az əhəmiyyət kəsb etməsi kimi))</p>				<p>Enerji menecment tətbiq olunarsa hansı sahədə dəstəyə ehtiyacınız olacaqdır?</p>					<p>Aşağıda qeyd olunanlardan hansının tətbiq edildiyi halda enerji menecmentin tətbiqi sizin üçün maraqlıdır?</p>				
b. Enerji menecmentin tətbiqi şirkətin fəaliyyətində ekoloji tələblərlə uyğunluğu artırır.	c. Enerji menecmentin tətbiqi şirkətdə əməliyyat xərclərinə daxil olan digər resurs səmərəliliyini yaradır	d. Enerji menecmentin tətbiqi şirkətin xidmət və məhsullarının keyfiyyətini artırır.	e. Enerji menecmenti şirkətin fəaliyyətinin beynəlxalq standartlara uyğunluğunu artırır.	a. Müvafiq texniki yardımın verilməsində, o cümlədən enerji auditin keçirilməsi və enerji ölçü alətlərinin alda olunmasında b. Enerji menecmentin	b. Müntəzəm təlimlərin keçirilməsinə, bu sahədə yeni məlumatların alınmasına, bələdçi təlimatların olmasına	c. Müntəzəm təlimlərin keçirilməsinə, bu sahədə yeni məlumatların alınmasına, bələdçi təlimatların olmasına	d. Müvafiq bilik və bacarıqları olan enerji menecerinin olmasına	e. Yuxarıda qeyd olunanların hamısına	a. Vergi yükünün azaldılması yaxud verginin geri ödənməsi tətbiq olunarsa	b. Şirkətin nüfuzunun artacağı ilə bağlı dövlət tərəfindən təşviq aparılırsa	səmərəliliyi tədbirləri ilə bağlı sərmayə ayrılmasında dövlətin xüsusi dəstəyi olarsa	d. Ətraf mühit yoxlamaların dan azad olunma halında	e. Bunların hamısı eyni zamanda icra edilərsə
	2	3	4					1					1
			1					1		1			
2			3					1				1	
				1					1				
2								1		1			
2			3			1				1			
			1	1									1
					1								1
2			3										1
1	4	5	3					1					1
2	4		3				1				1		
			1					1					1
1								1			1		
2								1					1
								1					1
			1		1					1			
	1		2					1					1
1			2		1								1
	2				1			1		1			1
7-2; 3-1	2-2; 2-4; 1-1	1-3; 1-5	4-1; 4-3; 1-4	3	4	1	5	7	5	1	3	0	12

Annex 14. The whole concept of adopting effective energy management program

Conceptual Model of Adopting EnMP

Program level	Type of policy	Policy Direction	Driving forces	Observations and Findings	Recommendations	Required time for implementation	Responsible party	Estimated impact for commitment	Ranks
	Prescriptive	Norms and standards	Policy obligations	Energy efficiency law is in the process of adoption by the GOA. Due to long haul in adoption process, MoE can not move forward with development of the other components of EnMP	Speed up adoption of energy efficiency law and issue related normative acts, decree for implementing control over its implementation	1 year	Ministry of Energy, AERA, Private companies engaged in energy audit services, Industrial and Energy associations, International Consultants, Azerishiq JSC	High	5
				Need for capacity building and capacity development by policy making institutions in the relevant field. Need for growing competent energy managers, certifying them.	Involve local and International Consultants in development of components of EnMP and filling the gaps in the market to meet the needs	1.5 years		Medium	4
			Knowledge and skill	Need for capacity building and capacity development for local private sector participants which shall facilitate external energy audit services for the industrial and other organizations. Market for energy audit services shall be formulated and be developed. Need for energy measuring tools.	MoE shall promote energy audit services and ensure that they have enecessary capacity, furnished with necessary tools, and shall provide dedicated trainings and certify them for operation. Energy auditors shall have right to receive EE fund for procurements of energy measuring tool kits.	1.5 years		High	5
		Voluntary agreements for SMEs with non intensive energy consumption	Policy obligations	Need for capacity for policy making organizations to develop voluntary agreements with attractive suggestions for SMEs	Raise awareness and promote voluntary agreements with optional Packages	0.5 year		Medium	4
		Mandatory establishment of minimum EE standards	Policy obligations	Need for external support for defining minimum EE requirements for the industrial equipment and devices.	Employe external consultants in the relevant field	1 year		High	5

Government
EnMP

Economic	Establishment of energy efficiency fund.	Financial		Initial source for EE fund could be state fund that are initially allocated , then be allocated as a loan with small (2-3%) interest rate to industrial organizations to implement EE projects with significant energy saving potential (up to 500 000 AZN for projects that generates saving up to 20% in the organization; for the projects above 500 000 AZN that generates more than 20% energy saving). Industrial oragnizations repay the amount within the predefined payback period of energy efficiency project on account of saved amount. Designation of EE fund will be not only to finance EE projects, but also renewable projects and procurements of energy efficiency measuring tools. Here energy auditors can also benefit this fund.	1 year	Ministry of Energy, Ministry of Finance	High	
			Today GoA cannot define the source of EE fund and is in need for asistance	EE fund could be extended on account of opportunity cash flow received on account of saved energy by the industrial organizations. Allocation of EE funds could be facilitated through ASAN Utility service.				5
	Tax rebates, CO2 trading for voluntary agreements to make it attractive for Large and SME	Financial	Capacity need for development of working echanizsm for tax rebates and CO2 trading	Development of several packages for the SME within the voluntary agreements and allow them to chose the pacjage of benefits as per their preference: 1. Tax rebate which also include free of charge energy manager trainings and certification; 2. CO2 trading and giving access to EE fund.			High	5
Information	Promotion of energy efficiency projects, EE fund, external energy audit services, certified energy managers	Knowledge	Need for capacity building and resources	Raising awareness and promotion of EnMS for the large, medium and small industrial organizations in prallel, develop informative brochuras	1 years	Ministry of Energy, Energy associations, media	High	5
	Establish labeling for the overall organization, for motors, boilers and other key equipment and define standards (minimum technical parameters) for key industrial equipment,			1 years	Medium		4	
	Networking. Establish network of energy efficiency, social media, website, provide case studies of other countries in this field. Discuss difficulties and barriers of organizations and provide way how to overcome it.			Provide monthly, quarterly and annual reporting of energy saving amount with listing and ranking the organization. Announce competition of energy saving within SME, award winners with monetary prizes. Holding annual energy efficiency conference case studies of local oragnizations that achieve significant amount of savings. Share their knowledge and experience with others. Recognition of those organization in the country as green company and provide them several privilagees.	1 year	NGOs and EE associations	High	5

Provision of technical assistance	There is a need for fund allocation and involvement of private sector	Provide online and physical support to industrial organizations. Number of web sources today provide open access to handbooks, guidelines for energy audits and adoption of energy management systems. Arrange translation and adaptation of them to local standards and conditions.	1 year	MoE, private sector, energy association, NGOs	High	
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