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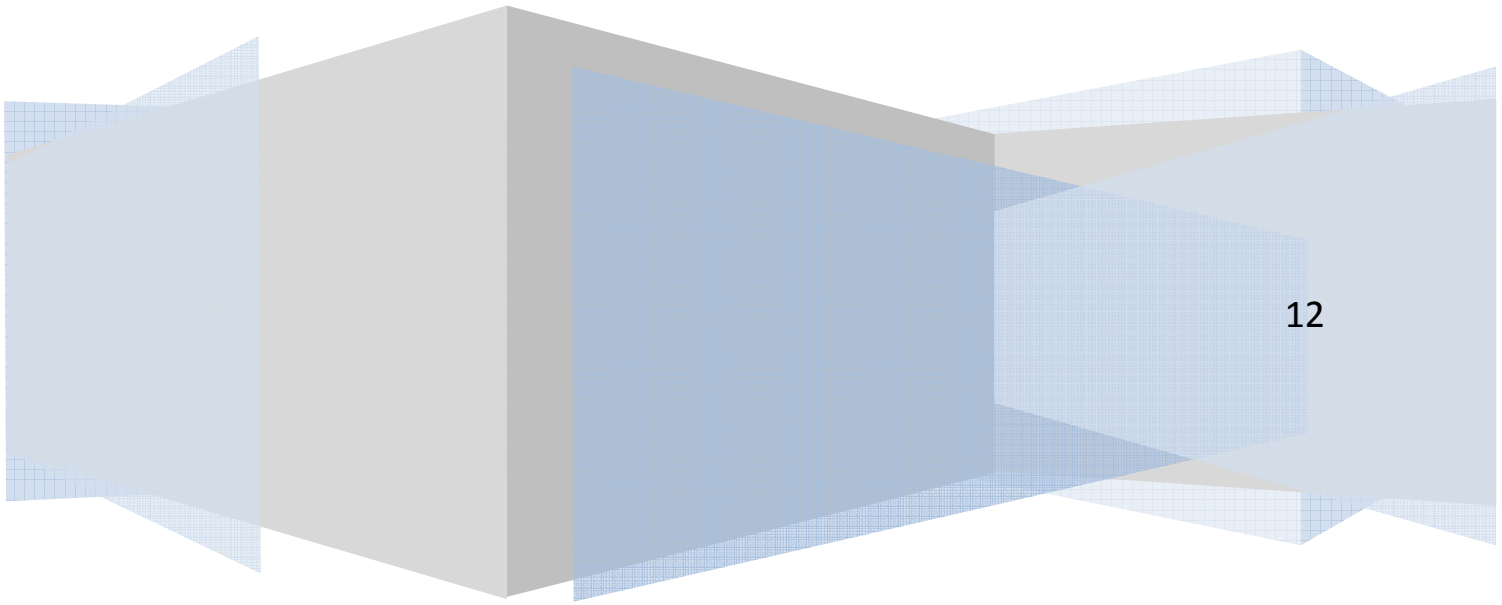
“ASSESSMENT OF BEST INTERNATIONAL PRACTICES AND EXPERIENCE IN CREATING AND OPERATING INDUSTRIAL ENERGY EFFICIENCY EQUIPMENT AND TECHNOLOGY DATABASES”

Component 3 of the Project: “Capacity Building and Energy Management Systems in SMEs.

UNIDO Project GF/RUS/10/004/A04: "Market Transformation Programme on Energy Efficiency in Greenhouse Gas-intensive industries in the Russian Federation"



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EXECUTIVE SUMMARY

The Report has been prepared as a result of the assessment of selected five energy efficiency web sites with the purpose of providing recommendations for the industrial energy efficiency database to be developed for Russian SMEs under the Market Transformation Programme on Energy Efficiency in Greenhouse Gas-Intensive Industries in the Russian Federation co-implemented by UNIDO and EBRD. Under this assignment a total number of 45 energy efficiency-related web sites were reviewed, of which 12 were preliminary short-listed and the final five subjected to a detailed scrutiny and comparative analysis.

Although the major criterion for the selection of the target databases was their relevance to the project objectives, consultant also employed the following approaches:

- Databases were selected containing as much information as possible on energy efficiency technologies, equipment and solutions
- Relevance of information to industries and SMEs, i.e. project developers interesting in the implementation of energy efficiency measures at their facilities
- Scope of the geographical coverage was also viewed important. Consultant considered not only EU countries but also other regions including existing Russian databases given that the project would be implemented in the Russian Federation;
- The list included databases where information is regularly updated and is accessible to users in an understandable format.

Characterized by a very large geographical distribution, the information on energy efficiency is still scattered and lacks good structuring. Despite the abundance of web sites the databases covering the technology aspect of energy efficiency are rather limited in number. There is apparent lack of structured databanks particularly focusing on energy efficiency/renewable energy technologies, innovations and equipment, i.e. those offering comprehensive industry-specific information which can be utilized by real practitioners – various industrial enterprises planning to introduce energy efficiency improvements.

Given the limited number of energy efficiency and technologies databases, the following five ones were considered to be the most relevant for the purposes of this assignment:

1. *Industrial Efficiency Technology Database*
2. *Portal of the Sustainable Energy Authority of Ireland*
3. *Green Energy Portals*
4. *Advanced Manufacturing office*
5. *Russian State Information System of Energy Conservation and Energy Efficiency*

Nearly all energy efficiency sites come with both strengths and weaknesses. Comprehensive coverage of the topic with information tailored to the needs of the target audiences, industry-specific information and educational materials (energy management system, ISO 50001, energy management action planning), various equipment and technology databases and links to worldwide energy efficiency resources, interactive tools and software (online calculators, technology assessment software), use of innovative multimedia tools (online trainings, video seminars, videos) have been recorded as the strong points of assessed databases. The major weakness of the web sites was relatively little coverage of the SME sector which is rarely perceived as a separate target for information dissemination as opposed to large industries.

Cross-linkages with other web resources were not sufficient either, particularly links to other energy efficiency databases while existing links were sometimes outdated.

While all five web sites had both strong points and shortcomings, it is recommended to take into consideration the positive experience of those web sites during the development of the energy efficiency technologies database for Russian users within the framework of the EBRD/UNIDO joint project, namely the following aspects:

1. As it comes to the concept of the web site, it is highly recommended that project implementers opt for the energy efficiency portal with comprehensive and all-inclusive information on energy efficiency rather than a pure technology database which will target only a narrow segment of users.

2. Sustainability of the portal, i.e. the potential of the web site to serve information needs of its audiences in the long run, beyond the scope of the project, should be taken into consideration. Sustainability is contingent upon consistent web promotion activities and interactive tools which provide for better exposure of the web site to target audiences.

3. Content which should be tailored to the information needs of the target audience and encompass different areas of energy efficiency which might be potentially interesting specifically for industries and SMEs. Apart from technology/equipment databases the portal must also include information on legislation/regulations, energy management systems and standards, registers of energy audit and energy service companies, profiles of typical projects implemented in the industrial or SME sector, and other relevant information. ESCOs and performance contracting must be given higher emphasis.

4. Cross-linkages with other web sites and databases will provide users with access to global resources on energy efficiency (industry data, research papers, articles, documents, case studies and success stories, best practice examples, equipment and technologies).

5. Well-defined structure and systemized information integrated into the navigation of the web site are both critical elements of any web site. Designing the right database with the right features and well thought out navigation is certainly one of the crucial factors for its further usability.

6. Use of interactive features and multimedia tools is highly recommended such as online technology calculators, assessment tools, webinars, online training, projects mapping, online marketplace etc. They enrich the content of the web site, visualize existing educational materials and improve user experience with the site.

More detailed information on the comparative review of databases and the results of assessment are available in the Report.

1. INTRODUCTION

This report has been prepared as part of the Component 3 "Capacity Building and Energy Management Systems in SMEs" of the Market Transformation Programme on Energy Efficiency in Greenhouse Gas-intensive industries in the Russian Federation jointly implemented by UNIDO and the European Bank for Reconstruction and Development.

The assignment included review of existing databases to short-list up to 5 databases on EE measures and technologies for further comparative analysis. The work involved the following steps:

- General review of available databanks on energy efficiency with an attempt to classify them by focus areas and select databases which are of relevance for the current assignment.
- Short description of databases and their detailed review in terms of technical features, content, applicability, user-friendliness and comparative analysis of strengths and shortcomings based on which recommendations are made to the Contractor on the design and content of the EE technologies and equipment database for SMEs.

Part 2 of the Report presents the overview of energy efficiency databases including their focus areas and contained information. Some illustrative examples are presented with their short descriptions. Main criteria used by consultant for short-listing of target databases for the further detailed review are also listed.

Part 3 presents the short descriptive summaries of target databases including their main objectives and content as well as main audiences. Part 4 contains detailed analysis of target databases in terms of their content, coverage, technical features, accessibility of information, user-friendliness. Strengths and weaknesses are discussed in Part 5 of the Report with the conclusions and recommendations to follow in Part 6.

2. SELECTION PROCESS

2.1 REVIEWED DATABASES

The consultant carried out a comprehensive review of existing resources on energy efficiency with the purpose of understanding the overall availability of energy efficiency databases including their main focus areas, coverage, content, data availability and so on.

The information on energy efficiency generally is of a mixed nature. Being widely available existing information on energy efficiency in the form of databases is nevertheless quite scattered and lacks good structuring. This assumption is confirmed by the results of the review of 45 energy efficiency web resources.

Reviewed resources primarily contain information on global energy consumption by end-use and sectors, global energy efficiency and CO2 indicators, climate change, energy efficiency-

related policies and measures implemented by Governments, Government-funded programs in the area of energy efficiency and renewable energy, various financing opportunities, etc. If looking at the nature of the web sites, it is obviously seen that the information on energy efficiency/climate change policies and measures as well as global data on energy consumption indicators, country-specific energy efficiency potential, etc. is widely available, regularly updated and quite inclusive, specifically those related to the European Union countries and the United States. The databases on implemented energy efficiency programs as well as available grants and financing opportunities are also easily identifiable and accessible.

The Table 1 below presents the list of the assessed web sites:

#	Web link	Name
1.	http://www.etde.org/	The Energy Technology Data Exchange
2.	http://www.odyssee-indicators.org/	Energy Efficiency Indicators in Europe
3.	http://www.enerdata.net	Enerdata Energy data center
4.	http://www.muredatabase.org/	MURE II Database
5.	http://www.unido.org/index.php?id=1002093	UNIDO Industrial Energy Efficiency Policy Database
6.	http://ietd.iipnetwork.org/	IIP, The Industrial Efficiency Technology Database (IETD)
7.	http://iepd.iipnetwork.org/	IIP, The Industrial Efficiency Policy Database (IEPD)
8.	http://iipnetwork.org/databases/supply-chain/	IIP, Supply Chain Initiatives Database
9.	http://green-energy-ru.com/cms/	Green Energy Portal Russia
10.	http://green-energy-ua.com/cms/	Green Energy Portal Ukraine
11.	http://green-energy-bg.com/cms/	Green Energy Portal Bulgaria
12.	http://green-energy-mx.com/cms/	Green Energy Portal Mexico
13.	http://green-energy-cal.com/cms/	Green Energy Portal US California
14.	http://www.energyefficiencyasia.org/	Energy Efficiency Guide for Industry in Asia
15.	http://oee.nrcan.gc.ca/home	Canada natural resources
16.	http://www.seai.ie/Your_Business/Technology/Industry/	Sustainable Energy Authority of Ireland
17.	http://www.interef.ru/en/	Inter RAO UES
18.	http://www.interef.ru/en/	Center for Energy Efficiency and Renewable Energy (CEERE)
19.	http://www.maeep.org/	Massachusetts Energy Efficiency Partnership
20.	http://www1.eere.energy.gov/manufacturing/index.html	US Department of Energy, AMO
21.	http://www.energystar.gov/	US Department of Energy
22.	http://ies.lbl.gov/	The International Energy Studies Group
23.	http://www.energy.gov.lk/	Sri Lanka Sustainable Energy Authority EE Technologies DB
24.	http://www.dsireusa.org/	US Database of State Incentives for Renewables & Efficiency
25.	http://www.eceee.org/	European Council for an Energy Efficient Economy
26.	http://www.epa.gov/cleanenergy/index.html	Clean Energy Home of US Environmental Protection Agency

27.	http://www.ameresco.com	Ameresco, Inc. site
28.	http://china.lbl.gov	China Energy Group
29.	http://www.eea.europa.eu/	The European Environment Agency (EEA)
30.	http://www.leonardo-energy.org	The Leonardo Energy Initiative
31.	http://www.ee-ip.org	Energy Efficiency in Industrial Processes
32.	http://energoeffekt.gov.by/	Department of Energy Efficiency, Belorussia
33.	http://solex-un.ru/energo	Energy Efficiency Topic Union, UNDP project
34.	http://rosenergo.gov.ru/	Russian Energy Agency
35.	http://www.energohelp.net/	Russian Energy Agency Project, Energy Efficient Russia Portal
36.	http://www.undp.ru/index.php?iso=RU&lid=2	UNDP Russia
37.	http://label-ee.ru/	Russian Ministry of Education and Science, UNDP GEF
38.	http://www.energy-exhibition.com	Virtual exhibition of energy efficient technologies, materials and services, Russian Ministry of Education and Science
39.	http://www.nntu.ru/nii-et/	Research Institute for Energy Efficient Technologies, Russia
40.	http://www.energy-saving.ru/	Kirov Regional State Enterprise "ENERGY AGENCY", Russia
41.	http://ec.europa.eu/energy/intelligent/	The Intelligent Energy – Europe (IEE) programme
42.	http://www.eaci-projects.eu/iee/page/Page.jsp	The Intelligent Energy – Europe, Project Database
43.	http://www.buildup.eu/	The European portal for energy efficiency in buildings
44.	http://www.energosovet.ru/	Portal EnergoSovet.ru
45.	http://portal-energo.ru	EE energy portal, Russia

Out of this list consultant made a preliminary short-list of 12 web sites (listed below) for more detailed screening and final selection of five databases to be included into the final assessment. There were very few genuine databases among the above mentioned 45 web site if any at all. The attention was paid to the energy efficiency-related web sites having some database structure and containing as comprehensive as possible information on energy efficiency.

- http://www.epa.gov/cleanenergy/index.html - Clean Energy home page of the US Environmental Agency offering information on clean energy policies and technology solutions and programs implemented in this area, namely combined heat and power partnership, green energy partnership, state and local climate and energy programs and many more. The website contains the following tools and databases: power profiler (tool for measuring the impact of electricity use), eGRID (emissions and generation resource integrated database), clean energy resources database and greenhouse gas equivalences calculator.
- http://www1.eere.energy.gov/manufacturing/industries_technologies/index.html - web portal of the Advanced Manufacturing Office of the US Department of Energy which

focuses on energy efficiency and technology-related information covering a broad range of areas: research and development, technology deployment, technologies and equipment, financing opportunities, etc.

- http://www.energyefficiencyasia.org – Energy efficiency guide for industry in Asia with countries including China, Bangladesh, Vietnam, Mongolia and Indonesia. This Guide has been developed for Asian companies who want to improve energy efficiency through Cleaner Production and for stakeholders who want to help them. The Guide includes a methodology, case studies for more than 40 Asian companies in 5 industry sectors, technical information for 25 energy equipments, training materials, a contact and information database
- http://www.energosovet.ru/ - Russian portal on energy saving Energosovet; Contains resources on energy conservation and energy efficiency including information on typical demonstration projects, catalogue of technologies, information on training and exhibitions, government policies and acting legislation, multimedia announcements. The web sites hosts an electronic magazine "Energosovet" – a specialized information, scientific and technical magazine which presents information about recent technical, technological, economic and other developments in the area of energy conservation and efficiency.
- http://www.etde.org – The Energy Technology Data Exchange, (ETDE), is a multilateral energy information exchange initiative under the International Energy Agency. ETDE world energy base is a data bank containing largest collection of research papers, documents, literature, articles on energy and technology including R&D; energy policy and planning; basic sciences and research; environmental impact assessments including climate change; energy conservation, renewable and many more.
- www.green-energy-ru.com – Green Energy Portals which are extended through five countries: Russia, Ukraine, China, Mexico, USA (California) designed with the purpose of facilitating green energy projects in these countries. The major subject areas of the portal include project financing opportunities and financiers, organizations involved in energy efficiency policy making, planning and research, technological solutions for major energy consumption areas, information on project development and etc.
- http://iipnetwork.org/databases/supply-chain/ - the Institute for Industrial Productivity's Supply Chain Initiatives Database of case studies describing supply chain initiatives for energy savings and GHG mitigation in industry. The database contains case studies of initiatives and projects targeted to improve energy productivity. The database is searchable by activity types, companies and organizations, target sector and the partnership program.
- http://iepd.iipnetwork.org/ - the Institute for Industrial Productivity's Industrial Efficiency Policy Database provides comprehensive information on industrial energy efficiency and GHG mitigation policies pursued in 12 countries. The policies of countries are represented in the form of the policy pyramid built around three policy layers: effort defining policies (on the top of the pyramid), implementing measures (the middle layer) and implementation toolbox (the bottom layer).
- http://ietd.iipnetwork.org/ - Industrial Efficiency Technologies Database aims to help decision makers identify technologies and measures that improve productivity and profits while reducing energy consumption and CO_2 emissions in industry, and assist companies in assessing the cost-effectiveness of energy efficiency investment options. Currently, the database focuses on cement, iron and steel industries and motors as

cross-sectorial systems. An important focus of the database is familiarization of users with the best practice of energy management systems including guidelines helping companies to design EnMS.

- http://www.odyssee-indicators.org/database/database.php - Odyssee offers data on energy consumption drivers by end-uses as well as energy efficiency and CO2 related indicators collected from EU member countries. The database contains information from 27 EU countries as well as Norway and Croatia which are continuously updated by the Energy agencies of those countries. The database covers period from 1990 to 2010.
- http://www.seai.ie – An energy portal of the Sustainable Energy Authority of Ireland containing information on various aspects of clean energy for a variety of audiences. Designed in an interactive format with the use of modern multimedia solutions, the portal provides comprehensive information on energy conservation and energy efficiency to the audiences from all sectors of the energy consumption market: population, public and business sector, manufacturers, SMEs.
- http://gisee.ru/ - State information system on energy conservation and energy efficiency – a Russian portal on energy conservation and energy efficiency covering the areas of policy/legislation and providing information to various target groups including the population, public and private sector organizations, energy audit and energy service providers. Some interesting elements of the web site are the users forum, information center as well as interactive training tools and calculators.

However, the review of 45 web sites showed that despite their abundance the databases covering the technology aspect of energy efficiency are rather limited in number and quality of information. Moreover, there is apparent lack of structured databanks particularly focusing on energy efficiency/renewable energy technologies, innovations and equipment, i.e. those offering comprehensive industry-specific information which can be utilized by real practitioners – various industrial enterprises planning to introduce energy efficiency improvements. Majority of the reviewed databases are targeted to policy and decision makers, researchers, field experts and project developers on the global level rather than industries or SMEs. The technology aspect of energy efficiency is more or less addressed on the sites such as Green Energy Portal and Industrial Efficiency Technology Database.

2.2 GEOGRAPHIC COVERAGE

Energy efficiency web sites are generally characterized by a very large geographical distribution and coverage of regions and countries alike. However, there is an interdependence observed between the economic and social development of countries and availability of energy efficiency/clean energy web resources. More developed countries such the European Union states, the United States or Japan have extensive coverage of these topics on the Web in various formats, with countries like Russia and China also joining this list recently. This revision of the list of 45 energy efficiency web sites once again verifies this assumption.
Simple web browsing by a keyword such as energy efficiency or clean energy brings mostly resources from Europe and the USA. This is because energy efficiency and climate change issues are getting increasing attention in developed countries and the governments of these states have been very active in pursuit of clean energy and energy conservation policies, promotion

and deployment of energy efficient technologies and project implementation over the recent decades. Meanwhile, their societies and public consciousness have reached the level where the concept of energy efficiency may not only be promoted and understood but also turned into action through various initiatives undertaken by communities, citizens and businesses alike.

2.4 SELECTION CRITERIA

Although the major criterion for the selection of the target databases was their relevance to the project objectives, consultant also employed the following approaches:

- Databases were selected containing as much information as possible on energy efficiency technologies, equipment and solutions
- Relevance of information to industries and SMEs, i.e. project developers interesting in the implementation of energy efficiency measures at their facilities
- Scope of the geographical coverage was also viewed important. Consultant considered not only EU countries but also other regions including existing Russian databases given that the project would be implemented in the Russian Federation;
- The list included databases where information is regularly updated and is accessible to users in an understandable format.

Given the limited number of Internet databases focusing on energy efficient technologies and equipment are available the following five ones were considered to be the most relevant for the purposes of this assignment out of the twelve web sites presented above:

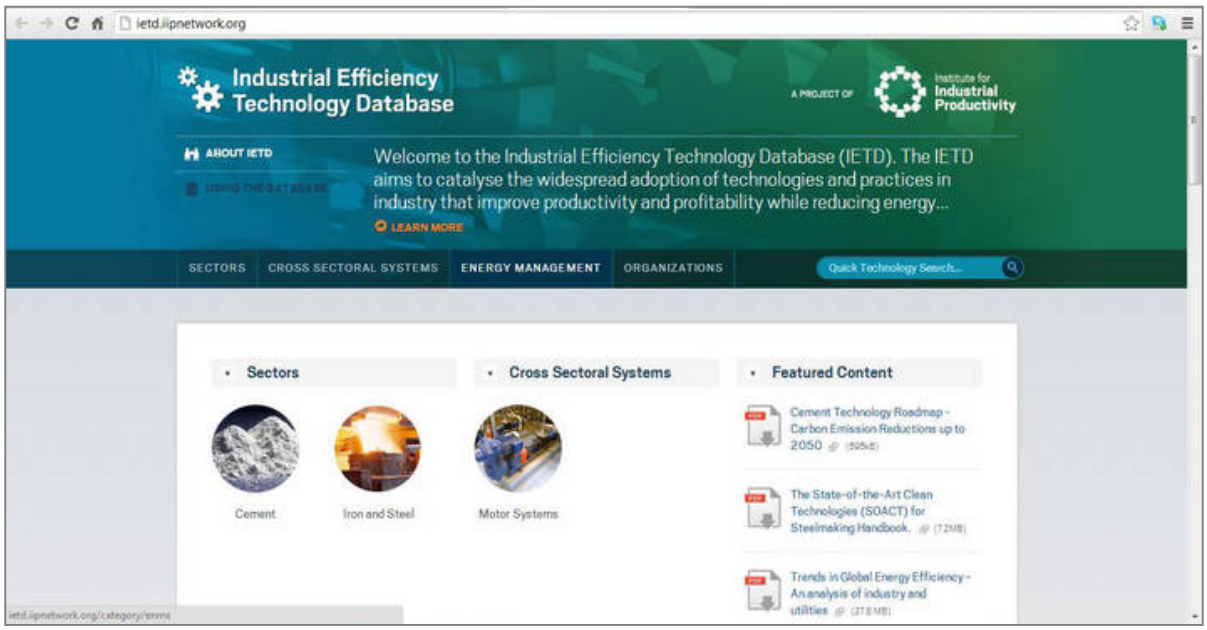
1. *Industrial Efficiency Technology Database*
2. *Portal of the Sustainable Energy Authority of Ireland*
3. *Green Energy Portals*
4. *Advanced Manufacturing office*
5. *Russian State Information System of Energy Conservation and Energy Efficiency*

The reasoning behind selection of these particular web sites is that each of these sites is equipped with information, databases, web tools or features that can be effectively transferred to the database to be developed under the Market Transformation Programme on Energy Efficiency in Greenhouse Gas-Intensive Industries in Russian Federation. For example, IETD contains information on energy efficiency technologies specifically targeted to the industrial sector just like the AMO web site containing also several useful databases. The SEAI web site is a portal with extensive coverage of energy efficiency-related information targeting nearly all segments of the energy efficiency market. The same objective is pursued by the Russian government-sponsored portal which is equipped with interesting interactive IT solutions. Green Energy Portals link resources across countries and even continents and this experience can be also utilized during the design of the Russian database.

3. SUMMARIES OF SELECTED FIVE DATABASES

3.1 INDUSTRIAL EFFICIENCY TECHNOLOGY DATABASE (IETD)

http://ietd.iipnetwork.org/content/about-ietd.



IETD is one of the databases developed by the Institute for Industrial Productivity (IIP). They contain vast amount of information on the range of topics such as technology, financing, policy, etc. As stated in the introductory notice on the web site, its objective is "*to help decision makers identify technologies and measures that improve productivity and profits while reducing energy consumption and CO_2 emissions in industry, and assist companies in assessing the cost-effectiveness of energy efficiency investment options*."[1] IETD is freely available without any additional charges.
As of now, IETD contains data from the following branches of industry: cement, iron and steel with motor systems specified as a cross-sectorial element.

The entire information of the database is grouped into four major categories: sectors, cross-sectorial systems, energy management and organizations with the following types of information provided under these categories:

- ***Sector-specific information*** – the sector characteristics including its size, its importance in terms of its energy consumption and GHG emissions, as well as estimated potential for technical improvements for improved energy and carbon efficiency.

[1] http://ietd.iipnetwork.org/content/about-ietd

- ***Technology description*** **-** overview of the technologies commonly used during production by the sector enterprises.

- ***Processes –*** used during production cycles in the industries. The web site is equipped with a user-friendly graphical link-based presentation of industrial processes for users to be able to select the overview of any technological process without reading the industry description.

- ***Key data*** on trends and current levels of production, the sector's position in the overall industrial energy use and CO_2 emissions, energy savings and GHG mitigation potential, and key countries and/or players in the sector.

- ***Benchmarks –*** information on best performance levels reported in the literature, broken to the level of main processes employed within a sector.

- ***Technologies/measures*** – technical and operational practices targeted to increase productivity by reducing consumption and GHG emissions. The information includes description of technologies and measures as well as estimates of energy savings and CO2 reductions including also implementation and operational costs.

The database also contains vast amount of resources on technologies and measures - publications, research papers, reports, guidelines, standards, links to websites, etc. In the Energy Management section of the database there are guidelines to the development, establishment and monitoring of energy management systems in enterprises including lessons learnt and detailed case studies of specific projects.

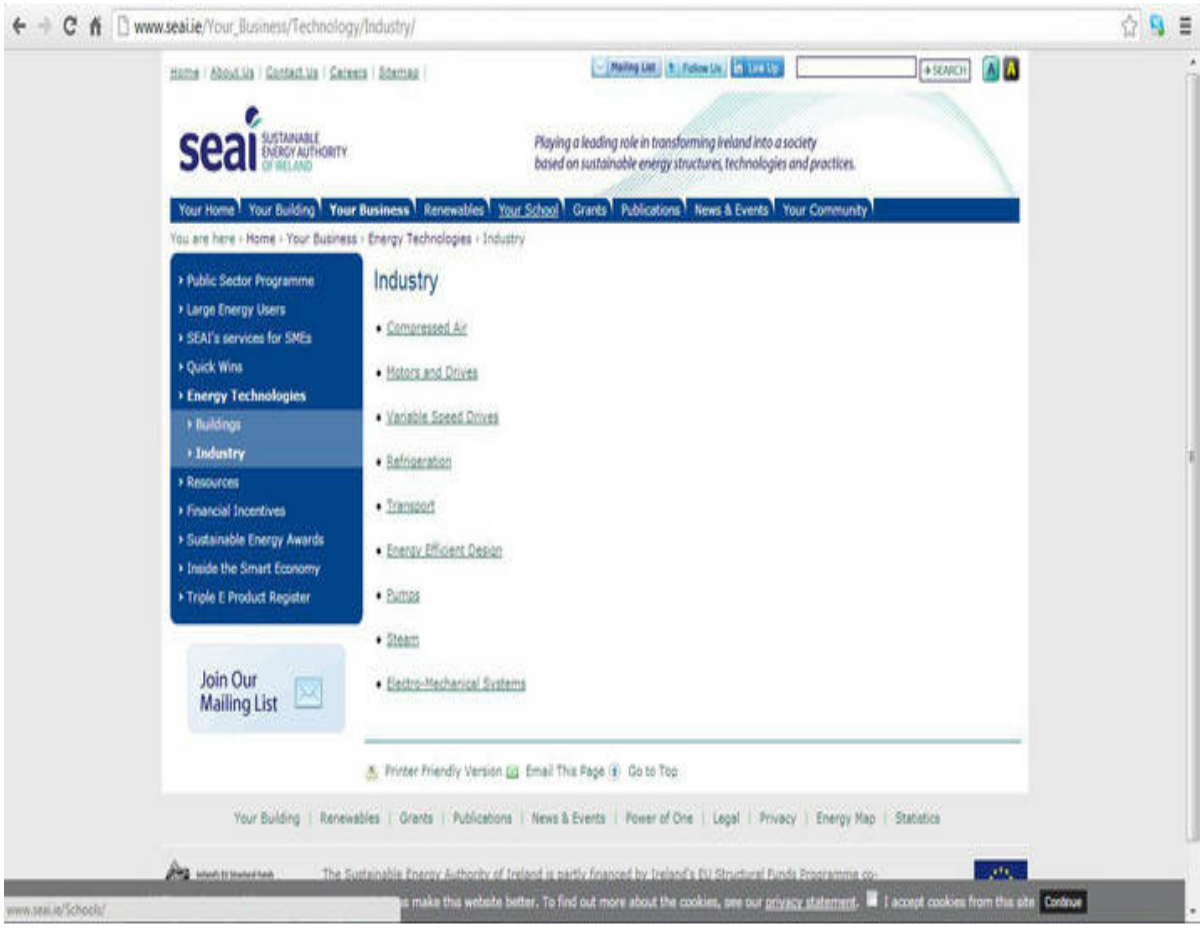
The target users of the database:

- Executives of enterprises
- Practitioners
- Energy sector experts, decision and policy-makers

3.2 SUSTAINABLE ENERGY AUTHORITY OF IRELAND (SEAI)

www.seai.ie

Sustainable Energy Authority is the Government-established agency the aim of which is to promote sustainable energy practices in Ireland. Apart from presenting the mission and objectives of the Sustainable Energy Authority, the web site is a real working portal covering virtually all topics related to energy: what is energy, what are the main sources, what is energy efficiency, renewables. The web site is divided into sections based on the different types of energy consumers: homeowners, building owners, public and business sector. Each of the sections provides detailed overview of energy consumption patterns for a particular type of consumer offering basic no to low-cost energy saving measures that can be implemented to increase energy efficiency of buildings and reduce energy bills.



The web site is an excellent educational and awareness building resource increasing consumer understanding that wasted energy is money wasted from their pockets. For each type of consumers (home owners, business owners, school administration, and building owners) the web site gives the overview of energy consumption sources showing where energy may be wasted and what needs to be done to prevent or minimize losses. For example, for residents these measures include lighting efficiency, tips minimizing heat losses, insulation tips, renewable energy tips, etc. with information on grants available to homeowners for energy efficiency improvements. There is also an energy calculator as well as fuel cost comparison calculator to allow consumers understanding the cost of various fuels used for space heating.

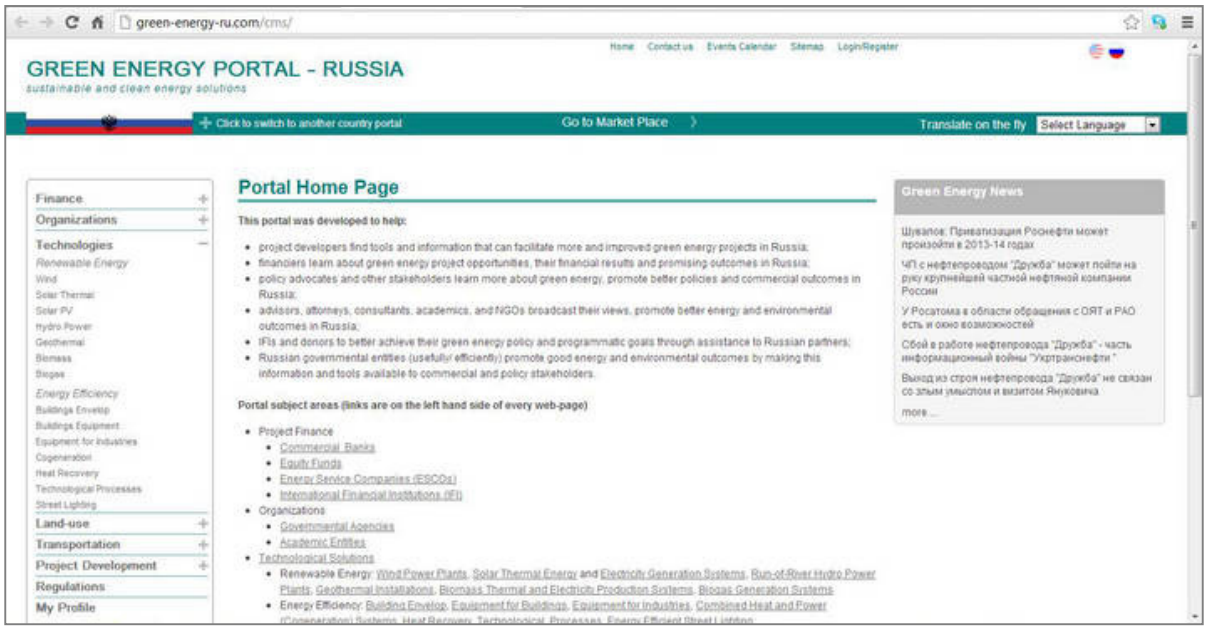
Energy saving tips referred to as Quick Wins are presented both for different sectors/business types – manufacturing/production, hotels/hospitality, retail, offices, healthcare, education, sports and culture – as well as for different sources of energy consumption – lighting, heating, refrigeration, insulation, equipment, technology and renewable (solar, biomass, geothermal, wind). This section also contains detailed information on financial incentives made available to organizations/companies for energy efficiency improvement projects: R&D, commercial grants and other mechanisms supporting energy efficiency improvements. There is also the detailed

information on Triple E (Excellence in Energy Efficiency) products available on the web site including the products database.

More detailed analysis of the SEAI web site will be provided in the chapter to follow.

3.3 GREEN ENERGY PORTALS

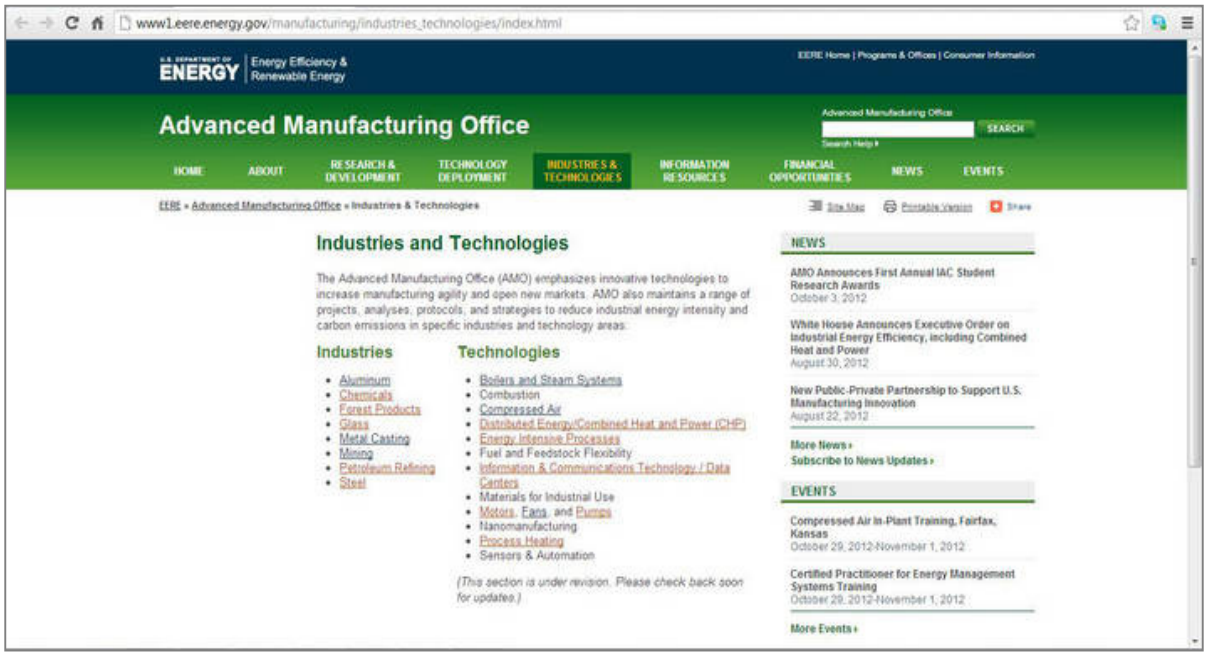
http://green-energy-ru.com/cms/
http://green-energy-ua.com/cms/
http://green-energy-bg.com/cms/
http://green-energy-mx.com/cms/
http://green-energy-cal.com/cms/



Green Energy Portal is a global portal developed across five countries – Russia, Ukraine, Bulgaria, Mexico and United States (California) with the aim of facilitating development, implementation of green energy policies, projects and technologies. Portal subject areas include information on financing mechanisms, organizations, technology solutions (Renewable Energy and Energy Efficiency), land use, transportation, project development, environmental trading and regulations. There is a projects tracker with the information on implemented projects and several energy efficiency calculators.
Each section of the portal contains numerous links to information covering the above-mentioned main subject areas. The Green Energy Portals may be interesting for the following groups of users: project developers, implementers, field experts, researchers, SMEs, policy-makers, etc. Some information of the portal is locked for users and requires registration.

3.4 ADVANCED MANUFACTURING OFFICE

http://www1.eere.energy.gov/manufacturing/industries_technologies/index.html



The home page of the Advanced Manufacturing Office of the EERE which contains a broad range of information on energy efficiency technologies covering such aspects as research and development, technology deployment, industries and technologies, financing opportunities and many more. The AMO facilitated establishment of an Energy Resource Center, Industrial Assessment Centers and networks of industries and manufacturers with the aim of facilitating expansion and deployment of innovative energy efficiency technologies through project development and co-financing, technology commercialization, SME training, industry assessments, etc.

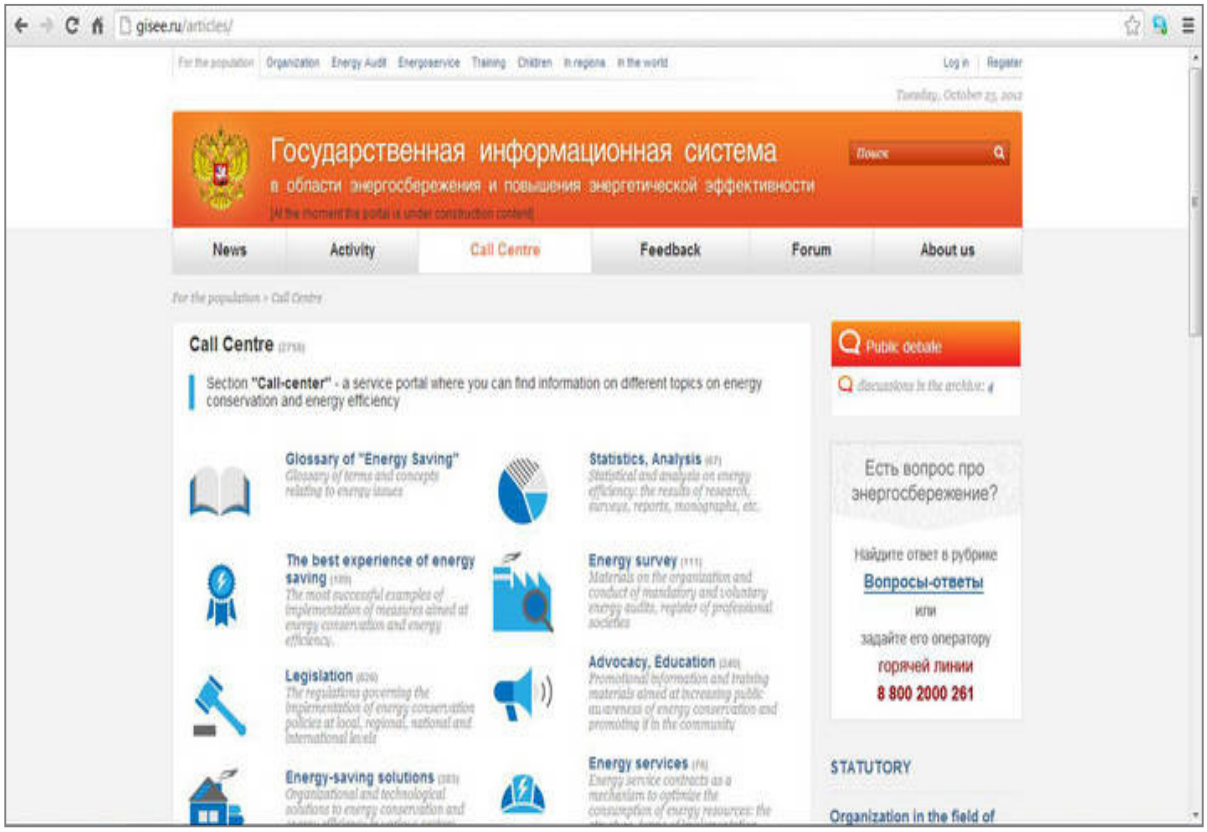
The web site contains several accessible databases, namely:

- Incentives and resources database – information on almost 2000 resources available for commercial and industrial plant managers, and energy saving incentives such as rebates, waived fees, analysis tools, financial assistance, training opportunities, and energy audit program assistance.
- CHP Projects database including detailed profiles of implemented projects
- Database of State Incentives for Renewables and Efficiency (DSIRE) containing information on federal, state, local, utility, and non-profit incentives and policies that promote renewable energy and energy efficiency.

The information is open for access to a larger public. The databases and publications are available for free without registration. The website is positioned to be used by a large target audience from students, researchers, scholars to industry experts, energy economics and engineers, ESCOs, project developers from different sectors of the economy including both private and public sectors such as large manufacturing plants and/or SMEs.

3.5 STATE INFORMATION SYSTEM ON ENERGY CONSERVATION AND EE

www.gisee.ru



The internet portal State Information System on Energy Conservation and Energy Efficiency is an instrument for informing the larger public in general and professional audience in particular on various issues pertaining to energy efficiency and energy conservation. It accumulates a broad range of energy efficiency-related information, analytical and practical resources and tools customized to the needs and information requirements of a specific target audience.

The search of information and resources is simplified and made freely accessible to visitors in an online regime. The target audience of the portal includes the following segments: the larger population (including also children and students), municipal, regional and national level policy makers, public and commercial organizations, sector professionals (energy audit and service providing companies). The portal utilizes advanced design technologies and instruments such as interactive services, personalized tools, virtual demonstration zones, multi-functional information system and options.

4. COMPARATIVE QUALITATIVE ANALYSIS

An assessment of selected databases was conducted with the purpose of comparing them against each other and identifying strengths and weaknesses of each database. This analysis will serve as a basis for a set of recommendations regarding the content and technical characteristics of the database on energy efficient technologies and equipment to be designed for Russian users.

The analysis of the databases was performed against the main criteria listed below and was aimed at responding to the following questions:

a) Content and the quality of information: what is the information coverage?
b) Technical characteristics: what are the main technical features? Are there search options and how effective they are in producing needed information? Are the search options adjustable or modifiable by topic, sub-topic, date, etc.? What other technical options are available and which ones are missing?
c) User-friendliness: How well is the information/content structured? Is it easy for users to identify the needed information?
d) Access to information and the target audience: Is it freely available? Who are the users? How large is the potential user audience?
e) Integration with other web sites/databases
f) Strengths and weaknesses

The table below presents the information coverage by sites, implementation of interactive tools and segment of energy consumer groups covered, industries and technologies presented.

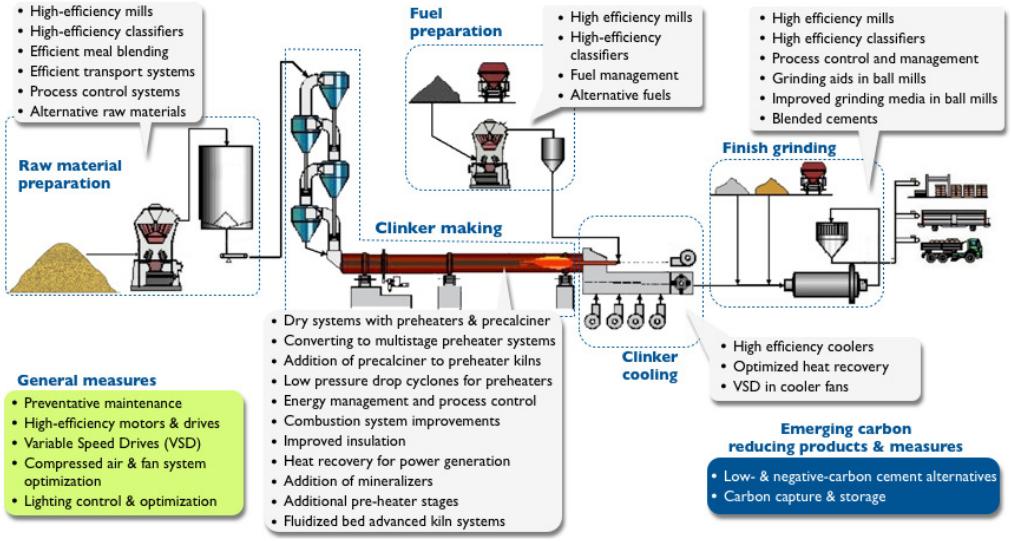
WEB SITES / CONTENT	INDUSTRIAL EFFICIENCY TECHNOLOGY DATABASE (IETD)	SUSTAINABLE ENERGY AUTHORITY OF IRELAND (SEAI)	GREEN ENERGY PORTALS	ADVANCED MANUFACTURING OFFICE	STATE INFORMATION SYSTEM ON ENERGY CONSERVATION & EE
CONSUMER GROUPS					
GENERAL POPULATION		X			X
BUSINESS	X	X	X	X	X
INDUSTRY	X	X		X	X
SME's		X	X	X	X
HEAVY INDUSTRIES					
ALUMINUM	X			X	
CHEMICALS	X			X	
FOREST PRODUCTS				X	
MINING				X	
STILL & METAL CASTING	X			X	
CEMENT	X			X	

WEB SITES CONTENT	INDUSTRIAL EFFICIENCY TECHNOLOGY DATABASE (IETD)	SUSTAINABLE ENERGY AUTHORITY OF IRELAND (SEAI)	GREEN ENERGY PORTALS	ADVANCED MANUFACTURING OFFICE	STATE INFORMATION SYSTEM ON ENERGY CONSERVATION & EE
TECHNOLOGIES					
BOILERS	X	X	X	X	X
STEAM	X	X	X	X	X
COMPRESSED AIR	X	X	X	X	X
COGENERATION		X	X	X	
MOTORS, PUMPS, DRIVES	X	X	X	X	X
BUILDING ENVELOPE		X	X		X
ENERGY INTENSIVE PROCESSES	X	X		X	
PROCESS CONTROLS	X	X	X	X	X
PROCESS HEATING	X	X	X	X	X
RENEWABLES		X		X	X
TYPE OF CONTENT					
GENERAL EE, CONSUMPTION		X		X	X
GHG EMISSIONS	X	X		X	X
ESTIMATED EE POTENTIAL	X	X		X	X
CASE STUDIES	X	X	X	X	X
EE EQUIPMENT AND LINKS	X	X	X	X	X
INCENTIVES		X		X	X
POLICY		X	X	X	X
ENERGY AUDIT		X		X	X
INTERACTIVE TOOLS USED					
INTERACTIVE GUIDES & TOOLS	X	X		X	X
EDUCATION TOOLS AND GAMES		X		X	X
VIDEO MATERIALS AND WEBINARS		X		X	X
MOBILE APPLICATIONS		X			X
ENERGY MANAGEMENT ACTION PLAN	X	X			
SEARCH AND BROWSING OPTIONS					
LOCAL SEARCH	X	X	X	X	X
ADVANCED SEARCH		X	X	X	X
INTERACTIVE BROWSING	X	X			X

4.1 INDUSTRIAL EFFICIENCY TECHNOLOGY DATABASE

http://ietd.iipnetwork.org/content/about-ietd

a) ***Content and quality.*** As it has been mentioned in the summary above, the database information is currently limited to three industry branches: cement, iron and steel with motor systems presented as the cross sectorial branch. For each topic the detailed description of the industry is provided including the schematic overview of the technological cycle. (See Picture 2)



Picture 2: Cement Schematic

Bulleted listings of technological cycles are in fact links to their more detailed descriptions as to what is involved into the process, what kind of equipment is used and what are the costs and benefits of efficiency improvements for a particular technology/equipment such as energy saving potential, CO2 reduction potential, retrofitting costs. These pages also contain links to relevant publications, documents, articles and case studies focusing on energy efficiency potential in a given industry and existing resource saving technologies and best practices. A number of links were checked for their accessibility. Publications are available in Adobe Acrobat format and downloadable.

The authors of the database also provided international benchmarks and key data for a given industry branch such as global production level, key producers (countries and separate manufacturers) including their shares, global consumption data specified also by regions/countries. Organizations and Programs page contains links with references to institutions on global, national and regional levels aiming to improve the resource productivity and reduce harmful environmental impact of these industries. Same information structuring refers to motor systems.

Visitors are also introduced to the concept of energy management system in the manufacturing enterprises and a number of international guidelines for the companies wishing to establish such as system at their enterprises. One of them is ISO 50001 – a global energy management standard for manufacturers, commercial enterprises and operations

which provides the latter with technical and management strategies aimed at increasing energy efficiency, minimizing operational costs and improving overall performance[2].

As it comes to the quality of information, the sources of information as well as organizations/individuals which performed the research and data compilation for specific industries are clearly indicated. Information is compiled from a wide array of publicly available sources and published literature. In case of misleading information users can easily contact experts for clarifications.

Unfortunately, the database covers only several industry branches: cement, iron/steel and motors which also limit the scope of users. The authors of the site confirm data on pulp and paper industries is being currently compiled and will be soon added to the web site.

b) ***Technical features.*** Detailed step-by-step instructions/recommendations on database browsing are provided to users and accompanied by a visual guidance on the use of the web site. Users can retrieve information in two ways: by browsing the database in search of the needed information or by using Search option.

If users are interested in a particular industry such as iron and steel, they click on the specific link and find a bunch of information related to the sector.

The search option has two possibilities: simple and advanced search brought to the front page of the web site. Advanced search allows users to specify requested information by the following categories:

- Technologies/measures and Tools/Resources
- Industry sectors and cross-sectoral systems
- Sources/authors
- Date and type of the resource (such as for example publication or case studies, guidelines etc.)
- Region or country
- Etc.

c) ***User-friendliness.*** The database is highly user-oriented. Separate industry-related pages have somewhat hierarchical structuring and the information is narrowed down from the general to more specific topics. As it regards the structure of information, in addition to search options the web site itself is divided into four major sections – Sectors, Cross-Sectoral Systems, Energy Management, Organizations - each having its own sub-sections/pages. Cross-linkages between pages are also available. It makes information retrieval quite easy for users without requiring specific technical competences. Effective design of search options must be particularly noted.

d) ***Access to information***. The website is publicly available for free. Moreover, it doesn't require going through any registration or login process which sometimes users are reluctant to do. The web site is linked to the modern social communication tools: Twitter, Facebook and LinkedIn. Therefore, users have the opportunity to share/disseminate the information

[2] http://www.superiorenergyperformance.net/ems.html

through their networks. The potential audience may be quite large ranging from practitioners to experts and industry researchers, students.

e) ***Integration with other web sites/databases***: In addition to numerous web resources available in the database, the IETD is also linked with other two databases developed by the Institute for Industrial Productivity: Industrial Efficiency Policy Database and Supply Chain Initiatives Database.

f) ***Strengths and weaknesses***: After careful review we can sum up that the IETD database has both strengths and a number of weaknesses. Its user-friendliness and accessibility are to be mentioned among the positive aspects including also detailed overview of technologies and processes and introduction of the energy management system concept and relevant international standards. The possibility of detailing the search options by a number of categories is also an advantage of this database in relation to other similar web sites. The web site utilizes interesting design solutions by presenting a schematic overview of technologies and processes supplemented with photos and graphs.

However, there is limited information in the database in terms of industry branches covered even taking into consideration the fact that two more industries are soon going to be added. Another limitation is that only large industries are included (cement, steel, iron) which means that this information may not be relevant for SMEs.

4.2 SUSTAINABLE ENERGY AUTHORITY OF IRELAND (SEAI)

www.seai.ie

a) ***Content and quality***. The web site is a comprehensive portal with a holistic approach to presenting energy-related information with the highest possible coverage both content and audience-wise. Being the web site of the Sustainable Energy Authority of Ireland it can be indeed viewed as a database considering the scope and depth of information provided. The portal effectively addresses all areas of energy consumption where energy efficiency can be sought and measures implemented: the residential sector, building infrastructures, business sector. There are also separate pages devoted to renewables, school energy education campaign, community-based programs and initiatives, existing grant funding to energy efficiency/sustainable energy initiatives as well as current publications on the subject area. Each page contains quite broad information on all aspects of energy consumption and energy efficiency related to the given segment.

Since the topic of this assessment is energy efficiency databases for SMEs we will dwell mostly on business-related information. The web site information targets both large energy users and SMEs therefore the information is distributed accordingly by its relevance for the two target groups. For example, Large Energy Users section covers the following:

- Overview of services for large users:
    - Large Industry Energy Network (LIEN) overview. Large energy consumers form the Large Industry Energy Network under the auspices of the SEAI to

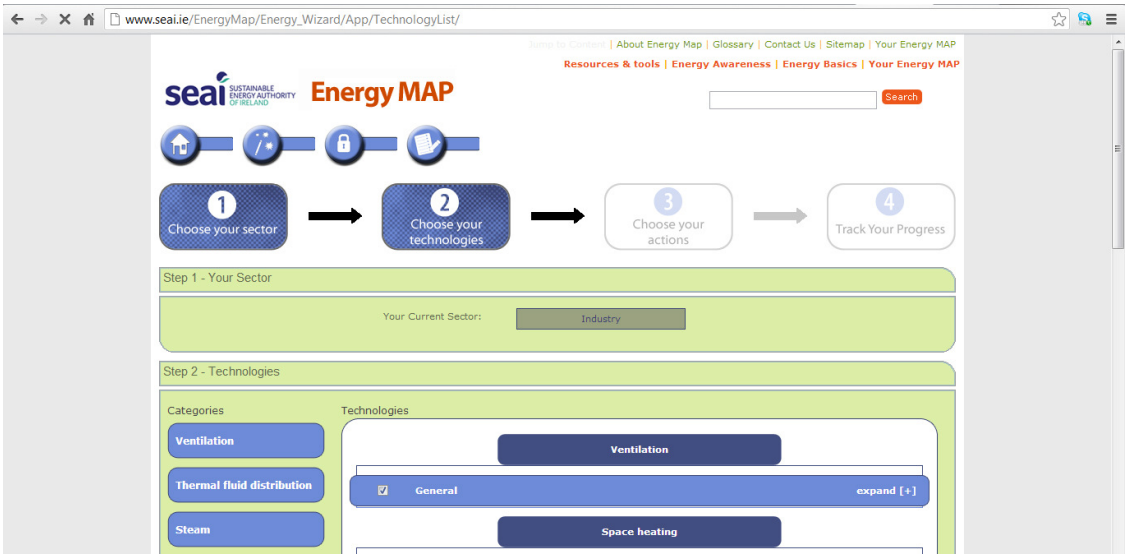
spearhead and implement efficient energy use programs. The list of companies and the information for those wishing to join the network is available including also LIEN reports and initiatives.
    - Energy Agreements Program including the program overview, technical support services available to program members, the list of agreement members
    - Special Initiatives such as industrial best practice initiative, energy efficient design initiative, SEAI outputs in areas including HVAC, refrigeration, compressed air, energy efficient design, etc.
    - Energy Management Standard section covers Ireland's latest EN 16001 standard representing the best practice in energy management including the standard overview, transition requirements and EN16001 resources.
    - Information Resources summarize available sources: presentations, articles, case studies and detailed reports covering specific areas, including Compressed Air, HVAC, Energy-Efficient Design, Refrigeration, Industrial Best Practice and Alternative Methodologies

The web site also offers quite comprehensive information for SMEs in energy efficiency such as SME-targeted services, mentoring and SME training. The following aspects deserve a special mention:

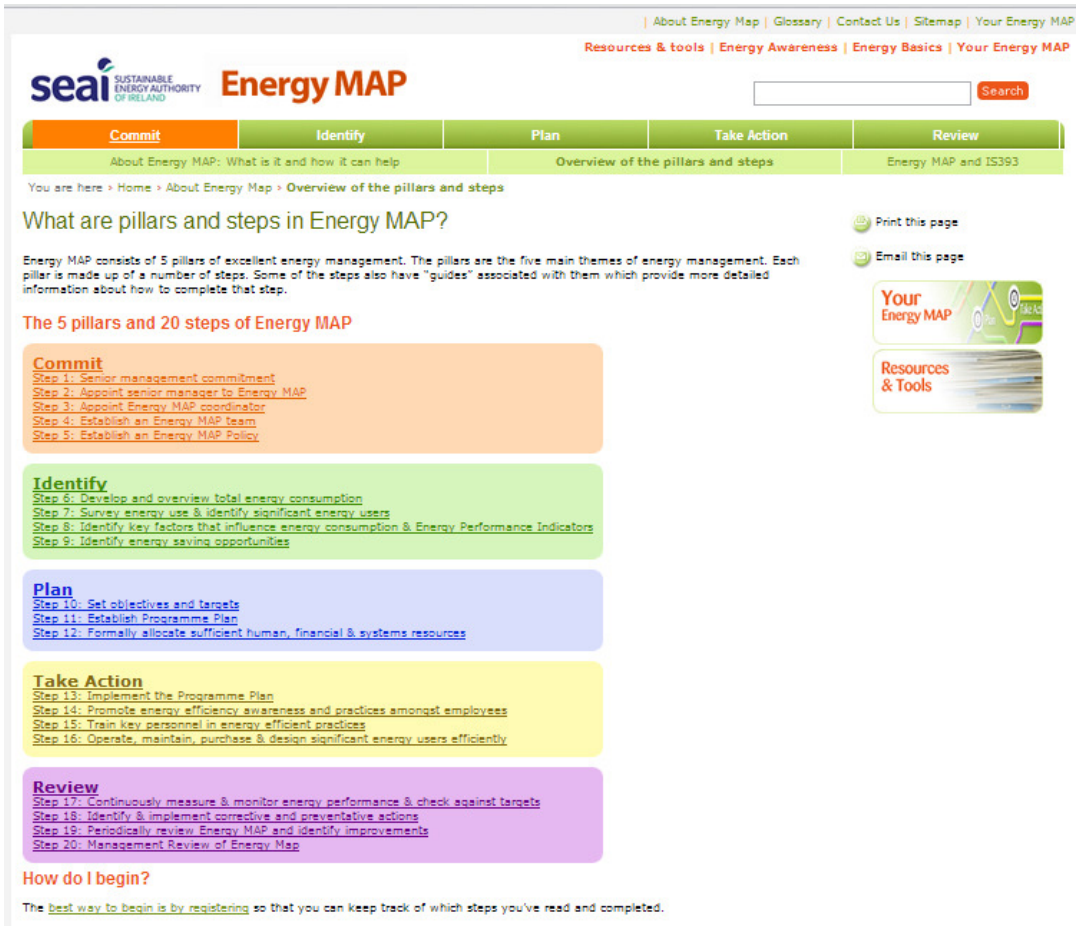
- Quick Wins – energy saving tips presented by sectors and by technologies. While clicking on a specific sector (e.g. manufacturing, retail, hospitality, etc.) or a technology (lighting, refrigeration, heating, CHP, etc.) users are introduced to basic low or no cost measures which can be implemented by SMEs on their sites to increase energy efficiency. More complicated information is also available both for specific energy consumption areas and sectors. For instance, when clicking on lighting the following information can be downloaded: lighting efficiency guides for offices, retail, hospitality, manufacturing and warehouses, technical manuals, lighting controls, etc. It refers to other technology areas as well. All information is supported by case studies and success stories from a given area.
- Energy Technologies database containing detailed information on energy saving opportunities by buildings and industries with the list of energy consumption areas in each category. For buildings this includes lighting, heating, HVAC, CHP, etc.
- Tools and Resources links including technology assessment tools (such as for example energy savings calculator for boiler replacement projects, motors best practice tool, pumps best practice tool, etc.), templates on planning and management, energy costs tracking, sample energy policies, procurement guides, and many more information.

The web site contains a link to Energy MAP (Energy Management Action Plan) – an online tool for the SMEs to creating their own best practice energy management action plan. A clear wizard for plan creation is provided with the description of major steps and related instructions. The MAP is based on five major pillars (Commit, Identify, Take Action and Review) and 20 steps. By registering online, users can create their own personalized Energy MAPs.

Picture 3: Energy MAP for Industry



Picture 4: Energy MAP pillars and steps



There is also the information on Triple E products – benchmark register of best in class products (equipment and vehicles) including Triple E information, financial incentives and guides on how to register the products under the Triple E account. Users can access the catalogue of Triple E products which meet benchmark energy efficiency criteria specified by the SEAI and are eligible tax exemptions under the ACA (accelerated capital allowance).

Other relevant information for SMEs is the overview of financial incentives available to enterprises charged with energy efficiency improvements: R&D grants, commercial grants, tax incentives, etc. There is information on Sustainable Energy Awards competition including the eligibility criteria, award categories and the lists of winners in different years.

b) ***Technical features.*** This web database obviously has a competitive edge over similar sites reviewed under this assignment both in terms of content, layout and other technical characteristics. It utilizes existing multimedia resources – video materials (DVDs, YouTube, vimeo video clippings), graphs, and pictures. The residents' page contains energy efficiency game zone (two games available) and a free iPhone application downloadable from the site. Users can also change background color of the web site. Each page can be printed separately in the printer-friendly format and sent to email.

Basic search option is also available and appears on top of the web site interface. Information is browsed by entering a specific keyword related to the search topic. More advanced search is not available. There is a separate search for Triple E products which exists in two options: basic search and advanced search. Basic search is also done by categories designed in the hierarchical format: product category - product technology – product program. In addition to the listed options advanced search can also be made by the Triple E code, manufacturer, product name, code and validity period. Manufacturers can create their own Triple E products account, login and submit new products.

Nearly all sections contain their respective FAQs pertaining to the given area. The web site also gives users an option to join their mailing list to follow on events and updates. There are additional subscription opportunities available, such as, for example, while undergoing through a web-based energy survey, residents can subscribe to receive energy saving tips by post, e-mail, or SMS.

There is a site map which presents the structure of the web-site graphically. Thematically related cross-linkages between pages are well organized. For example, when users are browsing Your Building page, the banner on Accelerated Capital Allowance (ACA) appears which directs the reader to the respective ACA page containing information on tax incentives from using energy efficiency technologies and products, ACA claiming procedure and the catalogue of Triple E products. Majority of pages also have links with related publications and resources.

c) ***User-friendliness*****.** The web site has quite a complicated structure which is normal given the scope of its coverage and the size of the potential target audience. Nevertheless, it can be truly rated as one of the most interesting and user-oriented web sites on energy efficiency reviewed under this assignment. There is a site map and search option therefore users can

easily retrieve the needed information. However, just browsing the web site may be quite interesting in itself because topics are covered for every type of audience.

The content of the web site is structured logically by energy consumption sectors with information for different target groups, therefore users can easily find relevant information based on their interests. Nevertheless, pages contain mutually related cross-linkages which make the web site more user-friendly.

d) ***Access to information***: The web site is designed for nearly all types of energy users and covers the largest potential audience from kids to adults, from individuals to corporate users. Information of the web site is available for free. If users are interested in receiving regular updates, they can register in the mailing list. Manufacturers can create their own accounts to register products in the catalogue. Links to Facebook, twitter, LinkedIn are also placed. In addition, interested individual and corporate users can also sign up to participate in specific programs such as AMA (advice, mentoring and assessment) or Energy MAP training or join the Energy Link online network for people engaged in energy management in public sector. As we can see plenty of services are offered to different target audiences.

e) ***Integration with other web sites/databases*:** SEAI page contains plenty of resources: research papers, articles, documents, case studies all downloadable in Adobe Acrobat format. There are SEAI pages on Twitter and LinkedIn. The web site is not integrated with other databases.

f) ***Strengths and weaknesses*.** The web site has a number of advantages as opposed to other similar resources. An apparent strength of the web site is its content and wide coverage and the scope of the potential audience targeted. More specifically, the following aspects should be mentioned:

- Diversified information
- Interesting site design
- Use of advanced IT tools such as multimedia resources (videos, games, etc.), iPhone application option, page emailing and printing opportunities, downloadable resources, etc.
- Numerous subscriptions available for different target groups
- Register of Triple E products

This is all well thought of and designed to attract as many users as possible. As it comes to weaknesses, the web site is poorly integrated with other similar web resources. It would be desirable if the web site contained a separate page with links to other relevant web sites and especially other energy efficient technology/equipment databases.

4.3 GREEN ENERGY PORTALS

http://green-energy-ru.com/cms/
http://green-energy-ua.com/cms/
http://green-energy-bg.com/cms/
http://green-energy-mx.com/cms/
http://green-energy-cal.com/cms/

a) ***Content and quality.*** The Green Energy Portal is a website with extensions to the following countries: Russia, Ukraine, Bulgaria, Mexico, US/California. The content of the web site focuses on the green energy issues covering the following energy-related aspects: technologies (Renewable Energy and Energy Efficiency), financiers of green energy projects and incentives, organizations charged with energy issues in these countries, land use, transportation, project development, regulations, etc.

   Although mostly similar, the content of the sites is not identical and information varies slightly by countries. For example, environmental trading issues are covered on all sites except Russia with policies, procedures and carbon trading schemes presented. Information on commercial and policy news on GHG trading is updated regularly on a weekly or even daily basis. The Project Development section contains the Project Tracker - a list of green energy projects submitted by project implementers – and several calculators: CO2 emissions reduction, energy cost, building heating, street lighting, economic evaluation of investment projects.

   The content of the web sites is link-based, i.e. after short introduction to the topic pages contain a number of links to the relevant websites/databases containing information on the subject matter: technology overviews, assessments, articles and handbooks, equipment standards, databases, etc. There is a link to the green energy portal's global marketplace where users can sell/buy various energy efficient equipment/technologies, buy/sell/finance projects and sell or seek various services (engineering, environmental, feasibility study, construction/installation, etc.). The market place is apparently not very active as only few postings could be found mostly on renewable energy technologies. The US Californian site also includes links to Californian energy and environmental blogs.

b) ***Technical features***. The web site has a simple user-friendly design. As opposed to SEAI web site, its features are quite basic. Users can switch between different country sites by clicking on the banner on the web site interface. Immediate translation of the web site to different languages is also possible through Google language translator. The search option appears only for data on project financing. The search is made through Google, Yahoo and Bing engines. However, when we tried to test the search function by picking the categories requested pages could not be found. Even when various options were selected it produced zero results. Browsing by categories seems to be more effective for retrieving information.

c) ***User-friendliness*.** The web-site has basic layout. The information is structured by categories - finance, organizations, technologies (renewables, energy efficiency), etc., therefore data retrieval is quite easy for users. The web site has an interactive design: users can post events, add organizations or edit their information, provide recommendations to the projects tracker and/or calculators, add their blog to the existing blogs list (for the Californian site).

d) ***Access to information***. The Green Energy Portals may be interesting for the following groups of users: project developers, implementers, field experts, researchers, SMEs, policy-makers, etc. Users can create their user accounts, but there is no proof that member-only restrictions are applied for users to access certain information. Obviously this refers to the option of adding/editing information, posting information at the marketplace. However, attempts to create an account failed because it requires the approval of the site administrator who is supposed to send the password for a given login name which he/she never did. In fact, feedback has been ever received from the site.

e) ***Integration with other web sites/databases*:** Green Energy Portals is a network of interrelated web sites for several countries: Russia, USA, Mexico, Bulgaria and Ukraine. The web portals are linked with numerous resources on green energy covering broad scope of issues: green energy policies, regulations, financing, technologies, equipment databases, project development tools, renewables, etc. From this perspective, portals can direct users to a great number of other web resources.

f) ***Strengths and weaknesses***. One of the advantages of Green Energy Portals is their multi-country network and interconnection with many other web resources. However, the web site has also a number of substantial weaknesses which undermine its quality and eventually reduce the number of users. These weaknesses include:

- Ineffective search function which brought no results when tested; simple browsing appears to be more informative.
- Some of the links placed on the site need to be tested and their accuracy verified. Random check of the links proved that some of them are outdated: information is either removed, no longer available or links are not found;[3] Users may no longer apply to this web site for information when they find that timely update of resources is not carried out.
- Account creation requires approval of the site administrator. However, when an attempt was made to create an account by registering the email, no feedback was received from the site administrator within next several hours as to whether an account has been approved (in this case password should have been sent) or rejected.

[3] For example, out of six randomly checked links, the following two appeared to be non-existent:
http://www.heatrecoveryboiler.com/ (Heat Recovery Boiler) – link not found
http://www.stateofgreen.com/Technology-Areas/Energy-Efficiency - information removed

4.4 ADVANCED MANUFACTURING OFFICE

http://www1.eere.energy.gov/manufacturing/industries_technologies/index.html

a) ***Content and quality*.** The website presents multi-faceted activities of the Advanced Manufacturing office designed to promote energy efficiency of the industrial sector in a number of areas. Given the scope of information and coverage, it can be indeed considered as a data bank of energy efficiency and technology-related information specifically targeted to the industry/manufacturing sector with the entire information presented by the following major subject areas: Research and Development, Technology Deployment, Industries and Technologies, Information Resources and Financial Opportunities.

Each of the sections contain a comprehensive information on a given subject area. For example, Research and Development includes data on R&D initiatives and project opportunities for manufacturers and SMEs in this area such as innovative manufacturing initiatives, manufacturing demonstration facilities (includes list of the sites and ways of participation covered), CHP development, Small Business Innovative Research, Next Generation Materials and Manufacturing Processes. The Technology Deployment contains comprehensive information on all AMO-supported activities/steps aimed at commercialization of energy efficient technologies through its Energy Resource Center and two other related programs: Industrial Assessment Centers and Clean Energy Application Centers. Every kind of information is linked with the funding opportunities available to project developers.

Currently being under revision for updates, the Industries and Technologies section now covers the following branches:

Industries	**Technologies**
Aluminum	Boilers and Steam Systems
Chemicals	Compressed Air
Forest products	Distributed Energy/CHP
Glass	Energy Intensive Processes
Metal Casting	IT/Data Centers
Mining	Motors, Fans, Pumps
Petroleum Refining	Process Heating
Steel	

Links for some technologies currently contained in the list (e.g. combustion, fuel and feedstock flexibility, nano-manufacturing, etc.) are not active. In addition to the industries overview and profiles, the active links refer to information on existing R&D projects (if available), analytical studies and publication including also documents for historical reference on the specific industry branch and additional links to other web resources (e.g. link to a glass portal).

The Information Resources page includes the following databases:

- Incentives and resources database – information on almost 2000 resources available for commercial and industrial plant managers, and energy saving incentives such as rebates, waived fees, analysis tools, financial assistance, training opportunities, and energy audit program assistance.
- CHP Projects database including detailed profiles of implemented projects
- Database of State Incentives for Renewables and Efficiency (DSIRE) containing information on federal, state, local, utility, and non-profit incentives and policies that promote renewable energy and energy efficiency.

The list also included two more databases - Industrial Assessment Centers Database (IAC)[4] and Large Plant Assessment Database[5] - links for which were inactive. There is a statement on the web site that the Large Plant Assessment Database is temporarily offline due to potential hacker attack.

Other information structured as databases include:

- AMO Activities by states. These can be searched by clicking on the relevant state on the map or picking it from the list.
- Energy Resources Center contains the database of Energy Saving Calculators and scorecards for different technologies as well as software tools for technology assessments.

b) ***Technical features***. Technically the website is well sustained and meets the technical characteristics a modern website should possess in terms of design, layout, format and presentation of information. For example, the AMO activities can be searched by clicking on an interactive USA map designed in Adobe Flash Player format. There is more detailed mapping of AMO activities on the interactive maps of states by their locations and types of activities which are flagged in different colors. The site is well thought of in terms of cross-linkages and hyperlinks: relevant pages appear on the left side of the interface as Quick Links whereas body texts contain multiple hyperlinks. For instance, the Quick Links on Research and Development page direct the user to related topics such as AMO Activities, Financial Opportunities etc. Related news and events appear on the right side of the pages as featured stories.

Search option is available by keyword browsing. Each database is equipped with a separate advanced search by categories. For instance, the CHP project profiles can be search by state, market sector, system size, fuel, installation year, specific code, etc. The database of states incentives and resources is available at the state, county and municipal level as well as utilities and non-profits. A separate search option (both by keyword and advanced) is available in the library of publications.

[4] According to the statement of the website the IAC database includes information on more than 11,000 energy assessments and 83,000 assessment recommendations for small- to medium-sized manufacturers conducted since 1981 to date with details covering fuel type, base plant energy consumption, and recommended energy efficiency improvements, as well as projected energy and cost savings, implementation cost and simple payback.

[5] Provides detailed information on completed onsite plant assessments in U.S. manufacturing plants designed to improve energy efficiency and increase productivity.

c) ***User-friendliness***. The content of the website has logical structuring by major thematic categories each consisting of related subpages. The information is abundant but users are not overwhelmed with the data due to clarity of texts and well thought-of content structuring of pages. There is effective use of body text hyperlinks and quick links which can immediately direct the reader to other related pages. For example, the databases can be found both at the Resources page and in topically related pages in quick links.

d) ***Access to information and target audience***. The information is open for access to a larger public. The databases and publications in Adobe Acrobat format are available for free without registration. However, prior registration is required for downloading the software tools which is also open to users from outside the United States. Banners with the subscription options to news and announcements appear on various pages for users to submit their email. Numerous search possibilities (keyword search, library search of publications, database search) also contribute to the accessibility of information for interested users.

   The target audience can be very wide ranging from students, researchers, scholars to industry experts, energy economics and engineers, ESCOs, project developers from different sectors of the economy including both private and public sectors such as large manufacturing plants and/or SMEs.

e) ***Integration with other web sites/databases***: Being quite resourceful the web site also contains numerous links to other related web pages. Banners of the web sites of the US Department of Energy as well as EERE (energy efficiency and renewable energy) home page are placed on top of the web site interface. Separate pages contain links to other thematically related web resources such as for example Advanced Manufacturing Partnership web site or industry-related publications. There are also some links to other web-based databases, for example the DSIRE database.

f) ***Strengths and weaknesses***. It is one of the most resourceful web sites reviewed by consultant under this assignment which in this respect can be compared with the SEAI home page. The following features deserve a mention as the strengths of the web site:
   - Availability of several diversified search engines in different resources: general keyword search around the entire web site, advanced library search for publications, database searches.
   - Use of modern design features such as interactive maps for tracing of AMO projects and activities, various subscription options, an opportunity of submitting feedback and comments on search results, use of numerous hyperlinks and quick links
   - Resource-wise the web site offers a diversity of information on energy efficiency including research and development, technology deployment, industries and technologies, financing mechanisms, technical assistance programs, numerous publications and web links.
   - The web site contains several different databases offering diversified data including also various useful tools such as energy saving calculators, energy assessment software etc.

   The web site doesn't seem to have significant drawbacks except for the two listed databases which appeared to be inaccessible at the moment.

4.5 STATE INFORMATION SYSTEM ON ENERGY CONSERVATION AND EE

http://gisee.ru

a) ***Content and quality***. Government-supported portal on energy efficiency and energy conservation which is still in the process of content development. The main objective of the internet portal is increase the awareness of the larger public and professional community on a wide range of energy efficiency-related issues and implementation of government policies in this area. Therefore its content may be interesting for community members as well as public and private sector institutions and companies interested in energy efficiency.

The Information and resource center of the portal is a service which contains a wide range of diverse on energy conservation and energy efficiency improvement issues: energy glossary, legislation, energy saving programs, methodologies, standards and tariffs, statistics/analysis, education and training and best practice in energy saving projects. There is also information on energy saving solutions, equipment and materials available in the resource center. For example, energy saving equipment is presented by categories: home appliances, lighting, metering and controls, industrial equipment, heating, ventilation, air conditioning, office equipment, small-scale power generation (renewable, CHP, small hydro). As to energy saving, materials generally include the articles on insulation materials for roofs, floor, pipes, windows and doors, walls and electricity supply networks.

There is an Events column which includes information and announcements of energy-related forums, conferences, exhibitions and training programs. Subscribed users have the opportunity to make postings of their events announcements. Postings refer not only to Russia but also other countries of Europe and CIS.

The information of the bottom menu is structured by target users: population, budget organizations, utilities and construction, business, energy audit, energy services, updates from regions and the world. Kids' column is particularly interesting with cartoons, games, contests on energy saving topics. Each audience group is introduced to a comprehensive information about energy saving and energy efficiency which are relevant for a given market segment of energy consumers. For instance, the population section includes interesting awareness building materials (posters, booklets), interactive energy saving tips, web-based training on energy efficiency, video seminars (referred to as webinars), appropriate legislation, the database of energy saving companies and many more. Web-based energy saving training focuses on a broad range of issues such as alternative energy, windows, water efficiency, lighting efficiency, energy efficient appliances, etc. There is a database of interactive calculators some of which can be used by residents, namely for window replacement, lighting replacement, heating calculator, and some more. A library of energy saving solutions contains a catalogue of energy efficiency measures and a register of energy saving appliances.

Web pages for the institutional and private sectors include information on policies and requirements for the implementation of energy efficiency solutions (mandatory for budgetary institutions), the programs overview and the list of typical measures, the register of organizations/associations operating in the area of energy efficiency. As opposed to other target audiences (public and private sector) the content of the population section is much more impressive and interesting enriched with visual aids and video materials. Some of this information (e.g. energy saving calculators, training materials, equipment database) is also applicable in the institutional and public sectors. Surprisingly, the coverage of the public and business sectors is rather limited including legislative aspects of energy efficiency, government requirements to the implementation of energy saving measures at budgetary organizations, the register of energy saving companies and featured articles.

Energy audit and energy service companies are well represented and targeted to both audit and energy service providers as well as their potential clients. Institutions interested in conducting an energy audit at their sites can get acquainted with the legislation, advice on how to choose an audit company and procurement procedures, energy audit costs and calculators, the list of energy audit companies and feedback about companies. The information for energy audit companies covers the legislation and procedures of establishment of an energy audit company, typical equipment and methodologies used, state procurement process, energy passport requirements, experience exchange and the list of energy audit companies. Similar data is provided on energy service companies (ESCOs) including the sample energy service contract, types of energy service companies and their register as well as financing of energy saving projects.

Picture 5: Energy Audit section

The portal contains several databases:

- Database of interactive calculators for window replacement, lighting replacement, heating calculator, cost of equipment in standby operation, building energy efficiency, equipment energy efficiency, power capacity of solar collectors, power capacity of a biogas plant, parameters of a wind plant.
- Library of energy saving solutions containing catalogue of energy efficiency innovations by energy consumption sectors (buildings, cities, transport, industrial processes, energy production, transportation and distribution) and register of energy saving equipment/appliances
- Databases of energy audit companies, organizations/associations operating in the energy saving area, energy service companies.

Each page also contains related news stories and featured articles as well as excerpts of page-specific information from the resource center appearing in separate banners. Other interesting features of the site include Hot Line service and the User Forum where users can communicate on different energy efficiency-related topics, initiate discussions, post questions and comments and receive professional feedback. Although postings in the forum are subscription-based other visitors of the site can access the forum and read discussions because very often answers to the questions can just be found in the forum postings. Site visitors can also participate in the survey which is conducted on different energy saving issues. Results of previous surveys are also available.

b) ***Technical features***. Although the site is relatively new and is still under development it is equipped with a lot of interesting technical features, namely use of multimedia solutions during the design of some pages, namely training and education section, video lessons, webinars, kids section, interactive energy saving calculators, etc.

There are two menu lines on the web site, one being structured by target audiences (population, business, public sector, regions, ESCOs, energy audit firms, etc.) whereas the other presenting site resources (news, events, information center, feedback, forum, portal overview). The information on both lines is interconnected, i.e. when a visitor enters the public sector page, all related resources from the second menu line appear on the page as quick links: news, events, featured articles from the information center, etc. In the page on regions there is an interactive map of Russia for those interested in the regional updates. By clicking on the map or picking the region from the list users can get a snapshot of the region, data on energy consumption, list and contacts of regional authorities charged with energy saving issues, legislation and other news.

The site has a search option including the general search by a keyword on top of the web site interface and more content-specific search available on separate pages, e.g. the search possibility for events by regions, types and dates, on the ESCO database, etc.

c) ***User-friendliness***. The information of the portal is structured and written in a format and style which can be understandable both for specialists and the larger public. A special mention should be made of the section designed for the population with interactive energy saving lessons, quick energy saving tips, webinars, etc.

There is a logical design of the pages all of which are mutually interrelated through quick links and direct users to relevant information. Since the menu is structured based on target groups, it is very easy for visitors to identify and retrieve needed information. The web site has a lot of interactive features which make it more attractive for users including the possibility to post announcements, access the forum, participate in the user survey, send feedback and ask questions through the web site and many more.

d) ***Access to information and the target audience***. The website is targeted to different energy consumption market segments from the larger population to representatives of public and private sectors, professionals such as ESCOs, energy auditors, engineers, project developers and implementers. Access to information is free for users; subscription is required for some activities such as participation in the forum and submission of announcements.

e) ***Integration with other web site/databases***. Cross-linkage with other similar web resources is limited; there are links to the web sites of Russian Ministry of Energy, Russian Energy Agency. The databases include links to existing web sites of energy audit and energy service companies and organizations. There are no links to other databases.

f) ***Strengths and weaknesses***. Newly developed and still in the process of improvement, this portal contains diverse information for different types of Russian users. It has both strengths and some weaknesses, too. Interesting and user-friendly content as well as interactive design are among its strong sides, namely:
   - Multimedia solutions and innovative approaches used in the site design such as the design of energy saving tips, training on energy saving, video lessons and webinars;
   - Attractive design of the Kids section and child education through games and cartoons.
   - User forum, web-based survey and hot line are features which haven't been encountered on other sites

Picture 6: Kids section

However, there are also some shortcomings mainly connecting with the distribution of the information throughout the web site. There is limited information on pages for business and public sectors. Video materials, calculators and other links placed on the population section could be also made available to business or public sectors users given that some of this information is focuses on these areas (e.g. calculators, energy efficiency solutions library). More coverage of the private sector is desirable particularly with information which would be interested to manufacturers including more data on production processes and technologies which is currently insufficient.

5. OVERVIEW OF STRENGTHS AND WEAKNESSES

Nearly all energy efficiency sites come with both strengths and weaknesses. The issue is how to utilize and effectively transfer the positive experience of these sites by avoiding major gaps that have been pointed out during the review process. The paragraphs below attempt to summarize strong and weak points of reviewed databases that have been discussed above.

Content-wise nearly all web sites tried to provide a comprehensive and diversified coverage of energy efficiency by encompassing nearly all or some of its aspects and targeting the main areas of energy consumption and consumer groups. There is quite extensive coverage of policies/legislation, technical support and financing programs, organizations addressing energy efficiency, technologies and renewable energy nearly on all web sites. Various consumer groups are provided with targeted information specifically oriented to a particular segment. Economic, environmental and social benefits of energy efficiency and conservation are also sufficiently accentuated and data-supported.

The industry-related information aims to address energy saving opportunities in the industrial sector and to make manufacturers understand that industrial energy efficiency improvements can ultimately lead to better performance and productivity of plants. In addition to presenting general overview of industries and existing energy saving opportunities web-sites also contain the following information:

- Overview of production processes, industrial energy saving technologies, costs and benefits of efficiency improvements
- Publications, research documents, articles and case studies focusing on industrial energy efficiency potential, best practices and technologies
- Overview of financial opportunities and state incentives including information on available financing schemes, grants and rebate programs.
- Energy management best practices, the importance of the introduction of the energy management standard in facilities and relevant international standards. At least two of the sites provide information and references to the ISO 50001 international standards of energy management systems in industries.
- Online energy efficiency calculators, special software and tools such as for example Energy MAP (Energy Management Action Plan) – an online tool for the SMEs to creating their own best practice energy management action plan.

- Different databases of energy efficient technologies, equipment, appliances, policies and measures; the database of CHP projects; Triple E products register; the library of energy saving solutions and the catalogue of innovations; databases of organizations such as energy audit companies, energy service companies, networks and organizations charged with energy efficiency issues.

Majority of assessed web sites are designed with user-friendly navigation and the use of modern technologies and multimedia tools including video materials, graphs, pictures, online training, interactive lessons and webinars, interactive country maps allowing spotlighting of projects and activities. Two of the web sites (SEAI and Russian energy conservation and energy efficiency portal) contained kids section with on-line games and child education activities on energy saving, while the SEAI portal also offered free iPhone application for iPhone users. Other strong points were advanced search options, interactive energy saving training and quick tips intended for various user groups, free databases of energy efficient equipment, technologies and appliances.

These features make web sites user-friendly and interesting for visitors and also contribute to the attainment of the major objective: to increase public awareness and understanding of the economic and social benefits of energy efficiency and provide tools and incentives for energy efficiency initiatives.

Along with the positive aspects the sites also contained some drawbacks which were already described above. Particularly, as opposed to the industry there is less coverage of the SME sector by the websites. Although the information provided by the web sites and the lists of energy efficient technologies and equipment contained in the databases can be also applied by SMEs, the latter (small to medium producers, processing enterprises) is rarely perceived as a separate target of information dissemination by the web sites. For example, business sector is distinguished as a separate area in the Russian State Energy Conservation and Energy Efficiency Portal; however provided information is not sufficient and doesn't meet information needs of SMEs.

Cross-linkages with other databases exist but not sufficiently represented: only a few links to other databases are placed such as, for example, the DSIRE database available on AMO web site. Linkages to a larger number of working databases on policies, technologies, equipment and organizations including also web sites will contribute to a better information exchange. However, information placed on web sites should be tested for their adequacy and accuracy. One of the major drawbacks of Green Energy Portals was that some links placed on the sites proved to be outdated after simple random testing. Similar refers to the AMO web site two databases of which also appeared to be inactive at the moment.

The following chapter summarizes the conclusions and recommendations made by consultant on the basis of the strengths and weaknesses listed above.

6. CONCLUSIONS AND RECOMMENDATIONS

As organized and easily accessible data systems, online databases have become an increasingly popular source of information for various Internet users. There is an incredible number of web sites and databases on energy efficiency/clean energy/energy conservation being circulated on the Internet, with their number only growing over time. Within the framework of this assignment the consultant reviewed 45 web sites on energy efficiency, of which 12 were preliminary short-listed and the final five subjected to a detailed scrutiny.

The recommendations and conclusions brought in this chapter are drawn based on the results of this assessment and aim to provide insights for the industrial energy efficiency database to be developed for Russian SMEs under the Market Transformation Programme on Energy Efficiency in Greenhouse Gas-Intensive Industries in the Russian Federation. There was actually only one pure database among the five assessed web sites – Industrial Efficiency Technologies Database with the remaining one possessing some database features. While all five web sites had both strengths and weaknesses, much of their positive experience should be definitely used during the development of the new web site.

In the opinion of many database researchers, in order to meet the needs of users, the information provided by online data systems should possess the following 12 qualities[6]:

- Accurate
- Tailored to the needs of the user
- Relevant
- Timely
- Immediately understandable
- Recognizable
- Attractively presented
- Brief
- Up-to-date
- Trustworthy
- Complete
- Easily accessible

These characteristics are equally applicable for the Russian database as well. Meanwhile, there are several other factors which we recommend taking into consideration during the site design.

1. ***Sustainability and web promotion***. One of the important conditions of any database is its sustainability, i.e. its potential to serve the information needs of customers in the long run and beyond the scope of the EBRD and UNIDO project. It means that an appropriate agency should be envisaged to assume responsibility over the database running and proper updating upon completion of the project.
   Principles of sustainability of the web site also have to do with two other aspects:

[6] http://osm7.cs.byu.edu/ER97/workshop4/jh.html A Framework for Assessing Databases by John A. Hoxmeier, Colorado State University.

a. *User-oriented content of the web site*
b. *Regular web promotion activities*

Interesting and interactive content of the web site and availability of information targeted to different user groups is one of the preconditions of its long-term usability. It is highly recommended that project implementers opt for the energy efficiency portal with comprehensive and all-inclusive information on energy efficiency rather than a pure technology database which will target only a narrow segment of users. In this respect, web sites of Sustainable Energy Authority of Ireland or Russian Energy Efficiency Portal reviewed under this assignment are good examples to follow. Their information is relevant for widest range of audiences including kids and wider public, private sector enterprises, public institutions, industries, field experts, researchers, government bodies, etc. Diverse information is provided with the use of different interactive tools already described above which enrich user experience with the site and encourage repetitive visits.
Regular web promotion efforts are important to keep users abreast of its availability and stay high on search engines. There are different web promotion techniques that web designers are usually aware of, such as search engine optimization, use of banner ads, exchange of links with similar web sites and databases, promotion through social pages, and many more. Web site features which encourage interactive user participation on the web site are also excellent ways of web promotion. These are, for example, online surveys, user forums or marketplaces where users can post questions and participate in discussions and buy/sell products. It is nevertheless important to remember that web promotion is not a one-time activity and requires regular planning and consistency of efforts.

2. ***Content.*** While planning the content of the web site, information needs of the target audience are the first thing to be taken into consideration. The concept of the energy efficiency portal is the recommended approach to the design of the web site (database). The content coverage of the web site should be as wide as possible to encompass nearly all aspects and areas of energy efficiency which might be potentially interesting different segments of the energy market including also industries and SMEs. Apart from the energy efficiency technologies and equipment databases, it is highly recommended to include areas such as the role of energy management systems, guidelines to their introduction and ISO standards, energy audit and methodologies, project design and structuring, planning and management templates, Monitoring and Verification protocols, various overview of the ESCO sector and performance contracting, access to finance as a critical aspect of energy efficiency project implementation including the list of relevant financial institutions, legislative/regulatory framework and information on any rebate programs, existing tax incentives for energy efficiency improvements; the overview of the types of EE projects and measures implemented in industries and SME sector, and many more

   Given that the concept of an energy service company is relatively new for post-Soviet countries, it is worthwhile providing more detailed *information on ESCOs* such as the types of activities, case studies of successful projects and the register of companies. *Performance contracting* must be given greater emphasis as the mechanism of structuring energy efficiency projects which is widely utilized in developed countries and has limited application in the CIS states. Case studies section must also include successful examples of

performance-based contracting, especially from Russia or other countries of CIS or Eastern Europe.

As it has been mentioned many times, it is recommended to equip the web site with various interactive tools which make it more user-oriented and provide for better exposure of the web site to its audiences. Interactive tools used by assessed web sites have been already discussed above in quite detail. Since the energy efficiency portal will be primarily targeted to industries/SMEs, it is recommended to create an online marketplace of energy efficiency products where producers will have an opportunity to open accounts, register and sell their products online, participate in user forums and discussions. Created as an online marketing opportunity for producers, the marketplace will also have a positive promotional effect for the portal by increasing its visitors' track records and providing for long-term sustainability.

Links to other Resources. The web site will have a competitive edge if it provides links to other similar web resources (web sites, research papers, articles, documents, case studies and success stories, best practice examples, etc.) and databases, both Russian and international – thus providing the Russian industrial enterprises and SMEs with more global insights on energy efficiency issues and connect them with foreign databases. It is however, highly important that the web links are regularly checked and updated and outdated information and off-line links removed on time. For example, Green Energy Portal contains a huge number of links to other web sites and databases and is a useful resource in this respect. However, one of the major drawbacks of this web site was that the information is not updated on time and several inactive links were met during the random check. This is a serious flaw which may divert users from using the web site services. Therefore, regular check-up and update of information contained on the web site should not be overlooked.

3. ***Structure and navigation***. The architecture of the web site ranks first in importance as the collection of data has actually little value if the web site has complicated structure and not equipped with necessary tools to ensure quick access of users to information. Therefore, designing the right database with the right features and well thought out navigation is certainly one of the crucial factors for its further usability[7]. Users generally prefer web sites with clear navigation or menu and good search options which enable them to easily orientate in the web site and find needed information. It is highly important that the entire information is properly systemized and integrated into the navigation of the web site, and cross-linkages to other pages and the ones on the top-level menu as well as proper hyperlinks between connected topics and terms are provided. Placed on each page quick links will allow users to directly move to any of these pages as well as to the top level menu.

   Availability of several search options including advanced and simple keyword search, separate search engine on the database, possibility of submitting feedback and various subscription options further contribute to the effectiveness of the web site increasing its usability.

[7] The ISO defines usability as the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use (ISO 9241-11). ***Usability Evaluation of Online Terminology Databases.*** **http://www.upf.edu/hipertextnet/en/numero-4/usabilidad.html**

Right placement of the menu, selection of the correct font size and color is also important. Menu is usually placed along the top or on the left-hand side of the web page thus making it more visible to users. For example, despite its interesting and rich content, the Russian http://gisee.ru web site has one significant drawback on its navigation. There are two menu lines on the web site. While the first one is clearly located, the other menu line containing information on key energy market segments is hardly noticeable to users. Although placed along the top and bottom of the web page, the menu line might fall out of the attention of the audience because of a small size and bad choice of coloring of words.

4. ***Technical Features***. It is also recommended that the newly designed web site is equipped with modern interactive features similar to those existing on the reviewed databases such as interactive calculators, maps, on-line training on technology use, webinars, videos clippings and any other features whatever authors might find appropriate to place on their web site will enhance technical capabilities of the web site and attract users.

There is probably no single and uniform prescription of how a good database should look like. The right structure and layout, well-defined navigation, modern interactive design and comprehensive content tailored to serve the information needs of the target audience are the main pillars which constitute the foundation of a good website and guarantee its usability.