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Promotion 2013

Report

Placement as a technician

Improvement of a database about energetic Polish facilities
AGH University – Krakow - Poland

From 16th of May till 12th of August 2011

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ACKNOWLEDGMENTS

First, I would like to thank Mr. Artur Wyrwa for having accepted me as a trainee during 13 weeks within his team at the AGH University. He permitted me to make a very useful internship.

Then I would like to thank other members of his team, Mr Janusz Zyśk and Mr. Marcin Pluta. They helped me in my work by giving me some information about energetics facilities. Besides, they gave me some advices to discover Poland and Krakow.

Finally, I would like to thank AGH University for its welcome in its campus and for the staff availability to fix administrative tasks.

INTERNSHIP MODALITIES

This internship as a technician lasted 13 weeks, its objective was to work in a team as a technician that is to say under the responsibility of an Engineer. It took place from the 16th of May till the 12th of August, in the AGH University of Krakow in Poland. I had to be present from 9h30 to 16h30 at the Faculty of Fuel and Energy, and I had a lunch time.

The subject was vague for I had to work for a project of the team but my work was clearly defined when I was at work.

The first week, I realized a webpage for my tutor's website linked to the university website.

Then, I worked on a website that provides data of a database in order to simplify the data access. First, I worked on the code, so I used several languages (SQL, Java and html) for the following tasks:

- Fix encountered mistakes into the code
- Create the code to display the results in the parts that aren't usable
- Implement the registration part and the administration part
- Implement some restrictions in the pages access

I have also worked on the design of the website by creating some logos and changing the website banner.

Finally, I've worked on an article about the database. In this article, I described the database, I gave some explanations and I provided some energetic results. In order to provide these results I had to search the useful data by using the website but also by writing some SQL queries so as to adapt the database.

ABSTRACT

In 2004, Poland has joined European Union, but before the country has had to evolve so as to be able to join EU and to be able to face the market economy. Besides, joining EU means that its measures have to be respected. As energetics and environment are evolving, Poland has also had to make its energetics sector evolve and for that some researches are needed. That's why in 2005, EDF Polska launched the ENVIRO project, in collaboration with AGH University and other organizations, in order to provide a feedback for building the strategy for the investments into environmental protections for the next 10 to 20 years while answering the increasing need for energy demand.

The internship took place in the Faculty of Fuel and Energy of the AGH University within the team that participated to this project. As a trainee, my work was mainly related with a database, about polish facilities, which was created for the needs of the ENVIRO project. Now, this database is evolving and it's useful for other works.

My contributions for the team consisted in improving the web interface of the database in order to make it entirely functional. Thus, I had to fix all encountered mistakes, to create some lacking parts and finally to implement functionalities such as the user registration.

I also had the opportunity to work on an article on which some results had to be provided and for that, I had to analyze a lot of data. As a lot of mistakes were found, a report was made in order to list all the mistakes with some explanations for the team can modify the wrong values.

In addition to this, I created a webpage, I wrote some informatics guide for the following manager of the web interface and I created some logos.

All these tasks permitted me to know in which domain I wanted to pursue my study for I hadn't decided yet. Besides, they gave me the opportunity to improve my knowledge in informatics. Finally this foreign internship was a great opportunity to discover Poland and Krakow and to improve my English.

KEYWORDS

- Energetics researches
- ENVIRO
- Database
- Polish facilities
- Web interface
- Data analysis

INTRODUCTION

For this second internship, as a technician, I planned to find something in the energetic field. Indeed, for several years, I have been thinking about the fact of pursue my study in this domain and my last internship in air-conditioning systems motivated me to go on with this idea. However, I have always liked informatics and lessons we had this year at school have also motivated me to choose this domain, so I hesitated between these two fields. Hence, this internship was the opportunity to know if I was always interested in working in energetics or not. I also planned to go abroad in order to have a foreign experience, to improve my English and to discover another culture.

Thus, my internship researches were focalized on energetics societies based abroad. That's how I contacted Mr. Wyrwa, who used to work in EDF Poland, but who works now in the AGH University of Krakow in Poland. The subject he proposed me was very interesting for me because it dealt with creation of energetic models thanks to informatics. So, I could work both in informatics and energetics in order to might know what I prefer.

From the 16th May till the 12th August, I worked with Mr. Wyrwa and his team in the Faculty of Fuel and Energy of the AGH University. This team works on several research projects about energetics in Poland. Indeed, Poland is now in the European Union and has to evolve so as to face to the market economy. Besides, EU set some targets, especially about pollution, and Poland is one of the larger emitter of pollutant in Europe. So, some researches are made so as to improve the rate of pollutant emission as do the team of Mr. Wyrwa.

In the first part of this report, the University will be presented, as well as the Faculty, before presenting the project to which my work is related. Then, my contribution as a trainee will be described: several informatics tasks but also a work on an article. The last part will be devoted to assets gained through this internship and personal impressions about these 13 weeks.

I. WORK ENVIRONMENT

The AGH University of Krakow, in Poland, in which the internship took place, is going to be presented before describing the team work.

1. AGH UNIVERSITY[1]

AGH University of Science and Technology (AGH – UST) is a technical university located in Krakow in Poland. Science and industry are taught to students and they are also subjects of research and development.

It started its activities in 1919 after a group of mining engineers and activists began, in 1912, the initiative to establish the Academy of Mining in Krakow. The First World War prevented the Academy from opening and the Polish Government authorized its opening on 8th April, 1919. Thus, 80 students started their education at the new faculty. Then, it started to collaborate with the industry and to keep contact with the country's economy, so it reached a high educational level. The Second World War imposed a break in the Academy's activities and in 1945 it was the only technical university capable of operating. Besides, it supported development of Polish technical universities at that time.

In 1949 the Academy was renamed as the Academy of Mining and Metallurgy and finally, in 2003 its name changed for the AGH University of Science and Technology.

Now, AGH-UST is one of the largest Polish universities, all sources rank it as one of the best technical university of Poland. Last year, more than 4.000 staff members were counted whereas more than 36.000 students were divided in 15 faculties and 2 inter-faculty schools. Thus, 50 branches of science, that include 200 specializations, are dealt.

Concerning the university's visual identification a graphic symbol is used, it consists of a signet and a logotype at which it's possible to add the full name of AGH-UST in Polish or in English. The signet (cf. Figure 1) has a form of a stylized eagle in reference to the AGH-UST emblem (cf. Figure 2), used exclusively to promote the history and scientific legacy of the university. As we can see, three colours are used in the signet: green, black and red, those refer to the traditional mining and metallurgy colouring. Indeed, green symbolizes nature, fields and wood; black represents mines depths and red represents fire and melted iron.

Figure 1 - AGH logo

Figure 2 – AGH emblem

It's worth mentioning that economically, Poland has had to change to prepare its adhesion with the European Union. All sectors were affected and have been modernizing in order to resist

[1] http://www.agh.edu.pl/en/university/about-us.html

market economy. The work completed by the team, as described below, is in line with this situation.

2. WORKING TEAM

The working team in which my internship took place pertains to the Faculty of Fuels and Energy. To contribute to their work, I treated some parts of one of their main projects, namely Enviro.

a. Faculty of Fuel and Energy[2]

This Faculty was created in 1974 with the aim of taking part in the research on energochemical coal processing in Poland and teaching it to students, its original status was the Institute of Coal Energochemistry and Physical Chemistry of Sorbents. In 1991, it became a faculty, the Faculty of Coal Energochemistry and Physical Chemistry of Sorbents before being renamed, in 1995, into the Faculty of Fuels and Energy. Now, it's considerate as one of the youngest faculties at AGH-UST and its Dean is Piotr Tomczyk, Ph.D., associate professor.

The development of the Faculty has taken into account the growing demand for fuels and energy as well as the importance of clean, green, renewable energy. Collaborations with global partners, projects, conferences and exchanges also take part in this development.

b. The ENVIRO project

"Optimizing Environment Protection Investments of EDF Polska Companies to Meet the Sustainable Development Criteria"

As it was previously said, Poland had to start to change for its adhesion with the European Union all the more so as it's a large emitter of pollutant in Europe. That's why it has ratified some international conventions that set, for example, emission reduction targets. Besides, the EU has put regulations in place concerning air quality and the adhesion of Poland with the EU forces its energy sector to evolve.

Even though this sector is developing itself, there aren't enough studies about environmental and health impact so they aren't really taken into account. It's in this context that the ENVIRO project has been created, it was launched in 2005 by EDF Polska to optimize their environment protection investments. Several scientists of different universities, like AGH, as well as some European Institutes (CEREA, IIASA...) collaborate to provide a feedback for building the strategy for the investments into environmental protections for the next 10 to 20 years while answering the increasing need for energy demand. Several steps were established, as we can see in the Figure 3:

[2] http://www.agh.edu.pl/en/university/faculties-and-inter-faculty-units/faculty-of-energy-and-fuels.html

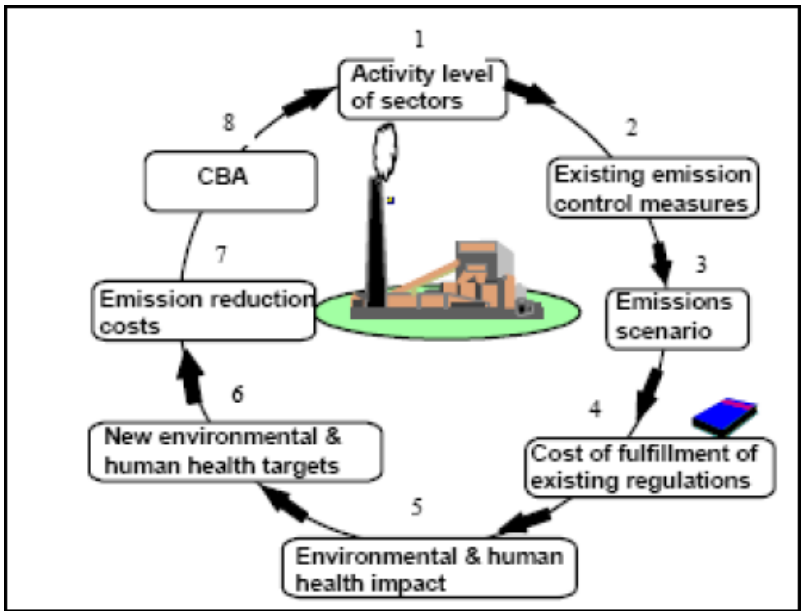


Figure 3 – Metrological approach for the project

Starting from the revision of the historical data and modeling of the future activity levels of several sectors, the year specific consumption of different fuels in these different sectors and regions can be determined. After taking into account the emission control measures applied to reduce emissions of a given air pollutant, the emission scenario can be prepared. Each emission scenario is associated with certain “emission control costs” required by the fulfillment of the relevant regulations imposed on emission sources. Besides, the final amount of emissions resulted from the given emission scenario is used for calculations of environmental and health impacts. When the results obtained with a given emission scenario aren’t satisfactory, new targets have to be specified. To reach these new targets, the control costs are supposed to increase because of new emission control measures. Finally, the cost benefit analysis (CBA) can be performed to find out the appropriate scenarios.

In practical terms, the following tasks are supposed to be carried out:

- Modeling of atmospheric dispersion of pollutants at the national and regional level (in regards to the latter in particular in regions where EDF companies are present) using POLAIR 3D model;
- Preparation of the emission databases;
- Preparation of the historical data on and modeling of the future activity levels of sectors (giving the emphasis on the energy sector);
- Integrated environmental (and health) impact assessment of Polish energy sector (EDF companies);
- Cost benefits analysis of the environment protection investments of EDF companies;
- Optimization of the investments to meet relevant regulations further development and improvements of methodology and tools.

The major part of my tasks during this internship was related with the database which contains data about 618 facilities all over Poland. Data were taken from several references, so values have been carefully studied before being added to the database.

II. WORK COMPLETED

Before coming at the internship I knew the project on which I was going to work and the first day I knew how I could contribute to this project, the subject had a little bit evolved. It was planned that I had to work on the web interface of the database (previously presented) and on the database itself. Since I had to meet the person who had created this interface, the first days I worked on a simple web page. Later, I was also put in charge of writing an article about the database.

1. INFORMATICS

The main task for me in this internship was to work on the web interface of the database. I was charged to fix problems that occurred and develop some parts. For beginning with informatics tasks, I had to create a simple webpage for my tutor's website. Moreover, I contribute in the interface design by creating some logos for an organization in which my tutor works.

a. Web page

On the AGH server, each teacher can create its own website to put all that concern its work and its contribution within the university. For completing his website, my tutor wanted me to create a webpage as to present foreign students that have worked with him during an internship.

This task was my first one and not the most important that was planned, so I only had few days to create a web page taking into account the fact that it would be linked to my tutor's website. By the way, I hadn't particular tools for creating this web page, I just used the computer notepad to write the code of the page (cf. appendix 1). This code has been written using html and CSS for the main structure and some JavaScript to hide and show some parts. These languages were chosen after thinking about the design of the page. Indeed, the web page being linked to my tutor's website (cf. Figure 4) the designs have to be similar that is to say very basic. Moreover, the webpage was expected to be descriptive, without dynamic elements, that's why using html and CSS was fully sufficient.

Finally, the web page is very simple (cf. Figure 5), as the main website, but all information expected are provided. Besides, JavaScript code permits to get a bit of dynamism by showing or hiding some text parts, thus there is a global view and the page isn't too long.

Figure 4 - Main page of my tutor's website

Figure 5 - My web page

More means would have permitted to get logos of better qualities by taking time to ask for real logos. Even if a better global design could have been reached, it wasn't necessary because of the main website. Furthermore, this webpage was created in few days, as an introduction to the next work.

Anyway, my tutor provides now information about foreign students that have worked with him. Moreover, it allows the school of Mines de Douai to be visible in AGH University.

b. Database interface

As it was said, the database and its web interface represented an important part of my internship. The web interface is available by writing this URL in the browser: http://149.156.122.159:8988/Enviro-Enviro-context-root/home.jsp or by accessing to the webpage of Mr. Wyrwa (the project manager) on which there is a link to the website. However, only users that are registered can access to data.

In the interface, data about energetic installations are divided in five main parts: “Facility”, “Technical Parameters”, “Production”, “Stack” and “Emissions”. All these data are taken from a database which already existed, it’s stored in Oracle and the TOAD for Oracle software is used to modify the database. It contains tables with data and also views that provide specific data from one or several tables. The database structure for the useful tables is presented in the Figure 6.

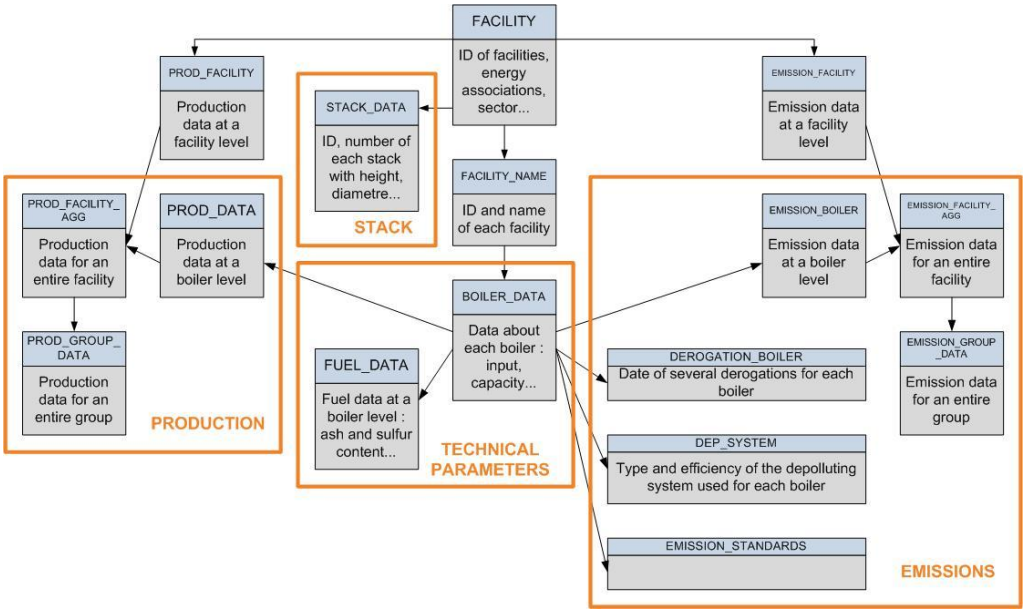


Figure 6 - The database structure and four main used parts for the website

For the team, the aim of my work was to get a correct interface that is to say an interface without any trouble in the presentation, which permits to provide specific data, thanks to a selection form, without mistake. Besides, the interface was expected to propose some additional functionalities (login, registration, creation of facilities groups), that weren’t available.

Thus, it was first planned to fix encountered mistakes then to build these functionalities and create new ones. Before starting, the interface structure was studied as to know which part needed to be fixed and which one needed to be built, then it was possible to know on which order parts had to be treated.

Changes into the code were done thanks to the Oracle JDeveloper software. This one permits to create JSP files (JavaServer Pages) for adding Java code into a static content. So, the code into JSP files is made up with html and Java. Besides, the web interface structure contains also CSS pages for defining the style, JavaScript files for creating dynamic actions and other formats by importing some classes or deploying the entire project.

In the code of the interface, some functions permit to make a connection with the database and to get data by writing queries in SQL code (in a java file). These functions use classes provided by the JDBC technology (Java Database Connectivity). When I modify the code, I

worked in local and when everything works, I can update the website on the server. For the local work, the connection is established with a 2-level model (cf. Figure 7).

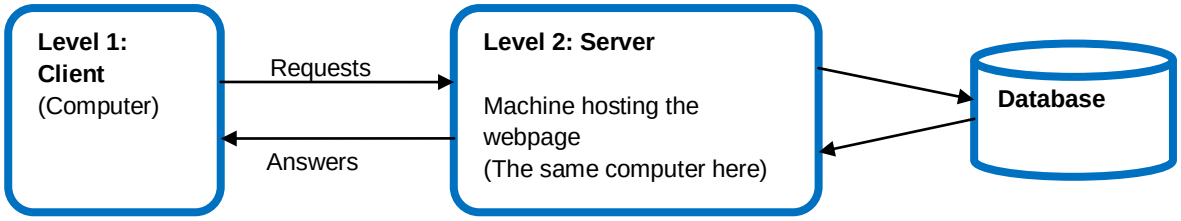


Figure 7 - JDBC Communication in the 2-level model

- **Fixing mistakes**

After having studied the structure, I knew which parts contained mistakes but I had to found exactly in which code page and which line or lines were responsible for mistakes. By reading the error messages provided by the software and testing several changes, all errors were fixed.

For example, the following error message was almost always provided when a variable has lost its value, so it has become null and caused a mistake:

```
java.lang.NullPointerException java.lang.NullPointerException
```

It was quite long, first because finding mistakes in code is more difficult than creating its own code and also because mistakes were various: variables that lose its value by changing page, wrong SQL query, wrong function, memory problem… However, with time I succeeded faster to find the mistake because I was more familiar with the code.

- **Writing code to get good results pages**

The web interface contains five main parts that provides data about polish facilities. In these parts, the ways to access to data and to provide them are very similar. Sometimes, selections didn't lead to a result page because the appropriate code or database structure didn't exist.

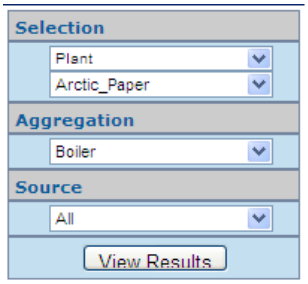


Figure 8 – Selection form for electricity production

In the "Production" part, not all selections (cf. Figure 8) lead to a result page. The code that permitted to get data for aggregations of plants wasn't well structured and not all selections could use it to provide a good results page. Thanks to the TOAD for Oracle software, I created a view that provides data of the plants aggregations by writing the following SQL code:

```
CREATE OR REPLACE FORCE VIEW  "PROD_GROUP_AGG" ("GROUP_NAME", "YEAR", "FUEL_TYPE",
"FUEL_CONS", "HEAT_PROD", "ELE_PROD", "REFERENCE") AS
  (select gp.GROUP_NAME, pf.YEAR, pf.FUEL_TYPE , sum(pf.FUEL_CONS) as FUEL_CONS,
sum(pf.HEAT_PROD) as HEAT_PROD, sum(pf.ELE_PROD) as ELE_PROD, pf.REFERENCE
from PROD_FACILITY_AGG pf,  USERS_GROUPS gp
where pf.PP_NAME=gp.PP_NAME
group by gp.GROUP_NAME, pf.YEAR, pf.FUEL_TYPE , pf.REFERENCE)
```

Besides, some conditions weren't present, such as those which provide data for boilers aggregations, even if the rest was good. There were also some problems with the size of the results table. Some memory problems were caused by the fact that too many queries were launched in the same time instead of closing each query before launching another one.

All these mistakes have been fixed. However, in a subpart ("Operation Time") there were still some errors. These last were caused by the fact that the associated table in the database didn't contain all data. As it will be said later, for the article needs, these missing data were provided by importing them or calculating them and by creating some useful views. Thus, imported data can now be provided by the web interface by adapting the code.

In the "Emission" part, nothing was created to provide aggregated data so I created everything: views, selection form, JavaScript code, query to access to the good table. Here we can see a function (in a java file) that permits to access to the table called "EMISSION_BOILER" in the database:

```
public ResultSet getEmissionValues(String selection_value, String aggregation,
String source,String pollutant_id, String emission_type) throws SQLException{

stmt = conn.createStatement(ResultSet.TYPE_SCROLL_SENSITIVE,
                ResultSet.CONCUR_READ_ONLY);
String query = "SELECT PP_NAME,BOILER_NO,YEAR,EMISSIONVALUE, REFERENCE FROM
EMISSION_BOILER where pp_name =\'" + selection_value + "\' and reference =\'" +
source + "\'  and POLLUTANTID =\'" + pollutant_id  + "\' and EMISSIONTYPEID =\'" +
emission_type + "\' order BY PP_NAME,BOILER_NO,YEAR";
System.out.println("Executing query:" + query);
ResultSet rset=stmt.executeQuery(query);

            return rset;
        }
```

In bold, we can recognize the query written in SQL that select useful data. This function returns a ResultSet object containing expected data, which can be displayed how we want.

In the same way, everything has been rebuilt for the "Technical Parameters" part: new functions, new results table, good conditions for selections. The "Facility" part wasn't complete but the database doesn't contain a lot of data for this part so nothing is expected for the moment.

Thus, all the parts containing data about energetic installations provide a good results page in any case. There are no more risks of getting wrong values or to waste time because data aren't available.

- **Saving the selection**

Figure 9 – Selection form for emissions

When studying pollutant emissions, generally one pollutant is studied at a time. So, saving the selected pollutant in the form of the “Emission” part (cf. Figure 9) could be interesting. Thus, data of one plant or one group are provided, then by returning to the selection page, the current pollutant is still selected and this as long as it isn’t changed by the user. This last has only to choose the plant or the group from which data are expected.

In order to save the selected pollutant, I’ve worked on variables for they don’t lose their value by changing or updating the page (a part of a JSP file that provides the pollutants list in the selection form is given in the appendix 2).

This idea of saving the selection can be extended for the entire selection and in the entire website, not only in this “Emission” part. By changing the code of every selection form and by creating some templates for this when it’s interesting, I succeeded in saving the entire selection from any page to another.

For sure, the fact of saving the last selection isn’t useful for all users. But, it’s common to work on one specific plant or one specific group of plants and in this case, the form hasn’t to be filled each time. Besides, if a change of selection is needed it takes as much time to fill the initially form as to change the current selection.

- **Administrating users**

Being registered is necessary to access to the interface content. However, the code that permits to create an account wasn’t created, so only the administrator could access to the web interface. Indeed, the code that manages the login worked.

I had to create this code as to allow people to ask for a registration. At the same time, I had to think about how to restrict some users in the access to the part that contains project reports.

For this work, all had to be created so I had to study carefully what I would need and how I would proceed before starting. Thus, I thought about links between the database, the functions that would be necessary and the new pages that would permit to administrate users on the website (cf. Figure 10).

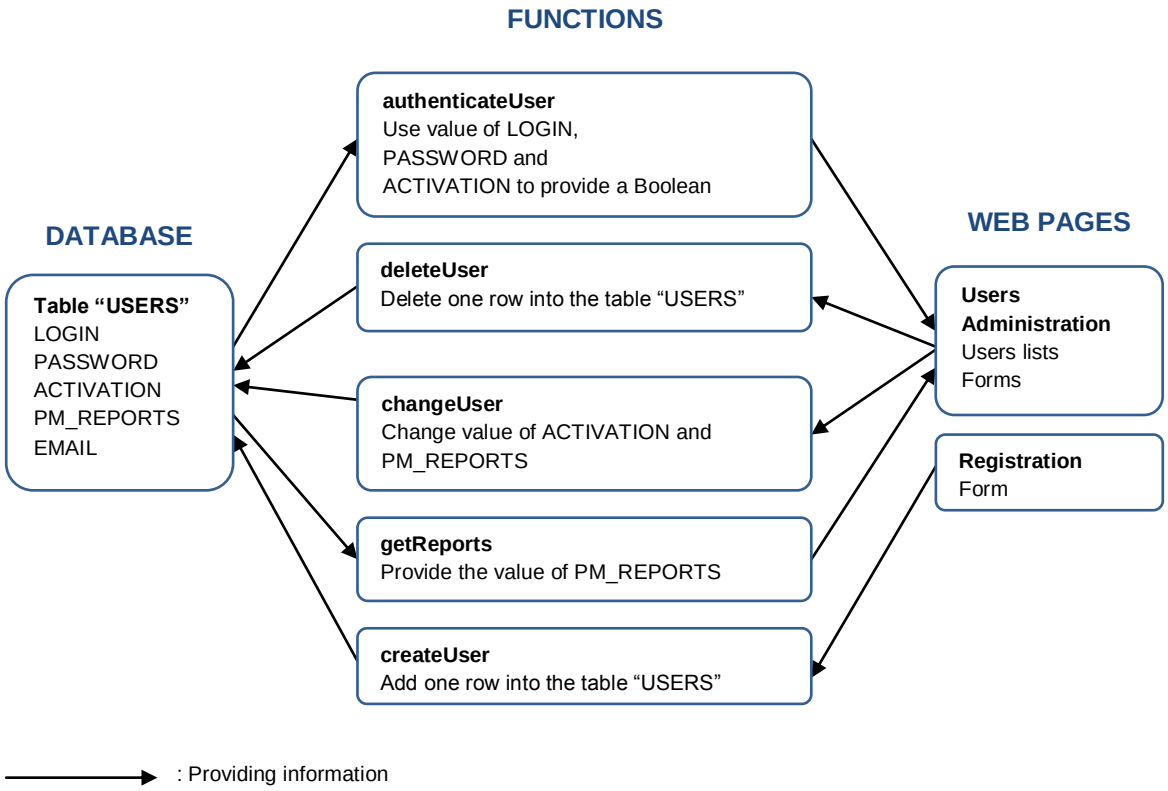


Figure 10 – Links between database, functions and web pages

First, I prepared the database: I added columns “ACTIVATION”, “PM_REPORTS” and “EMAIL” into the table “USERS”. The first column manages the authorization of accessing to the website, the other manages the access to the reports part and the last one provides the users e-mail (cf. appendix 3).

A registration form already existed (cf. appendix 4) but there was no action after validating. So, I created the code that permits to store the username, the password and the e-mail into the table “USERS” of the database by using the new function “createUser” (cf. appendix 5). The values of “ACTIVATION” and “PM_REPORTS” are set to 0 that is to say that the new users can’t access to the website neither to the reports part. By the way, the password is encrypted, thanks to the SHA1 function (Secure Hash Algorithm) in the table.

The users administration had to be available for the administrator only. To change the restriction of users, by using forms, we have to act on the table “USERS” that is to say that functions are needed to access to this table and modify data. So I created two functions: one to delete a user and one to change its restrictions (cf. appendix 5). Then, I created the web pages, with forms, of the users administration. The main page provides two lists: one with the users that aren’t accepted yet and one with users that already are accepted (cf. appendix 6). To separate users in this way, I had to know the value of the column about the access to the website. This value is provided by the function “authenticateUser” which already existed and that I have completed.

For users that aren’t accepted yet, it’s possible to not accept them, so they will be deleted from the database, or to accept them and to choose if they can access or not to the reports part. For other ones, their restriction information has to be provided in order to inform the administrator before choosing to change them or not. Thus, I created the function “getReports” to know if the selected user has the right to access to the reports part or not (cf. appendix 7).

At that time, links between the form, the functions and the database table were done. Then I had to create what is visible on the screen. First, I adapted the message displayed when the login is wrong (cf. appendix 8). That means that when the user isn’t in the database or when the

password is incorrect, the error message isn't the same. The main goal of these different messages is to inform users when their username and their password are good but they can't access to the website because the administrator hasn't accepted them yet. Concerning the reports part, a specific condition had to be written at the top of the main page of this part (cf. appendix 9). Thus, if the user can't access to this part there is a redirection to another page that displays the following message "You aren't authorized to access to this part." (cf. appendix 9).

After working on the users administration, the administrator was able to accept or not users that have had made a registration demand and to choose if they can access to the reports part or not. He can also change the parameters of an existing user or delete it. Furthermore, users that don't succeed in accessing to the website as well as users that can't access to the reports part can know why, thanks to the error messages displayed.

Obviously, it's easier to modify users parameters through the website than through the database: it's more accessible and more intuitive. Moreover, I had started to create the code that would permit to send an e-mail to the administrator to inform him when a user makes a registration demand and to send an e-mail to the user to inform it if it's accepted or not. However, I couldn't get the server parameters such as the SMTP server address, so I couldn't test the code.

- **Update on the server**

After testing the entire application (the website) locally, I had to update it on the server. For that, I had to proceed in several steps as I explained in a document (cf. appendix 10) which will be provided to the student that is going to manage the website after my internship. In the server, the JDBC used technology containing 3 levels. This third level is the application server (Apache-Tomcat here) which works on the server to execute the application. Thanks to it, several users can access to the website and the database in the same time.

After working on this database interface, there were no more mistakes, all results could be provided and all functions worked. However, it would have been interesting to spend more time on this interface to optimize the code structure in order to get a faster application.

c. Logos

As the website was initially created for the needs of the Enviro project linked to EDF, the EDF logo is displayed in the top banner of the entire interface. However, EDF doesn't use this interface whereas it is useful for other organizations such as CAESAR (Centre for Applied Energy System Analysis and Research). It would be more appropriate to display the CAESAR logo than the EDF one. As the current CAESAR logo doesn't suit the organization (cf. Figure 11), I was in charge to create a new logo.

Thanks to the Inkscape software, I've created several logos (cf. Figure 12). For one of them, for example, I kept the idea of these kinds of arrows, from the current logo, which represented a crown by inclining them so as to look like the laurel crown of Caesar. Anyway, I've made some small logos and some others with the entire signification of CEASAR so that the logo could be adapted to the support on which it's supposed to be displayed.

Figure 11 – Current logos

Figure 12 – Created logos

Thus the CAESAR organization, represented by my tutor, was able to choose their new logo among those I've created. By making a mix between these created logos, I created a new one which suits to my tutor and I could create a new banner, with Photoshop, for the website (cf. Figure 13).

Figure 13 – New banner

All of these tasks are related with informatics and they have been all useful: the web page is online, the database interface was updated with my new version and the new logo is displayed on the website.

2. Article

An article about the database and its interface had to be written in order to be published in a journal, such as Energy Policy for example, I was in charge to think about it and write it. So as to help me, an article about another database[3] was given to me. Besides, I had access to all the previous reports of the project. After studying these documents and in agreement with my tutor, the article had to contain some informatics explanations, a database description and some results got thanks to the database values.

The first two parts: informatics explanations and database description were written quite easily because they were the main object of my work. As for the results part, some researches were necessary before showing results. These last are about capacity, production, consumption, operation time and emissions in the polish facilities. Values were also compared with statistics in order to show the similitude between values.

Getting results was made in three steps: complete the database, analyze the results and optimize the presentation.

[3] KJARSTAD J. & JOHNSSON F.- The European power plant infrastructure — Presentation of the Chalmers energy infrastructure database with applications.- Energy Policy, 2007, 35, 3643-3664

a. Complete the database

In statistics, values are given per group of plants: CHP plants according to their capacity and power plants according to the type of used fuel. It would be easier to compare values for each group and it can also be interesting to use these groups to show other results, so these groups had to be added into the database. For that, I wrote some SQL queries, as we can see hereafter, for using the sector and the fuel type of each facility to define their group:

```
UPDATE GROUPS
SET GROUP_SYMBOL='EC1'
WHERE (GROUP_SYMBOL='A' AND
         (SELECT sum(EL_CAPACITY) as EL_CAPACITY FROM BOILER_DATA
                      WHERE (BOILER_DATA.PP_NAME=GROUPS.PP_NAME)
                      GROUP BY PP_NAME)>199
                      )
```

Next, I had to check each group so as to be sure that the database and statistics had the same groups.

Then, most of values are given per year (production, emission…), however some others are independent of the year, such as capacity. As we want to show results about current facilities, I had to select data on the database by limiting data by their startup year and their decommissioning year.

Concerning load factors (operation time), there were a lot of missing values. So I had to calculate them, from the electric capacity and the electric production, thanks to a SQL query.

b. Study results

First results were presented after completing the database. By analyzing them, some errors or strange results were finding. For example, some huge values of load factor were found: values are given in hour per year and some values were bigger than the total number of hours per year.

So as to find the reason why there were such differences, the database was analyzed and compared with the file with the input data. I started to write an errors report in order to point out the main problems and also to give some hypothesis about the errors origin (cf. appendix 11).

Concerning the load factor values, the file with the input data wasn't, in most of the case, detailed, that is to say that the values of the entire facilities were provided, but there wasn't any details about the boilers values. As for the database values, some calculations might have been done but with errors. Sometimes, capacity isn't taken into account or the number of boilers is wrong so the facility value is good but the boilers values are wrong.

For the emission results, the chemical energy values were used and some strange values were found: high values for the years before 2005. To get more information about that, I made a SQL query in order to get a selection of data to compare values. Thanks to this selection I noticed that for the years before 2005, the chemical energy value of each boiler of each plant is always the same: 23562,43 TJ and this for each reference. However, this chemical energy can be calculated by multiplying the fuel consumption (kton) by the lower heat value (kJ/kg). So, I created a view with each boiler of each plant, its fuel consumption for each year, its lower heat value, the initial value of the used chemical energy and the new calculated value of the chemical energy.

c. Results presentation

As it was said, presenting results for each group can permit to know if their behaviors are the same or not. Thus the load factor results and the emission ones were provided per group. In order to avoid errors and to provide results from good values, the load factor results were given by using facilities values. For the emission results, the chemical energy values were used so as to provide the rate of emitted pollutant according to the used chemical energy. We chose the calculated values for they were more similar to the values of 2005 and more plausible. Obviously, the evolution of the weight of emitted pollutants was also provided.

Concerning the electric capacity, the aim of the results was to know when the major part of the installations was built and the evolution of constructions according to the type of used fuel. Thus, it was not necessary to provide results per group.

Finally, the article contains 10 pages as planned, all results have been provided with some explanations. By searching all useful values a lot of mistakes were found and they were listed in a report. As these wrong values haven't been used for the results, they were no problem for the article but it might be a problem for the models that are based on these values. Anyway, the errors report will be useful for the team because I listed all encountered mistakes and gave hypothesis about the source of errors in order to fix them.

III. Assets and personnal impressions

This internship gave me the opportunity to improve my informatics skills and obviously to get some general knowledge. By the way, I could specify my career plan.

1. Informatics skills

As the major part of my work was related with informatics, I could improve my skills in this domain.

First of all, to deal with informatics tasks, knowing the used language is necessary. I had already some skills in html, CSS and java thanks to the school but also by personal interest and I improved it. Indeed, by creating the web page, I used the html languages with CSS pages. Then, the database interface required the use of java combined with html, as well as the use of CSS pages for managing the global interface style. As for the SQL, I hadn't real skills in this language even if I already used it, but working on the database highly improved my knowledge of this language. I had to use it in the queries to make the link between the web interface and the database but also in order to modify the database for the article needs. It's sure that I only know a little part of these languages but I'm more familiar with them and I could easier learn more.

Furthermore, I had to understand the global framework of a database interface, that is to say how a website can communicate with a database. That's why I gained some knowledge about J2EE which is a Java platform that allows, for example, the connection between a website and a database. This last contains a lot of components and I had to inform me about some of them: Servlet, JSP, JDBC, and JavaMail.

The fact of working in a different domain, energetic, required that I found needed information by myself. Thus, I may have spent more time but I learned a lot. Besides, I had to explain what I did at the team members, so I had to give some general explanations, as the ones I wrote in the article.

2. General knowledge

a. Energetic research

Working in a team of the Faculty of Fuel and Energy in the AGH University permitted me to learn about the research work but also to get some general knowledge about the energetic field.

The research work I've seen was a step-by-step work. That is to say that after one step, there are some meetings among the team so as to decide if some changes are needed or if the next step can be reached. These meetings permit also to avoid mistakes in results because those who hadn't worked on a task are more objective and can be aware of some strange results. Besides, several reports are written in order to clearly expose the results of the project. Thus, it's easier to know if the project is well-running or if it has to be stopped or re-oriented.

Since I was working within a project related with energy production and pollution, I was aware of the energetic situation in Poland. Indeed, as it was previously said, Poland has just joined EU and the desire of UE to act against pollution leads to reforms that have to be respected by all members. Thus, as a large emitter of pollutant in Europe, Poland has to reduce its emissions of CO2. However, its energy is mainly based on coal plants that emit too much CO2, so the polish energetic park has to be reevaluated. By the way, nuclear power plants aren't used

in Poland because of the last political regime and of the current prejudices on this subject, and then the main alternative is bioelectricity.

b. Foreign context

More generally, the fact of spending three months in a foreign country permitted me to discover another culture, to improve my English and to be autonomous.

Three years ago, in winter, I went in Poland with school in order to see Auschwitz and Birkenau and we have also visited Krakow, its Jewish Quarter and the city center. As the city is one of the only ones which were not destructed during the Second World War, beautiful places are still presents and the city is full of history and culture. However, we hadn't enough time to discover the entire city, so this internship allowed me to visit it again and in another context. Indeed, this year, I discovered the student life of Krakow which is very active but also the everyday life in this city and the tourists' arrival in summer.

Concerning the language, I always used English both at work and in town. At work, I had to speak in English with other team members. So, I used English to write some documents (guides) but also to present my results or only to talk about my work. Moreover, all documents that I had to read to inform me about informatics were in English, obviously the code I wrote was also in English, but a very basic one. Thus, I must have improved my English by working in this language. Besides, in everyday life I had also to speak English even if it's not the mother tongue of this country. Indeed, being alone in a foreign country imposed to be autonomous in order to get all I needed. Anyway, I feel myself more at ease with this language, I less hesitate when I talk but it's sure that I would have more improved in an English-speaking country.

Finally, I discovered some polish words and at the end of this internship I was pleased to understand what I read in town, shops…

3. Career plan

This internship has been really important for choosing my option at the school and now, I have no doubt about my choice.

When I looked for an internship, I contacted societies working in the energetic field because for a long time I thought to pursue in this domain. That's why I contacted Mr. Wyrwa that was used to work in EDF in Poland. However, I always liked informatics and this year I wondered if choosing the informatics option would be a good idea or not. Indeed, I spent some time at working in informatics for the project I did last year in the school of Mines de Douai but I didn't know if I was ready to spend much more time in this.

Before arriving in Poland, I knew that the project in which I was going to work was related with energetic, but also with informatics because creating models is an important part of the project. By the way, when I started my internship, I knew that I had to work on informatics tasks as I previously detailed. Thus, it was a really good opportunity, I could work on both informatics and energetic and might know which domain I prefer.

As I already said, I discovered the research domain and the energetic one. This permitted me to understand that these domains don't suit me. When I wrote the article, I had to give some energetic results so it was the part of the internship the most related with energetic. However, the results that I had to provide didn't convince me because of the data. Indeed, by providing results, I have found a lot of mistakes in data and even if I corrected a great part, I was disappointed by the fact of finding so many mistakes in this database. This database is used in the models of the project and I think it's important to be sure of the used values. It's pretty sure that these mistakes aren't very influent for the national values but working with these values isn't rigorous.

In fact, what I more appreciated in this article is the data research, that is to say creating queries to get new views or specific selections. Generally, I found the informatics tasks more attractive and the work is very rigorous. I was really interested in these tasks, I've looked for a lot of information, so I learned a lot. By the way, creating the login part of the website was the most interesting work I did. Indeed, I had to think about the part, the useful functions, the links with the database and after I had to write the code in order to get something functional.

All this allowed me to understand that I prefer working on something well-structured without imprecision, that's why choosing the informatics option might be a better choice. Besides, I could realize that I didn't grow tired of working an entire day on informatics tasks but on the contrary, I was more motivated to work on these tasks than to work on energetic results.

Anyway, this internship was a perfect transition between my previous internships and interests which were related with energetic and my new choice of studying and working in informatics.

CONCLUSION

At the end of this internship, by assessing these 13 weeks, I have the feeling to have improved myself in informatics and to have been useful through my work.

Concerning the tasks I realized, they permit to help the team by several ways.

The most important work I did was the web interface. This interface is now completely functional: all values are available by doing some aggregations or not, users have the possibility to ask for a registration and the administrator can choose the users that are allowed to access to the project reports or not. By the way, some improvements are now available such as the selection saving in the forms, the possibility to create huge groups without limit. Besides, I also created some logos and the banner of the interface was changed. By working on the web interface, I have written some documents in order to guide those who are going to manage this interface. These guides are, for example, about the installation of Oracle, Toad and JDeveloper that work together, about the import or export of database from Oracle or also about the upload of the website thanks to Apache Tomcat.

Moreover, the article I wrote permitted me to find a lot of mistakes in the database and to write a report that lists these mistakes and gives some hypothesis about the source of errors in order to fix them.

To conclude, this internship was very beneficial for me. I learnt a lot in informatics, I feel myself more confident in this field and that gave me the motivation and the conviction to pursue my study in this field. Besides, I had the opportunity to improve my skills in some software such as Inkscape and to get new skills in other software (Oracle, Toad for Oracle, JDeveloper).

Obviously, being abroad was a rich experience. I feel myself more comfortable with the English language and spending three months in Poland, for an internship, allowed me to get a foreign experience.

TERMINOLOGY

- **AGH – UST**: Akademia Górniczo-Hutnicza (Academy of Mining and Metallurgy) - University of Science and Technology
- **Apache Tomcat**: open source servlet container developed by the Apache Software Foundation (ASF)
- **CAESAR**: Centre for Applied Energy System Analysis and Research
- **Inkscape**: free software vector graphics editor
- **CEREA** : Centre d'Enseignement et de Recherche en Environnement Atmosphérique
- **CHP**: Cogenerated Heat and Power
- **CO2**: Carbon Dioxide
- **CSS (Cascading Style Sheets)**: style sheet language used to describe the presentation semantics (the look and formatting) of a document written in a markup language
- **EC1 (ElektroCieplownie 1)**: CHP plants with electrical power superior to 200MW
- **EC2 (ElektroCieplownie 2)**: CHP plants with electrical power between 100 and 199MW
- **EC3 (ElektroCieplownie 3)**: CHP plants with electrical power between 50 and 99MW
- **EC4 (ElektroCieplownie 4)**: CHP plants with electrical power inferior to 49MW
- **ECN (ElektroCieplownie Niezalezne)**: Independent CHP plants
- **EDF**: Electricité De France
- **EWB (Elektrownie na Weglu Brunanym)**: Brown Coal Power Plants
- **EWK (Elektrownie na Weglu Kamiennym)**: Hard Coal Power Plants
- **HTML (HyperText Markup Language)**: the predominant markup language for web pages
- **IIASA** : International Institute for Applied Systems Analysis
- **Java**: programming language, one of the most popular programming languages in use, particularly for client-server web applications
- **JavaMail**: Java API (application programming interface) used to receive and send email
- **JavaScript**: prototype-based, object-oriented scripting language that is dynamic, weakly typed and has first-class functions

- **JDBC (Java DataBase Connectivity)**: API (application programming interface) for the Java programming language that defines how a client may access a database

- **JSP (JavaServer Pages)**: Java technology that helps software developers serve dynamically generated web pages based on HTML, XML, or other document types

- **J2EE (Java Platform, Enterprise Edition or Java EE)**: widely used platform for server programming in the Java programming language

- **ORACLE**: The database management system (DBMS) software released by Oracle Corporation as Oracle RDBMS, and to individual databases which are managed by such software

- **POLAIR**: name of a chemistry-transport-model (CTM)

- **ResultSet**: a set of rows from a database, as well as meta-information about the query such as the column names, and the types and sizes of each column

- **Servlet**: Java programming language class used to extend the capabilities of servers that host applications accessed via a request-response programming model

- **SMTP (Simple Mail Transfer Protocol)**: Internet standard for electronic mail (e-mail) transmission across Internet Protocol (IP) networks

- **SQL**: Structured Query Language

- **Table**: set of data elements (values) that is organized using a model of vertical columns (which are identified by their name) and horizontal rows

- **Toad for ORACLE**: software application from Quest Software used for development and administration of various relational databases using SQL

- **View**: a view consists of a stored query accessible as a virtual table composed of the result set of a query

APPENDICES

AGH

APPENDIX 1

Web page code : index.html

```
<!DOCTYPE html>
<html>
<head>
	<meta http-equiv=”content-type” content=”text/html; chqrset=UTF-8”>
	<link rel="stylesheet" href="style.css" type="text/css">
	<title> Mines de Douai’s students </title>
</head>
<body>
	<div id="top"></div>
	<div id="corps">
		<div>
			<div class="logo_agh</div>
			<div class="logo_mines"</div>
			<div class="titre">
				Foreign students on internship at our Faculty (A. Wyrwa)
			</div>
		</div>
		<div class="intro">
			As I work within a team for some projects, some foreign students join us
to make internships.
		</div><br><br>
		<div class="cadre">
		<h1> 2010 : May to August</h1>
		<h2> Camille GAUGER, Celine ZELESZKO and Maxime ROLLAND</h2>
		<h3> Development of a model with GAMS as to optimize the use of biomass in
Poland.
		<div id="open6"><span class="more"><a href="#nogo"
onclick="document.getElementById('cache6').style.display =
'block';document.getElementById('open6').style.display = 'none';
		">Read more...</a></span></div>
		<div id="cache6">
		<p style="text-indent:10px;">[…]</p>
		<p style="text-indent:10px;">First of all, the data that we
		needed were noted, as the energy and CO2 embedded for planting or for the transport
of this biomass, for example. </p>
		<p style="text-indent:10px;">When it was done, the model has had to be improved so as to
become as accurate as possible and we showed what factor consumes more energy and emits more
		CO2 in order to minimize the impact of biomass on the environment.</p>
		<br>
		<a href="reports/S2-GAUGER_Camille-2010.pdf" target="_blank"><img
src="images/icone_pdf.gif" style="border:0px; margin-left:20px;"></a><span
style="position:absolute; margin-top:15px; margin-left:5px;"><a href="reports/S2-
GAUGER_Camille-2010.pdf" target="_blank" style="color:#A71930;">Download</a> the internship
report of Camille GAUGER.</span>
		<br>
		<a href="reports/S2-ROLLAND_Maxime-2010.pdf" target="_blank"><img
src="images/icone_pdf.gif" style="border:0px;margin-left:20px; "></a><span
style="position:absolute; margin-top:15px; margin-left:5px;"><a href="reports/S2-
ROLLAND_Maxime-2010.pdf" target="_blank" style="color:#A71930;">Download</a> the internship
report of Maxime ROLLAND.</span>
		<br><br>
		<span class="more"><a href="#nogo"
onclick="document.getElementById('open6').style.display =
'block';document.getElementById('cache6').style.display = 'none'; "
		>Read less...</a></span></div>
		</h3><br>
		</div><br>
```

JavaScript

JavaScript

APPENDIX 2

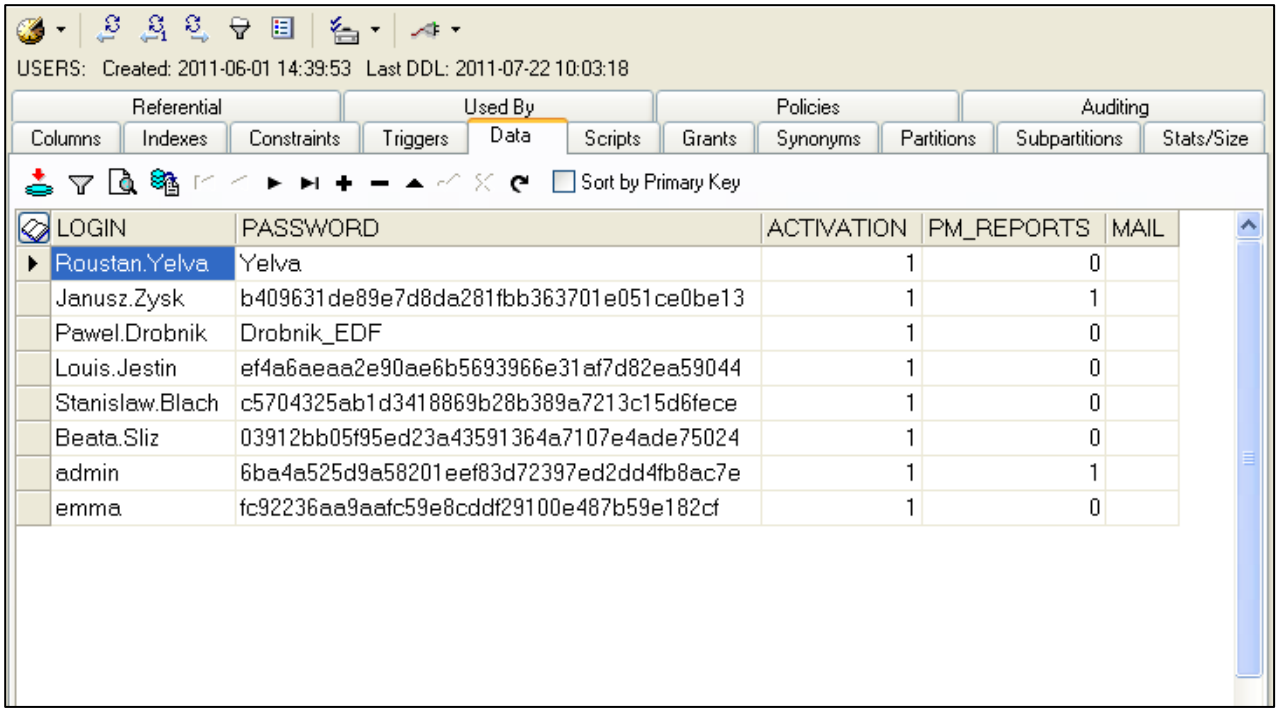
Part of the code that permits to save the selected pollutant

```
if(p==null){%> //if no pollutant has already been chosen in the
session
       <option selected value ="select">Select
pollutant</option><% //We see "Select pollutant" in the box of
the list
            for (int i=0;i<pollutant.length;i++){%>
      <option value
      ="<%=pollutant[i]%>"><%=pollutantName[i]%></option> <%
      //the list of pollutants
            }
}
else{  //A pollutant has already been chosen
            for (int i=0;i<pollutant.length;i++){ //p is the
            chosen pollutant, so this choice has to be selected
                  if(pollutant[i].equals(p)){%>
      <option selected
value="<%=pollutant[i]%>"><%=pollutantName[i]%></option>
                 <% }
                  else {%>
      <option value
="<%=pollutant[i]%>"><%=pollutantName[i]%></option> <%
                  } // other pollutants are enabled
                                              }
                                               }
```

AGH

APPENDIX 3

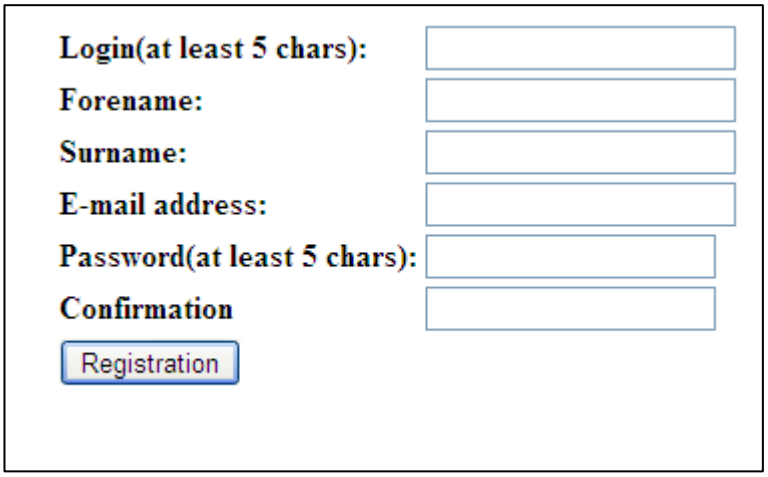
Table “USERS” in TOAD for Oracle



LOGIN	PASSWORD	ACTIVATION	PM_REPORTS	MAIL
Roustan.Yelva	Yelva	1	0	
Janusz.Zysk	b409631de89e7d8da281fbb363701e051ce0be13	1	1	
Pawel.Drobnik	Drobnik_EDF	1	0	
Louis.Jestin	ef4a6aeaa2e90ae6b5693966e31af7d82ea59044	1	0	
Stanislaw.Blach	c5704325ab1d3418869b28b389a7213c15d6fece	1	0	
Beata.Sliz	03912bb05f95ed23a43591364a7107e4ade75024	1	0	
admin	6ba4a525d9a58201eef83d72397ed2dd4fb8ac7e	1	1	
emma	fc92236aa9aafc59e8cddf29100e487b59e182cf	1	0	

APPENDIX 4

Registration form of the website



AGH

APPENDIX 5

The three created functions that modify the content of the table “USERS”

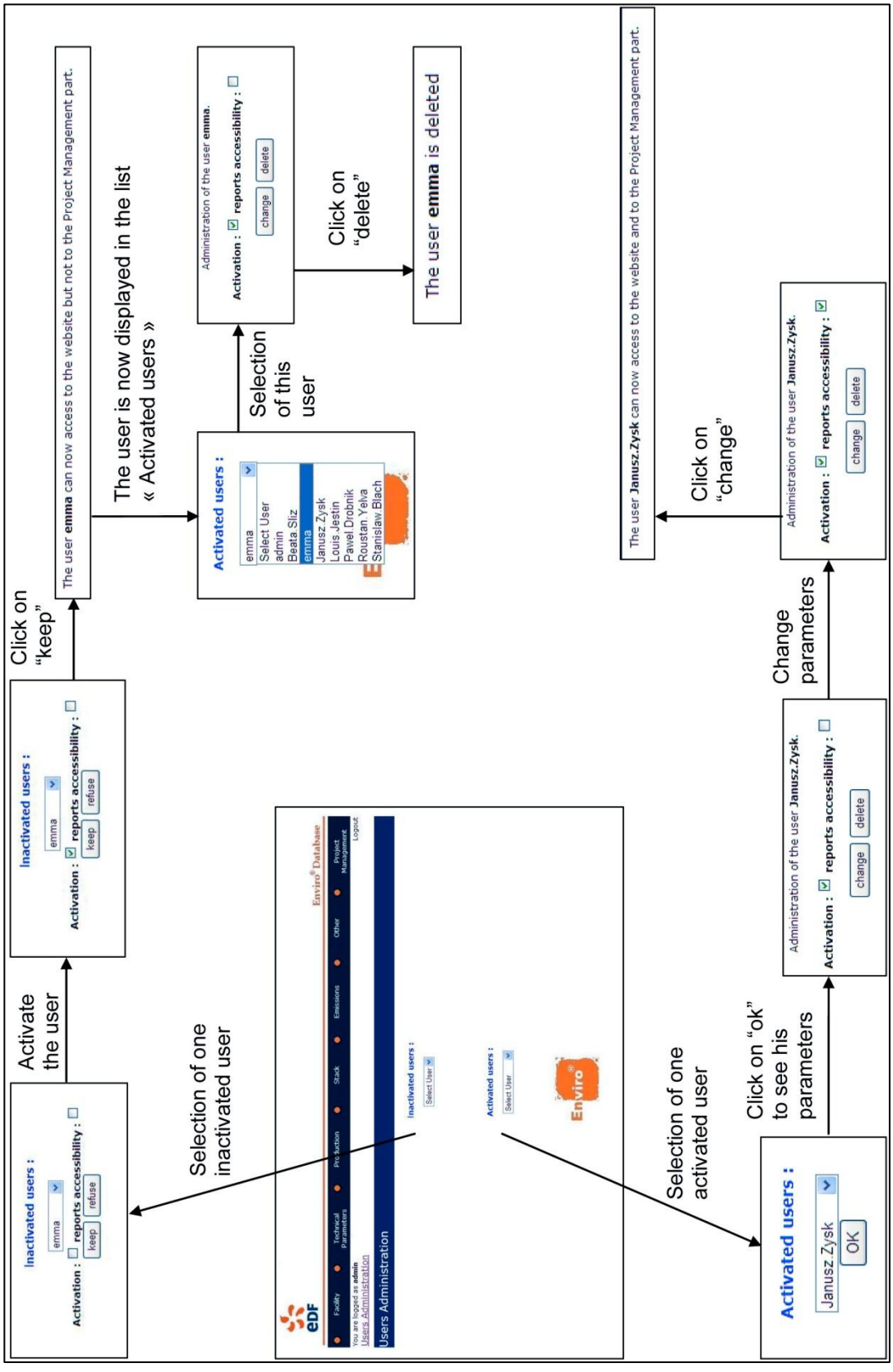
```
public void createUser(String user, String password, String mail) throws
Exception {

        String pass = SHA1(password);
        try {
            stmt = conn.createStatement(ResultSet.TYPE_SCROLL_SENSITIVE,
ResultSet.CONCUR_READ_ONLY);
            query = "INSERT INTO USERS(login, password, activation,
pm_reports,mail) values (\'" + user + "\',\'" + pass + "\',0,0, \'"+mail+"\') ";
            System.out.println("Executing query:" + query);
            stmt.executeUpdate(query);
            stmt.close();
        }
        catch (Exception ex) {
            System.out.println("Error while logging: " + ex);
            this.user = null;
            this.password = null;
        }
    }
```

```
public void changeUser(String user, String activation, String reports) throws
SQLException {
         stmt = conn.createStatement(ResultSet.TYPE_FORWARD_ONLY,
 ResultSet.CONCUR_UPDATABLE);
         System.out.println(user + " " + activation + " " + reports);
         if (activation.equals("activation")) {
             query = "UPDATE USERS SET activation=1 WHERE login = \'" + user +
 "\'";
             System.out.println("Executing query:" + query);
             stmt.executeUpdate(query);
         } else {
             query = "UPDATE USERS SET activation=0 WHERE login = \'" + user +
 "\'";
             System.out.println("Executing query:" + query);
             stmt.executeUpdate(query);
         }
         if (reports.equals("reportsok")) {
             query = "UPDATE USERS SET pm_reports=1 WHERE login = \'" + user +
 "\'";
             System.out.println("Executing query:" + query);
             stmt.executeUpdate(query);
         } else {
             query = "UPDATE USERS SET pm_reports=0 WHERE login = \'" + user +
 "\'";
             System.out.println("Executing query:" + query);
             stmt.executeUpdate(query);
         }
     }
```

```
   public void deleteUser(String user) throws SQLException {
        stmt =
conn.createStatement(ResultSet.TYPE_FORWARD_ONLY, ResultSet.CONCUR_UPDATABLE);
        query = "DELETE FROM  USERS WHERE login = \'" + user + "\'";
        System.out.println("Executing query:" + query);
        stmt.executeUpdate(query);

    }
```

APPENDIX 6

Schema of the users administration



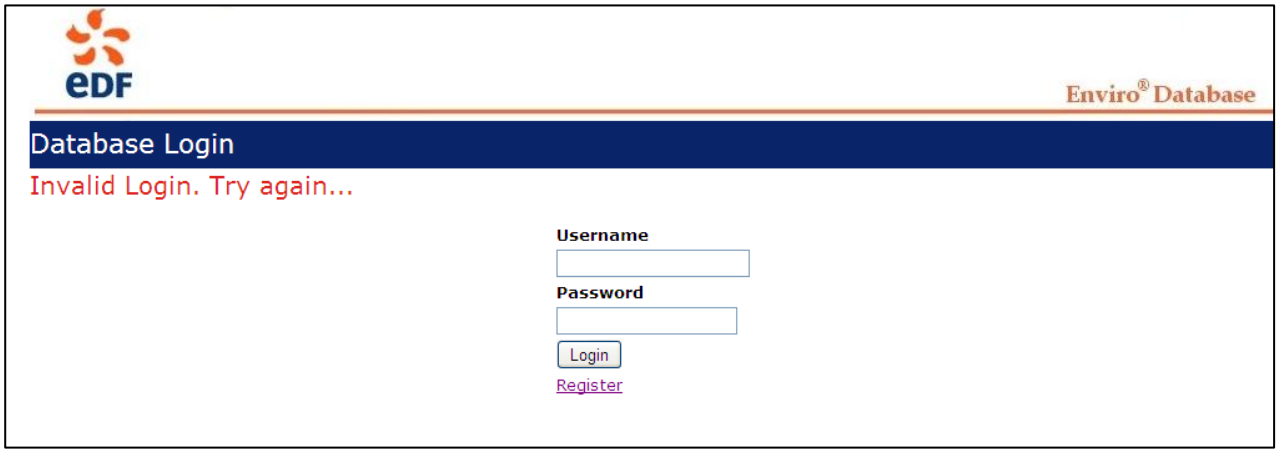
APPENDIX 7

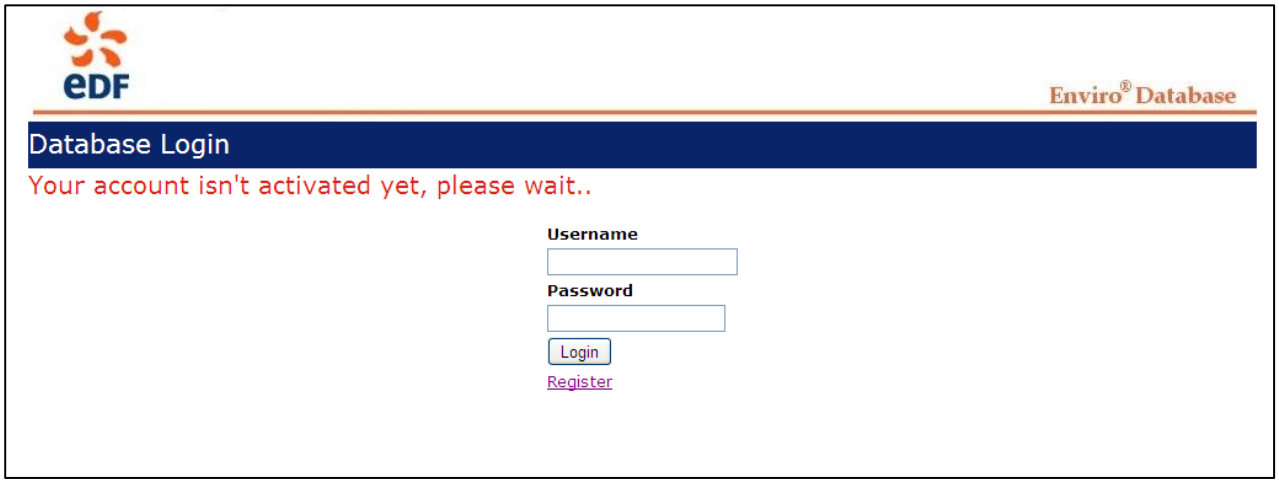
Function that permits to to know if the selected user has the right to access to the reports part or not

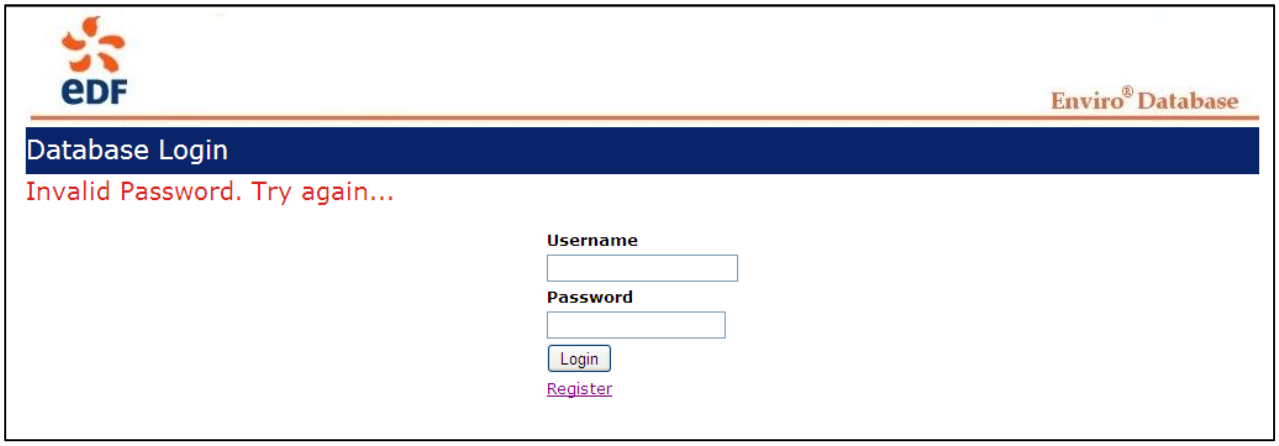
```
    public String getReports(String user) throws SQLException {
        /*
            * Return array of all plants names
            */

        stmt =
    conn.createStatement(ResultSet.TYPE_SCROLL_INSENSITIVE,
ResultSet.CONCUR_READ_ONLY);
        query = "SELECT PM_REPORTS FROM USERS WHERE LOGIN=\'"+user+"\'";

        System.out.println("Executing query:" + query);
        ResultSet rset = stmt.executeQuery(query);
        rset.first();
        String rep=rset.getString("PM_REPORTS");
        System.out.println("function rep :"+rep);

        return rep;
    }
```

APPENDIX 8

Message displayed when the login is wrong







APPENDIX 9

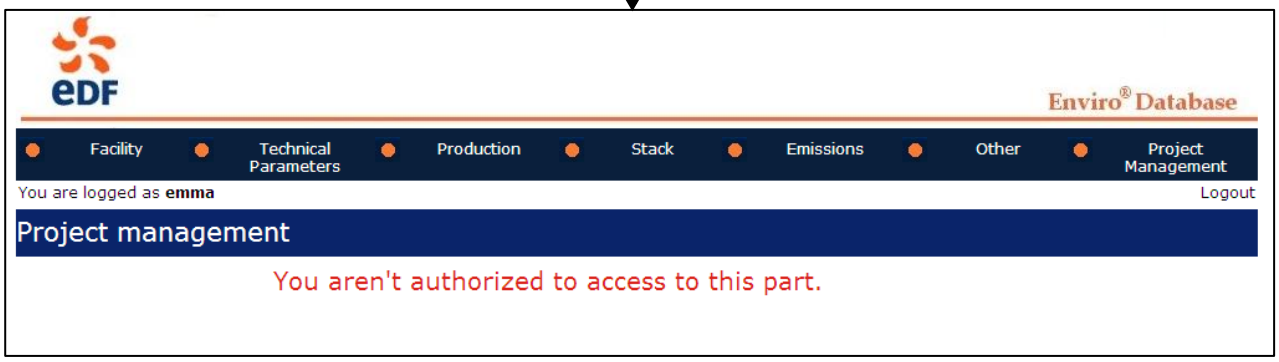
Reports part restriction

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN"
"http://www.w3.org/TR/html4/loose.dtd">
<%@ page contentType="text/html;charset=utf-8"%>
            <!-- Sprawdzanie czy uzytkownik jest zalogowany -->

<% if ((session.getAttribute("log_error")==null) || (Integer) session.getAttribute("log_error")==1 ){
    session.setAttribute("site_name",new String("/STRONA/PROJECT_MANAGEMENT/project_management.jsp"));
    %><jsp:forward page="/STRONA/LOGIN/login.jsp"/><%
}%>
<!-- Accessibility or not to this part -->

 <jsp:useBean id="empsbean"
class="enviro.DataHandler"
scope="session"/>
   <%
   String user=(String) session.getAttribute("user");
   String report=empsbean.getReports(user);
   if(report.equals("0")){
   %><jsp:forward page="/STRONA/PROJECT_MANAGEMENT/no_pm.jsp"/><%}

%>
```

← Get back the username

← Get back the value of "PM_REPORTS"

← Redirection



APPENDIX 10

Update the website on the server

Put the website online

1. In Jdeveloper
   - DataHandler.java :

   Change the URL into `jdbc:oracle:thin:@localhost:1522:XE`
   Change the User into `EDF_DATABASE` (or the Username of the database that is on the server)
   Change the Password into `ENVIRO_EDF` (or the Password of the database that is on the server)
   - Deploy a war file :

   After saving changes made in the DataHandler.java file, delete the *.deploy file in Applications\Enviro\Enviro\Ressources (but remember the exact name). Then click on the Ressources folder, click on new, click on General and Deployment Profiles and chose WAR File. Put the same name that before without .deploy and click on OK.
   Then click on the new deploy file and click on deploy to WAR file.
   To get the war file, go into developer\jdev\mywork\Enviro\Enviro\deploy. Save it.

2. Database

If some changes have been made in the current database:
The database has to be exported by writing the following command:

```
Expdp <DatabaseUserName>/<PasswordAssociated>
schemas=<DatabaseUserName> dumpfile=<NameOfTheDMPFile>
```

The DMP file is the one that is going to be created by exporting the database, it will be located in the dpdump folder (oraclexe\app\oracle\admin\XE\dpdump). Save it.

3. In the server
   - **If some changes have been made in the current database :**

   You have the dmp file which is the last version of the database.
   By security, export the database that is on the server by writing the following command :

   ```
   Expdp <ServerDatabaseUserName>/<ServerPasswordAssociated>
   schemas=<ServerDatabaseUserName>
   dumpfile=<NameOfTheServerDMPFile>
   ```

   Of course, chose a different name for this new dmp file that will be located on the dpdump folder of the server.
   Then go to the database home page of Oracle, create a new user and delete the one with the server database. Create a new user with the same name of the one that has just been deleted.
   To import the last version of the database, first the DMP file created with the export has to be copied into the dpdump folder of the server. Then, write this command:

   ```
   Impdp system/<SystemPassword>
   schemas=<DatabaseUserName>
   remap_schema=<DatabaseUserName>:<ServerDatabaseUserName>
   dumpfile=<NameOfTheDMPFile>.dmp
   ```

   The new user created could be deleted when the website update is completed.
   - TOMCAT :

   In the TOMCAT folder, reach the webapps folder. Stop Apache and by security, save the war file and the associated folder. Then, copy here the war file previously created. And launch Apache to generate the associated folder.
   Then, stop Apache. In the folder “WEB-INF”, edit the file web.xml and delete everything that is into the servlet and the error markers at the end of the file. Next, add the missing files in the libraries folder thanks to the saved folder.
   Finally, you can start Apache and test your website.

ERRORS REPORT

By analyzing the database so as to provide results, some errors were found.

1. Load Factor

a. EWB

El. Konin:
High load factor (good input when the load factor is high, false value for production?). El. Capacity of the 4th boiler seems to be twice lower than others. Fuel consumption value seems good.

PP_NAME	BOILER_NO	YEAR	FUEL_TYPE	EL_PROD	REFERENCE	EL_CAPACITY	LOAD_FACTOR_CALCUL	LOAD_FACTOR_INIT
El.Konin	3	1 996	BC	363,05	LEWA	55	6 600,91	5 787,20
El.Konin	4	1 996	BC	440,90	LEWA	28	15 746,43	7 028,20
El.Konin	5	1 996	BC	447,67	LEWA	55	8 139,45	7 136,00
El.Konin	6	1 996	BC	456,07	LEWA	65	7 016,46	7 270,00
El.Konin	7	1 996	BC	472,93	LEWA	50	9 458,60	7 538,70
El.Konin	8	1 996	BC	398,61	LEWA	50	7 972,20	6 354,00
El.Konin	11	1 996	BC	500,71	LEWA	120	4 172,58	7 981,60
Sum				3079,94			59106,63	49095,68

By checking into the source file and catalogs, we can affirm that values for El. Capacity are good. Besides, the sum of El. Prod is good and the load factor values that are in the source file are those of the load_factor_init column, that is to say that values of El. Production for each boiler are wrong. Indeed, Konin plant has 9 boilers and here we only have 7 boilers but the sum is exact.

As we have correct values foe electric capacity and loaf factors, we can calculate the electricity production of each boiler. Hereafter, we have results for 1996 but it has been done for each year and sometimes the sum is higher than what we could have expected.

BOILER_NO	EL_PROD_CALCUL
3	318,296
4	196,7896
5	392,48
6	472,55
7	376,935
8	317,7
11	957,792
missing boilers	47,40

Anyway, in our results, we use the right load factor.

b. EWK

El.Jaworzno_III:
High load factor (good input when the load factor is high, false value for production?). In 1996, there is no division between boilers but the sum of values is assigned at one boiler. Therefore, we have details of load factor values for each boiler in the source file.

PP_NAME	BOILER_NO	YEAR	FUEL_TYPE	EL_PROD	REFERENCE	EL_CAPACITY	LOAD_FACTOR_CALCUL	LOAD_FACTOR_INIT
El.Jaworzno_III	1	1 996	HC	6 480,10	LEWA	220	29 455,00	7 103,00
El.Jaworzno_III	2	1 996	HC	0,00	LEWA	220	0,00	6 834,00
El.Jaworzno_III	3	1 996	HC	0,00	LEWA	220	0,00	7 112,00
El.Jaworzno_III	4	1 996	HC	0,00	LEWA	220	0,00	4 546,00
El.Jaworzno_III	5	1 996	HC	0,00	LEWA	220	0,00	6 019,00
El.Jaworzno_III	6	1 996	HC	0,00	LEWA	220	0,00	5 000,00
								36 614,00

The sum calculated for the initial load factors is the same as in the source file so these values are used in the database. Other values are good if we consider that they represent all the installation and not the boiler mentioned.
Respect to the source file El. Production and load factor values are good, besides el. Capacity seems also to be good respect to catalogs. But if we calculate the load factor we these values we don't get the same values.

El.Lagisza:
High load factor (good input when the load factor is high, false value for production? the production value seems to be high respect to other values with a right load factor). In 1996, 1997, 1999 and 2000, there is no division between boilers, the sum of values is assigned at one boiler.

PP_NAME	BOILER_NO	YEAR	FUEL_TYPE	EL_PROD	REFERENCE	EL_CAPACITY	LOAD_FACTOR_CALCUL	LOAD_FACTOR_INIT
El.Lagisza	1	1 996	HC	3 952,01	LEWA	120	32 933,42	4 307,00
El.Lagisza	2	1 996	HC	0,00	LEWA	120	0,00	7 937,00
El.Lagisza	3	1 996	HC	0,00	LEWA	120	0,00	6 022,00
El.Lagisza	4	1 996	HC	0,00	LEWA	120	0,00	4 199,00
El.Lagisza	5	1 996	HC	0,00	LEWA	120	0,00	5 973,00
El.Lagisza	6	1 996	HC	0,00	LEWA	120	0,00	6 346,00
El.Lagisza	7	1 996	HC	0,00	LEWA	120	0,00	5 305,00
El.Lagisza	9	1 996	HC	0,00	LEWA	0		616,00
				3 952,01	0,00	840,00	32 933,42	40 705,00

Respects to catalogs el. Capacity values are good, besides respect to the source file load factor values and el. Capacity values are also good. We face to the same problem as for El. Jaworzno_III. In the database we use load_factor_init values.

El.Siersza:
High load factor (good input when the load factor is high, false value for production? the production value seems to be high respect to other values with a right load factor). Values of 2002 seem to be 10 times higher for El. Production. Others data seem good.

PP_NAME	BOILER_NO	YEAR	FUEL_TYPE	EL_PROD	REFERENCE	EL_CAPACITY	LOAD_FACTOR_CALCUL	LOAD_FACTOR_INIT
El.Siersza	1	1 996	HC	683,87	LEWA	130	5 260,54	6 828,00
El.Siersza	2	1 996	HC	267,92	LEWA	130	2 060,92	2 675,00
El.Siersza	3	1 996	HC	250,09	LEWA	120	2 084,08	2 497,00
El.Siersza	4	1 996	HC	502,69	LEWA	120	4 189,08	5 019,00
El.Siersza	5	1 996	HC	605,85	LEWA	120	5 048,75	6 049,00
El.Siersza	6	1 996	HC	257,10	LEWA	120	2 142,50	2 567,00
				2 567,52	0,00	740,00	20 785,87	25 635,00

Ec.Laziska : high load factor (good input when the load factor is high, false value for production ? the production value seems to be high respect to other values with a right load factor). Only 2 boilers have been taken into account instead of 6, but the sum is the same.

el_prod_calcul%	el_prod_database	el_prod_calcul_capacity
1571,36	1 100,45	1363,00
3215,36	3 686,27	5131,76
4786,72	4786,72	6494,76

By analyzing values of 1996, we can see that electricity production values of the database have the same sum as in the source file but they haven't been calculated by taking into account load_factor and capacity nor percentage of total load_factor with total production. Besides, as it was said, we have only 2 boilers in 1996 whereas there are 6 boilers that they were built and launched before 1996. We have values for the 6 boilers only for 2005.

As load_factor_init total values seem to be the good ones we use them in the database. Obviously load_factor_init values aren't good for each boiler because values are higher than 10000 and it's impossible in one year. As the total value is the good one respect to the source file we can use them to provide results per installation but **it has to be mentioned that values of load factor in the database aren't good for this installation.**

Except for El. Konin and El. Sierza, taking values for all the plant and not values per boiler would permit to get usual values even if we don't take into account load_factor_init.
Data in the source file are given for all the installation. No details for boilers are provided. In the database, there are some details (then the sum is the value of the source file) but sometimes the value of the sum is assigned to one boiler which can create some mistakes for the load factor. That's why graphs about load factor have to be provided per plant not per boiler.

c. EC1

EC.Karolin2: No data in the source file for the thermal input
EC.Wroclaw: high load factor in several years (good input when the load factor is high, false value for production?)

d. EC2

Ec.Czechnica: high load factor (good input when the load factor is high, false value for production? the production value seems to be high respect to other values with a right load factor)

e. EC3

EC.Gorzow: high load factor in several years (good input when the load factor is high, false value for production?)
EC.Szczecin: the el.capacity seems very low (3 MW) compare to the thermal input (47 MW) of the source file

2. Production

EWB
El. Patnow: El.prod is twice the value of the source file

Respects to catalogs el. Capacity values are good, besides respect to the source file el. Production values are also good. About load factor, values are good for the five values but one boiler is missing in the source file so that the total load factor values are not the same. Respect to the catalogs this installation has 6 boilers not 5 so we can consider that load_factor_init values are good.
One problem is that production values might have been calculated with these 6 load_factor_init values to get the same sum as for 5 boilers as in the source file but not taking into account capacity.

load factor %	el_prod_calcul	el_prod_database
0,27	683,90	683,87
0,10	267,93	267,92
0,10	250,10	250,09
0,20	502,71	502,69
0,24	605,87	605,85
0,10	257,11	257,10

Thus we have calculated production values taking into account % of total load factor and total electricity production and we get the same values as we can have in the database. By calculating production with capacity and load_factor_init values we have these values:

el_prod_database	el_prod_calcul	
683,87	887,64	
267,92	347,75	
250,09	299,64	
502,69	602,28	
605,85	725,88	
257,10	308,04	
sum in the source file	2 568,95	sum for 5 boilers
2567,52	3171,23	sum for 6 boilers

That might say that production values in the database are wrong, the total value for the installation is right but values for each boiler are not the good ones. For all years we face to the same problem. For 2002, there is an additional problem: production values seem to be 10 times higher than they should be.

load factor %	el_prod_calcul%	el_prod_database	el_prod_calcul_capacity	
0,22	5628,69	5 628,69	733,37	
0,05	1405,85	1 405,85	183,17	
0,19	5022,55	5 022,55	604,06	
0,25	6348,58	6 348,58	763,54	
0,25	6508,42	6 508,42	782,76	
0,04	918,04	918,04	110,41	
1,00		sum in the source file	2 413,77	sum for 5 boilers
		25832,13	3177,30	sum for 6 boilers

For 2005, we have values for each boiler in the source file but one boiler is still missing. Values of the database are the same for 5 boilers and we can't check for the last one.

For all years, load_factor_data values seem to be good even if one boiler is missing in the source file. Thus, we use these data in the database. **Electricity production values of 2002 have not been modified into the database that is to say that these values are still probably wrong in the database.**

EWK
El.Opole: values for the first four boilers aren't in the source file

3. Chemical Energy

Except for 2005 and 2006, for each boiler of each facility the chemical energy value is the same: 23562,43 TJ and that for each reference.
Since chemical value can be calculated by multiplying LHV and fuel consumption, it was calculated. However, by comparing the database values and the calculated values of 2005, some differences were still noticed.

- For ECN, EC.Knurow have still wrong values: 23562,43 TJ for each boiler, that is to say 3 boilers and the calculated values are inferior to 1000.
- For EWB, El.Belchatow hasn't any LHV values for its boiler n13, so the chemical energy couldn't be calculated and the initial value seems to be wrong (23562,43 TJ).

These mistakes explain well the difference noticed between database values and calculated ones. Besides, calculated values seem to be better than initial ones (no wrong values) even if one boiler is missing.