



Final Report

# **Mid Size Sustainable Energy Financing Facility (MidSEFF) Energy Efficiency Project at Petkim Petrochemical Plant: Non Technical Summary (NTS)**

August 2013

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European Bank for Reconstruction and Development

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The European Bank for Reconstruction and Development (EBRD) launched in January 2011 a financing facility aimed at scaling up Renewable Energy and Energy Efficiency investments in Turkey, to increase the country's energy savings and decrease its carbon emissions. The Turkish Mid Size Sustainable Energy Financing Facility (MidSEFF) launched by the EBRD with support from the European Investment Bank (EIB) and European Commission (source of the Technical Cooperation funds) will provide a total of EUR 975 million in loans through 7 Turkish banks for on-lending to private sector borrowers.

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## 1. General Plant Description

Petkim Petrokimya Holding A.Ş. intends to carry out energy saving projects within its production plant. In particular, 9 projects have been identified, whose main features are summarised in table below:

**Table 1-1: Energy Efficiency projects**

ID	Title of the project	Briefly information
1	Replacement of old cathodes with cushion cathodes	Installation of 20 “zero gap cushion mesh cathodes” in place of membrane cathodes currently installed at chlorine-alkali plant. The new system is characterised by an high efficiency and use a lower voltage to produce the same amount of NaOH, thus allowing a reduction the specific electrical energy consumption.
2	Chlorine Condensation and Chilling Water System Renewal Project	The renewal of Chlorine Condensation System foresees the installation of two new compressors (10kW each – one as back-up) in place of the current system which is oversized for the current plant production. The new compressors will allow to produce the same quantity of liquefied chlorine with a reduced electrical energy consumption. The renewal of the Chilling water System consists of the installation of a new system with higher efficiency allowing a reduced electrical energy consumption.
3	Replacement of Shrink Film Machines with Strechood Machines	The stretch hood machines do not need hot air for their packaging process, since the packaging is allowed only by mechanical power. Since the hot air is not anymore necessary, the new process allows lower electricity consumption and also a higher level of safety.
4	Use of LPG instead of Naphtha as feedstock in Ethylene Furnace	The project aims to feed one of the seven old virgin naphtha furnaces with a stream of unsaturated LPG (Liquid Petroleum Gas). The project benefit is mostly based on the increase of product value against production cost, which, according to Petkim, is favourable owing to the low cost of unsaturated LPG. Use of LPG gives also a more favourable energy balance allowing saving of fuel gas burnt by the furnace.
5	Steam Generation from VCM Furnace Quench System	Installation of an economizer for the production of about 10 ton/h of steam by cooling down the cracked gas, leaving the VCM furnace, which previously were cooled down by blending with cold EDC. The generated steam will be used in the reboilers of the distillation columns of VCM Plant in place of part of the steam generated by a NG boiler thus allowing a saving of NG.

6	VSD installation at motors of Cooling Towers Fans	Replacement of the existing electrical motors of cooling towers fan with high efficiency electrical motors. Particular, motors of class IE2 and VSD will be installed. A reduced electricity consumption is allowed.
7	Revamp of Direct Chlorination Unit	Replacement of nitrogen with ethylene in blanketing the stream at the exit of the ethylene chlorination reactor, to obtain a stream with a composition outside explosion limits but having a low inert content, which can be sent as a feed to the oxychlorination reactor, with a full recovery of ethylene. A vent gas compressor will be installed to feed the vent gas to the oxychlorination reactor. Energy saving is related to the load reduction of EDC unit and to reduction of chlorinated by-products to be incinerated. Moreover, the reduction of use of raw materials enables to reduce energy consumption in chlorine and ethylene manufacturing plants.
8	Feeding Furnace with a Mixture of Naphtha and Aromatics Plant Vent Gas instead of Naphtha	The project aims to use the aromatics plant vent gas as a feedstock to the ethylene plant instead of being used as fuel by the aromatics plant itself. In fact aromatics plant vent gas is more valuable there than being used as a fuel, and replaces purchased virgin naphtha, as input to the furnace of the ethylene plant. Its use as feedstock at ethylene plant allows a reduction of fuel gas consumption.
9	Capacity Expansion Project in PTA Plant	The project foresees the increase of the annual production capacity by 50% and the implementation of energy saving projects. The following measures are included: installation of a new compressor moved by an expander, installation of rotary filters replacing centrifuges, increase of oxidation reactor capacity by replacing the existing turbine stirrer with a new one and revamping o the acetic acid dehydration column. Plant capacity increase, energy saving and improved product quality are achieved.

**Table 1-2: Key project summary data**

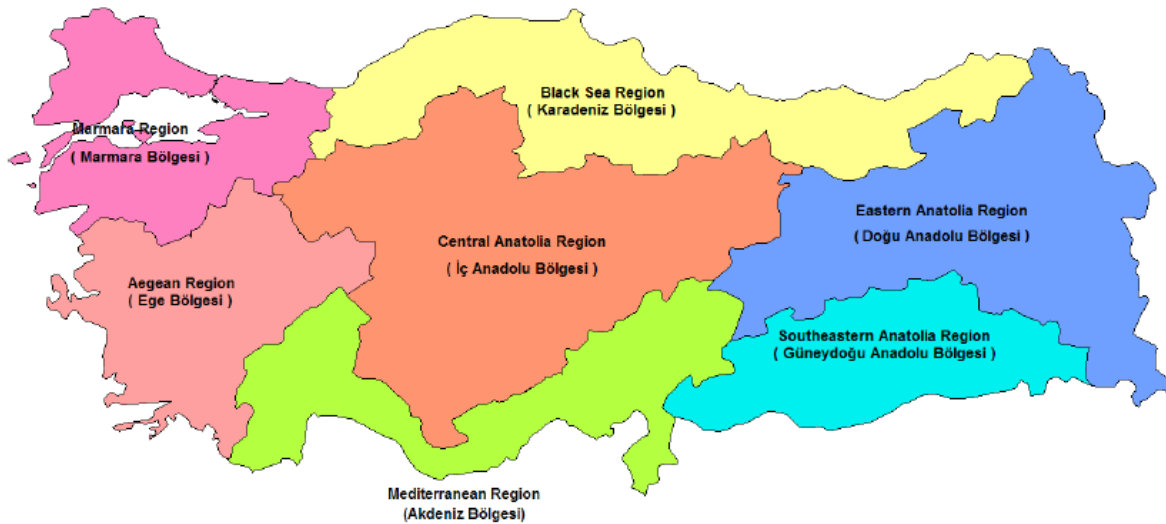
<b>Project Name</b>	Nine Energy efficiency projects at Petkim Aliğa plant																						
<b>Project Borrower</b>	Petkim Petrokimya Holding A.Ş.																						
<b>Project Sponsor</b>	Petkim Petrokimya Holding A.Ş.																						
<b>EBRD Transaction</b>	<p>Total project cost, excluding VAT, is 27,656,226, divided as follow:</p> <table border="1"> <thead> <tr> <th>CAPEX</th> <th>EUR</th> </tr> </thead> <tbody> <tr> <td>Sub-Project 1- Replacement of old cathodes with cushion cathodes</td> <td>1,689,922</td> </tr> <tr> <td>Sub-Project 2 Chlorine Condensation and Chilling Water System Renewal Project</td> <td>352,372</td> </tr> <tr> <td>Sub-Project 3 - Replacement of Shrink Film Machines with Stretch hood Machines</td> <td>700,000</td> </tr> <tr> <td>Sub-Project 4 -Use of LPG instead of Naphtha as feedstock in Ethylene Furnace</td> <td>343,259</td> </tr> <tr> <td>Sub-Project 5 - Steam Generation from VCM Furnace Quench System</td> <td>1,201,632</td> </tr> <tr> <td>Sub-Project 6 - VSD installation at motors of Cooling Towers Fans</td> <td>1,520,000</td> </tr> <tr> <td>Sub-Project 7 - Revamp of Direct Chlorination Unit</td> <td>3,875,969</td> </tr> <tr> <td>Sub-Project 8 - Feeding Furnace with a Mixture of Naphtha and Aromatic Vent Gas instead of Naphtha</td> <td>2,373,071</td> </tr> <tr> <td>Sub-Project 9 - Capacity Expansion Project in PTA Plant</td> <td>15,600,000</td> </tr> <tr> <td><b>Total</b></td> <td><b>27,656,226</b></td> </tr> </tbody> </table> <p>The total project cost is EUR 28,900,155 including capitalized financing costs. The proposed financial scheme includes 88% debt financing in the amount of EUR 25,500,000.</p>	CAPEX	EUR	Sub-Project 1- Replacement of old cathodes with cushion cathodes	1,689,922	Sub-Project 2 Chlorine Condensation and Chilling Water System Renewal Project	352,372	Sub-Project 3 - Replacement of Shrink Film Machines with Stretch hood Machines	700,000	Sub-Project 4 -Use of LPG instead of Naphtha as feedstock in Ethylene Furnace	343,259	Sub-Project 5 - Steam Generation from VCM Furnace Quench System	1,201,632	Sub-Project 6 - VSD installation at motors of Cooling Towers Fans	1,520,000	Sub-Project 7 - Revamp of Direct Chlorination Unit	3,875,969	Sub-Project 8 - Feeding Furnace with a Mixture of Naphtha and Aromatic Vent Gas instead of Naphtha	2,373,071	Sub-Project 9 - Capacity Expansion Project in PTA Plant	15,600,000	<b>Total</b>	<b>27,656,226</b>
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<b>Total</b>	<b>27,656,226</b>																						
<b>Project Description / Business Purpose:</b>	<p>The location of the proposed energy efficiency project is in the Aegean Region, in İzmir Province, Aliğa district. The project concerns nine energy efficiency projects, which are listed below:</p> <ol style="list-style-type: none"> <li>1. Replacement of old cathodes with cushion cathodes</li> <li>2. Chlorine Condensation and Chilling Water System Renewal Project</li> <li>3. Replacement of Shrink Film Machines with Strechood Machines</li> <li>4. Use of LPG instead of Naphtha as feedstock in Ethilene Furnace</li> <li>5. Steam Generation from VCM Furnace Quench System</li> <li>6. VSD installation at motors of Cooling Towers Fans</li> <li>7. Revamp of Direct Chlorination Unit</li> <li>8. Feeding Furnace with a Mixture of Naphtha and Aromatics Plant Vent Gas instead of Naphtha</li> </ol> <p>Capacity Expansion Project in PTA Plant</p>																						
<b>Annual Electricity Saving</b>	27,715 MWh/year																						
<b>CO<sub>2</sub> emission reductions</b>	65,400.tCO <sub>2</sub> / year																						

## 2. Project Area

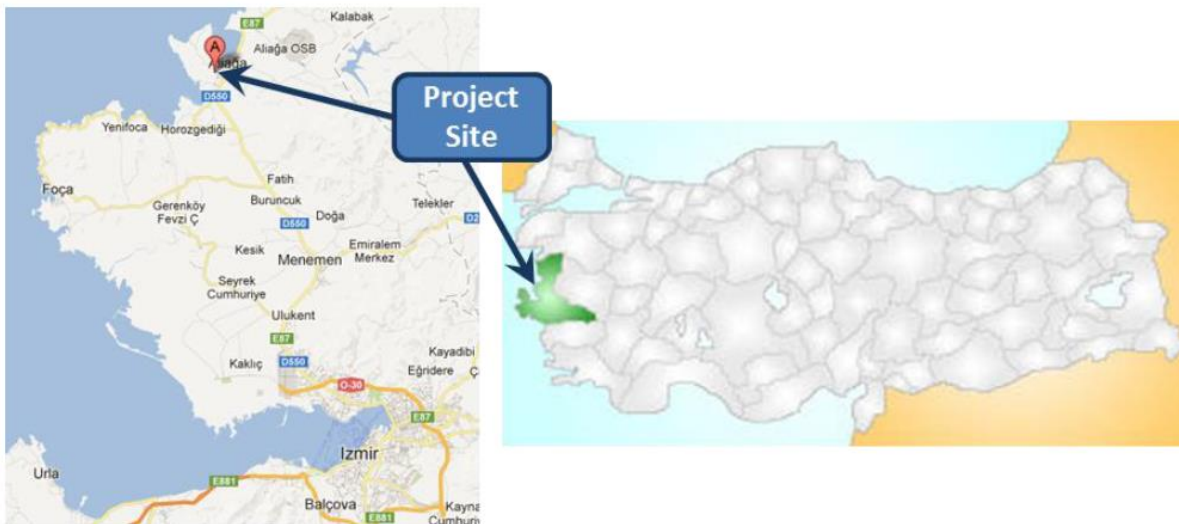
Petkim Petrokimya Holding A.Ş is one of the main petrochemical companies in Turkey.

The Aliğa Complex (located in the Aegean Region, Izmir Province) was its second plant, established in '80ies and expanded in the years to its present situation.

The figures below show the location of the plant.



**Figure 2-1: Turkey Map – Aegean Region**



**Figure 2-2: Plant Location - Izmir Province, Aliğa District**

Being the new facilities within the already existing industrial site, the construction activities will not be particularly impacting since the plant is far from natural protected area or areas with valuable habitats/species. The improvement of energy efficiency within the plant represents a favourable aspect from the environmental point of view and reflects in a reduction of the GHG emission to the atmosphere and in a more rational use of natural resources.

In addition project number 8, revamping of direct chlorination unit, will also avoid venting into the atmosphere 250 kg/h of ethylene dichloride for a total annual amount of about 2,000 tons.

There are no settlements or scattered houses close to the Plant and considering its distance from the nearest residential areas, the project will not affect them.



## 3. Social and Environmental Impact

### 3.1 Land Use

All the projects will be implemented within the existing Plant area and no new private land is needed. The Sponsor should supply some documents/studies that demonstrate that the Plant didn't affect the habitats around the industrial area during the operation, even proposed projects are located within an industrial site far from natural protected area or areas with valuable habitats/species, as the sponsor also confirmed during the site visit.

### 3.2 Waste Production and Management

A separate waste collection, storage and disposal system is employed at the Site in the scope of the Environmental Management System. Separate containers are provided at proper locations and the employees were trained for waste segregation and separate collection. In the context of segregation of recyclable and non-recyclable wastes, the facility is in compliance with the regulations. Hazardous wastes generated at the Site are segregated and stored temporarily in the dedicated hazardous waste storage area. The same procedures will be implemented also for the construction of the nine EE projects.

### 3.3 Noise

Considering project characteristics and location, the noise generated during construction/installation is reasonably a minor issue. A regular noise monitoring is foreseen at the plant and in case of standards excess, the workers are informed to use proper personnel protection equipment.

### 3.4 Water consumption and discharge

Concerning the construction and operation phase for the proposed projects, there will be domestic wastewater generation due to employees' daily waste. The management of these water consumption/discharge will be reasonably provided by the existing wastewater collection and treatment system.

EIA report does not mention if there will be an increase of industrial water consumption or wastewater generation during the operation phase after the implementation of the proposed projects. The Sponsor should clarify this aspect. Nevertheless, Petkim Petrochemical Complex has onsite wastewater treatment plant and the industrial wastewater will be treated according to ISO 14001 standards.

### 3.5 Emissions to air

Dust is generated from earth-moving and material storage, and air emission from the operation of construction machinery and equipment. This aspect will not be critical considering the location of the project and the already existing facilities. Some basic information especially on site preparation associated activities should be provided by the sponsor.

The Petkim Petrochemical Company holds ISO 14001 certification that guarantees that the company is compliant with the international regulation in force. However, the Project sponsor should be made available the reports of emission data (at least in terms of flow rate and pollutant concentrations) to demonstrate the compliance with regulatory limits.

**Table 3-1: Impact Quantification**

COMPONENT	IMPACT	QUANTIFICATION
<b>Land Use</b>	<u>Different use of the Land</u>	No change in the Land use: the new facilities are within an existing industrial area
<b>Waste</b>	<u>Production of solid waste</u>	N.A.
	<u>Excavation waste</u>	N. A.
<b>Water</b>	<u>Consumption and Discharge</u>	N.A.
<b>Emissions</b>	<u>Noise</u>	Operational phase < 85dB (security equipment are strictly required)
	<u>Particulate</u>	No specific data are available. ISO 14001

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