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COMMISSION STAFF WORKING DOCUMENT

ON THE IMPLEMENTATION OF THE ENERGY MARKETS OBSERVATION SYSTEM (EMOS)

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1. INTRODUCTION

The Energy Markets Observation System (hereafter EMOS) is a database built in the context of a preparatory action adopted by the budget authority. It was meant to help the Commission to monitor and analyse energy markets and cross cutting issues and to identify potential threats to the regular functioning of the energy system. EMOS has become operational by mid 2008. This report describes how the preparatory action has been implemented by the European Commission and what results it has achieved.

2. EMOS, A FORWARD LOOKING PREPARATORY ACTION

EMOS results from a preparatory action[1] adopted in 2004 by the budget authority and implemented until 2008 by the European Commission with the assistance of an external contractor[2].

The Commission first proposed the setting up of a specific structure and system for monitoring issues related to energy in the 2002 package of four directives aiming at safeguarding the EU's security of supplies in natural gas and petroleum products[3]. However, the legislative authority rejected the proposed provisions on monitoring structures.

In line with the Commission's proposal, the European Parliament decided to explore the possibility of establishing the observation entity in question and the budget authority adopted a preparatory action. A special budgetary line supporting this preparatory action was established in the EU budget for 2004 with commitment appropriations amounting initially to 1.5 million EUR (increased later by 500 000 EUR for specific data acquisition purposes). This appropriation was "*intended to cover, in particular, expenditure incurred by the Commission for collecting and processing information of all kinds needed for the analysis, definition, promotion,*

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1 Article 49 (6b) of the EC Financial Regulation (OJ L248 of 16.09.2002, p. 1) defines a preparatory action as "*designed to prepare proposals with a view to the adoption of future actions*".

2 The tendering process was completed in December 2004. The IT development contract for EMOS was awarded to a consortium of consulting firms lead by ATOS and amounted to 1.498 million EUR.

3 Communication from the Commission to the European Parliament and the Council, The internal market in energy: coordinated measures on the security of energy supply (COM (2002)488 final).

monitoring, evaluation and implementation of the common policy on security of supply and completion of the internal market in conventional energy sources". This preparatory action was not intended to supersede or duplicate activities of other entities active in statistics or collection of data. It was designed to create a new tool streamlining the vast amount of data currently available through different sources and facilitating the analysis of these data for policy purposes.

Due to its complexity, the project has been implemented in several stages. It included defining the needs of the Commission and the system's objectives, identifying the data to be used and the ways of sourcing it, conceptualising the application in IT terms and, eventually, developing, testing, and relocating the database to the Commission's premises.

The relevance of such a system has been confirmed on many occasions since the adoption of the preparatory action. Energy has become a priority for the European Union at a time when the EU and world energy landscapes are changing rapidly. Major transformations in fuel and electricity prices, new European legislation and regulation and geopolitical developments have moved concerns about the EU energy security to the forefront of the political and economic agenda. Very recent events, liker the oil prices hike, have showed how necessary a monitoring of the energy situation is.

In the fast evolving energy context, the need for further added value and expertise on energy issues has been widely perceived. At the end of 2006, the European Parliament has recalled the importance of an analysis capacity to ensure a monitoring and a better understanding of energy markets at EU level. In line with the preparatory action within which EMOS was developed, the European Commission proposed in its Communication on "An Energy Policy for Europe" of 10 January 2007, the creation within its premises of an Energy Observatory, whose tasks would be "*to undertake core functions regarding Europe's energy demand and supply, notably increasing transparency regarding the future investment needs in the EU for electricity and gas infrastructure and generation facilities and, via benchmarking and the exchange of best practice, the success of Member States in ensuring that their energy mix evolves in a manner that contributes effectively to the EU' s energy goals*"[4]. The European Council endorsed this view during its Spring Council in 2007.

Building on EMOS, the European Commission has therefore decided to create the Market Observatory for energy (hereafter Observatory) which has started its activities in 2008. Set up in the Directorate-General for Energy and Transport, the Observatory is designed to contribute to **an effective EU energy policy** and to a greater **transparency** of energy markets. Its mission consists in pooling information, analysing energy markets and cross-cutting issues, such as capacity and infrastructure, with a view to helping policy-makers to evaluate, propose or adjust the EU policies. The Observatory does not monitor the electricity and gas markets for regulatory purposes but supports the policy agenda of the European Union and helps the Commission to anticipate problems and submit possible solutions.

[4] Communication from the Commission to the European Parliament and the Council, An energy policy for Europe, (COM (2007) 1 final)

3. EMOS, A KEY TOOL FOR THE MARKET OBSERVATORY FOR ENERGY

EMOS is currently operated and developed by the **Observatory** of which it has become the backbone. It is the most important working tool of the Observatory and **supports its working methodology.** The Observatory develops analysis drawing on **facts and figures** and fosters **evidence – based** policies. To ensure quality and consistency, most of these analyses are subject to a regular peer review. They are carried out in close **cooperation** and **consultation** with international and national partners, market players, academia and other stakeholders.

– EMOS provides the necessary **data input** from institutional and commercial **sources** which are further analysed by the Observatory[5]. EMOS contains a considerable part of data relating to the EU and its Member States, the candidate countries and other European countries which are fundamental for policy-making at EU level. Essential data concerning other world players (such as the main producer countries) and are also included. EMOS data feature different reporting time frames (daily, monthly, and quarterly, yearly) depending on policy purposes. Where available and deemed appropriate, EMOS contains historical data series.

  Primarily covering oil, gas and electricity markets or petroleum products, EMOS is of paramount importance for **market observation**. The Observatory watches closely at issues such as demand and supply developments, import, export and trade volumes, wholesale and retail prices on physical and financial markets. On the **security of supply** side, the Observatory monitors the oil stocks situation in the Member States and energy infrastructure developments. EMOS supports the Observatory with data on operational status, capacity, ownership, costs. This complements the information Member States should provide under Council Regulation (EC) n°736/96 on notifying projects of Community interest in the petroleum, natural gas and electricity sectors[6].

– The various **technical capabilities** of EMOS support the analytical work of the Observatory. EMOS enables data to be retrieved from a single database, into an output sheet (or "report") through its special reporting application. It also enables cross-querying, regardless of the data source, and thus comparisons of data from different sources. When data organisation so permits a "drill down" feature can help to find the information at the right level, e.g. data on Europe further broken down to data on EU countries. EMOS thus allows considerable freedom in the preparation of data reports which **broadens the perspectives for analyses**. However, EMOS requires skilled IT users able to use reporting tools such Business Object[7].

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5 See Annex 1, for details on the content of EMOS.

6 Council Regulation (EC) n° 736/96 on notifying the Commission of investment projects of interest to the Community in the petroleum, natural gas and electricity sectors, OJ, L 102, 25.7.1996, p. 1

7 See Annex 2, for the technical description of EMOS.

4. THE EMOS-BASED PUBLICATIONS OF THE MARKET OBSERVATORY FOR ENERGY

The Observatory has developed a number of **regular** and **specific publications**. Alongside with an annual report[8], it publishes periodic reports on a number of recurring topics like on the development of European electricity prices. For topical issues, specific reports are prepared in conjunction with the Commission work programme and EU and international energy events. These reports do not compete with market reports from private information providers or with other reports already prepared by the European Commission. They constitute an additional type of reports whose added value consists in their analytical approach. They are not directly addressed to market participants but mostly to public institutions and policy makers, associations, general public and EU citizens. All publications and key data can be **retrieved from the Observatory's website** which is under constant development[9].

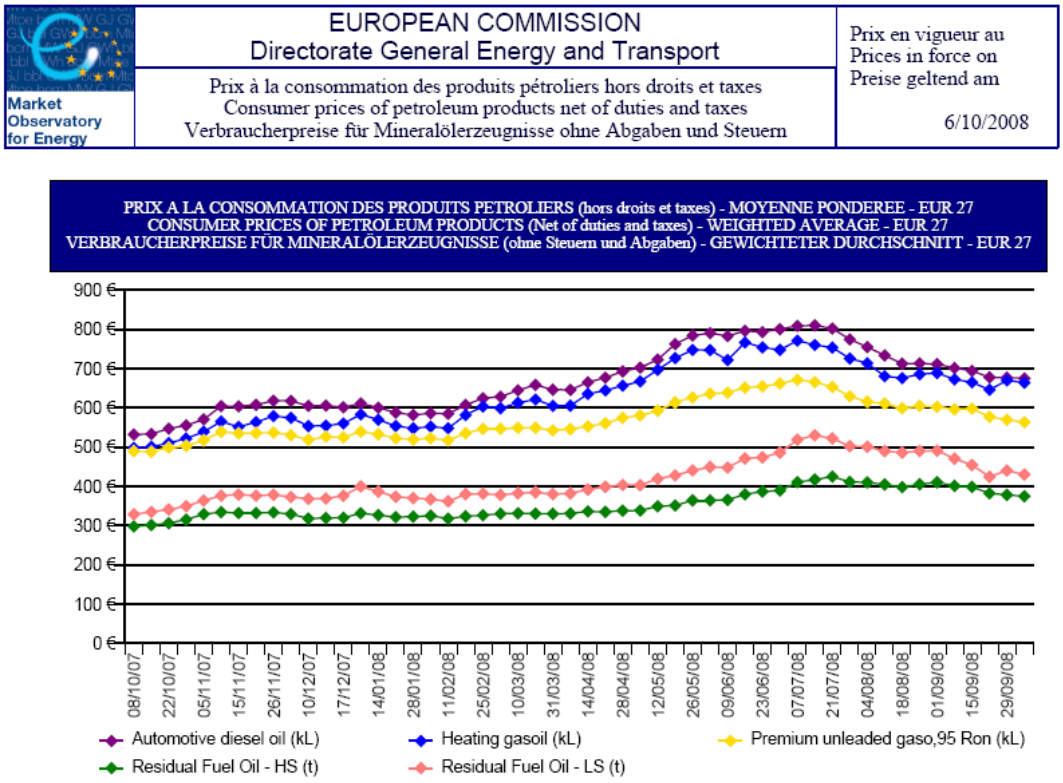
– **Overview of publications from the Observatory**

Oil bulletin

Designed to improve **transparency** of oil prices and to strengthen the **internal market**, the Oil bulletin presents evolutions of various aspects such as prices and taxation in the EU Member States on a weekly basis. The cost of crude oil supplies, including imported crude, deliveries and production in Member States are reported on a monthly basis. The weekly oil bulletin is subscribed by approximately one thousand readers, mainly transport professionals and public administrations. It is used for logistical and financial decisions, purchasing and invoicing but also market monitoring.

8 For 2008, SEC(2008) 2795, Europe's current and future energy position – demand, resources, investments

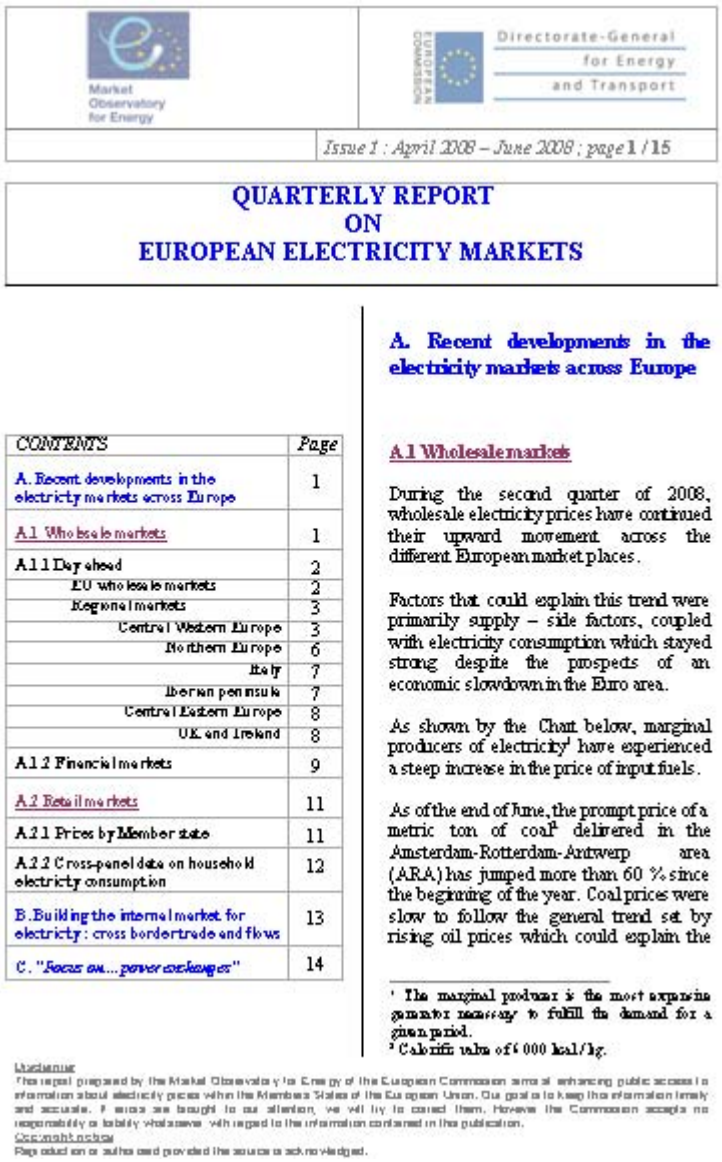
9 http://ec.europa.eu/energy/observatory/



EMOS facilitates the preparation of the Oil bulletin. With advanced uploading techniques, EMOS enables Member States to send their data on internet-based forms. National data are fed directly into the database, which allows the figures to be checked instantly against errors, analysed and presented in a flexible manner (including prompt publication).

Electricity market reports

The first Quarterly Report on European Electricity Markets prepared by the Observatory has been published in October 2008. This new series of reports gives an overview on physical and financial wholesale markets, covering different regions. Whenever data allow, the retail market, cross border trade and flows are also looked at. The reports complement the annual benchmarking reports on the internal electricity and gas markets within the EU.



Market Observatory for Energy

Directorate-General for Energy and Transport

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QUARTERLY REPORT ON EUROPEAN ELECTRICITY MARKETS

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A. Recent developments in the electricity markets across Europe

A.1 Wholesale markets

During the second quarter of 2008, wholesale electricity prices have continued their upward movement across the different European market places.

Factors that could explain this trend were primarily supply – side factors, coupled with electricity consumption which stayed strong despite the prospects of an economic slowdown in the Euro area.

As shown by the Chart below, marginal producers of electricity[1] have experienced a steep increase in the price of input fuels.

As of the end of June, the prompt price of a metric ton of coal[2] delivered in the Amsterdam-Rotterdam-Antwerp area (ARA) has jumped more than 60 % since the beginning of the year. Coal prices were slow to follow the general trend set by rising oil prices which could explain the

[1] The marginal producer is the most expensive generator necessary to fulfill the demand for a given period.
[2] Calorific value of 6 000 kcal/kg.

Gas market reports

Quarterly gas Market Reports are currently under preparation.

Annual Report

In support of the **Second Strategic Energy Review** adopted by the Commission on 12 November 2008, the Observatory concentrated on energy security and prepared a report on "*Europe's current and future energy position – Demand - resources – investments*". This report was designed to substantiate the political messages conveyed by the Commission with facts and figures and dedicated analyses of the situation of the EU from an energy security perspective. It will be published as the **first annual report** of the Observatory.

5. CONCLUSION AND OUTLOOK

As a result of the implementation of the preparatory action adopted in 2004 and of the creation of the Market Observatory for energy, the European Commission is now **equipped** with an **analytical capacity** observing market developments closely.

Financial support will need to be secured on the long term. **Energy** will remain a **high priority** for the European Union and the **future activities** of the Observatory will require **continuous improvements** of EMOS. The scope of EMOS will in particular need to be extended to cover all the EU energy mix and its evolution. While covering primarily electricity, gas and oil for the time being, EMOS will need to cover **renewable energy sources and relevant issues** such as greenhouse gas emissions. On the technical side, **processing functionalities** and the user friendliness of EMOS could be improved to facilitate analysis. The Observatory will also pay greater attention to **consumers'** and **EU citizens'** concerns through a web-based dissemination platform. In light of the policy evolution and the prospects of the Observatory's work, the financing of activities supporting the EU energy policy development remains a **matter of importance**.

ANNEX 1

Overview of data category stored in EMOS at current stage

Electricity

Data category
Capacity by fuel type
Capacity with dual firing capability
Closures by fuels – Electricity
Additions to capacity – Electricity
Electricity Peaks
Electricity demand (and historical development)
Electricity demand per sector
Consumption per GDP
Electricity Consumption by Household
Taxes on Electricity
Number of Suppliers and market shares
Electricity Power exchanges
Electricity Bilateral transactions
End user prices – Electricity
Electricity network charges
Electricity Customer switching rates
Available interconnection capacities (approx)
Planned additional electricity capacity
Length of Electricity networks
Length of transportation networks (>50 kV) by country

Gas

Gas reserves: proven, probable and possible worldwide
Production per country
E&P investments planned and carried out
Imports and exports EU – Gas
Demand of supply countries (historical)
Historical demand per country
Demand per sector and country
Demand per country and sector

Gas taxes
MS gas market concentration
EU Import and export
Diversification of supply sources
Prices on Gas hubs
End user gas prices
Gas customer switching rates
Pipelines - technical data
Network access regimes and tariffs
Planned pipeline investments
Storage technical data
LNG chain infrastructure
Planned LNG investments
LNG supply contracts (volumes)
Gas long-term contracts (volumes)

Oil

Oil Reserves
Monthly and yearly oil production
Yearly world oil demand
Transport sector demand in oil
Yearly and monthly EU demand by country and product
Oil Spot Prices
Oil Futures
Non-commercial operators activities on NYMEX
EU retail prices of oil and petroleum products
Oil refining figures by country
Oil pipelines data – intra and extra-EU
Current oil pipeline projects
Oil Terminals
Oil Storage capacities in EU by country and type
Strategic stock levels of oil and petroleum products
Oil imports and exports worldwide
Crude oil imports in EU

Refinery data
Imports and exports of refined products by EU

Key commercial data

Exchange rates
Inflation - CPI index
GDP
Balance of trade – by commodity and by country
Balance of trade – by country and by commodity
Population – total
Population – households
CO2 prices - spot and futures

Data stored in EMOS are provided by Eurostat, OECD, the International Energy Agency, CEER, Enerdata - Odyssée, Gas Strategies, IHS, Platts.

ANNEX 2

EMOS Technical description

The Architecture

EMOS is a data warehouse system which collects information from different data sources. All information is transformed, aggregated and adapted to fulfill the requirements of the final users. The system providing data on oil, electricity and gas covers the following objectives:

– To create output data reports (i.e query on the database structured in the form of tables and graphs) on aggregated data from the EMOS database;

– To collect relevant information from different data providers (automatically through web sites, through web forms, or via FTP, including manual extraction possibility);

– To import data into the EMOS system for automatic processing (including consolidation of input data sources, transformation and adaptation to EMOS requirements and aggregation in relevant analysis environments);

– To maintain and administer the EMOS system through an intuitive application

The EMOS architecture is thus centered on three main axes:

– A global and automated system for data extraction, transformation and loading

– A business reporting tool for data analysis and consultation

– A central administration tool for EMOS maintenance

The ETL Engine

The EMOS environment and related services are designed as a semi-autonomous system, using a minimum of human resources. A specific ETL (Extract/Transform/Load) engine was built into Business Objects Data Integrator software to automatically process the data of the various providers. Its flexibility ensures that it supports the following two types of feeding processes:

(1) In most cases, the ETL engine is able to automatically retrieve the data source files from the data providers (based on a HTTP or a FTP “get” procedure) and put them in the appropriate ETL folder for further processing by the ETL engine.

(2) If needed, human operators (who receive the data sources from the different providers) are able to manually analyse the content of the data files, format the content and put it in the input folder of the appropriate ETL process.

(3) A third possibility is to manually fill in a web form and to submit the result to the EMOS data administration for approval. After validation, the data are loaded directly into the database via an ETL process.

If a process fails, the EMOS system automatically sends an e-mail to the system administrator.

The Reporting Tool

The Business Object reporting tool enables querying the database without knowledge of the database language. The user builds the query by drag-and-dropping various data marts (choice of analysis field, product, etc) and additional factors for the axis of analysis (such as timeframe, geographical coverage, units, etc). Filters on all categories (e.g. "last 5 years" in the time frame choice) should also be defined. The user-generated report can be subject to remodelling by sorting, aggregation, division according to a specific category (time/country/etc), sub-selection ("drill down"), or conversion into a choice of graphs and charts.

The EMOS Administration Interface

EMOS offers a web administration interface allowing authenticated users to connect to the data warehouse repository and to maintain the main EMOS parameters and data dimensions. This interface is appropriate only for maintenance purposes.

The Software

To deploy and maintain all components of the EMOS system easily and quickly in the Commission's IT environment, the EMOS software architecture is built on:

– An Oracle database

– An ETL tool with graphical interface for workflow design (Software BODI XI)

– Reporting softwares for data mining (Business Object + WebI)

– Weblogic application servers

Additional software is needed to administer and upgrade the EMOS system:

– For database implementation: TOAD

– For ETL business process design: BODI XI

– VB libraries from Beyond 20/20 for converting IVT into CSV format

– For data reporting environment: Business Object Designer.

Access to the database

IT system integrity, access security, data protection and correct use of data are at the very heart of EMOS. For these reasons, direct access to the database is limited to a small number of experienced users and system administrators in principle from the Observatory. The Observatory responds to queries.