Evaluation of Scheduling Systems for the European Gas and Power Markets

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Preface

It has been over two decades since the EU liberalized the energy market with far-reaching repercussions. While consumers were now free to decide on their preferred provider for power and gas, the competition within the industry suddenly increased rapidly. On top of that, the political climate changed, and several member states announced nuclear phase-out and energy transition plans. A lot has been said and written about the effects of these events and how energy companies have struggled to adapt to the new market environment. And while these developments can be considered major milestones, new challenges are already in sight.

While some of these will help to address existing challenges, such as faster and more accurate trading, others can be considered innovations which will ultimately force market participants to rethink current business models and the corresponding IT.

One process within the trading lifecycle that will have to deal with all these challenges is the communication between energy trading companies and local/regional grid system operators.

This study aims at presenting a variety of scheduling and nomination solutions available on the European energy market. It will focus on the differences and similarities that exist within the commodity gas and the commodity power, and on how the different system solutions accommodate both current and future challenges in the world of energy trading and delivery. These challenges include the current energy market crisis, the decline in purchases of Russian gas, new commodities such as hydrogen, and the increase in data volumes and the shift to the cloud.

Ingo Passenberg
Director

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A Introduction

When talking about power and gas markets, one must inevitably discuss the scheduling systems which make possible the administration and communication between the market participants (subsequently referred to as "Operators") and the transmission system operators (TSOs), as well as the distribution system operators (DSOs) in the different geographical regions.

The term "scheduling" describes the physical movement of the respective commodity that an Operator has on the market. Both power and gas are associated with a point of origin (which may or may not be generation) and a point of destination (which may or may not be consumption). For the movement between those two, it is the grid operator who grants the capacity to transport power or gas through the network. In parallel, once the Operators have a physical position, they have to confirm movements of power or gas through a process called nomination.

Consequently, the communication between Operators and the TSO is a neuralgic point in the scheduling chain.

Therefore, scheduling responds to the need to optimize the physical positions of the Operators and it is closely linked to the energy trading and risk management (ETRM) systems available to them. Such systems collect all the positions of the Operator in question and contain their detailed information as well (date, quantity, price, counterparty, etc.). In addition, the scheduling system has to be connected to the ETRM system in order for the logistics of the physical positions to be managed correctly between the Operator and the TSO.

At this point, it must be clarified that the systems managing the positions of energy Operators (power and gas) can be classified according to the following criteria:

ETRM systems
Those who focus on collecting the position of the Operator in detail and closing this position in the market. This type of system may have some scheduling and communication capabilities, either through its standard functionality or other system extensions.

Specialized systems in logistics
These systems solely focus on the management of the Operator's physical positions in the end-to-end process. That is, from the management of demand to contracting capacity, nomination, and managing its daily and consolidated balance sheet. In addition, these systems have the ability to communicate with the TSO (and DSO) in a way that covers the entire management process of the physical positions between the Operator and the TSO.

Communication systems
These systems cover the need to communicate the power or gas movements of the Operator with the TSO, but do not have the capacity to manage the portfolio or store data on the positions like an ETRM does.

The software solutions covered in this study will fall into one of the categories above.

B Approach and objectives

This study aims to investigate products that offer a scheduling solution for the European power and gas markets.

During this study, a number of scheduling and nomination system vendors were approached with a questionnaire and asked to provide specific product information, which can be categorized as follows:
• System solution
• Functionalities
• Other (non-functional) requirements
• Implementation effort
• Costs
• Flexibility and maintenance
• Operating Model and Additional Services
• References and documentation

The questionnaire served as the basis for classifying the software applications enclosed in this study, and for detailing the coverage offered by each of them in terms of the different commodities (gas and power) and markets in which they operate.

Taking all of the above into consideration, please be aware that the purpose of this study is to:
• Present an overview of the power and gas scheduling systems on the European market
• Present an unbiased assessment of the different scheduling solutions within the study
• Present the different system characteristics and functionalities relevant to the industry

The purpose of this study is not to:
• Present an exhaustive list of all scheduling providers and systems on the market
• Present a quantitative ranking of the different survey participants or their systems
• Present the reader with an isolated and simplified decision-making process
• Replace a software selection process with the information presented here

Finally, the individual decision which would favor one software solution over the others can only be made after careful analysis and consideration of the client's individual technical requirements, regulatory directives and financial viability.

C Challenges in scheduling

Due to the constant arrival of new regulations and new technologies, the world of energy trading and its distribution is continually changing.

The following chapter describes some of the trends and challenges that currently affect the business and are thus a driver of change when assessing scheduling applications.

Ever-changing regulatory requirements
Changing regulatory requirements also have an impact on schedule and nomination management and therefore also on IT solutions. The relevant regulations are usually adapted in cycles and contain changes such as new data formats and requirements for supplier change management, or the shift to more responsibility and interfaces to the DSO (master data management of network resources, etc.).

In order to quickly adapt to new regulatory requirements, a flexible design of the solution is indispensable and is becoming increasingly important (see "Target Operating Model and Cloud").

Short-term trading (STT)

Energy demand was traditionally handled by the day-ahead market. The energy transition and nuclear phase-out changed European trading dynamics by developing the intraday market. This was a response to managing the production of renewable energy, where forecasts are difficult to establish and often less reliable. As intraday markets evolved, so did the necessity to trade as closely as possible to the time of delivery, which is known as short-term trading. Besides intraday auctions, exchanges such as EPEX offer continuous intraday trading throughout Europe, available 24/7. Furthermore, the arrival of automatic trading solutions enables utility companies to execute unmanned trading on an uninterrupted 24/7 basis as well.

EPEX currently offers intraday products, which are tradeable up to 0 minutes before delivery. As short-term trading converges to tradeable products up to "immediately before delivery" (i.e., real-time trading), scheduling systems are challenged to adapt to this trend.

Deal volume and efficiency

With the emergence of intraday markets and high trading volumes in general, there is a constant need to improve the quality of the data being processed. Scheduling systems must keep pace with aspects such as regulatory controls and reporting, monitoring, and risk management. Although some of these subjects may be inherent to the ETRM system, the scheduling solution is a pivotal part of the whole operation.

Scheduling solutions must also evolve in a way that assists in increasing the profitability and operational efficiency of their users.

Real-time positioning and scheduling

In order to assure that gate closing times are met and penalties due to possible imbalances are avoided, real-time interaction between traders and schedulers becomes necessary. Thus, the scheduling functionality must be fully integrated with the trading system in place.

Similarly, when a scheduler executes a deal for balancing purposes, this has to be communicated to the different branches of the organization including the middle office (which must monitor the financial positions and limits) and the back office (which must punctually process payments, etc.) on a real-time basis.

Further, schedulers should have the ability to manage changes to the original schedules sent out to the TSO in real-time. This becomes especially relevant in high trading volume environments (enabled by automated trading).

Automated trading and artificial intelligence

Managing demand and trading uninterruptedly and as closely as possible to delivery has created a degree of operational complexity which can no longer be handled efficiently by humans. This has resulted in the emergence of automated trading technologies (e.g., algorithmic trading, aka algo-trading), enabled by the use of artificial intelligence.

Another reason for embracing this new technology is cost efficiency, as traders are being replaced with this tool.

The challenge for the scheduling software is to simultaneously evolve alongside automated trading technology, that is, to support nomination on a continuous or even real-time basis, while being able to communicate with TSOs in different regions using different data exchange protocols.

Target Operating Model and Cloud

Driven by the need to reduce costs and to facilitate the outsourcing of business processes, there is an ongoing shift from conventional on-premises infrastructures to cloud technologies. Here, cost optimization is enabled through server scalability (ramping systems up and down as needed, thus eliminating operational inefficiencies), and by taking advantage of consumption-based pricing models offered by cloud providers.

Energy companies are currently also implementing cloud solutions in order to reduce the time-to-market for new products, reduce testing cycles, and to share a common platform between different businesses in different geographical regions.

With some of the most important ETRM vendors in the market already offering partial or complete cloud platforms, scheduling solutions have yet to adapt to this trend.

Security

With the increasing use of cloud computing (public cloud in particular), security is increasingly becoming a concern. The safe storage and flow of sensitive data must thus be assured, not only on the Operators' side but on that of the TSOs and DSOs as well.

System architecture should not focus only on encryption and firewall technologies, it must also include frameworks that incorporate dynamic controls (deterrent, preventive, detective and corrective controls) and compliance measures (data recovery, audit trails).

Customizability

The above topics and trends are not of concern only to the providers of timetable and nomination solutions, but above all to their customers. They increasingly want to write their code in-house and, for example, create and customize time series.

D System vendors

The following is a brief description of the vendors who took part in this study, in alphabetical order.

Aktif Technology
The energy industry is the commercial focus of the AKTIF company group, which was founded in 1997. The company is known as a software specialist for business processes in the energy industry. Products and services for the energy market and for other sectors, such as medicine, agriculture, industry and trade, are offered to customers.
Source: https://aktif.energy/en/about-us/

Brady Technologies
Brady Technologies enables energy market participants to profit in new ways from the green energy transition, supporting Environmental, Social & Governance (ESG) requirements. We provide software solutions to support above market returns, resilient risk management and scheduling in volatile markets.

Our customers include globally renowned organisations from utilities, independent power producers, renewable asset developers, energy trading firms, oil & gas companies, state power grid operators and commodity trading firms. Whether engaged financial or physical trading, on major exchanges or over-the-counter, we help market participants to realise revenue growth across the trading life cycle.

The software suite includes: PowerDesk SaaS, PowerDesk Scheduler, PowerDesk Data Manager, Igloo ETRM and CRisk.
Source: www.bradyplc.com

DIspo Gas

dispoGas is a SaaS platform that streamlines natural gas nomination handling in Europe. The platform simplifies the message exchange process for customers with the relevant TSOs and Market Area Coordinators.

Built for the cloud, dispoGas is accessible through web browsers. You can easily provide the quantities for nominations, and dispoGas will send the right information to the market partners in the appropriate format and via encrypted AS2/AS4 channels.

dispoGas is designed to be user-friendly, giving a clear overview of the current nomination status and the ability to automate the nomination process. If any action is required, dispoGas will actively notify the customer via email, text message or other communication channels.
Source: https://www.dispogas.com/solution/

e·Opt Solutions OHG

Companies have needs that mainstream ETRM Systems fail to meet. Key business processes include working off spreadsheets, with little participations to model imperfections, and no risk oversight.

E·Opt Solutions offers PriceHub, a business-led technology solution that helps companies transform their operations end-to-end. The aim is to help energy companies of all sizes make their processes more efficient and improve their ROI.
Source: https://www.eopt.org/home.php

EnergyOne Limited

Energy One has been listed on the Australian Stock Exchange since 2007 and is a global supplier of software products and services to wholesale energy, environmental and carbon trading markets. Thanks to more than 15 years of experience in this field, the Energy One Group has a successful track record of providing sophisticated, practical solutions and services to Australasian and European companies operating in the fast-paced 24/7 wholesale energy marketplace.
Source: https://www.energyone.com/about-energy-one/

GMSL

GMSL provides the European energy industry with comprehensive 24-hour dispatching operations and portfolio management software – applications and services essential for monitoring and evaluating gas markets. With more than 25 years' experience, GMSL works with over 150 gas and power market participants across all actively-traded European grids, helping to streamline business processes and manage energy-related data.
Source: www.gmsl.co.uk

Globalsyde Systemas S.L.

Globalsyde benefits from their consultants' experience in commercial management and business operations in different energy trading companies. Globalsyde provides a cloud service software platform (SaaS) accessed on a monthly subscription basis. The aim is to streamline and automate the processes involved in energy operations and marketing. The commercial back-office management module "Argentia", a module for logistics and balance sheet management, and an additional module ("Pioneer") for logistics management and gas balancing, are included.
Source: https://globalsyde.com/en/about-us/

Hitachi Energy Ltd (Hitachi ABB Power Grids)

Companies in the utility industry and infrastructure sectors with innovative solutions and services across the value chain are among the customers of Hitachi Energy.

Source: https://www.hitachienergy.com/about-us/who-we-are

KISTERS

KISTERS AG has employees in Europe, the US, Asia and Australia, and has its headquarters in Aachen, Germany.

KISTERS AG provides software solutions to over 750 companies in the energy sector, as well as in the field of resource management for water and air. Its portfolio includes energy data and portfolio management, smart metering, forecasting, virtual power plants, optimization, smart grids, and asset management of plants and grids.

Source: energie.kisters.de

PSI

PSI is a leading software supplier for Europe's energy and utilities industry. The company provides highly flexible and reliable standard products and services that are customized to their clients' needs, covering a wide range of energy industry processes, from energy production and grid operations to trading and energy sales. The high degree of standardization of the product modules enables both customers and partners to realize a large part of customization on their own, thereby significantly reducing the system's lifecycle cost. PSI was established in 1969 and employs more than 2,200 people worldwide, with its headquarters in Berlin, Germany.

source: www.psi.de

Soptim AG

Soptim AG focuses on understanding the energy industry, especially electricity projects in critical infrastructures, from many different angles. Soptim uses technologies and methods to meet the high demands of the industry.

Source: https://www.soptim.de/en/company/

Trayport Limited

Founded in 1993, Trayport is the primary network and data platform for European wholesale energy markets. Our network and solutions provide choice and support the growth of our trader, broker and exchange clients and trading markets. Our solutions are used worldwide in multiple asset classes across OTC and cleared markets.

Trayport Limited is a wholly-owned subsidiary of TMX Group Limited (TMX Group).

Source: https://www.trayport.com/company/

Volue ASA

Volue ASA aims to optimize energy production, trading, distribution and consumption, as well as infrastructure and construction projects, with market-leading products. Their mission is to realize a cleaner and more profitable future for over 2,200 customers and global society.

Source: https://www.volue.com/who-we-are

E System characteristics and functionalities

A set of standardized criteria was established in order to be able to compare the different system providers. As previously mentioned, this requirement catalogue was sent to the survey participants in the form of a questionnaire.

Using this methodology, we were able to identify the degree to which the different system solutions meet these criteria.

There is a brief description of the different sections covered in the study below:

System solution
In this section, we evaluate the specifics of the system solution. Which commodities are supported by the system? Is the system an in-house development? Is it a standalone application or an add-on module to an existing ETRM? Is the system available as a cloud-based solution?

We also enquired about standard interfaces available for the solution and if any third-party software is involved.

Functionalities
In this section, we evaluate specific system functionalities relevant to scheduling.

Basic features
Are there any restrictions on modelling trading hubs, shipper codes, balancing groups (etc.) across European countries?

Aggregation
Can the system automatically balance the different market zones? Can the system handle unit conversion when aggregating quantities? Can the data be aggregated in different granularities and by different hierarchies? We also elaborate on the system's capacity to handle different time zones and summer/winter time changes.

Nomination

We enquired about the capability to support the different nomination formats as applied to different European countries. Which communication standards are available for gas, which for power? Can the system automatically match IN/OUT files? Is intraday nomination available? Furthermore, we evaluate the different formats supported for transfer files, and the means of communication (to the TSO) that are available.

Monitoring

This section deals with the position management and monitoring function. Which position management functionalities are available? Is it possible to monitor available capacities?

Short-Term Trading and Algorithmic Trading

In this part we address the topic of an included algo trading solution. Is an algo/auto-trading solution included? Are there pre-defined strategies that can be parametrized by the customer? Can the customer develop strategies on their own?

Other (non-functional) requirements

This section deals with requirements that are not directly related to the scheduling functionality. For instance, how does the system handle user profiles and privileges? How user-friendly are the GUIs? It also looks at requirements related to notifications, for instance: does the system recognize when connectivity is lost and is a notification sent out? Can it be identified which users are logged-in and can their activity be tracked? Which reports are available?

Security-related subjects are also covered in this section: is the data regularly saved as a backup? Is saved data encrypted? Is transferred data encrypted?

Implementation effort

This section covers the time effort required to implement the solution. The scope and execution of training is also taken into account.

Costs

This section covers the different costs involved establishing the system solution (e.g., implementation, licenses, maintenance, training, etc.).

Flexibility and maintenance

This section covers how flexible the system is in regard to technical and regulatory changes. Additionally, we analyze how easy it is to upgrade the system. System support is also addressed.

Operating Model and Additional Services

In this section, we cover those additional services that are offered together with the system solution, as well as the operating model, such as SaaS, PaaS, BPO etc. Questions regarding partnerships, updates and release schedules are also included.

References and documentation

How many existing clients are known and who has already implemented the system solution successfully? To what degree is the system solution documented; is a standard documentation package delivered with the system?

F   Summary and conclusion

Summary

System solution

All surveyed vendors offer an in-house solution. 14 out of the 15 applications were developed as standalone solutions but can either be connected to an ETRM system as an add-on or utilized through ETRM interfaces. In addition, various peripheral functions are offered for standalone solutions, such as algo-trading systems, asset management or gas storage management. Some solutions are still offered as desktop (e.g., as Java) applications. Many vendors, however, have already made their application cloud-based via providers such as AWS or Azure.

Functionalities
Basic features
The solutions vary in terms of the countries the system can model regarding power and gas scheduling. Availability ranges from Germany-only to "all countries". All solutions except one support the modelling of EIC Codes and are able to simulate TSOs within European countries with just three exceptions.

Aggregation

Only three solutions are not able to balance different market zones automatically but each of the solutions support all relevant European time zones. In terms of individual calendars (e.g., (bank) holidays, country-specific public holidays etc.) the capabilities vary but almost all support the summer/winter time shift. A complete history and versioning of values are usually offered and the data granularity ranges from 15 minutes to yearly. The systems usually do not offer the support of formulas to model custom restrictions.

In terms of gas specifics, data aggregation by the quality of gas (L-Gas/H-Gas) is usually possible, if the solution covers the relevant countries. Furthermore, only one-third of the systems are not capable of transferring energy automatically between connected hubs.

Nomination

All of the systems are capable of automatically matching (IN/OUT) EDI files. However, four solutions are not capable of calculating balancing energy. All vendors offer a broad variety of formats for transferring files (MSCONS, CSV etc.) and communication channels to the TSO (email, AS4, AS2 etc.), but also differ in the available formats and channels. All systems support lifecycle management of certificates to sign and encrypt messages. Overall, the scope of the vendors varies a great deal in terms of the countries available to nominate (e.g., from only one country to almost all relevant countries).

Monitoring

In terms of monitoring, it is for all systems except three possible to change the view of the nomination data between hourly, half-hourly and quarter-hourly in the position management function. For those three limited views (e.g., daily only) apply. For the specifics of gas, the position management functions of 12 out of 15 systems are capable of monitoring available capacities.

Short-Term Trading and Algorithmic Trading
The short-term trading and algorithmic trading capacities of the solutions greatly vary. Six systems offer these while the other systems offer interfaces to common short-term trading or algorithmic trading solutions.

Other (non-functional) requirements
In the area of non-functional requirements, the picture is largely homogeneous. For example, all systems can open several windows at the same time, the user is informed if the connection is interrupted and the systems try to restore all automatic connections. The systems additionally record who was logged in and when. The main differences are in the customizability of the GUI and the standardized reports available.

Implementation effort

This chapter summarizes the implementation process of each solution. 13 Vendors offer their clients a demo version of their solution. For three of those a contract has to be signed and one other system offers a paid demo. The implementation time varies and ranges from a few weeks to several months. Implementation is usually carried out via a waterfall or using an agile approach.

All vendors offer different trainings. Some offer these for all users, others only for "core users" or as web-based training. The interface design is usually based on REST API. Only four vendors do not offer standard interfaces for specific users. Implementation is conducted via the service provider or in cooperation with other implementation service providers.

Costs

This section deals with the costs of the solutions involved. The applications are offered by the vendors either as SaaS subscription models or with license fees. These are paid per module, market or user, with support fees usually included. For some vendors, a third-party license fee is required (e.g., for ORACLE NUP). The implementation costs vary depending on the needs of the customer.

Training costs are often included in the SaaS or implementation fees. If not, they are charged on a daily basis. Additional costs for software updates or similar matters are usually not charged. Only individual customer requests, e.g., system hosting or 24h service, require an extra fee to be paid.

Flexibility and maintenance

This chapter deals with the flexibility of the solution from an IT perspective. Regulatory updates are usually carried out independently and regularly by the providers as part of the support and maintenance service. Upgrades usually must be requested by the customer before they can be implemented.

Independent adaptation and extension of the program by the customer is usually not possible. Although extended configurations can be made, changing the code is usually prohibited.

The creation, calculation and prediction of individual time series is enabled by every solution.

Customer reports can be created either within the user interface or after exporting the data to third-party programs. Support is offered for all solutions via different communication channels.

Operating Model and Additional Services

This chapter deals with the operating model of the solutions and additional services offered that are not covered in the preceding chapters.

All vendors offer a cloud-based SaaS solution for their application.

The publication of new releases is highly varied and ranges from bi-weekly releases to one release per year. In most cases, the providers rely on a real-time application for their solution.

As a supplement to the core product, all providers offer additional services such as price management. Twelve vendors also maintain partnerships with other companies to offer additional services.

References and documentation

This chapter deals with references, audit-compliance-related certificates and the documentation of the solution.

References can be observed in the detailed results; the target companies are usually (large) European utilities.

Several certifications (e.g., with regards to IT Security) can be observed. All solutions are delivered including various manuals. These range from simple PDF manuals to online tutorials and descriptions in video format.

Conclusion

In recent years, political resolutions have induced a series of changes that affect utility companies and the IT solutions they use to support their processes. One clear example is the increased dependency on renewable energies that has led to the rise of intraday markets, which in turn has led to the creation of new technologies, such as automated trade technology.

As we have shown in this study, the basic requirements of the scheduling functionality are covered by all almost all vendors. The main differentiating factors between them thus lie in the number of markets they currently serve out of the box and in the extent of "special" functionalities (e.g., integrated short-term-trading or algo trading solutions).

Many of the challenges that energy markets face today are already a prerequisite of all scheduling solutions presented. Supporting intraday nomination and being able to operate in the cloud are examples of this.

This document is only a summary. For the detailed results and the answers given by the vendors please see https://pages.pwc.de/scheduling-solutions-and-gas-nomination

G Our service offering

As the largest audit and consultancy firm for utility companies in Germany, PwC possesses the knowledge and expertise needed to help its clients in all areas relevant to the energy industry – from designing the IT landscape to integrating marketing and procurement processes; from defining risk management to the financial reporting-oriented conception of segmentation and safeguarding strategies.

We constantly leverage this expertise in order to accompany our clients in a variety of projects focused on the selection and implementation of system solutions.

In addition, we offer them access to industry references and assist them in the timely identification of potential obstacles.

In order to successfully select and implement a software solution in your organization, we will advise you using our proprietary methodology, which includes:
- Designing the IT strategy (general direction with respect to the IT systems and process support)
- Conceptual support in the integration of existing systems, software expertise and implementation support (system- and process-oriented)
- Assessment and quality assurance throughout the project, as well as certification
- Software selection (creating a criteria catalogue, supporting the decision-making process etc.)
- Drafting processes and specifications
- Project management and quality assurance with regards to software implementation

As a reliable partner, we will offer you services tailored to your specific needs. This will ensure that the necessary functionalities can be efficiently integrated in your organization's processes and IT landscape.

Contacts

Ingo Passenberg
Director
Mobile: +49 171 7618390
ingo.passenberg@pwc.com

Frederik Brückner
Senior Associate
Mobile: +49 151 29905008
frederik.brueckner@pwc.com

About us

Our clients face diverse challenges, strive to put new ideas into practice and seek expert advice. They turn to us for comprehensive support and practical solutions that deliver maximum value. Whether for a global player, a family business or a public institution, we leverage all of our assets: experience, industry knowledge, high standards of quality, commitment to innovation and the resources of our expert network in 151 countries. Building a trusting and cooperative relationship with our clients is particularly important to us – the better we know and understand our clients' needs, the more effectively we can support them.

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