



# getting the data right.\*

A survey of information technology solutions to meet EU Emissions Trading Scheme requirements

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# Foreword

The financial results a company delivers in today's economy are no longer the only defining measure of strength. A company's approach to corporate social responsibility and environmental sustainability is gaining ground.

The launch of the European Emissions Trading Scheme (EU ETS) in 2005 requires companies to monitor and report their emissions at the end of each compliance year. The independent verification of each installation's annual emissions is one of the key foundations of the market. It is essential, therefore, that the systems in place generate reliable and verifiable emission data.

Many companies are beginning to recognize that emissions trading can translate into business opportunities. Simple compliance is no longer good enough. The market for environmental and emissions monitoring software is growing. A few European but also US-based software vendors offer the technological response that is required to reduce and monitor emissions, and to manage and report on emissions performance.

What makes this market for emissions monitoring so attractive? What is the reason that more and more companies are deciding to use automated systems for their emissions monitoring and reporting? And what functionalities do these solution providers really offer? These are some of the questions that we seek to answer in this report.

Acting as a verifier for more than 250 companies in Europe, PricewaterhouseCoopers has assessed many data management systems used by companies to monitor and report their emission data. The use of spreadsheets is still widespread in many companies. But we are detecting a growing interest among companies in professionalizing their environmental data management. Assuring reliable data against the lowest possible cost is the main objective.

Our survey, conducted in the autumn of 2006, aims at painting a comprehensive picture of the variety of software solutions and the companies behind them. We hope that the results of this survey will help companies to gain a better understanding of the solutions that are available.

Hans Schoolderman

Director Sustainability & Climate Change Services  
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# 1. GHG Emissions Monitoring: Simple compliance is no longer good enough

## Introduction

In the autumn of 2006, PricewaterhouseCoopers conducted a survey to investigate IT solutions for emissions monitoring and reporting. The objective of the IT survey was to present a high-level analysis and comparison of software solutions for emissions monitoring relevant to installations under the EU ETS. The aim is to provide companies with a tool for kicking off their software selection procedure. This survey does not include an opinion on the software.

The following IT vendors responded to our invitation to participate in our survey:-

- a Pavilion
- b ESP
- c Promasys
- d EPM
- e CRS
- f TechniData

All vendors provided us with details on their solution. This information was reviewed and the demo software was presented to us. The participants completed a questionnaire consisting of a list of potential functionalities. Based on the information provided a draft report was prepared, which was validated by the solution providers.

## Why use IT for emissions monitoring and reporting?

Using software for emissions monitoring and reporting reduces costs, facilitates verification, enhances transparency and makes internal control and reporting easier, more accurate and timely.

While almost all companies already use IT, the use of IT for emissions trading is still in its infancy. Many companies use simple spreadsheets for emissions calculations. Others use more and more advanced tools, often in combination. This includes complex spreadsheets, ERP systems, process control systems and other systems. The mix of tools depends on the companies' scale, number of locations and emission sources, and complexity. But the relevance of knowing the (actual) status of emissions in the decision-making processes, including production and financial control, also plays an important role.

A recent survey by PwC for the European Commission indicated at least 90% of the EU installations use some form of software already for CO<sub>2</sub> emissions monitoring. But only 25% of the companies use special monitoring and reporting software, in many cases combined with spreadsheets. Half of this 25% developed their software in-house. In most other cases spreadsheets (MS Excel)

are used for calculation and reporting. The average time for monitoring and reporting CO<sub>2</sub> emissions in the EU was estimated well above 40 man-days per installation last year. We expect that this number will drop by at least 30% next year, but it could be even lower if the right software solutions are used.

Companies use software for the acquisition of data, for calculations of emissions, for internal quality control and quality assurance of both data and the metering and measurement system, for internal reporting, trading, cost price calculations and other decision-making processes, and of course for filing reports to the competent authorities and financial accounting.

On many occasions, this has led to a "labyrinth" of systems, with no clear dashboard overseeing it all. New software, integrating systems and converging data in clear, formatted views, is needed to create transparency and control. We expect that spreadsheets will be replaced in many companies by advanced software. Spreadsheets are considered high-risk when it comes to data integrity, security, verifiability, maintainability (version control) and transparency.

## Competent authorities are pro-active in automating emissions data reporting

A number of European competent authorities provide standard templates to companies for reporting to themselves and to verifiers. Occasionally, this is even integrated into an automated workflow system, such as in Austria, Finland and Germany. Currently, a group of EU Member States are involved in a (partially joint) project to develop such a system as well. In the end, this will lead to a situation where companies will be able to submit their annual emissions report to different competent authorities and verifiers in the format they require at the press of a button, while, at the same time, they can still use formats of their own. This will reduce time and costs significantly. Mostly large and complex enterprises and multinationals will benefit. The only condition is that the company's software should allow them to tap in to the new opportunities.

But the developments will not end here. E-PRTR<sup>1</sup> reporting, sustainability reporting and other initiatives are demanding data from companies as well. As the source data are usually the same, reporting requirements and their verification systems will be integrated or at least connected. Even if they are not, companies will converge and professionalize their internal reporting systems for reasons of cost effectiveness, reliability of reporting and timeliness.

<sup>1</sup> European Pollutant Release Transfer Register: E-PRTR will cover additional pollutants and industrial activities as well as provide information on waste transfers. The first reporting under E-PRTR is planned for 2009 and will cover 2007 data.

## What are the best solutions?

The software solutions presented in this survey are all capable of supporting reporting under EU ETS. All solutions offer advanced options for more transparent set-up, data security, internal and external reporting and reliable internal control such as data validations. The formats in which data can be reported can easily be made suitable for other reporting requirements, including those for internal reporting.

Specialised software such as the solutions presented in this survey offer opportunities that spreadsheets normally do not provide and come with less risk of error and re-use in later years. They are capable of integrating different source data systems, performing calculations according to the approved Monitoring Plan, consolidating multi-site data and reporting to installation, country or company level (customized reports), and are strong on data quality control. Yet, nearly all the software solutions are flexible to a great extent. They use proven technology, which is usually far more reliable. This will reduce (internal and third-party) verification time and internal time for data acquisition and processing.

Even though the solutions presented here have many advantages, their performance is highly dependent of the effort put into the implementation. These are not plug-and-play solutions. Mostly, more than one other IT system is involved and multiple other data sources. Calculations and internal control measures need to be defined on an installation and company level. This requires careful attention before the solutions can deliver.

## Where do the solutions differ?

The key differences in functionalities relate to graphic representation of reports, the logging and control of actions when deviations are identified, the capability of real-time and online availability of data, and data security such as backups and access control. A number of additional functionalities were identified as well. They include emission prediction systems and connections to trading systems.

Suppliers perhaps differ the most on non-functional requirements. Some of these may have a strong impact on the ultimate satisfaction level of key users. Therefore, selection criteria should also include the performance of the solution providers on non-technical issues such as the implementation and configuration approach, communication and helpdesk functions and release policies. References and information on how the solutions worked out elsewhere will only be relevant to a limited extent, due to the high impact of the effort that was put into the preparations and the complexity and nature of both the installation and the company.

The solutions will be used in small and large, simple and complex companies, in companies with installations in several countries, and under different legislative regimes. Installations as well as requirements change, sometimes more often than companies would like them to. As a consequence, standardization of software and reporting is difficult to realize and requires a flexible and user-friendly approach to the configuration of the system. All solutions are indeed flexible and modular. They differ in the extent to which they allow users to buy do-it-yourself knowledge or remain dependent on the supplier for maintenance.

In our software selection tool, the differences between the solutions are listed in detail (see: PwC's service offering).

## Selecting the right solution

To find out about the right functionalities, a company should first consider all users of the emissions information (internal and external) and all sources of data, and consider what connected data systems and reporting requirements are. This should also include E-PRTR reporting.

The software solutions we have identified and studied share a more or less common blueprint of what they can do. This means that parameterization of the blueprint to the specific needs of a company is the key to success. For this, experience is required in current and future monitoring, reporting and verification of legislative requirements of emissions trading and sustainability reporting. Also, a more in-depth view of differences between the solutions is necessary, to match the complexity of the company with the software and to be able to compare the solutions. The other steps of a typical selection procedure are outlined in the section entitled PwC's service offering.

Based on our survey, we see a number of attention points that are relevant when selecting emissions and reporting software. Key questions are: what do you want to achieve with the system and what should be the scope in terms of legislation (such as EU ETS, GRI-reporting, ISO systems), geography (number of sites, countries, managers) and emissions? Based on the answers to these questions, the business case can be established: implementation and configuration costs, licences, maintenance and change management. The nature and presence of the software supplier may be an issue: the information and knowledge is available within the company, as well as the countries and languages in which support can be provided.

## 2. Solutions for Emissions Monitoring & Reporting

This section provides general information on each software solution, its provider and an analysis of its functionalities.

### General information

The general information includes: contact data, product description, installation & configuration, release policy, support, other products and new developments, integration options, market sectors and references.

### Key functionalities

The monitoring and reporting process includes the acquisition of data, validation and notification of deviations, internal reporting and external reporting.

The analysis of software functionalities includes the key functionalities for these activities as well as the key functionalities related to implementation and configuration, security, logging and audit trail, and additional functionalities.



# Pavilion - Pavilion8 Real-time Environmental Management



## General information

### Introduction

Pavilion Technologies model-based software drives profitability for leading manufacturers such as Cemex, Dyckerhoff AG, Glacial Lakes Energy, NOVA Chemicals, Nestlé, SABIC Europe and TOTAL Petrochemicals. Pavilion's solutions improve production processes to facilitate quick response to market demands, continuous cost reductions, consistent achievement of quality targets, and enhanced environmental quality. To support corporate sustainability and environmental compliance and trading goals, Pavilion provides software solutions to reduce emissions, continuously monitor emissions, and to manage and report on emissions performance. Pavilion has offices in Australia, Belgium, China, New Zealand, Singapore and the US.

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### Product description

Pavilion8 Real-time Environmental Management (REM) is an environmental compliance and reporting application, providing "active compliance" continuously and in real-time. Sophisticated data validation and a secure metadata repository ensure all reporting information is accurate and auditable to meet the most stringent regulations. REM provides a flexible, scalable solution to meet predictive emissions, emissions monitoring and compliance reporting requirements. REM automatically collects, validates and aggregates data from various disparate sources such as process data historians, DCS, LIMS, PLCs, analyzers, etc. REM provides real-time visualization and reporting in a role-based, contextual format with a browser-based user interface. The application supports localized languages of English, Chinese, Danish, French, German, Korean, Portuguese, and Spanish. Other languages, such as Dutch, Norwegian, and Swedish, will be available in the near future. Environmental performance records are stored in a secure metadata warehouse providing a single source of record. This repository supports annotations and audit trails for unsurpassed validation of environmental performance.

### Installation

The Pavilion8 Application Server can run on the same hardware as the control applications or on a separate server connected to multiple controllers. User access is through the browser-based Pavilion8 interface and is available on any client computer that can access the Pavilion8 Application server using http.

A relational database (SQL Server or Oracle) is required for Pavilion8 REM. The application server and client machines can run on standard Windows-based operating systems. For the client machines, Microsoft Internet Explorer (included with operating system) is used.

### Release policy

New releases and updates are made available to customers through the Internet via the company's knowledgebase.net. Pavilion's product roadmap and development process includes strategic guidance and feedback from its Customer Advisory Council.

### Support

Two levels of support are available to customers:

- ValueBase – Software Support and Subscription Services
- ValuePlus – Application Support and Maintenance Services

Support is available 7 days a week and 24 hours a day.

### Other (related) products and new developments

Pavilion8 Software CEM, Pavilion8 Production Performance Management Applications and Pavilion8 Model Predictive Control Applications.

### Integration options

The Pavilion8 software platform is based on a Service-Oriented Architecture enabling integration with ERP applications, data warehouses, historians, distributed control systems and other data sources. Pavilion8 uses open platforms and infrastructure technologies. Pavilion8 is certified "Powered by SAP NetWeaver".

Pavilion's software has been integrated to actively acquire data from Honeywell's PHD, OSI's PI, Aspen's IP 21, SQL Database, Oracle Database, Intellution's Fix IMACS, and Wonderware.

### References

- Texas Commission on Environmental Quality
- US Environmental Protection Agency (EPA)
- Elsta, an energy producer in the Netherlands, delivers steam and electricity to Dow Benelux, as well as electricity to the local grid.

- Pavilion Technologies' environmental solutions are in use by enterprises such as Broin Companies, Chevron Phillips Chemical Company, Dow Chemicals, Equate, Fonterra, Shell, NOVA Chemicals, Sterling Chemicals, and TOTAL Petrochemicals.
- Verifiable and Auditable System of Record
  - Quality assurance of input data reducing reporting errors and rework
  - Minimization of unauthorized manipulation of results for economic gains
  - Single version of the truth
  - Promotion of best practices and consistency assurance
- Scaleable Foundation for Emissions Trading Programs
  - Essential information for buying/selling of emissions credits
  - Scalability to thousands of data sources and calculations
  - Flexibility to make additions or modifications as required by changing regulations

### Unique selling point

Pavilion Technologies claims that the unique selling points of the application are:

- Active Compliance Assurance
  - Real-time assessment of environmental performance
- Proactive implementation of process improvement measures
  - Unparalleled accuracy & timeliness of emission performance

## Implementation and software functionalities

Implementation and setup	When Pavilion8 REM is initially setup for a company, all the report templates, calculations, business rules and monitoring views are tailored to the specific client needs. Roles are established and user accounts are created. The Pavilion8 REM configuration libraries are used for configuration of calculations and reports.
Data acquisition	Pavilion8 REM has been deployed on boilers, turbines, process heaters, crude heaters, olefin furnaces, methanol reformers, incinerators, flares, process relief vents, storage tanks, cooling towers and wastewater discharge. Pavilion8 REM can be deployed on any source of emissions from a plant site. The data is retrieved actively on a real-time basis.
Data validation and deviation reporting	Data is validated based on predefined checks of data and monitor status. Also, flatline detection, range checks and other validations on data are configurable. Automatically determined deviations are noted and the responsible user is prompted via email to input the reason for the deviation and the corrective action taken. Recommended corrective actions can be predefined. The deviations, reasons for the deviations and the corrective actions are auditable in the Deviation and Monitor Downtime reports.
Internal reporting	<p>Although standard reports (e.g. annual reports) are available, users can create their own reports and monitoring views. Monitoring views are presented in the browser-based application and new views can be created easily by the end user. The system has broad possibilities for designing and filtering views. Real-time monitoring of information is provided. Up to the minute and historical CO<sub>2</sub>, other emissions and process data can be presented in various charts and graphs, with user-selectable aggregations and time ranges.</p> <p>The automatic consolidation of information for sources and periods is provided.</p> <p>Forecasting and trends can be presented in views and reports for enhanced and proactive decision-making.</p>
External reporting	<p>Data and calculated performance can be exported straight to Excel from the monitoring views. Reports can be created based on data from within the database of Pavilion8 or imported data. Data, records and reports can be Exported to PDF, Word, CSV and RTF.</p> <p>Crystal Reports (a Business Objects reporting tool) is used for the creation of custom report templates within Pavilion8 REM. The necessary license for Crystal Reports is embedded within Pavilion8 REM.</p>
Security	Users are assigned to roles that segregate the availability of certain features and components of the application. The user must log-in with a password using Microsoft Internet Explorer.
Logging and audit trail	When records are changed, an annotation must be entered and will be logged in association with the changed record(s). Audit reports provide key information about any changes to records.
Additional functionality	Pavilion8 REM can be integrated for closed loop control and energy optimization. Pavilion provides integrated solutions for strategies and decision-making.



## General information

### Introduction

ESP delivers enterprise software solutions that help Fortune-1000 companies manage their corporate sustainability programs, improve compliance assurance, and optimize their emissions trading programs. ESP has been active since 1992. ESP focuses on product development. Local partners sell and implement the ESP software. ESP has approximately 40 employees in Europe and the US.

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### Product description

opsEnvironmental is modularly based, with modules for air, water, waste, chemical inventory, task management, incident management, greenhouse gas management, metrics reporting, and emissions trading. The software provides a user interface in eight languages, and is customizable to meet the regulatory and sustainability needs of companies all over the world and in a diverse group of industries. opsEnvironmental has been available since 1996, with the first European implementations starting in 2002. The solution is available in Dutch, English, French, German, Italian, Portuguese, Russian, Spanish and Norwegian.

### Installation

opsEnvironmental uses client-based software for report development and general system configuration. The client connects to a database server, which supports Oracle or Microsoft SQL Server. Most daily users of the system will be using the Web interface to enter data, track tasks and run reports. Using the web requires a web server. Web client users require Internet Explorer version 5.5 and above.

### Release policy

The system is maintained by three service packs/year for minor upgrades; every 12-18 months there is a major upgrade in the form of a new release. Feedback is provided through a user group voting process for enhancements.

### Support

Training of end users, "power users", and/or administrators is provided in either a classroom setting or in 1X1 on-the-job training sessions. Training includes telephone or in-person follow-up sessions and support.

A European Support Centre opened its doors in 2006. Response to customer inquiries is provided within 4 business hours. Support is given 7 days a week 24 hours a day.

### Other (related) products and new developments

ESP's product vision is to become the leading provider of enterprise sustainability management solutions. An enterprise sustainability management solution would provide the management tools and multi-dimensional accountability that will enable companies to achieve superior levels of sustainability performance. Product development underway at ESP is fully aligned with this vision.

### Integration options

opsEnvironmental has been integrated with many other systems including Pi, PHD, SAP, JDEdwards, Maximo, IP-21, as well as PLCs, SCADA systems, portals, websites, etc. The software has also been integrated with ERPs such as SAP. ESP is currently in the process of certifying its product integration with SAP through Netweaver.

### References

ESP software is deployed in the oil & gas, power, chemical, pharmaceutical, automotive, pulp & paper, heavy manufacturing, and other industries. Customers include Arcelor, Shell, Eni, and General Motors.

### Unique selling point

ESP claims that their unique selling point is as follows: "ESP enterprise software solutions are focused on global companies and at the same time we have integrated special European requirements, such as different date and number formats, UOMs (units of measure) and local languages. On top of this, ESP solutions have the integrated capability of combining the operational view on data in parallel with the financial measurements of the EU ETS and under the umbrella of overall sustainability metrics."

## Implementation and software functionalities

Implementation and setup	Analyses and creation of reports and validation of data are key implementation issues. The setup is initially performed in a test environment. Setup is done from a central location (for instance head quarters). ESP applies its own implementation methodology (Assess, Design, Develop, Deploy, Train and Support). The first setup is done in the client environment. Configuration is simplified by copying emission formulas from the library.
Data acquisition	The software allows tracking of any emissions, and is flexible enough to allow new emissions to be added to the configuration as the need arises. Data is retrieved on a real-time basis.
Data validation and deviation reporting	<p>When data is imported validation of the data will take place. Configured limits and unit of measures are checked. Based on a scheduler, the imported and validated data will be automatically distributed by reports. Deviations will be visible on the reports.</p> <p>Much of the web functionality is centred around compliance management and reporting. Users can be directed to log on to the web application by a “tickler” email message which is sent to remind them to perform one or more compliance tasks. The follow-up of a task (for example documents) can be related to the task.</p>
Internal reporting	<p>Data can be imported in any required time frame (second, minute, hour, day, week, etc.) and can be presented on the monitoring screens, in consolidated or detailed form.</p> <p>Automatic generation of reports and tasks can be scheduled by email messages using Windows Services. Emission reports are distributed automatically by email and are visible within the web application.</p> <p>Forecasting reports are available. The user can view the predicted shortage or overcapacity of emissions.</p>
External reporting	<p>Reports can be exported to PDF, Excel and XML.</p> <p>opsEnvironmental reports are created within Crystal reports. The database can also be connected to other reporting tools. A license for Crystal reports is required.</p>
Security	The database and client for configuration can only be reached by the administrator with a password. Users can log on to the web application using a password.
Logging and audit trail	All changes on the configuration will be logged and can be presented in reports. Manual changes on data will be logged. Manual change of data will require validation of a dedicated manager. A workflow can be created for validation of data changes. A reason code can be set up as mandatory. Standard reports on change logs are available.
Additional functionality	Besides offering an environmental and sustainability management product, ESP also delivers an emissions trading product called ecoAsset Manager, which helps companies manage both the compliance and financial aspects of emissions trading programs such as EU ETS.

## General information

### Introduction

Promasys Upbound Int. B.V. develops and implements health, safety, environment and quality (HSE-Q) monitoring systems on a global scale. Its customers are primarily multinationals in oil and gas exploration, the (petro-)chemical industry, and utilities. Promasys consultants have extensive international experience in setting up certified monitoring systems, meeting ISO/EMAS/emission trading standards.

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### Product description

Promasys offers a software package to set up, manage and operate a structured HSE-Q monitoring system. Field data is entered or imported in local databases. Data validation and further processing is handled locally. The Promasys package can be set up on a stand-alone basis or server-based at any level in an organization. This allows for high scalability and flexibility during implementation. The software is available in many languages. Promasys Suite has been available since 1997.

### Installation and configuration

The Promasys Software Suite (version 3) is a Microsoft .NET application. Therefore, the software can be installed locally on any PC, or distributed via Active Directory. The software is independent on the operating platform: the underlying Microsoft.NET framework will automatically install if required. The Promasys database is based on Microsoft Access. The software can also be connected to Oracle, SQL-Server, etc. For larger organizations, Promasys recommends a Citrix platform, which also allows end user access through the Internet.

### Release policy

The Promasys Annual Software License Agreement includes IT-related support, and the right to receive and install new software releases. Updates to new software releases are not mandatory. Databases from previous Promasys software releases are automatically converted (upward compatibility). New releases occur several times per year.

### Support

Promasys offers various levels of training:

- 'Configurator' training – 5-day training on the defining (parts of) a monitoring system.
- 'Owner' training – 2-day training on reporting requirements.
- 'End user' training – This training is always customer-specific: end users either enter data on pre-defined forms, or generate pre-defined reports.

For IT-related issues, a 24/7 helpdesk is available at no extra cost.

### Other (related) products and new developments

- Usually, emission monitoring is associated with continuous emissions. However, a significant percentage of emissions are associated with incidental occurrences (e.g. shut-down, start-up, blowing of safety valve, purging of equipment, etc.). Therefore, the Promasys software suite includes an incident registration module, which is integrated with the monitoring of continuous processes. This module covers incidental occurrences, including safety incidents, environmental incidents, etc.
- Promasys CAR is an integrated module which takes care of corrective actions requests and follow-up. Corrective actions can arise from e.g. permit violations, incidents, audits, etc.

### Integration options

If data is already available in some electronic form, this can be imported. Data import from remote sources always requires some customer-specific software. Templates and examples are available. Once the data structure in the source database is clear, a dedicated import module can usually be prepared in 2 to 3 days. Promasys databases are accessible to other software applications.

### References

Promasys customers are multinationals in the chemical industry, oil and gas exploration, production, and power utilities. Promasys is currently active in the Netherlands, India, Pakistan, Indonesia, Kazakhstan, Bangladesh, and the United Kingdom. Customer contacts are available upon request. Worldwide, 15 companies are using the software.

### Unique selling point

Promasys claims that their unique selling point is that the Promasys Software Suite is scalable. A customer can choose to implement a single source and scale up to more at own speed. Other reported unique selling points are flexibility, transparency and compatibility with ISO standards.

## Implementation and software functionalities

Implementation and setup	<p>The implementation methodology focuses on a thorough preparation before setup. Promasys sets up the system locally. Preparation, configuration and training are the keys to a successful implementation. Part of the setup phase is defining attributes for reports, components, tags and formulas. Documentation of the setup can be entered within the system for each configuration. Several hundreds of chemical components have been pre-defined (including their CAS numbers).</p> <p>It is recommended to start out in small scale, for example a pilot site and scale up as fast the organization can follow. Promasys can do the setup and the reporting. Alternatively, Promasys can train the customer to perform these tasks. For content-related issues, Promasys offers a coaching role.</p>
Data acquisition	In Promasys, any chemical component can be reported at any emission point, where its emissions can be calculated using any formula (including if-then-else), towards any destination type (air/ water/waste, etc.). Data is retrieved on a daily basis.
Data validation and deviation reporting	Various alarm values and resulting actions can be defined for any imported or manually entered data. Pending the alarm configuration, violation may lead to automatic messages and a variety of responses (accept, deny, replace by a default value, etc.). Accepted alarm violations are registered.
Monitoring and reporting	<p>Promasys Portal is the reporting section of the Promasys Suite. With this module, users can define numerous report scopes, and create reports. Formulas for reporting are present in the reporting tool.</p> <p>Data can be consolidated per week, month, quarter or year. The validated data is stored in the database. When creating a report, the data required will be gathered and the calculation will be refreshed. In this way, the amount of data stored is limited and the database growth is limited.</p>
External reporting	Promasys reports are exported to Microsoft Excel workbooks & SQL Server tools. Business Intelligence applications and data mining are supported.
Security	The web application is password-protected. Users are identified by their Windows Logon ID. Automatic routine for backup and functions such as compression and recovery of data are available within the Promasys Software.
Logging and audit trail	The source of data is kept for auditing purposes.
Additional functionality	Promasys provides two extra modules: an incident registration module and a module for corrective actions registration and follow-up.

## General information

### Introduction

The EPM Foundation focuses on developing a high-quality standard for monitoring and reporting emissions and emission reductions. The methodology is described in the EPM Protocol. This protocol is made freely available through the Internet. The EPM Foundation invites software developers to design software packages for monitoring and reporting that are compliant with the EPM methodology. As a reference and for implementation in pilot projects, the EPM Foundation has developed monitoring and reporting software that complies with the EPM Protocol. The EPM Protocol was established in 2003.

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### Product description

The EPM protocol provides guidelines on how to technically implement monitoring and how to calculate emissions and emission reductions. It also provides means for crosschecking the measured data so reports are verifiable. The protocol describes procedures for securing the dataflow from measuring equipment to the data warehouse, to ensuring the reliability of the registered data.

The Dutch ICT company BowTie Technology provides a complementary demo software package, which simplifies monitoring and reporting while operating under the EPM protocol. The objective is high-quality and cost-efficient monitoring and reporting, through high-level data integrity, shared services and straightforward verification. The web application is available in many languages.

### Installation

The EPM methodology is based on a shared data warehouse which is set up in line with the EPM protocol and standard guidelines for information security. The user provides the data to the central database (pull or push). In the demo software developed by BowTie, standard reports based on the protocol will be available for the users. Installation of a web-based application is required. The web-based application has a view function only.

### Release policy

The release policy is determined by the software provider. With regards to the BowTie demo software, new releases of the software (both system and monitoring/reporting software) are issued when the installation's monitoring protocol has changed or when security upgrades are needed.

### Support

Users of the demo software will receive a 2-hour user training. Support on the application usage is offered during regular working hours, from Monday to Friday.

### Other (related) products and new developments

-

### Integration options

The demo system supports data import/export from basic industry standards including CSV, XML and XLS.

### References

Reference projects under the EPM protocol include industrial CHP, biomass, energy efficiency, and a wind energy project.

### Unique selling point

EPM claims that their unique selling point is the robustness of their monitoring and reporting methodology. EPM provides freely available a generic methodology for data management in environmental monitoring and reporting processes. Software developers are invited to use the methodology as basis for environmental monitoring software. The EPM methodology provides data management based on accountancy and information security standards. The EPM methodology is based on the principles of the Monitoring and Reporting Guidelines for the EU Emissions Trading Scheme (EU ETS). The methodology has been applied under the EU ETS and the Dutch NOx trading scheme and has undergone validation and verification successfully. Shared data warehouse services lower costs for projects and installations that are monitored. The result is high-quality monitoring and reporting, leading to swift and reliable verification. The administrative/transaction costs related to monitoring, reporting, and verification are low.

## Implementation and software functionalities<sup>2</sup>

Implementation and setup	<p>The EPM methodology requires that the project is implemented according to the EPM protocol. The EPM protocol focuses on data management and accountability in order to assure that emissions and emission reductions can be verified straightforwardly and easily approved. The EPM methodology prescribes the use of a central independent data warehouse where activity data are stored. An independent operator of the data warehouse and software manufacturer guarantees that data that are used for reporting of emissions and/or emission reductions, can not be manipulated. The EPM Foundation offers primarily a monitoring and reporting methodology. This methodology is to be supported by software for monitoring and reporting, which should be compliant with the EPM protocol.</p> <p>Implementation and setup will take 2-10 days. This mainly concerns the creation of customer made reports. The effort for putting the application in use is low because the EPM protocol prescribes required reports, formulas and validation of data which are all available in the shared database.</p>
Data acquisition	<p>Data can be retrieved on a daily basis. The application handles all types of emissions which can be monitored technically (and which are traded commodities), including:</p> <ul style="list-style-type: none"> <li>• CO<sub>2</sub></li> <li>• Other greenhouse gases, e.g. CH<sub>4</sub>, N<sub>2</sub>O</li> <li>• SO<sub>2</sub></li> <li>• NO<sub>x</sub></li> </ul>
Data validation and deviation reporting	<p>Validation of data is setup according to the EPM protocol. Data entered into the shared database will be validated and standard reports will show deviations.</p> <p>The operator is shown deviation of values. The deviation is communicated to the exploiter. On instructions of the exploiter changes will be made manually in the database by the operator. Changes are logged in the electronic log book.</p>
Internal reporting	<p>Reports will be created in Excel and can be consolidated to a monthly level. All reports are customer-created and built by the operator. Reports can be viewed within the web application.</p>
External reporting	<p>Excel reporting performed by the operator.</p>
Security	<p>The EPM methodology prescribes storage of the measured and calculated activity data in a central data warehouse where the software application is run in a secure environment. Because of data security constraints (based on the EPM protocol), it is impossible to run the software on a desktop system. The database complies with EU guidelines for monitoring and the Code for Information Security.</p> <p>The web application is password-protected and setup by the operator.</p>
Logging and audit trail	<p>Logging of data sources for tracing purposes is possible.</p>
Additional functionality	<p>-</p>

<sup>2</sup> Applies to the demo software, developed by BowTie technology. Other functionalities may apply to other EPM-based software applications.



## General information

### Introduction

CRS provides software and consulting services to players in emissions markets. As an early entrant supplier, CRS delivers market-leading solutions covering emissions data management, trading (FO, MO, and BO), and project management solutions for the Clean Development Mechanism. CRS also undertakes a large breadth and depth of international private client work, including financial institutions, trading and government agencies. CRS acts as a partner in both strategic and implementation projects. CRS can provide either full or components of emission solutions, including an outsource suite of offerings. CRS provides key software components for the Fortis bank global carbon banking solution provided to its clients.

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### Product description

The Carbon Portfolio and Compliance Platform (CPCP) is compatible with the full spectrum of environmental compliance programmes (EU ETS, IPPC, UKETS, UKCCA, US DOE, NL NOx) and all power and industrial sectors can be managed. The system can also support other environmental products such as Mercury and Water.

CPCP trade management covers the full range of trade processes and provides an integrated solution that can grow with increased registry automation. CPCP is available in English, Italian, French and Spanish. CPCP will be made fully multilingual by beginning 2007. CPCP has been available since 2003.

### Installation and configuration

The CPCP can be hosted on behalf of a client or it can be installed on local client infrastructure. A typical installation is shown below using industry standard approaches based on SQL databases. The system also contains the full company ownership structure allowing the emissions liability to be fully managed including segregation between different legal entities. The client is able to provide emission prediction data, which is mapped against the system data structure using the built-in data import/export engine.

### Release policy

Upgrades are delivered in a co-operative manner based on incremental legislative needs or specific client requirements. Typically, this may be twice a year.

### Support

Basic support is offered from Monday through Friday from 9 a.m. to 5 p.m. 24/7 support is available upon request.

### Other (related) products and new developments

The Carbon Project Administration Management System (CPAMS) is a secured web-based application developed by CRS to manage global portfolios of carbon projects. The CPAMS covers the full value chain from concept through to issuance and trading and provides online real-time tracking, risk management and oversight.

### Integration options

CPCP is based on industrial standard web technologies providing a robust API and web service access for bespoke application integration. CPCP has an underlying ODBC-compliant repository for data integration and reporting. CPCP can be integrated into data management systems such as PI, forecasting platforms, national registries for emission management and compliance surrender, EFETnet Confirmation, trade capture systems and payment systems, Trayport Global Vision.

### References

Currently, CPCP is being utilised within the utilities sector. Among these clients are E.ON UK and Centrica.

### Unique selling point

The unique selling point as defined by CPCP: "CPCP is a fully integrated emission management platform capable of providing clients with a full range of compliance solutions from emission capture through risk management to compliance trading and ultimately surrender.

CPCP is a one-stop solution that uses leading technology delivery to provide clients with a highly flexible solution to meet the continually evolving needs of the environmental markets."

## Implementation and software functionalities

Implementation method and setup	Installation of the web application takes half a day and access is via a client's intranet or for remote sites via the Internet using secure VPN tunnels. The application setup is always client-specific and consists of the practical implementation of the clients monitoring and reporting plan. Each setup is verified against the client monitoring and reporting plan for accuracy. The resulting system contains each specific meter, fuel, sources and registry accounts for each installation. A basic implementation will take 2 weeks. Training of users may take up to a month to be able to maintain the software.
Data acquisition	Data can be retrieved daily for wide range of sources, from CO <sub>2</sub> , SO <sub>2</sub> , NO <sub>x</sub> and particulates.
Data validation and deviation reporting	<p>The system captures data from meters either directly, through data management systems or manually entered. The system reflects the exact monitoring and reporting plan. The data to validate is imported daily. Raw data is validated automatically or validation by manual entry. Data entered electronically will be approved automatically. Calculations on predefined formulas will be stored within the database.</p> <p>Deviations or limit exceeded are reported, email notifications are generated through the system, default mailing lists and addresses are stored in the system. The system can be integrated into Outlook for mailing purposes.</p>
Internal reporting	<p>Monitoring views are defined for user groups. CPCP has standard monitoring views for daily, weekly, monthly and yearly figures. Views can also be presented graphically within the application. Monitoring views are easy to filter, group and ungroup to different levels of aggregation.</p> <p>The system can generate reports and send them via email, or populate the content of the emails.</p> <p>Forecasting reports on usage, expected usage and shortage are available. Reports for asset position and reconciliation status are standard reports within CPCP.</p>
External reporting	Reports can be presented in HTML, PDF, and Excel. Data can be presented to external reporting tools such as Business Object.
Security	Users belong to one or more user groups. Access to sensitive functions is restricted by menu security. The application has a "Menu Item" table, listing all menu items. Each can possess its own security settings. Each user or group who has "Read Security" over the menu item will be able to use it. The application is password-protected.
Logging and audit trail	<p>Available logs are: "Exceptions" that occur, together with an audit trail of date, time, user logged in, and parameters passed to the screen where the error occurred.</p> <p>Manual changes should always be approved by an other user. The system can display online summaries of all data records that have been changed, and these can also be output to PDF format.</p>
Additional functionality	<p>Broadcasting messages for sending announcements to all users within CPCP is an option.</p> <p>Basic standing data for meters can be maintained. Also, documents can be connected to the standing data for meters.</p> <p>CPCP can be integrated into the CRS trading system for all inter-company trading.</p>

## General information

### Introduction

TechniData AG provides solutions in the areas of product, chemical, environmental, and health & safety compliance. Compliance means operating in accordance with regulatory requirements, industry standards and voluntary undertakings. TechniData develops, implements, and operates innovative software solutions that enable companies to shape and optimize the sustainability of their business processes in a legally compliant manner. TechniData has been developing compliance solutions for over 20 years and is a strategic development partner of SAP. The TechniData Group incorporates TechniData America (Delaware/US), TechniData IT-Service GmbH (Markdorf, Germany), TechniData BCS (Siegen, Germany) and Sybit GmbH (Radolfzell, Germany). TechniData has 400 employees.

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### Product description

SAP xEM provides a compliance platform for monitoring and reporting environmental obligations such as emissions caps or plant safety issues. Legal and corporate regulations can be applied to facilities and persons. Actual data are checked against limits or forecast. Upcoming deviations will be identified automatically and assure immediate response. Multiple reporting requirements of external and internal stakeholders are realized on the basis of a single data source. SAP xEM has been available since 2004.

### Installation and configuration

The applications (server and client applications) SAP xEM is a web application based on SAP NetWeaver, no client installations required. The installation procedure is a standard installation of a web application server (SAP WAS 6.40, Java SP9+).

### Release policy

The current release is version 2.0 (June 2005). The next release is planned for October 2007. Updates are produced regularly and are delivered as Service Packs.

### Support

Training: TechniData offers different levels of training sessions for consultants and users (typically 2 times per year and on request).  
Helpdesk: an international helpdesk is available (24/7)  
Service agreements: TechniData offers a special xEM "Service Line Agreement" which includes access to a special client service portal.

### Other (related) products and new developments

TechniData delivers a solution for corporate sustainability reporting: EPM. Emissions data from xEM can be directly integrated into this reporting platform.

### Integration options

SAP xEM supports integration in SAP and non-SAP solutions. Typical integration interfaces are SAP: BAPI, RFC, XI and WebServices which provide a standard interface to non-SAP systems like data historians and online emissions measurements systems.

### References

More than 800 customers in over 20 countries use different TechniData solutions.

xEM customers:

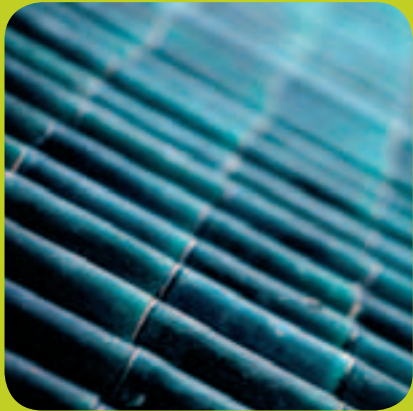
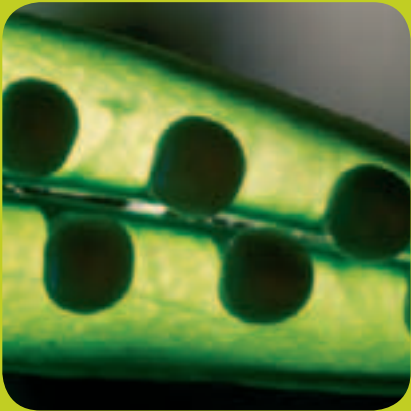
- Oil & Gas: Exxon, Tesoro, ConocoPhillips, Repsol, BG Group
- Utilities: E.ON, Pacificorp, Suncor, ESB, Endesa
- Chemicals: Nova Chemicals, Boehringer
- Metal: Arcelor, Corus, Dubai Aluminium
- HighTech: Intel, Microsoft
- Mining: BHP Billiton, Rio Tinto

### Unique selling point

TechniData has defined two main unique selling points: the flexibility and performance of the xEM reporting engines and the option of full integration into SAP and non-SAP systems.

## Implementation and software functionalities

Implementation method and setup	<p>The system can be adjusted to multinational legal obligations as well as to corporate regulations and rules. To start operation, predefined scenarios for emissions and exceptions can be used and modified to local requirements.</p> <p>A library with predefined formulas is available and can be used to copy formulas to other sources.</p> <p>For the roll-out in multi-site corporations, a pilot setup scenario will be prepared; this scenario will be copied to all sites and can be modified individually. Standard implementation approach: Blue print, Configuration, Testing, Training and Going Live. The basic implementations will require approximately 30-50 man-days.</p>
Data acquisition	<p>All kinds of sources are supported: emissions (including noise, radiation, etc.) into air, water, soil, waste, etc. The data can be retrieved in any required time frame to near real-time.</p>
Data validation and deviation reporting	<p>Data are validated during manual input as well as import, and can be stored in, and retrieved from, Oracle, SQL and other database types.</p> <p>Limits are predefined and deviations as well as limit-exceeding will trigger email notifications and can also be followed up on the exception monitor (within the web application).</p> <p>Manual data changes may require a justification statement (free text field).</p> <p>Activity defining tasks can be coupled to incidents (deviations) and notification of open tasks can be sent by email to responsible users.</p>
Internal reporting	<p>The tasks and exceptions monitors are the two main views on start up screen (the dashboard).</p> <p>Import of data and presentation of data can be presented in any required time frame (hours, days, etc.). Even near real-time data can be processed.</p> <p>The software has standard views for presenting monitoring limits. Standard reports can be customized. Customer-made reports can be produced in Excel or the SAP data warehouse. The input for the monitoring views and can be exported to Excel directly. Graphical views of reports within the web application can be reproduced as well.</p> <p>Actual emission data can be monitored versus (various) forecast scenarios.</p>
External reporting	<p>SAP xEM has three ways of creating reports:</p> <ol style="list-style-type: none"> <li>1. A query tool within the system for data presentation and export to Excel</li> <li>2. A SAP business warehouse to produce analytical reports</li> <li>3. Template-based reports to generate documents in PDF and XML format</li> </ol> <p>Data can also be extracted to other reporting tools. Standard reports are available.</p>
Security	<p>The database and web application login is secured by a password.</p>
Logging and audit trail	<p>Changes and deviations are logged; a reason code is mandatory. Reports on changes and deviations can be generated. The source of the imported data is logged.</p>
Additional functionality	<p>SAP xEM has functionality for management of change (MOC), typical for chemical clients to manage legal compliance of changes in production processes.</p> <p>Tasks and documents can be related to sources (facilities) for maintenance purposes.</p>



## 3. PwC's service offering

### Are you talking to the right people?

The extent to which emissions monitoring software solutions are successful depends largely on the extent to which these solutions contribute to the achievement of business objectives. The selection and implementation of software may have a strategic impact on an organization and its effect should not be underestimated.

PwC offers a number of integrated services to help you to identify and fulfil your needs.

### Defining the business case

On the basis of your IT strategy, any tangible and intangible benefits will be defined. On the basis of our warm relations with software vendors and understanding of the costs of software solutions, the business case will be prepared for decision-making purposes.

### Selection tool

PwC has developed a tool to compare the requirements and performance of all the software solutions. This goes one step further than the functionalities listed in this survey. The main advantage of the tool is that it helps to list your needs in a methodological way, providing insight into the performance of the solutions and your priorities.

### Development

PwC uses a structured approach in defining the exact functionalities for the system. This is done on the basis of process mappings and mappings of reports to be generated. These mappings will be incorporated into existing management systems, such as ISO 14001 where relevant, financial accounting and trading procedures. We will ensure that the procedures and reports are in compliance with the EU and local regulations for monitoring and reporting. This results in a well-documented data-acquisition and handling procedure as well, which is a requirement under the EU's new monitoring and reporting guidelines.

### Implementation

After the selection process, the software vendor will set up the software and train the users in dealing with the system. This will result in operating systems. The added value of PwC is that we ensure that the systems are effective from a business perspective. Our main asset is that we are able to manage the necessary changes in people's behaviour where this is relevant.

### Spreadsheet assurance

The use of spreadsheets creates a high risk of error in the data reporting chain. PwC uses sophisticated tools and methods to appraise the effectiveness, efficiency and reliability of spreadsheets. Assurance provided by PwC can be used in the verification process. For many companies, the finance department has an interest in well-controlled spreadsheets.

### Security

We are able to assess and evaluate the risks related to data security for any type of software solution. In complex situations, when many software solutions seem useable, many verifiers have a difficult time issuing an opinion on data integrity. PwC has the right experience and background to provide this assurance. This includes post-implementation audits.

### Verifications

PwC is a leading independent EU ETS verifier, with a network of climate change professionals in every EU Member State. In 2005, we acted as a verifier to more than 250 companies in different sectors across Europe, applying the rigour and approach used in financial audits to deliver a consistently high standard of work to our clients.

### Our wider credentials

- PwC has a network of more than 150 carbon market specialists across Europe, the Americas and Asia Pacific.
- PwC is a leading independent EU ETS verifier, with a network of accredited verifiers in all EU Member States. We act as verifier for more than 300 companies in different sectors across Europe, applying the rigour and approach used in financial audits to deliver a consistent high standard of work to our clients.
- PwC works with both buyers and sellers of carbon credits in all the main carbon markets, offering a full range of transaction services, including financial advice, tax structuring, auctions and carbon due diligence. We are the leading advisor on CDM and JI projects, with centres of excellence in London, Delhi, Sao Paulo and Beijing.
- PwC has a global network of environmental tax specialists, with specialists in the taxation of emissions trading throughout Europe.
- PwC also advises on corporate strategy and public policy in relation to climate change, carbon markets and offsets. We have a proprietary carbon pricing model to help evaluate carbon market and regulatory scenarios.

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At PricewaterhouseCoopers in The Netherlands, over 4.500 professionals work together in 19 offices and from three different points of approach: Assurance, Tax and Human Resource Services, and Advisory. On the basis of our philosophy, Connected Thinking, we supply sector-specific services and seek surprising solutions - not only for large national and international companies, but also for government entities and non-profit organisations, as well as for medium-sized and smaller enterprises.

As an independent part of a worldwide network of more than 140.000 colleagues in 149 countries, we are able to draw upon a huge amount of knowledge and experience. We share this with each other, with our clients and their stakeholders.

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