

IAEA Nuclear Energy Series

No. NG-T-6.2

Basic
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Technical
Reports

Development of Knowledge Portals for Nuclear Power Plants



IAEA

International Atomic Energy Agency

**DEVELOPMENT OF
KNOWLEDGE PORTALS FOR
NUCLEAR POWER PLANTS**

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IAEA NUCLEAR ENERGY SERIES No. NG-T-6.2

DEVELOPMENT OF KNOWLEDGE PORTALS FOR NUCLEAR POWER PLANTS

INTERNATIONAL ATOMIC ENERGY AGENCY
VIENNA, 2009

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© IAEA, 2009

Printed by the IAEA in Austria
February 2009
STI/PUB/1377

IAEA Library Cataloguing in Publication Data

Development of knowledge portals for nuclear power plants. — Vienna : International Atomic Energy Agency, 2009.
p. ; 29 cm. — (IAEA nuclear energy series, ISSN 1995-7807 ; no. NG-T-6.2)
STI/PUB/1377
ISBN 978-92-0-113008-2
Includes bibliographical references.

1. Nuclear power plants. 2. Knowledge management. I. International Atomic Energy Agency. II. Series.

IAEAL

09-00566

FOREWORD

The IAEA's activities in nuclear knowledge management seek to increase the level of attention and awareness in: preserving and enhancing nuclear knowledge; assisting Member States in preserving nuclear experience and competence needed for the effective and safe use of nuclear energy; promoting the networking of institutions for nuclear education and training; evaluating the relevance of current programmes and activities on nuclear knowledge; and identifying approaches aimed at how to best address these issues.

Data, information and knowledge critical to the operation of a nuclear power plant (NPP) are generated from the initial phases of research and development across the NPP's life cycle, including its decommissioning. As an example, the fundamental engineering principles incorporated into the design of an NPP constitute essential knowledge for subsequent considerations in the licensing process as well as in considering later changes to the design basis to support NPP modifications. In addition to detailed design and operating knowledge/experience, another important element of NPP knowledge includes the plant management processes which are utilized to ensure safety and security over the lifetime of the plant. These processes and their rigorous implementation are important in establishing a culture which recognizes safety and security as uncompromised objectives by all NPP personnel. Another obvious example is the accumulation of operating experience for use in developing 'lessons learned' and conducting training of new and serving personnel. Also, radiological exposure data in relation to the optimal use of personnel in both routine operations and abnormal situations constitute a critical body of knowledge.

Knowledge is the key resource of most organizations in today's world. Therefore, managing knowledge effectively requires the understanding of and attention to the concept of organizational knowledge rather than just the traditional notion of individual centred knowledge. Nuclear powers can make this shift by utilizing the same types of core competencies that have proved themselves to be of high value within many other organizations, nationally and internationally. One such example is the management system, an approach that is being recommended by the IAEA to promote and support nuclear knowledge management as a primary opportunity for achieving competitive advantage and maintaining a high level of safety. By taking this approach, an NPP should be much more likely to achieve long term competitiveness and sustainability through the active management of knowledge as a strategic resource that supports the establishment and maintenance of safe, high level organizational performance.

The IAEA has produced several publications on this topic, including IAEA-TECDOC-1510, Knowledge Management for Nuclear Industry Operating Organizations. This publication proposes guidelines for the development of a knowledge portal for NPPs and covers the design and typical content of such a portal.

The IAEA wishes to thank all participants and their Member States for their valuable contributions. The IAEA officers responsible for this publication were A. Kosilov and Y. Yanev of the Department of Nuclear Energy.

EDITORIAL NOTE

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1. INTRODUCTION

1.1. BACKGROUND

The importance of knowledge management in the safe and efficient operation of nuclear power plants (NPPs) has been increasingly recognized in recent years. Nevertheless, the effective sharing of knowledge continues to be a challenge, and many staff in operating NPPs and/or utilities may be unaware of the existence of even explicit knowledge/information, let alone implicit or informally documented knowledge, held by other staff, which would assist them in the effective discharge of their duties [1].

The issue of knowledge management has become especially significant due to the recent hiatus in NPP construction/development and the associated loss by resignations and retirements of significant numbers of experienced personnel, who often take large amounts of important, undocumented knowledge with them [2, 3].

Some of the potential benefits of effective knowledge management and sharing include:

- Providing all NPP management and staff with the information tools to ensure that safety and security are appropriately considered in all aspects of an NPP's life cycle;
- Increasing staff productivity by reducing the time taken to access necessary information; and providing information in a more useful form;
- Providing NPP management with powerful data management tools for an effective overview of plant performance and activities;
- More effective decision making based on access to needed knowledge;
- In an increasingly competitive energy environment, knowledge is being recognized as a key element of human capital with significant commercial value.

Successful and effective nuclear knowledge management programs should meet the following high level objectives as appropriate:

- Achieve safe operation and maintenance of all nuclear facilities by sharing of operational experience;
- Achieve gains in economics and operational performance through effective management of knowledge;
- Maximize the flow of nuclear knowledge from one generation to the next and attract, maintain and further develop a dedicated cadre of highly competent professional staff to sustain nuclear competence;
- Facilitate innovation to achieve significant improvements in the safe, economical operation of all new nuclear projects;
- Achieve responsible use by properly identifying and protecting sensitive knowledge from improper use.

1.2. OBJECTIVE

This publication is intended to provide guidance for Member State nuclear power plant (NPP) personnel responsible for the knowledge management programmes implementation, to help them establish a portal to serve knowledge management (KM) objectives.

1.3. SCOPE

The scope of this publication covers the main design principles and typical content of a knowledge portal for nuclear power plants. These principles and list of contents are for guidance only and are based on a combination of different designs which have been realized in various Member States, examples of which are included as attachments for information. The actual design of portals for specific NPPs/utilities should reflect the needs of those organizations.

1.4. TARGET USERS

This publication should be of benefit to anyone involved in the consideration, development or management of a knowledge portal for NPPs, including:

- Utility managers;
- Plant managers;
- Plant specialists (experts in nuclear safety, engineering changes, maintenance, radiological protection, environmental monitoring, modelling, emergency management, etc.);
- Staff responsible for the internal communication;
- Public information officers;
- Any staff involved in the design, development or maintenance of a knowledge portal.

2. PURPOSE OF A KNOWLEDGE PORTAL

Knowledge management encompasses a variety of activities including the support of operations and the effective management of human resources (coaching, mentoring, succession management etc.). However, one of the most important aspects of effective knowledge management is easy access to relevant and useful data, information and knowledge [4]. Role of a knowledge portal is to act as a gateway to users through which they could access all information they need for their activity, safe, secure and in the best quality.

Hence, a knowledge portal has three primary purposes:

- (1) *As an integration tool.* This provides easy, unified and integrated access to an organization's own resources. Most NPPs have existing, but diverse systems for collecting and accessing important information such as plant performance parameters, operating procedures, document management, work control, training and qualification records etc. An effective knowledge portal would provide a single point of access to all of these systems and would be structured in such a way that the location and retrieval of such information would be quick and easy.
- (2) *As an access tool for other (internal and external) information resources.* There are many useful sources of information, beyond their own organization's resources, which can be made available to staff. In reality, many staff members are unaware of the rich and up to date documents available for their work. This includes, for example: safety standards, guidance documents and reports from IAEA, World Association of Nuclear Operators (WANO) and regulatory bodies; INIS information; academic courses (distance learning) and libraries; government laboratories and libraries; nuclear industry forums; and training materials – both generic and plant specific. All of these could add to the support knowledge and effectiveness of NPP staff.
- (3) *As a communication tool.* This enables individuals, teams and 'communities of practice (CoP)' to share and discuss ideas and knowledge. A key aspect of knowledge management is the ability to share and discuss information, giving it context and thus making it knowledge. An effective knowledge portal should therefore facilitate formal and informal communication between individuals, work and project teams and various CoP in real time.

The purpose of the knowledge portal is to provide a structured system for easy, computer based, access to any information (in the form of plant performance and system data, drawings, design descriptions, procedures, guides, reference material, reports, studies, training materials etc.), which can be used by staff to maintain and improve their own, and hence their NPPs, productivity and performance. In addition, the portal should provide access to relevant non-technical information, such as news, email, management and administrative information etc., and should facilitate communication and discussions between individuals and teams (functional, role based and project) for the sharing and growth of corporate knowledge.

3. SCOPE OF AN NPP PORTAL

When addressing the concept of an NPP portal, two main aspects may be considered:

- *Design principles of a knowledge portal.* Here the functionalities of the portal are suggested in terms of principles and techniques currently in use, many of which can be found as features of products readily available on the market;
- *Content.* Here topics are listed that could become the content to be managed by the portal, again based on the experience of existing portal users.

The following two sections provide more details on the design and content of NPP portals based on what is presently considered good practice. These are not intended to be prescriptive lists. Rather, items of interest should be selected based on the particular needs of the NPP considering the development of a portal. They may also be useful as checklists in order to avoid accidental omission of relevant functionality and/or content [5].

4. DESIGN PRINCIPLES OF A KNOWLEDGE PORTAL

The aim of this section is to provide general guidelines for the design of portals to support information and knowledge management for NPPs. Each country, nuclear utility and NPP may have a separate set of specific requirements based on global, national and local regulatory requirements, safety standards and specific choices for enterprise data management solutions. For these reasons, it is not possible to prescribe the detailed design for a knowledge portal. The guidance presented in this and in the next section is based on feedback from a multi-national panel of industry experts who have developed, or are in the process of developing, such NPP portals for information and knowledge management.

The design of the portal and the choice of underlying software and hardware tools should support the NPPs' requirement to build and retrieve knowledge. Data at an NPP come from many systems (e.g. financial, control computers, maintenance, inspection, work orders, chemistry) and in many formats (e.g. on-line, real-time, infrequent). There is benefit in viewing data separately, but it may be more useful if grouped and structured as data with a common purpose, making it 'information'. Portals have become an industry tool for the display and collection of such data into information. When such data are collected, they can be classified by the addition of metadata to describe the collection of information. For example, the response to an event may be collected and classified and stored to form part of the corporate knowledge. The NPP can learn from such collection of knowledge, which may itself result in changes to the requirements for the data being collected at the station.

While portals may be designed corporately, their functionality should be based on the needs of the NPP, with data management philosophy and tools for the entire life cycle of the NPP. The fundamental functionality should be generic and not specific to any one application or user. Portal utilities, however, should be included to allow some user customization of the layout as well as administration tools, to control access to, and to facilitate the maintenance of the portal by qualified staff. The most effortless retrieval of knowledge would result from automatic self-customization of the portal interface to the individual user; i.e. the functions he or she uses regularly are automatically placed on the portal opening screen.

A high-level 'map' of the five key design principles of an NPP knowledge portal is provided in Fig. 1. A much more detailed 'design map' based on Fig. 1, is provided in Appendix II. The appendix also contains some context to the five key design principles.

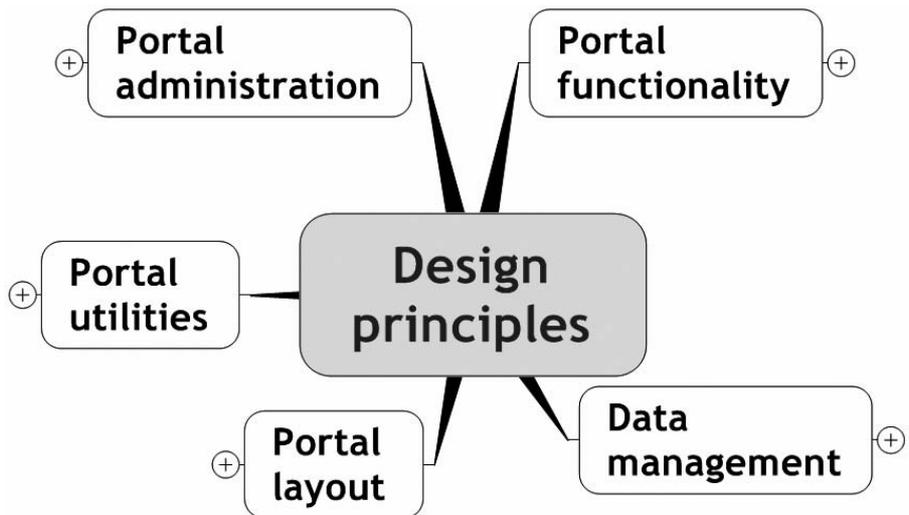


FIG. 1. High level map of portal design principles.

5. TYPICAL CONTENT OF AN NPP PORTAL

As stated above, each utility/NPP will have its own situation and requirements for portal contents based on plant specific needs. However, experience has shown that there are many common requirements for information/knowledge for the efficient operation of NPPs of different designs and in different countries. Figure 2 provides a high level ‘map’ of content requirements for a knowledge portal. Once again, this list of contents is not meant to be prescriptive, but much of this content is common to existing systems and is intended to provide suggestions to developers. The portal certainly contains most or all elements described in the configuration management [6]. Again, a more detailed breakdown of this ‘content map’ is provided in Appendix III, also with some contextual guidance.

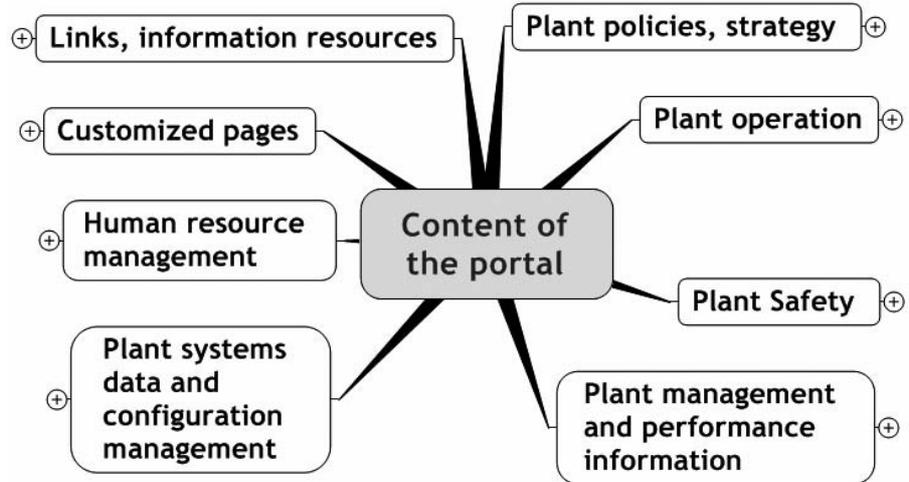


FIG. 2. Main categories of portal content.

6. GOOD PRACTICES FOR IMPLEMENTATION

Guidelines can be provided for 'good practices' for:

- Developing the portal in phases: concept, design, development, field trial and implementation;
- A field trial, involving the development of a portal based on requirements and refined by testing and improvement with candidate group prior to partial or full release — is important;
- Preparing design requirements for portal from dialogue with customers and users prior to development of the portal;
- Developing and testing the portal against these design requirements;
- Developing a general portal that has functionality required for one group, while at the same time knowing that the portal will need to be applied to many groups without specializing too early;
- Openly discussing the development of the portal – rationale, background, schedule etc.;
- Providing training for all staff;
- Publishing a portal description;
- Setting up a knowledge map prior to design;
- Developing the portal using a team rather than an individual.

Appendix I

DEFINITION OF TERMS

codification. The process of converting people's knowledge into a form to enable it to be communicated independent of those people.

configuration management. The process of identifying and documenting the characteristics of a facility's structures, systems and components (including computer systems and software), and of ensuring that changes to these characteristics are properly developed, assessed, approved, issued, implemented, verified, recorded and incorporated into the facility documentation.

communities of practice. Networks of people who work on the similar processes or in similar disciplines, and who come together to develop and share their knowledge in that field for the benefit of both themselves and their organizations.

concept maps. Tools for organizing and representing knowledge.

critical knowledge. The knowledge established in the context of a particular position that is deemed imperative for incumbents of said position to possess before being allowed to perform associated duties and tasks independently.

document management. Systems and processes for managing documents including the creation, editing, production, storage, indexing and disposal of documents. This often refers to electronic documents and uses specific document management software.

information management. The management of an organization's information resources with the aim of improving the performance of the organization. Information management underpins knowledge management, as knowledge is derived from information.

intranet. A computer network that functions similarly to the Internet, but the information and web pages are located on computers within an organization rather than being accessible to the general public.

knowledge. In the context of management systems, knowledge management helps an organization to gain insight and understanding from its own experience. Specific activities in knowledge management help the organization to better acquire, record, store and utilize knowledge. The term 'knowledge' is often used to refer to bodies of facts and principles accumulated by humankind over the course of time. Explicit knowledge is knowledge that is contained in, for example, documents, drawings, calculations, designs, databases, procedures and manuals.

knowledge base. The fundamental body of knowledge available to an organization, including the knowledge in people's heads, supported by the organization's collections of information and data.

knowledge management. An integrated, systematic approach to identifying, managing and sharing an organization's knowledge and enabling groups of people to create new knowledge collectively to help in achieving the organization's objectives.

knowledge management objectives. The KM objectives are the following: safety, economic, security, innovation and sustainability.

knowledge management strategy. A detailed plan outlining how an organization intends to implement knowledge management principles and practices in order to achieve organizational objectives.

knowledge mapping. A process to determine where knowledge assets are in an organization and how knowledge flows operate within the organization. Evaluating relationships between holders of knowledge will then illustrate the sources, flows, limitations and losses of knowledge that can be expected to occur.

knowledge portal. A comprehensive access structure to resources that are suitable to support the fundamental activities of knowledge management in a given knowledge domain to communicate, study and do research.

knowledge preservation. A process of maintaining an organizational system of knowledge and capabilities that preserves and stores perceptions, actions and experiences over time and secures the possibility of recall for the future.

portal. A special web page that organises access to all of the online resources relating to a topic, similar to providing a 'one stop shop'.

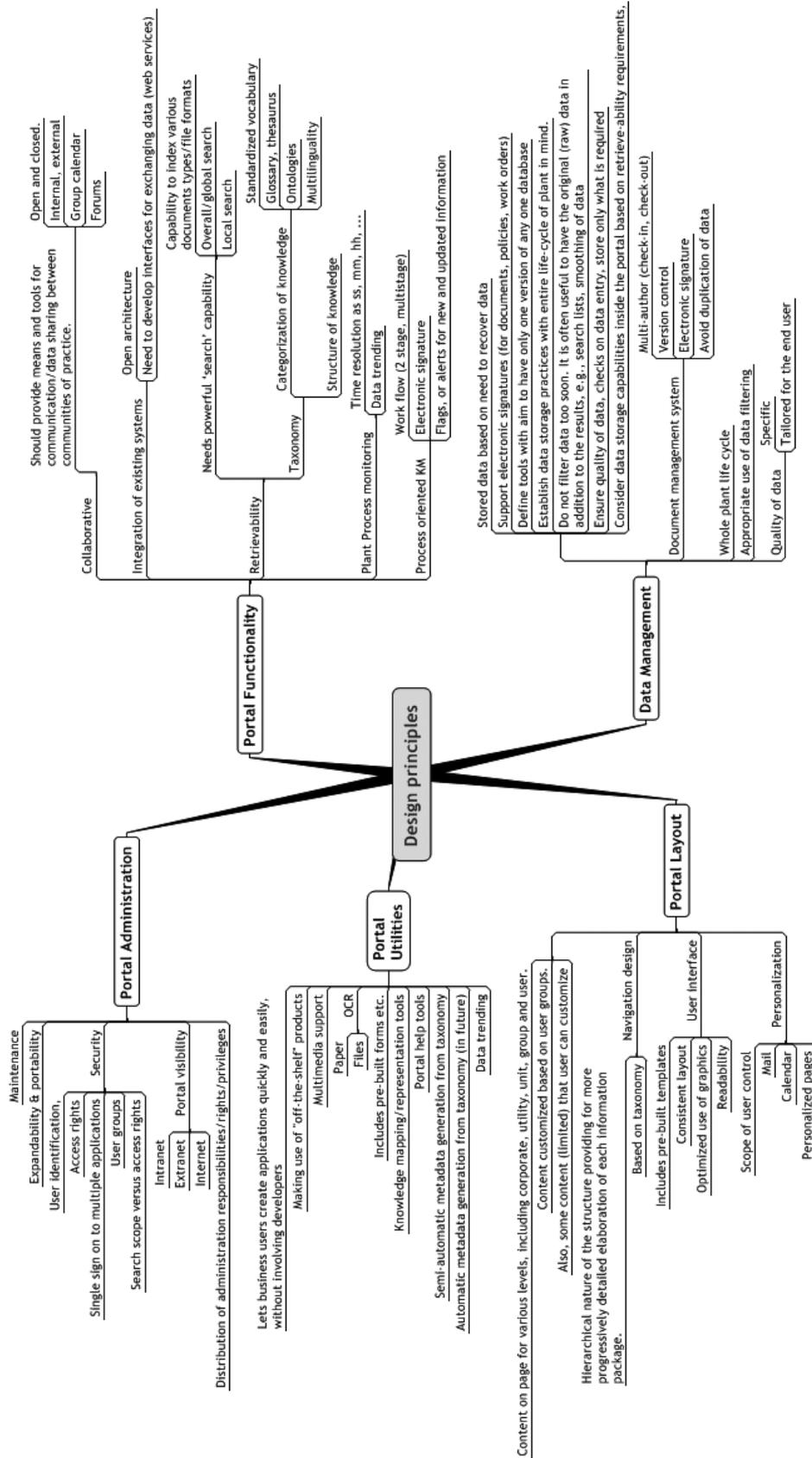
records management. Processes relating to the generation, receipt, processing, storage, retrieval, distribution, usage and retirement of an organization's records.

taxonomy. A hierarchical structure in which a body of information or knowledge is categorized, allowing an understanding of how that body of knowledge can be broken down into parts, and how its various parts relate to each other. Taxonomies are used to organize information in systems, thereby helping users to find it.

Note: For more definitions of terms in the field of nuclear knowledge management, see Ref. [1]; in the field of nuclear safety, see Ref. [7].

Appendix II

DETAILED DESIGN PRINCIPLES MAP FOR A KNOWLEDGE PORTAL



II.1. DESIGN PRINCIPLES OF A KNOWLEDGE PORTAL

II.1.1. Portal functionality

- The portal should support collaborative tools for sharing information between groups of users. These will have closed or open access, permit collaboration between both internal and external users, which could include contractors and suppliers. The ability to access group calendars is a benefit, as are forums (electronic, on-line) for discussion.
- The portal needs to support, as much as possible, the existing and future functionality (software, hardware) at the station. If not, choices may affect future implementation. The portal and utilities should be developed based on the requirements rather than just what is available.
- The ability to get data out of the utility information systems is important – data search and ‘web crawler’ functionality can enhance access. Aim is to reduce the time required to retrieve requested information. Care should be taken to develop a taxonomy for plant use – this will help with the layout of the portal, and will assist with the storage and classification of existing and future data.
- The portal should support plant process monitoring.
- The portal should support process oriented knowledge management.

II.1.1.1. Collaborative tools

These principles should provide means and tools for communication/data sharing between communities of practice.

- Open and closed;
- Internal and external;
- Group calendar;
- Forums.

II.1.1.2. Integration of existing systems

- Open architecture;
- Need to develop interfaces for exchanging data (web services).

II.1.1.3. Retrievability

There needs to be a powerful ‘search’ capability:

- Capability to index various documents types/file formats;
- Overall/global search;
- Local search;
- Taxonomy;
 - Categorization of knowledge:
 - Standardized vocabulary;
 - Glossary, thesaurus;
 - Ontology;
 - Multilingualism.
 - Structure of knowledge.

II.1.1.4. Plant process monitoring

- Time resolution as ss, mm, hh, ...;
- Data trending.

II.1.1.5. Process oriented KM

- Work flow (2 stages, multistage);
- Electronic signature;
- Flags or alerts for new and updated information.

II.1.2. Data management

- Stored data based on need to recover data.
- Support electronic signatures (for documents, policies, work orders).
- Define tools with aim to have only one version of any one database.
- Establish data storage practices with entire life cycle of plant in mind.
- Do not filter data too soon. It is often useful to have the original (raw) data in addition to the results, e.g., search lists, smoothing of data.
- Ensure quality of data, checks on data entry, store only what is required.
- Consider data storage capabilities inside the portal based on retrieveability requirements.

II.1.2.1. Document management system

- Multi-author (check-in, check-out);
- Version control;
- Electronic signature;
- Avoid duplication of data.

II.1.2.2. Whole plant life cycle

II.1.2.3. Appropriate use of data filtering

II.1.2.4. Quality of data

- Specific;
- Tailored for the end user.

II.1.3. Portal layout

- Content on page for various levels, including corporate, utility, unit, group and user;
- Content customized based on user groups;
- Also, some content (limited) that user can customize.

II.1.3.1. Navigation design

- Hierarchical nature of the structure providing for more progressively detailed elaboration of each information package;
- Based on taxonomy.

II.1.3.2. User interface

- Pre-built templates;
- Consistent layout;
- Optimized use of graphics;
- Readability.

II.1.3.3. Personalization

- Scope of user control,
- Mail;
- Calendar;
- Personalized pages.

II.1.4. Portal utilities

There is a series of functionalities that the portal should support in order to be useful. A representative sample of functionalities should:

- Let business users create applications quickly and easily, without involving developers;
- Make use of off the shelf products;
- Provide multimedia support;
- Facilitate OCR;
 - Paper;
 - Files;
- Develop pre-built forms;
- Develop knowledge mapping/representation tools;
- Create portal help tools;
- Facilitate semi-automatic metadata generation from taxonomy;
- Facilitate automatic metadata generation from taxonomy (in future);
- Initiate data trending.

II.1.5. Portal administration

II.1.5.1. Maintenance

II.1.5.2. Expandability and portability

II.1.5.3. Security

- User identification;
- Access rights;
- Single sign on to multiple applications;
- User groups;
- Search scope versus access rights.

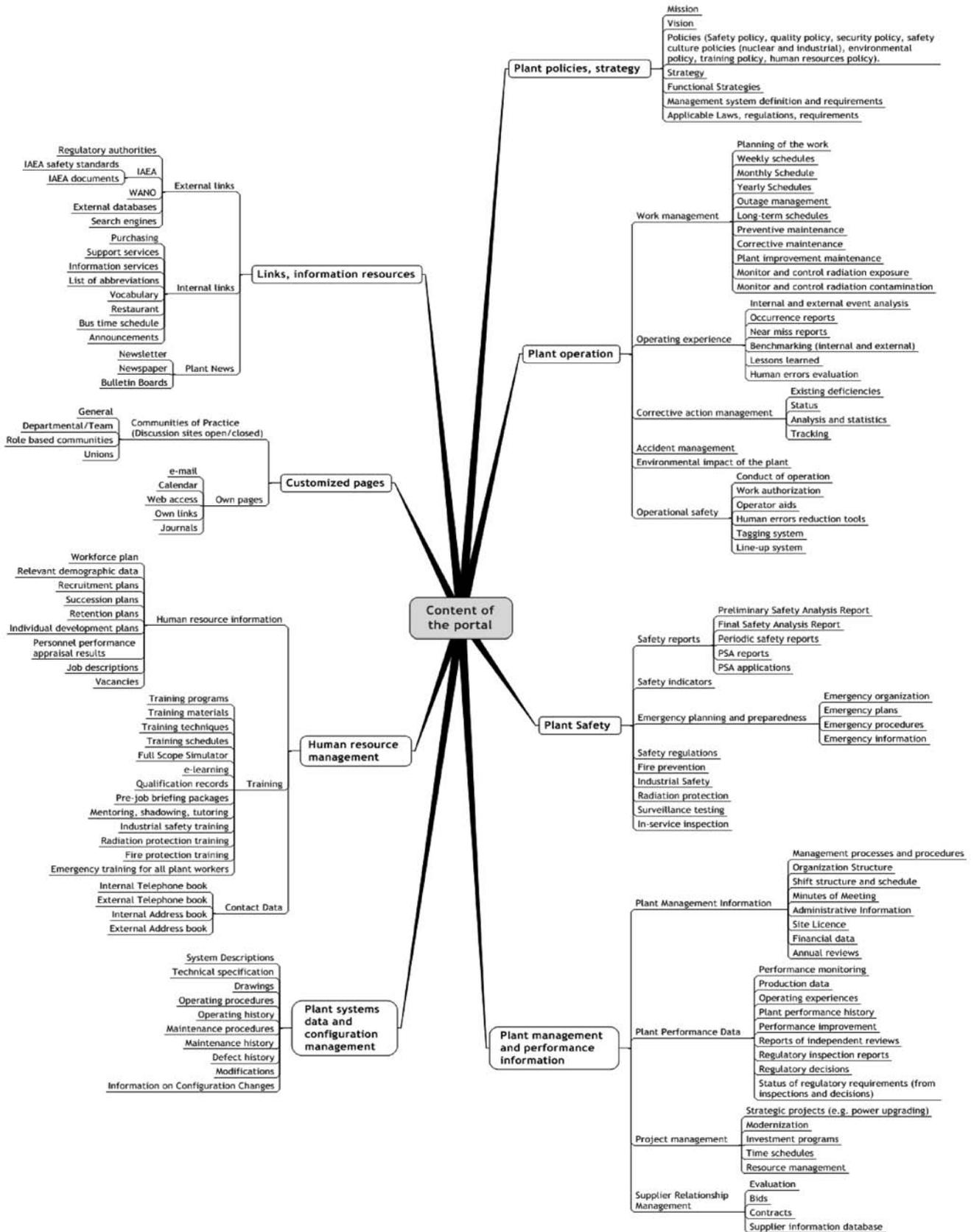
II.1.5.4. Portal visibility

- Intranet;
- Extranet;
- Internet.

II.1.5.5. Distribution of administrative responsibilities/rights/privileges

Appendix III

DETAILED CONTENT MAP FOR KNOWLEDGE PORTAL



III.1. CONTENT OF THE PORTAL

III.1.1. Plant policies, strategy

- The basic strategic plant documents should be accessible any time for all users. These documents help plant personnel to understand the future direction and what they can do to support this.
- The documents should include information on plant mission and vision; present clear policies on safety, safety culture, QM, radiological and industrial safety. Also, this section should provide access to relevant legislation documents.

III.1.1.1. Mission

III.1.1.2. Vision

III.1.1.3. Policies (safety policy, quality policy, security policy, safety culture policies (nuclear and industrial), environmental policy, training policy, human resources policy).

III.1.1.4. Strategy

III.1.1.5. Functional strategies

III.1.1.6. Management system definition and requirements

III.1.1.7. Applicable laws, regulations, requirements

III.1.2. Plant operation

- From the viewpoint of knowledge management, personnel should have access to all the relevant plant operations information needed to do their work to the highest quality;
- The information should describe work management planning, schedules, procedures, monitoring and control of site radiation conditions;
- It should reflect all existing types of data of operating experience, including event analysis and lessons learned;
- It should monitor corrective action implementation and contain information on major projects management and contractors evaluation.

III.1.2.1. Work management

- Planning of the work;
- Weekly schedules;
- Monthly schedule;
- Yearly schedules;
- Outage management;
- Long term schedules;
- Preventive maintenance;
- Corrective maintenance;
- Plant improvement maintenance;
- Monitor and control radiation exposure;
- Monitor and control radiation contamination.

III.1.2.2. Operating experience

- Internal and external event analysis;
- Occurrence reports;

- Near miss reports;
- Benchmarking (internal and external);
- Lessons learned;
- Human errors evaluation.

III.1.2.3. Corrective action management

- Existing deficiencies;
- Status;
- Analysis and statistics;
- Tracking;

III.1.2.4. Accident management

III.1.2.5. Environmental impact of the plant

III.1.2.6. Operational safety

- Conduct of operation;
- Work authorization;
- Operator aids;
- Human error reduction tools;
- Tagging system;
- Line up system.

III.1.3. Plant safety

- Access to the plant safety information data is essential. Use of the latest information about safety indicators and reports help to develop safety culture.
- Valid safety analysis reports, emergency procedures and other documents related to nuclear, radiological and industrial safety should be available.

III.1.3.1. Safety reports

- Preliminary safety analysis report;
- Final safety analysis report;
- Periodic safety reports;
- PSA reports;
- PSA applications.

III.1.3.2. Safety indicators

III.1.3.3. Emergency planning and preparedness

- Emergency organization;
- Emergency plans;
- Emergency procedures;
- Emergency information.

III.1.3.4. Safety regulations

- Fire prevention;
- Industrial safety;

- Radiation protection;
- Surveillance testing;
- In-service inspection.

III.1.4. Plant management and performance information

The portal content should:

- Include the description of management processes, their procedures and organization diagrams to help personnel do their activities in the right way;
- Present plant performance data and provide access to information needed for plant management.

III.1.4.1. Plant management information

- Management processes and procedures;
- Organization structure;
- Shift structure and schedule;
- Minutes of meetings;
- Administrative information;
- Site licence;
- Financial data;
- Annual reviews.

III.1.4.2. Plant performance data

- Performance monitoring;
- Production data;
- Operating experiences;
- Plant performance history;
- Performance improvement;
- Reports of independent reviews;
- Regulatory inspection reports;
- Regulatory decisions;
- Status of regulatory requirements (from inspections and decisions).

III.1.4.3. Project management

- Strategic projects (e.g. power upgrading);
- Modernization;
- Investment programmes;
- Time schedules;
- Resource management.

III.1.4.4. Supplier relationship management

- Evaluation;
- Bids;
- Contracts;
- Supplier information database.

III.1.5. Plant systems data and configuration management

- The plant system data is important for all technical personnel of the plant. It helps them access correct and validated information.
- The data should describe the plant design and provide access to available technical and operation documentation (technical specification, drawings, procedures, defect history, modifications, etc.).

III.1.5.1. System descriptions

III.1.5.2. Technical specification

III.1.5.3. Drawings

III.1.5.4. Operating procedures

III.1.5.5. Operating history

III.1.5.6. Maintenance procedures

III.1.5.7. Maintenance history

III.1.5.8. Defect history

III.1.5.9. Modifications

III.1.5.10. Information on configuration changes

III.1.6. Human resource management

- Human factors are a key element of the successful operation of any NPP and this view should be adequately reflected in the portal content.
- The portal should include information related to general issues of plant human resources management such as workforce recruitment, succession and retirement plans and job descriptions. Special attention should be paid to training information. The portal should present all available on-plant training materials and tools, including e-learning technology. Also the administrative information related to training activities (planning, schedules, announcements etc.) should be available.
- The portal should provide opportunities for protected access to relevant personal data of each staff member. This category should include frequently used information such as contact data, vacancies, personnel performance results etc.

III.1.6.1. Human resource information

- Workforce plan;
- Relevant demographic data;
- Recruitment plans;
- Succession plans;
- Retention plans;
- Individual development plans;
- Personnel performance appraisal results;
- Job descriptions;
- Vacancies.

III.1.6.2. Training

- Training programme;
- Training materials;
- Training techniques;
- Training schedules;
- Full scope simulator;
- E-learning;
- Qualification records;
- Pre-job briefing packages;
- Mentoring, shadowing, tutoring;
- Industrial safety training;
- Radiation protection training;
- Fire protection training;
- Emergency training for all plant workers.

III.1.6.3. Contact data

- Internal telephone book;
- External telephone book;
- Internal address book;
- External address book.

III.1.7. Customized pages

- Frequently accessed applications, both internal and external, should be visible on the customized page of the user.
- Every user should have the right to create their own page for convenient working. Navigation to important information for individual users will be direct from their own pages.
- ‘Communities’ give the ability for users to create their own teams in different topics, to share their documents, data, information and knowledge.

III.1.7.1. Communities of practice (Discussion sites open/closed)

- General;
- Departmental/team;
- Role based communities;
- Unions.

III.1.7.2. Own pages

- Email;
- Calendar;
- Web access;
- Own links;
- Journals.

III.1.8. Links, information resources

- During the daily work, it is useful to have those links which could help to find information on external and internal websites and databases. Also some of the most often used pages are plant news, bulletins and newsletters.

- Initially, users may not like the new portal. They may be reluctant to change and learn new things, having used the 'old intranet' with satisfaction. Hence, it is helpful to have links which support their daily routine such as vocabulary, bus time schedule, restaurant menus etc. These will encourage them to increase their use of the portal.

III.1.8.1. External links

- Regulatory authorities;
- IAEA:
 - IAEA safety standards;
 - IAEA documents;
- WANO;
- External databases;
- Search engines.

III.1.8.2. Internal links

- Purchasing;
- Support services;
- Information services;
- List of abbreviations;
- Vocabulary;
- Restaurant;
- Bus time schedule;
- Announcements.

III.1.8.3. Plant news

- Newsletter;
- Newspaper;
- Bulletin boards;

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Annex I

INTRANET PORTAL AT THE KRŠKO NPP, SLOVENIA

The intranet portal (named IntraNEK) at Krško NPP serves as a single entry point to access the internet and various plant applications and links (Fig I-1).

The front page consists of the standard internet search bar and links to various applications that can either reside within the technological computer network (TRM) or within the plant business computer network. Access to the TRM applications is “read only”. Some applications on the business computer network are open to all personnel who log on to the network while some applications are restricted and secured, and require additional login entries.

A selected link will open in a new window. Documents will open with the appropriate software tool depending on the document file format. Some categories of documents are available in image form only (e.g. procedures, drawings etc.), while some are available in fully searchable PDF format (e.g. technical specifications, updated safety analysis reports (USARs) etc.).

Plant departments (organizational units) have their own pages accessible from the front page. Their pages contain links to their own information resources or links to other resources and applications, tailored to the department needs.

During recent years a number of web based applications have been developed that are connected also with a common Oracle database. Some are designed to serve for data entry and browsing while others serve for browsing only.

The screenshot shows the IntraNEK intranet portal front page. The browser window title is "IntraNEK - Microsoft Internet Explorer" and the address bar shows "http://alfa.nek.si/". The page content is organized into several columns and rows of links. Annotations in pink boxes provide detailed descriptions for several key sections:

- TRM – Technological Computer Network:** Operations data, TS monitoring, Reporting system, Emergency Response Plan, Process Information System configuration ...
- Projects, Activities:** Planning, modifications, outage, projects,...
- MIS – Management Information System:** Modules: Work Order System, Document Control Module, Master Equipment List, Tagging, Temporary modifications, Corrective Program (Deficiency log)
- Documents:** Management directives, Computer network security policy, Licensing documents, Standards and regulations, Precautions, Limitations and Setpoints, Q list (suppliers), Drawings, Plant procedures, EOPs & background documents.
- Computer Network Misc. information, links**
- Organizational units - links**
- Union - link**
- Outside links Presentations**

FIG. I-1. IntraNEK front page.

I-1. EXAMPLE: CORRECTIVE ACTION PROGRAMME (CAP)

One important web based application developed in-house is called the Corrective Action Programme (CAP) which is designed to serve as a single input point and tracking system for various issues. It replaced various and diverse systems which were previously used for documenting and tracking plant events and issues such as equipment, structures, documents, human etc., regulatory requirements and commitments, non-conformances, failure analysis, domestic and industry operating experience and corrective actions.

All entries (CAP requests) are screened by a screening team for determination of further actions. Requests may be assigned for immediate repair and/or for further analysis. Repairs are either performed as minor maintenance which can be completed and tracked within the CAP system or work orders are issued which are processed in a different application called the Work Order System (WOS). Analysis results determine corrective actions which are assigned to responsible departments and individuals for resolution. The system provides for implementation of organizational hierarchy responsibilities allowing appropriate approval and delegation of work.

Figure I-2 shows a basic application use flow path. The application is supported by help options, pull down menus and jump functions to ensure correct inputs for various attributes associated with the CAP entry, including the possibility to attach computer files.

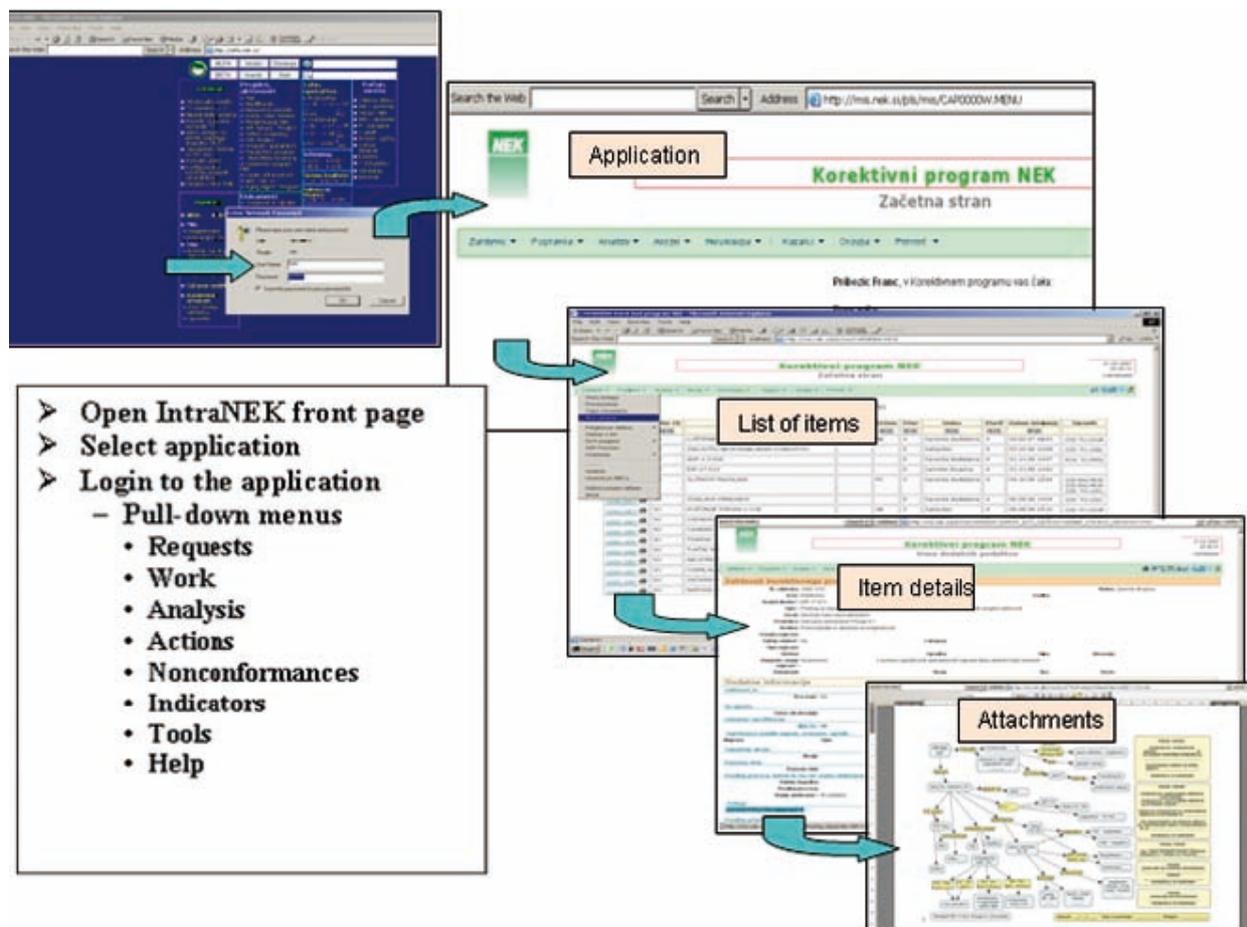


FIG. I-2. The basic application use flow path.

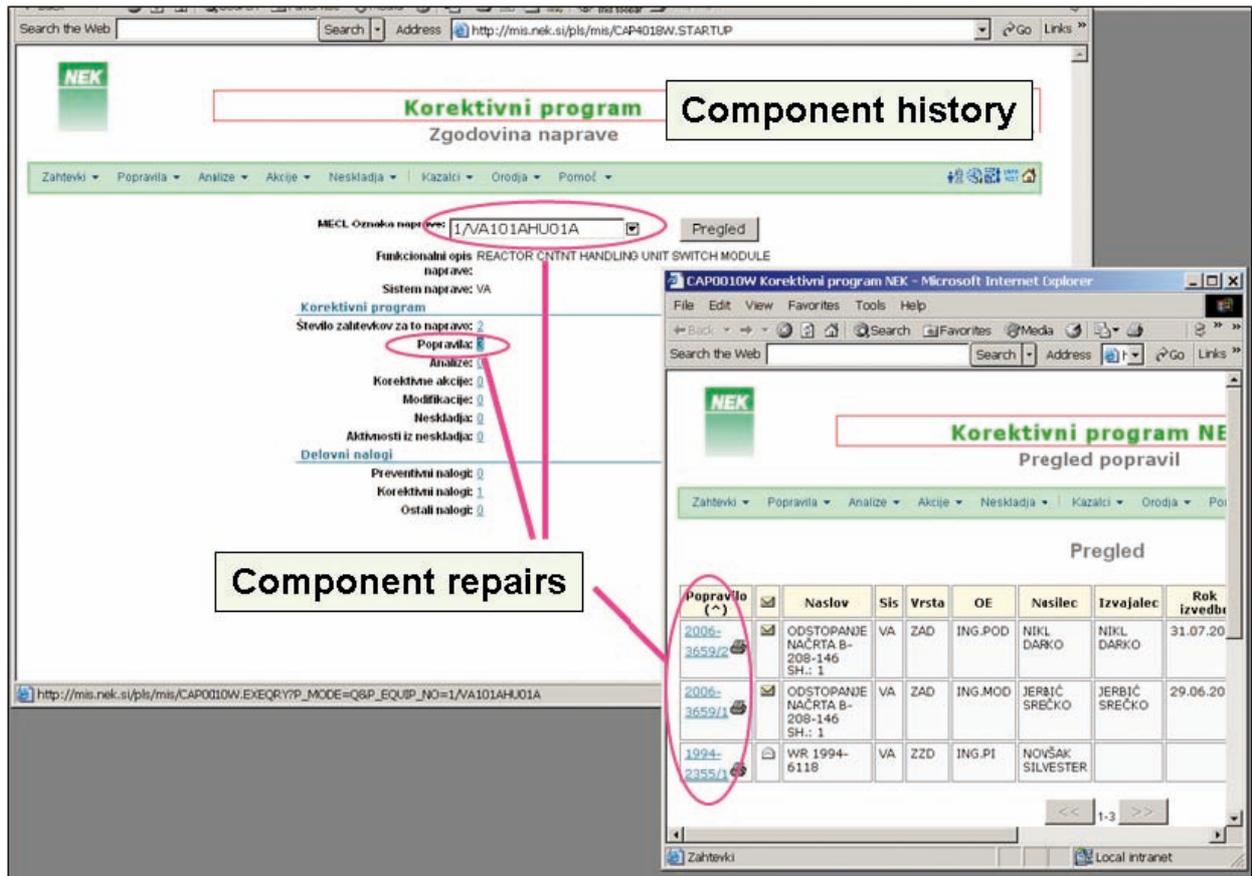


FIG. I-3. An example of component history browsing

An example of a useful browsing capability is a component history where it is possible from CAP system to view count of repairs, corrective actions, analysis, non-conformances, modifications etc., for a particular component (Fig. I-3). Links are provided to display more details and allow further review of individual items.

Similarly, in some applications jumps to other applications are possible directly from the point of interest, such as component ID or other attributes. Figure I-4 shows jumps from the Work Order Browse application to the Master Equipment List (MEL), which contains technical data and associated documentation, and further to the Document Control Module (DCM). All these modules are also accessible directly through the entry page links.

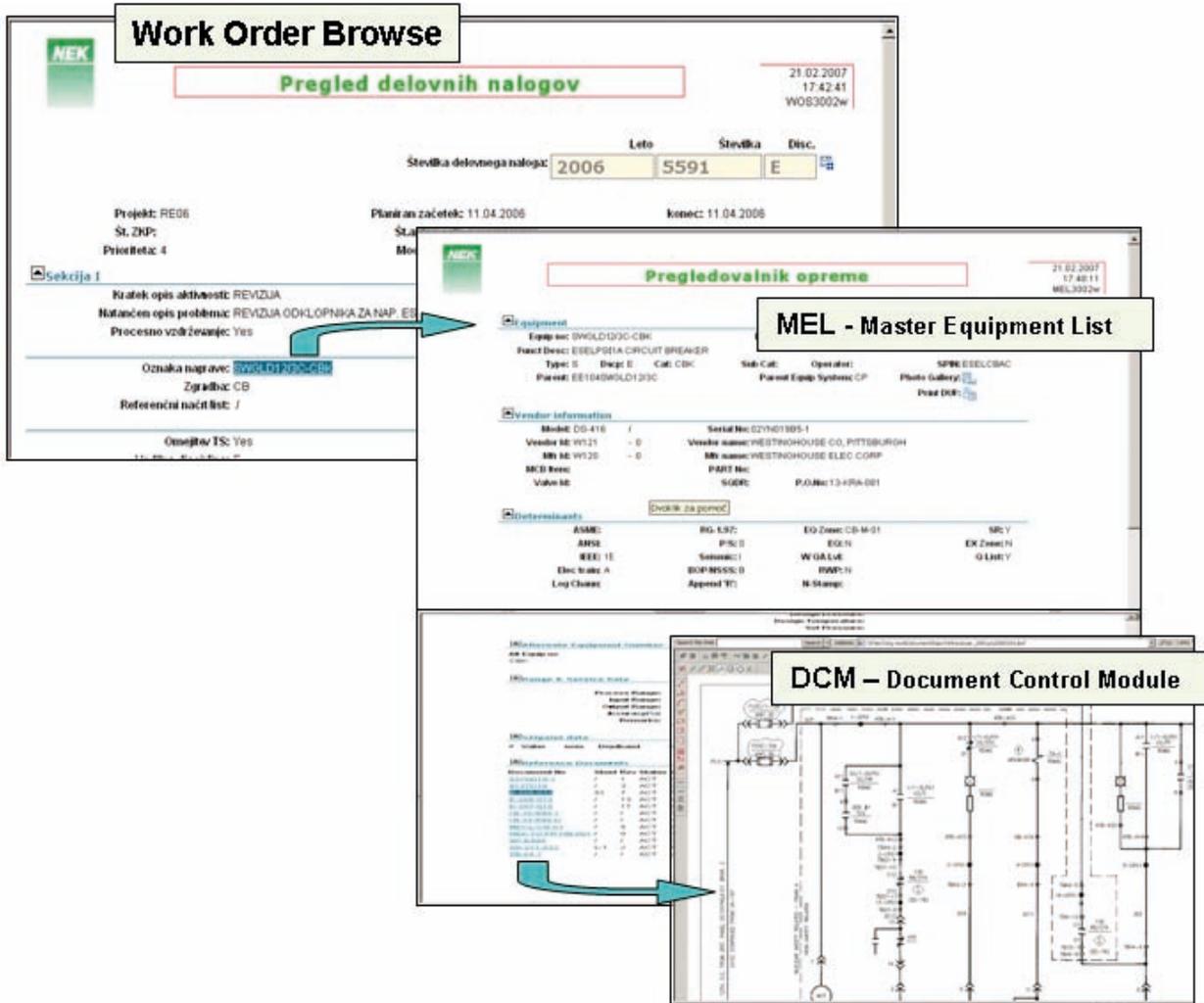


FIG. I-4. An example of application jumps.

Annex II

KOZLODUY NPP INTRANET PORTAL, BULGARIA

The Kozloduy NPP intranet portal was established in the late 1990s. The purpose of the portal was to provide access to general and frequently used information necessary for routine and daily work of the plant staff. Over the years the intranet site has been continuously improved and extended. The portal is now a standard tool for every member of plant personnel.

The portal architecture has been designed on a modular basis and follows the general structure of the plant. The home page contains general, publicly accessible and frequently used information and corresponding links. Each major division maintains its own sub-portal, which services the specific needs of the division personnel. Hierarchical structure, pull down and shortcut menus facilitate navigation and provide a user friendly interface.

The portal is based on FrameWork 1.1 and DotNetNuke and provides group and individual communications and data exchange. Most of the major plant databases related to documentation, plant operation, plant safety, plant systems data, training and human resources are accessible through the portal. Miscellaneous information and useful internal and external links also are available.

Different types of communication services are organized through a separate server. Depending on their role and position, each staff member has been provided with an internal and/or external email address and an individually configured internet connection. For general purposes cable internet is accessible at several points, which are evenly located around the site, and there is also a secure wireless network connection.

Search and retrieve functions are implemented through respective engines, which are incorporated into applications.

The portal has a strongly defined access rights system. Anonymous access is prevented; page personalization is available only for limited specific cases.

Figures II-1 and II-2 show the home page and the path to Units 5 and 6 on-line technical parameters.

Electricity production

Units conditions

Links to general topics

News

Environment conditions

Surveys

Birthday today

Phone service

Links to subportals

Състояние блокове

Блок 1	"Е"
Блок 2	"Е"
Блок 3	"Д"
Блок 4	"Е"
Блок 5	1023 MW
Блок 6	1019 MW

Анкетни

Въпрос на седмичната

Днес да посчerpят

Телефонен център

Техн. поддръжка на компютърната техника: **60-60**

Телефонни поръчки: **9**

Телефонни повреди: **21-10**

Телефонен указател

25-26 22-22

ПОЛИЦИЯ ПОЖАРНА

"АЕЦ Козлодуй" ЕАД

Нягора

FIG. II-1. KNPP intranet portal – home page.

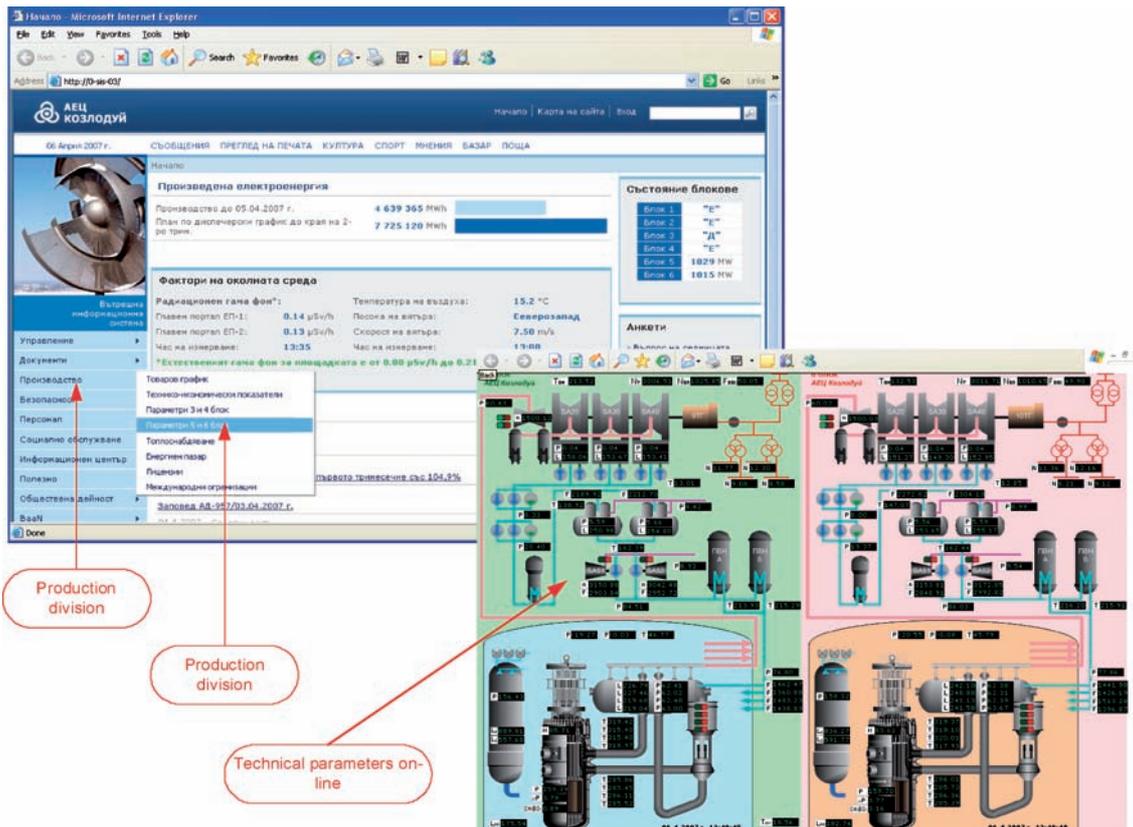


FIG. II-2. KNPP intranet portal – page “Technical parameters on-line”.

Annex III

GESELLSCHAFT FÜR ANLAGEN- UND REAKTORSICHERHEIT (GRS) M.B.H., GERMANY

III-1. SOME ISSUES CONCERNING PORTALS

- Actual information and messages for all users;
- Search in structured/unstructured document compilations;
- Simple exchange of information;
- Presentation of information in particular contexts;
- Archiving and distributing information;
- Integration with quality management;
- Support of management;
- Access to all relevant documents, information assemblies (e.g. databases, archives) and applications;
- White/yellow pages, calendars, mail;
- Discussions/forums;
- Organizing work flow.

III-2. THE COVERS PORTAL – AN EXAMPLE

According to the specific requirements, the necessary items can be selected for implementation. Below are some screenshots of a collaboration portal for the members of a European project.

Figure III-1 shows the home page of the COVERS (Coordination Action Project WWER Safety Research) portal that has been built for collaboration between international European partners on issues of research for safety of PLIM (plant life management) and PLEX (plant licence extension) for WWER NPPs.

Access to the portal is via the internet and is restricted solely to the partners. Access control for the diverse information in the portal can be administered by the topics 'Site Settings' (upper right corner of home page) and the subdivision 'Actions - Manage Users' (lower leftmost column of home page). The main structure items of the portal content may be found in the header line with the topics 'Home – Topics – Team Sites – Training'

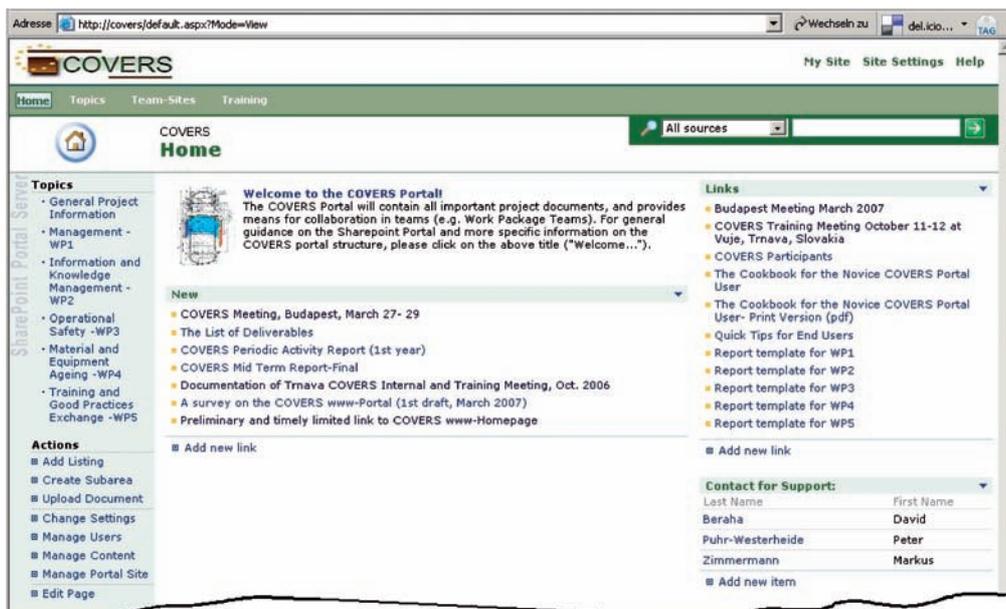


FIG. III-1. Example of a portal for collaboration: COVERS home page.

The two fields in the upper right beside the magnifying glass are for searching through portal information. The left field provides a drop down list of sub areas on which to be searched, whereas the search item must be entered to the right field. Searching is by full text search; but the underlying document management system also supports the use of metadata.

The item 'My Site' in the upper right corner allows a user to enter his/her personal information like address, affiliation, skills and other information that is also searchable. Clicking on user names elsewhere in the portal will open the user's personal site - thus simplifying actions like sending emails to users. In this way, 'Yellow Pages' and 'White Pages' functionalities are supported.

In the sub area, called 'Links' of the right column, a selection of relevant links is found. Just below is a list of contact persons who support the implementation and operation of the portal. In the centre area, news and other general project information can be found.

Figure III-2 depicts a meeting page of the COVERS portal. Here, the necessary information around a meeting is presented. In the run-up to the meeting, presentations can be uploaded easily by suppliers, and related information such as forms for visa applications, accommodation, and the agenda is contained. In the bottom middle area, the library of the presentations is shown. Pictures taken during the meeting have been added to the 'Image Library' on the right hand side.

Figure III-3 shows a document library where, for example, several authors may work on one document by use of the check out/check in mechanism. A user may set 'notifications' on information or libraries in the portal such that an email will be sent whenever a change has been made.

III-3. IMPLICATIONS OF THE COVERS PORTAL

- A transition from email based communication to team communication;
- An improvement in communication between members;
- The creation of a centralised project memory that can be used as a project archive after the project's end;
- The integration of a document management system in everyday work;
- Assist in knowledge sharing.

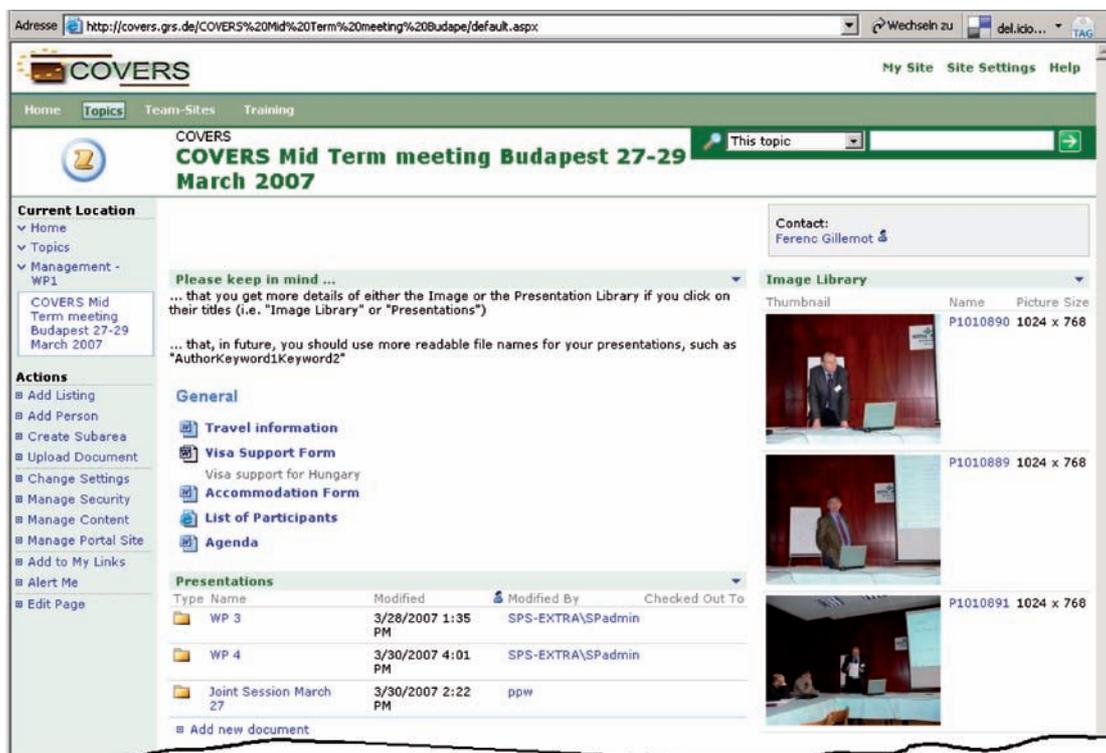


FIG. III-2. COVERS meeting page.

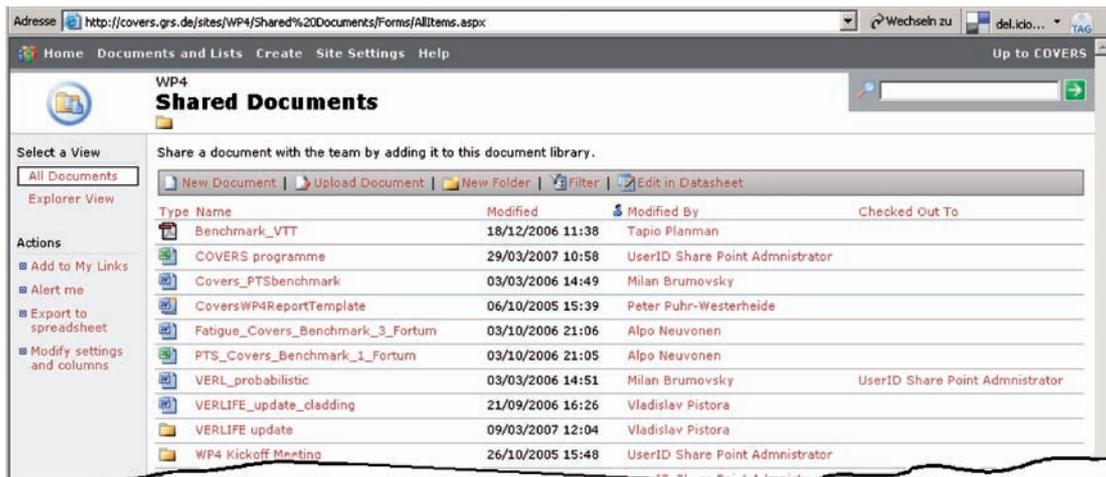


FIG. III-3. COVERS working group document library.

Annex IV

CORPORATE PORTAL SYSTEM AT PAKS NPP, HUNGARY

The new Corporate Portal System (CPS) of Paks NPP was launched in November 2006. The portal is based on one of the latest technologies, Plumtree Enterprise WEB 5.0. The main purpose of the installation of the new technology was to serve the working culture change, to give a platform to access all information and applications “including the integrated process model” used at the NPP. The new technology also supports those goals which were defined in the organization development programme: e.g. to improve internal communication with the establishment of communities of practice. Installation of the CPS has provided a powerful tool for knowledge management; it is possible to share and find all information “through a controlled access” in documents from various sources, to have links to people, portlets and different communities.

Document management of the Paks NPP is supported by the integration of the “Document 5” application, as the new Electronic Data Management System (EDMS) and the CPS.

Depending on their access rights, all users of the CPS, through Microsoft® Internet Explorer, can access technical, economic and human resources documents which are stored anywhere on the internal network (file servers, EDMS, old INTRANET). The CPS is also accessible from the internet through a secure connection (https://)

Figure IV-1 shows the architecture of the CPS. The main concept is the integration of all applications to one platform and to help users to find all information they need.

An access control list specifies which users and groups have access to an object (and what kind of access privileges they have such as read, select, edit, admin).

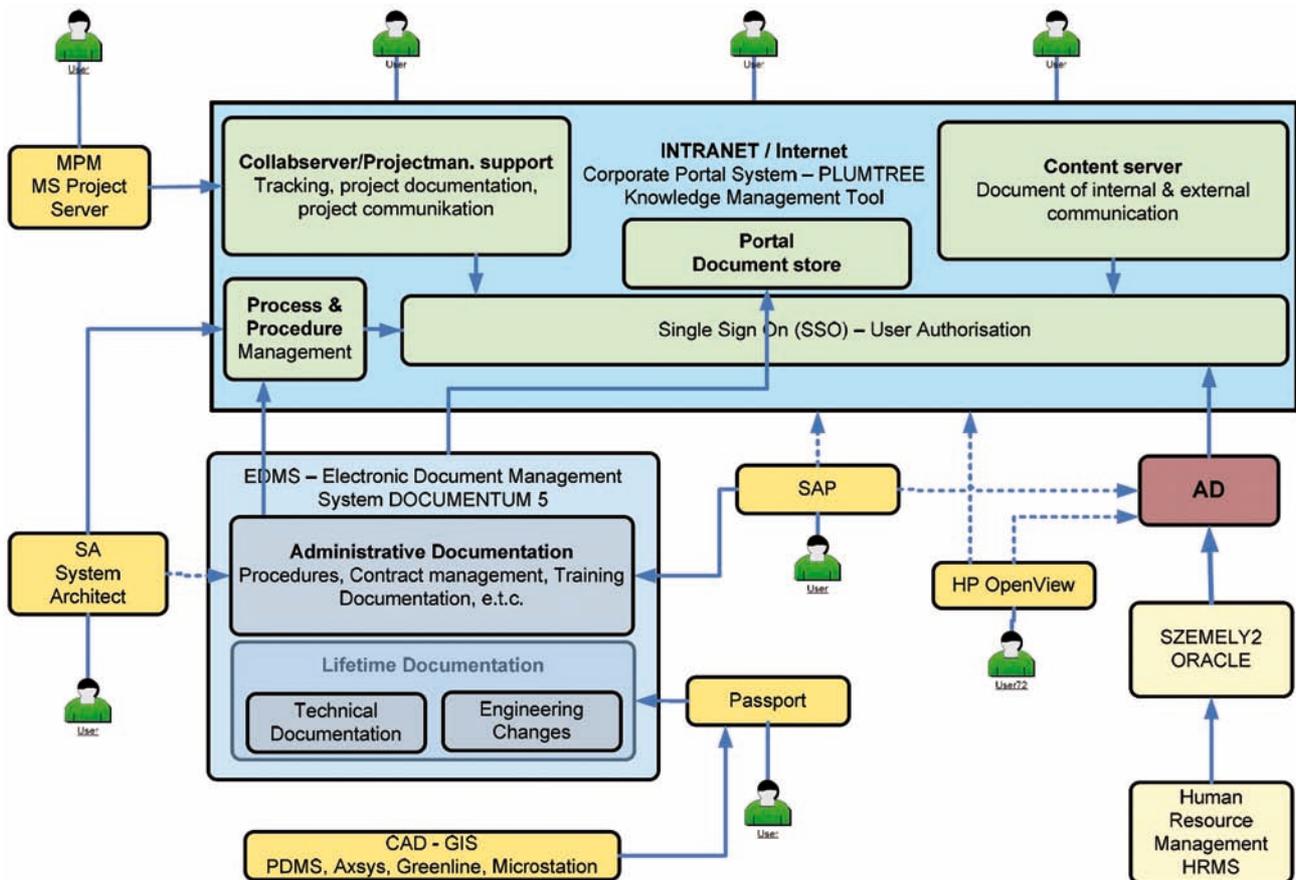


FIG. IV-1. The architecture of the CPS at the Paks NPP.

Figures IV-2 and IV-3 show the main page of the CPS. Via access control, the user has rights to access to all information relevant to their job; plant strategic and management documents (Mission, vision, values, strategies, business processes and procedures), technical information, EDMS, SAP, PassPort, ORACLE, regulatory requirements, production data, e-learning, internal communication, minutes of meetings, project web pages, support systems, links to utility organizations etc. The users have the rights to customize their own home page and to open a community of practice or to join a community of the same profession, interest, projects etc.

Figure IV-4 shows the search capability of the portal. It searches all documents on the portal or on connected content servers. Results of the search are organized by object type and it is also possible to conduct advanced searches based on the metadata of a file, or name, keywords, object type and content.

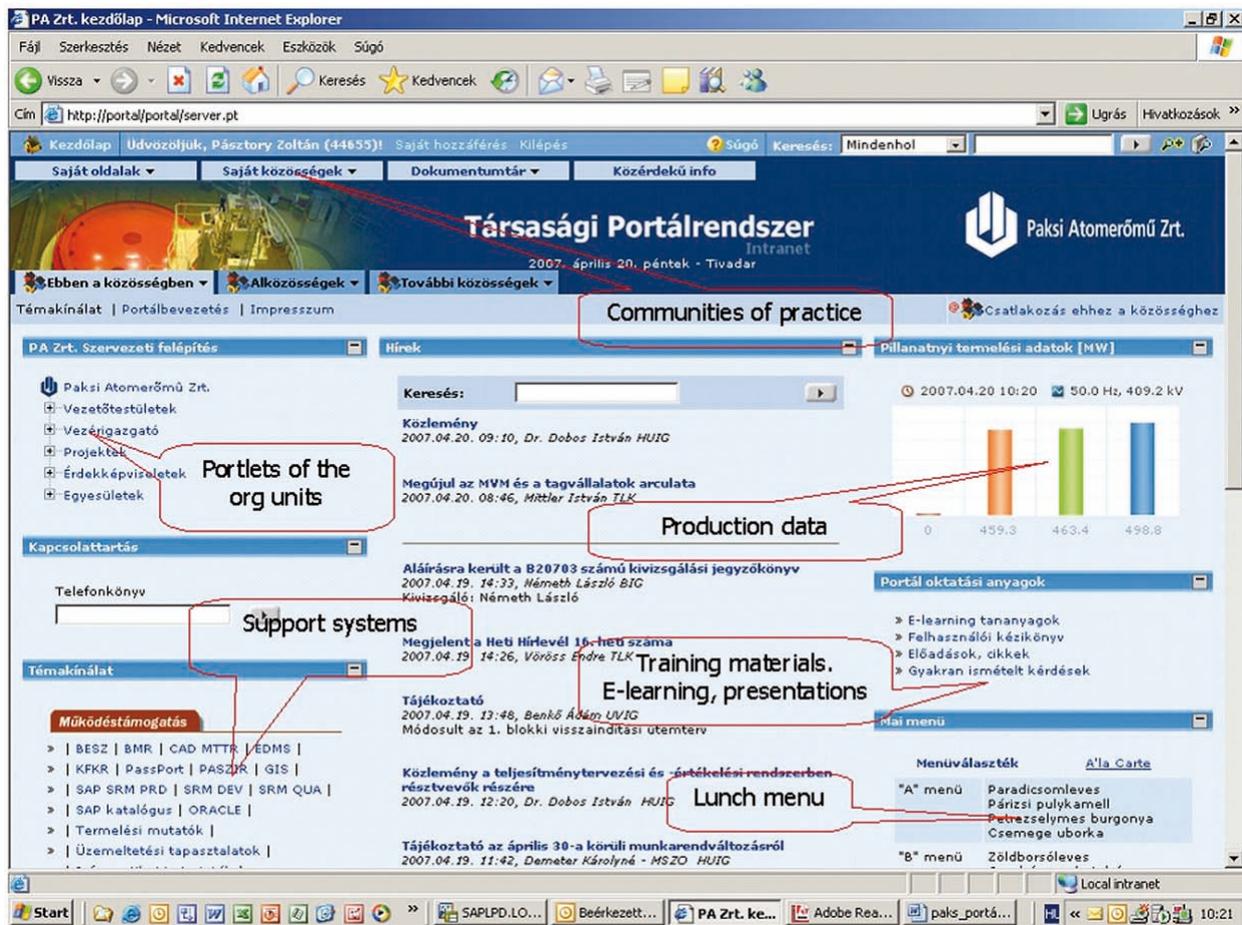


FIG. IV-2. First part of the main page of the CPS at the Paks NPP.

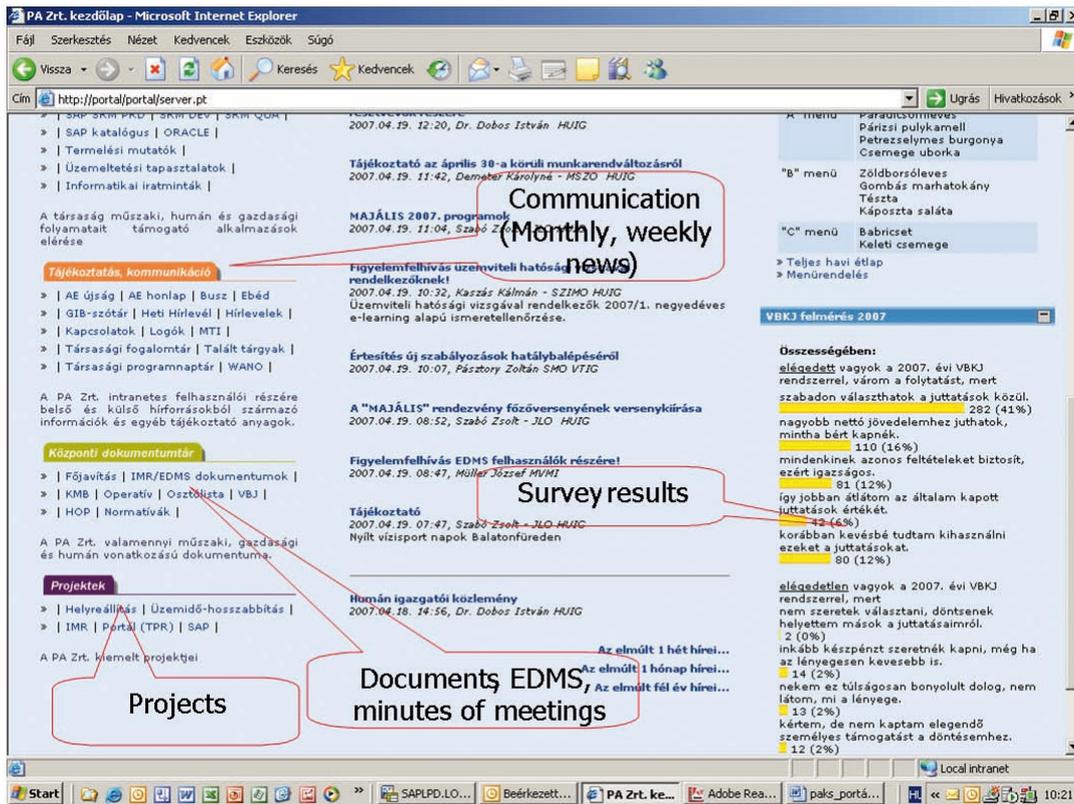


FIG. IV-3. Second part of the main page of the CPS at the Paks NPP.

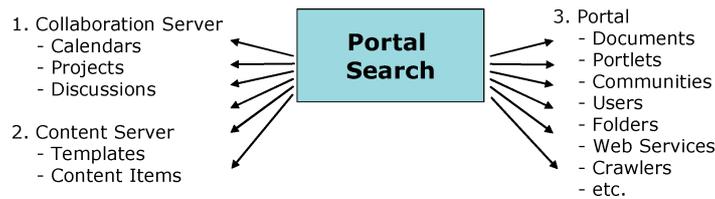


Fig. IV-4. The search overview of the portal.

Annex V

EVALUATION OF SOFTWARE PLATFORMS FOR THE KAEC PORTAL, KAZAKHSTAN

The Kazakhstan Atomic Energy Committee (KAEC) is developing a new portal product, which could serve their day-to-day activities, help to support working processes and to manage the documentation. The information below provides an evaluation of a number of commercial business portal products and could be used by other organizations for similar tasks.

V-1. GENERAL REQUIREMENTS FOR THE PORTAL PROJECT

KAEC strives to obtain a software installation that is both commercially competitive and sustainable. Preference will therefore be given to software solutions that are implementations or adaptations of well-established products. In order to reduce the risk of failure, only well established product vendors and implementers with proven, relevant experience were considered. Successful bidders must be able to give long term warranties regarding the performance of the products and must be able to provide on-site support at the location of the installation. The general criteria restrict the choice of software solutions to established mainstream products whose support network extends to Kazakhstan. Suitable support may be provided by the software producer or by the vendor/implementer or both. Although the initial implementation of the portal will be in Russian, stored documents can be in any language. The document management system must be able to store and handle documents in any language and the portal system must potentially support multilingual operation in Russian, Kazakh and English and handle the respective character sets. Although a multilingual interface is not foreseen for the initial implementation, the option should exist for a future upgrade.

V-2. SPECIFIC CRITERIA

For the initial installation at KAEC, the following features and functionalities of the portal software are considered essential.

V-2.1. Portal security, single sign-on and access rights management

The portal software must support the following requirements:

- Access control to document storage needs to be rigorous;
- Confidential documents need to be encrypted in storage and during transmission;
- All network transmission must be encrypted, including the transmission of login details;
- If the portal offers communication channels such as instant messaging or internal email, etc., then these communication channels must be encrypted as well.

V-2.2. Portal website with content management system

KAEC's intranet site is part of the information portal. The portal web site must support the following requirements:

- The content management system must be suitable for decentralized content management. Only basic IT knowledge should be needed in order to maintain contents.
- Page design and layout are separate from content management. A consistent look and feel will therefore automatically be enforced throughout the website
- Depending on an individual's access rights, all or only some of the portal's functionality and contents will be shown on the intranet site.

V-2.3. Document management system that supports document workflow and records management

Document workflow facilitates the creation and maintenance of documents by providing:

- Version control;
- Access control during document creation and editing;
- Automatic notification on status change;
- Integration of MS Office applications;
- A joint work environment for document creation.

V-2.4. E-library application with access control and metadata model

The e-library application must implement at least some minimal access control mechanism. Important criteria are a powerful, yet easy to use, user interface and advanced search functionality. The e-library should support an appropriate metadata model.

V-2.5. Business workflow

The business workflow module of the KAEC portal must support the tasks of the licensing process at KAEC. This involves interactions with counterparts outside KAEC. The basic functionalities of the module are:

- Form editor;
- Workflow editor;
- Progress tracking;
- Reporting and archiving.

V-3. EVALUATED PRODUCTS

The following products have been considered for the portal:

- BEA WebLogic Portal;
- IBM WebSphere Portal Server;
- Microsoft SharePoint Portal Server;
- OpenText LiveLink ECM;
- Oracle Application Server;
- SAP mySAP Enterprise Portal;
- Sun Java System Portal Server.

Limited resources restricted the evaluation to consultations of publicly available information on the Internet. Individual in-depth inspection and testing of the products was not possible.

The main sources of information for the evaluation of portal software were the respective websites of the vendors and Gartner's report "Magic Quadrant for Application Infrastructure for New Service-Oriented Business Application Projects, 2Q07".¹

V-4. OPEN SOURCE PORTALS

The main advantage open source software promises, compared to commercially available products, is that of cost savings, since no licensing fees apply. On the other hand, it might be difficult to obtain official support

¹ <http://mediaproducts.gartner.com/reprints/beat/vol2/article3/article3.html>

from the software producers. Although there are many companies who specialize in providing support for open source products, the cost for adequate third party support might outweigh the savings in licensing fees.

For the KAEC portal the following open source offerings were considered:

- Drupal (<http://drupal.org/>);
- Joomla! (<http://www.joomla.org/>);
- Mambo (<http://source.mambo-foundation.org/>);
- MediaWiki (<http://www.mediawiki.org/wiki/MediaWiki>);
- OpenPHPNuke (<http://www.openphpnuke.com/>);
- PostNuke (<http://www.postnuke.com/>);
- TYPO3 (<http://typo3.org/>).

Closer examination revealed that all of the above listed products provide mainly content management for websites. Beyond that, they lack almost all the required properties for KAEC's corporate portal. None of the listed providers can therefore be considered to offer a comprehensive solution for the KAEC portal.

Specialized companies² offer comprehensive business portal solutions based on a heterogeneous open source environment. It is, however, doubtful that the extra maintenance costs for a heterogeneously built business portal would compare favourably with the savings in licensing fees as compared to commercial portal solutions.

V-5. EVALUATION

On most vendors' portals it is difficult or even impossible to locate such essential business information as a listing of the functional features of their portals. Pricing information could only be located on the website of SUN.

Given the fact that the portals of most portal providers, in spite of the large number of available web pages provide only limited information, it was not possible to determine in the scope of this report whether all the solutions considered conform with the stated requirements for the KAEC portal.

The three software systems that fulfil the requirements for the KAEC portal most closely are:

- Microsoft SharePoint Portal Server;
- OpenText LiveLink ECM;
- Sun Java System Portal Server.

Open source portals have been considered, but have been discarded as too support intensive to be economically viable.

OpenText LiveLink ECM promises to support the requirements well (except for Russian language support which could not be determined). E-Library and archival applications, which are important issues for KAEC, are strong points of LiveLink ECM.

Microsoft (MS) products are generally available in many localizations including Russian. MS also provides support and training in that language. Given the extensive use of MS products (e.g. MS Word, MS Excel, MS Access, MS Project) at KAEC, specific advantages of the MS SharePoint Portal Server include the easy integration of previously produced documents and reduced training needs for the personnel at KAEC.

² For example see: <http://www.lightwerk.com/en/>

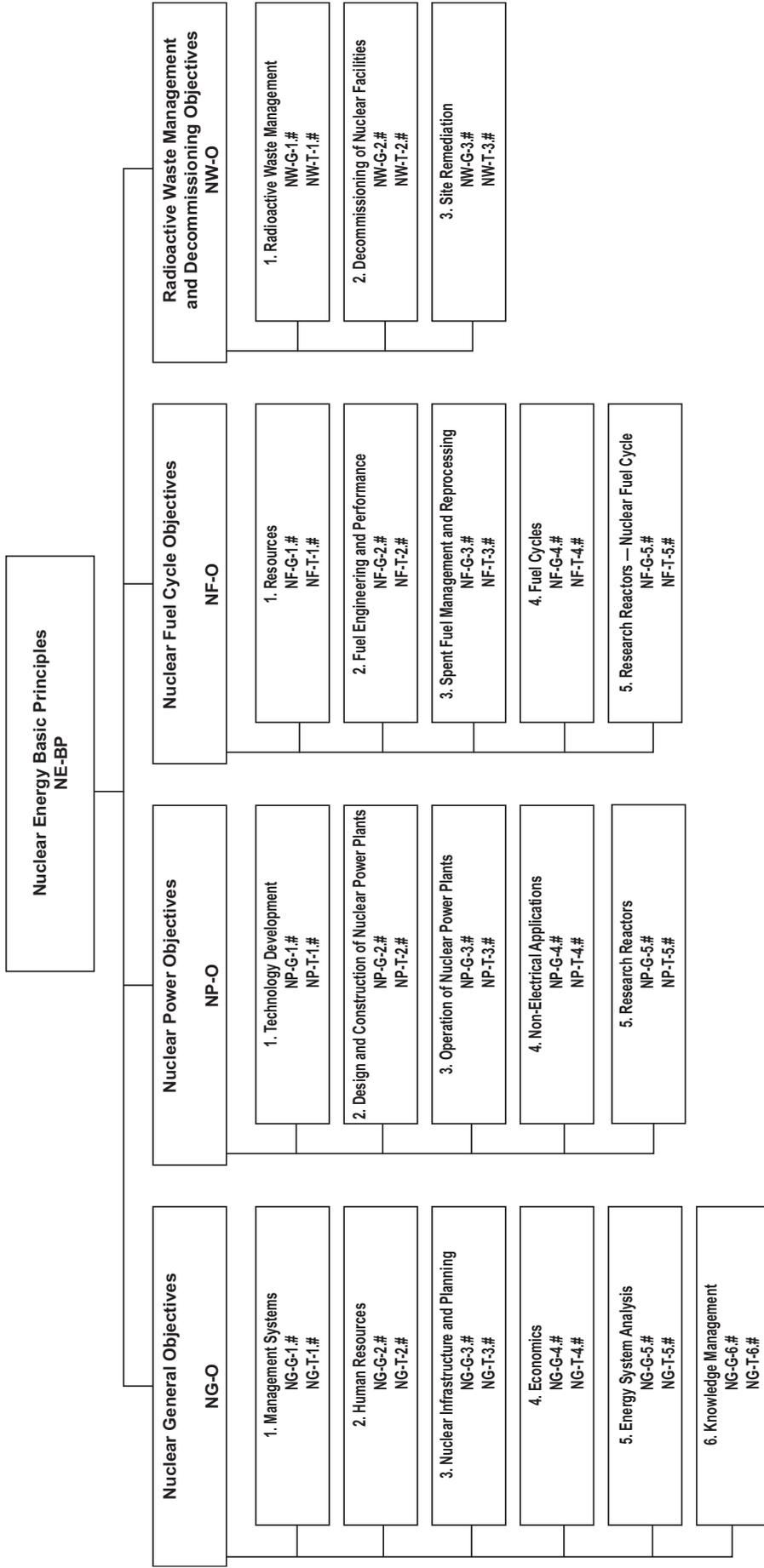
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Consultants Meeting

Vienna, Austria, 26 February–2 March 2007

STRUCTURE OF THE IAEA NUCLEAR ENERGY SERIES



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**INTERNATIONAL ATOMIC ENERGY AGENCY
VIENNA
ISBN 978-92-0-113008-2
ISSN 1995-7807**