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TEMPLATE FOR PROPOSAL UNDER DERRI

User-Project Proposal:

User-Project Acronym	GSSSI-EDU
User-Project Title	Generic Strategy for Standards-based System Integration for Electric Distribution Utilities
Main-scientific field	Smart grid
Specific-Discipline	System integration

Lead User of the Proposing Team:

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Activity type and legal status* of Organization	EIMV - Milan Vidmar Electric Power Research Institute is an engineering and scientific-research organization acting in the area of electric power engineering and general energy. Legal status: private not-for-profit research organization (3)
Position in Organization	Researcher

* Higher Education Institution (1) – Public research organization (2) – Private not-for-profit research organization (3) – Small or Medium size private enterprise (4) – Large private enterprise (5) – other (specify)

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Activity type and legal status* of Organization	Distribution System Operator Legal status: Joint Stock Company
Position in Organization	Assistant

* Higher Education Institution (1) – Public research organization (2) – Private not-for-profit research organization (3) – Small or Medium size private enterprise (4) – Large private enterprise (5) – other (specify)

(Repeat for all Users)

Date of submission	29 November 2012
Re-submission	YES_____ NO___X____
Proposed Host TA Facility	EDF infrastructure (Digi²tal)
Starting date (proposed)	1 February 2013

Summary of proposed research (about ½ page)

The key to success of the smart grid concept is the combined use of state-of-the-art technologies and solutions, which requires efficient information exchange among various intelligent devices and information systems within the enterprise, as well as the exchange of data between companies acting in the energy market. Distribution is the most affected domain by the Smart grid implementation, however the IT systems supporting distribution power system operation and control, metering, planning, maintenance, asset management and other processes, suffer from insufficient level of integration and interoperability. This is especially true for the information level of the integration stack, where a common semantic (i.e. Common Information Model) should be applied in the scope of an appropriate integration platform. Appropriate methodologies and standards are well defined in the Smart Grids Reference Architecture and related work done by CEN-CENELEC-ETSI Smart Grid Coordination Group, however a generic strategy for the distribution utilities on how to gradually reach a satisfactory level of system integration needs to be developed. Developing a generic strategy, which will be suitable for use in European distribution utilities, is the main objective of this project.

State-of-the-Art (about 1 ½ page)

Smart grid deployment requires a good standardization framework as there will be many intelligent devices and systems that must be interconnected and thus interoperable. European Commission has been aware of this, so the standardization mandate to European standardization organizations (CEN, CENELC, ETSI) [1] to support European Smart Grid deployment has been issued. As a result, the first set of standards [2] and the Smart Grids Reference Architecture [3] were published this month by CEN-CENELEC-ETSI Smart Grid Coordination Group.

In the scope of this project - according to Smart Grids Architecture Model (SGAM) defined in [3] - we are dealing with Operation and Enterprise zones of the SGAM Smart Grid Plane – that is the place where our systems, that need to be integrated, reside. As we look further into the Smart Grids Reference Architecture, IEC 61968 and 61970 standards are relevant for the Information layer and IEC 61968-100 for the Communication layer [2]. Therefore, the integration should be based on the Common Information Model (CIM) and on technologies commonly used for enterprise integration (SOA, Enterprise Service Bus (ESB) technologies, etc.).

The use of CIM and related integration technologies have already been studied [4]-[12]. There have also been many implementations, but they have been mostly related to the transmission power system. Deploying CIM in distribution is more challenging, as we must usually deal with

huge power networks (MV and LV) with a very large data model of geographically dispersed elements, unbalanced three-phase, two-phase, and single-phase systems, many systems which need to be integrated (SCADA, DMS, GIS, AMI, analytical tools, asset management systems, etc.) and many for the distribution specific processes, for instance, processes related to end users, demand side integration, etc. The IEC 61968 series of standards extend the CIM to meet the needs of electrical distribution and a special CIM profile for distribution named "Common Distribution Power System Model" has also been defined [11]. This work has been strongly supported by EDF and the results were implemented in the scope of the DIGI²TAL platform [4].

Despite all research and availability of the standardization framework most European distribution utilities are still left in cold as there is no generic strategy or roadmap available on how to deploy CIM and how to integrate their crucial systems in the Operation and Enterprise zones. Some good starting points were given in [6] as a 10 step implementation plan for the CIM within a wider strategy of enterprise information management. But further research is needed as well as deliverables dissemination and experience sharing.

References

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[12] Uslar, M.; Rohjans, S.; Specht, M.; Vázquez, J.M.G.; , "What is the CIM lacking?," Innovative Smart Grid Technologies Conference Europe (ISGT Europe), 2010 IEEE PES , vol., no., pp.1-8, 11-13 Oct. 2010

[13] Report on the CDPSM 2011 CIM-XML Interoperability Test, Final Report, UCAIug, June 25, 2012

Detailed Description of proposed project : Objectives – Expected Outcome – Fundamental Scientific and Technical value and interest (2-3 pages)

Optimal information exchange among key systems of a Distribution System Operator (DSO) is required to guarantee safe, secure and reliable power supply in an economically efficient manner. The major DSO's systems which support basic processes like operation and control, planning, metering and maintenance, etc. are:

- SCADA and DMS (Supervisory Control and Data Acquisition and Distribution Management System),
- Geographic Information System,
- Software tools to analyze, plan, optimize and simulate the power grid,
- Asset Management System,
- Workforce management,
- Advanced Metering Infrastructure.

The optimal information sharing among above listed systems is not possible, if the systems integration level is not sufficient as is the case in many European distribution system operators. With the deployment of various Smart Grid elements the situation is getting even worse. Even though the standardization framework has been well defined in the latest work done by CEN-CENELEC-ETSI Smart Grid Coordination Group, the roadmap on how to reach a satisfactory level of system integration when dealing with both existing as well as legacy systems is still unclear.

The main objective of this project is to develop a generic strategy for European distribution utilities on how to gradually reach a satisfactory level of system integration.

The strategy will be based on the guidelines and standardization framework defined in the Smart Grids reference Architecture developed by CEN-CENELEC-ETSI Smart Grid Coordination Group. The main focus will be on implementing the Common Information Model in accordance with IEC 61968/61970 for the information layer of the integration stack.

Actual contextual model - Common Distribution Power System Model (CDPSM) should be used to guarantee 3rd party software integration. The contextual model being used must comply with latest interoperability (IOP) tests [13].

Main topics in the expected outcome will be:

- Data engineering: Implementing a Common Information model (CIM) requires that a distribution utility first analyzes how existing data will be mapped to the CIM. A careful analysis on how existing data and systems will be modified, wrapped, or replaced, should also be performed. Handling data of new emerging technologies (e.g. electromobility, etc.) must be considered.
- System engineering: An appropriate integration platform using technologies commonly used for enterprise integration must be selected. Determining “data ownership” - what systems are supplying and/or consuming the CIM data is of key importance in order to avoid data-islanding and duplication. Analysis needs to be done to discover who should maintain that data and how it will be accessed. The handling of globally unique data

identifiers (Master Resource-ID) and mastering model version migrations will also be discussed.

- Organizational changes: The main question here is how to coordinate the data and system engineering activities across the utility, for instance: should a new organization unit be established, etc. Dealing with data and system engineering issues must be seen as a sustainable process in the utility.

The main outcome will be a generic strategy – a roadmap - for distribution system operators on how to deploy CIM and how to integrate their systems. The roadmap will be tested on the related ongoing project at Slovenian DSO Elektro Gorenjska. Dissemination of findings and experience sharing is of high importance.

The TA infrastructure, that is to be considered, must have CIM for distribution implemented. It should be based on technologies commonly used for enterprise integration (SOA, ESB).

Additional requirements for the TA infrastructure:

- full and incremental distribution model exchange in accordance with Common Distribution Power System Model must be supported,
- GIS (geographical data) exchange must be supported,
- tools for analyzing distribution network should be available,
- remote access to the infrastructure should be granted during the project period,
- CIM UML versions greater than 15 (IEC 61970) and 11 (IEC 61968) should be used.

Apart from the usual risks involved in the implementation of each project, we haven't foreseen any additional risks especially regarding the TA infrastructure which we are proposing in the section "Proposed Host TA Infrastructure/Installation". Both, the TA infrastructure as well as the proposed GSSI-EDU project have long-term vision.

Originality and Innovation of proposed research – Broader Impact (1-2 pages)

Standard-based system integration is the very cornerstone of the Smart grid concept. Without it the expectation towards Smart grid deployment cannot be met. In a broader sense, this would represent a serious threat to the European energy policy and would impact:

- *sustainability* by failing to achieve European environmental goals,
- *competitiveness* due to loss of efficiency and competitiveness of the energy market and
- *security of supply* due to inability to integrate renewable distributed energy resources into the distribution network on a very large scale.

Standard-based integration in accordance with European Smart Grids Reference Architecture and standardization framework should be promoted. Distribution utilities should be able to recognize benefits and to see a clear road path on how to approach to such projects. Developing road maps, promoting and experience sharing are crucial to achieve a sufficient degree of system integration, which will allow European Smart grids to expand to their full potential.

Proposed Host TA Infrastructure/Installation – Justification (about one page)

Proposed Host TA infrastructure: EDF **D**istrIbution **G**rid **I**ntelligence **I**n**T**egr**A**tion **L**aboratory [Digi²tal] in Clamart.

Digi²tal platform is composed of many applications that are integrated based on common semantics. The platform implements CIM for distribution. Electricité De France R&D has invested in IEC TC57 (CIM) standards since 2003 through several projects and has proposed to structure ERDF information system according to IEC 61968-1 Interface Reference Model. EDF R&D has developed ERDF CIM Information Exchange Model (internally called MSITE) that is synchronized with CIM for distribution according to IEC 61968-11. The platform is oriented towards technologies commonly used for enterprise integration.

Digi²tal portal (Digital DIstribution Grid Intelligence InTegrAtion Laboratory) is an Intranet portal published by the MIRE department from EDF R&D which gives access to :

- a catalogue of electrical network files that can be converted to various formats used by EDF;
- software developed by EDF for analyzing and planning electrical networks (PRAO,...);
- software from the electrotechnical and digital simulation sphere (EMTP, Eurostag,…);
- logistical tools to gather and share knowledge and problem reporting (knowledge management, Wiki, Bugzilla,…).

Remote access to the portal is possible.

Components of the Digi²tal platform: PRAO (MV planning Tool), Matlab-PSAT CIM API (MV DMS loadflow), GEDEON (EDF R&D CIM Database)) participated in CIM CDPSM 2011 interoperability (IOP) tests and have performed successfully [13].

The tests were designed to demonstrate and verify that the participants were able to successfully exchange power system network models using the IEC 61968-13: CIM Network Application Model Exchange Specification (CDPSM) and corresponding standards from IEC 61968 and 61970 sets. CIM UML versions used for the IOP were: IEC 61970 15v19 and IEC 61968 11v09.

Synergy with ongoing research (about ½ page)

Slovenian Distribution System Operator Elektro Gorenjska has started a pilot project "CIM for Elektro Gorenjska". This is a first project dealing with CIM for distribution in Slovenia. The company plans to get acquainted with CIM for distribution as well as obtain some experience on a pilot project and examine different possibilities of integrating systems in the enterprise in accordance with the concept of Seamless Integration Architecture (SIA). It is expected that the pilot project will provide experience which will serve as a basis for an estimate on how many phases, how much time and how much resources will be required to achieve systems integration in the enterprise in accordance with the SIA concept. The experience achieved in the pilot project will also provide an overview of existing interoperability between different systems, the organization of existing data, the quality of inner and outer human resources, etc. EIMV participates in the project as a consultant.

The implementation of CIM in a distribution utility is a difficult task, therefore the project has been divided into multiple phases. Phase 1 intends to provide a study in which a presentation of the Common Information Model for Distribution will be included, as well as an overview of the standardization framework provided by IEC and CENELEC TC57, an overview of existing tools related to CIM and an estimate of required resources and a schedule for phase 2.

The aim of the project "CIM for Elektro Gorenjska" is to establish a standard-based integration of technical information systems in the enterprise with the goal of providing a standardized information platform for future technical and business applications which intend to optimize and rationalize processes in the enterprise. The project represents a difficult, complex, long-term, multidisciplinary and a continuous path to the appropriate ultimate goal.

Deliverables of this project (GSSSI-EDU) – the generic roadmap on how to approach the topic - would be of great help. On the other hand - the roadmap could be tested within the scope of "CIM for Elektro Gorenjska" project.

Dissemination – Exploitation of results (about ½ page)

It's very important, that the experience will be shared, so the dissemination of deliverables is of high importance. The research output from the project will be published in journals/conferences. It will also be published on the project website. A forum will be set up on the website for discussion and experience sharing.

Time schedule (about ½ page)

In order to get acquainted with the Digi²tal platform, we would like a 2-day training and experience sharing discussion at EDF Research & Development in Clamart. These two days will help us and EDF to define the best personalization of the DIGI²TAL for our use, and to learn how to use it.

After the training and discussion days, the use of Digi²tal will be performed remotely at EIMV by 2 users. Remote access to Digi²tal portal should be granted during the project period.

The proposed target starting date of the project is 1 February 2013. The project will last 6 months.

Description of the proposing team (as long as needed)

Lead User of the Proposing Team

Andrej Souvent received B.Sc. degree in electrical engineering in the field of automatics and process informatics from the University of Ljubljana, Slovenia in 1999. After graduation, he had been working as an engineer at private companies in the field of process automatics and informatics, working mostly for industrial clients and distribution utilities. Since 2007 he has been employed as a researcher by EIMV – Milan Vidmar Electric Power Research Institute, Ljubljana.

His research is focused on smart grids technologies and solutions, process informatics, system integration, distributed generation remote supervision and control and other issues of operation, control and maintenance of secondary systems of the overall electric power system. He is a certified engineer, member of Slovenian chamber of engineers and head of a mirror technical committee TC57 (Power systems management and associated information exchange) at Slovenian Institute for Standardization.

He co-authored Slovenian Smart Grid Implementation Roadmap [1] [2] (he contributed chapters System integration and Advanced Metering Infrastructure [2]) and has participated in the first Slovenian projects in the area of Smart grids.

Selected references related to this project:

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Complete personal bibliography can be accessed online at:
http://splet02.izum.si/cobiss/BibPersonal.jsp?lang=eng&init=t

Member of the Proposing Team

Nejc Petrovič received a B.Sc. degree in electrical engineering in the field of power engineering at the University of Ljubljana, Slovenia in 2012. After graduation he had been employed as an engineer at a power distribution company Elektro Gorenjska, Kranj. His work focuses on researching smart grids technologies and solutions with the main focus on systems integration. He is also a member of a mirror technical committee TC57 (Power systems management and associated information exchange) at the Slovenian Institute for Standardization.