Go Nuke Slovakia!

Data Systems & Solutions
July 2003
DS&S Historical Overview

I&C: 25+ digital RPS’s, 80+ NPP’s I&C products (e.g. SPINLINE-3 I&C)
35+ turbine/generator controls
85+ Plant Information Computers, Software, Simulators BWR / PWR / VVER / AGR / MAGNOX / RBMK

IT Services: Data Base Integration --- PERFORMA
Automation Tools --- CORA
“Paperless NPP”

Risk Analysis: Off-line & On-line Risk Management Systems--- EOOS

Asset Management: Nuclear Asset Management --- integrated concept

Engineering: Services, Support, Analyses

SAIC 41,000
DS&S / USA: 300 HQ / Reston, VA
R&R 42,000
DS&S / UK: 400 Gateshead
DS&S SES / F:200 Grenoble

50% Purchased

Schneider Group SES Grenoble

50%
There are five prime product and service areas

- **Nuclear Engineering Projects**: control and monitoring systems, real-time plant process computers, major nuclear I&C engineered upgrades (Ignalina, PPCs, Turbine Governors, AVR Excitation)
  - 100 employees, operations in Gateshead, UK, and Huntsville, Alabama;

- **Simulation and Analysis**: training simulators and engineering modeling tools for nuclear and fossil plants (SIMPORT, RELAP5, CAFTA, RBDA)
  - 35 employees; based in Frederick, Maryland;

- **DS&S, France (SES)**: nuclear instrumentation and control, reactor protection for nuclear power stations (PWR, BWR, VVER, RBMK, Research, Naval PWR’s)
  - 200 employees, offices, training and manufacturing in Meylan and Poisat, Grenoble, France;

- **Engineering Consulting Services**: consulting services and software for risk management and operational efficiency (CORA, MMW, PERFORMA, EOOS, R&R Workstation, Nuclear Asset Management)
  - 35 employees, offices in Los Altos, California; Houston, Texas and Prague, Czech Republic;

- **Nuclear Asset Management**: all offices; adapting the products and technology to provide wholistic risk-informed decision making.
Sizewell B Nuclear Power Station:
Instrumentation and Control Contracts

- Design
- Process plant control & instrumentation
- Primary protection system
- Secondary protection system – nucleonic
- Nuclear sampling
- Reactor building fans C&I
- Load shedding control
- Turbo-generator C&I
- Mechanical installations
  - Pipework
  - Racks and panels
  - Pumping systems
Torness Nuclear Power Station: Instrumentation & Control Contracts

- Design
- Main control room and EIC desks & panels
- Flux measurement systems
- Reactor coolant C&I
- Post trip sequence systems (X & Y train)
- Essential plant protection equipment
- Fuel route
- Reactor analysis system
- Turbine island
- Seismic monitoring
q Delivery of Reactor Protection Systems for NPPs in France (EdF)

q Installation of Spinline in many countries including Lithuania, Brazil, Belgium, China, etc.

q Complete replacement of Nuclear Instrumentation and Control System for Dukovany NPP, Czech Republic
List Of Projects For Russian Designed Reactors

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>COUNTRY</th>
<th>FUNDING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PPC Replacement:</strong></td>
<td></td>
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<tr>
<td>Ignalina NPP Unit 1</td>
<td>Lithuania</td>
<td>EXIM bank</td>
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<tr>
<td>Ignalina NPP Unit 2</td>
<td>Lithuania</td>
<td>EXIM bank</td>
</tr>
<tr>
<td>Armenia NPP</td>
<td>Armenia</td>
<td>DOE</td>
</tr>
<tr>
<td>Kalinin NPP UNIT 2</td>
<td>Russia</td>
<td>TACIS</td>
</tr>
<tr>
<td>Balakovo Units 1&amp;2</td>
<td>Russia</td>
<td>TACIS</td>
</tr>
<tr>
<td><strong>Development of Strategy</strong></td>
<td></td>
<td></td>
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<tr>
<td>For PPC Replacement</td>
<td>Lithuania</td>
<td>EBRD</td>
</tr>
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# List Of Projects

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>COUNTRY</th>
<th>FUNDING</th>
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</thead>
<tbody>
<tr>
<td>Novovoronezh NPP Unit 3</td>
<td>Russia</td>
<td>DOE</td>
</tr>
<tr>
<td>Novovoronezh NPP Unit 4</td>
<td>Russia</td>
<td>DOE</td>
</tr>
<tr>
<td>Novovoronezh NPP Unit 5</td>
<td>Russia</td>
<td>DOE</td>
</tr>
<tr>
<td>Ignailina NPP Unit 2</td>
<td>Lithuania</td>
<td>DOE</td>
</tr>
<tr>
<td>Armenian NPP</td>
<td>Armenia</td>
<td>DOE</td>
</tr>
<tr>
<td>Kalinin NPP Unit 2</td>
<td>Russia</td>
<td>TACIS</td>
</tr>
<tr>
<td>Balakovo Unit 1, 2</td>
<td>Russia</td>
<td>TACIS</td>
</tr>
</tbody>
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## List Of Projects

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<tr>
<th>PROJECT</th>
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<tbody>
<tr>
<td>Reactor Protection System</td>
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</tr>
<tr>
<td>Novovoronezh NPP Unit 5</td>
<td>Russia</td>
<td>EU</td>
</tr>
<tr>
<td>Ignalina NPP Unit 2</td>
<td>Lithuania</td>
<td>EU</td>
</tr>
<tr>
<td>Armenian NPP(detectors)</td>
<td>Armenia</td>
<td>EU</td>
</tr>
<tr>
<td>Reactor Related I&amp;C Replacement</td>
<td></td>
<td></td>
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<tr>
<td>Dukovanny NPP</td>
<td>Czech</td>
<td>CEZ</td>
</tr>
<tr>
<td>Verification &amp; Validation</td>
<td></td>
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<tr>
<td>I&amp;C</td>
<td>Temelin</td>
<td>CEZ</td>
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<tr>
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<tbody>
<tr>
<td>Rad Monitoring System</td>
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<tr>
<td>Ignalina NPP external</td>
<td>Lithuania</td>
<td>EBRD</td>
</tr>
<tr>
<td>Ignalina NPP internal</td>
<td>Lithuania</td>
<td>NPP</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental Monitoring System</td>
<td>Kazakhstan</td>
<td>WorldBank</td>
</tr>
</tbody>
</table>
# List Of Projects

## In-Depth Safety Analysis

<table>
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<tr>
<th>PROJECT</th>
<th>COUNTRY</th>
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</tr>
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<tbody>
<tr>
<td>Kola NPP</td>
<td>Russia</td>
<td>DOE</td>
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<tr>
<td>Novovoronezh NPP</td>
<td>Russia</td>
<td>DOE</td>
</tr>
<tr>
<td>Kursk NPP</td>
<td>Russia</td>
<td>DOE</td>
</tr>
<tr>
<td>Khmelnitsk NPP</td>
<td>Ukraine</td>
<td>DOE</td>
</tr>
</tbody>
</table>

Several NPP Projects under INSP Program:  
e.g. reliability databases,  
symptom oriented instructions  
Russia, Ukraine  
DOE
## List Of Projects For FSU

### Crisis Centers

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>COUNTRY</th>
<th>FUNDING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crisis Center for Regulatory Body</td>
<td>Ukraine</td>
<td>DOE</td>
</tr>
<tr>
<td>Crisis Center for Regulatory Body</td>
<td>Russia</td>
<td>DOE</td>
</tr>
</tbody>
</table>
List Of Projects For Czech Republic

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>NPP</th>
<th>CUSTOMER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Analysis, Level 2 PSA</td>
<td>Dukovany</td>
<td>BNL, DOE</td>
</tr>
<tr>
<td>Risk-Based Tech. Specs.</td>
<td>Dukovany</td>
<td>SUJB</td>
</tr>
<tr>
<td>Safety Analysis, Level 1 PRA</td>
<td>Dukovany</td>
<td>IAEA, DOE</td>
</tr>
<tr>
<td>I&amp;C replacement</td>
<td>Dukovany</td>
<td>CEZ</td>
</tr>
</tbody>
</table>
## List Of Projects For Slovakia

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>NPP</th>
<th>CUSTOMER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk and Reliability Workstation</td>
<td>UJD</td>
<td>PNL, DOE</td>
</tr>
<tr>
<td>Risk Monitoring</td>
<td>Bohounice</td>
<td>SE</td>
</tr>
<tr>
<td>Safety Analysis Level 1, PRA</td>
<td>Mochovce</td>
<td>SE, VUJE</td>
</tr>
<tr>
<td>Simulator Upgrade with VUJE</td>
<td>Slovakia</td>
<td>DOE</td>
</tr>
</tbody>
</table>
ESG Products & Services

Putting you in control of information so you can better manage your operation

Support

Protect

Control

Inform

Automate

Enterprise

Core

Nuclear Asset Management for your plant and fleet

Helping you plan future strategies for success

Monitoring and analyzing critical operational information to reduce costly unplanned events

Engineering services to help you run plant operations

Systems to monitor and control equipment and ensure your plant's safety

Paperless data collection and mobility solutions

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Systems to monitor and control equipment and ensure your plant’s safety
Products & Services

- Digital Instrumentation & Controls Systems
  - SPINLINE3-Reactor Protection, Rod Control, Secondary Shutdown Systems
  - Neutron Flux Detectors, Boron & Reactivity Meters & other SES products

- Turbine/Generator Controls
  - Automatic Voltage Regulators (AVRs)
  - Electrohydraulic Governors (EHGs)
  - Excitation Systems
  - Programmable Logic Controllers

- Plant Computers, Rad Monitoring, Rod Position Indication, etc

- Simulators and Safety Analysis

- Plant Automation and Risk Management Systems

- Security Products
Product Summary –
SE Systems & Equipment

- N4 NPP safety systems (1E), safety related systems:
  - Large installed base in France
  - International references include:
    - Dukovany – in progress
    - Ignalina Unit 2 DSS
    - Novovoronesh RPS-in progress
    - Koeberg 1 & 2 (So. Africa),
    - Uljin 1 & 2 (Korea),
    - Doel 1-4,
    - Tihange 1-3 (Belgium),
    - Daya Bay 1 & 2, Ling Ao 1&2, Qinshan I&II (China),
    - Kozloduy 3 & 4 (Bulgaria),
    - Medzamor (Armenia)
EDF NPPs safety I&C systems in France

- 1970
  - 900 MW
  - analogue
  - relaying
  - CP0-1-2

- 1980
  - 1300 MW
  - 8 bits Motorola microprocessors
  - point-to-point links
  - assembler
  - P4

- 1990
  - 1450 MW
  - 16 bits Motorola µP
  - NERVIA networks
  - SAGA SDE
  - N4

- 2003
  - KOZLODUY
  - FESSENHEIM
  - BUGEY
  - QINSHAN
  - TIHANGE
  - DUKOVANY
  - IGNALINA
  - Novovoronesh
  - 32 bits Motorola µP
  - NERVIA networks
  - CLARISSE SSDE

SPINLINE 3 unique experience
Product Summary – TG Island Products

- Complete tool kit of capabilities to control, protect and monitor the health of the turbine and generator

- Automatic Voltage Regulators (AVR)/Excitation Systems
- Electro-Hydraulic Governors (EHG)
- Electronic Overspeed Trips (EOST)
- Generator Core Condition Monitors (GCCM)

Diagram:
- Electronic over speed trip
- Electro-hydraulic governor
- Turbine supervisory equipment
- Excitation systems
Paperless data collection and mobility solutions
Integration Concept

AutoLog

AutoScheduler

AutoTour

AutoSpec

MRViewer

EQOS

Shift complement

Log entries composed on HHC

List of relevant LCOs and Tech Specs

Up-to-date equipment out of service information

Tech Spec and LCO information for risk model

List of relevant LCOs and Tech Specs

Plant Network

PPC Points

Plant Apps

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Product Summary - AutoTour

q RoundsMaker
  β prepare field action lists, e.g., rounds

q AutoTour Host
  β store, review and approve and evaluate field collected data
  β data trending tool

q AutoTour on the HHC
  β execute field action lists, e.g., rounds, work orders
AutoTour Wireless Field Mobility Solution

- Batch Mobile Option
- Kona Bridge
- Wireless Networks
  - CDPD, CDMA, GSM, iDen, GPRS, 1xRTT, WiFi, etc.
- Kona Console
- Kona Bridge
- Kona Console
- Kona Console
- Kona Console
- Kona Console

AutoTour Application

Kona Shuttle

- Transactional Reliability
- Security
- Central Administration & Management
- Seamless Enterprise Integration
- Monitoring and Auditing Data
- Persistent User Experience
AutoTour Mobility Applications

- **Operator Rounds and System Engineering Walkdowns**
  - Collect accurate and timely information about asset condition to make “real time” assessments about component or system health
  - Receive new information associated with work to be performed on assets in round or walkdown
  - Trigger work requests and wirelessly transmit these to effectively schedule preventative and/or corrective maintenance activities (optimization and prioritization)

- **Work Order Field Mobility**
  - Wireless transmission of work task status enables commencement of dependent activities, as well as optimal scheduling of resources

- **Valve Checklists (using AutoAlign)**
  - Wirelessly execute nuclear startup procedures
    - Shave 1 to 2 days off outage

- **Inventory Management, Warehousing, Goods Request, and Ordering Material**
  - Track goods from warehouse to receipt by technician
  - Query and place orders for additional stock items
Monitoring and analyzing critical operational information to reduce costly unplanned events
Product Summary: Plant Computers-

- Full suite of plant monitoring systems and applications
- Modular open system architecture
- Single-train or redundant system to meet customer needs
- Can be linked to enterprise-level information systems
- Includes Process Computer, SPDS, Annunciator, Radiation Monitoring, Rod Position Indicator applications, etc.
Product Summary: Performa

- **Configuration Editor**
  - Connects data sources to Performa

- **Snapshot Agent**
  - Extracts data through the use of automated queries

- **Performance Assessment Module**
  - Data integration & analysis

- **Web Publisher**
  - Publishes output to web pages

- **Scheduler**
  - Schedules run-times for program & issues Email notifications
Product Summary: MMW/MRA

- **Importance Module**
  - Orders equipment by customer-defined measures of importance

- **Condition Indicating (CI) Module**
  - Calculates overall equipment condition using wear model algorithms

- **Ranking Module**
  - Combines importance and condition to produce an overall maintenance ranking
Example Application: Trending of Process Data

- Interfaces with popular historians (i.e. OSI’s PI, AspenTech IP2.1, DNA, etc.)
- **Equation Editor** to provide full trending capabilities and curve fits
- Set-up **alarms** for notification via the corporate e-mail system
- Data from multiple sources can be **combined** with process data
- Trends can be **automated** through Performa’s template function
- **Limit** lines can be added to easily determine out of limit conditions
- Graph **annotations** can be used to document event reconstruction
Helping you plan future strategies for success
EOOS
- predicts changes in plant availability and real time evaluation of risk from changing plant configurations

Simport
- simulates plant thermal hydraulic performance with full real time nuclear reactor transient reproduction
- provides real-time executive control, graphical engineering station, Instructor and Operator Station, full set of simulation modeling tools, panel graphics environment and diagram animation features

Other simulations and Engineering Analysis,
- RELAP5,
- CAFTA, RBDA, etc
Nuclear Asset Management for your plant and fleet
Nuclear Asset Management (NAM)

**NEI Definition**

Process for making resource allocation and risk management decisions at all levels of a nuclear generation business to maximize value / profitability for all stakeholders while maintaining plant safety.
NAM Community of Practice (NEI)

Data Acquisition Tools & Analysis

ER, WM MS, CM CoPs

INPO

NEI (Lead)

EPRI

Supplier Members (includes DS-S)

NAM CoP
- Update of Process Descriptions & Business Performance indicators
- Coordinate Activities
- Identify & Coordinate Issues
- Communicate Information

EUCG Data

Industry Data Bases

US and International Utility Member Companies
A Nuclear Success Story (source NEI)

Relative Cost/Risk

Capacity Factor

Based on UDI & NUS Data plus info. from ERIN Eng & EPRI
Asset Management in Nuclear

- Understanding plant conditions and fleet impact
- Standardizing performance
- Integrating information from disparate systems
- Predicting plant, system, and component performance
- Making better decisions that support a real strategy
ESG SW Products Enable Operations, Maintenance, and Engineering

**Engineering**
- System health monitoring, system walkdowns, Maintenance Rule evaluations, equipment reliability assessments, performance monitoring, risk-informed assessments and risk analysis
- **Performa/MMW, AutoTour, MRViewer, Simulator, R&R software**

**Operations (Control Room)**
- Plant system monitoring, narrative logging, rounds and general inspections, LCO tracking, configuration management, scheduling, “what if” analyses
- **PMS, AutoLog, AutoTour, AutoSpec, AutoAlign, AutoScheduler, EOOS**

**Maintenance**
- Work close-out, work planning, maintenance effectiveness/maintenance optimization
- **AutoTour, EOOS, Performa/MMW**

**Training**
- Practicing decision-making in simulated environments
- **Simulator, EOOS**
The Feedwater System Engineer’s homepage reflects emergent threat to FW Pumps.

The FW System Engineer drills down to view pump health indicators. Recent data shows that there are two new threats to FW pump health, affecting suction pressure and flow balance.

The FW System Engineer drills down from the suction pressure indicator to see recent data from the PPC. Spikes in the graph indicate a control system problem associated with spurious closure of the Heater Drain Level Control Valve.
The FW System Engineer confirms that the Recirculation Valves are in a SAT condition. He deduces that the pressure threat is compounded by a FW Heat Exchanger tube leak because of the RED status of the Flow Balance component health indicator.
Equipment Wear Models are created in the Maintenance Ranking Assessor (MMW) to scale the equipment failure probability. Wear models use real-time plant data to determine the wear of the equipment.

Automated feature: MRA uses the number of suction pressure spikes to periodically update the FW Pump wear model.
Automated feature: EOOS uses the output from MRA (updated equipment wear model) to recalculate unit trip risk.

Equipment Out of Service Monitor (EOOS)

Maintenance Ranking Assessor (MRA)

EOOS calculates the plant risk and unit trip risk, providing work planning decision support.
Systems to monitor and control equipment and ensure your plant’s safety
6. Representative Services

- Engineering (e.g., specialist I&C design, reliability, obsolescence, Safety Analysis)
- Risk-Informed Services
  - Performance-based leak-rate testing
  - Risk-based in-service testing
  - Risk-based technical specifications
  - Graded QA
- Plant Availability Modeling & Life Cycle Cost Modeling (LCCM) Services
- PRA Model Building & Maintenance
- Work Management System Implementation

A broad range of engineering support activities
DS&S maintains a leadership position in the development of risk informed applications through close cooperation with NEI, EPRI and other industry groups.

Recent and ongoing projects include:
- NEI’s Guidance for Risk Assessment of ILRT Interval Extensions.
- EPRI’s Spent Fuel Cask PRA Study
- PRA model updates at Entergy (4 plants)
- PRA Training at Brunswick
- Level 1 PRA and EOOS implementation at Cernavoda
- Level 1 PRA at Novovoronezh Unit 3
- Risk Informed MOV Evaluation for British Energy Sizewell
- Capacity factor loss model development for a US pilot utility
DS&S Industry Participation

- IAEA
  - Harmonization of VVER/RBMK PRA results
  - IPERS missions
  - PRA Software for China, Romania, Czech Republic, Slovakia
  - Risk-based Technical Specification evaluation for Dukovany and Bohunice NPPs

- Codes and Standards
  - ASME PRA Quality Standard
  - ANS Seismic and Shutdown Risk Standards
  - National Fire Protection Association (NFPA) Performance-Based Fire Protection

- Nuclear Energy Institute
  - Member
  - PRA Peer Review Certification
  - NAM Working Group Member

- International Generic Reliability Database project for WANO
Summary

- **You** already have the I&C and IT infrastructure...

- **we** have domain expertise and industry-leading products, which are the foundation for building Nuclear Asset Management tools that enhance plant **Availability, Safety, and Financial Performance**

So

Slovakia “Pust’me sa do toho”

GO Nuclear-with confidence