Slide Notes
Nuclear Asset Management

VVER 2004 Experience and Perspectives
19th – 22nd October
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Biography:

Mr. William Puglia has 12 years experience in the application of PSA techniques to address safety issues in VVER NPPs. In 1993, Mr. Puglia moved to Prague and was involved in the original PSA studies performed for the Dukovany and Bohunice NPPs. During the 8 years that he spent on his first assignment in Prague, Mr. Puglia was involved in PSA studies and related applications at the Dukovany, Bohunice, Mochovce, Novovoronezh, Kola, Khmelnitsky and played an active role in related IAEA initiatives. Mr. Puglia established the DS&S (formerly SAIC) office in Prague in 1995.

From 2000-2003, Mr. Puglia moved back to the USA to take a position as the Manager of the Nuclear SW & Services Division of DS&S. He managed a team of 30 engineers dedicated to software development, asset management support services and systems to the nuclear industry worldwide. During this time, he managed the DS&S internal research and development effort to develop its Nuclear Asset Management (NAM) prototype and delivered several highly successful NAM–related projects with several major US utilities.

After acquiring the Schneider Electric Nuclear business and the award of the Dukovany I&C Refurbishment contract in 2003, DSS made a decision to make additional investment its Prague business to make it a regional center to support delivery of all projects in Central Europe and the Former Soviet Union. In February 2004, Mr. Puglia returned to Prague to assume the position of Business Manager. He is currently Project Manager for NAM-related projects with Ringhals (Sweden) and Rolls-Royce Naval Marine (UK).

Mr. Puglia is happily married to a Czech wife and plans to make this his permanent home. In his presentation, Mr. Puglia will share his experience and present DS&S's approach to Nuclear Asset Management.

1. Cover Slide

The focus of this presentation will be on Nuclear Asset Management.

- Define & explain NAM
- Present financial benefits achieved in US industry over the past 12 years.
- Demonstrate NAM benefits in nuclear industry from DS&S client experience.

Examples will be provided

2. DS&S Company

- Established in 1999 as 50/50 JV between RR & SAIC
- We are finishing our 5th year as a company and have grown from 50M to 130M in revenue
- In 2003, we acquired the Schneider Nuclear business
- DS&S is delivering the RPS Upgrade at Dukovany and has delivered > $150M in projects to VVER reactors
- DS&S has a broad set of technology & services to the nuclear industry
- For example, with EDF DS&S has a long-term contract for the maintenance obsolescence management for I&C systems for the entire French nuclear fleet

3. NAM Definition

The NEI definition of NAM is provided on this slide.
NAM represents more than just investments in technology. Rather, NAM involves the smart application of technology to support smart decisions that will maximize profitability measured in terms of increased generation output.

In the slides that follow, I will explain what this means.

4. US Fleet Performance

Over the past 12 years, the US utilities (and several international ones) have worked together in the NEI NAM Taskforce to share information and experience, to measure performance, to identify best practice & improve process. This slide shows the results.

> Significant improvements have been achieved in plant performance in an environment of increasingly difficult regulatory and safety requirements
>
> Capacity Factor increase from 75% to 91.9% has resulted in 22,000 new MW (equivalent to 22 new operating units!) … while safety system failures and unplanned outages have been reduced dramatically

This presentation will talk about some of the techniques and methodologies that have been used to achieve these gains.

5. The Pyramid

The Pyramid is a framework that shows the components of asset management at each level of an organization. Blocks on each level work together to create value and support higher level practices. Benefits increase as you move up the pyramid ---

The lowest level, Maintenance Management is where you gain control of workflow & supply chain (purchasing, materials, etc.). This has been the primary focus in utilities for many years and it has been where most of the money has been spent in the implementation of computerized maintenance management systems (CMMS) such as Passport.

The middle level, Asset Reliability is where component-level reliability is improved through realizing best industry practices. The focus here is on improving reliability performance by

reducing unplanned failures through better field data collection, the use of PSA data and RCM techniques, condition monitoring, etc.

In theory, all of the systems should work together to allow communication back to the CMMS ("add intelligence") so that you are able to reduce costs and at the same time improve plant availability. In practice, this has been difficult for many utilities to achieve.

After the implementation of CMMS systems, many utilities actually experience a significant increase in cost as they tried to eliminate failures across the plant by increasing the amount of preventive maintenance (PM) performed. So even though the number of failures decreased, they were forced to reduce the amount of PM performed. This can turn into a cycle where plants are unable to achieve the cost benefits in Asset Reliability, or what I will call the "GLASS CEILING" where you can see the goal, but you can't make it there.

The reason for this is that CMMS systems are "transaction-based" systems that respond to scheduled events, not conditions.

It is the top layer of the pyramid, Asset Optimization that allows you to break through the "glass ceiling" between the first and second levels and maximize the overall performance of the plant (or the Fleet).

Life cycle cost (LCC) models are used to simulate plant generation output taking into account operating & maintenance costs, reliability behavior, spare parts usage, etc. and can be used to prioritize decisions and optimize costs.

With an effective Asset Optimization program in place, the key information from lower levels of the pyramid are integrated together to allow plant managers to optimize the allocation of resources and make decisions that will maximize enterprise value (i.e., increase generation output).

In the world of Asset Optimization, all decisions are made on the component importance to generation. This includes PM activities, spares inventories and how plant money is spent on capital investments to name a few.

With the knowledge gained from the Asset Optimization level, we are now able to use the systems in the second level (field data collection, RCM, etc.) to "add intelligence" to the CMMS system to achieve reduced costs, while at the same time improve safety.

6. Asset Mgt Strategy

This slide repeats the point I just made on the previous slide.

Breaking through the "glass ceiling" requires not only investment on good technology, but effective integration of information at all levels of the pyramid.

7. MacroMedia Demo

DS&S provides a comprehensive range of products and services to support Power Plant Asset Management - from data collection to decision support.

This demonstration is based on DS&S experience working with clients in the nuclear industry, and shows how the major components of asset optimization can be achieved.

The picture shows a typical energy fleet that may include a combination of nuclear, fossil and other generation assets, along with the various groups within the company that utilize data.

The buttons on the bottom show how DS&S transforms event and operating data into decision support information that improve performance across the fleet. Leveraging data in each step to break "glass ceiling" & provide management with information to support decisions

Efficient Data Collection

Here we are breaking through the “glass ceiling” by collecting data & doing more with it to communicate back and “add intelligence” to the CMMS

Operators are out in the field performing operator rounds on equipment. We are now leveraging that data to build information around inspections, configuration management, trending & data completion to build simulation models (thermal performance, failures).

<AUTOTOUR> DS&S’s AutoTour product is used by >50% of US NPPs to capture field maintenance data on a hand-held computer and integrates directly with the CMMS

Condition Monitoring

Here we are leveraging the data from digital control systems and the plant process computer (PPC) from systems already in place and building out the asset optimization strategy

Diagnostics

Here we are processing collected data to perform predictive analysis. This means using the data to diagnose conditions and support real-time decisions using simulation technology. Normally the various sources of data are in isolated “silos” and not used in an effective manner.

<EOOS> DS&S’s EOOS product is used by >70% of US NPPs by plant operations and maintenance staff to support on-line plant configuration management and maintenance activities

LCC

Here life cycle cost (LCC) management techniques are used to support decisions are made on the component importance to generation. This includes maintenance decisions on whether to let the equipment fail (run to failure), overhaul, or replace. LCC can also be used to optimize spares inventories and how plant money is spent on capital investments.

Data Mining & Visualization

Here the plant performance data is presented to staff at all levels of the organization via customizable web pages, including drill down capabilities, data mining and other analytical processing features.

Services

DS&S offers a variety of services from the development including fleet-wide process data integration and equipment obsolescence management.

8. Duke Example

Duke is a large fleet nuclear operator in the USA with a total of 7 nuclear units at the Catawba, Kewanee and Oconee stations.

DS&S has worked with Duke in a partnership role to standardize its processes and access to data across the fleet, even though the plants are different.

At Duke’s plants, DS&S has developed a NAM system that allows for access to

- Work Request Notifications - system notifies engineers when a work request has been issued
- Corrective Action investigation (PIP)
- Equipment health, trending and monitoring (vibrations, etc.)
- In Service Testing
- Maintenance Rule
- Digital Demand and Runtime reporting.

The system developed by DS&S has >4600 users and provides automated reporting of equipment reliability with alarm capability, & allows seamless access to data at all levels of the organization.

Duke is a recognized leader in the US from a process perspective, and in 2002 was noted by NEI as best practice for equipment reliability.

9. US Map

This slide shows the DS&S customer base in the US for our products and systems. As you can see, DS&S products are industry leading and have large user base.

Our philosophy is to develop integrated systems that meet the needs of our clients and take advantage of the existing data, systems and infrastructure that they already have in place.

DS&S has long-term partnerships with several US NPPs who have integrated a number of different products into integrated NAM solutions. These include Duke Energy, Exelon (15 units), Detroit Energy, RG&E, Arizona Public Service and others.

Return on Investment < 1 year for customers who have implemented DS&S integrated systems

10. Europe Map

In France, DS&S has a long-term contract with EDF for I&C maintenance obsolescence for the entire French fleet

In Spain, DS&S risk monitoring software is used at 7 Iberdrolla units for on-line plant configuration management and maintenance activities

DS&S has established partnerships with both British Energy & Ringhals (Sweden) and is currently implementing our first NAM pilot projects in Europe.

DS&S has extensive experience with VVER plants including PRA studies (9 units), PPC replacements (7 units), SPDS (8 units). DS&S is currently performing RPS upgrades at the Dukovany Units 1-4 and Novoronezh Unit 5.

A complete list of DS&S VVER references is provided at the end of this presentation.

11. Closing

DS&S is a leader in asset management.

The same asset optimization strategy is being realized not only in nuclear and power engineering industry, but in aviation as well.

DS&S is currently operating asset data centers to optimize over 3,700 RR Turbines (engines) for 6 of the 8 major airlines.

We know how to deploy this strategy in highly regulated, asset-intensive industries and seek partnerships to apply our know-how to provide similar benefits to VVER operators.

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Data Systems & Solutions

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Data Systems & Solutions

Data Systems & Solutions

DS&S is a Joint Venture Between Rolls-Royce and SAIC

- DS&S is a leading provider of I&C Systems & Asset Management support services and systems to Energy, Aerospace, Defense & Process Industries
- Consistent growth → $50M in 1999 to $132M in 2003
- Major operations in the UK, USA, France and CZ (19 offices with ~ 900 employees)
- Acquired Schneider Electric Nuclear Business in 2003
- Experience with > 100 NPPs worldwide, including CEZ, REA, EDF, British Energy, Duke Power, Exelon
- Delivered more $150M in systems for VVER reactors

- Nuclear Products & Services
  - I&C Upgrades
  - Plant Process Computers
  - Automation Software
  - Simulation
  - Risk Analysis
  - Engineering Services

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Nuclear Asset Management (NAM) has been defined by the US Nuclear Energy Institute's (NEI) NAM Task Force as: "the 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."

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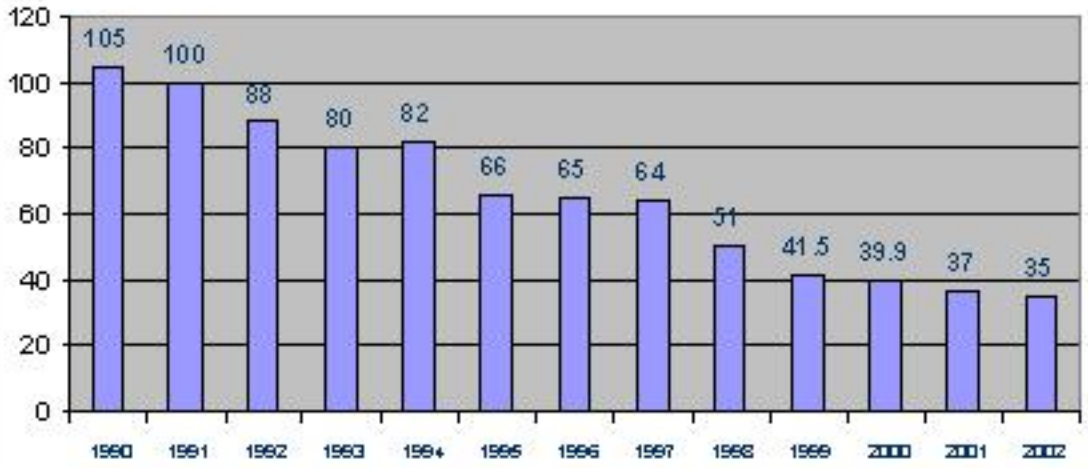
US Nuclear Fleet Performance Improvement (1990-2002)

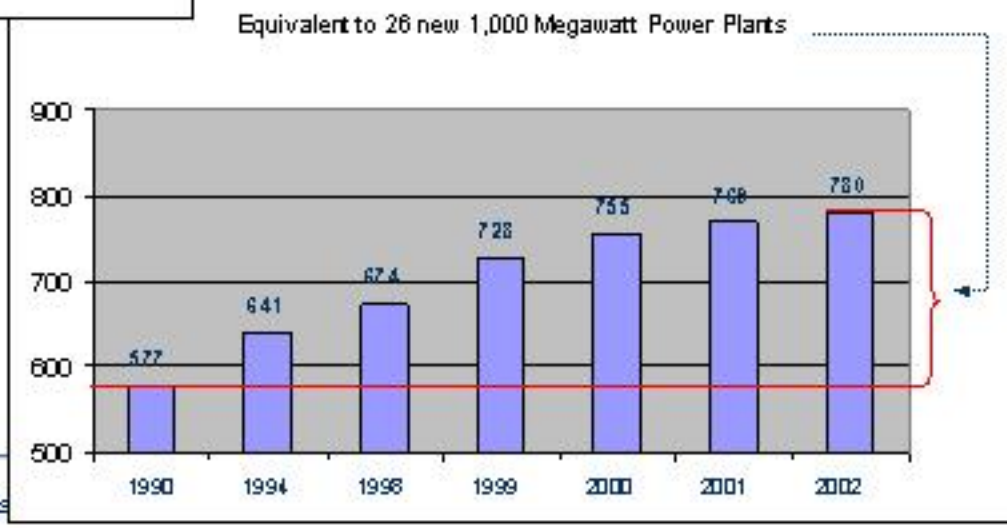
Avg. Duration of US Nuclear Refueling Outages



- During this period:
  - Average Capacity Factor increased from 75% to 91.9%
  - Safety System Failures reduced 400%
  - Unplanned Outages reduced 500%

Source: Institute of Nuclear Power Operators (INPO)
Note: Average Values do not include data from shutdown units

US Nuclear Plant Output Growth



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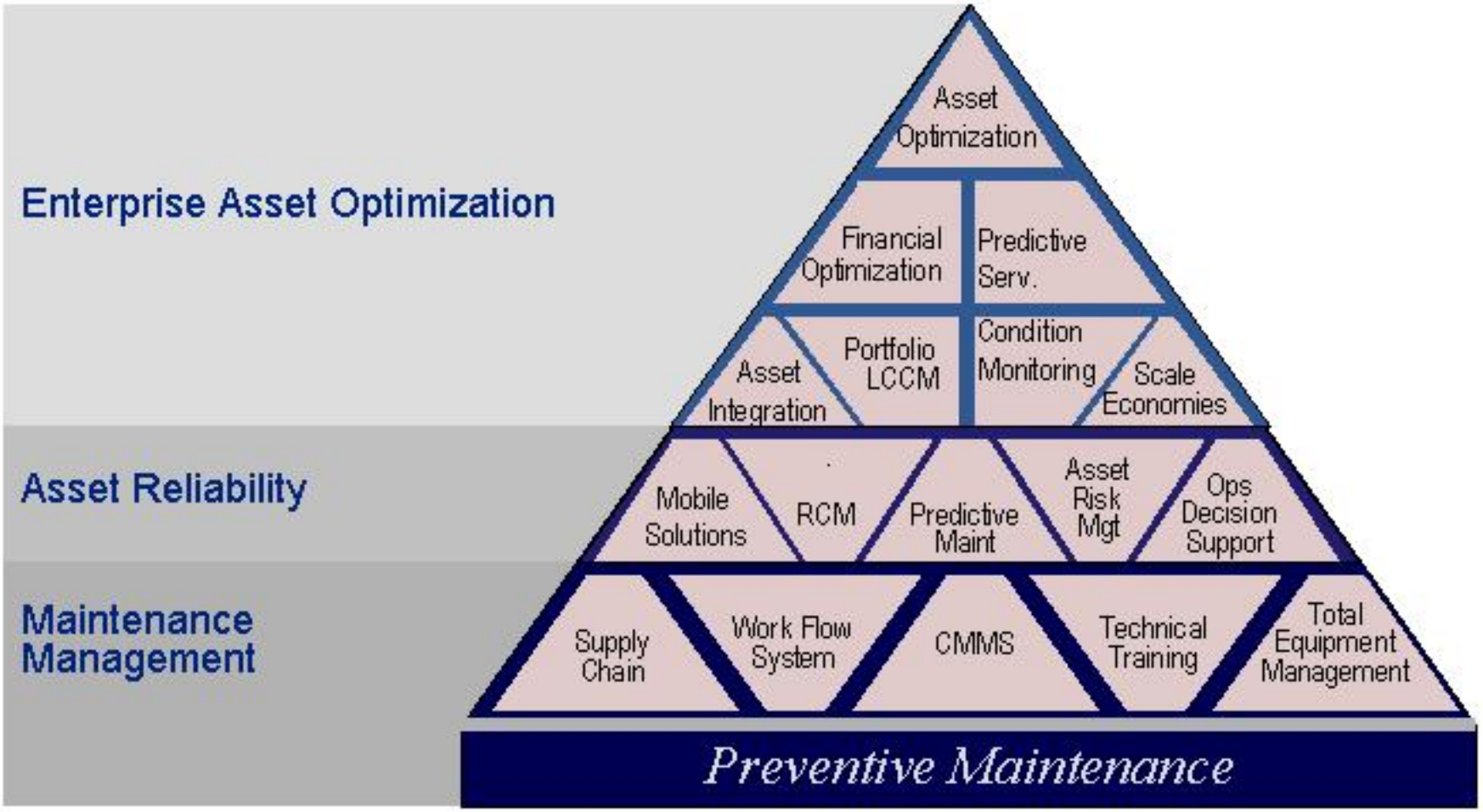
Asset Management Components



Asset Management Strategy

The right strategy drives asset management

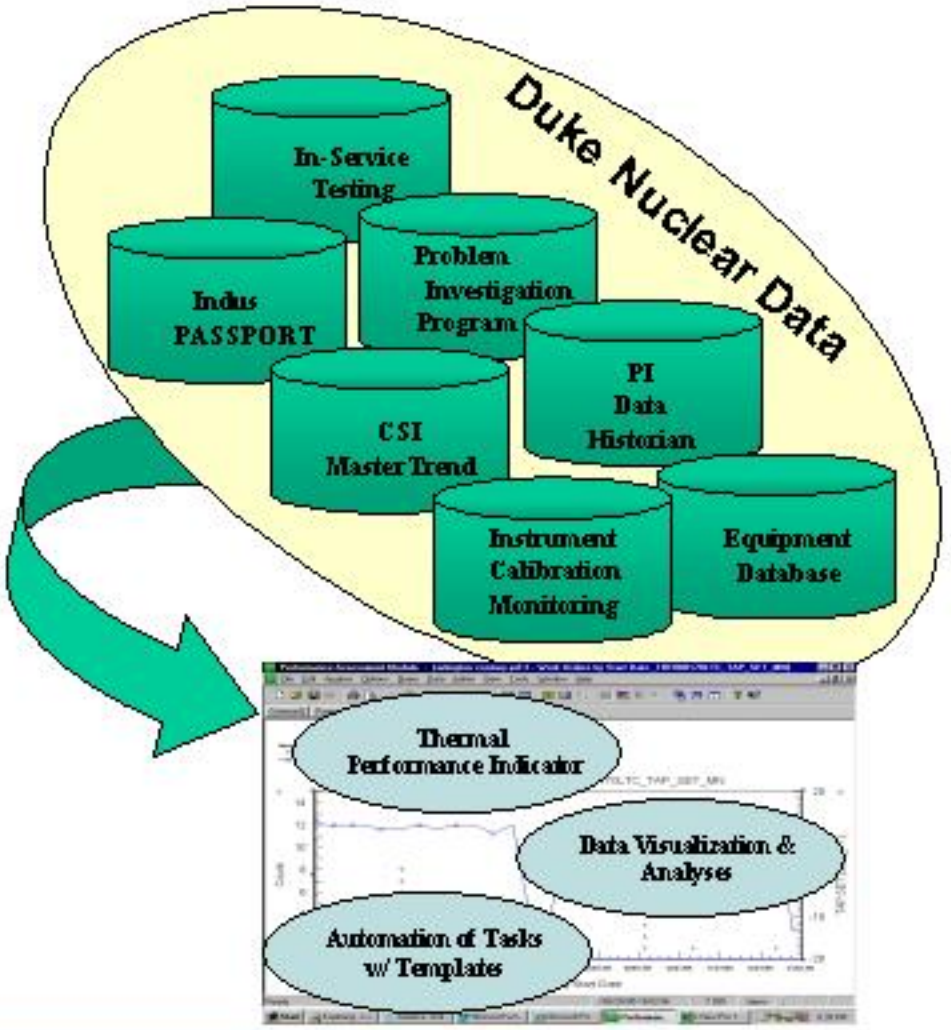
Asset Reliability has traditionally been the elusive barrier to more cost effective asset management.

Fleet Asset Management Overview

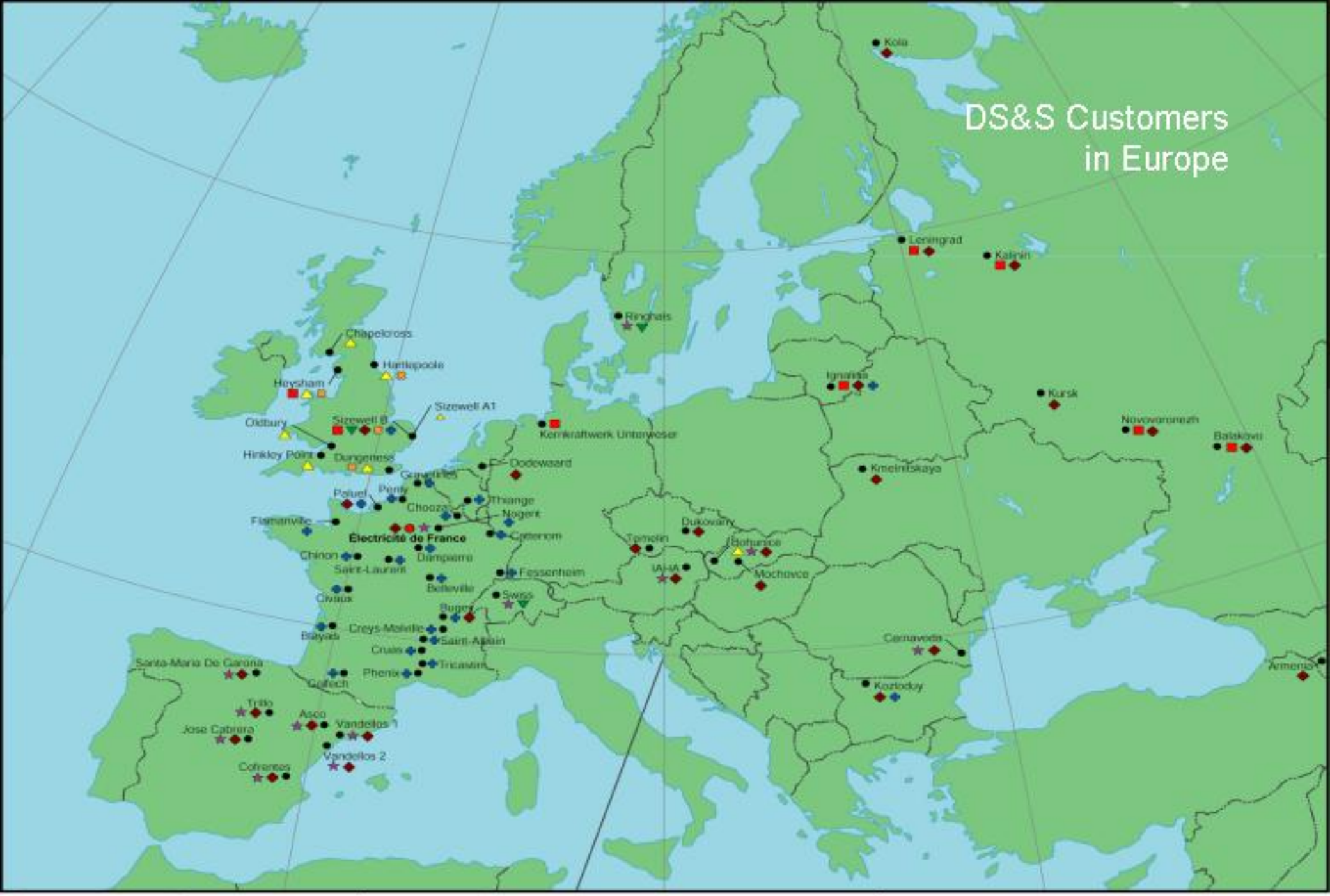
go to interactive demo dss_Fleet_AM.exe

NAM Technology Integration Example: Duke's Engineering Support Program

- Mobility Solutions Collect Accurate Data
  - Key Performance Indicator trends and threshold changes
- Performance Monitoring for decision support
  - Integrated decision support systems with asset management software to analyze risk management at or near real-time
- Asset Management data is published
  - Tactical: Data Mining and Visualization Tool
  - Strategic: On-demand Key Performance Indicators and Drill-downs
- Lifecycle Cost Management Program is improved
  - NEI/INPO Equipment Reliability Benchmarking Best Practice Realized (2002)




DS&S Customers in North America
DOE Hanford N Reactor
DOE MHTGR-NPR
EPRI
Western Area Power Authority
Diablo Canyon 1 & 2
San Onofre 2 & 3
Palo Verde 1,2,3
Arkansas Nuclear One 1 & 2
Wolf Creek
Callaway 1
Cooper 1
Fort Calhoun 1
Quad Cities 1 & 2
Duane Arnold
Byron 1 & 2
Prairie Island 1 & 2
Monticello 1
Kewaunee 1
Point Beach 1 & 2
LaSalle 1 & 2
Dresden 2 & 3
Clinton 1
Braidwood 1 & 2
Comanche Peak 1 & 2
TXU
South Texas Project 1 & 2
Ontario Power Generation
Pickering
Bruce
Perry
Davis Besse 1
Beaver Valley 1 & 2
Allegheny Power
Darlington
Ginna
Point Lepreau
Vermont Yankee 1
Fitzpatrick 1
Nine Mile Point 1 & 2
Seabrook 1
Pilgrim 1
Millstone 2 & 3
Indian Point 2 & 3
Con Ed
GPU
Allegheny Power
Oyster Creek 1
Limerick 1 & 2
Hope Creek 1
Salem 1 & 2
Calvert Cliffs 1 & 2
Susquehanna 1 & 2
Three Mile Island 1
Peach Bottom 2 & 3
Perry
Fermi 2
Cook 1 & 2
Palisades 1
Genoa 1
Zion
DOE
NRC
North Anna 1 & 2
PEPCO
Surry 1 & 2
Duke
Catawba 1 & 2
McGuire 1 & 2
Sharon Harris 1
Oconee 1, 2, 3
Brunswick 1 & 2
Robinson 2
VC Summer
Vogtle 1 & 2
US DOE Savannah River C, P, K, L
Watts Bar 1 & 2
Sequoyah 1 & 2
TVA
Browns Ferry 1, 2, 3
Georgia Transmission
Hatch 1 & 2
Farley 1 & 2
Grand Gulf
River Bend
Waterford 3
Crystal River 3
St. Lucie 1 & 2
Turkey Point 3 & 4
Automation Software
Plant Computers
Simulators
Risk Monitors
Engineering Services
Turbine Island Products
Predictive Maintenance
I&C Products


DS&S Customers
in Europe
Kola
Leningrad
Kalinin
Ringhals
Chapelcross
Hartlepoole
Heysham
Sizewell A1
Oldbury
Sizewell B
Kernkraftwerk Unterweser
Hinkley Point
Dungeness
Gravelines
Dodewaard
Paluel
Penly
Thiange
Chooz
Nogent
Flamanville
Cattenom
Électricité de France
Dukovany
Temelin
Bohunice
Chinon
Dampierre
Saint-Laurent
Fessenheim
Mochovce
Belleville
Swiss
Civaux
Buger
Creys-Malville
Blayais
Saint-Alban
Cruas
Tricastin
Phenix
Cernavoda
Santa-Maria De Garona
Golfech
Kozloduy
Trillo
Asco
Vandellos 1
Jose Cabrera
Vandellos 2
Cofrentes
Ignalina
Kursk
Novovoronezh
Balakovo
Kmelnitskaya
Armenia
I&C Products
Plant Computers
Simulators
Risk Monitors
Automation Software
Engineering Services
Turbine Island Products

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DS&S Is a Leader in Asset Management

- Unparalleled experience in equipment health monitoring, information management, predictive analysis and support for: Civil Aerospace, Transport, Defense, Nuclear Power and Fossil Energy
- Strong engineering focus; > 700 engineers
- Currently operating asset data centers to optimize over 3,700 RR Turbines (engines) for 6 of the 8 major airlines
- Comprehensive range of products and services to support Power Plant Asset Management - from data collection to decision support
- Strong commitment to long term performance based partnership with NPPs, including CEZ, REA, EDF, Duke Power, Exelon, British Energy, Ringhals

DS&S provide diagnostics and prognostics via the internet / intranet, right up to the Operations Room

This example is powered by DS&S for R-R engine fleet data management

We are now delivering on the components that will help deliver NAM to the VVER industry

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Project References in CEE and FSU (1)

	NPP	PROJECT	FUNDING	YEAR
1.	Armenia	Ex-Core Monitoring System Upgrade	TACIS	2003 – present
2.	Novoronezh 5, Russia	Reactor Protection System Upgrade	TACIS	2003 – present
3.	Balakovo, Russia	Complete Replacement of Plant Process Computer System	TACIS	2003 – present
4.	Leningrad, Russia	Control Room Redesign and Upgrade	TACIS	2003 – present
5.	Ignalina 2, Lithuania	Secondary Shutdown System	PHARE	2002 - present
6.	Dukovany, CZ	Complete Replacement of I&C on four units	CEZ	2000 – present
7.	Kolzloduy, Bulgaria	VVER emergency operating instruction (EOI) thermal-hydraulic analysis	DOE	2000 - present
8.	Kalinin 2, Russia	Complete Replacement of Plant Process Computer System	TACIS	2002 - present
9.	Kmelnitskaya, Ukraine	In-depth Safety Analysis (probabilistic and deterministic analyses)	DOE	1997 - present
10.	Armenia	Complete Replacement of Plant Process Computer System	DOE	2002
11.	Bohunice V2, Slovakia	Full-scope simulator, installed at the VUJE training facility in Trnava	DOE	2001

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Project References in CEE and FSU (2)

	NPP	PROJECT	FUNDING	YEAR
12.	Armenia	In-depth Safety Analysis (probabilistic and deterministic analyses)	DOE	2001
13.	Mochovce, Slovakia	Level 1 internal and external events PRA support - HRA, EE methodology, Seismic PRA.	VUJE	2001
14.	Ignalina 2, Lithuania	Safety Parameter Display System	DOE	2000
15.	Armenia	Safety Parameter Display System	DOE	2000
16.	Bohunice, Slovakia	Revised Level 1 PRA to support real-time risk monitor	SE	2000
17.	Ignalina, Lithuania	Radiation Monitoring System	EBRD	1999
18.	Novovoronezh 5, Russia	Safety Parameter Display System	DOE	1999
19.	Armenia	Safety I&C for safety valves Sub-contractor of SEBIM	TACIS	1998
20.	Ignalina 2, Lithuania	Complete Replacement of TITAN Plant Process Computer System	EXIM Bank	1998
21.	Novovoronezh 3/4, Russia	Safety Parameter Display System	DOE	1998
22.	Novovoronezh 1/2, Russia	In-depth Safety Analysis (probabilistic and deterministic analyses)	DOE	1998
23.	GAN, Russia	Crisis Center for GAN (Russian Nuclear Regulation Authority)	NRC	1998
24.	GAN, Ukraine	Crisis Center for GAN (Ukrainian Nuclear Regulation Authority)	NRC	1998

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Project References in CEE and FSU

	NPP	PROJECT	FUNDING	YEAR
25.	Dukovany, CZ	Level 2 probabilistic safety assessment	DOE	1998
26.	Kozloduy, Bulgaria	Core monitoring equipment TR 3 (source range instrumentation channels + reactivity meter)	PHARE	1997
27.	Ignalina 1, Lithuania	Complete Replacement of TITAN Plant Process Computer System	EXIM Bank	1997
28.	Temelin, CZ	Independent Verification and Validation of I&C (Instrumentation and Control System)	CES	1997
29.	Kola 1/2, Russia	In-depth Safety Analysis (probabilistic and deterministic analyses)	DOE	1997
30.	Kozloduy, Bulgaria	Core monitoring equipment TR4	PHARE	1996
31.	Ignalina, Lithuania	Replacement Strategy for Plant Process Computer System	EBRD	1996
32.	Dukovany, CZ	Real-time risk monitoring system	DOE, SUJB	1996
33.	Dukovany, CZ	Risk-based analysis of limits and conditions (technical specifications)	DOE, SUJB	1996
34.	Bohunice V2. Slovakia	Level 1 internal events probabilistic safety assessment	DOE, IAEA	1995
35.	Dukovany, CZ	Level 1 internal events probabilistic safety assessment	DOE, IAEA	1994