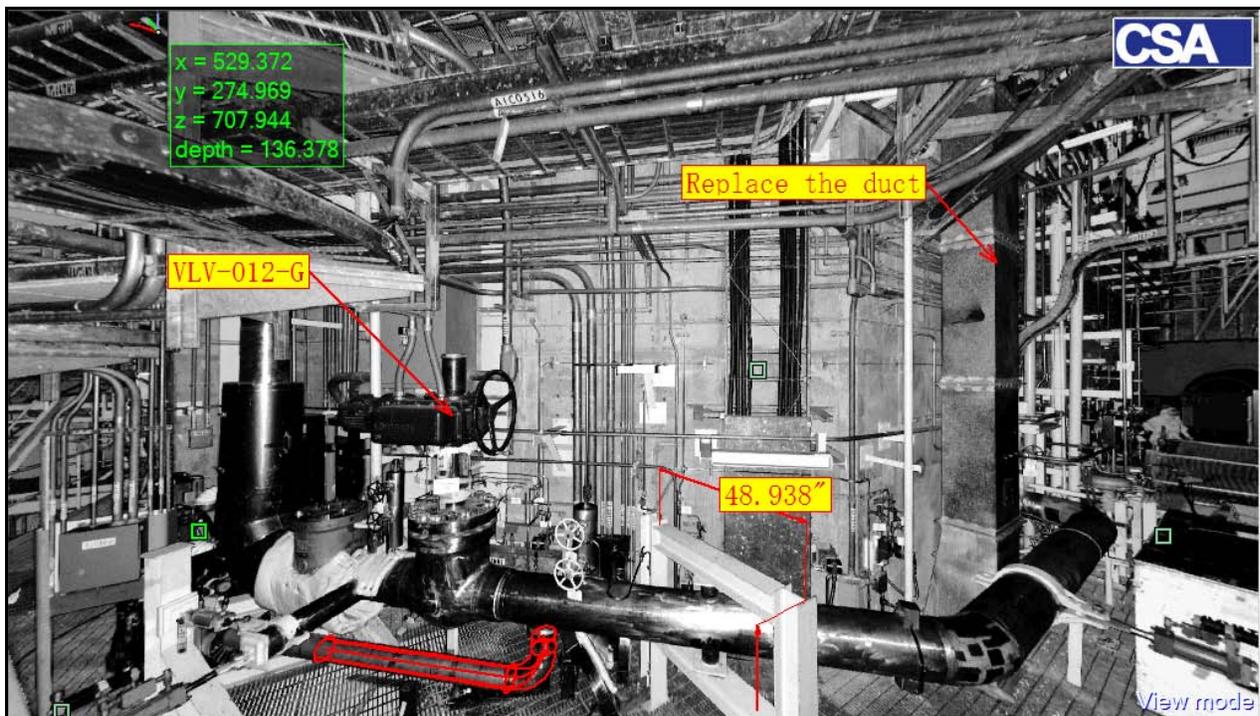# PanoMap® in the Nuclear Industry

For the last twelve years, CSA has been providing laser scanning for the US nuclear industry. Currently, 93 reactors (units) are using CSA's **PanoMap® laser scanning** software and applicable services. CSA's combined database for the nuclear industry represents over 50,000 laser scans.

PanoMap® Photorealistic Scan Access

Project scope ranges from project support scanning (as few as 30 scans), to a complete plant scanning of 7,000 laser scans. CSA maintains one laser scan database for each nuclear unit. Scans from new projects can be added to the database, and each scan is uniquely identified with attributes including date/time stamp, operator, and scanner used. CSA also maintains a comprehensive archive of all of its scanning projects. PanoMap® provides comprehensive support from simple review/ measurement applications to complex modeling and plant support applications.

PanoMap® is often used for design verification. **3D models of new design can be placed within the scan space. Interferences are detected and prominently displayed in the scan, and highlighted red. Clearances can be reviewed and verified by all end users including engineering, construction, safety and operations prior to construction.** A similar process is used for Major Projects with significant rigging and other major temporary or permanent structures used to support project activities.

3D Model Merged in Scans   **iPanoMap™ Scan on a tablet**

An example of a major project is the EPU for Turkey Point Nuclear Plant. About 3,700 laser scans have been collected to support the project. PanoMap® has been installed on the FPL site server, Bechtel's site server, and Bechtel's corporate office. Other engineering contractors working on the project are using the software as well.

The laser scans are periodically updated with new EPU design, merging new design with the scans. Hundreds of designers working on the project are accessing the updates and using them for interference checking and design reviews.
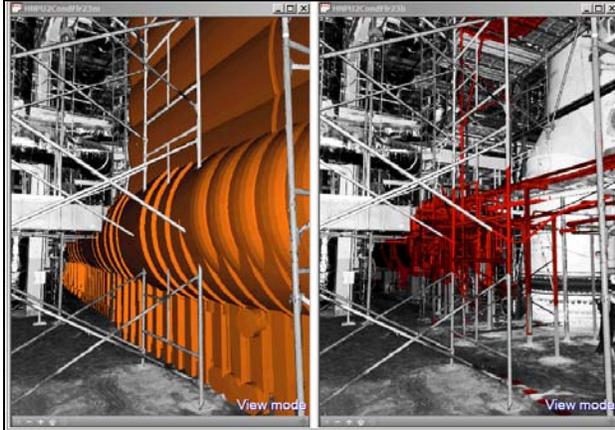
Recent projects also included laser scanning of equipment vessels at the manufacturing sites, comparing as-built with as-designed models for sixteen vessels such as heat exchanger, condensers, etc. This identified discrepancies early in the process, prior to shipment and installation.

Typically, the laser scan database is installed on the plant server with clients accessing the scans on individual PCs. There is no limit to the number of users that can access the scan database. The PanoMap® implementation does not require any special computer or graphic hardware.

The **iPanoMap™** app for Android tablets is also available, allowing a review of all the scans, including those merged with the 3D design model. iPanoMap™ functions include dimensioning, intelligent labeling, and integration of photographs, video and other databases with the scans. These tablets, with 32 GB of memory, can hold about 10,000 laser scans. A complete laser scan documentation of a nuclear unit requires less than 10,000 laser scans. Mobile user access is even more user-friendly and faster than PC applications. iPanoMap is an excellent walkdown tool.

A new **PanoRem™** module of PanoMap is used for dose estimation, radiation survey collection, and workflow management. EPRI-developed algorithms are used to provide accurate dose calculations.

PanoMap® Equipment Removal Simulation
(interferences shown in red)   Keyplan with Scan Locations
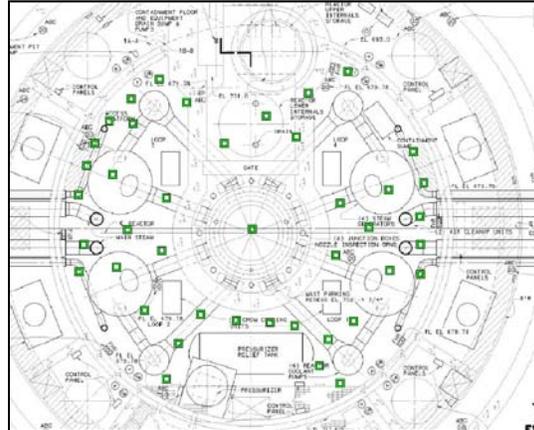

The plant database is organized into buildings, floors, and areas. For each area, a drawing keyplan is provided showing the location of the scans within the area. The user can select a single scan or multiple scans and perform desired reviews.

The nuclear plant laser scanning database can be used for multiple applications, including:

- **Work Planning and Scheduling**—location, clearances, interferences, worker location, equipment staging

- **Pre-Job Briefings**—how to get there, where to position workers and equipment

- **Operator Rounds and Valve Lineups**—best route, reading locations, component locations

- **Radiation Surveys**—lowest dose, hot spot locations, high radiation area proximity warnings

- **New-to-Nuclear Training**—plant familiarity

- **Emergency Planning Repair and Corrective Action Team Deployment**—best route, target worksite

- **Initial and Continuing Plant Worker Training**—general familiarity, specific task

- **Scaffolding and Shielding Installations**—fit, interferences, end-user validation prior to build, archive for future installs

The **benefits** of using PanoMap® as a planning tool include **reduction of dose, cost and errors**, and **improved as-built documentation.**
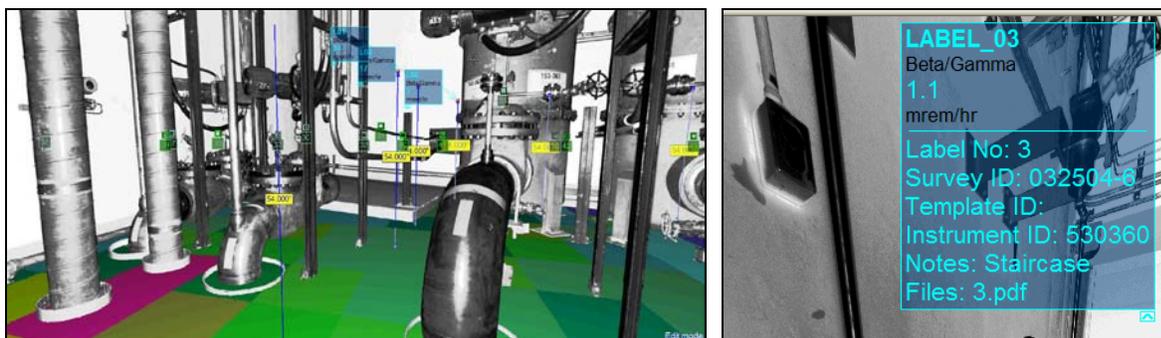
Component Labels Access to Data in PanoMap®
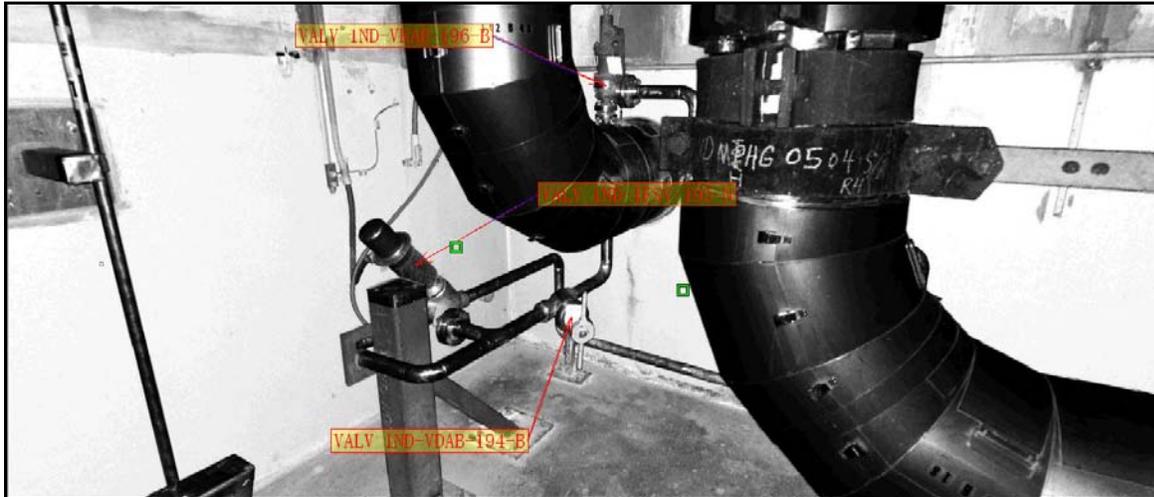
Registered Photo / Laser Scan Example
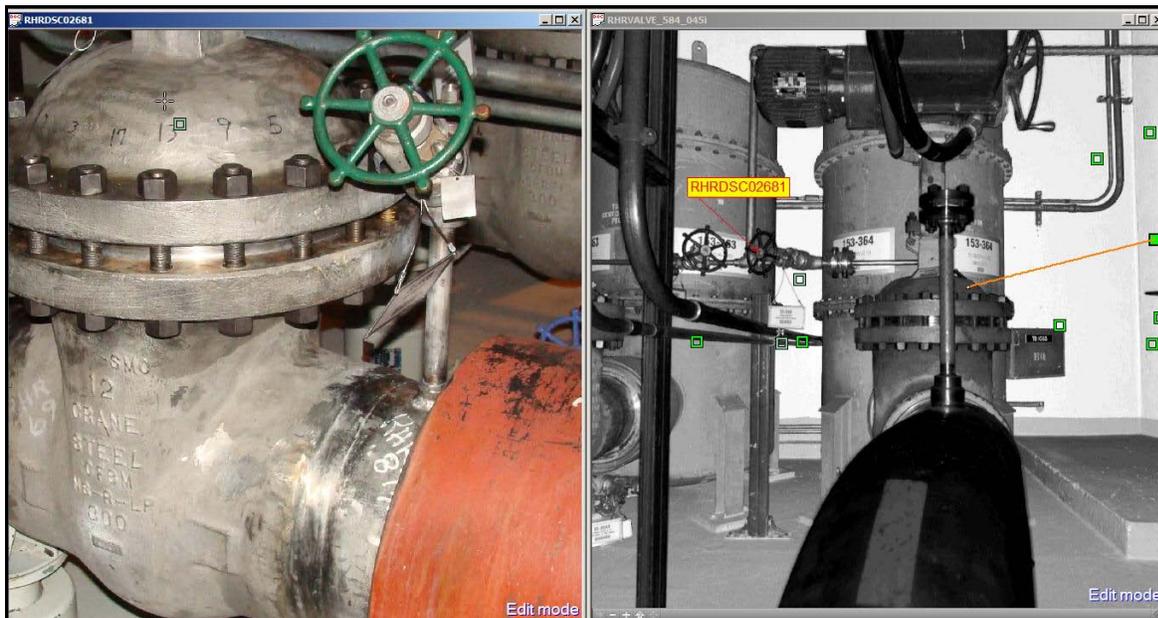
PanoRem™ for dose estimation, radiation survey collection, and workflow management

US and foreign sites using CSA's PanoMap® and Plant/CMS™ are listed below.

Plant Name	Unit (B. Unit = Single Unit Plant)	PanoMap Laser Scanning	Plant/CMS 3D Modeling
Arkansas One	Unit 1	Y	
Beaver Valley	Unit 1	Y	Y
Beaver Valley	Unit 2	Y	Y
Bellefonte	Unit 1	Y	Y
Bellefonte	Unit 2	Y	Y
Browns Ferry	Unit 1	Y	Y
Browns Ferry	Unit 2	Y	
Browns Ferry	Unit 3	Y	
Braidwood	Unit 2	Y	Y
Byron	Unit 1	Y	
Callaway	Unit 2	Y	
Calvert Cliffs	Unit 1	Y	Y
Calvert Cliffs	Unit 2	Y	Y
Catawba	Unit 1	Y	
Catawba	Unit 2	Y	
Chernobyl Plant	S. Unit		Y
Clinton	S. Unit	Y	
Comanche Peak	Unit 1	Y	
Comanche Peak	Unit 2	Y	
Cook, DC	Unit 1	Y	Y
Cook, DC	Unit 2	Y	Y
Cooper Station	S. Unit	Y	
Crystal River	Unit 3	Y	
Darlington	Unit 1	Y	Y
Davis-Besse	S. Unit	Y	
Dresden	Unit 2	Y	Y
Dresden	Unit 3	Y	Y
Farley, JM	Unit 1	Y	Y
Farley, JM	Unit 2	Y	Y
Fermi, E II	S. Unit	Y	
Fort Calhoun	S. Unit	Y	Y
FitzPatrick, JA	S. Unit	Y	
Fukushima	S. Unit	Y	Y
Ginna, RE	S. Unit	Y	
Grand Gulf	S. Unit	Y	
Hamaoka	Unit 5	Y	Y
Hatch, EI	Unit 1	Y	
Hatch, EI	Unit 2	Y	
Hope Creek	S. Unit	Y	
Indian Point	Unit 2	Y	Y
Indian Point	Unit 3	Y	Y
Jaslovske Bohunice	Unit 1		Y
Jaslovske Bohunice	Unit 2		Y
Jaslovske Bohunice	Unit 3		Y
Jaslovske Bohunice	Unit 4		Y
Kashiwazaki Kahira	Unit 2		Y
Kashiwazaki Kahira	Unit 3		Y
Kashiwazaki Kahira	Unit 4		Y
Kashiwazaki Kahira	Unit 6		Y
Kashiwazaki Kahira	Unit 7		Y
Kewaunee	S. Unit	Y	
LaSalle	Unit 1	Y	
Limerick	Unit 1	Y	
Limerick	Unit 2	Y	
McGuire	Unit 1	Y	Y
McGuire	Unit 2	Y	Y
Midland Plant	S. Unit		Y

| Plant Name	Unit (B. Unit = Single Unit Plant)	PanoMap Laser Scanning	Plant/CMS 3D Modeling
Millstone	Unit 2	Y	
Millstone	Unit 3	Y	
Monticello	S. Unit	Y	
Nine Mile Point	Unit 1	Y	
Nine Mile Point	Unit 2	Y	
North Anna	Unit 1	Y	
North Anna	Unit 2	Y	
Oconee	Unit 1	Y	
Oconee	Unit 2	Y	
Oconee	Unit 3	Y	
Oyster Creek	S. Unit	Y	Y
Palisades	S. Unit	Y	
Palo Verde	Unit 1	Y	Y
Palo Verde	Unit 2	Y	Y
Palo Verde	Unit 3	Y	Y
PBMR (South Africa)	S. Unit		Y
Peach Bottom	Unit 2	Y	
Peach Bottom	Unit 3	Y	Y
Perry	S. Unit	Y	
Pickering	Unit 1		Y
Pilgrim	S. Unit	Y	
Point Beach	Unit 1	Y	
Point Beach	Unit 2	Y	
Prairie Island	Unit 2	Y	
Quad Cities	Unit 1	Y	Y
Quad Cities	Unit 2	Y	Y
River Bend	S. Unit	Y	Y
Robinson	S. Unit	Y	Y
St. Lucie	Unit 2		Y
Salem	Unit 1	Y	Y
Salem	Unit 2	Y	Y
San Onofre	Unit 2		Y
San Onofre	Unit 3		Y
Seabrook	S. Unit	Y	Y
Sequoyah	Unit 1	Y	Y
Sequoyah	Unit 2	Y	Y
Shearon Harris	S. Unit	Y	
Sizewell B	Unit B		Y
South Texas Project	Unit 1		Y
South Texas Project	Unit 2		Y
Surry	Unit 1	Y	
Surry	Unit 2	Y	
Temelin	Unit 1		Y
Three Mile Island	Unit 1		Y
Three Mile Island	Unit 2		Y
Tokai	S. Unit	Y	
Turkey Point	Unit 3	Y	
Turkey Point	Unit 4	Y	
Ulchin	Unit 3		Y
Ulchin	Unit 4		Y
VC Summer	S. Unit	Y	
Vogtle	Unit 2	Y	
Watts Bar	Unit 1	Y	
Watts Bar	Unit 2	Y	
Wolf Creek	S. Unit	Y	Y
Yellow Creek	S. Unit		Y

PanoMap® and Plant/CMS™

Typical Projects:
- FWH, MSR Replacement
- RC Pump Motor Replacement
- Chillers Replacement
- Scaffolding Design Verification
- Pipe Slope Verification/Gas Voids
- Piping Insulation Replacement/ New Design Verification
- Alloy 600 Mitigation
- Permanent Shielding Design Verification

Benefits:
- Cost Reductions through Better Planning
- Work Control Efficiency and Quality
- Accurate, Remote Measurement and Dimensioning
- Rework Minimization
- Dose Reduction through Better Planning
- Direct Interface with Plant Documents
- Regulatory Compliance Verification
- Reduced Need for Plant Walkdowns
- Removal Simulation and

New Design Merged with Scan

Interference Shown in Red
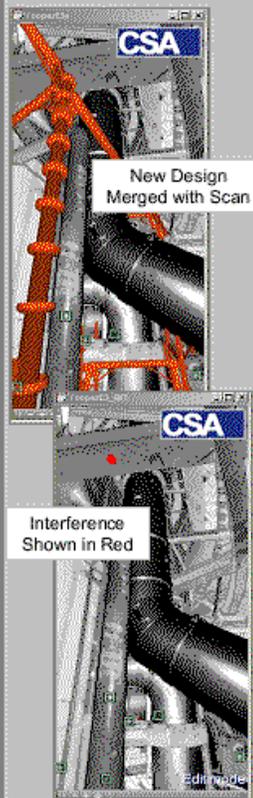
Plant/CMS^TM is CSA's intelligent 3D modeling technology.