



# Introduction to nHance Technologies

Your partners in simulation



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# Overview

## History

In 2001, the simulation services business unit of a company now known as Areva (a global company headquartered in France that is widely known as a nuclear power plant vendor) was divested, or spun-off, to create nHance Technologies. Since the entire product line was divested, nHance has become the sole owner of all of the Simulation Services' intellectual property. This property includes the Modular Modeling System (MMS), which has an extensive history and comprehensive library of nuclear and fossil power plant components. In addition, the entire library of controls and HMI translators, as well as many of the key personnel who were instrumental in the development of the intellectual property, were transferred to the new company called nHance Technologies.

## Simulation Achievements

The nHance staff of technical professionals has a strong legacy in the application of engineering analysis and development of power plant simulations. With this background and the early involvement in the development of the Modular Modeling System (MMS) with EPRI, the group was well positioned to become the commercializing agent for MMS in 1984. Since that time, millions of R&D dollars have been invested to continuously enhance the MMS product for users worldwide. During these developments, a long list of first achievements accumulated:

- 1. First modular modeling system**
- 2. First dynamic modeling system for fossil plants**
- 3. First Power Plant Simulation User Group in 1984**
- 4. First graphical modeler in 1985**  
(now on third generation, second for Microsoft Windows)
- 5. First dynamic simulation to use Windows NT** (now 2000 and XP Pro)
- 6. First Windows-based training simulator**
- 7. First Instructor Station to use and exploit the features of Windows**  
(e.g. cut & paste, directory structure, OLE automation)
- 8. First in standard graphics interfaces:** Visual Basic, Active X, extended metafiles
- 9. First fully automated DCS HMI translators using computer industry standards**  
(i.e. Windows, MS Visual Basic)
- 10. First remote-site control (via local HMIs)** of a simulator using Windows RAS utility
- 11. First to support simulation users over the Internet**
- 12. First to support Internet browsers** to view emulated HMIs used by training simulators
- 13. First native IOS application** for the iPhone/iPad/iPod Touch

## Simulation Advances

nHance believes strongly in leveraging the latest technology to continuously improve user experiences of our products and services. In our goal to provide customized and versatile solutions, we continue to be early adapters of new technology, such as:

**Mobile Apps:** We have developed native mobile applications for the iOS platform, such as *nH2O*, a water property calculator for the iPhone. In addition, we have a working prototype of an iPad version of our Instructor Station that, once approved by Apple, will be included with our projects.

**Interactive e-Books:** We have developed an interactive e-book prototype to serve as a companion for future operator training simulators. The resulting e-book can be taken home by students to study offline. This convenient, portable type of self-study is an alternative to instructor-less training sessions, and can be customized to each plant's specific needs by incorporating existing training material.

## Simulation Highlights

Some highlights of the nHance simulation environment:

**Full scope simulation at speeds several times real-time** on a single PC are obtained through the use of a robust matrix-flow solution. The matrix-flow solution provides computational efficiency and benchmarked accuracy while maintaining component modularity. Component modularity allows end users to build models quickly and efficiently with simple components and connections, without concerning themselves with the order of module placement. Plant models with emulated DCS controls, including a four-train combined cycle plant and a once-through supercritical boiler plant, have been benchmarked at speeds well over 10 times real time.

**The Instructor Station may be operated from any computer** on the simulator computer network, whereas some are restricted to using the process model simulation server. This approach alleviates any conflict or degradation while offering increased system configuration flexibility.

**nHance's software takes advantage** of the features offered by the Windows environment, and is not a port from OS/2, UNIX, VAX VMS, etc.

**A flexible methodology** is provided for setting up conditional logic expressions for any of the process variables without having to pre-program the malfunction into the process model. The Instructor can simply copy, paste, and edit to easily setup similar but separate malfunctions.

**Proprietary graphical interfaces are avoided** for emulating DCS HMIs because they are subject to becoming outdated through future advances of PC hardware and operator systems. Instead, nHance leverages the advantages of standard graphic tools (i.e. Microsoft Visual Basic) to emulate DCS HMIs. The HMIs are produced automatically with the nHance Technologies' DCS translators. In addition to direct stimulation of replica hard-panel controls and instrumentation, nHance offers more cost-effective software for hard panel emulation.

**nHance Technologies has a set of control and HMI translators for DCS systems** (Honeywell, Westinghouse, Bailey, Fisher Provox, Siemens, Woodward Governor Controls, etc.) that provide the supplier/customer lower cost alternatives to stimulating the actual DCS hardware. These translators automatically convert the DCS configuration files into simulator model software that can be combined with plant process models to produce very effective training simulators, as well as maintain the simulator controls to match the plant controls.

## Simulation Products

nHance Technologies simulates the power plant control room to familiarize operators with the controls and processes and how they function so they are fully prepared when it's time to operate in the real control room. We also create dynamic simulations of power plants for engineering analysis, control system studies, and operator training simulator development, and provide a source of background theory. To accomplish this, we provide custom operator training simulators (OTS), a series of generic operator training simulators called PlantSim™, the Modular Modeling System (MMS™), HMI emulations, and a growing line of mobile applications.

## Simulation Industry Standards

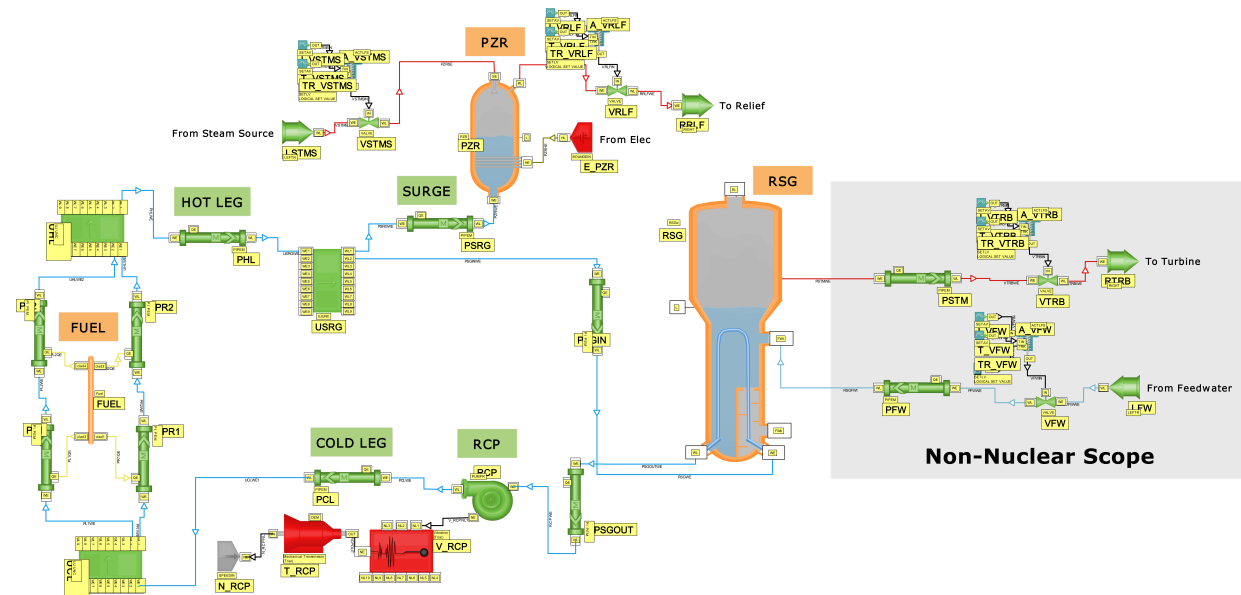
Using and adhering to software and hardware industry standards provides ready access to future hardware and software upgrades and advances, provides customers access to the software itself, and provides large pools of resources to draw from; therefore, using nHance Technologies for your simulation project protects your investment because we are concentrated on utilizing industry standards in both hardware and software.

### **nHance incorporates these industry standards:**

- **Standard PC hardware**
- **Windows 2000, XP Pro, 7**
- **Visual Basic**
- **C, Visual C++, Fortran**
- **Internet Browser Support**
- **Windows Programming**
- **Ethernet, TCP/IP**
- **Microsoft Foundation Classes**
- **OPC (OLE for Process Control)**
- **Active X Controls**

# Product Line

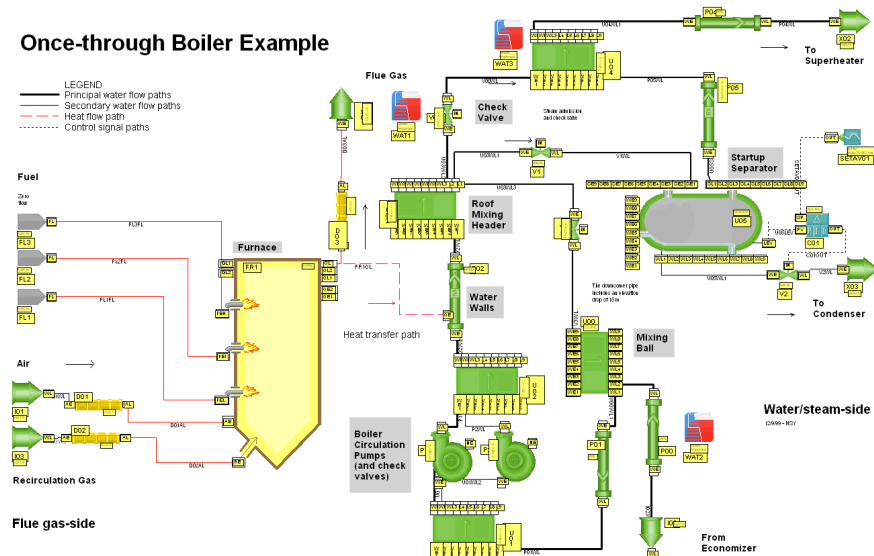
## Dynamic Simulation



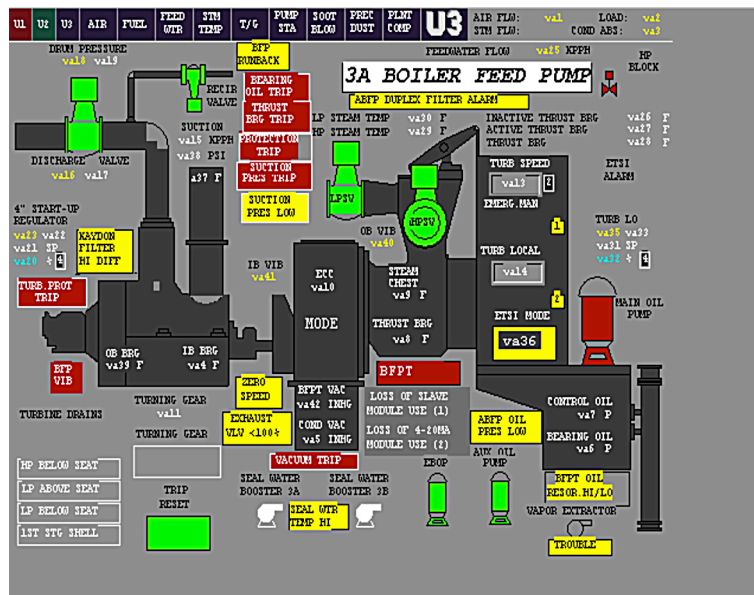
nHance's dynamic simulation line primarily consists of the *Modular Modeling System*, MMS™, but also includes human machine interface (HMI) emulations. MMS™ is a software system of pre-engineered "modules" that are assembled to create a dynamic simulation of power plants for engineering analysis, control system studies, and operator training simulator development.

**The Modular Modeling System (MMS™) Simulation Tools** software package is a collection of applications that are designed to work together to transition an MMS model from engineering analysis to a complete replica of an operator training simulator. These packages are designed to work with a process model and are capable of running on a single physical computer or can be separated into multiple networked computers to replicate a plant control room.

### Once-through Boiler Example



**Figure 1:** Supercritical Boiler using the MMS Model Builder.



**Figure 2:** Emulated DCS HMI Operator Display.

### Related experience:

- **DCS Control Logic, HMI, Links**
  - Westinghouse
  - Honeywell TDC3000, GUS, Experion
  - Bailey
  - Fisher Provox
  - Woodward Governor Co.
  - Foxboro
  - Siemens PLCs, Teleperm, Moore Products
- **HMI Emulation Development**
- **DCS Translator Development**
- **PC Networking, Integration, Synchronization**
- **Training Operators, Software Users**



## Operator Training Simulators (OTS)



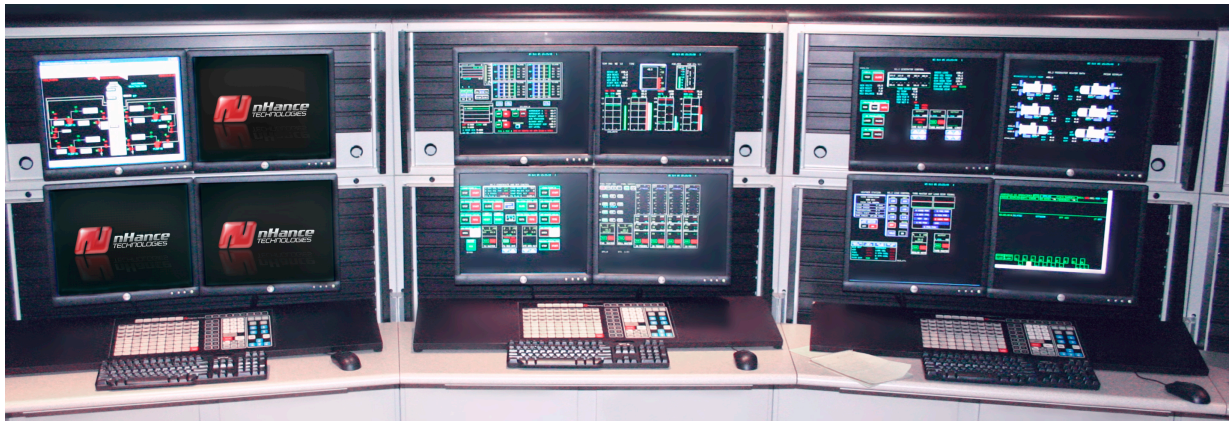
nHance Technologies has developed, delivered, and supported numerous full scope training simulators of various sizes. During support, nHance has worked with people in various positions in the power industry, including managers, operations personnel, and controls engineers, giving us a full understanding of what is needed from the simulator.

The nHance résumé includes development of a wide range of full scope custom power plant simulators and a series of generic operator training simulators called PlantSim™. We typically provide the HMI emulations, hard panel emulations, setup, and installation for the custom simulators. Here are some of the final results:



**Figure 3:** HMI workstations.





**Figure 4:** Operator workstation layout.



**Figure 5:** Full scope simulator developed on a limited budget.



**Figure 6:** A full scope, high fidelity turnkey project seen from the Instructor station room.

nHance offers the most cost-effective training simulators in the power industry because we focus on providing customized training solutions that optimize training value. We custom build these simulators to match the client's plant for the most realistic training.



Most of our OTS projects involve the development of at least one hard panel, so nHance has extensive experience in developing hard panel emulations. Here are some recently designed hard panels:



Figure 7: A recent Black Start hard panel emulation.

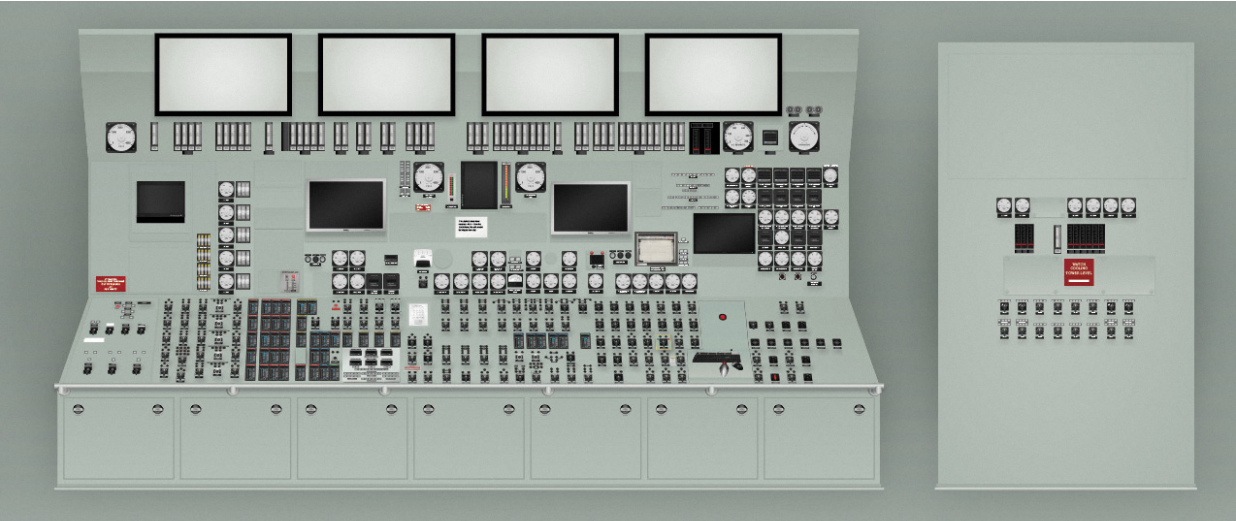
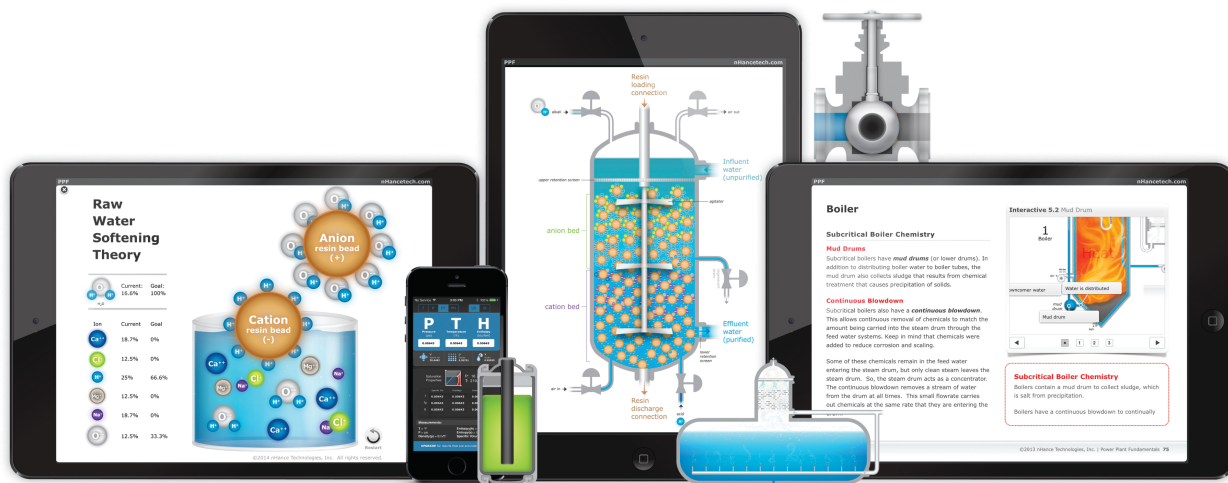


Figure 8: The overview screen from another recent OTS project.



nHance also offers a low cost alternative to building a custom simulator: PlantSim™. PlantSim™ is a series of four generic operator training simulators that simulate a standard control room, including HMI screens. Customers can choose one of the four standard types, and either take the pre-built standard as-is, or have nHance modify it to more closely match their plant's control room. Visit [plantsim.com](http://plantsim.com) for more details.

## Mobile Applications



Our line of products extends beyond the PC market with numerous mobile applications, most recently including a series of interactive ebooks entitled ***Power Plant Fundamentals***. Power Plant Fundamentals is a fourteen-book series on the theory and application of the basics of power plant operation. We also have a water and steam property calculator, *nH2O*, and a customizable, realistic simulation of a synchroscope, *SyncGen*, which trains users on the process of generator synchronization. All of these are available on the App Store or iBookstore.

## nHance Staff

Many of the key personnel who were instrumental in the development of MMS are still with nHance Technologies today. We are a small company, with 7 permanent employees and several part-time engineers hired on a project basis. Together, we hold over 12 Engineering degrees — BS, MS, and PhD's in various Engineering fields, and are all trained to serve our customers to the best of our abilities.

### Staff Strengths

- **Process Modeling**
- **Training Simulator Development**
- **Mechanical Engineering**
- **Controls**
- **Electrical Engineering**
- **Software Development**