• WSC Introduction
• Southern Company & Mississippi Power Overview
• About Plant Watson
• Simulator History & Decision Drivers
• Project Execution
• Overview of full scope simulator structure
• Simulator capabilities and limitations
WSC Company Overview

- A Multi-National Company founded in 1995
- Employees: ≈ 85; Multidisciplinary team of nuclear, mechanical, electrical, chemical engineers, physicists and computer scientists, 30% with advances degrees.
- Research Oriented – over 20% of gross profit goes into R&D
- Headquarters in Frederick, Maryland, USA
- Engineering office in Moscow, Russia
- Main Business - Power Plant Simulation
  - Nuclear Power Plant Simulators 40%
  - Conventional Power Plant Simulators 30%
  - Simulation Assisted Engineering 20%
  - Navy and Marine Simulation 5%
  - Process and Pipelines 5%
- ISO 9001:2008 Certified
WSC HQ Location
High Fidelity Simulation for use in:

- **Development of Replica Training Simulators**
  - Nuclear, Coal, Combined Cycle & Gas Plants, Solar, Process, Pipeline...
  - Part-Task and Full-Scope Simulators
  - Classroom Simulators
  - Web based simulators

- **Simulation Assisted Engineering (SAE)**
  - System Analysis and Design
  - Human Factors Engineering
  - Logic and Control Testing, V&V
  - Plant Optimization
  - Plant Test and Operating procedures – e.g. commissioning procedures
Conventional Power Generation

Large Solar  
Hydro, Grid  
Fossil / Coal

Desalination, Gasification, FGD Process and Pipelines  
Single & Combined Cycle
Our Customers
Simulation Technology Overview

Software Products Suite for Comprehensive Plant Coverage

3KEYMASTER™ Simulation Platform and Modeling Tools - Flagship for this Suite
- Graphical Engineering Station for Simulation Development and Control / Instructor Station
- 2-Phase Flow network Tool
- Electrical Network Tool
- Logic & Control and Relay Tools
- Component Tool and Library

3KEYDCS™ – is our solution for Distributed Control Systems that provides accurate emulation for Control and Logic, Man-Machine Interfaces, including trend and alarm displays

3KEYTOUCH™ – Alternative Training Delivery Platform

3KEYITS/3KEYSTUDENT™ – Web and Classroom based Simulator Lesson delivery
Distributed Control Systems DCS Emulation/Virtual Solutions

Touch Screen Virtual Panels
Southern Company Generation manages production, fleet operations, planning, engineering and fuel procurement for Southern Company's more than 280 coal, oil, gas and hydro generating units at 73 power plants.
Mississippi Power is a Southern Company Subsidiary, along with Alabama Power, Georgia Power, and Gulf Power. Plant Watson is an integral part of the Gas Generation diverse capacity mix.
Plant Watson is located in Gulfport, MS.

- Unit 4—GE Turbine and Generator set rated at 250 MW. Riley-Stoker boiler rated for 2400 psig at 1000 degF
- Unit 5—GE Turbine and Generator set rated at 500 MW and 24,000 volts. Foster Wheeler boiler rated for 2400 psig at 1000 degF
- Control systems on both Units are ABB Symphony Plus.
- Also on site, Unit 3 rated at 112 MW and a 39 MW combustion turbine with black start capability.
Unit 3—Commercial operation in 1962.
Unit 4—Commercial operation in 1968.
Units 4 and 5 were converted from coal to natural gas as the primary fuel in April, 2015.

Used the same Riley dual fuel burners but reconfigured the natural gas piping and controls.
Since plant conversion to natural gas, the workforce has been reduced from around 150 employees to 80 with a goal of 67 total employees.
WSC has won all competitive bids for Southern Company, Alabama, Georgia, Gulf, and Mississippi Power simulators for the past seven years due to:

- Best Technology
- DCS Experience
- Quality of Staff
- Price & **Value**

WSC prides itself on customer relationships and the partnerships we have created in the industry & successfully delivered the last seven simulators contracted by Southern: Plants Ratcliffe (Kemper), Crist, Daniel, McIntosh, Greene County, & Watson
• WSC Supplied
  - Model Server
  - Instructor Station
  - HPE Computer with dual 42” monitors
  - 3 Panel Glass top

• ABB Supplied
  - Engineering Workstation
  - Ops server
  - Harmony Training Simulator
  - 5 Operator Workstations
  - Two 42” monitors
Two Simulators
Simulator Network

Model Server
- Process Models
- Emulated PLC
- Wiring Diagrams

Glasstop
- Operator Control

Hard Panel Client
- Operator Control

Instructor Station
- Instructor Control

OPC

Harmony Training Simulator
- Engineering Workstation
  - DCS Logic
- Ops Server
  - DCS Graphics
  - Operator Clients
    - Operator Control
GlassTop Panel Graphics
Unique Challenges of Project

- Two simulators (one per unit)
- Unique Mixture of Hard Panel and DCS control
- Older units, less design data
P&IDs

Discharge psig IN # 1424

Auto valve is air operated, fail open.
Why Two Simulators?

Unit Similarities

- Gas fired
- Steam driven
- ABB control
Unit Differences

• Units are different sizes (250 MW vs 500 MW)
  ▪ Difference response times, different response amplitudes

• Units have different controls
  ▪ Turbine controlled by hard panels in U4, ABB in U5
  ▪ U5 has more controls in ABB than U4

• Units have different equipment
  ▪ U4 has motor driven BFPs, U5 has turbine driven BFPs
  ▪ U4 has inlet vane ID fans, U5 has VFD ID fans
  ▪ Nearly all systems are different in some way, shape or form
Benefits of Two Simulators

- Focuses on intricacies of each individual unit
- Showcases differences between units which operators need to account for
- Operators need to use both units
- Both simulators have an identical training platform
Benefits of Two Simulators

UNIT 4 SIMULATOR

UNIT 5 SIMULATOR
Hard Panel vs DCS

- Important to carefully emulate wiring diagrams
- Requires careful understanding of why things respond the way they do
- Surfaces potential issues with DCS logic
• Annunciators and lights not working like they do on wiring diagrams
  ▪ Investigation showed wires disabled in benchboard, lights replaced with wrong colors
• Valve response when resetting turbine does not match plant
  ▪ Response was due to an imperfect turning gear
• Testing runbacks and thinking critically about response
On-Site Installation
Conclusion

• Unique project with a lot of challenges
• Excellent support and involvement from Plant Watson Operations
  ▪ Luke, Bill, Eric B, Felicia, Eric L, Jeff, Ritchie, Chris, Johnnie, Scott, Jeff, Derick
• Excellent support and involvement from Plant Watson I&C
  ▪ Adam, Chuck
Questions?

THANK YOU!

WSC, Inc.
7196 Crestwood Blvd, Suite 300
Frederick, MD 21703
www.ws-corp.com