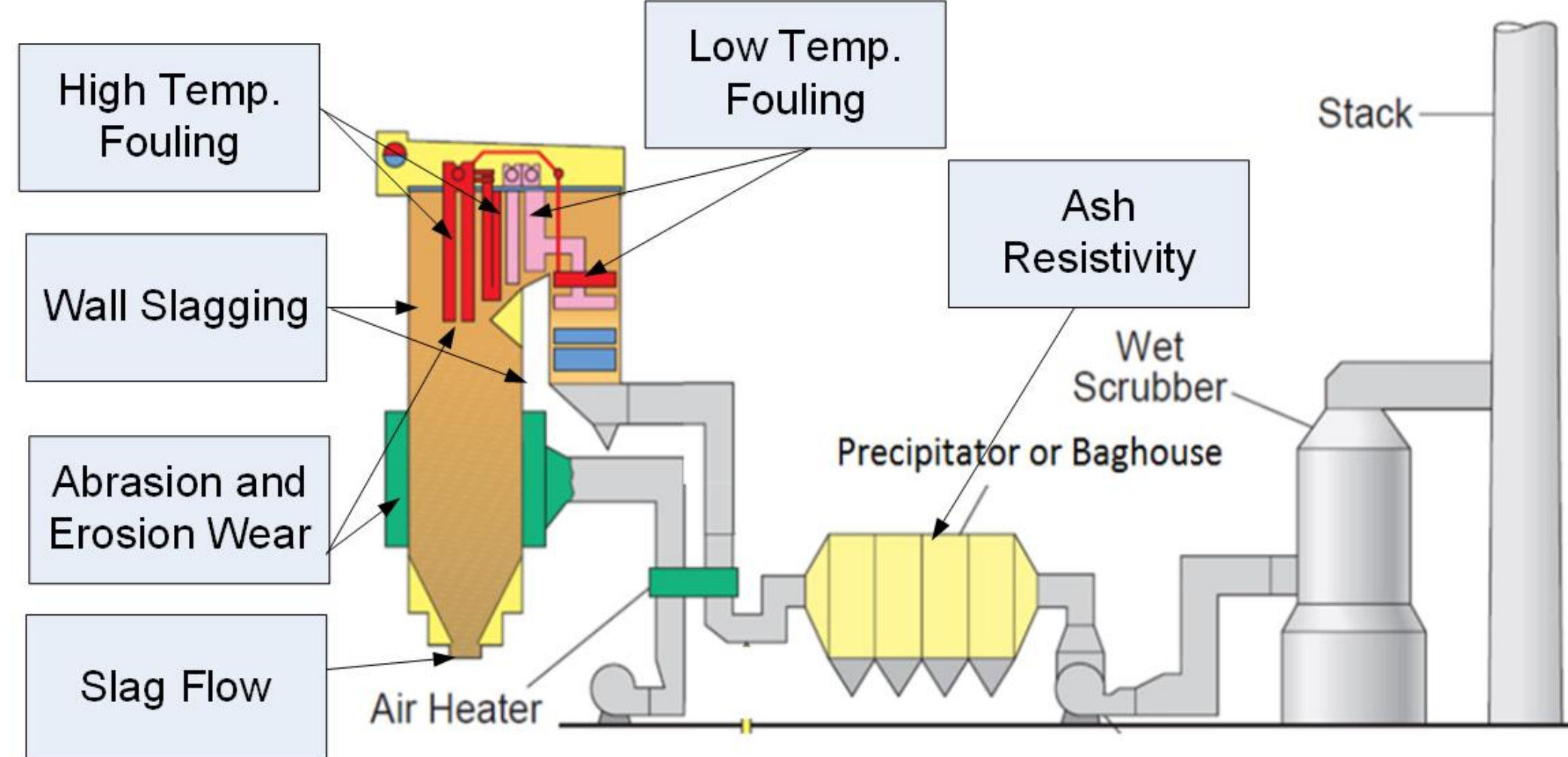# IMPROVING COAL-FIRED PLANT PERFORMANCE THROUGH INTEGRATED PREDICTIVE AND CONDITION BASED MONITORING TOOLS

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Introduction

Coal-fired Power Plant Fireside Challenges

High Temp. Fouling · Low Temp. Fouling · Wall Slagging · Ash Resistivity · Abrasion and Erosion Wear · Slag Flow · Stack · Wet Scrubber · Precipitator or Baghouse · Air Heater
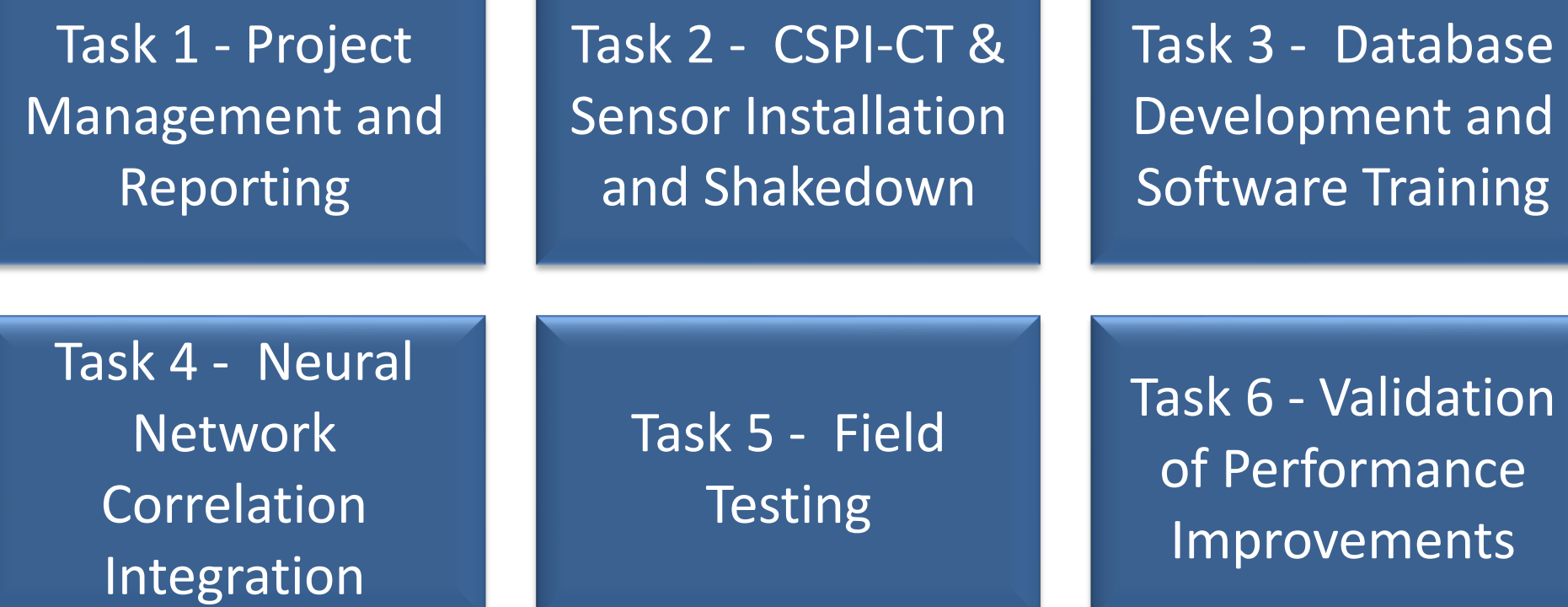
Goal

To demonstrate at a full-scale coal-fired power plant the ability to improve boiler performance and reliability through the integrated use of condition based monitoring (CBM) and predictions of the impacts of coal quality on boiler operations.

Objectives

- Install Combustion System Performance Indices (CSPI)-CoalTracker (CT) program's beta version at a coal-fired power plant
- Develop statistical correlations and neural networks to determine impact of fuel properties and plant parameters on plant performance
- Integrate neural networks and statistical correlations in CSPI-CT software
- Conduct on site field tests and perform advanced analysis on field test samples
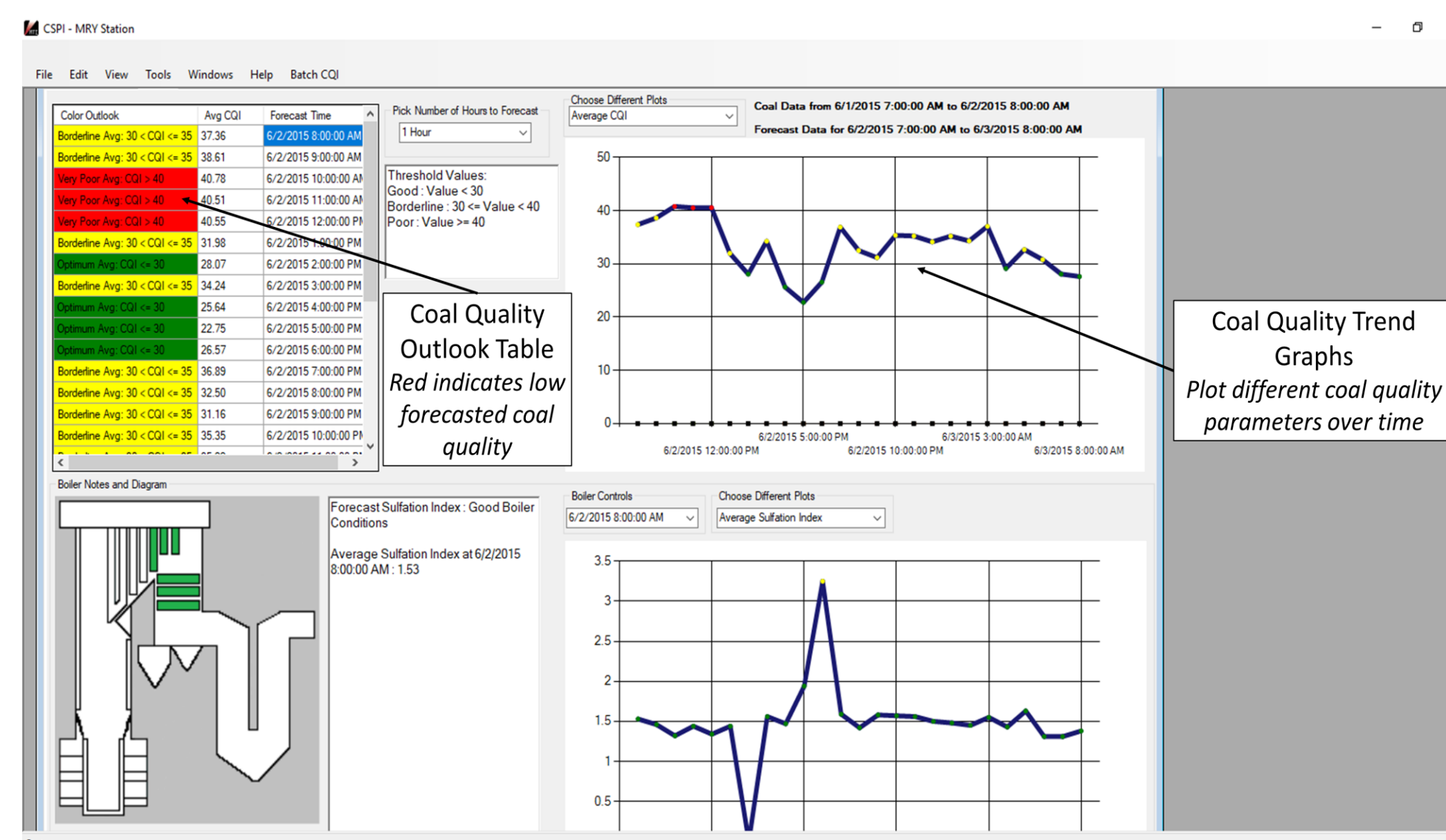- Validate performance improvements

Task Structure

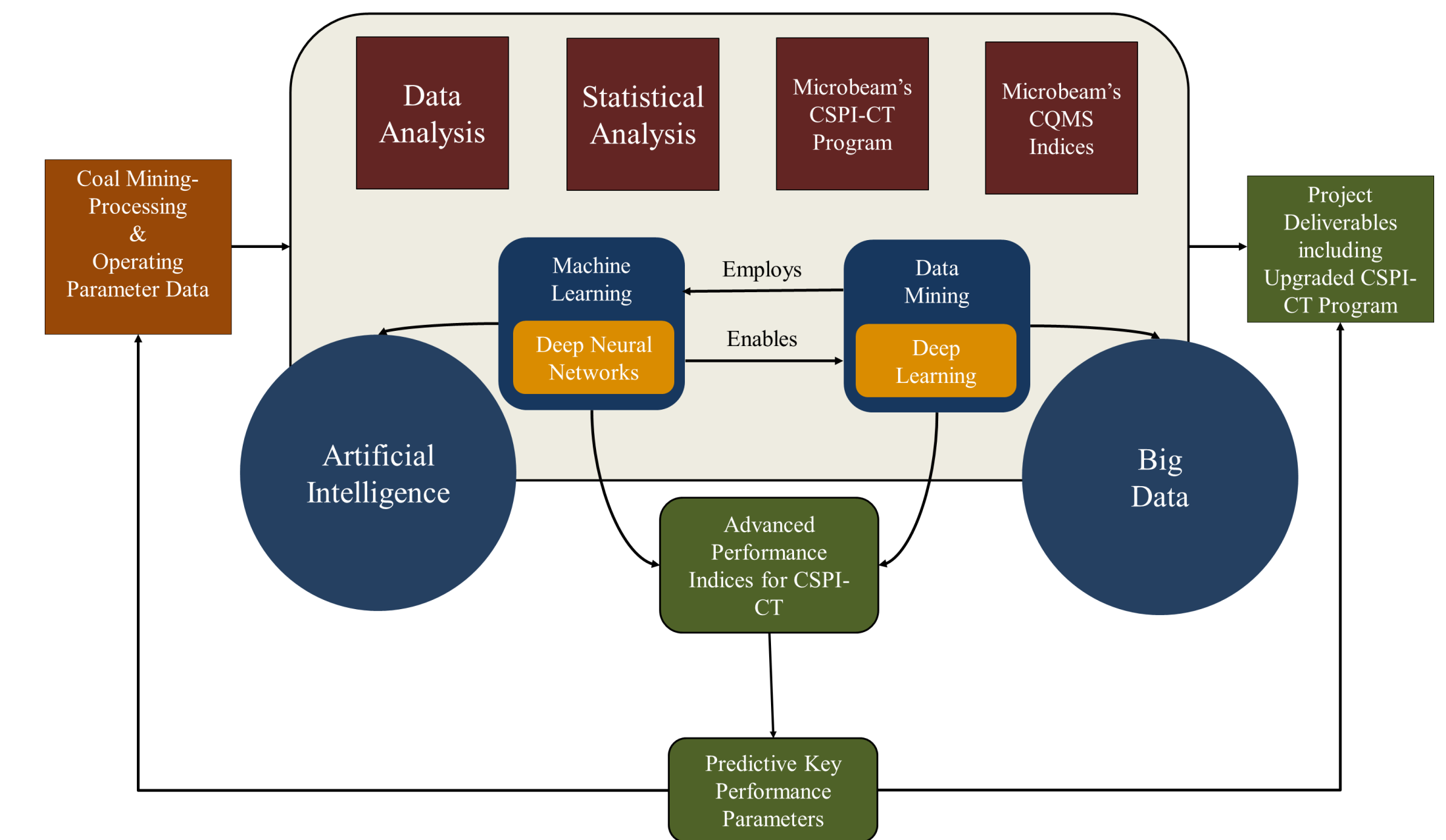| Task 1 - Project Management and Reporting	Task 2 - CSPI-CT & Sensor Installation and Shakedown	Task 3 - Database Development and Software Training
Task 4 - Neural Network Correlation Integration	Task 5 - Field Testing	Task 6 - Validation of Performance Improvements

Key Steps

- Identify measurement points – coal mining/processing and boiler operations parameters
- Access coal properties and boiler conditions sensors and make recommendations on new sensors
- Conduct sampling and analysis
- Build databases for selected coal mining/processing and boiler operations
- Conduct training of Neural Network for each selected operation
- Integrate trained networks – feed forward and feed back predictions
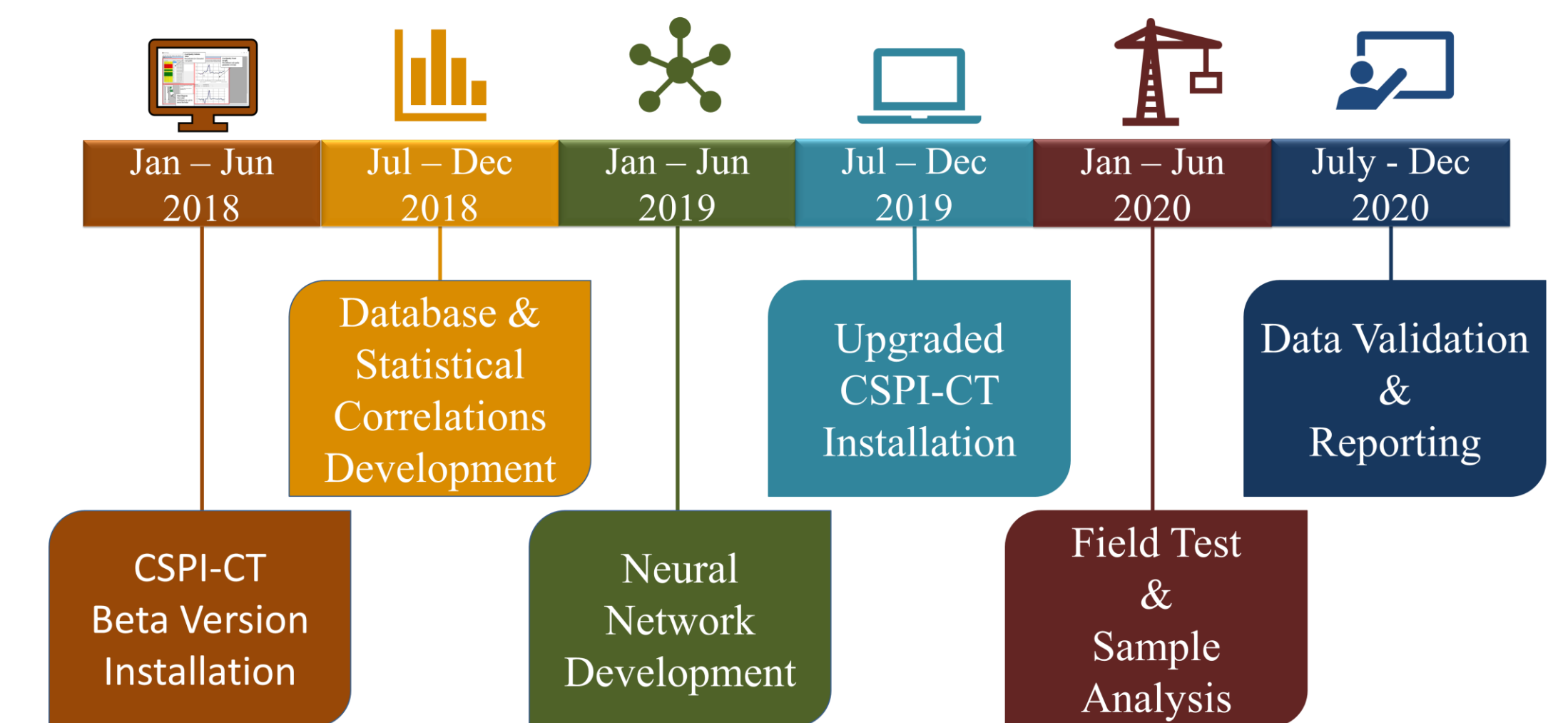- Validate improvements

CSPI-CT Program

Coal Quality Outlook Table — *Red indicates low forecasted coal quality*

Coal Quality Trend Graphs — *Plot different coal quality parameters over time*

Workflow

Coal Mining-Processing & Operating Parameter Data · Data Analysis · Statistical Analysis · Microbeam's CSPI-CT Program · Microbeam's CQMS Indices · Project Deliverables including Upgraded CSPI-CT Program · Machine Learning · Employs · Data Mining · Deep Neural Networks · Enables · Deep Learning · Artificial Intelligence · Big Data · Advanced Performance Indices for CSPI-CT · Predictive Key Performance Parameters

Timeline

Jan – Jun 2018	Jul – Dec 2018	Jan – Jun 2019	Jul – Dec 2019	Jan – Jun 2020	July - Dec 2020
CSPI-CT Beta Version Installation	Database & Statistical Correlations Development	Neural Network Development	Upgraded CSPI-CT Installation	Field Test & Sample Analysis	Data Validation & Reporting

Acknowledgement

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