

Outage Control Center for Successful Asset Management

*Submitted by Michael J. Dammann, Principal, Black & Veatch Management Consulting, LLC
Frank R. Wilson, Principal, Wilson & Wilson Consulting LLC*

Planned maintenance outages are one of the most resource- and cost-intensive activities performed to maintain facility reliability. During planned outages, production is suspended, making it imperative that an outage is conducted safely, on schedule and within budget so that revenue-producing operations can be re-instituted without delay.

An **Outage Control Center (OCC)** is an effective element of managing outages necessitated by capital investment projects for repair, rehabilitation, or replacement. The role of the OCC is to manage outages, ensuring that they meet schedule and budget, by establishing standards and a leadership structure that dictates how communications, schedule, work scope, budget, costs and emergent issues are handled.

During a recent \$120 million rehabilitation project of a 700 MW coal facility, Black & Veatch's Management Consulting team and its client implemented an OCC organization to effectively manage the rehabilitation outage. The outage scope was extensive and included boiler, turbine and generator overhauls, full replacement of the facilities digital control system (DCS), bottom ash equipment replacement, air quality control systems upgrade and standard balance of plant maintenance. Black & Veatch's approach delivered the outage not only on schedule and within budget, but in addition, the rehabilitation effectively achieved project objectives to create one of the most efficient and clean coal power plants in the country. The success of the project is primarily attributed to two factors - an effective key leadership structure and behaviors and management tools used by Black & Veatch's OCC team during the rehabilitation outage.

OCC Leadership Structure

Capable staff need organizational support and empowerment through mechanisms such as formal standards, organization charts, and safety plans.

OCC standard: An outage is resource intensive and typically requires that site personnel perform additional or different roles while interfacing with many third-party contractors. It is important, therefore, to develop a written OCC standard that establishes the organizational structure, expectations and behaviors for outage team roles and responsibilities, OCC facility setup, meeting times and format, communication protocols, schedule updates, scope control approval, budget reporting and issue management. The written standard establishes how the organization will function effectively during the outage period and how it will demobilize at the end of the outage following commissioning activities.

Outage Management Team: The designation of a competent outage management team and a central OCC facility location is a foundational principle for the OCC

organization. Having an outage management team with experienced personnel in respective areas of expertise (called work area coordinators) is essential in supporting the various work groups in staging for the outage, supporting daily work progress, cost tracking, addressing challenges and demobilization. Having a central OCC facility location for the outage manager, staff and area coordinators facilitates highly effective communications of work progress, management of challenges to work progress and the ability to quickly address issues that will impact critical and near critical path scheduled work. An example of the OCC organization chart and an OCC office configuration is offered in Figures 1 and 2.

Figure 1: OCC Organization Chart

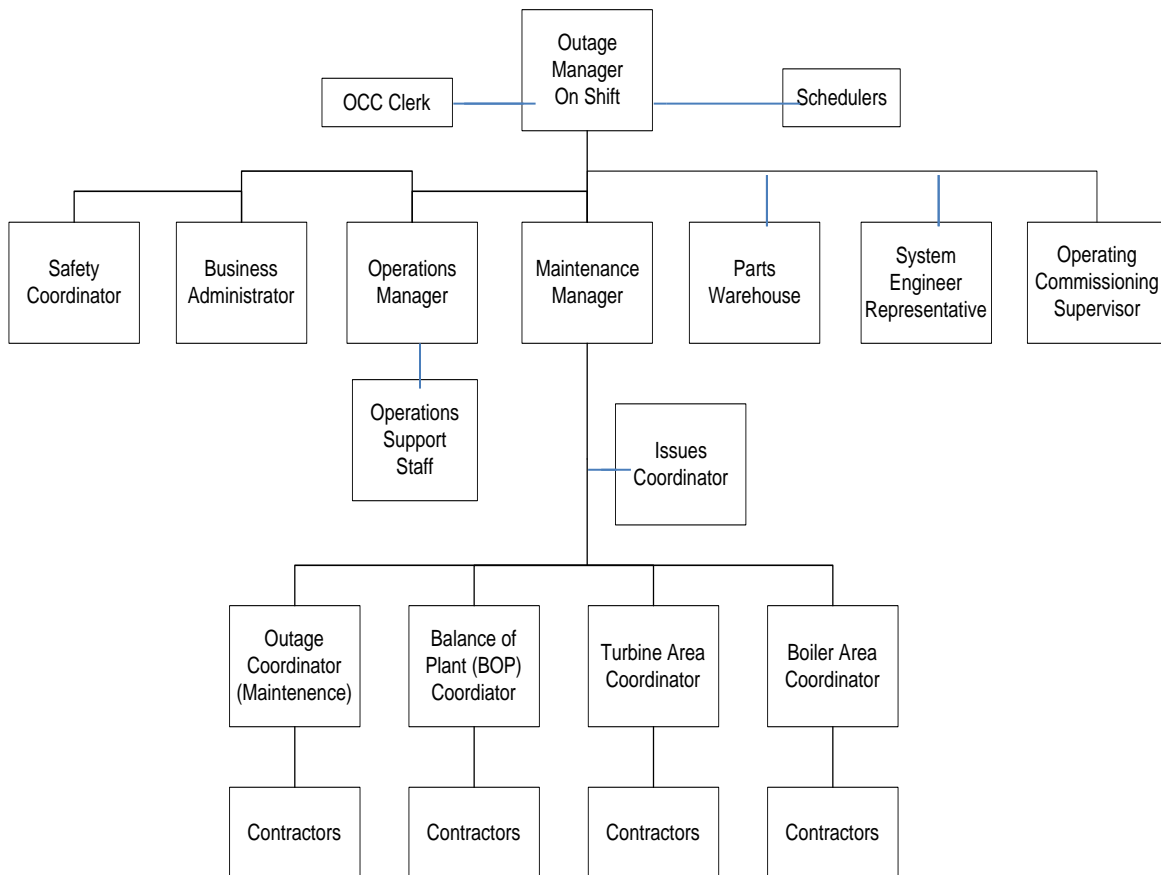
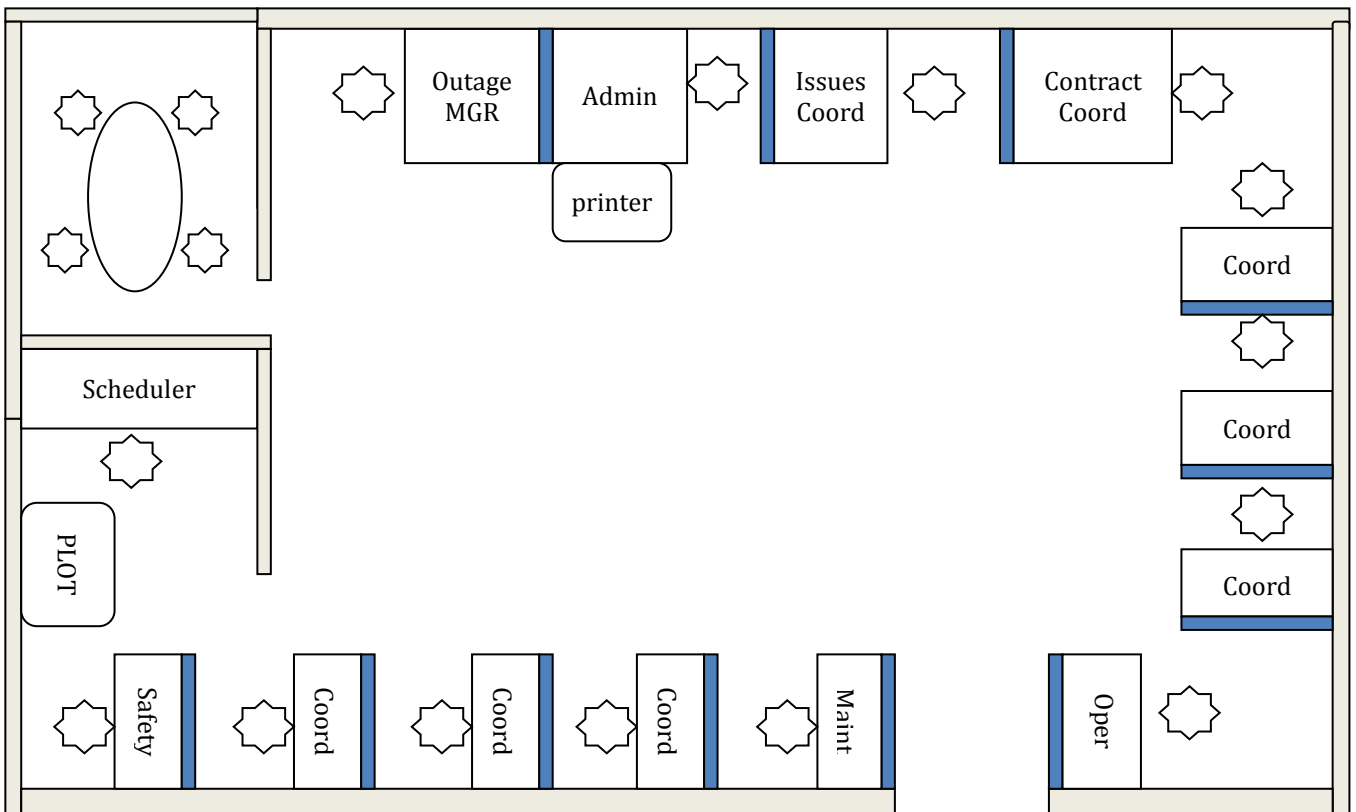


Figure 2: OCC Office Configuration



Safety Plan: Personnel that work on the facility during the outage will work to the safety standards that are established and reinforced by the OCC management, as agreed to by the facility leadership. A comprehensive safety plan sets the tone for a safely run outage. The safety plan starts with safety aspects built into each scope of work during the planning phase, and includes communications to the outage workforce around safe work expectations and emergency response plans, site security access, equipment staging, and parking logistics. With increased labor force and work activity, having additional safety professionals and management in the field observing and correcting unsafe work practices is essential in reinforcing safety standards and preventing safety incidents. An interactive management presence in the field engaging with the workforce results in superior safety performance.

OCC Behaviors and Management Tools

Daily feedback and Review of Integrated level 3

schedules: Daily feedback on progress of each scheduled outage activity is required to determine actual status of critical, near critical path and bulk work scopes. The schedule provides a picture of the work sequences



and interfaces between each work group and their associated support activities. This allows outage management and area work coordinators to manage risk when reviewing the impact of any work that is advanced or delayed in the schedule. The schedule displays critical milestones of major critical path activity windows and the float assigned to off-critical path work. Work groups provide daily work progress allowing the integrated schedule to be updated daily. Work groups are provided daily with a “three day look ahead” schedule containing the next three days of scheduled work. The daily inputs are used to determine status of critical and near-critical path activities, which then allow the outage management team to develop recovery actions.

Communications: With the amount and complexity of work occurring between many work groups during an outage it is important to establish communications standards. Establishment of communications standards will result in effective meetings and direct resources to where they are most needed during an emergent issue. Effective communications include establishing outage meeting times, a formal meeting agenda and attendees with reporting expectations. These meetings will provide a construct for reporting of issues to outage management when critical or near-critical path is impeded or stopped, making requests for assistance, and reporting of safety issues. However, it should be clear to the organization that any delays in critical or near-critical path work be reported immediately to outage management and not delayed until scheduled outage meetings. Immediate reporting is critical so that the organization can properly respond with appropriate additional resources as needed to minimize the impact to the outage schedule and budget. It should also be clear that the organization should not wait for the next outage meeting to bring up a problem or issue for resolution, and that standard outage meetings are not for problem solving. Problem solving is conducted outside of the outage progress and coordination meeting with the specific responsible personnel.

Management of Emergent Work / Issues: Emergent work and unexpected issues can pose significant challenges to outage critical and near critical path. These can arise out of unexpected events, issues or material conditions during the discovery phase, or performance of planned work. Most of this can be addressed prior to the outage by establishing written contingency plans to address potential discovery issues. An effective approach in managing issues is with the establishment of an “issues log” that is managed by an Issues Manager or Coordinator.

The issues log is a simple behavioral tool used by the outage manager and area coordinator to track the many issues and responsibilities that occur in an outage. The issue must be properly defined, with appropriate actions assigned to an **owner of the issue by name** with a defined due date and time. Without a person specifically assigned to the issue along with a due date, important issues slip and do not get resolved, which can further delay progress in an outage.

Example of Issue Management Log:

ISSUE	ACTION	OWNER by NAME	Due Date and Time
Bolt dropped into transformer through manhole on top of transformer and fell to bottom of transformer and unable to locate	Find and obtain specialist with equipment to locate and retrieve foreign object from transformer	John Smith	10/12/17 1000 hrs
Wrong weld procedure used on high pressure feed water piping fittings	Determine correct weld procedure and obtain welders and materials to properly weld fillings on all three feed lines.	Al Reynolds	10/20/17 1600 hrs

For more complicated issues the Issue Manager role is a short-term assignment of a competent leader assigned to bring all appropriate resources together quickly to solve a specific issue that has the ability to directly impact critical and or near-critical path progress. By assigning an Issue Manager to assemble a team to solve the problem, the outage manager and rest of the outage team will be able to maintain focus on the other outage activities rather than be distracted. The Issue Manager and his small team will investigate the issue, and develop the solution and activities required to resolve the issue. Based on the complexity of the issue, the Issue Manager may be assigned to manage the issue until resolved.

Scope Control Management: The OCC will establish a process for outage work scope additions and removals. The standard should include specific description of work, cost of labor and parts, labor resource, work order, impact to schedule and appropriate management approvals before the work is added to or removed from the outage. This provides the facility manager and outage management the opportunity to properly review and challenge the scope of the work, resources, impact to outage schedule and long-term reliability and resiliency of the facility before it is added or removed to the outage scope.

Budget and Cost Control: Prior to the outage commencing, it is critical that all work be assigned to specific work charge numbers for each work group and that approved purchase orders for specific specialist work are in place. The OCC will establish a standard with site personnel and vendors to submit daily time reporting to each work scope. The labor and material charges will be rolled up daily to the designated facility financial coordinator with the capability to monitor daily outage cost to budgeted outage cost and overall projected budget performance. This will allow management to

determine which work scope areas are on, under or over budget with the ability to make financial adjustments before exceeding the overall outage budget.

By establishing a competent outage management team and reinforcing effective OCC leadership standards around safety, communications, schedule reporting, scope control, management of emergent issues and budgets for an outage is guaranteed to be successful.



Michael Dammann is a principal management consultant at Black & Veatch Management Consulting, LLC, and previously served as Director of Outages, PSEG Fossil. He is a US Navy Nuclear submarine veteran and has 42 years of experience in industrial facility safety, operations, maintenance, technical training, facility assessments, outage management and causal analysis in nuclear, coal, combined cycle, hydro, water treatment and electrical transmission industries.



Frank Wilson is a principal of Wilson & Wilson Consulting LLC. Prior to establishing Wilson & Wilson Consulting, Frank was a principal consultant at Black & Veatch Management Consulting, LLC. Frank served as the VP Business Development for Western Technical Services and has 31 years of experience in industrial facility safety, operations, maintenance, technical training, facility assessments, outage management and causal analysis in nuclear, coal, combined cycle, hydro, water treatment and electrical transmission industries.