



The Power To Change

**How Montana Power Company is Preparing for a
Deregulated Generation market**

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Introduction

Colstrip Project Division is a 2276 MW mine mouth fossil fuel generating complex located in southeast Montana. The first two sister units of 333 MW were constructed in the 1970's. Units 3 & 4, 805 MW units, were completed in the 1980's. The plant is located in a remote area that is environmentally controlled as a pristine area. Consequently the site is designed as a zero discharge water facility and has large wet scrubbers in place to assure clean air compliance.

The plant is owned by a consortium of Northwest Utilities including Montana Power Company, Puget Sound Energy, Washington Water Power, Portland General Electric and PacifiCorp. Montana Power is the operator of the facility and the owner operator of the coal mine.

Colstrip is the largest of two fossil generating stations operated by in Montana Power Company, and is located across the vast state of Montana from the corporate offices in Butte, MT. Therefore the plant has been traditionally organized to be self-supporting. Accounting, engineering, human resources, materials management and environmental services are located at the site. Additionally, MPC has supported the administrative operations of the town-site, including property sales, street maintenance, water utilities, and maintaining housing in the area for transient contract workers.

During the early 1990's, with de-regulation on the horizon, we realized that our overall performance must improve. The non-operating owners expected significant improvements in the financial performance of the station. One of the owners managed several coal stations in the region and had been on a long-term program of improved performance. They wanted results that at least matched what had been achieved at other plants.

Business Plan (the Squeeze)

In 1995 Montana Power selected new management for Colstrip Project Division with the charge to prepare for the era of competition that was emerging in the industry. The mission to prepare for the future had to be understood. What level of performance was required?

To answer these questions a business planning process was initiated. To achieve truly radical change, the entire organization would have to be committed to the targeted performance goals, therefore they would have to believe the goals were required and achievable. This commitment had to start with the Leadership Team. Decisions at CPD have always been made through reaching consensus among the managers reporting to the Site Vice President. The changes that would be necessary were to require complete and unqualified buy-in by each individual manager. This would go beyond traditional consensus; agreeing to abide by the wishes of the group to achieve its goals was not sufficient.



The business planning began with a process of discovery. What level of performance was our regional competition achieving? What levels in other areas of the county? And finally, other parts of the world?

How were the best performances achieved? This information was collected through research, phone calls and site visits. A profile of the competitive market emerged. We needed to produce electricity at less than \$10/MWHR. This represented a gap of nearly \$4/MWHR. The goal was set to achieve this cost of production by 1998 and maintain it through and beyond the year 2000.

A Business Plan was developed that established improvement goals for specific areas of performance over a five year planning horizon.

What became clear is that the goals were not going to be achieved much less maintained with obvious staff reductions and postponing maintenance. We were going to have to rethink the way we operated and maintained the plant. We needed to become much more focused at managing the plant equipment. Our vision emerged: To achieve the minimum required production from each plant equipment for the least possible cost.

This was distinctly different from our traditional approach of the maximum production from plant equipment, without enough regard for the short term cost.

The scope of change was going to require an extensive change management effort. It had to be a revolution.

Organization

As we began to assess the impact of our Business Plan, we discovered that the managerial ownership of plant equipment was not focused to a single responsible manager. Ownership was spread through the traditional operations, maintenance and engineering organizations. Equipment ownership did not consolidate until the office of the Site Vice President.

Consequently, each department tended to make decisions regarding equipment from their own perspective on priorities and methods, sometimes for their own convenience. This in many cases was in conflict with optimum plant performance.

Additionally, the plant staff level appeared to be too high in comparison to the industry benchmark staffing we had obtained. This had been justified in the past as necessary to support the extraordinary environmental equipment and the administrative staff required to support a remote, independent plant site. The cost of extra staffing was believed to be more than offset by the relatively low price of coal that served the station.



To resolve these issues the following actions were taken. First, it was determined that the size of the staff should be reduced by 30%. Second, positions would be reorganized to focus responsibility on the primary function of managing plant equipment.

The reduction in staff was a difficult decision. Beyond the normal human concerns of laying off friends in a small community, there was uncertainty whether the plant could be operated successfully with so few people. There was also a question of whether to make the reduction in two phases to better understand the impact of the changes, or to make the changes in one downsizing and to then have the unpleasantness behind us and clear constraints ahead of us. Finally, through the bold leadership of the new Vice President and some of the department managers, the decision was to make the complete reduction at one time.

The downsizing was not only to be a reduction in union employees or first line managers, the reduction was to occur in positions across all levels of the organization. Personnel were carefully evaluated by the Leadership Team, independent of the department in which they were currently employed. Final decisions on layoffs were made based on the ranking of employees. Within the union, employees were ranked by seniority when there was not significant difference in performance. Ultimately 65 people were laid off in February of 1996. It was a depressing and difficult time, but everyone knew it had to happen, the squeeze was on.

The second aspect of re-organizing was to change the structure to focus on equipment management. To accomplish this a new position of "Area Leader" was established. The Area Leader would report directly to the Site Vice President and would have complete checkbook authority for the equipment in their area. This authority extended to the degree and content of the maintenance and operations to be performed on the equipment and any capital improvements that would be authorized. Their goal was to operate the equipment at just the right amount of availability at the minimum possible cost. They would have no people in their organization to perform this work. They have no personnel responsibility, they have no staff to protect and extend. They are singularly motivated to reduce cost and improve plant performance...long term.

The work processes to perform all of the work required to support the Area Leaders are the responsibility of two managers in the organization: Operations and Maintenance Manager, and the Business Services Manager. These managers also report to the Site Vice President. They are responsible to provide all of the services required by the Area Leaders. They do not make equipment decisions or determine the level of preventive maintenance or operational staffing. They are responsible to organize the work and to deliver an efficient, cost-effective, and quality work output.

By focusing their attention on people and work processes, the organization is not divided into operations, maintenance or engineering. All participate in the same processes which are driven by the needs of the equipment. Efficiency grows as each manager pays more attention to how the work is performed rather than what work is performed. We have discovered that the accountability achieved by having the Area Leaders expect work to be performed by

these service groups has radically changed many of the attitudes of the people within the service organizations. Work assignments are clear and results are visible.

Major Equipment

To support the new concept of area management, the design of an equipment management program was initiated. This new management program was christened Reliability Based Production (RBP). The purpose of the program was to establish an integrated approach to develop and execute optimized equipment plans. A team of key employees was organized to design and develop the RBP program.

RBP was developed over a six month period during which the Leadership Team met regularly to consider the issues and implications of Reliability Based Production as a management imperative. Many issues were raised and at times it seemed like too big a task to achieve and too much change to accomplish within the organization. However, at each point in crisis, we assessed our alternatives. It became increasingly clear that to achieve our goals it would require a bold initiative. Ultimately RBP emerged as the central management philosophy of the Colstrip Project Division. The following features of RBP summarize the essential elements of the program.

Major Equipment RCM Strategies - The concept of Major Equipment emerged as the primary structure to manage the volume of equipment in the plant. We discovered that Major Equipment is the equipment that operators have traditionally managed. These are the units of equipment that they turn on and off. All of the other equipment exists to support the Major Equipment function.

As Reliability Centered Maintenance (RCM) techniques were tested and evaluated, we determined that the RCM analysis at the plant system level was too broad, and did not adequately evaluate the impact of all the equipment in a system. Instead, by focusing the RCM techniques at the Major Equipment level, we could prioritize the equipment for analysis, and could accomplish these analyses much more quickly.

The result of each RCM analysis is a customized operating and maintenance strategy formatted to address all the aspects required to completely manage the equipment. This includes effective operational requirements, all of the preventive maintenance (PM) required, the anticipated corrective maintenance (CM) including its cost and frequency, and the testing required to support the condition based maintenance (CdM) strategies.

The Major Equipment RCM Strategies are the responsibility of the Area Leader. Their responsibility is to develop and approve these plans for all Major Equipment in their assigned plant process areas. Teams of employees including mechanics, operators, and engineers are organized by the Area Leader with the responsibility to develop a specific equipment's RCM plan. These plans are intended to contain the best personnel experience, engineering design, and are supported by detailed maintenance and operating histories from computerized databases.



Production Allocation - One of the key principles of RBP is that each Major Equipment should be maintained and operated to achieve the minimum level of production required to meet the plant production goal. Because of redundant equipment and parallel production systems, many of the Major Equipment are not required to operate at production levels as high as the overall plant production levels. For these equipment the frequency of PM tasks can be reduced to the minimum required to sustain the targeted level of production.

A model was designed to calculate the production requirements needed by each Major Equipment to support the forecast production of the generating unit. When implemented, the model will produce the projected production requirements that will drive the RCM strategy to be the lowest cost possible. Traditionally, each plant equipment has been maintained as though it was required to be available more of the time than is actually necessary.

Condition Based Maintenance. One of the major cost reduction options of the RCM strategy is to substitute testing information for the traditional preventive and corrective maintenance response. Each RCM plan identifies the test information that can substitute for expensive and often intrusive preventive maintenance. For those failures that require corrective maintenance, testing is developed to prevent the occurrence of catastrophic failure and to contain the maintenance action to the planned corrective work scope when a failure does occur.

Work Plans and Procedures. As the RCM work teams have analyzed equipment histories, one of the critical discoveries is the need to standardize certain maintenance troubleshooting and repair procedures. History has proven that different skilled craftsmen will use different procedures often introducing errors for which they have no corrective feedback. Well-intended experiments are often tried, unknown to the rest of the organization, by one employee. The resultant effects of the trial procedure are not verified and recorded, consequently nothing is learned in the organization. Often the same trial may be repeated by other employees many times over the history of the equipment.

Therefore, Work Plans have been developed to control critical maintenance procedures. These plans are not developed by one individual but represent the best knowledge of experienced employees. As the plans and procedures are implemented people are expected to strictly perform the procedures. Employees from all levels and areas of the plant formally contribute their ideas and knowledge as members of Plant Improvement Program (PIP) Teams. New ideas or concerns about the procedures are documented and fed back to the Work Plan design team. The intent is that the Work Plans and procedures become the documented intellectual property of the organization, and as such are worthy of our highest attention and support.

Failure Diagnostics - As each Major Equipment is analyzed through the Root Cause Analysis process, a structure of diagnostic failures is identified. These failures are the typical symptoms the equipment exhibits when something has gone wrong. These first indicators then lead to a second set of diagnostic questions to further troubleshoot the underlying equipment



problem. This process continues until the root problem is identified and the corrective maintenance work request can be correctly generated.

This process enables the resultant CM work request to be accurate in description, providing the maintenance personnel with the detailed diagnostic questions and answers to support their maintenance efforts. The diagnostic questions also accurately identify the correct lower tier equipment number so that the maintenance history is accurately assigned to the correct equipment. Finally, the diagnostic process enables the automated assignment of the correct Work Plan and procedures to the CM work request. This ensures that a prepared Work Plan is not overlooked in the CM process.

Again, one of the critical aspects of the diagnostic process is the ability of the people to add to the diagnostic tree as new information is discovered. This then also becomes part of the all-important intellectual property of the organization.

Processes

It quickly becomes evident that RBP requires the ability to organize and perform work in a highly consistent and reliable manner. New information is required to be acquired, processed and controlled. The new responsibilities established in the organization require different processing of information. And the task of converting to RBP requires significant implementation efforts to develop critical initial information such as the Major Equipment, diagnostic failure codes and the initial RCM plans.

These challenges caused us to think through the implications of RBP on all the business processes and the databases currently existing in the organization. Impacted processes were identified to be assessed and redesigned to comply with RBP principles, and where possible to improve the process efficiency and quality. Each selected business process was assigned to a design team to assess the current processes and to establish a new process that is fully compliant with RBP. The team is required to prepare an implementation plan that identifies the costs and benefits of the implementation. A Business and Change Organization, formed as part of reorganization, coordinates and documents business process design work.

Through the process redesign, options are developed for implementing the new design. Often these options involve computerization. Our philosophy is to automate only what has a favorable cost benefit analysis. Each process team develops a design requirement specification for information technology and the Information Services group prepares an options and cost proposal for the requested functionality. Always the effort is made to utilize existing technology tools if at all possible.

One of the important priorities of the process redesign projects is to identify all of the data that is created in the process or required to support the process. The data requirements are managed in the Business and Change Organization, so that the definitions are consistent throughout the RBP Program and the various business processes. The result is that



information is created once for all and the data is efficiently used through out all of the processes.

Many processes have required redesign to support RBP. Our maintenance work management processes have been modified to fully implement the diagnostic failure analysis, the major equipment and the assignment of Work Plans. The clean up of spurious data in the legacy systems and the enforcement of new accountability in the process have been important features in the implementation.

The budgeting and accounting processes have been redesigned to handle the new organizational structure. Of particular importance is the concept of Responsible Business Units and Home Business Units. This new form of accounting and budgeting support the monitoring requirements of both the Area Leaders and the service provider managers. RBP also requires that the operating budget be developed based on the actual Major Equipment RCM plans. The new budget design calculates the forecast cost of the current RCM plans as a baseline for each year's new proposed budget. This enables the budgeting process to be driven by the work requirements rather than by the current level of staffing and historical work practices. Staffing levels and skill development in the service business units is expected to align with the budgeted work requirements. With the design complete, we are able to achieve much of the design intent even though we have not fully automated the new processes. The completed designs provided the vision for a new approach to financial management.

We also discovered that our technical processes were not able to support RBP. Previous RCM programs were isolated in the engineering organization with little impact on daily plant management. Condition monitoring processes were inconsistently executed, analysis was inadequate, and the findings were often ignored. Redesigning these processes found new priority because of RBP. A new process was established to track the work of PIP teams that are responsible for developing the RCM plans. The testing currently performed throughout many different organizations was consolidated into one accountable process. This Testing Process controls all tests to assure the tests are accurately performed, the data analyzed and logged into the tracking system, and any corrective actions initiated based on the test analysis are appropriately entered into the maintenance work management process.

These process changes have involved a large percentage of the management work force on the design teams. This involvement has developed a broad base of understanding and commitment to RBP. The process design work gives tangible evidence of management direction and consistent support for RBP. And participation on these process design teams has instilled the need to execute the process and the Work Plans faithfully and flawlessly. Debates about our ability to execute the processes and plans have reinforced the need for a change in our work culture at the plant.



People

Change has not been limited to structural changes at Colstrip. People have changed. They have changed their attitudes about how work should be performed, about the reality of competition, and that real, substantial change can occur successfully.

At the time of the layoffs, the stress in the organization was tremendous. Personal tragedies were an unfortunate but real part of the experience. During this darkest time there was no history or evidence to prove the plan, only the confidence of the Leadership Team. All outside opinion was negative. Newspapers, local civic groups, the union, and even our spouses questioned these radical decisions. It was during this time that the Leadership Team displayed its greatest resolve as they stood together to weather the storm.

Once the layoffs were completed, management stated that no future layoffs were expected in core business areas. All future downsizing would occur as a result of attrition. This was consistent with the Business Plan goals, and over the following year the organization became convinced of this commitment. Then we could begin to build the new vision for Colstrip.

Union Relationship - The layoff exacerbated an already difficult union relationship. Prior to the layoff, union members were regularly participating on PIP teams although union leadership was not comfortable with the concept. Once the layoffs were announced, the union forbade any union employees to participate on these teams because of the perception they were eliminating union jobs. This had the potential of a major union confrontation. Management did not make participation mandatory, but continued to offer the opportunity for team participation to union members. Many union employees continued to attend PIP meetings. We provided the union information about our goals for PIP, and made a commitment to discuss only technical equipment-related problems in team meetings.

One of our major goals is to create a kind of partnership with union employees. We would welcome a similar relationship with union leadership.

Work Plan Compliance - We have had to acknowledge that change is more than acknowledging that we must do better, that we can do better, and that we are willing to change our processes and procedures to get better. Change of our fundamental work behaviors is also required.

As we pursued the implementation of RBP and the redesign of our business processes, we discovered something about ourselves: we did not follow up adequately when we did not get compliance to written assignments, standards and procedures. We did not make these assignments with clear enough expectations so they could be strictly followed, we did not accept work assignments understanding the importance of complying exactly to them, and we did not expect to be held accountable when we chose not to comply because we thought we had a better way. Our culture allowed employees too much latitude to make decisions regarding their work assignments, in both scope and content.



This issue emerged as we implemented our new processes and experienced our inability to reliably perform PMs and condition testing. Excuses abounded. At the heart of these excuses was an inability to hold people accountable for execution because of vague assignments and procedures. We were afraid to be too restrictive on our people, that we might keep them from thinking, or they would become angry with our attitude of prescribing formal work assignments and procedures. This greatly frustrated the Area Leaders and compromised our success.

Our attitude was in direct contradiction with RBP. In RBP we have to work as a team using the best information available. This required each of us to acknowledge that the organization as a whole has more information and expertise than any one individual. And therefore, we are all accountable to perform to the expectations of the organization as set forth in written work assignments, standards and procedures. And we can expect to be held accountable by our managers for our objective work performance. If we have ideas that can improve the procedures, these are proposed to the appropriate Area Leader or business process owner for consideration. Changes are typically made through the appropriate PIP or business process design team. We all have the opportunity to make some of the rules and we are all expected to comply with other team's design rules.

This attitude of clearly stating our expectations and holding people accountable is our foundation for change. We think of this as the difference between a sandlot football team and a professional team. We will plan the work and work the plan. What we learn will be recorded and added to the store of organization knowledge. This is how we get better.

CONCLUSION

We have all read the books on change; new management eras, new paradigms, new styles, and new techniques. We often wonder if these kinds of changes can really happen. At Colstrip we have changed. Our vocabulary is different. Our jobs are different. Our priorities are different. Our attitudes are different. And our results are different.

We are on plan. In 1998 our costs will be below \$10/MWHR. But more importantly, we have a vision for operating our plant into the next century. We will get even better.