

Operations Consolidation Project

Final Report

Prepared By:

Operations Consolidation Project Team

December 14, 2007

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1. Executive Summary and Recommendations

a. Operations Center, ACC and Transmission services Location Recommendation

The Operations Consolidation Team (Team) has investigated the technical merits for consolidating the Desert Southwest (DSW), Rocky Mountain (RMR) and Upper Great Plains West (Watertown) Balancing Authorities and Transmission Operations into a single operations organization as identified in the Project Plan included as Attachment A. Although the Team could not come to an agreement on the recommended location, it is recommended that the selected location host both the Operations Center, the ACC within a one hour location of the Operations Center and the Transmission Services functions. Either Desert Southwest or the Rocky Mountain region could host these functions.

The Team agrees that Western should continue the consolidation of operations and transmission functions as this strategically prepares Western for the future.

i. Operations Center location

The Watertown alternative was screened out as identified in Attachment D based on extensive shortcomings dealing with building space, SCADA, communications requirements and personnel impacts. The team reviewed operations in the Desert Southwest and Rocky Mountain regions and came to the conclusion that there are no technical criteria with respect to SCADA, communications, business tools or space for selecting one Region over the other. Utilizing other criteria outlined in Section 4 to review DSW and RMR also resulted in the Team being unable to come to an agreement on a preferred alternative. This location analysis for each area is included in Appendix K and Appendix L.

ii. ACC location

The Team recommends that the Alternate Control Center (ACC) be located within one hour of the Operations Center that is selected. To locate an ACC in the non-selected primary location requires eight to 14 additional dispatchers which would cost an extra \$1.2 million to \$2.1 million per year assuming a loaded cost of \$150,000/dispatcher. If it is desired to fully man an ACC seven days a week and 24 hours a day it would be better to utilize these funds to construct a new site that is within the one hour distance from the new consolidated dispatch center. Some of the advantages include, having dispatchers man the center periodically so that everyone would be familiar with it and in an emergency it could be staffed much quicker than a site that has limited personnel.

It is believed that this report does not need to define exactly what type of ACC Western desires to have in the future, as both DSW and RMR have ACC's that meet all the NERC and WECC requirements. It is felt that this is a separate issue and is not critical to this present decision process other than defining the general location of the ACC.

iii. Transmission Services Location

It is recommended that the selected location host both the Operations Center and the Transmission Services functions. The coordination of the TSP functions is the driving force for this recommendation. Co-location maximizes the communication and coordination of the TSP functions that interact with real-time operations.

b. Organizational Recommendations

The Team recommends that the following organizational structure be strongly considered and evaluated in detail as part of the implementation planning phase when reorganizing Western's Operation and Transmission Services:

Transmission Service Organization - It is recommended that a separate Transmission Services organization be developed that include functions that are responsible for OATT compliance, OATT administration, Transmission Business (contracts, OASIS management and OATT/Queue management), and transmission planning functions.

SCADA - It is recommended that due to the unique and real-time nature of operating the power system that the SCADA organization report to the Operations Manager.

Transmission Support Structure - Since this organization will be responsible for managing multiple Federal Transmission Projects it is recommended that the following support areas be functionally separate from Federal Power Marketing Project functions. It is recommended that the consolidated organization include:

- Transmission rates staff
- Settlements staff
- Contract support staff

Transmission Planning - It is also recommended that transmission planning staff be located in both DSW and RMR so that local planning efforts can continue in conjunction with WECC regional planning efforts.

c. Timeframe

The timetable by which this consolidation project can be completed will be determined by a number of factors. Depending upon implementation methodology, the critical factors will be the merging the two SCADA systems and the modifications of the communications infrastructure.. There was not sufficient time to analyze an implementation time for this project, but it is estimated that it could be implemented in a one to two year effort. Neither Space nor Business Tools are considered to be critical with respect to implementation timeframe. This will be more definitively evaluated in the Implementation Plan phase after a site has been selected.

Given that little or no facility modifications will be required to accommodate the consolidated Transmission Operation's functions in either DSW or RMR, a consolidated control center separately operating the WALC BA/TOP and the WACM BA/TOP could be up and running in a relatively short period of time. This can be achieved once the necessary equipment and personnel are put in place to remotely operate either the WALC BA/TOP or WACM BA/TOP, whichever site was not chosen

to locate the consolidated control center. Later, once the necessary SCADA, Communications and Business Tools are put in place, the consolidated control center could begin operating a consolidated BA/TOP. This, coupled with other measures to retain Western's expertise such as: retention allowances, the use of over-hires to shadow experienced staff unlikely to relocate, and recruitment incentives serves as a means to accelerate implementation and retain critical expertise that could otherwise be at risk due to a prolonged implementation.

2. Proposed Action and Alternatives

a. Business Need

To remain competitive in our changing industry and reduce duplicative costs; certain Western Balancing Authorities (BA) and Transmission Operations (TOP) within the Western Electric Coordinating Council (WECC) need to be consolidated into a single entity. The Rocky Mountain Region (RMR), the Desert Southwest Region (DSW), and the Upper Great Plains Region (UGPR) each have operations functions within the WECC's area that are physically interconnected with Western transmission lines. The operations functions include Balancing Authorities (BA), Transmission Operators (TOP), Transmission Service Provider (TSP), Transmission Planner (TP) and Transmission Planning Authority (PA).

With the demise of the North American Electric Reliability Corporation (NERC), recognition of "Control Areas" and the movement to a functional model as represented by the functions described above, there has been an emphasis by the Federal Energy Regulatory Commission (FERC) to encourage the industry to reduce the number of BA's and TSP's that are in existence. It is anticipated that regulation, reserve and other operating efficiencies will occur with the consolidation of the BA function. Western also has filed one Open Access Transmission Tariff (OATT) with FERC, and managing fewer OATT queues will result in efficiencies for both the transmission customers and Western. Other efficiencies will be gained in managing fewer NERC & WECC compliance processes. It has been also quite challenging to keep up with various NERC, WECC, FERC and North American Energy Standards Board (NAESB) changes that have come with industry deregulation and a more centralized organization will facilitate efficiencies in this area. Efficiencies would also be gained by reducing the number of Supervisory Control and Data Acquisition (SCADA) systems and other operational tool sets.

Combining these three BA's would also make Western the 10th / 11th largest BA in WECC out of 35 BA's. This will strategically make Western a stronger participant in influencing WECC policy, RTO formation efforts and other industry initiatives. The combined TOP would have operations within 11 of the 15 western states in which Western operates. It would operate 97 generating units having an installed capability of over 5,600 MW. It would control and operate over 190 substations using approximately 9,000 miles of transmission lines. In 2006, this combined area of operations supplied more than 18,000 GWH of energy to customers.

For the above reasons we propose that Western Senior Management consider consolidating the transmission services and transmission operations functions currently within the DSW, RMR and UGPR-West regions into a single entity.

b. Alternatives

i. Overview of Alternatives:

The Team evaluated several alternatives in order to maximize the use of existing infrastructure. The infrastructure that was evaluated included the Primary and Alternate Control Centers of DSW, RMR and UGP. This resulted in the evaluation of 15 alternatives which can be broken down into the following four categories which are based on the location of the selected Primary Control Center, Alternate Control Center, and Transmission Services:

- 1) The Primary Control Center of the selected region would host the consolidated Operations function. The existing (one hour) ACC of the selected region would provide the backup. The selected region would host the Transmission Services function. These alternatives were designated as Alternative 1a and 2a.
- 2) The Primary Control Center of the selected region would host the consolidated Operations function. The non-selected region would host the ACC function. The selected region would host the Transmission Services Function. These alternatives were designated as Alternative 1b and 2b.
- 3) The Primary Control Center of the selected region would host the consolidated BA function and that region's Transmission Switching Function. The non-selected Region would host the ACC function and the non-selected region's Transmission Switching Function. The selected region would host the Transmission Services Function. These alternatives were designated as Alternative 1b+ and 2b+.
- 4) The same as alternatives 1, 2, or 3, with the exception that the non-selected region would host the Transmission Services function. These alternatives were designated as Alternative 1c, 1d, 1d+, 2c, 2d and 2d+.

Note: Using the UGP Alternate Control Center was not considered for alternatives where DSW or RMR was selected to be the Primary Control Center location. This is because the Transmission Switching function of UGP is not being considered for consolidation, and the communication infrastructure would make this cost prohibitive.

ii. Screen-out of the UGP alternatives:

The use of the UGP Primary and Alternate Control Center to host the consolidated Operation functions was eliminated due to several factors including:

- The Watertown Operations Center is not physically large enough to accommodate the consolidated organization.

- Watertown presently has a dissimilar SCADA system from those used by DSW and RMR and would require extensive modifications.
- There are currently insufficient communications facilities between RMR & UGP to support the transfer of data from DSW and RMR to UGP.
- Consolidation of Operations in Watertown will require a much larger number of employees to be relocated from the DSW and RMR regions to Watertown than the selection of either Loveland or Phoenix.

Appendix C contains the details of the Screen-out paper that recommends the elimination of the UGP alternatives.

iii. Screen-out of existing DSW and RMR sites as the ACC:

It is recommended that the ACC be located within one hour of the Operations Center that is selected. The downsides of the non-selected region providing the ACC function outweigh the upsides.

- To locate the ACC at the non-selected primary location requires an additional eight to 14 dispatchers and would cost an extra \$1.2 to \$2.1 million per year.
- Organizational culture would be more difficult to manage with remotely located personnel.
- Risk increases with having to quickly move additional staff to the remote location.

c. Recommendation for co-located Operations Center and Transmission Services:

It is recommended that the selected location host both the Operations Center and the Transmission Services functions. The coordination of the TSP functions is the driving force for this recommendation. Co-location maximizes the communication and coordination of the TSP functions that interact with real-time operations.

It is recommended that a separate Transmission Services organization be developed that include functions that are responsible for OATT compliance, OATT administration, Transmission Business (contracts, OASIS management and OATT/Queue management), and transmission planning functions.

The Team also recommends that strong consideration be given to include transmission rates staff, settlements staff and contract support staff in this organization. This organization will be responsible for managing multiple Federal Transmission Projects and as such, a unique organization that is functionally separate from and independent of the Federal Power Marketing Project functions is highly recommended. It is also recommended that transmission planning staff be located in both DSW and RMR so that local planning efforts can continue in conjunction with WECC regional planning efforts.

The complete list of Alternatives can be found in Appendix B.

d. Staffing Requirements

An Organizational Chart for both the Operations and Transmission Services organizations are included as Appendix D. *It should be noted that this analysis is not intended to show the final organizational structure or numbers, but is a maximum staffing condition used to determine space requirements and comparison of the alternatives.* The staffing requirements for each of the alternatives are listed in Appendix E.

The Team recommends that the following organizational structure be strongly considered when reorganizing Western's Operation and Transmission Services:

Transmission Service Organization - It is recommended that a separate Transmission Services organization be developed that include functions that are responsible for OATT compliance, OATT administration, Transmission Business (contracts, OASIS management and OATT/Queue management), and transmission planning functions.

SCADA - It is recommended that due to the unique and real-time nature of operating the power system that the SCADA organization report to the Operations Manager.

Transmission Support Structure - Since this organization will be responsible for managing multiple Federal Transmission Projects it is recommended that the following support areas be functionally separate from Federal Power Marketing Project functions. It is recommended that the consolidated organization should include:

- Transmission rates staff
- Settlements staff
- Contract support staff

Transmission Planning - It is also recommended that transmission planning staff be located in both DSW and RMR so that local planning efforts can continue in conjunction with WECC regional planning efforts.

3. Functional Analysis

a. SCADA

Based on a review of the RMR and DSW SCADA systems, there is no overriding technical obstacle to consolidating SCADA operations at either location. Consideration must be given to potential site specific issues such as IPP support at DSW and USBR support at RMR.

System similarities include the base SCADA software and some hardware; however, there are significant challenges in conversion of the SCADA databases and the software customs in both systems. These challenges are implementation issues, not specific to site selection. Each region has established expertise in different areas that should be viewed as complimentary contributions to a combined system (emphasis added!).

The implementation plan will need to address existing operations while developing of the new combined control center SCADA system.

The following is a list of significant implementation issues:

1. SCADA databases (the entire point database for one of the sites will need to be rebuilt to avoid point assignment collisions, as well as the DAC database and ICCP objects)
2. Merging of SCADA and AGC customs.
3. AGC migration
4. RTU checkouts for RTUs swung to the new system (involves dispatch, switching and field teams)
5. Historian conversion from one to the other or historian integration (running both systems)
6. Scheduling package integration
7. Running the current SCADA systems while simultaneously building, testing, and supporting the new system has significant challenges both technically, planning/project management, and resources

Top Ten Combined Control Center SCADA Functional requirements:

1. Fully functional redundant primary and backup control centers
 - a. Hot backup center
 - b. Includes all the following functions at both centers
 - c. Redundant communications between the Primary and Backup Control centers
 - d. Separate RTU telemetry to the Backup Control center
2. Non-redundant development system
3. Power Grid monitoring and control
4. Multi-area AGC
5. All RMR & DSW SCADA Customs
6. Advanced Applications
 - a. State Estimation
 - b. Dispatch Load flow
 - c. Contingency Analysis
 - d. Dispatch Training Simulation
 - e. Black Start Simulation
 - f. Optimal Power Flow
 - g. CIM-XML
 - h. Voltage Stability analysis
7. Integrated Outage Scheduler
8. Historian
9. Inter-Utility Communications
10. Reserve group support

Appendix F is a chart that describes various aspects of the involved SCADA systems and provides a comparison among themselves and a combined system.

b. Communications

Based on a review of the RMR and DSW Communications systems, there are no overriding technical obstacles to consolidating Operations Control Centers at either location. However, consideration must be given to specific issues such as channel, bandwidth and path redundancy requirements.

Western will continue to support Reclamation's control centers in Colorado and Wyoming, as is presently done in Loveland. Locating the consolidated control center in Loveland reduces the bandwidth required between Loveland and Phoenix by six T1s:

- Support for the Reclamation control centers in Colorado and Wyoming will not have to be remotely connected from Phoenix to Loveland (2 T1s saved). Although the 2T1s are needed Western presently has enough existing bandwidth between RMR and DSW to accommodate this requirement. However this will critically limit bandwidth between Montrose and Loveland for future expansion. In addition reliability for BOR support will be increased if connection to Phoenix not required.
- Channels required to take the UGP RTUs beyond Loveland to Phoenix will not be required (4 T1s saved). Although the 4T1s are needed Western presently has enough existing bandwidth between RMR and DSW to accommodate this requirement. However this will critically limit bandwidth between Montrose and Loveland for future expansion.

This is extremely critical to Reclamation, especially with respect to Reclamation controlling their power plants.

The communication needs for control area consolidation are roughly 12 T1s. Note that existing capacity between Montrose and Loveland will be largely used up with this effort. It will be necessary to expedite communications replacements of the Central and Colorado Joint Rings in RMR to ensure sufficient capacity is available for future expansion.

To accommodate consolidation, the DSW microwave system between Phoenix and Mexican Hat will require activation of a second DS3. Upgrade of the microwave system from Phoenix to Montrose will need to be expedited – the existing Alcatel radios are 10 years old and getting difficult to maintain. The main concern is placing a large amount of critical BA and TOP data on this older equipment.

To adhere to operational redundancy requirements, all circuits will be aggregated at two different locations in each region with diverse routes to the chosen primary and alternate control centers for control area reliability. The first of these routes will be the

existing microwave system between Phoenix and Loveland. The second route could include any one of the following options: (1) the DS3 fiber connection from Phoenix to CSO, continuing on RMR's backbone to Loveland; (2) lease bandwidth from a public network carrier; (3) explore the possibility of communications partnering with other utilities between DSW and RMR.

Completion of communication changes and upgrades to implement the consolidated operations center are expected to take between one and two years.

Other communication requirements do not have a major impact on site location selection - please see Communications Comparison Chart in Appendix G for details regarding all communication requirements.

c. Space Requirements

DSW

DSW has sufficient space to accommodate the proposed new Transmission Services and Transmission Operations organizations without construction of new facilities. DSW also has sufficient real estate to accommodate construction of new facilities to provide for future expansion if needed. To accommodate Alternative 1a, some areas would need to be modified converting a conference room and an existing communications bull pen area into new offices and cubicles. Additionally, Alternative 1a would require relocation of some employees to optimize the existing space. These relocations are already being planned within DSW as part of an effort to consolidate personnel within the G5000 and G4000 functions.

The DSW ECC, located less than 1-hour away at Coolidge Substation, has sufficient space within the existing control building to accommodate the ACC. This would require some modification of the basement area to accommodate the increased number of desks. Coolidge Substation also has sufficient real estate within the secured perimeter to accommodate construction of new facilities to provide for current and/or future needs.

Layouts for both Transmission Services and Transmission Operations are included in Appendices H-1 and H-2 respectively.

The Transmission Services layout shows that the building can accommodate 26 Transmission Services employees, three Dispatch Trainers/Certifiers along with an on-site Dispatch Training Room.

The Transmission Operations layout shows that the dispatch area can accommodate 9 or 10 desks utilizing 6 current dispatch workstations and adding three or four more. The map board currently accommodates 7 – 120" screens which could be replaced with at least 28 – 65" screens. The Transmission Operations area can accommodate all Transmission Operations personnel including Settlements and SCADA.

RMR

RMR has sufficient space to accommodate the proposed new organization without construction of new facilities, although in some instances areas would need to be modified from conference rooms, shop areas and vehicle bays. It would also require some employees to be relocated. The available space is shown in Appendix I. A summary of the available space includes:

Appendix I-1 shows the dispatch area that could accommodate nine desks utilizing modular dispatch work stations.

Appendix I-2 (LLM-3910) shows the remainder of dispatch area that includes space for a total of 23 team leads, supervisors and managers including space for three supervisors indicated in Appendix I-1 above. This area requires the relocation of six communications personnel.

Appendix I-2 also shows space for 17 SCADA personnel. This area requires the relocation of one conference room, an AFGE office and one USBR person.

Appendix I-3 (LLM-3908) shows space for 28 Managers, Operations Engineers, Compliance Engineers and Settlements personnel.

Appendix I-4 (LLM-3911) shows space for 26 Transmission Services employees. This area would require the relocation of 11 Maintenance employees, the conversion of a shop area and some vehicle bays.

Appendix I-5 shows adequate space to locate the required additional dispatch desks in the ACC.

It is expected that all relocated personnel could be accommodated in the RMR Maintenance building by converting some vehicle shop space into office space.

d. Employee Impact

Approximately 40 to 50 employees will be impacted by this relocation. It is recommended that the consolidated operations organization proceed as quickly as possible to minimize the risk to system operations. The Transmission Services organization can be implemented over a longer period of time without a large impact. There is also a high probability that some key employees may decide to not be a part of the new consolidated organization and this needs to be accounted for in the implementation plan. It is recommended that Western be prepared to offer employee incentives to participate in this re-organization effort. There will also be a cost impact to move those employees that choose to be a part of the consolidated office.

e. Operations Tools

In the consolidation discussions for WACM, WAUW and WALC Balancing Authorities, the tools used by the Operations/Dispatch and Transmission Service staff are elements that are not location dependent. This means that while the business tools are essential, the ultimate decision for the location of the consolidated office is not dependent upon the existing business tools at either location. After the location of the consolidated office is determined, an analysis of the business tools will be required to determine the best tool for use at the new combined office. This analysis will include the existing tools at the current individual dispatch locations, as well as tools used elsewhere within the industry. The biggest impact will occur during the implementation phase of this effort.

Appendix J is a table that has an initial list of the dispatch function tools and details the existing tools of both RMR and DSW.

4) Location Analysis

The following criteria was used to evaluate the location analysis for each office:

1. Location
2. Facility
3. Staffing
 - a. Ability to recruit dispatchers, engineers and computer specialists
4. Complexity of Operations:
 - a. Existing complex operations that have required special tools and implementation issues
 - b. Staff Expertise and Experience
5. Other Factors
 - a. Speed of Implementation
 - b. Loss of institutional knowledge

The DSW location analysis is included as Appendix K.

The RMR location analysis is included as Appendix L.

Appendix A

Operations Consolidation Project Plan

Operations Consolidation Project Plan

Project Plan

1. Project Name

- 1.1. Operations Consolidation Project (OCP).

2. Purpose / Business Need

- 2.1. To remain competitive in our changing industry and reduce duplicative costs; certain Western Balancing Authorities (BA) and Transmission Operations (TOP) within the Western Electric Coordinating Council (WECC) need to be consolidated into a single entity.
- 2.2. The Rocky Mountain Region (RMR), the Desert Southwest Region (DSW), and the Upper Great Plains Region (UGPR) each have operations functions within the WECC's area. The operations functions include BA, TOP, Transmission Service Provider (TSP), Transmission Planner (TP) and Transmission Planning Authority (PA).
- 2.3. The purpose of this project is to (A) provide an analysis of where to locate a consolidated operations function based on agreed upon criteria and (B) establish an operations center with backup facilities, including staffing, budget, and a transition plan.

3. Critical Success Factors

- 3.1. Document the results of analyzing the consolidated operations function at the existing facilities in RMR, DSW, or UGP (Watertown) using the criteria attached.
- 3.2. Recommend a location for the operations center and backup facilities. If the team is unable to agree on a recommended location, produce individual site reports on the alternatives.
- 3.3. Provide data showing 1) cost, 2) pros & cons, and 3) proposed implementation approach for all alternatives.
- 3.4. A high level review of generation-related ancillary service requirements and alternatives are analyzed, and a recommendation is made with regard to utilization of resources, reserve sharing group participation and cost allocation. Federal resources are evaluated subject to project specific constraints.

4. Key Stakeholders

- 4.1. Tom Boyko is the Senior Manager sponsor for the project. It is the project sponsor(s)'s responsibility to evaluate the critical success factors and, if warranted, ensure resources are provided that are sufficient to complete the project.
- 4.2. Ed Hulls is the Project Manager, responsible for coordinating and completing the project. It is the project manager(s)'s responsibility to develop and review project plans, organize team meetings, delegate such responsibilities as deemed necessary, and ensure overall successful completion of the project.

- 4.3. Key stakeholders include members from Operations, Communications, SCADA, IT (Information Technology), and senior managers.
- 4.4. Final deliverables will be provided to the project sponsors and senior managers.

5. Project Approach

- 5.1. The Project Manager will develop a project schedule with deliverable items and dates.
- 5.2. No acquisitions are planned for the development of the feasibility study.

6. Schedule and Milestones

6.1. Milestones

- 6.1.1. Written report to Senior Managers on preferred location of consolidated operations center (criteria analysis)-December 14, 2007.
- 6.1.2. Senior Manager decision to proceed-December 18, 2007.
- 6.1.3. Initial Consolidation Plan-January 31, 2008.
- 6.1.4. Final Project plan-April 1, 2008.

6.2. Critical Decisions

- 6.2.1. Approval of Project Plan-November 16, 2007.
- 6.2.2. Decision on consolidated operations center location-December 31, 2007.
- 6.2.3. Proceed with consolidation-March 15, 2008

7. Funding and Resources

- 7.1. Only program direction funding will be required for this project.
- 7.2. Each office covers its own costs.
- 7.3. Resources to be used include staff from Operations, Communications, SCADA and IT.
- 7.4. Staffing strategies:
 - 7.4.1. Western staff will be pulled into the project as-needed. Other than a few key personnel, time spent on the study should be moderate, so no problems are foreseen.
 - 7.4.2. Skills and competencies needed are evident in the choice of team members.
 - 7.4.3. Team members will continue to report to their respective managers. Feedback may be given by the respective project managers and project sponsors as appropriate to managers.
- 7.5. No non-labor resources will be needed for this project.

8. Scope and Deliverables

8.1. Criteria Analysis

- 8.1.1. Provide a report showing (1) cost, (2) pros & cons, and (3) proposed implementation approach for all alternatives

8.2. Project Plan

- 8.2.1. Propose new organizational structure.

- 8.2.2. Ensure functional and physical requirements are met.
- 8.2.3. Create an implementation Plan.
- 8.2.4. Perform a cost analysis.
- 8.3. Sponsor briefing

9. Assumptions and Constraints

9.1. Staffing

- 9.1.1. It is assumed that managers will allow each team member to participate in the study at an appropriate level of effort.
- 9.1.2. Any limitation on travel may impact the results of this study, making it difficult to reach agreement and conclude the study on time.

9.2. Project

- 9.2.1. Consolidation of UGP-West, RMR, and DSW Balancing Authorities into a single BA
- 9.2.2. Consolidation of UGP-West, RMR, and DSW Transmission Operations OATT responsibilities into a single TP and PA
- 9.2.3. All dispatch BA and TOP functions (except for UGP-West Dispatch Switching function) will be performed from a single consolidated location with appropriate Alternate Control Center.
- 9.2.4. All OATT management will be consolidated.
- 9.2.5. Because of existing contractual arrangements in place for UGP-West, the above assumptions may be modified.
- 9.2.6. All alternatives will meet 100 percent of the criteria.
- 9.2.7. All transmission functions under consideration in this analysis will be assumed to be under the direction of a single Senior Manager.
- 9.2.8. The initial report on a recommendation and analysis of the preferred location of the consolidated facilities will evaluate only those costs associated with determining the recommendation. Total project costs will not be estimated until the final project plan is completed.

10. Communication Management

- 10.1. The project plan will be submitted in November 2007 and updated in December 2007. Status (written or verbal) will be provided by the project manager. The final study report will be written and a synopsis will be delivered in a briefing to senior management.
- 10.2. Team communication will be via team meetings (teleconference and face-to-face), email, and joint activities.

11. Evaluation Criteria


- 11.1. Cost - This reflects the total cost for each option, both initial cost and expected annual, over the next 5 years. For annual costs, an inflation index of 3 percent per year will be used.
- 11.2. Functionality - This rating reflects how well the installation itself meets the needs of the organization. This rating will include office facilities, communication infrastructure, and other requirements.

- 11.3. Impact on Personnel - Each option is rated on the impact to personnel and the ability to recruit new personnel. The best rating is given to options with the least impact on personnel.
- 11.4. Impact on other entities - Each option will address services to others and how those services will be impacted.

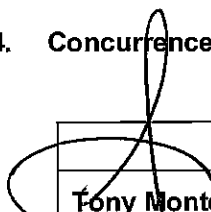
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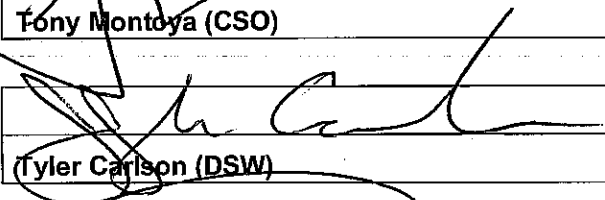
Revision description	Date	Baseline Change?	Sponsor Approval (initials)

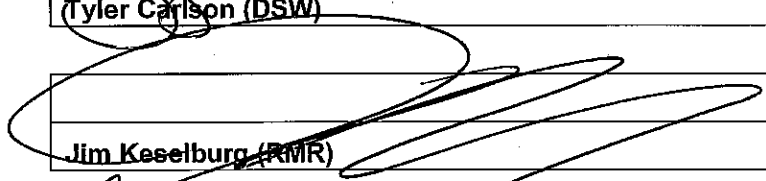
13. Submitted by Project Manager

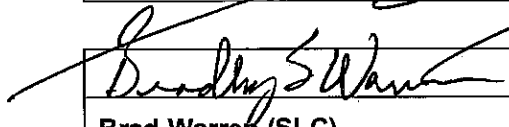
	11/27/07
Ed Hulls (RMR)	Date

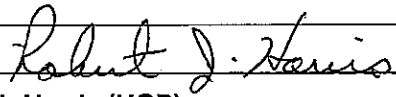
14. Concurrence by Senior Manager(s)

	11-20-07
Tony Montoya (CSO)	Date

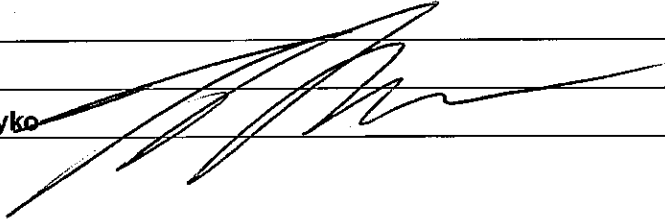
	11/19/07
Tyler Carlson (DSW)	Date

	11/26/07
Jim Kesselburg (RMR)	Date

	12-6-07
Brad Warren (SLC)	Date

	11/30/07
Bob Harris (UGP)	Date

15. Approval by Project Sponsor(s)

	Date
Tom Boyko	1/27/2007

Team List

Name	Org.	Function	Duty Station	Email Lists		
				Team	Minutes	Status Rpts
Ed Hulls	RMR	Project Lead	Loveland, CO			
Ron Moulton	DSW	Operations	Phoenix			
Lloyd Linke	UGP	Operations	Watertown			
Dave Shelton	CRSP	Operations	SLC			
Dave Ambrose	RMR	SCADA	Loveland, CO			
Brent Sessions	DSW	SCADA	Phoenix			
Joe Mayfield	UGP	SCADA	Watertown			
Chuck King	DSW	Communications	Phoenix			
Kevin Hogg	RMR	Communications	Loveland, CO			
Todd Meyer	UGP	Communications				
Raymond Vojdani	RMR	Business Tools	Loveland			
Mike McElhany	DSW	Business Tools	Phoenix			
Mike Gough	UGP	Business Tools	Watertown			

Appendix B
Alternatives

Appendix B - Alternatives

Alt.	Primary Control Center	Alternate Control Center	Transmission Services	Description
1a	DSW	Coolidge	DSW	All functions will be consolidated in the DSW area, except for some transmission planning functions for the north part of the system and a transmission switching certification function. An ACC would be provided that would be operational within 1 hour of the primary center.
1b	DSW	RMR	DSW	Similar to 1a, except that the ACC would be hosted at the RMR. Additional staff would need to be provided at RMR in order to be operational within the one hour time frame.
1b+	DSW	RMR and North Switching	DSW	Similar to 1b, except that the North Dispatch Switching desk would be located in RMR. A like number of dispatch positions would be reduced in DSW.
1c	DSW	Coolidge	RMR	Similar to 1a, except that Transmission Services organization would be located in RMR.
1d	DSW	RMR	RMR	Similar to 1b, except the ACC would also be in RMR.
1d+	DSW	RMR and North Switching	RMR	Similar to 1b+, except the ACC would also be in RMR.
2a	RMR	Cheyenne	RMR	All functions will be consolidated in the RMR area, except for some transmission planning functions for the south part of the system and a transmission switching certification function. An ACC would be provided that would be operational within 1 hour of the primary center.
2b	RMR	DSW	RMR	Similar to 2a, except that the ACC would be hosted at the DSW. Additional staff would need to be provided at DSW in order to be operational within the one hour time frame.
2b+	RMR	DSW and South Switching	RMR	Similar to 2b, except that the South Dispatch Switching desk would be located in DSW. A like number of dispatch positions would be reduced in RMR.
2c	RMR	Cheyenne	DSW	Similar to 2a, except that Transmission Services organization would be located in DSW.
2d	RMR	DSW	DSW	Similar to 2b, except the ACC would also be in DSW.
2d+	RMR	DSW and South Switching	DSW	Similar to 1b+, except the ACC would also be in RMR.
3	UGP	UGP ACC	UGP	All functions will be consolidated in the UGP area,
3a	UGP	UGP ACC	DSW	Similar to 3, except the Transmission Service function would be in DSW.
3b	UGP	UGP ACC	RMR	Similar to 3, except the Transmission Service function would be in RMR.

Appendix C

Screen-out Paper - Elimination of Watertown as an Operations Consolidation Alternative

Screen-out Paper

Elimination of Watertown as an Operations Consolidation Alternative

Overview

The Operations Consolidation Project Plan calls for the Operations Consolidation Project Team to consider DSW, RMR and UGP (Watertown) operations centers as alternatives for possible consolidation. In order to address the most realistic alternatives, the team recommends eliminating Watertown as an alternative based on extensive shortcomings dealing with building space, SCADA, communications requirements and personnel impacts. This paper is to document these screen-out items and recommends elimination of this alternative from further consideration.

Screen-out Items

Building Space – The Watertown Operations Center is not physically large enough to accommodate the additional 9 dispatch workstations that are expected to be required for this consolidation. In addition to these dispatch positions there will need to be office space for more than 50 additional employees that will be required to support the consolidated operations. Furthermore, the Watertown ACC space that is being constructed will not accommodate these new dispatch positions and additional space would be required to be constructed.

Due to the major construction effort that will be required, it is recommended that this alternative not be given further consideration.

SCADA – Watertown presently has a dissimilar SCADA system from DSW and RMR and would require that all DSW and RMR SCADA databases be converted. This would include:

- All DSW and RMR SCADA customs would have to be completely re-written,
- All DSW and RMR SCADA displays would have to be re-built and re-linked from scratch,
- All DSW and RMR SCADA hardware (both centers and ACC's) could not be re-used,
- Would require development of H5000 and B-TAC RTU protocols and
- All DSW and RMR Advanced Applications would have to be completely developed.

Due to the extensive cut-over time, cost for conversion and work that would be required, beyond that required for the DSW and RMR alternatives, it is recommended that this alternative be eliminated.

Communications -- There are currently insufficient communication facilities between RMR & UGP to support the estimated 26 T1's for this option. There are future plans for UGP to upgrade links to Yellowtail by FY09, and to Wayside by FY10 and for RMR to upgrade its system between Loveland and Wayside over the next 3-8 years. These upgraded systems will be constructed primarily of fiber and high capacity digital radios

which would be capable of carrying the bandwidth required for this option. The option of leasing the required bandwidth was not considered for primary communication due to the large quantity of control data.

This option is not feasible if short term implementation is required and would be significantly more expensive than the DSW and RMR alternatives.

Personnel Impact – Consolidation of Operations in Watertown will require a much higher number of employees to be relocated from DSW Region and RMR Region to the Upper Great Plains Region than selection of either Loveland or Phoenix as the control center. Relocating more employees will increase the cost of consolidation, and Western may lose more employees who are not willing to relocate from Phoenix or Loveland to Watertown.

To reduce the cost and to minimize the impact to employees, it is recommended that this alternative be eliminated from further consideration.

Recommendation – Due to the increased impact associated with personnel, additional cost, extended timeline and additional construction that will be required to consolidate the West Side Operations Center at Watertown, it is recommended that all Watertown alternatives be eliminated from further consideration.

Recommendation

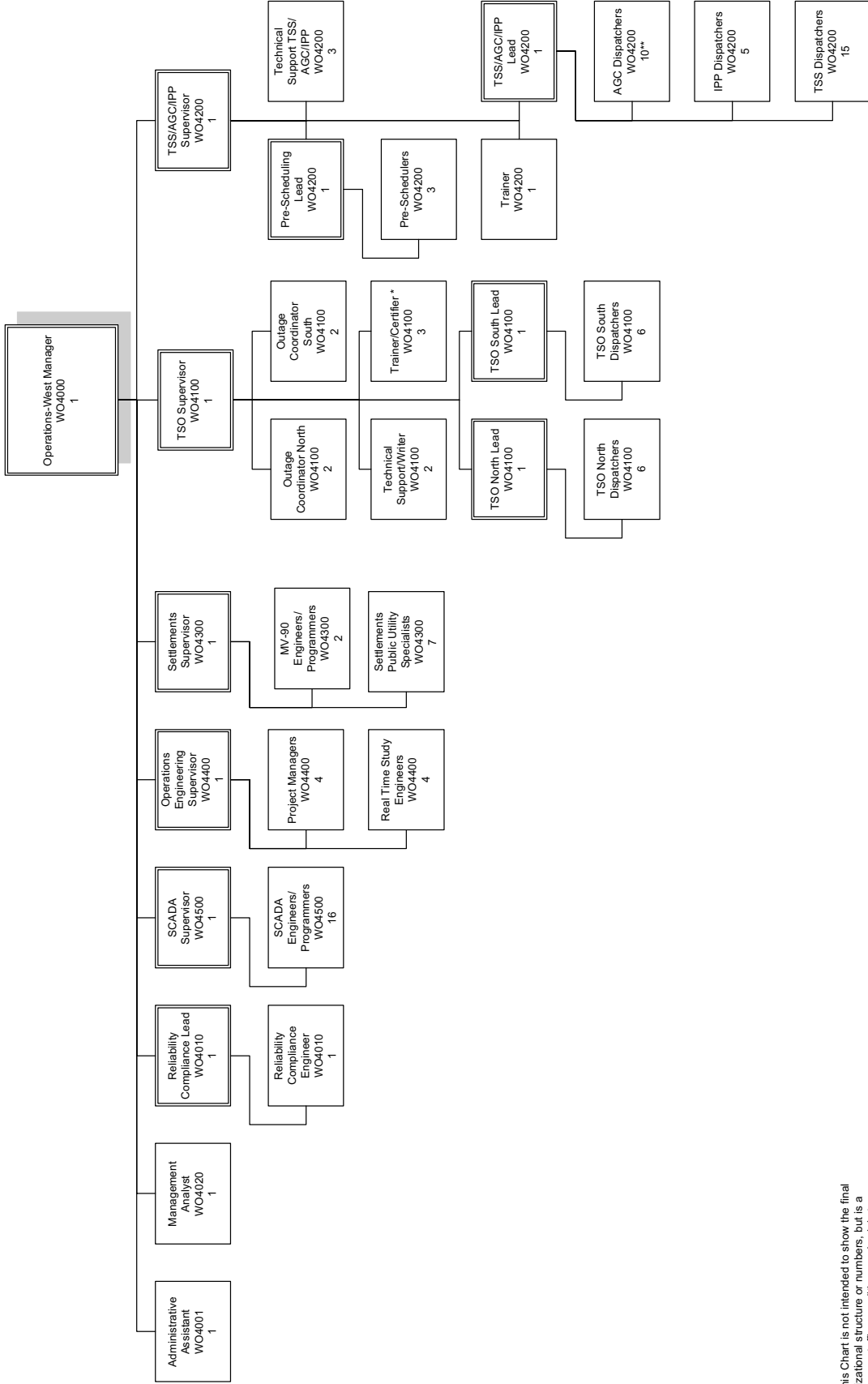
Ed Hulls 11/30/07
Ed Hulls
Operations Consolidation Project Manager

Approved

Tom Boyko 12/5/07
Tom Boyko
Project Sponsor

Appendix D
Organization Charts

Transmission Operations West - Organization Chart

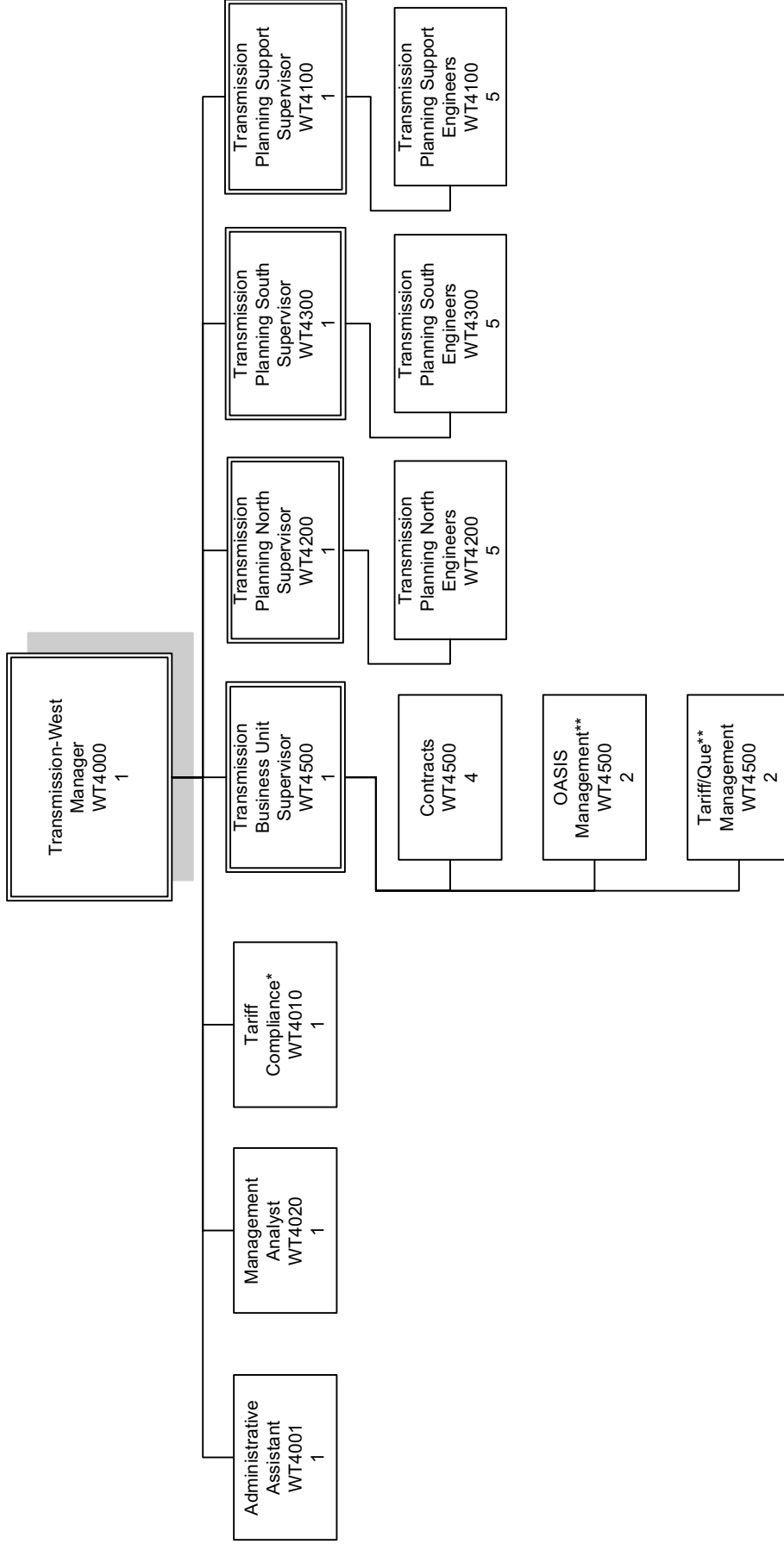


Note: This Chart is not intended to show the final organizational structure or numbers, but is a maximum staffing condition used solely to determine space requirements.

* One of the three Trainers/Certifiers will be located remotely to support local switching certification needs.

** May only require 1 Desk/5 Dispatchers.

Transmission Services West - Organization Chart



Note: This Chart is not intended to show the final organizational structure or numbers, but is a maximum staffing condition used solely to determine space requirements.

* 1 FTE Assumes Centralized Western-wide Tariff Compliance Office

** Could be separated into a separate function within Transmission Services or Transmission Operations

Appendix E

Staffing Requirements for Each Alternative

	DSW Existing		RMR Existing		1a		1b		1b+		1c		1d		1d+		2a		2b		2b+		2c		2d		2d+		
	DSW	RMR	DSW	RMR	DSW	RMR	DSW	RMR	DSW	RMR	DSW	RMR	DSW	RMR	DSW	RMR	DSW	RMR	DSW	RMR	DSW	RMR	DSW	RMR	DSW	RMR	DSW	RMR	
Transmission Operations																													
Transmission Operation - West Manager	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Administrative Assistant	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Management Analyst	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Reliability Compliance Engineer	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Reliability Compliance Engineer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SCADA Manager	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SCADA Engineers/Programmers	8	8	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Operations Engineer Supervisor	0	0.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Real Time Study Eng.	2	1.5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Project Manager/Operations Eng.	1	1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Settlement Supervisor	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MV-90 Eng./Programmers	2	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Settlements PUS's	4	3	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
TSO Supervisor	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Outage Coordinator - North	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Outage Coordinator - South	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Tech Support/Writer	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Trainer/Certifier	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
TSO - North Supervisor	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TSO - North Dispatchers	0	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
TSO - South Supervisor	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TSO - South Dispatchers	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
TSS/AGC/IPP Supervisor	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pre-Scheduling Lead	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pre-Scheduling	2	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
TSS/AGC/IPP Technical lead	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Trainer	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TSS/AGC/IPP Supervisor	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
AGC Dispatchers	5	5	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
TSS Dispatchers	11	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
IPP Dispatchers	11	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Total	60	52	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107
Total For Each Alternative	112	1a	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108

Note that red numbers indicate staffing in other organizations

	DSW Existing		RMR Existing		1a		1b		1b+		1c		1d		1d+		2a		2b		2b+		2c		2d		2d+		
	DSW	RMR	DSW	RMR	DSW	RMR	DSW	RMR	DSW	RMR	DSW	RMR	DSW	RMR	DSW	RMR	DSW	RMR	DSW	RMR	DSW	RMR	DSW	RMR	DSW	RMR	DSW	RMR	
Transmission Operations																													
Transmission Operation - West Manager	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Administrative Assistant	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Management Analyst	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Reliability Compliance Engineer	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Reliability Compliance Engineer	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SCADA Manager	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SCADA Engineers/Programmers	8	8	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Operations Engineer Supervisor	0	0.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Real Time Study Eng.	2	1.5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Project Manager/Operations Eng.	1	1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Settlement Supervisor	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MV-90 Eng./Programmers	2	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Settlements PUS's	4	3	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
TSO Supervisor	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Outage Coordinator - North	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Outage Coordinator - South	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Tech Support/Writer	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Trainer/Certifier	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
TSO - North Supervisor	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TSO - North Dispatchers	0	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
TSO - South Supervisor	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TSO - South Dispatchers	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
TSS/AGC/IPP Supervisor	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pre-Scheduling Lead	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pre-Scheduling	2	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
TSS/AGC/IPP Technical lead	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Trainer	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TSS/AGC/IPP Supervisor	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
AGC Dispatchers	5	5	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
TSS Dispatchers	11	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
IPP Dispatchers	11	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Total	60	52	107	1	108	1	107	1	108	1	107	1	108	1	107	1	108	1	107	1	108	1	107	1	108	1	107	1	108
Total For Each Alternative		112	1a	108	1a	108	1c	108	1c	108	1d	127	1d	127	96	25	96	25	96	25	96	25	96	25	96	25	96	25	96

Note that red numbers indicate staffing in other organizations

Appendix F

SCADA Comparison Chart

Appendix F - SCADA Comparison Chart

Specific Item	Combined Control Center Requirement	Currently Implemented at DSW	Currently Implemented at RMR	Currently Implemented at UGP	Scope of effort to site at DSW	Scope of effort to site at RMR	Comment
SCADA Release level	10.x.x	XA 8.1.2	XA 8.1.2	PCS4.3			
Database sizing							
Substation RTUs (Telemetered)	400	69	140	22			(UGP, DSW, RMR)
SCADA (status, analog, accumulators)	200,000	56,000 points	69,000 points	2,700			
Advanced Applications	7,500 buses	1,081 buses	2,600 buses				Enough buses to model down to the 69kv
AGC							
Generation (controllable units)	150	54	24	3			
Tie lines	500	102	140	9			46 dynamic ties at DSW
DTS	Yes	Yes	Yes				
ICCP							
Associations	60 companies	40	40	3			22 companies at RMR
ICCP Data Points	100,000	5,000	18,000	50			CCC needs 100,000 ICCPObjectIDs for WECC-wide model @ 100kv +
Historical	150,000	56,000	8,500 PI Tags	2,750			
Displays	2,500	535	1447	100			Not counting apps displays
Customs-RMR							
Sidney DC Tie direct control	Yes		Yes				
Helicopter tracking	Yes		Yes	Yes			
Personnel tracking	Yes		Yes				
BOR water gate control	Yes		Yes				
AGC rough zone management	Yes		Yes	Yes			
AGC block unit control	Yes		Yes				
Synch-check relay monitoring & control	Yes		Yes				
WDL for YT and North Platte	Yes		Yes				

Appendix F - SCADA Comparison Chart

Specific Item	Combined Control Center Requirement	Currently Implemented at DSW	Currently Implemented at RMR	Currently Implemented at UGP	Scope of effort to site at DSW	Scope of effort to site at RMR	Comment
TOT2,3,5 limit calcs (state decisions)	Yes		Yes				
HLO tagging	Yes		Yes	Yes			
Info and safety tagging	Yes		Yes	Yes			
Station service transfer trip	Yes		Yes				
Reservoir storage & CFS Calculations	Yes		Yes				
PCALC AGC customs	Yes		Yes				
TP management systems	Yes		Yes				
TRPTrace TP location finder	Yes		Yes				
Reserve calculations	Yes		Yes	Yes			
ES customs for synch and HLO	Yes		Yes				
BOR unit availability and run-time calculations	Yes		Yes				
CTRL-L for Enternet Suite	Yes		Yes				
DTS - Enhancement to Special Function Modeling to allow switch status (SFM is used to update ICCP points which don't get updated by DTS)	Yes		Yes				
DTS - Handling of non-modeled control points like reclosers	Yes		Yes				
Alternate data source company control	Yes		Yes				
No-alarm alarm box	Yes		Yes				
ATC calculations	Yes		Yes	Yes			
CPS report	Yes		Yes				
DG&T set point program	Yes		Yes				
EIDE	Yes		Yes				
LRS check program	Yes		Yes				
MVA calculations	Yes		Yes	Yes			
RMRG offset program	Yes		Yes				

Appendix F - SCADA Comparison Chart

Specific Item	Combined Control Center Requirement	Currently Implemented at DSW	Currently Implemented at RMR	Currently Implemented at UGP	Scope of effort to site at DSW	Scope of effort to site at RMR	Comment
ES licenses (New SCADA user interface GUI)	Yes	No	Yes				
Fixed control	14	0	12				Power system control
Floating control	40	0	24				Power system control
View only	30	12	12				Read only
Servers	8	2,2	1/5				Read only/control
ICCP licenses	4-PC-based, Secure ICCP	3-PC-based, Secure ICCP	Unlimited PC-based, Secure ICCP	2-PC-based, Secure ICCP			
SCADA functional node differences	None	None	None	Many			
Hardware list							
Servers	20 servers	14 servers	16 servers	3			ICCP, DAC, ES, Oracle, AP, TSM
Workstations	50	17	34	6			34@RMR,
DAC nodes	4	2	2	2			2@RMR
DAC channels	400/512	130/256	156/256	14/ (N/A)			Implemented/sized
Operating systems	NA	AIX, Windows 2000	Solaris-8,10 Windows 2000	Windows Srv 2003 WindowsXP			
SCADA Functionality							
AGC	AGC	DSW & ACC	RMR & ACC	UGP			
Advanced Apps							
State estimator	SE	DSW & ACC	RMR & ACC				
Contingency Analysis	CA	DSW & ACC	RMR & ACC				
Dispatch Load Flow	DLF	DSW	RMR & ACC				
Black Start Simulation	BS	No	RMR & ACC				
Dispatch Training Simulation	DTS	DSW	RMR				
Optimal Power Flow	OPF	No	No				
Enterprise Gateway(CIM_XML)	EG	No	RMR				

Appendix F - SCADA Comparison Chart

Specific Item	Combined Control Center Requirement	Currently Implemented at DSW	Currently Implemented at RMR	Currently Implemented at UGP	Scope of effort to site at DSW	Scope of effort to site at RMR	Comment
License matrix	N/A Feature dependent	XA BCS PC-ICCP ES ODBC Autocad TSM DTS Oracle-Rack Oracle server IBM compiler PowerView EDNA	XA PC-ICCP ES ODBC Autocad TSM DTS Oracle-Rack Oracle server PowerView PI EG				
RTU protocols implemented	Dmp3-serial H5000, B-Tac,	Dmp3-serial H5000, B-Tac,	Dmp3-serial H5000	Landis & Gyr QEI TruTime PPC			
Non-RTU Communications protocols implemented	ICCP, WDL, EIDE, SQL, FTP, HTTP, HTTPS	ICCP, WDL, EIDE, SQL, FTP, HTTP, HTTPS	ICCP, WDL, EIDE, HTTP, HTTPS	ICCP, FTP, BFP, HTTPS(under development)			
Historian	TBD	EDNA	PI	EDNA			
Protocol (SCADA <-> Historian)	TBD	GE-interface	ICCP	Custom			
Displays	1000	25	967	20			Spreadsheet/displays
Customs for integration	TBD	1	0	1			Reactive reserves, BOR generation tracking

Appendix F - SCADA Comparison Chart

Specific Item	Combined Control Center Requirement	Currently Implemented at DSW	Currently Implemented at RMR	Currently Implemented at UGP	Scope of effort to site at DSW	Scope of effort to site at RMR	Comment
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Functionality deployed	TBD Feature set to be developed	<ol style="list-style-type: none"> 1. 100,000 tags 2. Unlimited eDNA Clients including View, Trend and Excel Add-in 3. Unlimited use eDNA API 4. Unlimited use eDNA Math and Notification Service 5. Alarm Manager 6. eDNA to ODBC interface Unlimited 7. eDNA to SQL interface Unlimited 8. Java interface unlimited 9. eDNA Manual Logger per server 10. eDNA web 	<ol style="list-style-type: none"> 1. Process-book(50) 2. Active View(15) 3. Alarm view 4. Modular DB 5. Calculation Engine 6. Excel add-in 				
				Just Like DSW except currently 50,00 tags			

Appendix F - SCADA Comparison Chart

Specific Item	Appendix F - SCADA Comparison Chart						Scope of effort to site at RMR	Scope of effort to site at DSW	Currently Implemented at UGP	Scope of effort to site at RMR	Comment
	Combined Control Center Requirement	Currently Implemented at DSW	Currently Implemented at RMR	Currently Implemented at UGP	Scope of effort to site at DSW	Scope of effort to site at RMR					
OATI interface	EIDE	EIDE	EIDE								
Adv Apps modeling											
Internal modeling		Yes-DSW	Yes-WACM & RDRC						Telemetered model		
External modeling		Yes-2 buses into neighbors	Yes-All WECC						Non-Telemetered model		
WAMS data											
PMUs	Yes	No	Yes (4)						Ault, Bears Ears, Shiprock, and Yellowtail		
WAMS data incorporation	TBD	No	No								
ACC Functionality											
General description	Full redundancy	Limited redundancy	No redundancy	Under development							
Hardware	10 servers 10 workstation	5 servers 2 workstation	4 servers 9 workstation								
ACC Synchronization	Manual hot-synch, system isolation	BCS	Custom								
Oracle Synchronization	Yes	BCS-Data Guard	Custom								
ACC Exercises performed	Bi-yearly	Bi-yearly for 2 years	Bi-yearly for 3 years								
Vendor support services	SCADA (HW & SW), Historian Oracle, DBMS, OS	SCADA, EDNA, OATI, Oracle	SCADA, PI, OATI, Oracle								

Appendix F - SCADA Comparison Chart

Specific Item	Combined Control Center Requirement					Scope of effort to site at RMR	Scope of effort to site at DSW	Scope of effort to site at RMR	Comment
	Currently Implemented at DSW	Currently Implemented at RMR	Currently Implemented at UGP	Currently Implemented at DSW	Currently Implemented at RMR				
Staffing (in FTE)									
Core SCADA	Based on proposed org chart								
SCADA manger	1								
SCADA/ACC/AGC/APPS Progrs	6								
Displays/database/RTU checkout	4								
Historian displays/database	3								
Firewalls/networks/cyber security	3*	6.5 +2 open	9	1 for West System					*This assumes firewalls, networks, Oracle, Windows server, DOE min configs and CIP-002-009 is done in the SCADA group
Power system modeling	3	1	2						Due to model expansion to cover the entire interconnection
IT in direct support of SCADA	1*	2	.5	.5 for West System					*If firewall/security is performed in IT, 2 FTE transfer from SCADA to here.
RTU support [local, not field support]	2	1	1	.5					
Comm techs in direct support of SCADA	2	1	2	.5 for West System					
Non-ICCP Network Connections to external entities	Montrose, OATInet, ACC, SWTCO, ECN ISN	Montrose, OATInet, ACC, SWTCO, ECN	Montrose, OATInet, ACC, ISN, ECN	OATInet,					
WECC database support	WECCnet, EHV, Virus Sigs, NTP	No	WECCnet, EHV, Virus Sigs, NTP	No					
Reserve group information	SRSRG, RMRG	SRSRG, RMRG	SRSRG, RMRG	NWPP					

Appendix F - SCADA Comparison Chart

Specific Item	Combined Control Center Requirement	Currently Implemented at DSW	Currently Implemented at RMR	Currently Implemented at UGP	Scope of effort to site at DSW	Scope of effort to site at RMR	Comment
Special considerations	Support BOR Dispatch of power plants	No	Support BOR Dispatch of power plants				

Appendix G

Communications Comparison Chart

APPENDIX G Communications Comparison Chart

Specific Item	Combined Control Center Requirement	Currently Implemented at DSW	Currently Implemented at RMR	Scope of effort to site at DSW	Scope of effort to site at RMR	Comment
1. ACC Sites (Coolidge, Cheyenne)	Space for 10 desk	ACC implemented at Coolidge	At Cheyenne Sub, full ACC implementation	Add CBA's for RTUs, Data Link, Add Redundant comm path to support the required reliability	Add CBA's for RTUs, Data Link, Add Redundant comm path to support the required reliability	Comm Path to UGP required for both DSW and RMR Space requirements addressed by Project management team
2. Remote Terminal Units	Reliable comm To all subs Require 330 RTU channels total	152 RTUs total 125 Subs 27 Comm	153 RTUs total 140 existing 13 future BOR/WY	Additional 178 RTUs required for PCC and ACC Note UGP RTU circuits routed thru RMR comm system	Additional 177 RTUs required for PCC and ACC	25 RTUs from UGP included in additional RTU totals
3. BA's control boundary points	Reliable comm To all boundary points	1 D20 (43- TLM Points)	2 D200s consolidate 40 meters; 2 DSO ea to PCC & ACC	2 DSOs each from RMR to PCC and ACC (4 DSO's)	1 DS0 each from DSW to PCC and ACC (2 DS0's)	3T1's required to the PCC and ACC if remote grooming is not acceptable- Implies increased bandwidth, increased cost and longer implementation
4. ICCP/WON	Meet WECC Requirements	ICCP 9 T1s 8 Primary 1 T1 Backup to APS	ICCP 5-1/2 T1s 4-1/2 Primary 24 DSO Backups to	Move ICCP backup tie points as required	Move ICCP backup tie points as required. Note more tie points	

APPENDIX G Communications Comparison Chart

Specific Item	Combined Control Center Requirement	Currently Implemented at DSW	Currently Implemented at RMR	Scope of effort to site at DSW	Scope of effort to site at RMR	Comment
5. Bulk com paths DSW ← → RMR	Sufficient capacity between RMR and DSW	1 DS3 MW DSW to RMR; 1 DS3 Leased Fiber DSW to CSO	OC3 Mexican Hat to Montrose; 5/6 OC3 Montrose to Bald Mtn	Turn-up DS3 #2 from Phoenix to Mexican Hat, Implement system upgrades and expansion on this route	Implement System upgrades and expansion on all comm paths between Phoenix and Loveland	
6. Redundancy requirements (tie lines, gen, major subs)	Provide diverse communication paths to both the PCC and ACC	Major Subs and Power Plants have redundant communications to Phoenix and Coolidge ACC	Major Subs and Power Plants have redundant communications to Loveland and Cheyenne ACC	Build redundancy to COL from Subs and Power plants; Note: DSW needs to make some comm. Path changes to secure a redundant path to COL	Plans are in place to provide diverse routing from CSO to Loveland/ Cheyenne ACC in 2008	All diverse routing changes need to happen regardless of option
7. Mobile (VHF) Radio System	Provide mobile radio service for all areas	1-Comparator at Phoenix and 1 Comparator at Coolidge ACC	5 comparators in Loveland, 3 comparators in Montrose, 2 comparators at Cheyenne ACC	Run 8 control channels from RMR to DSW PCC and ACC	Run 2 control channels from DSW to RMR PCC and ACC	
8. Communications Alarm System	Monitor all system status	Sub Net Master at Phoenix with a future redundant station at Mead	TSM-8000 in Loveland, soon to be redundant in Montrose	N/A	Note 27 comm RTUs in item #2	Comm Masters remains in current configuration
9. Camera security	Meet WAPA	Existing cameras	Currently utilize	N/A	N/A	Security monitored

APPENDIX G Communications Comparison Chart

Specific Item	Combined Control Center Requirement	Currently Implemented at DSW	Currently Implemented at RMR	Scope of effort to site at DSW	Scope of effort to site at RMR	Comment
requirements	Security requirements	handled by: 1-T1 PPK 1-T1 MED	WAN at ACC for existing cameras			thru LAN, may need expanded regardless of location chosen
10. Corporate WAN	IT Support	WAN existing	WAN existing	N/A	N/A	
11. WIN	Maintenance Support	Not implemented	RMR – Master router and several sites implemented	N/A	N/A	System growth as needed – could use RMR router to connect DSW sites
12. Telephone Switches	Provide telephone and voicemail support	TRKS – 1100 USED – 444 DID – 1200 USED – 550	TRKS – 436 USED – 351 DID-500 USED-486 Current System is expandable	Add phones sets at PCC and add a phone switch at the ACC	Expand phone switch at the PCC, add phone sets, reconfigure DID usage, currently expanding ACC switch	Trunks can be installed between Phoenix and Loveland for required connectivity
13. Relay Access	As required by operations	OPX Lines to Subs 125 This will be accessed by additional trunk lines between switches	OPX Lines to Subs 55 This will be accessed by additional trunk lines between switches	N/A	N/A	Could migrate to WIN
14. Plant Equipment – Telecom Dispatch Consoles	Support operations	10 – Consoles Supports Hotline/DID/Autodial	Consoles for mobile radio only (4); Telephones multi-button only	Add work stations	2 DS0's per work station	Decision needed from operations regarding implementation at new center
15. AGC data links	Provide generation data to	11 Data links (HVR, GC)	1 Data link (Casper)	1 DS0 from RMR to DSW	11 DS0's from DSW to RMR	

APPENDIX G

Communications Comparison Chart

Specific Item	Combined Control Center Requirement	Currently Implemented at DSW	Currently Implemented at RMR	Scope of effort to site at DSW	Scope of effort to site at RMR	Comment
16. BOR SCADA Support	SCADA Provide Operations/ SCADA Support	Not Implemented	Casper Desks 2 Loveland Desks	2 TI's from Loveland to Phoenix	No Change	
17. Hotline	Provide hotline support as necessary	Hotline participant	24-line hotline system	Unknown	Unknown	Decision needed from operations regarding implementation at new center

Appendix H

Phoenix Space Layout Drawings

Settlements - 1 Supv, 8 PUS, 3 MV-90

Room for two Comm engineers

Pre-scheduling Lead, 3 Preschedulers, 3 Tech support TSS/AGC/IPP

TSS/AGC/IPP Lead, TSO N Lead, TSO S Lead, 2 N Outage Coordinator, 2 South Outage Coordinator, 2 Tech writers

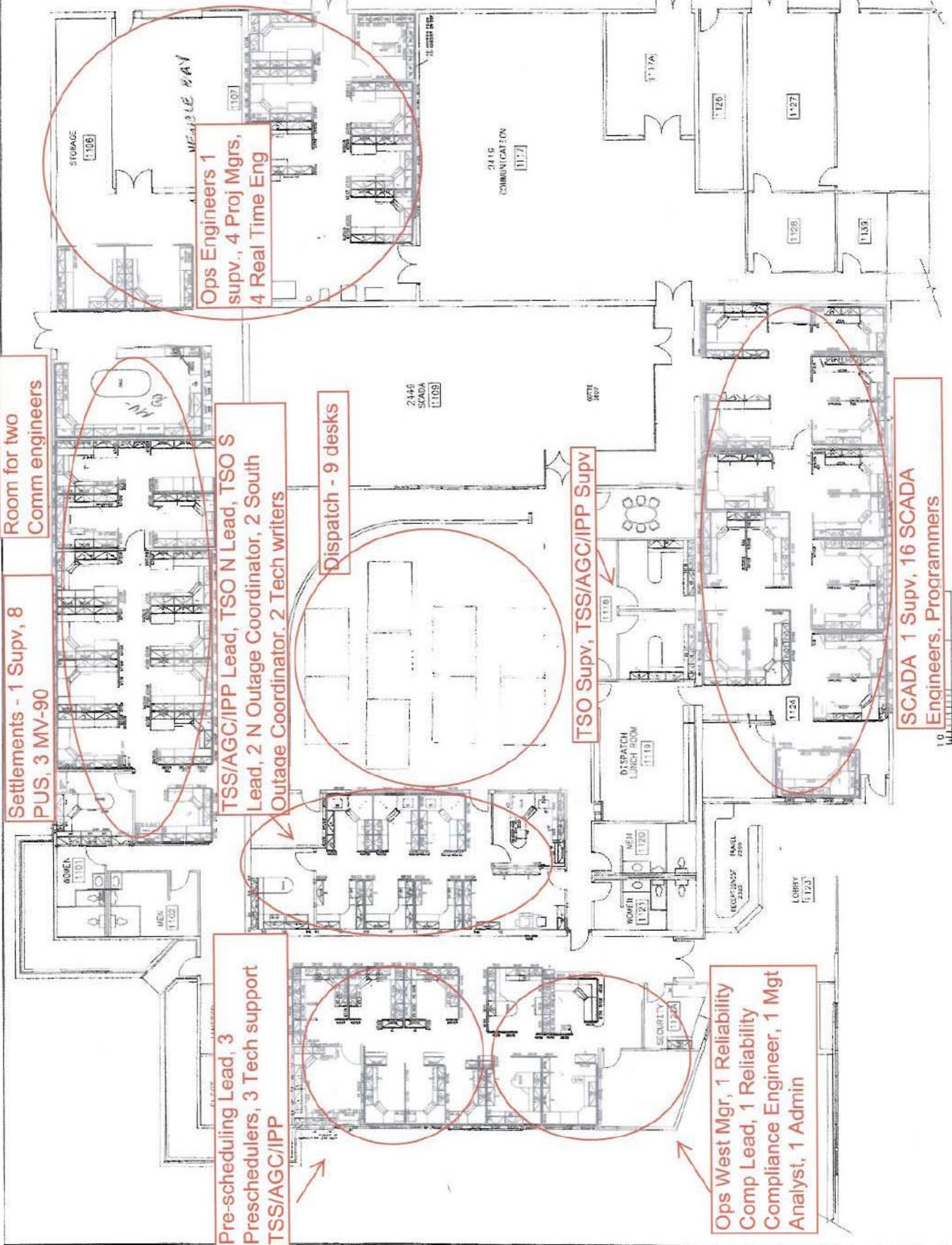
Dispatch - 9 desks

TSO Supv, TSS/AGC/IPP Supv

Ops West Mgr, 1 Reliability Comp Lead, 1 Reliability Compliance Engineer, 1 Mgt Analyst, 1 Admin

SCADA 1 Supv, 16 SCADA Engineers, Programmers

Ops Engineers 1 supv., 4 Proj Mgrs, 4 Real Time Eng





Transmission Planning DSW Supv,
5 Planning Engineers

Transmission West Mgr,
1 Mat Analyst, 1 Admin

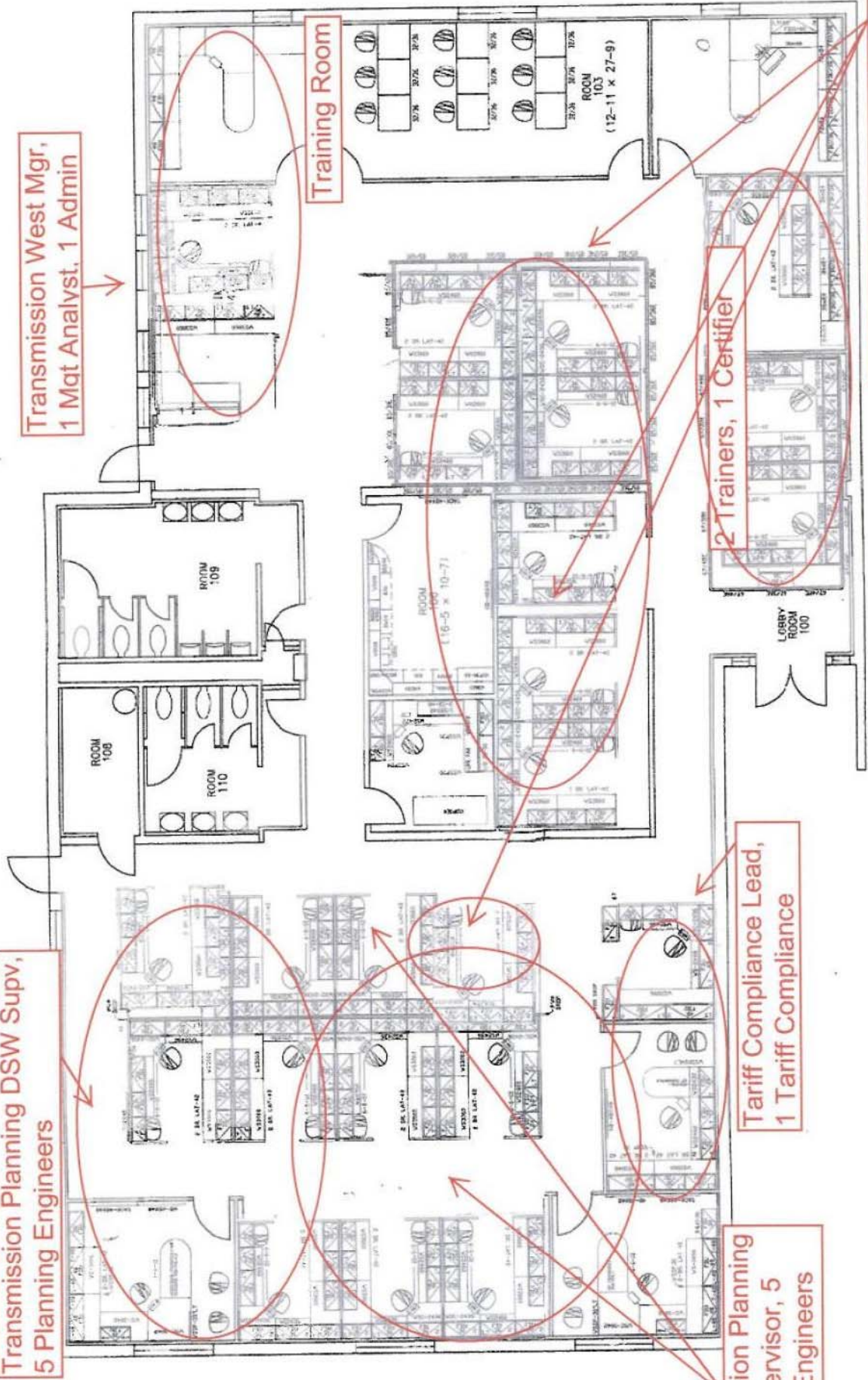
Training Room

Transmission Planning
West Supervisor, 5
Planning Engineers

Tariff Compliance Lead,
1 Tariff Compliance

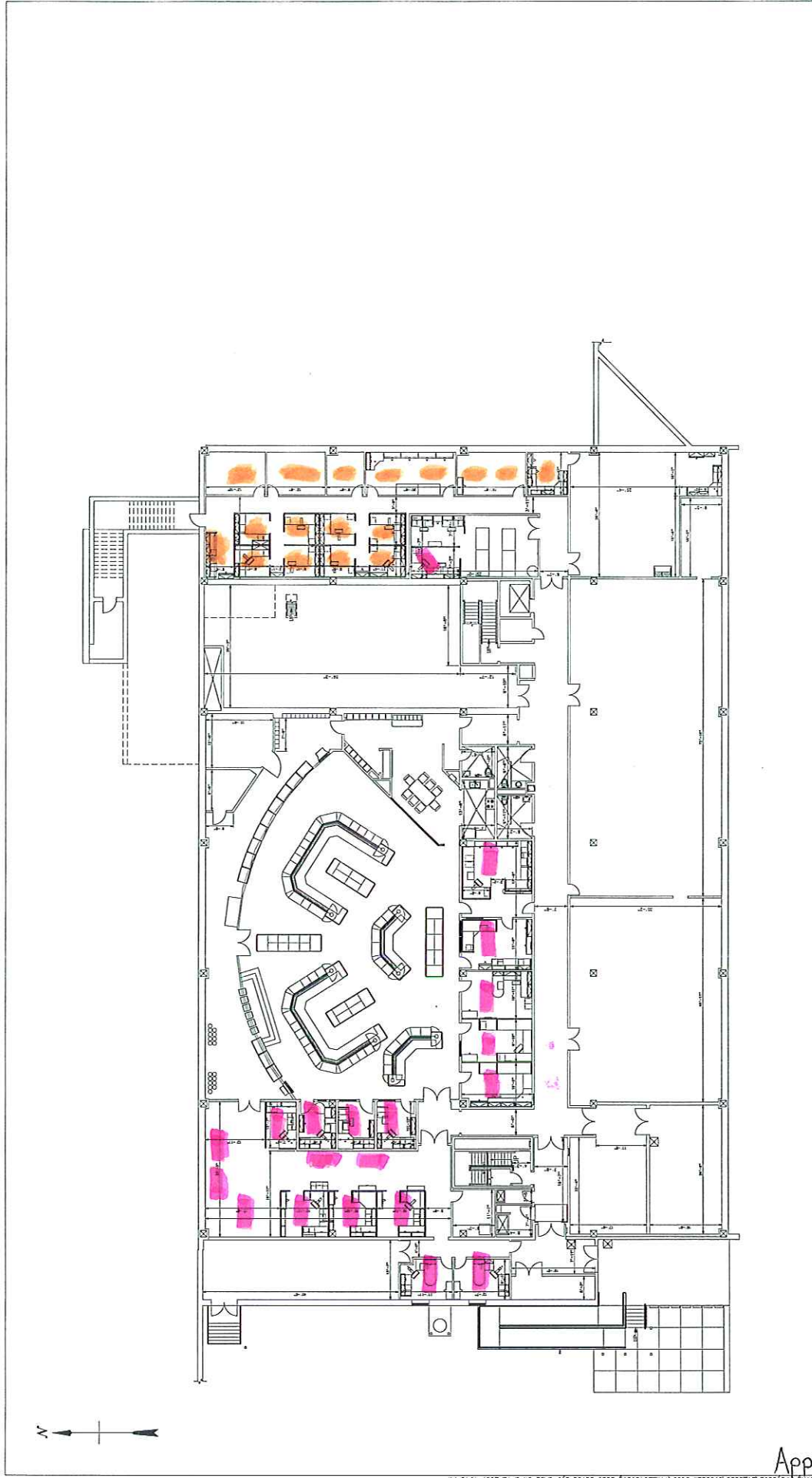
2 Trainers, 1 Certifier

TBU Supv., 4 Contracts, 2 OASIS,
2 Tariff/Que Mgt



Appendix I

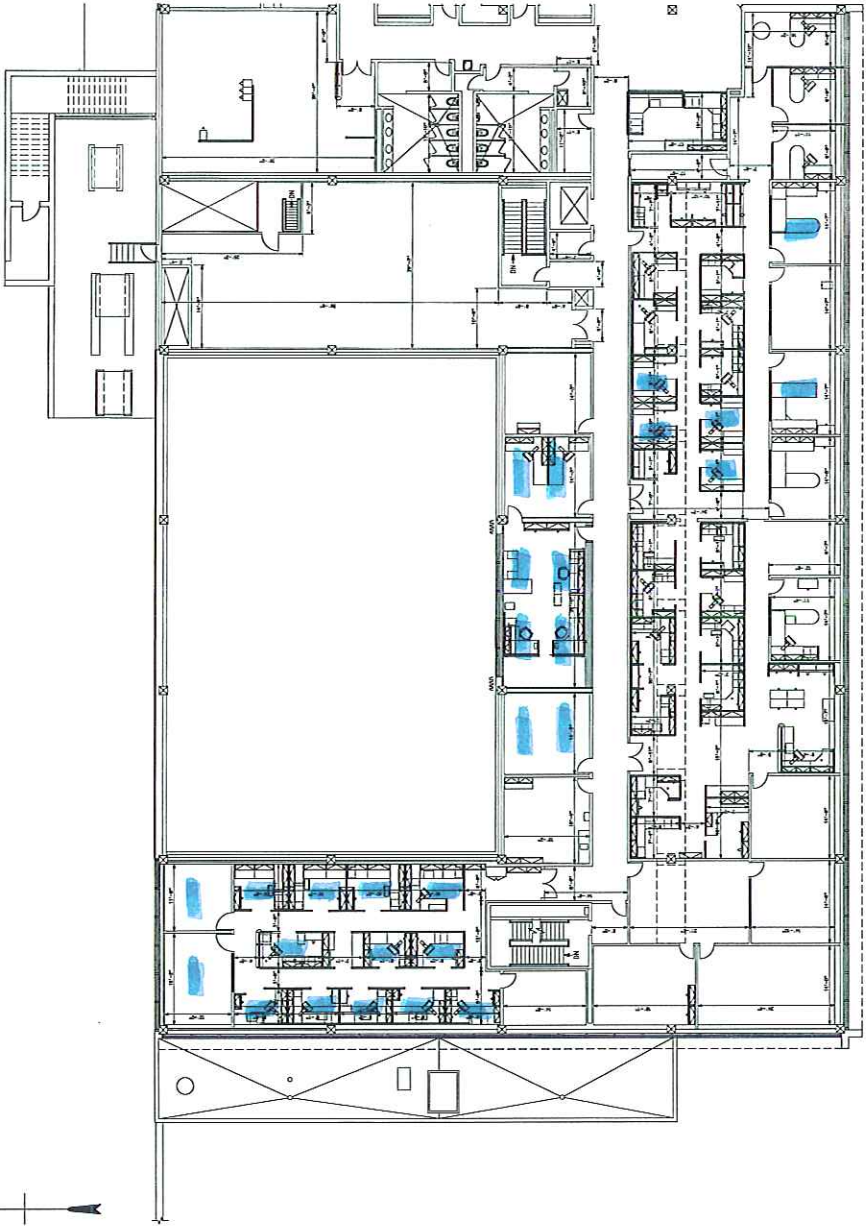
Loveland Space Layout Drawings



UNITED STATES DEPARTMENT OF ENERGY
 WESTERN AREA POWER ADMINISTRATION
 ROCKY MOUNTAIN REGION - COLORADO REGIONAL
 COLORADO
 LOVELAND AREA PMOC
 DISPATCH & ADMIN BLDG
 LOWER LEVEL - FLOOR SPACE PLAN

REF: CS - 114-5501
 APPROVED BY: [Signature]
 DATE: FEBRUARY 14, 2007
 DRAWN BY: LLM
 SHEET NO.: 3910

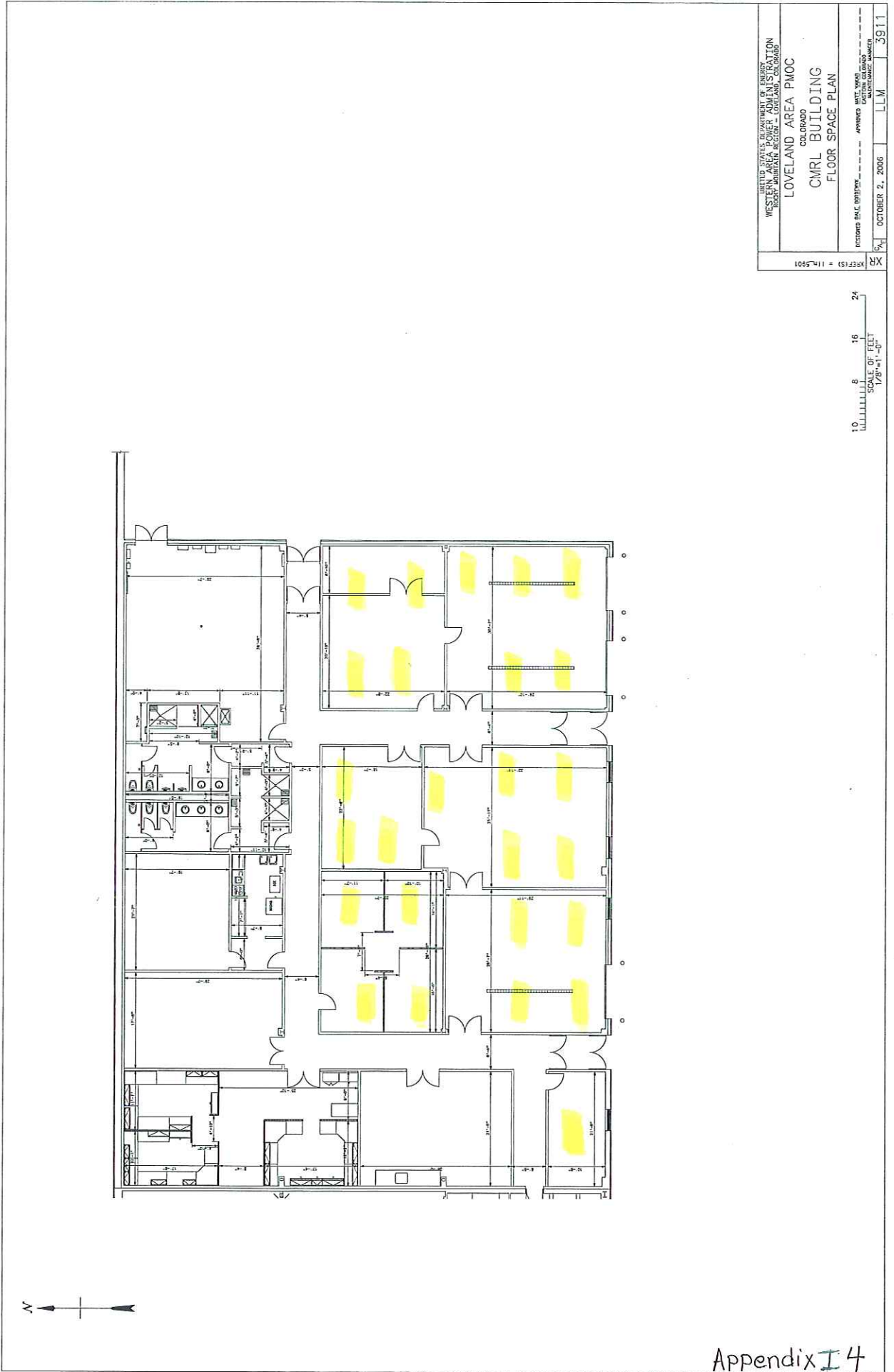
SCALE OF FEET
 3/32" = 1'-0"
 0 8 16 24



8 0 8 16 24
 SCALE OF FEET
 1/8" = 1'-0"

UNITED STATES DEPARTMENT OF ENERGY WESTERN AREA POWER ADMINISTRATION REGIONAL HEADQUARTERS BLDG	
LOVELAND AREA PMOC COLORADO	
DISPATCH & ADMIN BLDG UPPER LEVEL WEST - FLOOR SPACE PLAN	
DATE	REVISED BY
FEBRUARY 14, 2007	MATT NAB MATT NAB MATT NAB
PROJECT NO.	3908

Appendix I 3



UNITED STATES DEPARTMENT OF ENERGY
 WESTERN AREA POWER ADMINISTRATION
 ROCKY MOUNTAIN REGION - LOVELAND, COLORADO

LOVELAND AREA PMOC
 CMRL BUILDING
 COLORADO
 FLOOR SPACE PLAN

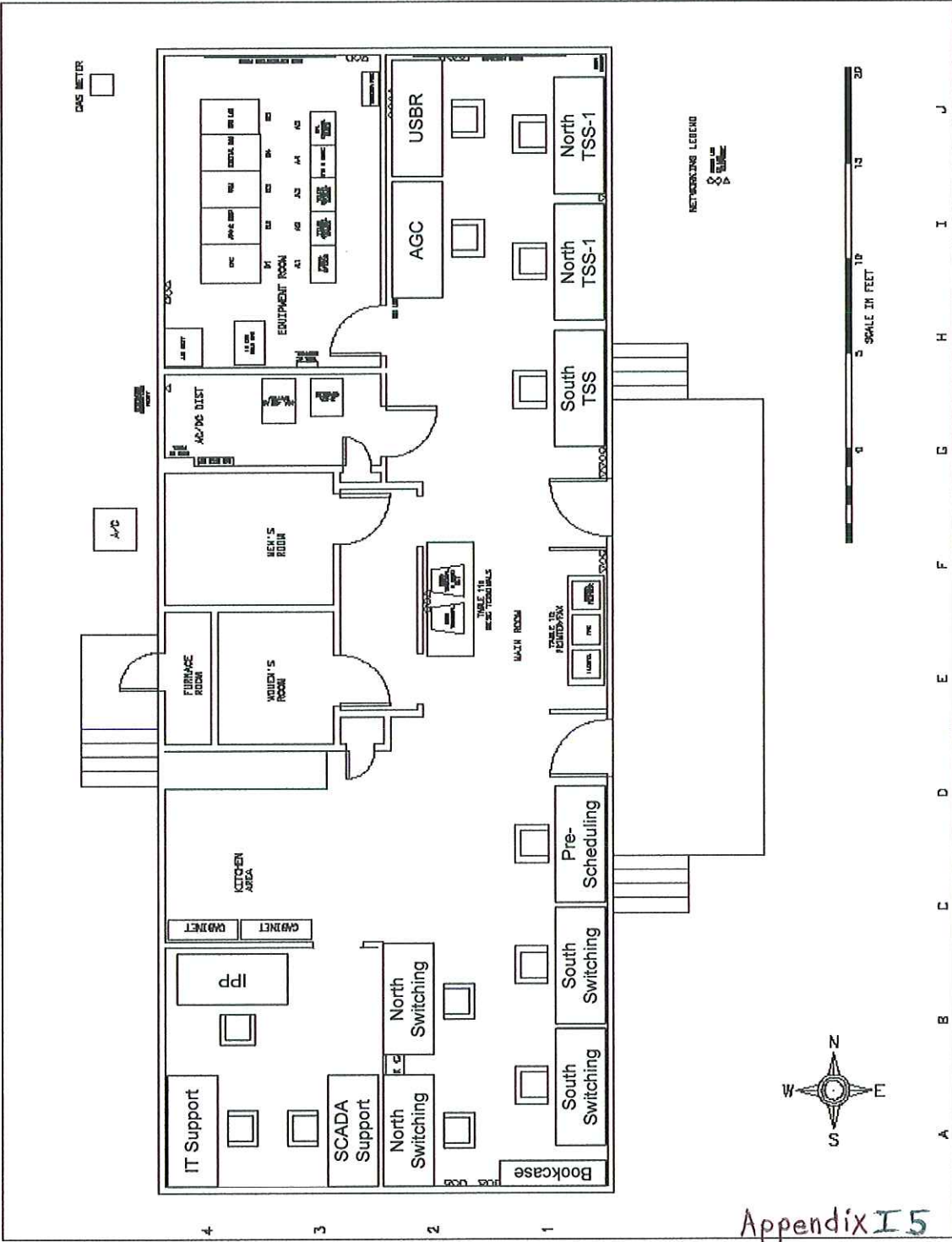
DATE: OCTOBER 2, 2006
 APPROVED BY: [Signature]
 DRAWN BY: [Signature]
 CHECKED BY: [Signature]

PROJECT NO. 11-5501
 SHEET NO. 3911

DESK DETAIL

DESK DESCRIPTION	DESK TYPE	GRID LOCATION	SCADA LAM	MOBILE W/O	SCADA - 1 SCREEN	SCADA - 2 SCREEN	PC - 1 SCREEN	PC - 2 SCREEN	PHONE # 9
FRESH	1	12	X	X	X	X	X	X	7282/200
ESC	2	12	X	X	X	X	X	X	7284/200
AGC	3	11	X	X	X	X	X	X	7284/200
TSS 1	4	11	X	X	X	X	X	X	7284/200/200/200
TSS 2	5	11	X	X	X	X	X	X	7284/200/200/200
REL LAB	6	11	X	X	X	X	X	X	7284/200
SEM 2/ALT	7	11	X	X	X	X	X	X	7284/200/200/200
SEM 1	8	11	X	X	X	X	X	X	7284/200/200/200
SCADA	9	12	X	X	X	X	X	X	7284/200/200
PERIPHERALS	10	12	X	X	X	X	X	X	7284
PERIPHERALS 11	11	12	X	X	X	X	X	X	7284
MEETING	12	12	X	X	X	X	X	X	7284

NOTE
1- ALL PHONE NUMBERS ARE IN A 24-HOUR BLOCK STARTING WITH 307-772-7280 AND ENDING WITH 207-772-7280.



IT	1/24/2004	ADD DESK DESCRIPTION TABLE & LOCATION GRID
IT	1/24/2004	REVISED FOR BRUNN 2004 TEST
IT	1/24/2004	REVISED LAYOUT INCLUDING ALL DEPARTMENTS
IT	1/24/2004	UNIT TO BE REVIEWED BY PROJECT MANAGER
IT	1/24/2004	REVISIONS TO BE MADE - APPROVED BY PROJECT MANAGER
CHEYENNE SUBSTATION ALTERNATE CONTROL CENTER FLOOR PLAN		
DESIGNED BY	S. L. LUNA	DATE
DRAWN BY	S. L. LUNA	DATE
CHECKED BY		DATE
DATE	JANUARY 15, 2002	CH
ACC. FILE		

Appendix I 5

Appendix J

Business Tool List

Business Tools

In the consolidation discussions for WACM, WAUW and WALC Balancing Authorities, the tools used by the Operations/Dispatch staff are elements that are not location dependent. This means that while the business tools are essential, the ultimate decision for the location of the consolidated office is not dependent upon the existing business tools at either location. After the location of the consolidated office is determined an analysis of the business tools will be required to determine the best tool for use at the new combined office. This analysis will include the existing tools at the current individual dispatch locations as well as tools used elsewhere within the industry. The biggest impact will occur during the implementation phase of this effort.

The following table is an initial list of the dispatch function tools and details the existing tools of both RMR and DSW.

Tool	DSW	RMR
Scheduling Package	OATI vendor	(TIGER)
Oasis software	OATI vendor	OATI Vendor & In-House Developed Module For Posting Hourly ATC Calculation
Dispatch Log	SONIC (Switching & Outage Network InteraCtive) In-house developed	In-House Software (Java-Based)
Outage Coordination	SONIC	In-house Software
Switching Software	SONIC	In-house Software
Data Historian	E-DNA	PI
Helicopter Tracking	None	Algorithm Built in SCADA
Training Tracking (CEH Tracking)	Quality Training Database Vendor: Quality Training Systems (QTS)	
NERC Compliance Tracking	N/A	Spread Sheet
Accounting & ATF	OATI Vendor	TIGER and Many Automated Spread Sheet Using Macros
Power Billing	Billing Management System (BMS) – in-house and tied into the CMS	Power Billing System (SNR's Original Software) With Some Modification. SQR Report Builder to Extract Data
Contract Management	Contract Management System (CMS) – based on Vendor supplied FileNet software, in-house modified	InfoBase In-house software developed by UGP
CAD system	AutoCad 2006, moving to	AutoCad 2008, Raster

	AutoCad 2008	Design 2008
Planning (system study) Tools	1)Power System Analysis GE PSLF Program Version 16.1 2)Power System Analysis GE PSLF Program Version 15.2 3)Power System Analysis Siemens PSS/E Version 30.2 4)Aspen One Liner Version 10.9 by ASPEN Corp 5)Compaq Visual Fortran 6 6)Microsoft Project Professional 2002 by Microsoft 7)Sonic - Switching & Outage Network Interactive (WALC Program) 8)EnterNet Suite (WALC Program) 9)Microsoft Access 2000 Database	1)Power System Analysis GE PSLF Program Version 16.0.04 2)Power System Analysis Siemens PSS/E Version 30.2 3) Aspen One Liner Version 10.9 by ASPEN Corp 4) Intel Fortran Compiler (IVF) 5) EnterNet Suite (GE Program) 6) Microsoft Access 2000 Database 7) MatLab
Dispatch Testing	Logic eXtension Resources (LXR) to develop and administer testing.	Logic eXtension Resources (LXR) to develop and administer testing.

Appendix K

DSW Location Analysis

Appendix K

DSW Location Analysis

DSW Location Analysis Summary

While the Operations Consolidation Team has concluded that from a technical perspective with respect to SCADA, Communications, Business Tools and Space, there is no appreciable difference in locating the Western consolidated Transmission Services and Transmission Operations functions in DSW or RMR, there are several key strategic advantages beyond these technical criteria that Senior Management may want to consider for locating these functions in DSW. Keys among the competitive strategic advantages for consolidating in DSW are: 1) the DSW Location; 2) the DSW Facility; 3) DSW Staffing; and, 4) the DSW Technical Expertise and Experience. All of these will help contribute to Western positioning itself as a premier Transmission Services Provider and Transmission Operator for the future.

DSW Location: DSW finds itself strategically located in Phoenix, Arizona, home to several Western customer groups (CREDA, AMPUA, IEDA, KRSA, etc.), and the center of an extremely dynamic and rapidly growing southwest energy market. Positioned centrally between RMR on the east and SNR on the west, DSW is uniquely positioned to serve as Western's Transmission Services and Transmission Operations center within the Western Electricity Coordination Council. With a major international airport within minutes of the DSW facility business travel within the Western Interconnection can be conducted efficiently and cost effectively by Western staff and its customers, with most locations within a 90 minute flight. Additionally, the Phoenix weather provides a desirable location for both recruiting diverse new talent as well as a reliable location unencumbered with conditions that could disrupt operations due to weather or natural disaster.

DSW Facility: The DSW facility, both attractive and modern in construction, located just 20 minutes from Sky Harbor Airport, has sufficient space to accommodate the proposed new consolidated Transmission Services and Transmission Operations organizations without the need for constructing any new facilities. Additionally, DSW has sufficient real estate to accommodate construction of new facilities if needed in the future. The DSW facility has recently been upgraded, expanding and improving critical infrastructure (HVAC, UPS, Power Supply) key to providing reliable Transmission Services and Transmission Operations functions.

DSW Staffing: DSW workforce, with a locality pay of just 13.98% is relatively low compared with other parts of Western. DSW has a diverse workforce and been recognized by Western's EID Office for our performance with respect to our recruiting strategies and resulting diverse hires. DSW is very successful in recruiting a diverse, professional, competent and cost-effective staff. DSW successfully recruits engineers, dispatchers and support staff from a diverse pool of candidates on a national basis that want to relocate to Phoenix due to its desirable location.

DSW Expertise and Experience: DSW operates the WALC Balancing Area and serves as the Balancing Authority (BA), Transmission Operator (TOP), Transmission Owner (TO), Transmission Service Provider (TSP), Transmission Planner (TP), and Load-Serving Entity (LSE) and Planning Authority (PA) for multiple Federal projects including the Parker-Davis Project, the Pacific Northwest/Southwest Intertie Project, the Central Arizona Project, the Colorado River Storage Project, and the Boulder Canyon Project.

The dynamics of the southwest have contributed to an increased demand for DSW OATT services on multiple Federal projects as well as complex and complicated operations that have required DSW staff to develop new and innovative solutions and services for managing the Balancing Area and transmission systems while effectively meeting our customers' needs. Recently, DSW successfully upgraded Mead Substation to accommodate a major new 500-kV interconnection, is presently working with over a half dozen new entities that are moving into the WALC BA, has successfully cutover from a legacy Integrated Scheduling Application to industry standard OATI tools (integrated Etag, Scheduling & OASIS); upgraded the SCADA system to Revision 8 and brought on-line a new eDNA historian.

DSW actively supports the Administrator's effort to ensure full compliance with FERC's Open Access Transmission Tariff, OASIS, and Standards of Conduct requirements. This culture of compliance was reflected in the fact that the preliminary self-audit recently conducted by CSO's Compliance & Audit Liaison group revealed no OATT compliance violations by the Montrose Merchant Office on DSW's system. DSW has also developed an Internal NERC Reliability Standards Compliance Program and has dedicated and staffed a GS-14 FTE to ensure compliance with the NERC reliability requirements.

DSW participates in a variety of international, national, regional and sub-regional industry forums including NERC, NAESB, WECC, SWAT, STEP, Westtrans, SRSG, RMRG, etc. DSW staff have represented Western, other utilities, Federal PMAs, customers and served in leadership positions within these forums as part of standing committees and/or sub-committees to influence the outcomes of these efforts to ensure both Western and our customers continue to be positioned for success within the electric utility industry.

DSW Implementation: Given that little or no facility modifications will be required to accommodate the consolidated Transmission Services and Transmission Operation's functions in DSW, a consolidated control center separately operating the WALC BA/TOP and the WACM BA/TOP could be up and running in relatively short period of time. This can be achieved once the necessary equipment and personnel are put in place to remotely operate WACM BA/TOP. Later, once the necessary SCADA, Communications and Business Tools are put in place, DSW could begin operating a consolidated BA/TOP. This, coupled with other measures to retain Western's expertise such as: retention allowances, the use of over-hires to shadow experienced staff unlikely to relocate, and recruitment incentives serves as a means to accelerate implementation and retain critical expertise that could otherwise be at risk due to a prolonged implementation.

DSW Location Analysis Detail

DSW Location

Phoenix, the capital city of Arizona, is among the nation's fastest growing regions and is consistently recognized for its strong job growth due to its strong labor force and low cost of doing business. With over 300 days of sunshine per year and very low exposure to natural disasters of any kind, Phoenix is a desirable place to live for employees and a reliable place to operate a business, in particular a consolidated Transmission Operations function. Additionally, Phoenix's strategic southwest location is positioned as the hub of the rapidly growing southwest energy market.

Phoenix is the City of the Future. Phoenix is diverse, with over 110 different languages being spoken, the third highest number of any region in the United States. Phoenix is talented, being the home of Arizona State University (the largest producer of natural sciences and engineers in the country), the Maricopa Community Colleges (Arizona's largest provider of job training), and several technical and vocational schools. Phoenix is quickly and easily accessible, with access to the fifth busiest airport in the nation, Sky Harbor Airport, and located on one of the nation's major interstate highways, I-10.

What this means for Western is that DSW is a prime location for establishing it's consolidated Transmission Services and Transmission Operations for the future. The availability of diverse talent, the low cost of doing business, the desirable and reliable climate, and the quick and easy access to air transportation are all key strategic competitive advantages of DSW that will help position Western as a premier Transmission Provider both now and in the future.

Key Phoenix Demographics and Statistics include:

• Population	3.8 M
• Labor Force	2.0 M
• Employment	1.8 M
• Unemployment	3.6%
• Mean Income	\$37.1K
• Median Income	\$48.7 K
• Federal Locality Pay Rate	13.98%
• US Inflation Rate	3.4%
• Office Space	\$25.27/sf
• Median Home Price	\$262,500
• Electric Rates Residential	\$0.0704/kwh
• Natural Gas Rates	\$10.47/Tcf
• ACCRA Cost of Living Index	100.4
• FORBES Cost of Doing Business Ranking	121
• Sunny Days	>300/yr
• Precipitation	7.66 in/yr
• Sky Harbor Airport	5 th Busiest Airport
• Sky Harbor Airport	Delays,<18% for weather

Greater Phoenix Rankings

- No. 1 Destination for Relocations
- North American City of the Future
- No. 1 Large Metro for Job Growth
- No. 3 Best City in US for Jobs
- No. 1 Large Metro for Recruitment and Attraction
- No. 2 Large Metro for Strong Opportunities for Young Adults
- No. 2 Large City for Doing Business
- Greater Phoenix has Best Jobs in Hottest Market
- No. 2 Safest City in which to Conduct Business
 - Low susceptibility to major business disruptions due to weather, natural disasters or terrorism.

DSW Facility

The DSW facility, both attractive, modern in construction, and secure (24-hr security), is located just 20 minutes from Sky Harbor Airport, has sufficient space to accommodate the proposed new consolidated Transmission Services and Transmission Operations organizations without the need for constructing any new facilities. However, should future expansion be required, DSW has sufficient real estate to accommodate construction of new facilities if needed. The Transmission Services area can accommodate all Transmission Services employees, in addition to three Dispatch Trainers/Certifiers along with an on-site dispatch training room. The Transmission Operations area can accommodate all Transmission Operations personnel including Settlements and SCADA.

Recently the DSW facility has been upgraded providing both increased capacity and increased reliability for key infrastructure critical to Transmission Operations. In 2007, DSW installed a new Uninterruptible Power Supply (UPS) and also added additional cooling capability, doubling the HVAC systems from 30 tons to 60 tons via three redundant chilled water units (20 tons per unit). In addition, the DSW facility now has three independent main electrical feeds providing power to the facility. In 2008, DSW will be upgrading the SCADA system with new front-end processors at both the primary and Emergency Control Center (ECC).

The fully functional DSW ECC, located less than 1-hour away, via multiple diverse routes from the DSW Facility and less than 40 minutes from Sky Harbor Airport, at Coolidge Substation, has sufficient space within the existing control building to accommodate the Alternate Control Center (ACC). The existing ECC would require some modification of the basement area to accommodate the increased number of desks needed by a consolidated ACC. Coolidge Substation also has sufficient real estate and utilities (electrical, sewer, water, communications, etc.) within the secured perimeter to accommodate construction of new facilities (modular, mobile or permanent) to provide for current and/or future needs of the ACC.

DSW Staffing

DSW has the ability to recruit and staff both the consolidated Transmission Services and Transmission Operations functions with quality dispatchers, engineers, computer specialists and support personnel. DSW successfully recruits from a diverse pool of candidates on a national basis that want to relocate to Phoenix due to its desirable location. Normally, DSW has several candidates to choose from for each vacancy and typically fills these vacancies within 60 days.

DSW is diverse and has been very successful in recruiting a diverse staff. The efforts made under the Desert Southwest Region's (DSW) 2007 EEO Plan are acknowledged for the commitment and willingness of DSW managers and supervisors to fill positions at other than full performance. The DSW has utilized various strategies across the EEO Plan that resulted in 27 career ladder positions and five student hires this year. The recruitment sources identified by the DSW are based on demographic research for the DSW area with attention to populations where diverse candidates exist. The strategies employed by the DSW EEO Plan are also found in the DSW 2006 Business Forecasting and Workforce Planning documents. These efforts have been sustained over the past two years with continuing evidence of successful diverse hires.

The DSW has also been recognized for the sustained efforts in presenting diversity training events and developing a tracking system in compliance with the mandatory hours of training needed under the DOE Order 311.1B, EEO and

Diversity Program. The DSW tracks and reports the number of hours required, earned, and remaining hours needed throughout the fiscal year for each employee in the Region. The DSW tape records diversity programs and offers the opportunity for employees to make up sessions utilizing the recordings to complete the necessary hours by end of year.

Lastly, cost of the DSW workforce relative to other parts of Western is low. The projected 2008 locality pay for DSW will be just 13.98 percent, well below that of the Loveland-Fort Collins (Denver) area at 20.52 percent.

DSW Technical Expertise and Experience

DSW is a full-service energy services provider. DSW operates the WALC Balancing Area and serves as the Balancing Authority (BA), Transmission Operator (TOP), Transmission Owner (TO), Transmission Service Provider (TSP), Transmission Planner (TP), and Load-Serving Entity (LSE), Planning Authority (PA) for multiple Federal projects, including: the Parker-Davis Project, the Northwest/Southwest Intertie Project, the Central Arizona Project, the Colorado River Storage Project and the Boulder Canyon Project.

DSW's strategic southwest location provides for an extremely dynamic and challenging operating environment. With transmission facilities located in extremely high growth areas south of Phoenix and along the Colorado River, the southern portion of which recently declared a National Interest Electric Transmission Corridor by DOE, DSW is and will continue to be involved in transmission projects and generation projects involving a variety of Open Access Transmission Tariff services necessary to meet the Region's growing demands.

The dynamics of the southwest have also contributed to complex and complicated operations that have required the DSW staff to develop new and innovative solutions and services for managing the transmission system while effectively meeting our customers' needs. Recently, DSW successfully upgraded Mead Substation to accommodate a major new 500-kV interconnection, is presently working with over a half dozen new entities that are moving into the WALC BA, successfully cutover from a legacy Integrated Scheduling Application to industry standard OATI tools (integrated E-tag, Scheduling & OASIS); upgraded the SCADA system to Revision 8 and brought on-line a new eDNA historian.

DSW actively supports the Administrator's effort to ensure full compliance with FERC's Open Access Transmission Tariff, OASIS, and Standards of Conduct requirements. This culture of compliance was reflected in the fact that the preliminary self-audit recently conducted by CSO's Compliance & Audit Liaison group revealed no OATT compliance violations by the Montrose Merchant Office on DSW's system. DSW has also developed an Internal NERC Reliability

Standards Compliance Program and has dedicated and staffed a GS-14 FTE to ensure compliance with the NERC reliability requirements.

Lastly, DSW participates in a variety of International, National, Regional and sub-Regional industry forums including NERC, NAESB, WECC, SWAT, STEP, Westtrans, SRSG, RMRG, etc. DSW staff have represented Western, other utilities, Federal PMAs, customers and served in leadership positions within these forums as part of standing committees and/or sub-committees to influence the outcomes of these efforts to ensure both Western and our customers continue to be positioned for success within the electric utility industry.

Complexities of the DSW-WALC operations include:

1. **Regulation and Imbalance Responsibilities** - WALC provides regulation, ramping and reserves and imbalance for four other Adjacent Balancing Authorities (who represent several customers and projects). WALC provides regulation for WACM. WALC also provides Regulation, Ramping and Reserves for a number of internal metered sub-systems such as the Fort Mohave Indian Tribe, City of Farmington, City of Page, Central Arizona Project, Arizona Electric Power Cooperative and the Colorado River Association. In 2008, the City of Needles, Sulphur Springs, the San Carlos Irrigation Project, ED2, ED3, ED4 and ED5 will all be moving into WALC and will be contracting for these services.
2. **Interproject Regulation Distribution** – WALC has a highly complex distributed Automatic Generation Control system which provides for limited regulation ranges between Lower Basin Federal Projects (BCP, PDP, Other lower basin Generating entities and CRSP). The AGC separates the obligation and performance of each Project.
3. **Independent Power Producers** - WALC has four active IPP Generators (three with ratings in excess of 500 MW) which require considerable real time interactive dispatching support to maintain a deviation balance and to monitor, relieve or assess excursion penalties and curtail or restore generation. WALC's SCADA has these plants included in its AGC response. WALC SCADA provides back feed to these plants for proof of penalty and Plant Load Control response purposes.
4. **Native American Entities with Generation and Load** – WALC operates a metered sub-system containing Federal generation for the Bureau of Indian Affairs and provides regulation, ramping and reserves for this entity in the WALC BA ACE. WALC also as a BA and/or TOP or LSE operates other Native American metered sub-systems such as the Aha Macav, San Carlos Indian Project and others.

5. **Defense Department Load** - WALC operates for several major defense loads in Southern California and southwestern Arizona providing a range of electrical ancillary or integrated services.
6. **Spinning Reserves** - WALC belongs to two spinning reserve groups, SRSG and RMRG. WALC has two reserve group computer interfaces and the BA provides contingency response through these agreements to adjacent BAs TEP, APS, SRP, PNM, NPC, IID, WACM and indirectly to El Paso, PSCO and PACE. WALC also responds to supply assistance to internal entities which are reserve members such as IPPs and metered sub-systems such as SWTCO, Mohave Electric, Farmington, and others. WALC maintains individual Lower Colorado Basin and Upper Colorado Basin Spinning Reserve and load identity and provides for the sale of reserves between the Basins in real-time to support Project and BA reserve requirements.
7. **Federal Project Loads** – WALC Generation Control in the Lower Colorado Basin is responsible for supplying and maintaining vertically integrated electrical service for seven Federal Hydro/Irrigation or Flood Control Projects and multiple municipalities.
8. **Nuclear Shut Down Power** - WALC has a primary role in providing safe shut down power for the Palo Verde Nuclear Generating Station if service is not available to the Plant. WALC is a secondary supplier of safe shut down power for the San Onofre Nuclear Generating station. **SEE SOP 513.**
9. **Black Start Responsibility** – WALC is of key importance in the Rocky Mountain Desert Southwest Reliability Coordinator (RDRC) Regional Black Start plan. WALC maintains components in its plan to energize the CAISO through SCE/MWD and DWP systems as well as to energize the NPC BA. WALC supplies start up power to the APS BA and is the principal entity responsible for powering PNM and TEP BAs. **SEE SOP 513.**
10. **Operating Joint Use Generation Projects** – WALC operates a contingent firm joint use plant with 15 contractors which apply both dynamic schedules and static schedules. Intricate capacity scheduling and highly specialized AGC computer code is applied to operate this project. **SEE HOOVER MOSIs, BCP Contracts, SCADA personnel**
11. **WALC BA Operates with Multiple Deviation (Pseudo ACE)** - The WALC BA is operated with dynamic identity of a diverse spectrum of metered-subsystems which include IPPs, Sub-regional entities such as Cooperatives, Municipalities, Consortiums of Metered Load with both contiguous and remote transmission systems, Federal entities which include Defense Department, Homeland Defense, Interior Department, Native American Tribes, Commercial loads, and very large irrigation projects.

12. WALC BA Operations includes Large Dynamic Remote Load Obligations

– The WALC BA is the supplier of last resort for approximately 1200 MW of remotely supplied foreign load. These loads are dynamically supplied through a series of dynamic schedules which are linked between the WALC BA SCADA and the foreign entities SCADA. This network of dynamics creates a complex monitoring and alarming system.

13. WALC Transmission Operations includes 6 345-kV Lines and 3 500-kV lines

- With three major 500-kV Interconnections which involve joint use and independently joint owned transmission projects like Mead-Phoenix Project with 13 separate owners and Transmission Providers. WALC operates and integrates operations of multiple Federal Transmission Projects with voltages ranging from distribution to 500-kV Lines.

14. WALC Transmission Operations of SPS

– WALC Transmission Operations involve the dispatching of several complex and critical Desert Southwest and WECC Special Protection Schemes such as the PITT RAS Scheme, GC Unit Load Dropping Scheme, Blythe RAS, Mead Separation SPS, Parker-Gene Overload Mitigation, etc.

15. WALC Supports and maintains a full range of Standard Operating Procedures

- Presently 460 WALC Procedural documents cover the Spectrum of System Operator reference and guidance needs. WALC also maintains a large body of System Administrative Procedures as proof of NERC Compliance. WALC maintains and coordinates a series of emergency plans which are required by NERC and other government entities. A listing of some of the more complex or involved SOPs follows:

- **SOP 513** Black Start
- **SOP 550** Plan for Loss of Control Center
- **SOP 2008U** Harry Allen and MPP 500-kV Overload Mitigation
- **SOP 510** Load Limits
- **SOP 509** Voltage Limits
- **SOP 4828** WALC RAS Schemes
- **SOP 4275** Arizona Security Manual
- **SOP 4513** Emergency Operating Plan

The Emergency Plans WALC maintains and coordinates are:

Plan for Operating Emergency Assistance EOP-001-0 R1. – Adjacent /Remote BAs

SRSG and RMRG Reserve Assistant Agreements and PLAN 1002: PLANS 1002 and 551 – “Operating Reserve Deficiencies” and “NERC Documentation Requirements”

Plan for Emergency Load Reduction and Identification of IROLs EOP-001-0 R2. :

PLAN 513 – “DSW Black Start and Bulk System Restoration”

Plan to Mitigate Emergencies for insufficient generating capacity EOP-001-0 R3.1:

PLAN 1105A and 1105B – “Energy & Capacity Emergency Plan”, “Energy & Capacity Emergency Response”

Plan to Operate Emergencies on the transmission system EOP-001-0 R3.2:

PLAN 513 and 4828 “Black Start and Bulk System Restoration”, “WALC RAS SCHEMES”

Plan for Load Shedding EOP-001-0 R3.3:

PLANS 513 and 1106 – “DSW Black Start and Bulk System Restoration”, “Emergency Curtailments and Load Shedding”

Plan for System Restoration EOP-001-0 R3.4:

PLAN 513 – “DSW Black Start and Bulk System Restoration”

Plan for Emergency Communications protocols EOP-001-0 R4.1:

PLANS 513, 526, 529, 542, 543, 545, 550, 1100, 1201H, 1202 –

513 “SW Black Start and Bulk System Restoration”

526 “System Security - Emergency Notification”

529 “WALC - RDRC Communications”

542 “Loss of Primary Facility Equipment”

543 “Loss of Primary Facility Voice Communications”

545 “Evacuation of Primary Facilities”,

550 “Loss of Primary Control Center”

1100 “Loss of SCADA”,

1201H “WECCNet Messaging”, 1202 “Troubleshooting Program Problems”

Plan of Actions to Resolve Emergency within timelines EOP-001-0 R4.2:

PLAN 513 – “DSW Black Start and Bulk System Restoration”

Plan of tasks among TOPS and BAs during emergencies EOP-001-0 R4.3:

PLAN 513 – “DSW Black Start and Bulk System Restoration”

Plan for Emergency Staffing Levels EOP-001-0 R4.4:

PLAN 513 and 4291 – “DSW Black Start and Bulk System Restoration”, “Emergency Preparedness Plan”

Plan of Generator Maintenance and Fuel Availability Schedules EOP-001-0 R7.3:

PLAN 4524 - “USBR 24 Month Study”

16. **WALC Maintains Policy Manager** – WALC BA and TOP applies this software as the interface and repository tool for System Operator Reference and for NERC Standard verification of compliance.

17. **WALC Supports and Uses a Special Switching, Reporting and Time Keeping Program** - The program provides for developing or writing of Switch Orders and Master Switch Orders while acting as a repository for executed switching. The Program includes Logging based on the Switching Times, Reports based on the Switching Performed and SCADA Alarms linked into the system. The is used to coincidentally generate Transmission and BA logs, Trouble Reports, Incident Reports, OE417 Reports, Accountable Outage Reports, Summary of Switching Reports, and provides a Summary of Projected or Past Switching for any given period of time. The Program also is used for SOL/IROL violation and reporting and has email capability for all of its reporting features. WALC also uses and interfaces to Maximo for proper reporting and use of Trust and Reimbursable Funds as it is applied to field switching.

18. **DSW Contracts** – DSW's new contracts for the years 2005, 2006 and 2007 number 60, 96 and 154 respectively. Of these, approximately 70% are Power Operations related. These do not include OATT agreements.

17. DSW Key System Statistics

- Peak Load ~2,300 MW
- Transmission Lines ~3,100 Mi
 - i. Voltages 34.5 – 500 kV
- Substations ~70 Federal
 - i. Voltages 34.5 – 500 kV
- Federal Projects 9
 - i. Boulder Canyon
 - ii. CAP
 - iii. CRSP
 - iv. Gila
 - v. Levy
 - vi. Navajo
 - vii. Pacific NW/SW Intertie
 - viii. Parker-Davis
 - ix. Salinity
- Generation
 - i. Federal ~4,150 MW
 - ii. Non-Federal ~1,680 MW
- IPPs 4
- Tags >200,000/yr
- Switching Programs >2,800/yr
- WALC BA 5 States & Mexico
- Boundary Tie Lines 102

- Adjacent BAs 11
- Metered Subsystems 5
- CIP Critical Assets 13

DSW Implementation

Given that little or no facility modifications will be required to accommodate the consolidated Transmission Operation's functions in either DSW or RMR, a consolidated control center separately operating the WALC BA/TOP and the WACM BA/TOP in relatively short period of time. This can be achieved once the necessary equipment and personnel are put in place to remotely operate either WALC or WACM, whichever site was not chosen to locate the consolidated control center. Once the necessary SCADA, Communications and Business Tools were put in place the consolidated control center could begin operating a consolidated BA/TOP. This, coupled with other measures to retain Western's expertise such as: retention allowances, the use of over-hires to shadow experienced staff unlikely to relocate, and recruitment incentives serves as a means to accelerate implementation and retain critical expertise that could otherwise be at risk due to a prolonged implementation.

Appendix L

RMR Location Analysis

Appendix L

RMR Location Analysis

Executive Summary:

The Western Area Power Administration Colorado Missouri Balancing Authority (WACM) is considered one of the premier Balancing Authorities in the Western Electricity Coordinating Council (WECC) Interconnection. Western's Rocky Mountain Region (RMR) manages the WACM Balancing Authority (BA) that consists of a large (the largest of all Western BAs) and complex power system covering portions of 8 western states. The WACM BA hosts two (2) large Federal Projects, ten (10) transmission providers, thirteen (13) Load Serving Entities, fifteen (15) network transmission customers, and three (3) sub-balancing authority operating entities. The WACM BA is operated similarly to a Regional Transmission Organization (RTO). WACM operations are complicated by the management of 5 WECC constrained paths and 3 DC ties, the operation of phase shifting transformers for management of loop flow in the WECC, and the hosting of several Interconnection-wide software and tools.

To manage this complex system, RMR has become a pioneer in developing or acquiring the necessary tools and software. RMR's full integration of its tag-based scheduling software and its OASIS occurred back in 2001. The RMR Operations staff members are considered expert in their field among their peers and other industry participants; and are often consulted to resolve complex operational issues. The RMR Operations staff has developed the necessary algorithms for computation of ancillary services and has properly distributed collected revenue between its two Federal projects. The RMR-developed algorithms are being copied by other Western offices. Additionally, WACM provides numerous agent services to other entities, resulting in the collection of more than one million dollars annually.

The existing RMR facility has ample space to accommodate the consolidated organization. In addition, the current facility has additional real estate to accommodate any future expansion. According to many visitors from other utilities and Reliability Organizations, the Loveland Control Center and its layout is one of the best they have ever visited. RMR's central location (between WAUW & WALC) is optimal for efficient data communications throughout the consolidated organization, which will span from Montana to Western Arizona and Nevada.

The WACM control center is located at the RMR office in a very desirable area of Northern Colorado that has been continuously ranked the best place to live and raise a family (Money Magazine, Forbes, and Reader's Digest). The workforce in Northern Colorado is highly educated as evidenced by the number of universities nearby and presence of companies like Intel, American Micro Device, Hewlett Packard, Agilent, Kodak, Asea Brown Boveri, Vestec, and others.

RMR, with its premium northern Colorado location; has excellent quality of life, ample office space, operational expertise, the necessary tools, and project management experience to complete the proposed Operations Consolidation efficiently and effectively; thus minimizing the impact to affected employees.

Introduction

This paper addresses the proposed Operations consolidation and presents a case for housing the consolidated functions in the existing RMR office, located in Loveland, Colorado.

RMR is the operator of Western's largest BA, while also serving as the Transmission Service Provider for two Federal transmission systems [Loveland Area Projects, (LAPT) and Colorado River Storage Project (CRSM) transmission], and two non-Federal transmission systems [Black Hills/Basin (BHBE) and Basin Electric West Transmission system (BEPW)]. RMR also provides agent services for numerous utilities.

The WACM BA encompasses a vast geographical area, complicated operationally by the incorporation of 10 transmission providers, 15 Network Integration Transmission Service customers, 13 load-serving entities, 5 WECC constrained paths, 3 DC ties, and 2 phase shifting transformers within its footprint. WACM has distinguished itself as one of the premier BAs in the WECC, possessing both an excellent reputation for customer service, and the willingness and knowledge to accept and successfully accomplish large operational projects.

Background

On April 1, 1998, Western consolidated management of two of its operations centers into a single center managed by RMR. The new BA included: 1) the northern portion of the Western Area Upper Colorado (WAUC) control area and 2) the Western Area Lower Missouri (WALM) control area, combined to become the WACM BA. The WACM BA represented a doubling in size from RMR's former WALM, in both square miles and load responsibility. Consolidation and subsequent operation was a tremendous challenge for RMR staff, made all the more difficult by distinctly different, and previously unaddressed, operational philosophies held by WAUC and WALM. Integration of WAUC and WALM Balancing Authorities resulted in an overall improvement of transmission system operation. WACM maintained an effective working relationship with Montrose Operations Office, WALC, and the emerging Montrose Energy Management Office to address transitional issues resulting from consolidation and other industry changes.

Coincidentally on April 1, 1998, RMR also implemented, per FERC Order 888, its Open Access Transmission and Ancillary Services rates, which now covered both of the

former control areas' footprints. The issuance of FERC Order 888 provided RMR with the opportunity to begin to improve its energy accounting practices.

By early 1999, RMR completed the remodeling of its control center to accommodate the control area consolidation, including a state-of-the-art rear-projection map board and distinct separation of function among Switching (Transmission Operator/TO), Automatic Generator Control (AGC-Balancing Authority), and Transmission Service Provider (TSP) to match the North American Reliability Council's (NERC) newly developed functional model. According to many visitors from other utilities and Reliability Organizations, the Loveland Control Center and its layout is one of the best they have ever visited

Operational statistics for the WACM BA footprint are:

1. Encompasses part or all of Arizona, Colorado, Montana, Nebraska, New Mexico, South Dakota, Wyoming, and Utah.
2. Includes more than 300 substations.
3. Includes a peak load of approximately 3,500 MW.
4. Includes peak generation capacity of 5,600 MW.
5. Includes > 140 boundary points (intertie meters) with 8 other BAs.
6. Includes approximately 40 boundary points (intertie meters) with 3 Sub-BAs.
7. Operates 5 WECC constrained paths.
8. Operates the two phase shifting transformers most effective for coordinated control of loop flow in the WECC
9. Processes over 220,000 electronic tags annually.
10. Administers over 3,300 switching orders annually.
11. Processes over 17,000 transmission request annually.
12. Provides more than 700 hours of switchman certification training annually.

Discussion

WACM is the largest Balancing Authority managed by a Western Regional Office. It is 1 of 35 WECC BAs, had a 2007 peak load of 3,481 MWs, and has total installed generation of over 5,600 MWs. WACM load growth is increasing by about 3% per year due to economic expansion in the BA, and the continuing desire of entities to move their loads and resources into WACM...a direct outcome of WACM's ability to both recover its costs and work cooperatively with customers.

RMR has control of Federal hydroelectric resources and accomplishes revenue recovery for both generation and transmission, utilizing Western's project power repayment studies. RMR manages the Fryingpan-Arkansas Project and the Missouri Basin Power Program—Western Division, which combined consist of 20 power plants with an installed capacity of 830 MW, and average generation of 2,160 GWhs. The majority of the generation within WACM is comprised of non-Federal generation, including 140 MW of intermittent renewable generation located across 5 wind farms. RMR also dispatches 1120 MW of coal-fired generation at Laramie River Station.

RMR operates the Loveland Area Projects transmission system and the northern part of the Colorado River Storage Project transmission system (approximately 5,300 miles). In addition, RMR operates the Basin Electric Power Cooperative west transmission system (approximately 500miles).

RMR's Operations staff has accumulated a wide array of expertise in the operation of WACM. Special skill sets and knowledge have been acquired, resulting in the successful management of all aspects of BA responsibility including, but not limited to: the management of 5 constrained paths (3 of which are WECC Qualified Paths); the scheduling and operation of 3 DC ties; and the operation of 2 phase shifting transformers. WACM's phase shifting transformers are the most effective in WECC for control of loop flow and are frequently utilized to provide this service. As a result of providing this service, Western receives approximately one million dollar annually. RMR's Operations staff is widely recognized by other Western offices, WECC, NERC, and it's neighboring BAs as both a pioneer and a team player, adapting readily and cooperatively to the ever-changing climate of the electric utility industry.

RMR receives numerous requests to provide Operations-related services, in direct response to other entities' respect for RMR Operations staff broad knowledge and expertise. These include acting as the Transmission Agent for the Basin Electric West-side transmission system (BEPW) and the Common Use System of Basin, Black Hills, and PreCorp (BHBE). Additionally, WACM provides transmission switching services to BEPC, WMPA, and MEAN.

For more than 20 years, RMR has provided joint use SCADA and services to the USBR Eastern Colorado Area Office, allowing the USBR to monitor and control their Colorado hydroelectric and water projects. Additionally, radio communications services are provided to the USBR throughout Colorado and Utah (both LAP & CRSP).

Why RMR?

Quality of Life. The entire front range of Colorado is an excellent place to live. From the 13 ski resorts within 100 miles to the multitude of golf courses, everyone can find a reason to enjoy themselves. With low crime and electricity rates, excellent air and water quality, one can be assured that placing the control center in Loveland is a good choice. In addition, with median housing prices in the low 200's, all Western employees will be able to find an affordable place to live. Additionally, Denver is only 50 miles away, offering all the benefits of a major metropolitan city.

Transportation. The regional office sits directly adjacent to an airport that can accommodate planes up to the 737 in size. This convenient facility has been used on a regular basis not only by Western's federal staff, but also by many of Western's customers to fly in for meetings. In addition, the office is situated directly adjacent to an interstate highway, and is only a one-hour drive from Denver International Airport. A

major hub of United as well as several other airlines, DIA's modern facilities provide an excellent means to travel anywhere in the west or around the world. In 2004, DIA was ranked first in major airports for on-time arrivals according to the FAA.

Amenities. The Loveland-Fort Collins area is continually ranked highest in surveys of places to live. Most notable among these are:

- Ranked as one of the best places to live and do business (*Forbes & Kiplinger's*)
- #1 Best Place to Live (*Money Magazine*)
- Best Place to Raise a Family (*Reader's Digest*)

In addition, the area directly around the RMR facility has seen an explosion of growth with the Centerra development over the past 5+ years. Key additions include "The Ranch" - a new fair grounds/conference facility, the Medical Center of the Rockies hospital, and the Promenade Shops at Centerra mall. In addition, a new state-of-the-art 74,000 sq ft Embassy Suites conference facility is being built within a quarter of mile from the office.

Workforce. The workforce in northern Colorado is highly educated as evidenced by the number of universities nearby. Colorado State University is located right in Fort Collins just a 20 minute drive from the RMR office. In addition University of Colorado (Boulder & Denver), University of Northern Colorado, Colorado School of Mines, University of Denver, as well as the University of Wyoming are all located within an hour's drive. With northern Colorado being recently added to the Denver area locality pay scale, the Region has been even more effective in its efforts to recruit highly educated and skilled individuals.

Load Growth & Transmission Expansion. In addition to major transmission expansion of Eastern Plains Transmission Project (EPTP), WACM is in process of upgrading its 115-kV transmission system in Wyoming & northeast Colorado area to 230-kV to accommodate load growth of its network customers. The Rocky Mountain Region is in the middle of an energy explosion. Tri-State G&T – a major Western customer – recently issued an RFP seeking 250MW of new generation. Xcel Energy plans to increase its wind generation in Colorado from 1100MW to 1900MW by 2015. The Rocky Mountain area, in general, continues to boom with both renewable and traditional sources of energy. WACM's load is expected to increase by more than 6% in 2008 and 8% in 2009 with addition of the Cheyenne Light, Fuel and Power and the Aquila transmission system.

Proximity to CSO. The RMR office is approximately 60 miles from Western CSO. Face to face meetings between staffs are easily facilitated by the short travel distance. DOE personnel and other CSO guest are often brought to RMR to observe and understand real-time power system operation. EPTC students are routinely brought to WACM Control Center on field trips to witness real-time power operations.

Technical Considerations

1. RMR was the first Western office to successfully implement Western's Open Access Transmission Tariff; developing rates for Firm and Non-Firm Point-to-Point Transmission Service, Network Integration Service, all seven FERC-identified Ancillary Services, and Balancing Authority service that collects transmission losses incurred within the Balancing Authority, regardless of the ownership of transmission. For the sale of LAPT and CRCM transmission, RMR recovers an annual average of about \$18 million in Network Integration Transmission Service. Additionally, WACM collects an annual average of \$12 million for Point-to-Point Transmission Service beyond the bundled transmission service for native load (CROD). WACM BA's ancillary services revenues in Fiscal Year 2007 totaled almost \$14 million. This combined \$44 million in revenue was previously bundled in with the firm electric customers' costs; now, however, are seen as an offset to such.
2. In June 2000 RMR/WACM became one of the first BAs within WECC to implement tag-based scheduling software, in response to NERC's modification of e-tagging specifications and requirement to tag all interchange transactions. As OATI had not yet developed software to meet RMR's needs, RMR utilized its in-house expertise to develop Transmission Integration Generation Energy Reporting (TIGER) software. The in-house development of TIGER increased the reliability and security of WACM's power scheduling capability and enabled WACM to function independently regardless of OATI outages/issues.
3. RMR has been a true pioneer in establishing new services such as Yearly Non-Firm and new revenue collection methodologies for Regulation and Frequency Response Service and Energy Imbalance Service. RMR developed and implemented its Yearly Non-Firm transmission service offering a full 1-1/2 years prior to FERC's mandate for utilities to provide a similar service, "Conditional Firm Transmission Service". While RMR has this offering in place, other utilities are struggling to implement FERC's requirement. RMR collects almost \$500,000 annually for this additional service. RMR's efforts regarding a Regulation and Frequency Response Service rate that addressed the added regulating burden of intermittent renewable resources was a pioneering effort (no other utility had yet addressed this), and was implemented after 2-1/2 years of interaction and dialogue with the wind development community. BPA is just beginning this effort with a series of workshops. RMR collects approximately \$3.5 million for this service. RMR's implementation of Energy Imbalance (EI) Service and its accommodations toward intermittent renewable resources was in direct response to properly assign energy cost to entities with imbalance between their resources and obligations. RMR is the only Western office with Energy Imbalance Service fully implemented, the result of which has been behavior modification and better scheduling practices. This process insures that RMR remains revenue neutral and Federal power projects do not subsidize other entities.
4. RMR provides a wide variety of agent services such as OASIS Administration and Transmission Service Provider functions for Black Hills Power (BHP) and

Basin Electric Power Cooperative (BEPC). RMR also provides tag agent and approval services for BHP and BEPC in addition to operating two 550-MW generating units and several smaller gas turbines for BEPC. RMR also provides transmission switching services for the Missouri Basin Power Project's west-side transmission system, and provides Unscheduled Flow Mitigation Service to the Municipal Energy Agency of Nebraska, BHP, and the Wyoming Municipal Power Agency. Due to the exemplary tools developed by RMR/WACM, all of these services have been provided without an increase in FTE levels. RMR collects in excess of one million dollars annually for providing these services.

5. RMR received numerous compliments from the NERC Audit Team during the May 2006 Readiness Audit. Some of these positive comments included:
 - The NERC Audit Team commended WACM for providing a work environment that proactively supports staff certification. Not only are the WACM operators NERC certified, but also additional key personnel such as the managers, leads, supervisors, trainer, switching trainer, and some operations engineers and transmission planners.
 - Interconnected neighbors have a high degree of confidence in the WACM operator's ability to maintain reliability
 - A proprietary software program – Transmission Inerties Generation Energy Reserves - TIGER – provides seamless e-tag/scheduling system interface
 - A fully functional, carefully planned, and managed alternate control center
6. RMR's Operations staff fills many leadership positions in various industry groups: NERC, North American Electricity Standards Board (NAESB), WECC, and others such as WestTrans and WestConnect. Through this participation, Western/RMR is recognized as a leader in the formulation of standards and business practices, particularly those impacting the Western Interconnection. RMR participation has been critical in the successful completion of Interconnection-wide tools such as the WECC Registry, Western Interchange Tool (WIT), EHV Data Pool, WECC Operations Network (WON), unscheduled flow management tool (webSAS) and WECC's real-time messaging system (WECCnet). RMR's Operations staff is considered to have a high level of expertise and is frequently consulted in the resolution of complex operational issues.
7. RMR's SCADA group offers the best chance to successfully complete the proposed consolidation effort in the shortest possible time. General Electric Corporation (GE) has recognized RMR's SCADA group as 1 out of only 3 of its 50 SCADA customers, who have the necessary expertise to implement SCADA release upgrades and modifications in-house, without having to contract any services back to GE. With combined experience totaling 132 years, the RMR SCADA group has implemented numerous software upgrades and has a long history of successful project management; e.g., USBR joint SCADA operations in 1986; transformation consolidation in 1998; establishment of WECC's Reliability Coordination Office (RDRC) at Loveland in 1999; subsequent development of

WECC-wide state-estimator modeling software for RDRC; and implementation of one of the first Western Alternate Control Centers supporting WACM, USBR, RDRC, and WECC databases.

The USBR has entered into funding agreements with RMR and Western States to consolidate its SCADA operations at RMR. This consolidation will enable the BOR to close one of its operations centers at an estimated savings of approximately \$1,000,000 per year. Nine months into the project, the BOR is very reluctant to deviate from the agreed upon design locating the SCADA operations center at RMR.

RMR SCADA group also hosts the Phasor Data Concentrator which collects 30 millisecond data from Phasor Measurement Units installed at Ault, Bears Ears, Yellowtail, Shiprock, and Mead substations. Data collected from these substations along with data from BPA, CAISO, British Columbia Transmission Corporation are used to evaluate major system disturbances within WECC.

8. In 2001, to optimize revenues and assure accurate transmission posting, RMR implemented real-time postings of its available Federal transmission capacity, reflecting accurate transmission use. This real-time calculation of Available Transmission Capacity (ATC) is a complex equation involving close interaction between TIGER, SCADA, and OATI's WebTTrans. RMR has received excellent feedback from transmission customers regarding the improvements to reflect accurate postings of the availability of its non-firm transmission.
9. Locating the consolidated organization in Loveland enhances communication reliability and reduces the bandwidth required between Loveland and Phoenix by six T1s:
 - Support for the Reclamation control centers in Colorado and Wyoming will not have to be remotely connected from Phoenix to Loveland (2 T1s saved).
 - Channels required to take the UGP RTUs beyond Loveland to Phoenix will not be required (4 T1s saved).

Reliability of all the above circuits will be increased by locating the consolidated organization in Loveland since the additional communication circuit length of 650 miles from Loveland to Phoenix will not be required. This is extremely critical with respect to USBR control of their power plants. In addition, locating the center in Loveland results in a more reliable communication network overall. This is due to the fact that maximum communication circuit length for implementing the center in Loveland would be roughly 800 miles vs. 1100 miles if implemented in Phoenix.

Recommendation

The recommendation of this paper is that the three Balancing Authorities (WAUW, WACM and WALC) be incorporated into a single Balancing Authority in Loveland. There are several reasons supporting this recommendation.

Operations expertise and industry relationships developed over the last 10 years can continue to strengthen, solidify, and maintain Western's position for future growth and increased viability. Selecting Loveland will increase the retention of Operations staff proficient in the special Operations procedures, phase shifter operation, TOT management, DC tie management, and knowledge of complex energy accounting procedures that will not be easily transferable.

RMR's central location provides an opportunity to optimize the use of the existing communications system by minimizing the number of channels and the number of hops required to perform real-time operations. The RMR's proximity to Western's Corporate Services Office is strategically advantageous to Western as we transition to a single transmission organization.

Further support for the selection of the Loveland facility is the efficiency and use of expertise with which this consolidation project can be completed. The length of time to complete the consolidation will be determined by a number of factors. One of the most critical will be the skill level of the SCADA staff as it deals with the problem of merging the two SCADA databases, incorporating customs, performing field checkouts and remapping display, report, ICCP, and historical dynamic data. RMR's staff has the ability to perform these tasks without the procurement and contractual delays involved in going to General Electric for additional vendor support. Consolidation at RMR would ensure that the highly qualified SCADA staff is available to be utilized to minimize the time involved in completing the consolidation effort.

We believe RMR has the necessary skills and expertise to successfully complete this consolidation. In addition, the area is nationally recognized as one of the top places in the country to live. In summary, RMR has the space, a desirable location, and a proven record in accomplishing large scale projects.