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Reliability Must Run Study

For

River System Years 2003-2005

Arizona Corporation Commission

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E-00000D-03-0047

DESERT SOUTHWEST REGION

Transmission Planning

January 2003

Arizona Corporation Commission
DOCKETED

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TABLE OF CONTENTS

1. INTRODUCTION AND PURPOSE	1
2. CONCLUSIONS	3
3. STUDY METHODOLOGY AND ASSUMPTIONS.....	4
4. STUDY CRITERIA.....	5
FIGURE 1: RIVER SYSTEM FOR RMR STUDY	2
TABLE 1: RIVER SYSTEM RATED GENERATION	3
TABLE 2: RIVER SYSTEM PROJECTED PEAK LOADS.....	6

1. Introduction and Purpose

In response to a request from the Arizona Corporation Commission's staff, the Desert Southwest Region (DSW) of Western Area Power conducted this Reliability Must Run (RMR) Study of its River System for years 2003 through 2005.

The River System includes the portion of the DSW transmission network that encompasses the lower Colorado River south of Las Vegas, Nevada to Yuma, Arizona. DSW owns and operates all the facilities of the transmission network within the River System. Figure 1 shows the River System for the RMR study. Because no transmission or generation changes were expected for the River System by the year 2005, only the year 2005 was evaluated.

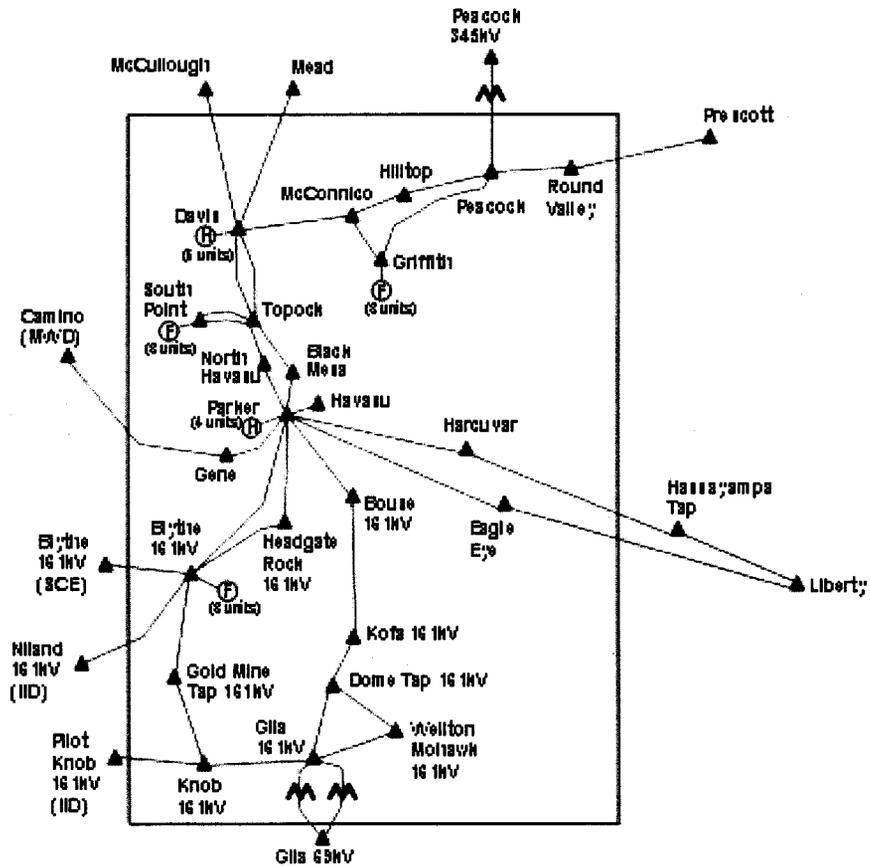
Distribution systems embedded on the DSW transmission network within the River System include the following:

- Aha Macav (AMPS)
- Arizona Public Service (APS)
- Central Arizona Water Conservation District (CAWCD)
- Citizens Utilities Corporation (CUC)
- City of Needles (Needles)
- Mohave Electric Cooperative (MEC)
- Southwest Transmission Cooperative (SWTC)
- Wellton-Mohawk Irrigation District (WMID)

The purpose of this River System RMR Study is to determine the following six components as specified in the "Reliability Must-Run Generation (RMR) Requirements" by the Arizona Corporation Commission:

1. **River System Import Limit (SIL)** – The maximum import level that the River System can reliably support when none of the River System generators are on-line.
2. **River System Maximum Load Serving Capability (MLSC)** – The maximum load level that the River System can reliably support when all of the River System generators are at maximum dispatch.
3. **River System Generator List** – List includes generator ratings.
4. **Reliability Must Run (RMR) conditions** – RMR conditions exist only if the River System cannot reliably support its projected peak load without dispatching some of its generators.
5. **Effectiveness of New Facilities** – A new facilities effectiveness evaluation is to be done only if new facilities (transmission or generation) are needed to mitigate RMR conditions in the River System.
6. **Comparative Analysis of Alternatives** – Comparative analysis of alternatives is to be done only if such alternatives are needed to mitigate RMR conditions in the River System.

Figure 1: River System for RMR Study



Notes:

1. All facilities are 230kV unless otherwise noted.
2. Line or transformer flows that cross the boundary are measured at the station inside the River System.
3. Encircled F denotes fossil generation; encircled H denotes hydro generation.
4. Number of generating units are shown in parentheses. Refer to Table 1 for Generator List.

Table 1 – River System Generator List

Description		Rating [MW]
--- FOSSIL GENERATION ---		
Blythe		503
Combustion Turbine #1	155	
Combustion Turbine #2	155	
Steam Turbine #1	193	
Griffith		780
Combustion Turbine #1	230	
Combustion Turbine #2	230	
Steam Turbine #1	320	
South Point		541
Combustion Turbine #1	182	
Combustion Turbine #2	182	
Steam Turbine #1	177	
SUBTOTAL FOSSIL GENERATION		1824
--- HYDRO GENERATION ---		
Davis		260
Unit #1	52	
Unit #2	52	
Unit #3	52	
Unit #4	52	
Unit #5	52	
Parker		104
Unit #1	26	
Unit #2	26	
Unit #3	26	
Unit #4	26	
SUBTOTAL HYDRO GENERATION		364
TOTAL RIVER SYSTEM GENERATION		2188

2. Conclusions

For the six components that are described in section 1 and that are to be determined by this River System RMR Study, these conclusions follow from this Study.

1. **River System Import Limit (SIL)** – At River System Import Limit (SIL) conditions, in which no River System generation is on-line, the River System did not require its generators in order to support its year 2005 projected peak load of 1297 MW. This projected peak load excludes generating station auxiliary loads (about 53 MW if the units were at maximum dispatch) because all River System generators are off-line when determining the SIL value. The SIL is limited to 1335 MW. The SIL is limited by

a WECC 5% post-transient voltage deviation at the Peacock 230kV station for the single contingency outage of the Peacock 345/230-kV transformer.

2. **River System Maximum Load Serving Capability (MLSC)** – The Maximum Load Serving Capability (MLSC), in which all River System generation is near maximum, is limited to 1698 MW. The MLSC is limited by a WECC 5% post-transient voltage deviation at the Bouse 161kV station for the single contingency outage of the Parker-Bouse 161kV line. This maximum River System load includes 53 MW of River System generating station auxiliary loads for the dispatch of 1746 MW of total gross River System generation. Net flow across the River System boundary is 0 MW.
3. **River System Generator List** – The River System generators with ratings are listed in Table 1 on page 3.
4. **Reliability Must Run (RMR) conditions** – RMR conditions do not exist for the River System because it can reliably support its projected peak load without dispatching any of its generators.
5. **Effectiveness of New Facilities** – No RMR conditions exist for the River System. Therefore, an effectiveness evaluation for new facilities (transmission or generation), that mitigate RMR conditions in the River System, is not needed.
6. **Comparative Analysis of Alternatives** – No RMR conditions exist for the River System. Therefore, no comparative analysis of alternatives that mitigate RMR conditions in the River System is needed.

3. Study Methodology and Assumptions

The following summarizes the study methodology and assumptions used to determine the System Import Limit (SIL) and the Maximum Load Serving Capability (MLSC).

1. Because no transmission or generation changes were expected for the River System by the year 2005, only the year 2005 was evaluated.
2. To develop a Starting Case for the year 2005 heavy summer River System, the latest available CATS_HV case (revision 7a) was modified according to the utilities within the River System. Incorporated into the Starting Case were the year 2005 projected peak loads within the River System. Table 2 on page 6 summarizes these year 2005 peak load projections.
3. To develop a System Import Limit (SIL) case, the Starting Case described in item 2 above was modified so that all generators within the River System were taken off-line. Replacement generation for the River System was scheduled from the following sources: 25% from Glen Canyon generation, 25% from Hoover generation, 50% from southern California generation. The SIL case was evaluated for NERC Category A (i.e. no contingency outage) and NERC Category B (i.e. single contingency outage) conditions in the River System.
4. To verify post-transient voltage stability in the SIL case, the "Voltage Support and Reactive Power" section of the NERC/WECC Planning Standards (section I.D.WECC-S2) was applied so that total River System load in the SIL case was increased 5%. Then this SIL margin case was evaluated for NERC Category A (i.e. no contingency

outage) and NERC Category B (i.e. single contingency outage) conditions in the River System.

5. To develop a Maximum Load Serving Capability (MLSC) case, the Starting Case described in item 2 above was modified so that all generators within the River System were on-line at maximum dispatch. The increased River System generation was scheduled to an equal amount of increased River System load. The MLSC case was evaluated for NERC Category A (i.e. no contingency outage) and NERC Category B (i.e. single contingency outage) conditions in the River System.
6. To verify post-transient voltage stability in the MLSC case, the "Voltage Support and Reactive Power" section of the NERC/WECC Planning Standards (section I.D.WECC-S2) was applied so that total River System load in the MLSC case was increased 5%. Then this MLSC margin case was evaluated for NERC Category A (i.e. no contingency outage) and NERC Category B (i.e. single contingency outage) conditions in the River System.

4. Study Criteria

NERC/WECC Planning Standards were applied. The following summarizes the technical criteria used to determine whether the River System performance is acceptable.

NERC Category A (i.e. no contingency outage)

- Pre-outage flow on each transmission line or transformer is within its continuous rating, which has been specified by its owner or operator.
- Pre-outage voltage at each station is within its continuous high and low ratings, which have been specified by its owner or operator.
- With the SIL or MLSC case adjusted so that its River System load level is 5% greater than the SIL or MLSC case, the adjusted SIL or MLSC pre-outage case has a power flow solution.

NERC Category B (i.e. single contingency outage)

- Post-outage flow on each transmission line or transformer is within its emergency rating, which has been specified by its owner or operator.
- Post-outage voltage at each station is within its emergency high and low ratings, which have been specified by its owner or operator.
- Post-outage post-transient voltage at each station is within 5% of its pre-outage station voltage.
- With the SIL or MLSC case adjusted so that its River System load level is 5% greater than the SIL or MLSC case, the adjusted SIL or MLSC post-outage case has a power flow solution.

Table 2 – River System Projected Peak Loads

Description	MW
Aha Macav (AMPS @ Davis)	8.7
Arizona Public Service (APS @ RndVly, EagleEye, Parker, Bouse, Headgate, Blythe)	103.6
Central Arizona Project (CAP)/Central AZ Water Conservation District (CAWCD)	355.0
@ Havasu – Pumping Station total	293
@ Harcuvar – Pumping Station total	62
Citizens Utilities Corporation (CUC @ Davis, Hilltop, Black Mesa, North Havasu)	344.0
Desalter (Knob)	10.0
Metropolitan Water District (MWD @ Gene)	108.0
Mohave Electric Cooperative (MEC @ Topock, Riviera) – in addition to SWTC values	40.0
Northstar Steel (McConnico-Harris)	50.0
Southwest Transmission Cooperative (SWTC @ Riviera, Topock, Round Valley)	161.4
Western Area Power Admin. (WAPA-DSW)/Wellton-Mohawk	116.0
TOTAL	1296.7