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March 18, 2011

California Energy Commission
Docket Office
Attn: Docket 11-IEPR-1E
1516 Ninth Street, MS-4
Sacramento, CA, 95814-5512

To Whom It May Concern:

Subject: Electric Transmission-Related Data (Docket 11-IEPR-1E) Submittal for the California Energy Commission's (CEC) 2011 Integrated Energy Policy Report (IEPR).

This submittal is in response to the CEC's request that all electric transmission system owners in California file information on their bulk transmission network, including projects identified in their transmission expansion plans as well as data on anticipated transmission corridor needs.

Enclosed is the latest information available at the Los Angeles Department of Water and Power (LADWP) that has been identified by the LADWP's Power System Planning and Development section. If there are any changes, they will be provided to the CEC as soon as possible while the 2011 IEPR is being developed.

An electronic file was also submitted to Docket@energy.state.ca.us on March 18, 2011.

LADWP believes that this submittal fully complies with all the requirements of the CEC data request and continues to look forward to working with CEC staff in this and other matters.

If additional information is necessary concerning this matter, please contact Mr. Oscar A. Alvarez at (213) 367-0677 or Mr. Oscar Herrera at (213) 367-4880.

Sincerely,

for

Randy S. Howard
Power Engineering Manager

OH:lkm
Enclosure
c/enc.: Mr. Oscar A. Alvarez
Mr. Oscar Herrera

CALIFORNIA ENERGY COMISSION
TRANSMISSION-RELATED DATA SUBMITTAL

March 18, 2011

CEC's text LADWP's response

NOTE: The following transmission-related data, as requested by the CEC under Docket #11-IEPR-1D, contains the latest and most accurate information currently available. Nevertheless, it is important to emphasize that this data is subject to change as LADWP continues to pursue implementation of its aggressive renewable portfolio standard and to evaluate opportunities to reduce its Greenhouse Gas (GHG) emissions. LADWP believes that this submittal fully complies with the requirements of the data requested, and LADWP staff is available to answer any questions the CEC staff may have.

Bulk Electric System Description and Needs
Each transmission owner shall submit its most recent transmission expansion plan for its bulk electric transmission system, as well as a description of its existing transmission facilities and updated information on planned facilities not reflected in the most recent transmission expansion plan. The information filed shall include the following four items:

1. The transmission owner's most recent transmission expansion plan. This plan should describe in detail all of the transmission facilities over 100 kV that the transmission owner needs to:

    a. Meet applicable reliability and planning standards.
    b. Reduce congestion.
    c. Interconnect new generation.
    d. Meet state policy goals such as the Renewables Portfolio Standard or once-through cooling policies.

Attached is LADWP's 2010 Ten-Year Transmission Assessment (Attachment 1, "Assessment"). The Assessment is essentially LADWP's transmission plan and is developed to meet the North American Electric Reliability Corporation (NERC) Transmission Planning (TPL) Reliability Standards. The attached Assessment was found fully compliant with the TPL Reliability Standards by the Western Electricity Coordinating Council (WECC) in January 2011.

2. Existing Facilities:

    a. A description of the transfer capabilities for transmission lines or transmission paths delivering electric power **into** the transmission owner's grid.

        i. The description shall include the size (for example, megavolt ampere [MVA] or megawatt [MW]) and length of the lines or lines included in the path and the substations to which the line connects.

Table 1 – Existing Transfer Paths and Characteristics

Existing Transfer Path	Rating (MW)	LADWP Share (MW)	Length (Miles)	Connecting Substation
Pacific DC Intertie	3100	1240	845	Celilo Sylmar
Intermountain DC	2400	1429	488	Intermountain Adelanto
McCullough-Victorville 500kV (2 lines)	2242	2159	162	McCullough Victorville
Mead-Victorville 287kV	350	350	174	Victorville Mead
Marketplace-Adelanto 500kV	1291	313	202	Marketplace Adelanto
Navajo-Crystal-McCullough 500kV	1422	695	274	Navajo Crystal McCullough
Perkins-Mead 500kV	1300	74	256	Mead Perkins
Mead-Marketplace 500kV	2600	104	13	Mead Marketplace
Victorville-Lugo 500kV	2400 to Lugo 900 to Victorville	2400* 900*	16	Victorville Lugo

*100% share only to the midpoint of the line

b. A description of the transfer capabilities for the bulk transmission lines or bulk transmission paths limiting the delivery of electric power **within** the transmission owner's grid.

i. The description shall include the size (MVA, MW) and length of the line or lines included in the path and the substations to which the line connects.

Table 2 – Transfer Paths limiting the delivery of electricity within the LADWP grid

Existing Transfer Path	Length (Miles)	Capacity	Connecting Substations
Adelanto-Toluca 500kV	69	Total capacity of the path is 4000 MW	Adelanto Toluca
Adelanto-Rinaldi 500kV	78		Adelanto Victorville
Victorville-Rinaldi 500kV	86		Victorville Rinaldi
Victorville-Century 287kV (2 Lines)	84		Victorville Century

3. Planned transmission upgrades (including both upgrades to existing facilities as well as new facilities) that that are expected to be operational between January 2011 and December 2020, including those affecting both imports **into** a transmission owner's grid and those affecting the transmission owner's ability to move energy **within** its transmission network:

The Barren Ridge Renewable Transmission Project would affect the transfer of electric power **within** LADWP's bulk transmission network.

There are no planned upgrades affecting imports into LADWP's bulk transmission network.

a. Descriptions of the upgrades including costs, maps, and the MW impact of the upgrades on transfer capabilities.

Planned Barren Ridge Renewable Transmission Project

Planned Capacity: 1600 MW

Commercial Service Date: April 1, 2015

LADWP Share: 100%

Estimated Project Cost: $350 million (approximately)

Transmission Additions/Alterations:

- Construct two new 230 kV line from Barren Ridge Switching Station to Haskell Junction.
- New Haskell Switching Station to be located north of Santa Clarita, just south of the Angeles National Forest.

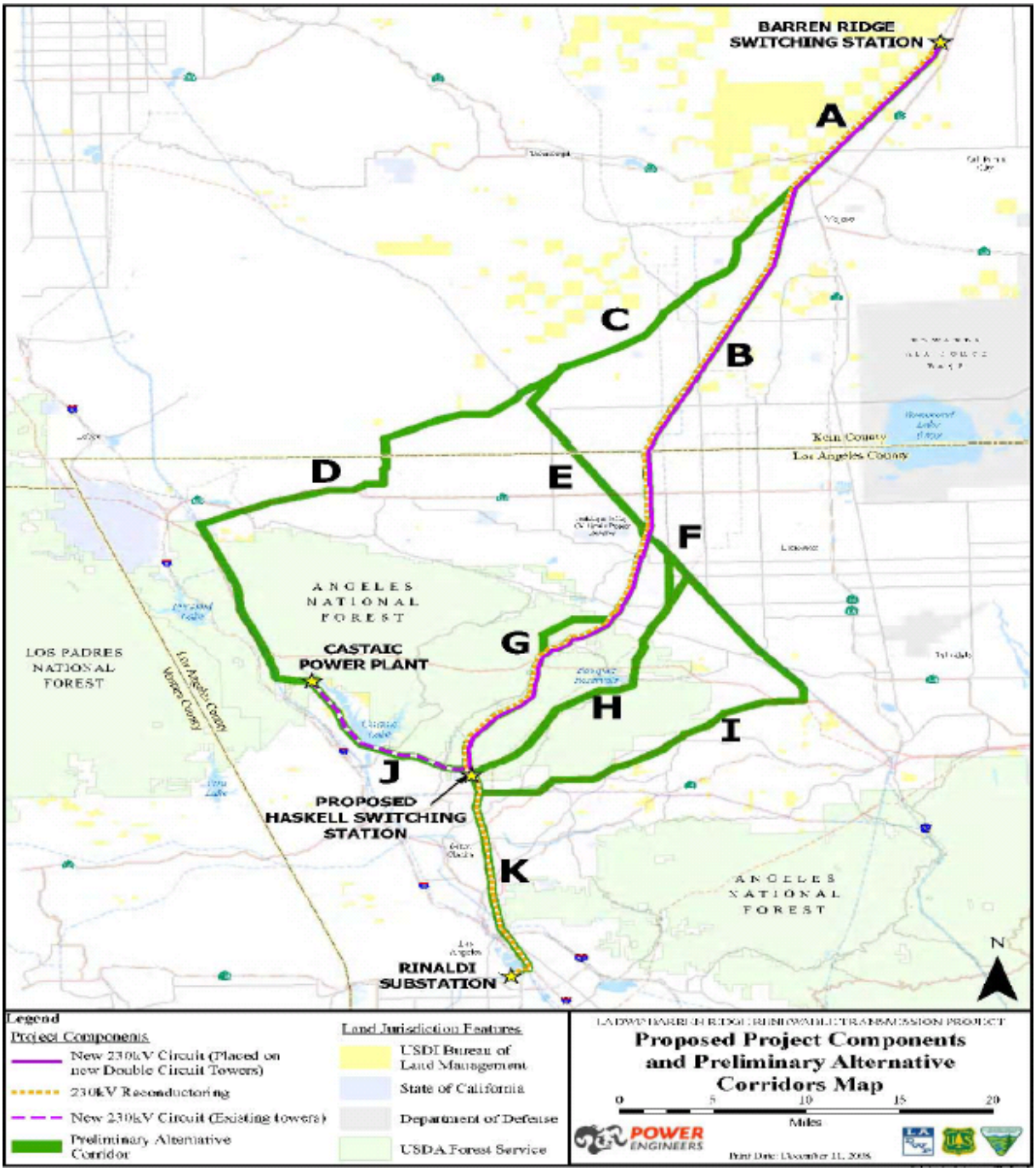

Figure 1: Proposed Project Components and Preliminary Alternative Corridors Map for the proposed Barren Ridge Renewable Transmission Project

b. A detailed description of the upgrade's benefits including:

i. The effect of the transmission facilities on the transmission owner's ability to comply with state mandated electric policy goals such as renewable energy requirements, complying with State Water Resources Control Board policies

for phasing out power plants that use once-through cooling,[1] or eliminating or reducing local capacity requirements.

Benefits of the Planned Barren Ridge Renewable Transmission Project include:

- Increased additional transmission capacity will allow integration into the LADWP power grid of the many proposed renewable solar and wind energy projects in the Mojave Desert and Owens Valley of southern California
- Reduced environmental impacts associated with greenhouse gases and emissions of other air pollutants

As a municipal utility, LADWP is subject to its governing bodies (LADWP Board of Commissioners and the City Council) mandates. LADWP's governing bodies have directed LADWP to fulfill the intent of state law on renewable energy policy goals, and the LADWP Board of Commissioners has adopted a policy to achieve 20% renewables by 2010 and 35% by 2020. Furthermore, by City Charter mandate, LADWP has the statutory obligation to serve its customers by constructing, operating, and maintaining its electric facilities for the benefit of the City and its inhabitants. All the transmission projects listed above, inside and outside the state, are geared towards those ends.

ii. Any increase in access to renewable energy. Where possible, list the location (region, competitive renewable energy zone) from which the energy can be imported.

- **Barren Ridge Renewable Transmission Project**

  The Tehachapi area is a wind corridor that LADWP is tapping into to meet its RPS goals. This project reinforces existing transmission corridors to deliver wind energy to Los Angeles.

iii. Any increase in the ability to import energy into transmission-constrained areas. Where possible, describe the area (local capacity area, sub-area) and potential reductions in local capacity requirements and the need to commit such capacity.

As proposed, the Barren Ridge Renewable Transmission Project will not increase the ability to import energy into transmission-constrained areas.

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[1] See the State Water Resources Control Board's document titled *Statewide Water Control Policy on the Use of Coastal and Estuarine Waters For Power Plant Cooling*, which became effective on October 1, 2010, available at the following website:
http://www.waterboards.ca.gov/water_issues/programs/npdes/docs/cwa316/policy100110.pdf
For more information on the process and proposed amendments to the final policy, see the following website:
http://www.waterboards.ca.gov/water_issues/programs/npdes/cwa316.shtml

iv. Please indicate if the upgrade reduces or may reduce the need for existing capacity at specific locations within transmission-constrained areas or affect the commitment of specific resources in these areas.

As proposed, the Barren-Ridge Renewable Transmission Project will not potentially reduce the need for existing capacity at specific locations within transmission-constrained areas or affect

v. Where specific project benefits are anticipated but not yet defined, describe the information and/or studies that would be required to specifically define the benefits.

Currently not applicable.

c. Descriptions of the alternatives considered in developing the upgrades, including non-wires alternatives such as generation and demand-side management.

- Reconductoring the existing Barren Ridge to Rinaldi was abandoned for construction of a new parallel line from Barren Ridge to Haskell Junction. The capacity achieved through reconductoring was not sufficient to bring potential renewable resources from the region.

4. Any maintenance or construction that could impact transfer capabilities or the ability to move power over a path between January 2011 and December 2013.

- Barren Ridge Renewable Transmission Project will require an outage of the Barren Ridge-Rinaldi 230 kV line for several months while it is being sectionalized at Haskell Junction.

5. A general description of any transmission upgrades that are expected to begin operating after December 2020.

Three long-term transmission projects are being technically evaluated in the feasibility stage and have demonstrated superior cost effectiveness to meet future transmission needs with minimum environmental impacts. Those are:

1. Upgrade PDCI with hybrid voltage-current enhancement (DC voltage at Sylmar=±495kV DC and DC current = 3410 A).

2. Upgrade Series Compensation of all LADWP's WOR Transmission to 75%

3. Convert the double-circuit Victorville – Century 287 kV AC Lines to ±245kV two split Voltage Source Controller (VSC) bipole.

Table 3 – Summary of Potential Benefits of each post- 2020 Upgrade

LONG-TERM TRANSMISSION PROJECT	EXISTING CAPACITY	POTENTIAL INCREASED CAPACITY	NET CAPACITY INCREASE	BENEFITS
Upgrade PDCI with hybrid voltage-current enhancement	3100 MW	3733 MW	633 MW	Deliver additional amount of renewable wind and hydro energy from the Pacific Northwest to Los Angeles
Upgrade Series Compensators of all LADWP's WOR Transmission to 75%	3373 MW	TBD	TBD	Deliver additional amount of renewable wind, solar and geothermal from Wyoming, Utah, Arizona, Nevada and California desert southwest.
Convert the double-circuit Victorville – Century 287 kV AC Lines to ±245kV two split VSC bipole	894 MW	1780 MW	886 MW	Increase the power transfer capability from Victorville-Adelanto into the Los Angeles basin area and provide additional voltage support capability.

Transmission Corridor Needs

Each transmission owner shall evaluate its needs for transmission corridors on non-federal lands by addressing the following three items:

1. For those point-to-point electrical transfer needs identified in the section above entitled "Bulk Electrical System Description and Needs," please discuss potential corridor needs in relation to the following:

   a. Opportunities to link with existing federally-designated corridors or potential federal corridors identified under Section 368 of the Energy Policy Act of 2005.

- For the Barren Ridge Renewable Transmission Project, new corridor designation under the Energy Policy Act 2005 - Section 368 is highly desirable.

- The three projects in Section 5 above (PDCI upgrade, WOR series compensation, and 287 kV conversion to DC) are all upgrades to existing transmission lines.

b. Opportunities to provide transmission capacity to develop the renewable generation resources needed to meet the state's Renewables Portfolio Standard (RPS) goals.

- Barren Ridge Renewable Transmission Project: the Tehachapi area is a wind corridor that LADWP is tapping into to meet its RPS goals. This project reinforces existing transmission corridors to deliver wind energy to Los Angeles.

- Two projects in Section 5 above (PDCI upgrade and WOR series compensation) increase access to renewable generation resources to the north and east of California.

c. Opportunities to import additional economical electricity from out of state.

- Barren Ridge Renewable Transmission Project: currently, there are no opportunities to import additional economical electricity from out-of-state from this project.

- Two projects in Section 5 above (PDCI upgrade and WOR series compensation) increase opportunities to import additional economical electricity from the north and east of California.

d. Opportunities to improve the reliability or reduce the congestion of the state's electricity system.

- Barren Ridge Renewable Transmission Project: currently, this project does not present opportunities to improve reliability or reduce congestion of the state's electricity system.

- The three projects in Section 5 above (PDCI upgrade, WOR series compensation, and 287 kV conversion to DC) all provide opportunities to improve the reliability or reduce the congestion of the state's electricity system in the post-2020 timeframe.

e. Opportunities to upgrade existing transmission lines.

The three projects in Section 5 above (PDCI upgrade, WOR series compensation, and 287 kV conversion to DC) are all upgrades to existing transmission lines.

f. Opportunities to meet future growth in load.

The Barren Ridge Renewable Transmission Project, as well as the three projects in Section 5 above, can deliver additional transmission capacity to meet future load growth.

g. The potential to impact sensitive lands that may not be appropriate locations for energy corridors – including, but not limited to, state and national parks, state and national designated wilderness and wilderness study areas, state and national wildlife refuges and areas, critical inventoried roadless areas in national forests, habitat conservation plan areas, and special habitat mitigation areas.

- Barren Ridge Renewable Transmission Project: as proposed, is within federally-designated transmission corridors.

- The three projects in Section 5 above (PDCI upgrade, WOR series compensation, and 287 kV conversion to DC) are all upgrades to existing transmission lines and are not expected to impact sensitive lands.

h. Consideration of the Garamendi Principles (See Appendix B) as identified in Senate Bill (SB) 2431 (Garamendi, Chapter 1457, Statutes of 1988) and as noted in SB 1059, Section 1 (Escutia and Morrow, Chapter 638, Statutes of 2006), in the case of existing corridors.

- Barren Ridge Renewable Transmission Project

  As part of this project, LADWP will upgrade a 230kV line from the Tehachapi Wind Resource Area to Rinaldi substation in the San Fernando Valley by reconductoring the line. Since the existing line is at capacity, before the upgrade is started, LADWP is proposing two circuits on one double circuit line adjacent to the existing line to the overall goals of the Barren Ridge Renewable Transmission Project.

  During transmission line planning, LADWP first looks at upgrading existing facilities or utilizing existing rights-of-way for new facilities. For example, for the Tehachapi Transmission Project, LADWP will upgrade an existing 230kV line from the Tehachapi Wind Resource Area to Rinaldi substation in the San Fernando Valley and construct a new line utilizing the existing corridor.

- The three projects in Section 5 above (PDCI upgrade, WOR series compensation, and 287 kV conversion to DC) are all upgrading existing facilities and utilizing existing rights-of-way for new facilities.

i. Any work previously done with local agencies and any geographical areas of sensitivity that may have been identified.

Barren Ridge Renewable Transmission Project

- Applications of Right-of-Way Grants have been submitted with the Bureau of Land Management and U.S. Forest Service in January 2007.

- No geographical areas of sensitivity have been identified for this project.

j. Any other known major issues that have the potential to impact a future corridor designation.

- Rapid urban development in the areas of these proposed projects could have an impact of the corridor designation.

k. Executive Order S-14-08, which established California's renewable energy goal of 33 percent from renewable resources by 2020, improved licensing processes for renewable projects, and ordered the development of the Desert Renewable Energy Conservation Plan (DRECP) for the Mojave and Colorado deserts.

Although this appears to be a good process to streamline multiple complex licensing processes, the Barren Ridge Renewable Transmission Project is too far along to benefit from this effort: The Barren Ridge Renewable Transmission Project is utilizing existing processes.

2. If you have no plans for proposing a transmission corridor, please identify the circumstances or planning timeframes where you would opt to obtain a transmission corridor designation from the Energy Commission before applying for approval to build (or participate in) a transmission line project.

As proposed, the Barren Ridge Renewable Transmission Project is within federally-designated transmission corridors**.**

3. If you would not consider applying to the Energy Commission for a transmission corridor designation, please explain why not.

As proposed, the Barren Ridge Renewable Transmission Project is within federally-designated transmission corridors.

Los Angeles Department of Water & Power

2010 Ten-Year Transmission Assessment

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November 2010

Transmission Planning and Studies

Power System Planning & Development

Los Angeles Department of Water & Power

2010 Ten-Year Transmission Assessment

November 2010

Transmission Planning & Studies

Power System Planning & Development

Table of Contents

EXECUTIVE SUMMARY **1**

INTRODUCTION **5**

METHODOLOGY **7**

WECC REFERENCE CASE. 7
Table 2. POWER FLOWS ALONG MAJOR SOUTHERN CALIFORNIA TRANSMISSION CORRIDORS IN THE REFERENCE CASE *7*
ANALYSIS. 8
CRITERIA. 8

ASSUMPTIONS **10**

LADWP LOADS. 10
Table 3. COMPARISON OF 1-IN-10 SYSTEM LOADS (MW) *10*
Table 4. RECEIVING STATION (RS) PEAK LOADS (MW) *11*
INFRASTRUCTURE IMPROVEMENTS AND EXPANSION. 12
Table 5. PLANNED SYSTEM ENHANCEMENTS *12*
GENERATION. 12
Table 6. LADWP's GENERATION MIX (MW) *13*
TRANSMISSION. 13
Table 8. FLOWS ALONG MAJOR TRANSMISSION CORRIDORS IN STUDY CASES (MW) *14*

ASSESSMENT RESULTS **15**

(N-0) OR NO CONTINGENCIES. 15
(N-1) CONTINGENCIES. 15
(N-2) CONTINGENCIES. 15
Table 10a. Overloads on Scattergood-Olympic from (N-2) Contingencies *15*
Table 10b. Overloads on Northridge-Tarzana from (N-2) Contingencies *16*
Table 10c. Overloads on Sylmar-Northridge from (N-2) Contingencies *16*
EXTREME EVENTS — MULTIPLE CIRCUIT OUTAGES 16
Table 11. OUTCOME OF MULTIPLE CONTINGENCIES *17*
LIGHT WINTER SCENARIOS. 18
Table 12. POWER FLOWS ALONG MAJOR SOUTHERN CALIFORNIA TRANSMISSION CORRIDORS IN LIGHT WINTER STUDY CASES *18*
Table 13. DISTRICT LOADS IN LIGHT WINTER STUDY CASES (MW) *19*
Table 14. GENERATION MIX IN LIGHT WINTER STUDY CASES (MW) *19*
STABILITY. 19

RECOMMENDATIONS **20**

Appendices

APPENDIX A. NERC/WECC PLANNING STANDARDS

APPENDIX B. RECEIVING STATION LOADS

APPENDIX C. GENERATION SCHEDULE FOR LADWP-OWNED FACILITIES

APPENDIX D. TRANSMISSION LINE CAPACITIES

APPENDIX E. ONE-LINE DIAGRAMS

APPENDIX F. LIST OF CONTINGENCIES STUDIED

APPENDIX G. SWITCHING SEQUENCES FOR TRANSIENT AND POST-TRANSIENT

APPENDIX H. POWER FLOW RESULTS

APPENDIX I. TRANSIENT AND POST-TRANSIENT STABILITY RESULTS

APPENDIX J. RENEWABLE TRANSMISSION EXPANSION PROJECT

APPENDIX K. LONG-TERM TRANSMISSION PLAN

2010 Ten-Year Transmission Assessment

Executive Summary

This 2010 Ten-Year Transmission Assessment covers years 2011 to 2020. At least one system (1-in-10 peak) condition is modeled for years 2011 through 2020.

As in the previous years, the Los Angeles Department of Water and Power's (LADWP) 2010 Ten-Year Transmission Assessment is compliant with the four NERC Transmission Planning Standards:

1. TPL-001-0.1. System Performance Under Normal (No Contingency) Conditions (Category A)
2. TPL-002-0b. System Performance Following Loss of a Single Bulk Electric System Element (Category B)
3. TPL-003-0a. System Performance Following Loss of Two or More Bulk Electric System Elements (Category C)
4. TPL-004-0. System Performance Following Extreme Events Resulting in the Loss of Two or More Bulk Electric System Elements (Category D)

The 2010 Ten-Year Assessment meets the following NERC Standard Measurements:

1. The Bulk Electric System (BES) shall be tested for transient, dynamic, and voltage stability with all facilities in service, checking to find that all facilities are within their facility ratings and within their thermal, voltage, and stability limits.
2. The BES shall be tested for transient, dynamic, and voltage stability following a single contingency, checking to find that all facilities are within their facility ratings and within their thermal, voltage, and stability limits.
3. The BES shall be tested for transient, dynamic, and voltage stability following a multiple contingency, checking to find that all facilities are within their facility ratings and within their thermal, voltage, and stability limits.

With management's approval, this transmission assessment shall be a publicly available document and therefore made available to NERC and WECC.

This 2010 Ten-Year Transmission Assessment (Assessment) is based on WECC-approved case 2010HS3-OP which models anticipated heavy summer conditions with heavy flows from the Pacific Northwest to California and moderate flows elsewhere.

LADWP system loads for each study year are shown in Table 3 and are modeled according to the April 2010 Peak Demand Forecasts issued on May 6, 2010. As in past assessments, steady state load flow analysis, transient stability analysis, and post-transient voltage stability analysis were performed during the Assessment after incorporating planned system improvements and expansions and resource acquisitions.

This Assessment does not show any Interconnection Reliability Operating Limit conditions in the next ten years and does not have any stability-limited contingencies.

Full analyses of all credible outages listed in Appendix F reveals the existing and planned system should be able to sustain every studied contingency except for the following:

(1) A simultaneous (N-2) outage of Rinaldi-Tarzana 230kV Lines 1 & 2 would overload Northridge-Tarzana 230kV Line 1 on the 2011 Summer Peak.

(2) A simultaneous (N-2) outage of the Tarzana-Olympic 230kV Line 1 & the Tarzana-Olympic 138kV Line 1 would overload Scattergood-Olympic 230kV Line 2 from 2011 Summer Peak through the 2013 Summer Peak.

(3) A simultaneous (N-2) outage of Rinaldi-Tarzana 230kV Lines 1 & 2 would overload Scattergood-Olympic 230kV Line 2 on the 2013 Summer Peak.

(4) A simultaneous (N-2) outage of Rinaldi-Tarzana 230kV Lines 1 & 2 would overload Sylmar-Northridge 230 kV Line 1 on the 2013 Summer Peak.

(5) A simultaneous (extreme event) outage of three elements (Rinaldi-Tarzana 230kV Lines 1& 2 and Northridge-Tarzana 230 kV Line 1) would cause local low voltages at RS-U (Tarzana) and RS-T (Canoga) on the 2015 Summer Peak.

(6) A single (N-1) outage of Sylmar-Haskell Canyon 230 kV Line 1 would overload the Olive-Northridge 230 kV Line 1 on the 2020 Summer Peak.

To mitigate these overloads, the following corrective actions are recommended. These measures will satisfy the applicable NERC planning standards for contingency or post-contingency system performance[a] :

(1) On the 2011 Summer Peak, continue using a selective load-shedding program at RS-U (Tarzana) to relieve the overload on the Northridge-Tarzana 230kV Line 1 during a double contingency outage of Rinaldi-Tarzana 230kV Lines 1 & 2. The load-shedding will be needed until completion of the currently budgeted project to increase the ampacity of Northridge-Tarzana 230kV Line 1 prior to Summer 2012.

The following three recommendations all utilize load shedding as an interim measure until the new Scattergood-Olympic 230 kV Line 1 is put in-service:

(2) From the 2011 Summer Peak through the 2013 Summer Peak, implement a selective load-shedding program at RS-K (Olympic) to relieve the overload on Scattergood-Olympic 230kV Line 2 during a double contingency outage of Tarzana-Olympic 230kV Line 1 & the Tarzana-Olympic 138kV Line 1. The load-shedding will be needed until completion of the new Scattergood-Olympic 230 kV Line 1 scheduled to be in service in June 2014.

(3) For the 2013 Summer Peak, implement a selective load-shedding program at RS-U (Tarzana) to relieve the overload on Scattergood-Olympic 230kV Line 2 during a double contingency outage of Rinaldi-Tarzana 230kV Lines 1 & 2. The load-shedding will be needed until completion of the new Scattergood-Olympic 230 kV Line 1 scheduled to be in service in June 2014.

[a] NERC TPL-002-0b for N-1 (Category B) , NERC TPL-003-0a for N-2 (Category C)

(4) For the 2013 Summer Peak, implement a selective load-shedding program in RS-U (Tarzana) to relieve the overload on Sylmar-Northridge 230 kV Line 1 during a double contingency outage of Rinaldi-Tarzana 230kV Lines 1 & 2. The load-shedding will be needed until completion of the new Scattergood-Olympic 230 kV Line 1 scheduled to be in service in June 2014.

(5) For the 2014 Summer Peak onwards, implement a selective load-shedding load program at RS-T for the simultaneous (extreme event) outage of three elements (Rinaldi-Tarzana 230kV Lines 1& 2 and Northridge-Tarzana 230 kV Line 1) to mitigate local low voltages at RS-U (Tarzana) and RS-T (Canoga).

(6) Before Summer 2020, resolve overloads on the Olive-Northridge 230 kV Line 1 during a loss of the Sylmar-Haskell Canyon 230 kV Line 1 by completing two projects:

- Relocate the 230/155 kV Banks from Olive Switching Station to Haskell Canyon Switching Station.

- Remove the existing twin 115 kV circuits between Haskell Canyon Switching Station and Olive Switching Station and replace with a single new 230 kV circuit (utilizing the existing 115 kV right-of-way) to connect Haskell Canyon Switching Station to Sylmar Switching Station via Olive Switching Station by stringing the currently vacant position between Olive Switching Station to Sylmar Switching Station.

Table 1 summarizes the findings and recommendations of the 2010 Assessment.

Table 1. FINDINGS AND RECOMMENDATIONS

Year	Outage(s)	Reliability Category	Overloaded Line or System Violation	Recommendation
Summer Peak 2011	Rinaldi-Tarzana 230kV Lines 1 & 2	C (TPL-003-0a)	Northridge-Tarzana 230kV Line 1	Selectively shed load in RS-U (Tarzana) for short term Upgrade Northridge-Tarzana 230kV Line 1 for long term
Summer Peak 2011 Through Summer Peak 2013	Tarzana-Olympic 230kV Line 1 & Tarzana-Olympic 138kV Line 1	C (TPL-003-0a)	Scattergood-Olympic 230kV Line 2	Selectively shed load in at RS-K (Olympic) for short term Add new Scattergood-Olympic 230 kV Line 1 for long term
Summer Peak 2013	Rinaldi-Tarzana 230kV Lines 1& 2	C (TPL-003-0a)	Scattergood-Olympic 230kV Line 2	Selectively shed load in RS-U (Tarzana) for short term Add new Scattergood-Olympic 230 kV Line 1 for long term
Summer Peak 2013	Rinaldi-Tarzana 230kV Lines 1& 2	C (TPL-003-0a)	Sylmar-Northridge 230 kV Line 1	Selectively shed load in RS-U (Tarzana) for short term Add new Scattergood-Olympic 230 kV Line 1 for long term
Summer Peak 2014 Onward	Rinaldi-Tarzana 230kV Lines 1& 2 and Northridge-Tarzana 230 kV Line 1	D (TPL-004-0)	Local voltage collapse	Suggested load shedding program in RS-T
Summer Peak 2020	Sylmar-Haskell Canyon 230 kV Line 1	B (TPL-002-0b)	Olive-Northridge 230 kV Line 1	Two projects are needed
	• Relocate the 230/155 kV Banks from Olive Switching Station to Haskell Canyon Switching Station. • Remove the existing twin 115 kV circuits between Haskell Canyon Switching Station and Olive Switching Station and replace with a single new 230 kV circuit (utilizing the existing 115 kV right-of-way) to connect Haskell Canyon Switching Station to Sylmar Switching Station via Olive Switching Station by stringing the currently vacant position between Olive Switching Station to Sylmar Switching Station.			

Introduction

The City of Los Angeles' (City) transmission system consists of high voltage (above 500kV) alternating current (AC) and direct current (DC) transmission corridors and a 115kV-to-230kV in-basin network totaling more than 3,600 miles. Of those, high voltage AC and DC transmission lines alone account for 2,900 miles providing over 10,000MW of import capability. The City utilizes these resources to transport power from the Pacific Northwest, Utah, Arizona, Nevada, and within California to serve its customers and to wheel power for the Cities of Burbank and Glendale. In addition, the City's transmission system is interconnected with other utilities in the Western Electricity Coordinating Council (WECC) to coordinate and promote electric reliability throughout the Western United States. Thus, the importance of the security and adequacy of the City's transmission system extends beyond its physical boundaries. A drawing of LADWP's Power System is provided in next page.

Transmission Planning annually performs a ten-year transmission assessment to:

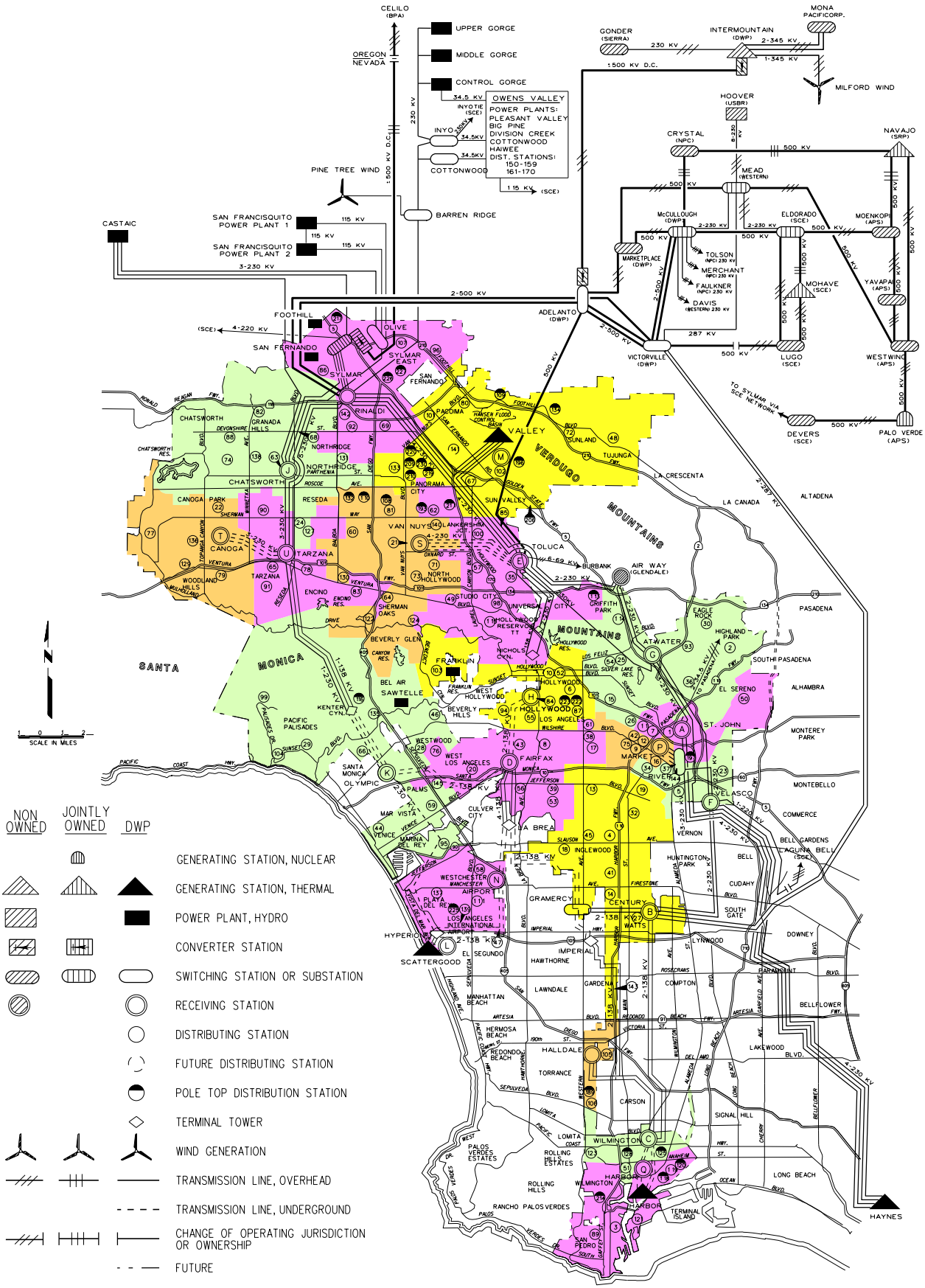
- ensure the City's electrical demand and energy requirements are met at all times under normal conditions (TPL-001-0.1);
- ensure the City's electrical system is able to withstand and respond to unanticipated system disturbances, losses of system components (TPL-002-0b and TPL-003-0a), and disturbances arising from switching operations;
- ensure WECC/NERC Reliability Standards are met even when facilities are forced out of service; and
- assess system performance following extreme events (TPL-004-0).

By responsibly addressing any concerns identified in the assessments before they become critical system limitations, LADWP has also minimized system infrastructure costs, an important consideration in maintaining competitive electric rates.

Annual ten-year transmission assessments are required by the NERC Compliance Enforcement Program to adhere to the NERC/WECC Planning Standards in effect at the time of the assessment. As of October 1, 2010, these Planning Standards are:

1. TPL-001-0.1. System Performance Under Normal (No Contingency) Conditions (Category A)
2. TPL-002-0b. System Performance Following Loss of a Single Bulk Electric System Element (Category B)
3. TPL-003-0a. System Performance Following Loss of Two or More Bulk Electric System Elements (Category C)
4. TPL-004-0. System Performance Following Extreme Events Resulting in the Loss of Two or More Bulk Electric System Elements (Category D)

POWER SYSTEM DIAGRAM



POWER SYSTEM PLANNING AND DEVELOPMENT
TRANSMISSION PLANNING GROUP

OES-LCM67
JULY 2010
REV. 16

Methodology

WECC Reference Case. Study cases were developed from the WECC-approved 2010HS3-OP case which models the expected power flows throughout the Western United States during heavy summer conditions with heavy flows from the Pacific Northwest to California and moderate flows elsewhere.

Table 2 summarizes the power flows along major transmission corridors in the reference case that are relevant to this 2010 Assessment. These flows are scheduled above the projected LADWP's firm transfer levels to represent reasonable stressed system.

Table 2. POWER FLOWS ALONG MAJOR SOUTHERN CALIFORNIA TRANSMISSION CORRIDORS IN THE REFERENCE CASE

Transmission Corridor	Rating	Power Flow (MW)	Loading
Pacific DC Intertie (Path 65)	3100	2779	90%
Intermountain DC (Path 27)	2400	1705	71%
East-of-the-Colorado River (Path 49)	9300	4889	53%
West-of-the-Colorado River (Path 46)	10623	6159	58%
Victorville-Lugo 500kV Line 1 (Path 61)	2400	1171	49%
LADWP-SCE @ Sylmar (Path 41)	1600	-80	5%
Adelanto-Toluca 500kV Line 1	TBD	942	
Adelanto-Rinaldi 500kV Line 1		625	
Victorville-Rinaldi 500kV Line 1		559	
Victorville-Century1 287kV Line 1		202	
Victorville-Century2 287kV Line 1		202	

Analysis. A minimum of one study case is developed from the 2010HS3-OP reference case for each study year, 2011 through 2020. Each study case models the LADWP system as it is likely to be configured on the 1-in-10 year peak summer day that year to capture the critical system conditions.

Initially, power flow studies are conducted for each study case with all transmission facilities in-service (N-0) and within normal operating procedures. Subsequently, all single-transmission line or transformer outage (N-1) and all credible double-transmission line outages (N-2) are also studied. The results from these studies identify the transmission lines likely to experience thermal overloading or significant voltage depression under the applicable test condition. The most severe of these scenarios are further studied for post-transient stability and reactive margins.

As a summer-peaking system, LADWP plans its outages at cooler times of the year. Therefore, planned outages as initial conditions are not modeled in this Assessment.

Transient stability is investigated for line outages of critical transmission paths to assess their inter-regional impacts and to ensure system adequacy and security. Control devices such as HVDC controls, SVC controls and all other controls are modeled in the WECC dynamic database. Protective systems such as Under-frequency Load Shedding are also modeled in the WECC dynamic database, whereas relevant remedial action schemes are listed in the switching sequence files which drive the dynamic simulation.

Where study results show that transmission paths are constrained, overloaded, or unstable, recommendations to mitigate or alleviate the problems are provided.

Criteria. Annual transmission assessments are performed in compliance with NERC/WECC Planning Standards (Appendix A) and fulfill WECC's requirement that each utility independently performs such a reliability assessment and demonstrates compliance with the NERC/WECC standards.

Power Flow. In addition to the NERC and WECC requirements, LADWP has established performance standards for its in-basin electric system as follows:

1. With all transmission system components in service (N-0), the in-basin electric system shall not experience the following:
    a. Interruption of load
    b. Bus voltage less than 0.99 pu
    c. With the worst-case generating unit off-line, operation of a transmission system component at a level in excess of its normal rating.
2. A Single Contingency (N-1) shall not result in any of the following:
    a. Interruption of load
    b. Bus voltage less than 0.95 pu
    c. With the worst-case generating unit off-line, operation of a transmission system component at a level in excess of its emergency rating.

Transient and Post-Transient Stability. Transient and post-transient performance under the various contingencies described in Appendix G shall meet the following additional requirements:

Transient Stability:

1. All machines in the system shall remain in synchronism as demonstrated by their relative rotor angles
2. Induction motors shall be modeled at 20% of the total load across the WECC region
3. System stability shall be evaluated based on the damping of the relative rotor angles and the damping of the voltage magnitude swings
4. The transient voltage dip should be maintained above 0.80pu at Adelanto and Sylmar

Post-Transient Stability

1. All loads shall be modeled as constant MVA during the first few minutes following an outage or disturbance.
2. All voltages at distribution substations shall be restored to normal values by the transformer tap changers and other voltage control devices.
3. Generator MVAR limits shall be modeled as a single value for each generator since the reactive power capability curve will not be modeled in the program output.
4. No manual operator intervention is allowed to increase the generator MVAR flow.
5. Remedial actions such as generator dropping, load shedding and blocking of automatic generation control (AGC) shall not be considered for single contingencies.
6. Shunt capacitors (132 MVAR) at Adelanto and Marketplace shall be used if the post-transient voltage deviation exceeds 5% at those buses. Although modeled as shunt capacitors the actual devices are automatically controlled Static Var Compensators (SVCs).
7. Other assumptions:
    - Area Interchange: Disabled
    - Governor Blocking: Base load flag shall be used per WECC practice
    - DC Line Transformer Tap Automatic Adjustment: Enabled
    - Generator Voltage Control set to local except for Palo Verde, and selected Northwest generation
    - Phase Shifter Control: Disabled
    - Switched Shunt Devices: Disabled

Assumptions

LADWP Loads. One-in-ten year summer heat waves, as represented in the "April 2010 Retail Electric Sales and Demand Forecast" released on May 6, 2010 are modeled each year in the study.

The one-in-ten system loads modeled in this 2010 Assessment are higher than those applied in the 2009 Assessment which are those forecast in the "January 2010 Retail Electric Sales and Demand Forecast", a comparison of which is presented in Table 3.

Table 3. COMPARISON OF 1-IN-10 SYSTEM LOADS (MW)

Year	2009 Assessment	2010 Assessment	Increase/Decrease
2011	6275	6262	(13)
2012	6300	6307	7
2013	6331	6377	46
2014	6394	6479	85
2015	6405	6538	133
2016	6432	6597	165
2017	6526	6697	171
2018	6742	6807	65
2019	6833	6917	84
2020	6940	7020	80

Receiving Station loads are scaled according to the "Receiving Station and Distributing Station Load Forecast – 2009 to 2018" distributed February 25, 2010. Loading at receiving station banks are generally developed with the power factors provided in the Receiving Station/Distribution Station Forecast, but with some modification to match available historical peak load data. Table 4 lists the forecasted real power loads at the receiving station level. Appendix B lists the coincidental peak real and reactive power loads at the receiving stations.

Table 4. RECEIVING STATION (RS) PEAK LOADS (MW)

Service Area	Receiving Station	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Central	Airport	208	209	213	216	219	220	224	228	231	235
	Atwater	321	323	331	333	337	339	344	352	358	363
	Century	300	303	306	312	316	318	323	333	339	344
	Fairfax	409	413	416	421	423	424	428	433	441	447
	Hollywood	405	411	415	426	427	432	437	444	452	458
	Market (River)	370	371	371	375	378	381	383	388	395	401
	Olympic	423	423	430	442	445	452	460	467	475	482
	Scattergood	27	27	27	27	27	27	28	28	29	29
	St. John	226	230	230	233	235	237	241	244	248	251
	Velasco	229	230	231	234	235	238	242	246	250	254
	Total Central Load	**2918**	**2940**	**2970**	**3019**	**3042**	**3068**	**3110**	**3163**	**3218**	**3264**
Southern	Halldale	49	49	49	49	50	50	52	52	53	54
	Harbor	204	205	206	208	209	211	213	216	219	223
	Wilmington	165	164	165	168	168	170	171	175	177	180
	Total Southern Load	**418**	**418**	**420**	**425**	**427**	**431**	**436**	**443**	**449**	**457**
Valley	Canoga	375	377	380	372	376	378	383	389	396	402
	Northridge	529	533	535	557	563	568	579	588	598	606
	Rinaldi	301	304	312	319	322	328	334	341	347	352
	Tarzana	350	354	358	364	367	370	379	383	390	395
	Toluca	415	414	419	418	424	432	437	444	452	458
	Valley	321	328	330	337	341	340	348	355	361	366
	Van Nuys	432	436	443	455	461	465	474	483	491	498
	Total Valley Load	**2723**	**2746**	**2777**	**2822**	**2854**	**2881**	**2934**	**2983**	**3035**	**3077**
Total Receiving Station Load		**6059**	**6104**	**6137**	**6167**	**6226**	**6380**	**6480**	**6589**	**6702**	**6798**
Diversity Factor		1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
Total Coincidental Receiving Station Load		**5770**	**5813**	**5873**	**5968**	**6022**	**6076**	**6171**	**6275**	**6383**	**6474**
Owens Valley Load & Transmission Losses		492	494	504	511	516	521	526	532	534	546
1-in 10 Peak Load Forecast[b]		**6262**	**6307**	**6377**	**6479**	**6538**	**6597**	**6697**	**6807**	**6917**	**7020**

[b] Forecast estimates customer generation of 212 MW in 2011 increase to 311 MW in 2020

Infrastructure Improvements and Expansion. Table 5 lists the infrastructure improvements, expansion projects, and resource acquisitions captured in this 2010 Ten-Year Transmission Assessment.

Table 5. PLANNED SYSTEM ENHANCEMENTS

System Enhancements	In-Service Date	Initial Model Year
Southern Transmission System Upgrade	December 2010	2011
Harper Lake Solar Project	January 2012	2012
Northridge – Tarzana 230 kV Line Upgrade	July 2012	2012
Owenyo Solar Phase I Project	July 2013	2013
Castaic Power Plant Modernization	January 2013	2013
Haynes Generation Station Re-powering Phase 2	February 2013	2013
Scattergood-Olympic 230KV Line 1	June 2014	2014
Beacon Solar Project	May 2014	2014
RS-C Bypass	March 2014	2014
Owenyo Solar Phase II Project	October 2014	2015
Synchronous Condenser Replacement	June 2015	2015
Pine Canyon Wind Project	September 2015	2015
Barren Ridge-Haskell 230kV Lines (*)	December 2014	2015
Barren Ridge-Rinaldi 230kV Line (upgrade) (*)	December 2015	2016
Scattergood Generating Unit 3 Re-powering	December 2015	2016

(*) The new Barren Ridge-Haskell 230kV Lines and the upgraded Barren Ridge-Rinaldi 230kV Line are part of the Renewable Transmission Expansion Project as illustrated in Appendix J

Renewable energy projects anticipated in the near–term include:

- Wind projects in the Owens Valley (Pine Tree Wind and Pine Canyon Wind Projects) and in Utah (Milford Wind Project)
- Solar projects in the Owens Valley (Beacon Solar and Owenyo Solar Projects) and California High Desert (Harper Lake Solar Project)

Generation. LADWP owns and operates resources capable of producing up to 5203 MW by internal generation and 3291 MW external generation. Table 6 shows how LADWP's resources are dispatched in this study whereas unit commitments are provided in Appendix C.

Table 6. LADWP's GENERATION MIX (MW)

Resource Type	Capacity (MW)	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Pumped Storage	1595	221	77	98	-58	13	2	18	128	300	162
Natural Gas	3677	1832	1774	1732	1732	1682	1682	1732	1732	2127	1802
Wind	285	40	40	40	40	85	85	85	85	85	85
Solar	210	0	0	100	100	200	200	200	200	200	200
Hydroelectric	221	160	160	160	160	50	120	160	160	160	160
Internal Generation	***5987***	***2253***	***2051***	***2131***	***1975***	***2030***	***2089***	***2195***	***2305***	***2872***	***2409***
% Total Generation	*64%*	*47%*	*42%*	*43%*	*39%*	*40%*	*41%*	*42%*	*43%*	*53%*	*43%*
Hydroelectric	491	410	410	410	410	410	410	410	410	410	410
Wind	306	80	80	80	80	80	80	80	80	80	80
Solar	500	0	250	250	500	500	500	500	500	500	1087
Coal	1681	1681	1681	1681	1681	1681	1681	1681	1681	1204[c]	1204[c]
Nuclear	387	387	387	387	387	387	387	387	387	387	387
External Generation (*)	***3365***	***2558***	***2808***	***2808***	***3058***	***3058***	***3058***	***3058***	***3058***	***2581***	***3168***
% Total Generation	*36%*	*53%*	*58%*	*57%*	*61%*	*60%*	*59%*	*58%*	*57%*	*47%*	*57%*
Total Generation	**9352**	**4811**	**4859**	**4939**	**5033**	**5088**	**5147**	**5253**	**5363**	**5453**	**5577**

(*) *External Generation represents projected firm transfer for each of the ten years*

This Assessment shows that sufficient capacity is available to meet the Renewable Portfolio Standard target of 33% provided that 1324 MW of renewable resources are imported using (a) transmission from the retired Navajo coal generation facility and (b) the Pacific DC Intertie and 98 MW of roof top solar goals in 2020[d]. Appendix C includes the breakdown of renewable energy resources represented in the 2020 Heavy Summer base case.

Transmission. LADWP's extensive transmission system of more than 3,000 circuit miles reaching beyond its neighboring states facilitates access to low cost power purchases and LADWP's external generation. As Table 7 shows, over 60 percent of LADWP's power needs are served by heavily leveraging transmission assets. Over the next ten years, additions of approximately 100 circuit-miles of transmission will increase LADWP's access to renewable energy intrastate.

[c] Navajo contract will be expired in 2019. It is assumed that the contract will not be renewed, but may still be retained as a long term energy hub.

[d] The 10 Year Transmission Assessment takes a snap-shot of the system at the hours of the highest stress on the electrical system. This peak snapshot will likely have a lower than average renewable mix because thermal peaking units are required on peak hours. In contrast to thermal peaking units, renewable resources are used any hour they are available, all year long. Because the renewable target is the annual energy consumed, regardless what is seen in a single snap-shot, the actual resource mix could be substantially lower on the most stressed hours without preventing LADWP from meeting its 2020 RPS's goal.

Table 7. ELECTRIC SUPPLY-DEMAND BALANCE (MW)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
LADWP Receiving Station Load	5770	5813	5873	5968	6022	6076	6171	6275	6383	6474
System Losses	492	494	504	511	516	521	526	532	534	546
Total Power Requirement	6262	6307	6377	6479	6538	6597	6697	6807	6917	7020
Internal Generation	***2253***	***2051***	***2131***	***1974***	***2031***	***2089***	***2195***	***2305***	***2872***	***2409***
% Power Requirement	*36%*	*33%*	*33%*	*30%*	*31%*	*32%*	*33%*	*34%*	*42%*	*34%*
External Generation & Purchases	***4009***	***4256***	***4246***	***4505***	***4507***	***4508***	***4502***	***4502***	***4045***	***4611***
% Power Requirement	*64%*	*67%*	*67%*	*70%*	*69%*	*68%*	*67%*	*66%*	*58%*	*66%*

Table 8 summarizes the power flows along LADWP's major transmission paths in this 2010 Ten-Year Transmission Assessment.

Table 8. FLOWS ALONG MAJOR TRANSMISSION CORRIDORS IN STUDY CASES (MW)

Transmission Corridor	Rating (MW)	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Pacific DC Intertie (Path 65)	3100	2779	2779	2779	2779	2779	2779	2779	2779	2779	2779
Intermountain DC (Path 27)	2400	1705	1705	1705	1705	1705	1705	1705	1705	1705	1705
East-of-the-Colorado River (Path 49)	9300	4889	4886	4887	4886	4886	4886	4886	4886	4441	4440
West-of-the-Colorado River (Path 46)	10623	6159	6151	6152	6150	6150	6150	6150	6150	5709	5840
Victorville-Lugo 500kV Line 1 (Path 61)	2400	1170	1166	1141	1144	1136	1136	1134	1130	1218	1151
LADWP-SCE @ Sylmar (Path 41)	1600	-80	-169	-163	-143	-136	-133	-135	-130	15	-111
Adelanto-Toluca 500kV Line 1 Adelanto-Rinaldi 500kV Line 1 Victorville-Rinaldi 500kV Line 1 Victorville-Century 287kV Lines 1 & 2	TBD	2531	2692	2718	2716	2725	2724	2725	2730	2410	2719

Assessment Results

- **(N-0) or No contingencies.** LADWP system meets the performance requirements of Category A in all base cases.

- **(N-1) Contingencies.** All LADWP circuits were studied for (N-1) contingencies. The only instance where performance criteria was not met was the Olive-Northridge 230 kV Line 1.

  Olive-Northridge 230 kV Line 1 Overload

  Table 9 shows that projects to mitigate overloads Olive-Northridge 230 kV Line 1 need to be completed by 2020.

Table 9. Overloads On Olive-Northridge from (N-1) Contingencies

Single Outage	Overloaded Line	Loading	Study Year
Sylmar – Haskell Canyon 230 kV Line 1	Olive –Northridge 230 kV Line 1	103%	2020

- **(N-2) Contingencies.** The only instances where performance criteria were not met were (a) Scattergood-Olympic 230kV Line 2 overloads, (b) Northridge-Tarzana 230kv Line 1 overloads and (c) Sylmar-Northridge 230 kV Line 1 overloads.

Scattergood-Olympic 230kV Line Overloads

Table 10a shows that overloads on Scattergood-Olympic 230kv Line 2 are remedied by the new Scattergood-Olympic 230 kV Line 1 scheduled to be in service in June 2014.

Table 10a. Overloads on Scattergood-Olympic from (N-2) Contingencies

Double Outage	Overloaded Line	Loading	Study Year
Rinaldi-Tarzana 230kV Lines 1 & 2	Scattergood-Olympic 230kv Line 2	102%	2013
Rinaldi-Tarzana 230kV Lines 1 & 2	Scattergood-Olympic 230kv Line 2	<90%	2014-20
Tarzana-Olympic 230kV Line 1 & Tarzana-Olympic 138kV Line 1	Scattergood-Olympic 230kv Line 2	120%	2011
Tarzana-Olympic 230kV Line 1 & Tarzana-Olympic 138kV Line 1	Scattergood-Olympic 230kv Line 2	115%	2012
Tarzana-Olympic 230kV Line 1 & Tarzana-Olympic 138kV Line 1	Scattergood-Olympic 230kv Line 2	121%	2013
Tarzana-Olympic 230kV Line 1 & Tarzana-Olympic 138kV Line 1	Scattergood-Olympic 230kv Line 2	<90%	2014-20

Northridge-Tarzana 230kV Line Overloads

Table 10b shows the Northridge-Tarzana Line 1 (230kV) needs to be reinforced. Ignoring this work would likely overload the line during a double line outage of Rinaldi-Tarzana Lines 1 & 2 (230kV) as early as summer 2011.

Table 10b. Overloads on Northridge-Tarzana from (N-2) Contingencies

Double Outage	Overloaded Line	Loading	Study Year
Rinaldi-Tarzana 230kV Lines 1 & 2	Northridge-Tarzana 230kV Line 1	102%	2011
Rinaldi-Tarzana 230kV Lines 1 & 2	Northridge-Tarzana 230kV Line 1	104%	2012
Rinaldi-Tarzana 230kV Lines 1 & 2	Northridge-Tarzana 230kV Line 1	<90%	2013-20

Sylmar-Northridge 230 kV Line 1 Overloads

Table 10c shows that the overload on Sylmar-Northridge 230 kV Line 1 are remedied by the new Scattergood-Olympic 230 kV Line 1 scheduled to be in service in June 2014.

Table 10c. Overloads on Sylmar-Northridge from (N-2) Contingencies

Double Outage	Overloaded Line	Loading	Study Year
Rinaldi-Tarzana 230kV Lines 1 & 2	Sylmar-Northridge 230 kV Line 1	101%	2013
Rinaldi-Tarzana 230kV Lines 1 & 2	Sylmar-Northridge 230 kV Line 1	<90%	2014-20

- **Extreme Events — Multiple Circuit Outages**

In general, each annual Assessment can examine different extreme events. There is no NERC or WECC requirement to plan corrective action for such extreme events. The extreme events are selected by their degree of credibility and their expected effect on the BES.

In this Assessment, the two extreme events studied were the simultaneous loss of three lines which share the same tower.

Table 11 shows that the loss of a triple-circuit tower which consists of Toluca-Hollywood 230kV lines 1 & 3 and Toluca-Hollywood 138kV Line 2 would not result in any overloads or any voltage violations. However, the loss of a triple-circuit tower which carries Rinaldi-Tarzana 230kV Lines 1 and 2 and Northridge-Tarzana 230kV Line 1 would result in local under-voltage conditions at RS-U (Tarzana) and RS-T (Canoga). These under-voltage conditions can be mitigated by direct load-tripping at RS-T.

Table 11. OUTCOME OF MULTIPLE CONTINGENCIES

Multiple Contingency	Impacted Elements	Study Year
Loss of Toluca – Hollywood 230kV Lines 1 & 3 and Toluca-Hollywood 138kV Line 1	None	2015
Loss of Rinaldi – Tarzana 230kV Lines 1 & 2 and Northridge-Tarzana 230kV Line 1	Local under-voltage @ RS-T and RS-U	
Loss of Rinaldi – Tarzana 230kV Lines 1 & 2 and Northridge-Tarzana 230kV Line 1 with direct load-tripping at RS T	None	

Light Winter Scenarios. Heavy summer studies test the ability of LADWP's transmission system to handle disturbances when equipment are most vulnerable to thermal overloads and the system is susceptible to under-voltage due to the heavy electricity demand. Light winter studies test the ability of the transmission system to handle over-voltage concerns because the network is intact but only modestly loaded. Operationally, LADWP imports electricity from the east and Intermountain and exports to the Pacific Northwest through the Pacific DC Intertie during the winter, but imports electricity from the east, Intermountain, and the Pacific Northwest during the summer. By investigating both summer and winter conditions, this 2010 Assessment provides a comprehensive test of LADWP's transmission facilities to ensure these assets operate within their ratings and within their thermal, voltage, and stability limits.

Light winter scenarios for Winter 2011 and Winter 2015 were developed from the WECC-approved 2010-11 LW1A operating case which models the anticipated operating conditions with heavy power flows into the Pacific Northwest. The light winter studies were conducted in a manner identical to the approach used with the heavy summer studies.

Table 12 summarizes the power flows along major transmission corridors in these study cases that are relevant to this 2010 Assessment.

Table 12. POWER FLOWS ALONG MAJOR SOUTHERN CALIFORNIA TRANSMISSION CORRIDORS IN LIGHT WINTER STUDY CASES

Transmission Corridor	Rating (MW)	2011	2015
Pacific DC Intertie, *south to north* (Path 65)	3100	1850 MW 60%	1849 MW 60%
Intermountain DC (Path 27)	2400	1746 MW 73%	1746 MW 73%
East-of-the-Colorado River (Path 49)	9300	3905 MW 42%	3904 MW 42%
West-of-the-Colorado River (Path 46)	10623	4693 MW 44%	4692 MW 44%
Victorville-Lugo 500kV Line 1 (Path 61)	2400	645 MW 27%	601 MW 25%
LADWP-SCE @ Sylmar (Path 41)	1600	370 MW 23%	276 MW 17%
Adelanto-Toluca 500kV Line 1 Adelanto-Rinaldi 500kV Line 1 Victorville-Rinaldi 500kV Line 1 Victorville-Century1 87kV Line 1 Victorville-Century2 87kV Line 1	TBD	2904 MW	2907 MW

Table 13 aggregates the receiving station bank loads according to their district assignments.

Table 13. DISTRICT LOADS IN LIGHT WINTER STUDY CASES (MW)

Service Area	2011	2015
Central	1141	1183
Southern	160	166
Valley	1041	1079
Total Receiving Station Load	**2342**	**2428**

Table 14 confirms the expectation that off-peak demand is served primarily from out-of-basin fossil resources acquired through ownership and long-term purchase agreements.

Table 14. GENERATION MIX IN LIGHT WINTER STUDY CASES (MW)

Resource Type	Capacity	2011	2015
Pumped Storage	1595	(425)	(382)
Natural Gas	3677	1135	1085
Wind	285	92	183
Solar	210	0	0
Hydroelectric	221	50	50
Internal Generation	***5987***	**852**	**936**
% Total Generation	*64%*	25%	27%
Hydroelectric	491	340	340
Wind	306	120	120
Solar	500	0	0
Coal	1681	1681	1681
Nuclear	387	387	387
External Generation	***3365***	**2528**	**2528**
% Total Generation	*36%*	*75%*	*73%*
Total Generation	**9352**	**3380**	**3464**

For the winter conditions studied in 2011 and 2015, LADWP's transmission facilities are expected to operate within their ratings and within their thermal and voltage limits for (N-0), (N-1), and (N-2) contingencies.

Stability. The 2011, 2015, and 2020 heavy summer cases and the 2015 light winter study cases described in this 2010 Assessment were tested for transient and post-transient performance under (N-1) and (N-2) contingencies described in Appendix G. There were no violations and no stability limits in these studies. Typical plots from these studies are provided in Appendix I.

Recommendations

#1. Resolve potential overloads on Northridge-Tarzana 230kV Line 1 due to loss of Rinaldi-Tarzana 230kV Lines 1 & 2 for 2011 only.

- *Implement a Load Shedding Program in RS-U (Tarzana) when Rinaldi-Tarzana 230kV Lines 1 & 2 are lost.* The problem is resolved upon completion of the upgrade to increase the capacity of Northridge-Tarzana 230kV Line 1 prior to Summer 2012.

  It is estimated that a load shed of 40 MW should be sufficient to mitigate overloading Northridge-Tarzana 230kV Line 1 in the event of this double contingency outage.

#2. Resolve potential overloads on Scattergood-Olympic 230kV Line 2 during a loss of Tarzana-Olympic 230kV & 138 kV Lines in Summer 2011, Summer 2012 and Summer 2013.

- *Implement a selective load-shedding program at RS-K (Olympic) to relieve the overload.* The problem is resolved upon completion of the new Scattergood-Olympic 230 kV Line 1 in June 2014.

  It is estimated that a load shed of 60 MW should be sufficient to mitigate overloading Scattergood-Olympic 230kV Line 2 in the event of this double contingency outage.

#3. Resolve potential overloads on Scattergood-Olympic 230kV Line 2 during a loss of Rinaldi-Tarzana 230kV Lines 1 & 2 in Summer 2013 only.

- *Implement a selective load-shedding program at RS-U (Tarzana) to relieve the overload.* The problem is resolved upon completion of the new Scattergood-Olympic 230 kV Line 1 in June 2014.

  It is estimated that a load shed of 40 MW should be sufficient to mitigate overloading Scattergood-Olympic 230kV Line 2 in the event of this double contingency outage.

#4. Resolve potential overloads on the Sylmar-Northridge 230 kV Line 1 during a loss of the Rinaldi-Tarzana 230kV Lines 1 & 2 in Summer 2013 only.

- *Implement a selective load-shedding program at RS-U (Tarzana) to relieve the overload.* The problem is resolved upon completion of the new Scattergood-Olympic 230 kV Line 1 in June 2014.

  It is estimated that a load shed of 40 MW should be sufficient to mitigate overloading Northridge-Tarzana 230kV Line 1 in the event of this double contingency outage.

#5. Implementation of corrective action is not required by TPL-004 but this Assessment provides a recommendation to the Transmission Operator to implement a direct load shedding scheme at RS-T (Canoga) from 2014 onward. [e]

[e] Recommendation 5 in the 2010 Assessment is the same as Recommendation 5 in the 2009 Assessment. The 2009 Assessment evaluated only model year 2014 for this event, and the 2010 Assessment evaluated only model year 2015 for this event; the recommendation from the 2009 Assessment is still valid, so the recommendation indicating the earliest need to act (2014) is kept in the 2010 Assessment.

#6. Resolve potential overloads on the Olive-Northridge 230 kV Line 1 during a loss of the Sylmar-Haskell Canyon 230 kV Line 1 in Summer 2020.

Two projects are needed:

- *Relocate the 230/155 kV Banks from Olive Switching Station to Haskell Canyon Switching Station.*
- *Remove the existing twin 115 kV circuits between Haskell Canyon Switching Station and Olive Switching Station and replace with a single new 230 kV circuit (utilizing the existing 115 kV right-of-way) to connect Haskell Canyon Switching Station to Sylmar Switching Station via Olive Switching Station by stringing the currently vacant position between Olive Switching Station to Sylmar Switching Station.*

Summary of load shed requirements at RS-U for loss of Rinaldi-Tarzana 230kV Lines 1 & 2

2011: 40MW (covers #1)
2012: no load shed needed
2013: 40MW (covers #3 and #4).

Implementation Plan for these Recommendations

#1: Design work has already commenced to increase the capacity of the Northridge-Tarzana 230kV Line 1. The work is budgeted and the expected in-service date is prior to Summer 2012. The Load Shedding Program in RS-U (Tarzana) is an interim solution that will work until the in-service date.

#2, #3 and #4: The Scattergood-Olympic 230kV Line 1 is budgeted and has an expected in-service date of June 2014. This project is too far out for the current budget cycle. It will appear in the 2011-2012 budget year. The Load Shedding Programs at RS-U (Tarzana) and RS-K (Olympic) are interim solutions that will work until the in-service date.

#5: Load-shedding programs are not capital budget item, and require minimal lead time, so implementation is done by Grid Operations.

#6: This project is too far out for the current budget cycle. It is expected to appear in the 2017-2018 budget year.

Comparison with Recommendations in the 2009 Ten-Year Transmission Assessment

Changes to previous recommendations

Note: recommendations are renumbered chronologically in each Assessment

Recommendation 1 stayed the same for both the 2009 and 2010 Assessment.[f]

Recommendation 3 in the 2010 Assessment is very similar Recommendation in the 2009 Assessment, but was delayed two years, and load shed was replaced by generation

[f] The upgrade of the Northridge-Tarzana 230kV Line 1 was modeled in the 2010 Assessment so no overload was reported after Summer 2011.

dispatch[g]. The overload did not appear in 2011 because of lower load forecast in 2011 and a delay of the RS-C bypass from July 2012 to March 2014. Like the 2009 Assessment, the new Scattergood-Olympic 230kV Line #1 fixes the problem, but the new in-service date is July 2014 instead of July 2012.

Recommendation 2 in the 2010 Assessment is very similar to Recommendation 3 in the 2009 Assessment, but the overload persists two years longer, and load shed was replaced by generation dispatch. The overload persists because the in-service date of the new Scattergood-Olympic 230kV Line #1 is delayed two years to July 2014.

Recommendation 4 (in the 2009 Assessment) does not appear in the 2010 Assessment because the potential overload was relieved by a lower coincidental peak load at the Olympic Receiving Station. [h]

Recommendation 5 in the 2010 Assessment is the same as Recommendation 5 in the 2009 Assessment. The 2009 Assessment evaluated only model year 2014 for this event, and the 2010 Assessment evaluated only model year 2015 for this event; the recommendation from the 2009 Assessment is still valid, so the recommendation indicating the earliest need to act (2014) is kept it the 2010 Assessment.

New recommendations in the 2010 Assessment

Recommendation 4 (in the 2010 Assessment) : high loading on the same line was found in the 2009 Assessment, however it was just below the criteria to flag as a potential overload. The 2009 Assessment reported 98% while 2010 Assessment reports 101%.

Recommendation 6 (in the 2010 Assessment): this is the first Assessment to study 2020, when the overload occurs.

[g] Generation dispatch does not provide enough relief, so load shed was utilized. The effectiveness of generation dispatch was marginal in the 2009 Assessment, and the effectiveness of generation dispatch was not sufficient in the 2010 Assessment due to system changes such as delay of the RS-C bypass from July 2012 to March 2014.

[h] This previous recommendation was to relieve a potential overload starting in 2018 of the Olympic 230/138kV transformer F due to the loss of the Olympic 230/138kV transformer E.

Appendix A. NERC/WECC Planning Standards

Appendix B. Receiving Station Loads

Appendix C. Generation Schedule for LADWP-Owned Facilities (MW)

Appendix D. Transmission Line Capacities

Appendix E. One-Line Diagrams

Appendix F. List of Contingencies Studied

Appendix G. Switching Sequences for Transient and Post-Transient

Appendix H. Power Flow Results

Appendix I. Transient and Post-Transient Stability Results

Appendix J. Renewable Transmission Expansion Project

Appendix K. Long-Term Transmission Plan