Department of Water and Power the City of Los Angeles

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DOCKET
09-IEP-1D
DATE MAR 16 2009
RECD. MAR 17 2009

March 16, 2009

California Energy Commission
Docket Office
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512

To Whom It May Concern:

Subject: Electric Transmission-Related Data (Docket 09-IEP-1D) Submittal for the California Energy Commission's (CEC) 2009 Integrated Energy Policy Report (IEPR)

This is in response to the CEC's request that all electric transmission system owners 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) as has been identified by the LADWP Power System Planning and Development Section. If there are any changes, they will be provided to the CEC as soon as possible while the 2009 IEPR is being developed.

An electronic file was also submitted to Docket@energy.state.ca.us on March 16, 2009.

LADWP believes that this submittal fully complies with all the requirements of the CEC data request and continues to look forward 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. Than Aung at (213) 367-3367.

Sincerely,

Michael [illegible] for

Aram Benyamin
Senior Assistant General Manager - Power System

OAA:sa
Enclosures
c/enc: Mr. Oscar A. Alvarez
Mr. Than T. Aung

CALIFORNIA ENERGY COMMISSION
TRANSMISSION-RELATED DATA SUBMITTALS

March 16, 2009

NOTE: The following transmission-related data, as requested by CEC under Docket # 09-IEP-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 assess a more 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.

Each transmissions system owner shall submit a description of its bulk electric system and its latest transmission expansion plan. The electric system description and plan shall include:

SECTION 1

The electric transmission system owner's most recent transmission 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 Renewable Portfolio Standard or aging power plant retirement/once-through cooling goals.***

Attachment 1, "2008 Ten-Year Transmission Assessment" is essentially LADWP's transmission plan. The 2007 Ten-Year Transmission Assessment was successfully audited by NERC last year. The 2008 Assessment covers the same issues with the same level of detail.

SECTION 2

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

- ***a. The description shall include the size (Megawatt [MW]) and length of the lines or lines included in the path and the substations to which the line connects.***

Existing Transfer Path	Rating (MW)	LADWP Share (MW)	Length (Miles)	Connecting Substations
Pacific DC Intertie	3100	1240	845	Celilo Sylmar
Intermountain DC	1920	1143	488	Intermountain Adelanto
McCullough-Victorville 500kV (2 lines)	2242	2159	162	McCullough Victorville

Existing Transfer Path	Rating (MW)	LADWP Share(MW)	Length (Miles	Connecting Substation
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 <u>any planned upgrades</u> to the facilities that are used to import power <u>into</u> the transmission owner's grid that are expected to be operational between January 2009 and December 2018, including:

i. Descriptions of the upgrades including costs, benefits, maps, MW impact of the upgrades on transfer capabilities, and alternatives considered.

(1) Planned Intermountain DC Line Upgrade Project

Planned Capacity Upgrade: 480 MW

Commercial Service Date: November 2010

LADWP Share: 59.534%

Estimated Project Cost: $120 million

Other Participants: Anaheim, Riverside, Pasadena, Burbank and Glendale.

Benefits:

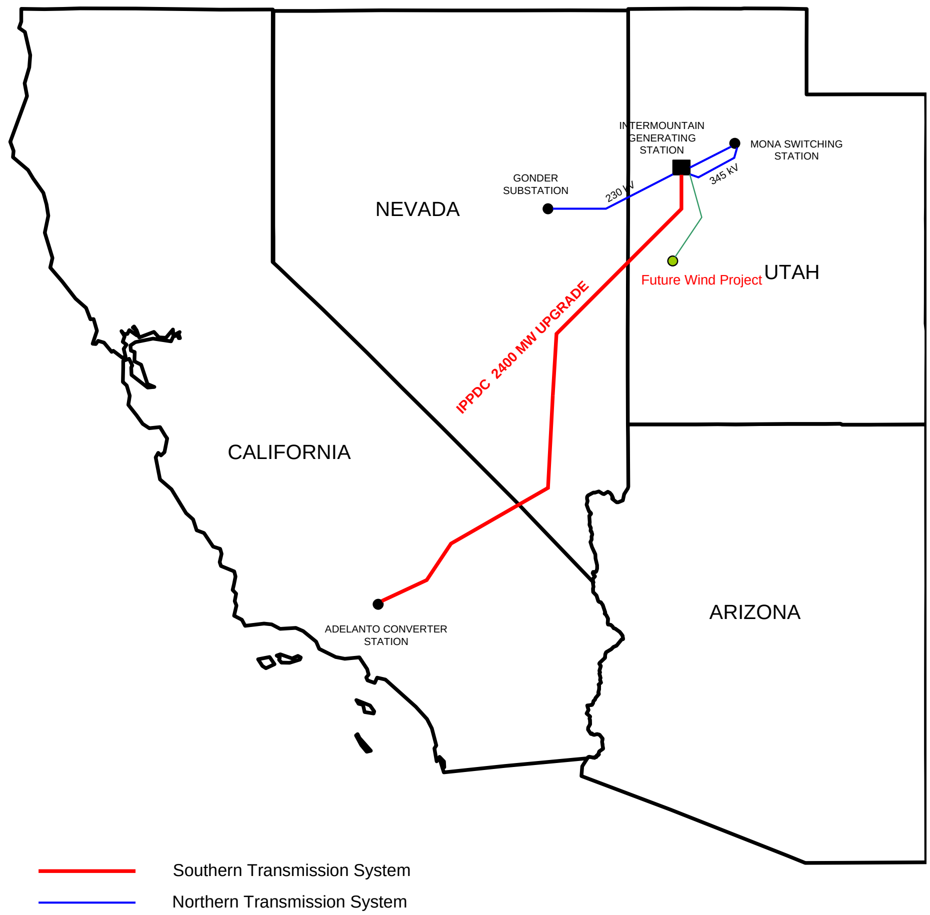
- Increases transfer capability from 1920 MW to 2400 MW with minimal environmental impact and cost.
- Supports development of approximately 400 MW of wind and other renewable resources in Utah and surrounding areas.

Transmission Additions/Alterations:

- The project involves upgrading existing DC converter stations only. There are no transmission additions or line alterations planned.

Alternatives Considered

- Various upgrade configurations were considered, ranging from 330 MW to 800 MW, but the 480 MW was determined to be the most cost-effective option.



c. Any maintenance or construction that could impact transfer capabilities or the ability to move power over a path between January 2009 and December 2011.

- The Intermountain DC Line Upgrade Project will necessitate the Intermountain DC to operate at reduced levels during installation of the new converter equipment.

d. A description of any planned transmission facilities that would create a new transmission path or transmission line to import electric power into the transmission owner's bulk electric network that are expected to be operational between January 2007 and December 2016, including:

i. Descriptions of the upgrades including costs, benefits, maps, and the MW impact of the upgrade on transfer capabilities.

(1) Planned Green Path North Project

Planned Capacity: 1200 MW

Commercial Service Date: November 2013

LADWP Share: 76%

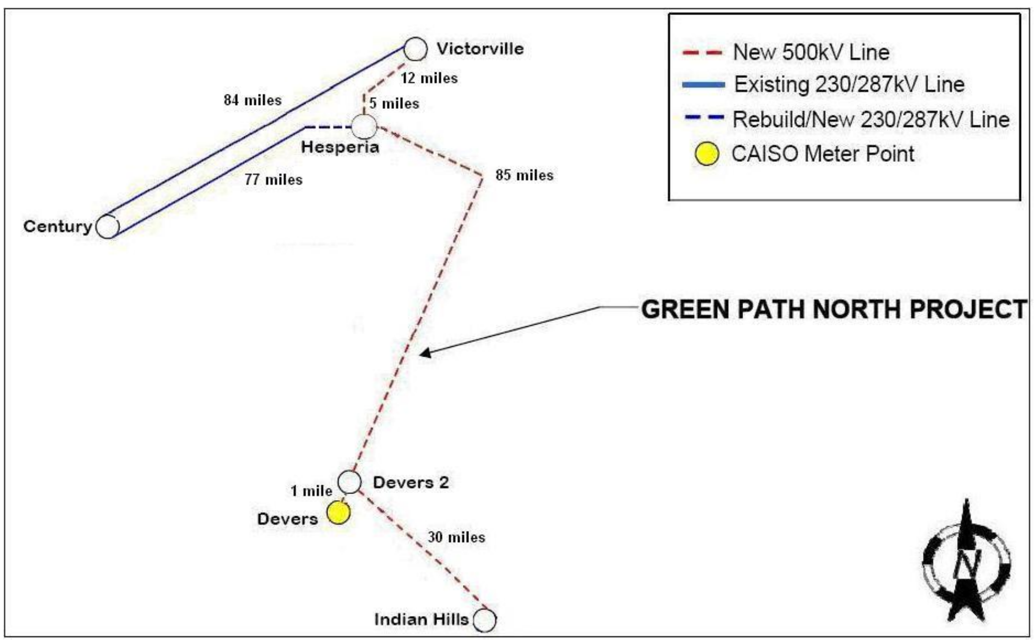
Estimated Project Cost: $700 million

Other Participants: Imperial Irrigation District (IID) and SCPPA

Benefits:

- Supports development of geothermal, solar and other renewable resources in the Imperial Valley.
- Helps meet the State of California's greenhouse gas (GHG) regulation that seeks to reduce dependence on fossil fuel power.
- Displaces fossil fuel power with clean, non-polluting energy
- Provides economic stimulus for the Counties of San Bernardino, Riverside, and Imperial Valley
- Supports regional transmission network by reducing the amount of load trips with PaloVerde-Devers 2 in-service.
- Reduces congestion at West-of-Devers and Victorville-Lugo 500 kV line.

Transmission Additions/Alterations.



LADWP Facilities:

- Construct one 85-mile 500kV line with 70% series compensation from LADWP's new Devers 2 substation near Palm Springs to LADWP's new Hesperia substation near Lugo.
- Construct one or two 500kV tie lines from new Devers 2 substation to existing Devers substation owned by SCE and approximately one mile apart.
- Construct new Hesperia switching station, located approximately 5 miles east of the existing transmission corridor, to sectionalize one Victorville-Century 287kV line.

- Construct one new 5-mile line from Hesperia to tap one existing Victorville-Century 287kV line on one end, creating one new 77-mile Hesperia-Century 287kV line.

- Construct one new 17-mile line from Hesperia to Victorville 500kV. One Victorville-Century 287kV line remains in operation.

LADWP/IID Joint Facility:

- Construct two 30-mile 230kV or one 500kV line from new Coachella substation to Devers 2 substation to be jointly owned and operated by LADWP and IID.

IID Facility:

- Expand existing Coachella 230 kV substation.

ii. Descriptions of the alternatives considered in developing the upgrades.

- Participation on the PaloVerde-Devers 500kV line 2 was considered, but it was determined that it was best for LADWP to keep the existing transmission rights on the PaloVerde-Devers 500kV line 1, as allowed by existing contractual arrangements.

- IndianHills-Upland 500kV line was abandoned as a result of a new line from Indian Hills to a new Devers 2 substation and a new line from Devers 2 to Hesperia substation.

e. A general description of any planned upgrades to the facilities that import electric power into the transmission owner's bulk transmission grid that are expected to be operational after December 2018.

- None scheduled.

SECTION 3

2. A description of the transfer capabilities for bulk transmission lines or bulk transmission paths limiting the delivery of electric power <u>within</u> the transmission owner's grid.

a. 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.

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

b. A description of <u>any upgrades</u> to the facilities that are used to import power <u>into</u> the transmission owner's grid that are expected to be operational between January 2009 and December 2018, including:

i. Descriptions of the upgrades including costs, benefits, maps, and the megawatt impact of the upgrade on transfer capabilities.

(1) Planned Barren Ridge Renewable Transmission Project

Planned Capacity: 1600 MW

Commercial Service Date: November 2013

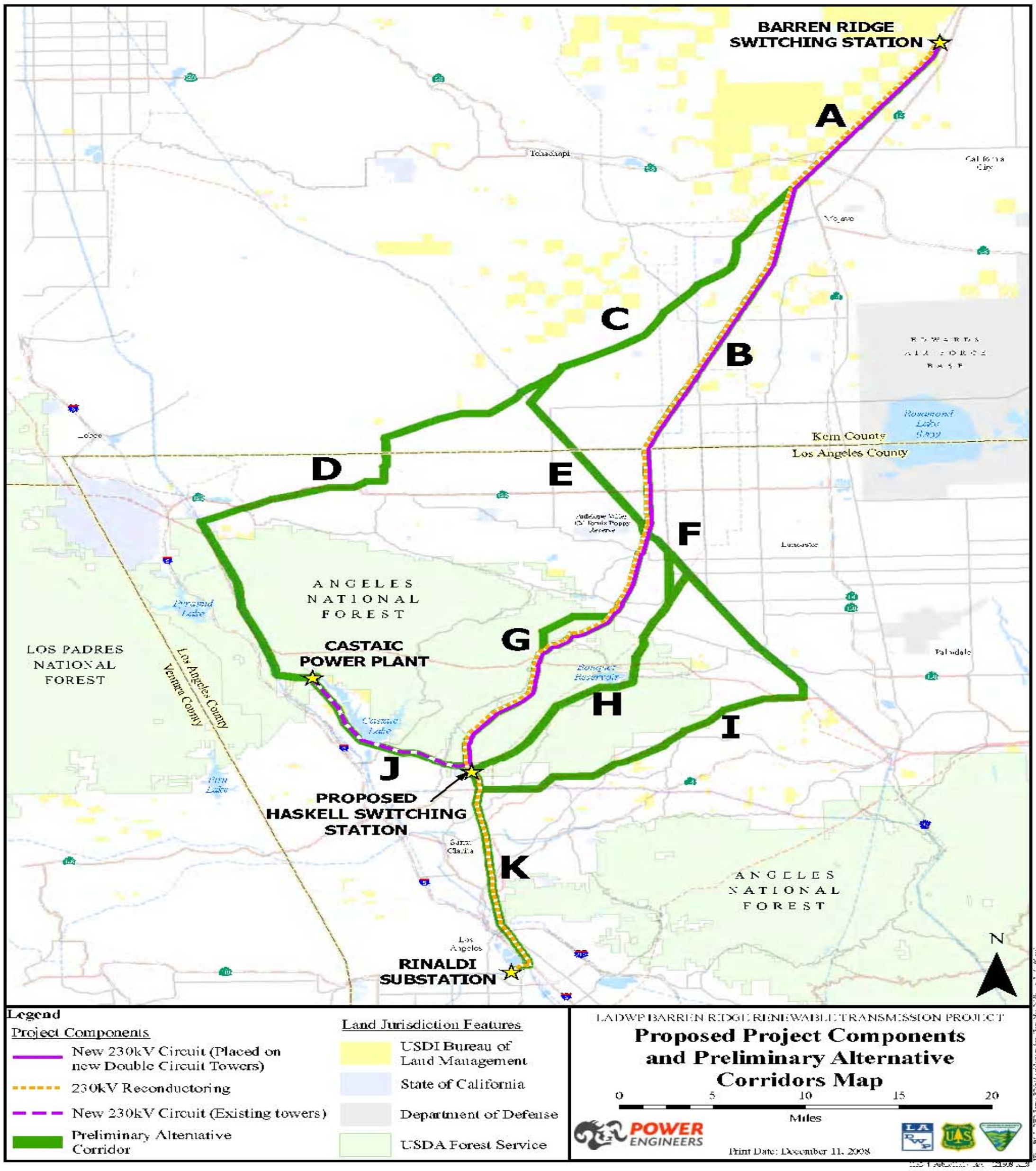
LADWP Share: 100%

Estimated Project Cost: $200 million

Benefits:

- Increase additional transmission capacity through integration of the many proposed renewable solar and wind energy projects in the Mojave Desert and Owens Valley of southern California
- Reduces the environmental impacts associated with greenhouse gases and emissions of other air pollutants

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.

MW Impact: 1150 MW

Alternatives considered:

- Reconductoring the existing Barren Ridge to Rinaldi was abandoned for construction of a new parallel line from Barren Ridge to Haskell Junction.

(2) Planned Green Path North Project

Please read 1.d. for a description of the project. As part of Green Path North Project, the new Hesperia switching station will sectionalize one Victorville-Century 287kV line.

Alternatives considered:

- New Upland-Victorville 500kV and Upland-Century 287kV lines were considered, but abandoned because of seismic concerns.

c. Any maintenance or construction that could impact transfer capabilities within the transmission owner's bulk transmission grid between January 2009 and December 2018.

- Green Path North Project will necessarily cause an outage of one of the Victorville-Century 287kV lines while it is being upgraded and reconfigured to include new Hesperia switching station.
- Barren Ridge Renewable Transmission Project will necessarily cause an outage of Barren Ridge-Rinaldi 230kV line while it is being sectionalized at Haskell Junction.

d. A description of any planned transmission facilities that would create a new means to transfer electric power <u>within</u> the transmission owners bulk transmission network that are expected to be operational between January 2009 and December 2018, including:

- 2.b.(1) describes the Barren Ridge Renewable Transmission Project, which would create a new means to transfer electric power within LADWP's bulk transmission network.

e. A general description of any planned upgrades to the facilities that transport electric power within the transmission owner's bulk transmission network that are expected to be operational after December 2018.

- None scheduled.

SECTION 4

Transmission Facilities needed to meet renewable energy requirements or other state mandated electricity policy goals, or to replace aging power plants that retire, or to eliminate or reduce local capacity requirements.

As a municipal utility, LADWP is subject to its governing bodies (LADWP Board and the City Council) mandates. LADWP's governing bodies have directed LADWP to fulfill the intent of state law on renewable energy policy goals. Also, 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.

SECTION 5

For those point-to-point electrical transfer needs identified in the sections (1-3) above, 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 Green Path North and Barren Ridge Renewable Transmission Projects, new corridor designation under Energy Policy Act 2005 - Section 368 is highly desirable.

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

- **Intermountain DC Line Upgrade**

  LADWP has identified and contracted for wind energy from Wyoming and Utah to be delivered to Los Angeles over the Intermountain DC line.

- **Green Path North Transmission Project**

  LADWP is aggressively pursuing this project as it will be the conduit for the majority of our renewable portfolio. Geothermal and solar projects have been negotiated for the City.

- **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.

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

Intermountain DC Line Upgrade provide some opportunities for additional acceptable economical electricity from out-of-state,

d. Opportunities to export renewable-based generation outside of California.

None

e. Opportunities to improve the reliability or reduce the congestion of the state's electric system.

Green Path North provides the greatest opportunities to reduce the congestion of the West-of-Devers transmission bottleneck.

f. Opportunities to meet future growth in load.

Intermountain DC Line Upgrade, Green Path North and Barren Ridge Renewable Transmission Projects can deliver additional transmission capacity to meet future load growth.

h. 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.

The Green Path North Project may require that transmission lines cross the Bureau of Land Management designated Morongo Area of Critical Environmental Concern (ACEC). The construction of the transmission line is proposed to parallel an existing electrical line and road through the Morongo ACEC.

Close coordination with resource management agencies during the environmental planning process will be needed.

i. In relation to the Garamendi Principles, as identified in Senate Bill (SB) 2431 (Chapter 1457, Statutes of 1988) and as noted in SB 1059, Section 1 (Chapter 638, Statutes of 2006), in the case of existing corridors, identify the following:

Intermountain DC Line Upgrade

- 25% capacity increase by upgrading HVDC equipment with no impact to the existing right-of- way.

Green Path North Transmission Project

- Approximately 12 miles of LADWP's existing right of way south of the Victorville Substation will be upgraded from 287kV to 500kV. Of the 12 miles, approximately 4 miles will be across federal lands managed by the U.S. Forest Service.

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 double-circuit lines adjacent to the existing line to handle the capacity during the upgrade and to meet future needs.

- 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.

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

Green Path North Transmission Project

- Applications for Right of Way Grants have been submitted with the Bureau of Land Management and U.S. Forest Service in December 2006.

- The BLM-designated Area of Critical Environmental Concern (ACEC) was identified since it is adjacent to Joshua Tree National Park. However, the proposed project route will parallel an existing power line and road through the ACEC.

Barren Ridge Renewable Transmission Project

- Applications for 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.

k. 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 on corridor designation.

Attachment 1

2008 Ten-Year Transmission Assessment

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Los Angeles Department of Water & Power

2008 Ten-Year Transmission Assessment

APPROVED BY:

ARAM BENYAMIN

SENIOR ASSISTANT GENERAL MANAGER

POWER SYSTEM

MOHAMMED J. BESHIR

MANAGER

POWER SYSTEM PLANNING & DEVELOPMENT

November 2008

Transmission Planning

Power System Planning & Development

Table of Contents

Appendices

2008 Ten-Year Transmission Assessment

Executive Summary

This 2008 Ten-Year Transmission Assessment covers years 2008 to 2018. Year 2008 serves as a review of the current system and is considered as Year Zero. At least one system (1-in-10 peak) condition is modeled for years 2008 through 2018.

As in the previous years, the Los Angeles Department of Water and Power's (LADWP's) 2008 ten-year transmission assessment is being compliant with the four NERC Transmission Planning Standards enacted on April 1, 2005:

1. TPL-001-0. System Performance Under Normal (No Contingency) Conditions (Category A)

2. TPL-002-0. System Performance Following Loss of a Single Bulk Electric System Element (Category B)

3. TPL-003-0. 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)

This year's ten-year transmission assessment is also in accordance with the LADWP's System Operating Limits (SOL) Methodology for the Planning Horizon as required by NERC Standard FAC-010-1. The 2008 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 2008 Ten-Year Transmission Assessment (Assessment) is based on WECC-approved case 2008HS4A-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 October 2007 Peak Demand Forecasts issued on December 15, 2007. 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. Regarding to FAC-010-1, 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 three:

- A simultaneous (N-2) outage of Rinaldi-Tarzana Lines 1 & 2 (230kV) would overload Northridge-Tarzana Line 3 (230kV) from 2009 Summer Peak onward.

- A single (N-1) outage of Toluca-Hollywood_F Line 3 (230kV) would overload Toluca-Hollywood_E Line 1 (230kV) in 2013 Summer Peak.

- A simultaneous (N-2) outage of the Adelanto-Rinaldi and Victorville-Rinaldi Lines (500kV) under the light winter conditions and high imports and re-export, would overload Bank H (500/230kV) terminating the Adelanto-Toluca (500kV) line at RS-E (Toluca) in 2012.

- Also from 2009 onward, the complete outage of the entire RS-E (Toluca), as an extreme contingency, would require attention due to post-contingency multiple overloads.

To mitigate these overloads, the Assessment identifies the following improvements:

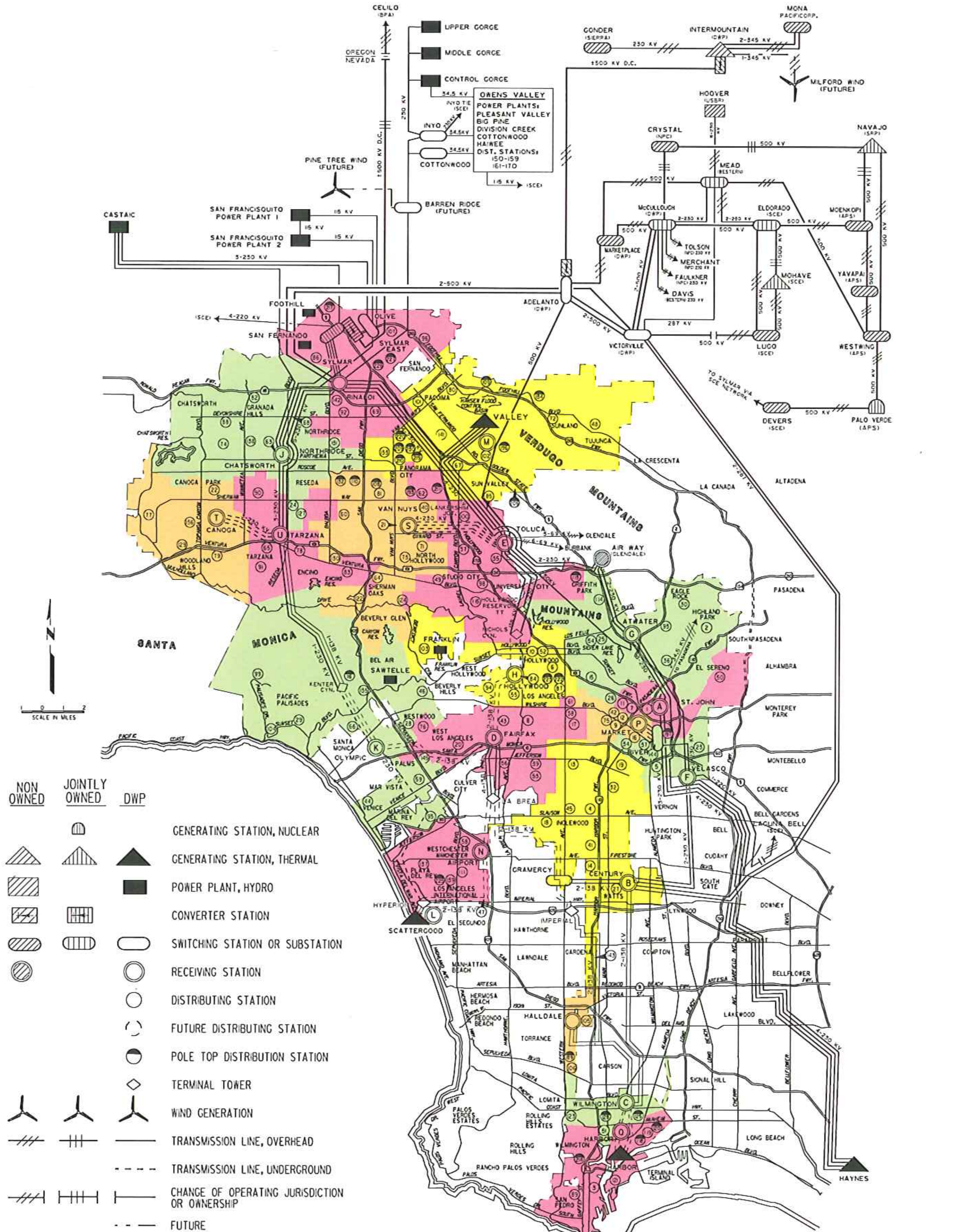
- In the summer 2009, develop a selective load shedding program in Tarzana to relieve the overload on Northridge-Tarzana Line 3 (230kV) during a double contingency outage of Rinaldi-Tarzana Lines 1 & 2 (230kV) for short term (1 to 3 years); then increase the ampacity of Northridge-Tarzana Line 3 (230kV) for long term. This improvement will satisfy the NERC TPL-003-0 Standard or post-contingency system performance for Category C.

- In the summer 2009, it is suggested to develop a Load Shedding Program at RS-H when the voltage dips below approximately at 0.85 p.u. Such a program should selectively shed one load bank, in the Hollywood area to mitigate the overloads as well as under-voltage conditions in the event of a station outage at RS-E (Toluca). This improvement is not required by the NERC TPL-004-0 Standard or post-contingency system performance for Category D.

- Before summer 2013, increase the ampacity of the underground section of Toluca-Hollywood Line 1 (230 kV) between Nichols Canyon and Hollywood to mitigate overloading Toluca-Hollywood Line 1 (230kV) due to an outage of Toluca-Hollywood Line 3 (230kV). This improvement will satisfy the NERC TPL-002-0 Standard or post-contingency system performance for Category B.

- During light winter or any light load conditions under which LADWP imports electricity from the Arizona-Nevada-Utah region and exports to Pacific Northwest, the import level should be monitored and maintained at a level that a simultaneous double-line outage of Adelanto-Rinaldi and Victorville-Rinaldi Lines will not overload any facilities.

POWER SYSTEM DIAGRAM



POWER SYSTEM PLANNING & DEVELOPMENT
TRANSMISSION PLANNING GROUP

OES-LCM67
APRIL 2008
REV. 12

Table 1 summarizes the findings and recommendations of the 2008 Assessment.

Table 1. Findings & Recommendations

Year	Outage(s)	Reliability Category	Overloaded Line or System Violation	Recommendation
2009 Onward	Rinaldi-Tarzana 230kV Lines 1& 2	C	Northridge-Tarzana 230kV Line 3	Selectively shed load in RS-U (Tarzana) for short term Upgrade Northridge-Tarzana 230kV Line 1 for long term
2009 Onward	RS-E (Toluca) Station	D	Scattergood-Airport 138kV Lines 1 & 2 Hollywood-Fairfax 138kV Lines 1 & 2 RS-H (Hollywood) Voltage @ 0.741pu	Suggested Load shedding Program in RS-H (Hollywood)
2014	Toluca-Hollywood 230kV Line 3	B	Toluca-Hollywood 230kV Line 1	Upgrade underground section of Toluca-Hollywood 230kV Line 1
2012 light load conditions Onward	Victorville – Rinaldi and Adelanto-Rinaldi 500kV Lines	C	Bank H (500/230kV) at Toluca	Monitor and maintain imports from Arizona/Nevada/Utah area to a safe level

Introduction

The City of Los Angeles' (City's) 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 Figure 1.

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);
- ensure the City's electrical system is able to withstand and respond to unanticipated system disturbances, losses of system components (TPL-002-0 and TPL-003-0), 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 April 1, 2005, these Planning Standards are:

1. TPL-001-0. System Performance Under Normal (No Contingency) Conditions (Category A)
2. TPL-002-0. System Performance Following Loss of a Single Bulk Electric System Element (Category B)
3. TPL-003-0. 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)

Methodology

WECC Reference Case. Study cases were developed from the WECC-approved 2008HS4A-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 2008 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

<table>
<tr><th>Transmission Corridor</th><th>Rating</th><th>Power Flow (MW)</th><th>Loading (%)</th></tr>
<tr><td>Pacific DC Intertie
(Path 65)</td><td>3100</td><td>2980</td><td>96%</td></tr>
<tr><td>Intermountain DC
(Path 27)</td><td>1920</td><td>1804</td><td>94%</td></tr>
<tr><td>East-of-the-Colorado River
(Path 49)</td><td>8055</td><td>5275</td><td>65%</td></tr>
<tr><td>West-of-the-Colorado River
(Path 46)</td><td>10623</td><td>5497</td><td>51%</td></tr>
<tr><td>Victorville-Lugo 500kV Line 1
(Path 61)</td><td>2400</td><td>1435</td><td>60%</td></tr>
<tr><td>LADWP-SCE @ Sylmar
(Path 41)</td><td>1600</td><td>-44</td><td>3%</td></tr>
<tr><td>Adelanto-Toluca 500kV
Line 1</td><td rowspan="5">3900[1]</td><td>782</td><td rowspan="5">52%</td></tr>
<tr><td>Adelanto-Rinaldi 500kV
Line 1</td><td>502</td></tr>
<tr><td>Victorville-Rinaldi 500kV
Line 1</td><td>438</td></tr>
<tr><td>Victorville-Century 287kV
Line 1</td><td>161</td></tr>
<tr><td>Victorville-Century 287kV
Line 2</td><td>161</td></tr>
</table>

[1] SAG Operation Note 87-16, revision 6 dated February 28, 1992

Analysis. A minimum of one study case is developed from the 2008HS4A-OP reference case for each study year, 2008 through 2018. 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 "October 2007 Retail Electric Sales and Demand Forecast" released on December 15, 2007 are modeled each year in the study.

The one-in-ten system loads modeled in this 2008 Assessment are higher than those applied in the 2007 Assessment which are those forecast in the "October 2006 Peak Demand Forecasts" issued on November 16, 2006, a comparison of which is presented in Table 3.

Table 3. Comparison of 1-in-10 System Loads (MW)

Year	2007 Assessment	2008 Assessment	Increase
2008	6132	6282[2]	150
2009	6177	6358	181
2010	6231	6442	211
2011	6289	6526	237
2012	6342	6605	263
2013	6402	6684	282
2014	6468	6763	295
2015	6534	6843	309
2016	6599	6924	325
2017	6663	7005	342

Receiving Station loads are scaled according to the "Receiving Station and Distributing Station Load Forecast—Year 2008 to 2017" (RS/DS Forecast). Loading at receiving station banks are generally developed with the power factors provided in the RS/DS Forecast, but with some modification to match available historical peak load data. Further, receiving station loads for year 2017 and 2018 are escalated at the average long-term growth rate of 1.1%. Table 4 lists the forecasted real power loads at the receiving station level. Appendix B extends the table with reactive power loads.

[2] Actual 2008 peak load of 6006 MW occurred at 4:00 pm on June 20, 2008

Table 4. Receiving Station Loads (MW)

Service Area	Receiving Station	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	Airport	201	205	209	212	217	219	224	225	226	230	233
	Atwater	320	323	327	333	339	343	344	350	354	359	363
	Century	302	304	311	316	317	319	325	330	336	342	346
	Fairfax	430	433	423	423	434	435	437	440	443	447	452
	Hollywood	400	409	417	421	428	434	442	447	451	456	461
Central	Market (River)	370	373	377	377	380	383	384	386	388	393	398
	Olympic	392	396	412	419	422	430	438	443	450	454	459
	Scattergood	27	28	28	28	28	28	28	28	28	28	28
	St. John	228	230	232	233	237	238	241	243	246	250	252
	Velasco	225	227	229	231	235	237	240	243	244	247	249
	Total Central Load	**2896**	**2928**	**2965**	**2993**	**3037**	**3066**	**3103**	**3134**	**3166**	**3206**	**3241**
	Halldale	48	48	50	50	50	50	50	51	52	53	54
Southern	Harbor	199	201	199	204	206	207	208	209	213	213	215
	Wilmington	164	167	167	170	170	173	173	175	176	178	180
	Total Southern Load	**411**	**416**	**416**	**423**	**426**	**430**	**431**	**435**	**441**	**444**	**449**
	Canoga	371	374	381	386	373	379	382	386	390	392	397
	Chatsworth											
	Northridge	526	533	536	544	564	570	578	584	594	601	608
	Rinaldi	292	300	308	315	317	325	329	335	343	348	351
Valley	Tarzana	345	351	355	361	366	373	376	380	385	389	394
	Toluca	425	429	429	433	438	444	445	451	456	461	466
	Valley	304	308	314	317	320	324	328	332	333	338	342
	Van Nuys	425	430	440	450	452	457	472	477	483	489	495
	Total Valley Load	**2688**	**2725**	**2762**	**2805**	**2831**	**2872**	**2909**	**2946**	**2984**	**3018**	**3051**
Total Receiving Station Load		**5995**	**6069**	**6143**	**6221**	**6294**	**6368**	**6443**	**6515**	**6591**	**6668**	**6741**

Infrastructure Improvements and Expansion. Table 5 lists the infrastructure improvements, expansion projects, and resource acquisitions captured in this 2008 Ten-Year Transmission Assessment.

Table 5. Planned System Enhancements

System Enhancements	In-Service Date	Initial Model Year
MWC Wind Project - Phase 1 and Phase 2	December 2008 – July 2009	2009
Pine Tree Wind Farm Project	March 2009	2009
Southern Transmission System Upgrade	July 2009	2009
Harper Lake Solar Project	December 2010	2010
Hoffman Summit Wind Project	October 2010	2011
Beacon Solar Project	June 2011	2011
Haynes Generating Station Re-powering – Phase 2	May 2011	2011
Castaic Power Plant Modernization	June 2011	2011
Barren Ridge-Castaic 230kV Line (new) (*)	2011	2011
Barren Ridge-Rinaldi 230kV Line (upgrade) (*)	2012	2012
Scattergood-Olympic 230KV Line 1	June 2012	2012[3]
Scattergood Generating Station Re-powering	April 2013	2013
Pine Canyon Wind Project	April 2013	2013
Green Path North Project	November 2013	2014

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

LADWP has been mandated by the City to provide 20% of its electricity to its retail customers through renewable sources by 2010. To comply with this directive, LADWP is aggressively acquiring renewable energy sources. The Green Path North Project, a transmission corridor through which the City will import such resources including geothermal energy in the Imperial Irrigation District, is by far the most ambitious of the City's expansion efforts. Other renewable energy projects anticipated in the near–term include:

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

[3] Capital Expenditure Program report on 10-28-08

Generation. LADWP owns and operates resources capable of producing up to 5456MW by internal generation and 3586MW 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	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Pumped Storage	1272	86	162	216	53	116	153	232	188	186	162	217
Natural Gas	3684	2666	2520	2290	2255	2255	2255	2255	1986	2066	2166	2186
Wind (Pine Tree & Pine Canyon)	270		40	40	40	40	80	80	80	80	80	80
Hydroelectric	230	160	160	160	160	160	160	160	160	160	160	160
Internal Generation	***5456***	***2912***	***2882***	***2706***	***2508***	***2571***	***2648***	***2727***	***2414***	***2492***	***2568***	***2643***
% Total Generation	*60%*	*55%*	*53%*	*49%*	*45%*	*45%*	*46%*	*47%*	*44%*	*45%*	*45%*	*46%*
Hydroelectric	491	426	426	426	426	426	426	426	426	426	426	426
Wind (Hoffman Summit & MWC)	576		120	120	160	160	160	160	160	160	160	160
Solar	520			250	500	500	500	500	500	500	500	500
Coal	1625	1625	1625	1625	1625	1625	1625	1625	1625	1625	1625	1625
Nuclear	374	374	374	374	374	374	374	374	374	374	374	374
External Generation (*)	***3586***	***2425***	***2545***	***2795***	***3085***	***3085***	***3085***	***3085***	***3085***	***3085***	***3085***	***3085***
% Total Generation	*40%*	*45%*	*47%*	*51%*	*55%*	*55%*	*54%*	*53%*	*56%*	*55%*	*55%*	*54%*
Total Generation	**9042**	**5337**	**5427**	**5501**	**5593**	**5656**	**5733**	**5812**	**5499**	**5577**	**5653**	**5728**

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

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, roughly half of LADWP's power needs are served by heavily leveraging transmission assets. Over the next ten years, additions of approximately 200 circuit-miles of transmission will increase LADWP's access to renewable energy intrastate.

Table 7. Electric Supply-Demand Balance (MW)

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
LADWP Receiving Station Load	5955	6069	6143	6221	6294	6368	6443	6515	6591	6668	6741
System Losses	429	432	445	446	485	446	449	465	464	467	469
(Cogeneration)	(180)	(180)	(180)	(180)	(180)	(180)	(180)	(180)	(180)	(180)	(180)
Total Power Requirement	***6204***	***6321***	***6408***	***6487***	***6599***	***6634***	***6712***	***6800***	***6875***	***6955***	***7030***
Internal Generation	***2921***	***2882***	***2706***	***2508***	***2573***	***2650***	***2728***	***2416***	***2494***	***2570***	***2646***
% Power Requirement	*47%*	*46%*	*42%*	*39%*	*39%*	*40%*	*41%*	*36%*	*36%*	*37%*	*38%*
External Generation & Purchases	***3283***	***3439***	***3702***	***3979***	***4026***	***3984***	***3984***	***4384***	***4381***	***4385***	***4384***
% Power Requirement	*53%*	*54%*	*58%*	*61%*	*61%*	*60%*	*59%*	*64%*	*64%*	*63%*	*62%*

Table 8 summarizes the power flows along LADWP's major transmission paths in this 2008 Ten-Year Transmission Assessment.

Table 8. Flows along Major Transmission Corridors in Study Cases (MW)

Transmission Corridor	Rating	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Pacific DC Intertie (Path 65)	3100	2980	2980	2980	2980	2980	2980	2980	2980	2980	2980	2980
Intermountain DC (Path 27)	1920/2400[4]	1804	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925
East-of-the-Colorado River (Path 49)	8055/9300/10500[5]	5275	5273	5270	5271	5270	5270	5270	5252	5259	5252	5253
West-of-the-Colorado River (Path 46)	10623/11823[6]	5497	5494	5099	5100	5099	5099	5100	5439	5439	5440	5440
Victorville-Lugo 500kV Line 1 (Path 61)	2400	1435	1452	1428	1418	1411	1409	1406	823	822	827	825
LADWP-SCE @ Sylmar (Path 41)	1600	-44	-57	-94	-85	-80	-78	-76	-186	-188	-185	-184
Adelanto-Toluca 500kV Line 1	In excess of 3900[7]	782	823	892	898	905	910	915	976	975	971	975
Adelanto-Rinaldi 500kV Line 1		502	530	573	559	557	554	551	588	591	591	590
Victorville-Rinaldi 500kV Line 1		438	463	504	490	488	486	483	519	521	522	520
Victorville-Century 287kV Line 1		161	158	177	195	198	199	201	241	240	237	238
Victorville-Century 287kV Line 2		161	158	177	195	198	199	201				
Hesperia-Century 287kV Line 1									225	224	221	222

[4] Planned in-service date for Intermountain DC 2400MW (Path 27) upgrade is May 2009
[5] Planned in-service dates for Path 49 upgrade to 9300 MW and to 10500 MW are 2009 and 2010, respectively.
[6] Planned in-service date for Path 46 upgrade to 11823 MW is 2010
[7] SAG Operation Note 87-16, revision 6, dated February 28, 1992, provides operational limits for the corridor in the absence of Hesperia-Century Line 1. When Green Path North Project is placed in service in November 2013, Hesperia-Century Line 1 will be placed in service and Victorville-Century Line 2 will be removed from service. The revised path is currently unrated.

Assessment Results

- **(N-0) or No contingencies.** LADWP system meets the performance requirements of Category A in all base cases.
- **(N-1) Contingencies.** Higher load profiles in this Assessment have advanced the need to mitigate overloading Toluca-Hollywood_E Line 1 (230kV) due to an outage of Toluca-Hollywood_F Line 3 (230kV).

Table 9 shows that the Toluca-Hollywood_E Line 1 (230kV) needs to be reinforced with any immediacy. An outage of Toluca-Hollywood_F Line 3 (230kV) in summer 2013 would likely load its parallel counterpart to 101% of its emergency rating.

Table 9. Critical (N-1) Contingencies

Single Outage	Stressed Line	Loading	Study Year
Toluca-Hollywood_F 230kV Line 3	Toluca-Hollywood_E 230kV Line 1	100%	2012
Toluca-Hollywood_F 230kV Line 3	Toluca-Hollywood_E 230kV Line 1	101%	2013
Toluca-Hollywood_F 230kV Line 3	Toluca-Hollywood_E 230kV Line 1	103%	2014
Toluca-Hollywood_F 230kV Line 3	Toluca-Hollywood_E 230kV Line 1	103%	2015
Toluca-Hollywood_F 230kV Line 3	Toluca-Hollywood_E 230kV Line 1	104%	2016
Toluca-Hollywood_F 230kV Line 3	Toluca-Hollywood_E 230kV Line 1	106%	2017
Toluca-Hollywood_F 230kV Line 3	Toluca-Hollywood_E 230kV Line 1	107%	2018

- **(N-2) Contingencies.**

Table 10 shows only the Northridge-Tarzana Line 3 (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 2009, after RS-J (Northridge) bypass is in-service. Lower load profiles in this study have indeed eliminated near-term concerns of overloading Scattergood-Olympic Line 2 (230kV) and Sylmar-Northridge Line 1(230kV) that was reported in the previous 2006 Ten-Year Assessment.

Table 10. Overloads from (N-2) Contingencies

Double Outage	Overloaded Line	Loading	Study Year
Rinaldi-Tarzana 230kV Lines 1 & 2	Northridge-Tarzana 230kV Line 3	104%	2009
Rinaldi-Tarzana 230kV Lines 1 & 2	Northridge-Tarzana 230kV Line 3	110%	2010
Rinaldi-Tarzana 230kV Lines 1 & 2	Northridge-Tarzana 230kV Line 3	113%	2011
Rinaldi-Tarzana 230kV Lines 1 & 2	Northridge-Tarzana 230kV Line 3	114%	2012
Rinaldi-Tarzana 230kV Lines 1 & 2	Northridge-Tarzana 230kV Line 3	117%	2013
Rinaldi-Tarzana 230kV Lines 1 & 2	Northridge-Tarzana 230kV Line 3	120%	2014
Rinaldi-Tarzana 230kV Lines 1 & 2	Northridge-Tarzana 230kV Line 3	121%	2015
Rinaldi-Tarzana 230kV Lines 1 & 2	Northridge-Tarzana 230kV Line 3	123%	2016
Rinaldi-Tarzana 230kV Lines 1 & 2	Northridge-Tarzana 230kV Line 3	124%	2017
Rinaldi-Tarzana 230kV Lines 1 & 2	Northridge-Tarzana 230kV Line 3	127%	2018

Extreme Events — Station Outage – Impact of Bypassing Toluca and Northridge Stations

Table 11 shows, with the completion of bypass project, an outage of RS-J would not result in any overloaded lines while an outage of RS-E would result in three overloaded transmission lines and an under-voltage condition at RS-H (Hollywood), with each problem being correctible.

Simulation of an Under-Voltage Load Shedding (UVLS) protection system to selectively shed one load bank in the Hollywood area would mitigate under-voltage conditions and overloads in the event of a station outage at RS-E (Toluca).

Table 11. Outcome of Station Outages

<table>
<tr><th>Station Outage</th><th>RS-E and RS-J Bypassed</th><th>Study Year</th></tr>
<tr><td>RS-J (Northridge)</td><td>No Overloaded Lines</td><td rowspan="5">2009</td></tr>
<tr><td rowspan="3">RS-E (Toluca)</td><td>Scattergood-Airport 138kV Lines 1 & 2 @ 113%</td></tr>
<tr><td>Hollywood–Fairfax 138kV Lines 1 & 2 @ 169%</td></tr>
<tr><td>RS-H (Hollywood) Voltage @ 0.741pu</td></tr>
<tr><td>RS-E (Toluca) with
load shedding at RS-H (Hollywood)</td><td>No Overloaded Lines
RS-H (Hollywood) Voltage @ 0.97pu</td></tr>
</table>

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 2008 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 2009 and Winter 2012 were developed from the WECC-approved 2008-09 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 2008 Assessment.

Table 12. Power Flows along Major Southern California Transmission Corridors in Light Winter Study Cases

Transmission Corridor	Rating (MW)	2009	2012
Pacific DC Intertie, *south to north* (Path 65)	3100	1850MW 65%	1850MW 65%
Intermountain DC (Path 27)	1920/2400	1803MW 94% of 1920MW	2406MW 100% of 2400MW
East-of-the-Colorado River (Path 49)	9300/10500	3926MW 42% of 9300MW	3894MW 37% of 10500MW
West-of-the-Colorado River (Path 46)	10623/11823	4719MW 44% of 10623MW	4687MW 40% of 11823MW
Victorville-Lugo 500kV Line 1 (Path 61)	2400	747MW 31%	844MW 35%
LADWP-SCE @ Sylmar (Path 41)	1600	290MW 18%	225MW 14%
Adelanto-Toluca 500kV Line 1 Adelanto-Rinaldi 500kV Line 1 Victorville-Rinaldi 500kV Line 1 Victorville-Century 287kV Line 1 Victorville-Century 287kV Line 2	3900	3021MW 77%	3445MW 88%

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	2009	2012
Central	1171	1210
Southern	176	182
Valley	1037	1071
Total Receiving Station Load	**2384**	**2463**

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	2009	2012
Pumped Storage	1272	-372	-568
Natural Gas	3684	1144	814
Wind (Pine Tree and Pine Canyon)	270	0	25
Hydroelectric	230	160	160
Internal Generation	***5456***	**932**	**431**
% Total Generation	*60%*	27%	13%
Hydroelectric	491	356	356
Wind (Hoffman Summit and MWC)	576	80	425
Solar (Harper Lake and Beacon Solar)	520	0	0
Coal	1625	1625	1625
Nuclear	374	374	374
External Generation	***3586***	**2435**	**2780**
% Total Generation	*40%*	*72%*	*87%*
Total Generation	**9042**	**3367**	**3211**

Finally, Table 15A shows that for the winter conditions studied in 2009 and 2012, LADWP's transmission facilities are expected to operate within their ratings and within their thermal and voltage limits, except for the Toluca 500/230kV Transformer Bank H.

Table 15A. Contingency Analyses Results in Light Winter Study Cases

Double Contingency	Critical Element	2009	2012
Adelanto-Rinaldi 500kV Line 1 Victorville-Rinaldi 500kV Line 1	Toluca 500/230kV Transformer Bank H Toluca 500/230kV Transformer Bank G	96% 86%	109% 98%

The overload occurs in the 2012 is caused by high import from Adelanto/Victorville area with high pumping load. This overload can be operationally mitigated without impacting load serving capability by reducing the import and the pump load.

Table 15B shows no violation when the net import and the pump load reduced by 300 MW**.**

Table 15B. Contingency Analyses Results in 2012 with reduced import

Double Contingency	Critical Element	2012
Adelanto-Rinaldi 500kV Line 1 Victorville-Rinaldi 500kV Line 1	Toluca 500/230kV Transformer Bank H Toluca 500/230kV Transformer Bank G	100% 90%

Table 15C. Comparison of Generation Mix and Intermountain DC Flow (MW)

Resource Type	Capacity	2012 High Import	2012 Reduced Import
Pumped Storage	1272	-568	-116
Natural Gas + Wind + Hydroelectric	4184	1014	1014
Internal Generation	***5456***	**431**	**883**
% Total Generation	*60%*	14%	26%
External Generation	***3586***	**2780**	**2480**
% Total Generation	*40%*	*87%*	*74%*
Total Generation	**9042**	**3211**	**3363**
Intermountain DC Transfer	**2400**	**2406**	**2220**

Stability. Each of the heavy summer cases and light winter study cases described in this 2008 Assessment was tested for transient and post-transient performance under the various 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

Resolve potential overloads, 2009 onward, on Northridge-Tarzana Line 3 (230kV) due to loss of two Rinaldi-Tarzana lines.

Either of the following recommendations should be considered:

- *Increase Capacity of Northridge-Tarzana Line 3 (230kV) to mitigate an overload due to loss of Rinaldi-Tarzana Lines 1 & 2 (230kV).* Increasing the amperage is a long-term solution and the most direct means of addressing overloads on Northridge-Tarzana Line 3 (230kV), but the work required due to the tower configuration and the cost of the work may favor adopting an interim strategy.

- *Implement Load Shedding Program in RS-U (Tarzana) when Rinaldi-Tarzana Lines 1 & 2 (230kV) are lost.* Within a short planning horizon from 2009 to 2011, it is estimated that a range of 39MW to 108MW should be sufficient to mitigate overloading Northridge-Tarzana Line 3 (230kV) in the event of the double contingency outage. This should be considered a fallback option to increasing the rating of Northridge-Tarzana Line 3 (230kV).

Resolve potential overloads in 2013 on Toluca-Hollywood_E Line 1 due to loss of Toluca-Hollywood_F Line 3.

- *Increase Capacity of Toluca-Hollywood_E Line 1 (230kV) to mitigate loss of Toluca-Hollywood_F Line 3 (230kV).* Increasing the amperage of the underground section of Toluca-Hollywood_E Line 1 (230kV) from Nichols Canyon to Hollywood is a long-term solution and the most direct means of addressing this issue.

Resolve Under-Voltage issue, although not required under TPL-004-1, 2009 onward at RS-H (Hollywood) due to loss of entire station, RS-E (Toluca).

- *Implement a Under Voltage Load Shedding (UVLS) Program.* An UVLS program is essential in the Hollywood area. Partial load shedding should mitigate under-voltage concerns in the event of an outage of RS-E (Toluca).

Resolve potential overloads, under light load conditions, on Toluca 500/230kV Transformer Bank H due to loss of Victorville-Rinaldi and Adelanto-Rinaldi 500kV Lines.

- *Monitor and maintain the import level from Arizona/Nevada/Utah to LA system to a safe level.*

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