

## I INTRODUCTION AND PURPOSE

The Los Angeles Department of Water and Power (LADWP) is currently facing some of the most serious environmental, regulatory, and economic challenges in its 100-year plus history. LADWP now finds itself at a crossroads in terms of how the utility operates that will require revamping its power generation portfolio to continue providing the same reliable, low-cost electricity to the residents and businesses of Los Angeles for the next 100 years. As the largest municipally owned utility in the nation, LADWP must continue to ensure reliable electricity service as it reduces greenhouse gas (GHG) emissions and transitions from energy sources based on fossil fuels to sustainable forms of renewable energy.

This 2010 Power Integrated Resources Plan (IRP) provides a 20-year framework to ensure LADWP will meet the future energy needs of its ratepayers. Through an IRP, utilities forecast the demand for energy and determine how that demand will be met. This 2010 IRP is guided by the following key objectives:

- Maintain a high level of electric service reliability
- Maintain competitive rates
- Exercise environmental stewardship.

In balancing these key objectives, LADWP's integrated resource planning efforts must be deliberate, comprehensive, and clear to our ratepayers as well as all other City stakeholders. LADWP's goal—and primary challenge—is to develop a long-term resource plan that is informative, sensitive to the local and regional economy, and adaptable to changes in state and federal regulations, fuel prices, and advances in power generation technologies.

This 2010 IRP is a high-level plan that establishes the overall strategic course of the Power System over the next 20 years and provides the necessary flexibility to adjust to changes in the system. This plan sets forth various initiatives requiring steady progress to ensure the availability of the greatest number of options at each step, while avoiding costly delays, setbacks, and rate impacts.

This IRP presents several potential strategies for meeting LADWP's regulatory requirements and policy objectives for increasing renewable energy generation and reducing GHG emissions, maintaining electric power service reliability, and minimizing any financial impact on ratepayers. LADWP rigorously evaluated each potential strategy to identify and recommend the best overall plan to meet its key objectives at the least cost.

Reducing GHG emissions while increasing generation from renewable resources is one of this IRP's key objectives. LADWP will increase procurement of renewable resources significantly over the next several years. Initiatives in energy efficiency (EE) and the implementation of demand-side resources (DSR) will help ensure LADWP meets its environmental policy objectives and regulatory requirements.

To ensure a minimal effect on energy rates, this IRP outlines anticipated capital, operations, and maintenance expenditures for each potential strategy. All strategies are analyzed and compared to ensure LADWP identifies how to achieve key IRP objectives at the least cost.

This plan also strives to maintain a high level of electric service reliability. To ensure reliability, LADWP recommends replacing portions of its aging transmission and distribution infrastructure along with re-powering several units of its natural gas-fired generation fleet. Furthermore, the integration of intermittent renewable resources like wind and solar poses significant challenges. The siting of intermittent renewable resources over a wide geographic region, together with incorporating a variety of generation technologies into LADWP's resource mix, contribute to system reliability and is a strength of this IRP.

## II PUBLIC OUTREACH

To ensure that this 2010 IRP accurately reflects the needs of the City of Los Angeles and all of its various stakeholders, a public review process was conducted to encourage public participation and solicit feedback from the community. LADWP's community outreach program, through a series of public workshops held at various venues throughout Los Angeles, allowed community members to provide valuable input and direction during the development of this IRP. Additionally, LADWP conducted a series of stakeholder meetings with participants, including representatives from neighborhood councils, environmental interests, and local businesses.

LADWP's IRP public outreach program was designed to

- Educate and create awareness of the 2010 IRP process and goals.
- Communicate strategies for reducing carbon emissions, integrating renewable energy to meet various policy goals and regulatory requirements, and maintaining reliability and competitive electricity rates.
- Receive public input to help shape the various strategies under consideration.

LADWP also made the Draft 2010 IRP available to the public on a dedicated website, [www.lapowerplan.org](http://www.lapowerplan.org). This website included interactive features designed to gather additional public comments. All comments received from the public workshops and website were carefully considered during development of this Final 2010 IRP.

Several themes emerged from the comments and ideas LADWP received from its public outreach program (presented below). More details on each theme are provided within this IRP document.

- LADWP should emphasize a variety of energy resources.
  - LADWP is including 160 MW of generic renewable resources that could include biomass, ocean tidal, and other emerging technologies in this IRP.
  - LADWP will also continue to seek a diversified energy mix and diversify its portfolio regionally to enhance system reliability.
- LADWP should maximize energy efficiency and conservation.
  - LADWP is recommending increasing energy efficiency to achieve at least a seven percent reduction of total load by 2020. Prior to 2010, LADWP was achieving a three percent load reduction through energy efficiency initiatives. Next year, LADWP will conclude a study on implementing various energy efficiency technologies and initiatives. The results of this study will be addressed in future IRPs.

- LADWP is recommending 500 MW of Demand Response (DR) programs to control and shift load during peak hours. Tactical plans will be developed that may utilize smart grid technology, incentives, and rate structuring to meet this objective.
- LADWP should eliminate coal from its generation portfolio.
  - LADWP is recommending a policy action to replace the Navajo Generating Station by 2014—four years ahead of the date mandated by Senate Bill (SB)1368. The Intermountain Power Project (IPP) is modeled in this IRP through 2027, but LADWP is open to a mutually agreeable early compliance plan between the project participants that preserves the site and transmission for clean fossil and renewable generation.
  - LADWP is currently 22 percent below 1990 levels of GHG emissions and is planning further emissions reductions.
- LADWP should increase local solar generation.
  - LADWP is recommending a policy action to allow approximately 40-50 percent of its solar resources be sited locally through initiatives including the Solar Incentive Program, feed-in tariffs, and installation of solar on City-owned properties. LADWP recommends this as a balanced approach between the benefits of local solar and the benefits of large, controllable solar projects connected to LADWP's transmission lines. The actual percentage will vary based on the success of the local programs.
- LADWP should avoid adverse impacts to vulnerable communities.
  - LADWP will continue to provide reduced low-income electric rates.
  - LADWP will develop plans that address energy efficiency deployment and other incentive programs that effectively reach out to low-income communities that may help mitigate impacts of future rate increases.
  - Local geographic diversity is critical to maintain high reliability of the electric grid, and LADWP will continue this policy so that no single community will experience an inequitable share of impacts from energy facilities.
- LADWP should clarify costs of IRP implementation and potential impacts to ratepayers
  - LADWP will incorporate a detailed financial analysis into the IRP development process to identify the costs of various planning alternatives and recommendations using computer modeling software.

- LADWP should reduce environmental impacts
  - To minimize environmental impacts, LADWP will maximize the use of existing transmission and facility infrastructure to generate and deliver energy. All projects will have the proper environmental review and impacts on the environment will be mitigated as necessary.
- LADWP should lead by example, proactively engage the public, and increase transparency.
  - LADWP will develop plans to better educate ratepayers on progress related to this IRP (e.g. energy efficiency) and will continue the IRP process of biannual updates to provide transparency on its long-term goals.
  - LADWP will improve its system operations and run its power grid as efficiently as possible. LADWP is completing a study on how it can increase the efficiency of the power delivery grid through advanced reliability improvements.
  - This 2010 IRP sets forth LADWP's long-term plans and objectives, clarifying implementation of various initiatives and their potential impacts on ratepayers. A discussion of rate impact is included in Section 5.4 of this IRP

### III ACCOMPLISHMENTS TO DATE

A summary of LADWP's accomplishments in achieving its key objectives of reliability, competitive rates, and environmental stewardship is provided below.

#### Reliability

- Power Reliability Program (PRP)
  - The PRP is a comprehensive, long-term power reliability program developed by LADWP to replace aging distribution infrastructure. Through this program, LADWP is accelerating the replacement of transformers, poles, underground cables, underground vaults, station transformers, and distribution and receiving stations. LADWP is also installing new control, integrated central monitoring and dispatch systems needed to facilitate reliable and secure system operations.
- Re-powering Haynes Generating Station units 3 and 4 and all units of Valley Generating Station
  - In 2003 and 2005, two combined cycle generating units were installed, one at Valley Generating Station and the other at Haynes Generating Station, to replace older, inefficient, and less reliable gas fired units. The new units are 30 percent to 40 percent more efficient, and produce 30 percent to 40 percent fewer emissions. Additionally, Valley Generating Station now uses reclaimed water for cooling. These combined cycle generating units also have a shorter start-up time and increased ramp rates to respond to load changes for improved reliability over the older units.
- Castaic
  - The seven units of the Castaic Pumped-Storage Hydroelectric Plant are currently being rotated out of service for modernization. This multi-phase process, initiated in 2004, is expected to be completed in 2013. To date, modernization of five units has been completed. The associated increase in efficiency is projected to add 80 MW of renewable qualifying capacity to Castaic. The increased capacity also results in more reserves available to reliably meet peak system demands.
- Sylmar Converter Station
  - LADWP replaced aging transformers, removed hazardous materials, and installed new technology on this high-voltage direct-current facility to provide continuously reliable transmission capacity to access low cost hydro and renewable energy available from the Pacific Northwest.

- Combustion Turbines installed at Harbor and Valley Generating Station
  - Six natural gas combustion turbine “peaker” units totaling 280 MW have been installed in the Los Angeles area. These quick-start peaking units are used to provide reliable sources of electricity during periods of peak demand. Five of the units are located at Harbor Generating Station, and one unit is located at Valley Generating Station.
- NOx reduction of In-basin Units
  - Selective Catalytic Reduction (SCR) equipment to reduce NOx emissions has been installed on all natural gas-fired generating units in the Los Angeles area. The SCR installations resulted in a 90% reduction in NOx emissions since 1989.

### Environmental Stewardship

- Renewable Portfolio Standard
  - Through the active procurement of energy from renewable resources, LADWP has increased its energy mix from 3 percent renewables in 2003 to an expected 20 percent in 2010.
- Energy efficiency
  - LADWP continued its commitment to reduce demand through numerous programs encouraging customer energy efficiency and the installation of energy efficiency equipment. Since 2000, LADWP’s energy efficiency programs have reduced average peak demand by 270 MW, providing over 890 GWh of energy savings.
- Emissions reductions
  - LADWP has reduced its CO<sub>2</sub> emissions from power generation, achieving a 22 percent reduction from 1990 levels through the sale of Colstrip Generating Station and partial sale of Mojave Generation Station. Mojave Generating Station is now removed from service.
- Once-through cooling (OTC)
  - LADWP has reduced the use of once-through ocean water cooling 17 percent in its in-basin generation fleet. The current plan calls for a complete phase-out of ocean water cooling.

- Solar Incentive Program
  - LADWP encouraged the installation of over 22 MW of solar at over 2,700 customer locations through its ratepayer-funded Solar Incentive Program.
- Upgraded capacity on the Southern Transmission System (STS)
  - Five-hundred MW of additional capacity was added to the existing transmission line from Utah, allowing LADWP to increase procurement of renewable energy.
- Green Power Program
  - LADWP offers its customers an opportunity to participate in a Green Power Program (GPP). “Green Power” is produced from renewable resources such as wind energy and geothermal, rather than fossil-fueled or nuclear generating plants. Over 18,995 LADWP customers participated in the program in 2009. These participants increased LADWP’s procurement of renewable energy by 90,000 MWh annually. This number is expected to increase to approximately 100,000 MWh by 2016.

## IV CHALLENGES AND CRITICAL ISSUES

LADWP faces major uncertainties in terms of legislative mandates, particularly those pertaining to reduction of GHG emissions and the amount of renewable energy that must be procured and integrated into its energy mix. At the same time, LADWP's generation portfolio contains a number of older, natural gas-fired generating units that are nearing the end of their service lives and are in need of replacement.

Following are the key issues and challenges addressed in this 2010 IRP.

### Ensuring Reliability

LADWP will continue to maintain its historically high level of electric power service reliability. LADWP faces several challenges, including replacement of its aging generating facilities and transmission infrastructure.

This 2010 IRP reflects LADWP's long-standing policy of remaining a vertically integrated utility with control over its own generation, transmission, and distribution capacity. This has proven to be a successful strategy in ensuring reliability—especially during periods of volatility in the energy markets. Such conditions occurred in California at the beginning of this decade, and LADWP remained relatively insulated. This 2010 IRP calls for LADWP to continue this strategy.

LADWP's generating units sited within the Los Angeles Basin were primarily built in the late 1950s and early 1960s. While these units have undergone extensive upgrades, they are approaching the end of their service lives. Re-powering of these units began in 1994, and refurbishment is approximately one-third complete. Re-powered units will be substantially cleaner, more efficient, and more reliable than the units they are replacing. Furthermore, re-powering LADWP's gas-fired units will also assist in integrating intermittent renewable resources into LADWP's energy mix by providing quick-response, back-up generation

The procurement of significant amounts of intermittent renewable energy poses the challenge of integrating those resources into LADWP's energy mix. While research is underway to develop energy storage technologies such as batteries and compressed air systems, LADWP will primarily use the Castaic Pumped-storage Hydroelectric Plant in conjunction with its gas-fired generation fleet to integrate its intermittent renewable resources.

Further studies are required to determine maximum levels of intermittent energy resources that can be integrated reliably and the investments necessary to support the power grid and necessary information system.

### Environmental Policies and Regulations

- Local air quality mandates

The South Coast Air Quality Management District (SCAQMD) issued a Stipulated Order for Abatement in 2000 that required LADWP to reduce local air emissions through re-powering its less efficient in-basin generating facilities. Haynes units 5 and 6 and Scattergood unit 3 must be re-powered by 2013 and 2015, respectively.

- Once-through cooling

Once-through cooling (OTC) is the process of drawing water from a river, lake, or ocean, pumping it through a generating station's cooling system, and discharging it back to the original body of water. Dry cooling will be used on all re-powered units included in this IRP. Compliance strategies that do not include re-powering with dry cooling will severely impact the reliability of the power system.

### GHG Emissions

- Assembly Bill (AB) 32, the California Global Warming Solutions Act of 2006, calls for reducing the state's GHG emissions to 1990 levels by 2020. Although the regulation and implementation process is still being determined, compliance may be in the form of emissions credits, or allowances, that LADWP would need to purchase at market prices to achieve a specific emissions cap. Additionally, specific targets for renewable energy may be required. As noted earlier, LADWP has already achieved a 22% reduction in CO<sub>2</sub> emissions levels from 1990.
- SB 1368, the California Greenhouse Gas Emissions Performance Standard Act, also enacted in 2006, prohibits LADWP and other California utilities from importing new power that exceeds the GHG emissions performance standard. The GHG emissions level must be equal, or below, that of a gas-fired combined cycle units (i.e., 1,100 lbs. per MWh). This standard also applies to existing power plants for any life extension investments or contractual extensions.

LADWP has historically relied upon coal for base load generation. The two LADWP plants affected are the Navajo Generating Station in Arizona and IPP in Utah. The Navajo plant contract expires in 2019 while the IPP contract is in effect until 2027.

- At the federal level, various bills have been introduced, such as the Waxman-Markey American Clean Energy and Security Act (HR 2454) and the Kerry-Lieberman American Power Act that address GHG emissions. A future federal regulatory program to address GHG emissions—if and when adopted—can potentially supersede any state program.
- The U.S. Environmental Protection Agency (EPA) has recently taken steps toward regulating GHG emissions under authority of the current Clean Air Act.

### Renewable Energy

- The LADWP Board of Commissioners has adopted a policy to achieve 20 percent renewables by 2010, and 35 percent by 2020. The Board and City Council have approved projects and long-term power purchase agreements to achieve the 20 percent RPS goal by the end of 2010.
- The California Air Resources Board (CARB) approved regulations which will subject all utilities to a new Renewable Energy Standard (RES) of 33 percent by 2020, including the following interim targets:
  - Maintain at least 20 percent renewables between 2012 and 2014
  - Maintain 24 percent renewables between 2014 and 2017
  - Maintain 28 percent renewables between 2018 and 2019
  - Achieve 33 percent renewables by 2020 and maintain this level thereafter.

The regulations were adopted by the Air Resources Board in September 2010 and will go into effect in early 2011. The regulations provide the full authority of CARB to issue significant penalties for failure to achieve the targets.

### Competitive energy rates

While LADWP provides electricity at competitively low rates, several factors challenge the current rate structure. These factors include the volatility of natural gas and coal prices, the costs required to replace the aging portions of the Power System infrastructure, and new regulatory requirements such as the elimination of once-through cooling for several LADWP generating stations. Furthermore, the acquisition and integration of renewable energy resources along with the required transmission capacity upgrades will potentially exert upward pressure on energy rates. Because of these initiatives, it is expected that structural rate adjustments and amendments to the Energy Cost Adjustment Factor (ECAAF) will be necessary to maintain appropriate debt ratios and bond ratings. Balancing the needs of reliability and environmental stewardship with efforts to maintain competitive rates will be an on-going challenge and goal of LADWP.

## V STRATEGIES AND RECOMMENDATIONS

LADWP's recommended strategy set forth in this IRP for meeting its key objectives can be separated into two areas: regulatory and reliability initiatives and strategic initiatives. Regulatory and reliability initiatives ensure system reliability and compliance with regulatory and legislative mandates. Strategic initiatives achieve objectives established by the LADWP Board of Water and Power Commissioners and the Los Angeles City Council and reflect their vision and leadership. These mandates include, for example, establishment of LADWP's RPS, early compliance with SB 1368, and investing in local solar. The recommended strategy also reflects feedback from LADWP's community outreach efforts.

### Regulatory and Reliability Initiatives

- Power Reliability Program (PRP) and system infrastructure investment  
LADWP must continue to invest in replacing aging transmission and distribution infrastructure in a systematic and sustained manner to ensure system reliability, especially during significant weather events. The PRP has a core level of investment included in the current financial plan to meet the following objectives: (1) Replace assets in-line with equipment life cycles, but focusing on the worst performing equipment first, (2) fix known problem areas, and (3) invest in equipment to satisfy local and regional load demands.
- Re-powering  
LADWP will continue to re-power older, gas-fired generating units at Haynes Generating Station and Scattergood Generating Station for the reasons discussed previously. These, and future re-powering projects, will mitigate the need for once-through ocean cooling.
- Demand Side Resources (DSR)  
LADWP must procure sufficient resources to meet load growth and maintain system reliability. Along with augmenting its generation portfolio, LADWP will implement Demand Response (DR) and energy efficiency (EE) measures to reduce energy demand. DR and EE programs are not only crucial for meeting customer load growth, they also represent the most cost-effective strategy for reducing GHG emissions, since the cleanest kilowatt-hour any utility can produce is one that is never generated.
- Load Growth  
DR and EE alone cannot meet projected load growth, and new gas-fired generation is necessary.
- SB 1368 Compliance  
Navajo and IPP must be compliant with the mandates established in SB 1368 by 2019 and 2027, respectively. IRP modeling determined that these units will be replaced with a combination of DR, EE, renewable energy, and conventional gas-fired generation.

- Castaic FERC Re-licensing Program

LADWP and the Department of Water Resources (DWR) hold a joint co-license to operate the Castaic Pumped-storage Hydroelectric Plant. This license is set to expire in 2022. Both parties have initiated the joint re-licensing process, which will include completing preliminary studies, negotiating contracts, and preparing a filing strategy.

### Strategic Initiatives

- RPS Percentage

LADWP recommends a steady and continuous effort until 2020 to achieve an RPS of 33 percent renewables comprised of a diverse mix of renewable resources sited over a wide geographical region. Since wind and solar resources are intermittent and production depends on weather conditions, regional diversity will be important for ensuring a balanced and dependable energy supply. Legislation has been introduced twice to achieve a state-wide RPS of 33 percent and failed to pass—not because of the RPS percentage—but for technical requirements included in the legislation that limited compliance options. Additionally, CARB has currently approved a regulation to require 33 percent renewables as per the Governor’s Executive Order, which will be reviewed by the Office of Administrative Law before it is finalized in early 2011. LADWP is including this as an optional policy action only in that this rule has not been finalized and near-term elections could alter the rule and its final approval. LADWP heard very clearly from the public outreach workshops that investments must be made with our customer’s costs in mind. LADWP staff is recommending 33 percent renewables instead of the current Board-approved policy of 35 percent, which was established in 2008. This will reduce capital expenditures by up to \$2.4 billion over the next 20 years.

The current financial plan has no provision for LADWP to replace expiring short-term RPS contracts. Without replacing expiring contracts, LADWP projects the generation from renewables will drop from the current level of 20 percent to 13 percent in 2015. The ramp from 13 percent to 33 percent in five years is enormous and not prudent from an engineering, cost, technology, or integration standpoint. Additionally, the CARB regulation will require interim milestones to achieve 20 percent in 2012, 24 percent in 2015, 28 percent in 2018, and 33 percent in 2020. LADWP recommends that investments be made in long-term projects to maintain the RPS percentage at approximately 20 percent between 2010 and 2014.

- Early Compliance with SB 1368

Comments from the public workshops indicated the desire to comply with SB 1368 as early as possible. Navajo must be compliant with SB 1368 by 2019. LADWP recommends divestment from Navajo by 2014. This will reduce LADWP's GHG emissions by 10.5 million metric tons and add about \$350 million in capital investment.

LADWP recommends modeling and planning for IPP to be compliant with SB 1368 by 2027. However, LADWP will continue to evaluate options in future IRPs. LADWP will continue to work with the Intermountain Power Agency (IPA) Board and the other participants to secure IPP as a renewable energy hub and provide replacement generation compliant with SB 1368. LADWP recommends no change in IPP until 2027 at which time the site would be reconfigured, providing LADWP with firm transmission capacity for potential renewable projects.

- Local Solar

Comments received at the public workshops indicate local solar development should be a priority in LADWP's renewables procurement strategy. LADWP is recommending a policy action to allow approximately 40-50 percent of its solar resources be sited locally through initiatives including the Solar Incentive Program, feed-in tariffs, and installation of solar on City-owned properties. Local solar costs an estimated additional \$50/MWh over utility-scale solar located outside the Los Angeles Basin, estimated to cost \$150/MWh, primarily due to economies of scale and about 30% better solar insolation.

- Advanced Reliability Improvements

LADWP is looking ahead to technologies that will enhance the reliability of its system, including smart grid technologies, enhanced information systems, automation of system functions, and advanced methods of outage management. These advanced system enhancements are recommended from a planning perspective to not only increase reliability, but also to better integrate local generation such as solar into the distribution network, enable smart charging of electric vehicles, and advance demand-side management technologies.

Table ES-1 illustrates the reliability, regulatory, and strategic investments included in this 2010 IRP.

**Table ES-1: 2011-2020 Investments**

<b>ACTION</b>	<b>INVESTMENT</b>
<b>Power Reliability</b>	<b>\$11 billion</b>
<b>Modernize Power Plants</b>	<b>\$1.4 billion</b>
<b>Transition from Coal (Navajo GS)</b>	<b>\$0.3 billion</b>
<b>Increasing Renewable Energy (includes cost of additional transmission)</b>	<b>\$7 billion</b>
<b>Expand Local Solar</b>	<b>\$1.2 billion</b>
<b>Increasing Energy Efficiency</b>	<b>\$1.2 billion</b>
<b>Smart Grid Investments</b>	<b>\$1 billion</b>
<b>SUB TOTAL</b>	<b>\$23 billion</b>
<b>Basic Generation, Transmission and Distribution</b>	<b>\$22 billion</b>
<b>TOTAL</b>	<b>\$45 billion</b>

Regulatory and Reliability Investments

Regulatory investments are investments needed to comply with various regulatory requirements, including eliminating once-through ocean cooling, reducing GHG emissions, and re-licensing certain power plants. Reliability investments are investments needed to maintain, refurbish, or replace aging infrastructure. These investments include pole, cable, and transformer replacements in addition to various initiatives established to ensure system reliability.

Strategic Investments

Strategic investments include procurement of additional renewable generation resources and associated transmission and early compliance with certain GHG emissions regulations. These investments would ensure LADWP is well positioned to implement various environmental policy objectives.

### Strategic Case Options

The Draft 2010 IRP originally presented six strategic alternatives (or case options) to help evaluate the strategies and associated costs for meeting LADWP's key objectives. The six cases vary by two main factors: the amount and mix of renewable energy resources (RPS Strategy), and the timeframe for complying with SB 1368 (GHG Reduction Focus).

- Amount of Renewables—Solar and Wind Strategies

This IRP studied different renewable energy mixes needed to achieve 35 percent renewables by 2020. For comparison purposes, cases setting a goal of 20 percent renewables by 2020 were also developed. Through initial screening, LADWP determined the renewable energy mix for each strategic case must include a certain and consistent amount of base load geothermal energy to ensure system reliability. Based on projected cost, resource availability, resource diversity requirements, and geographic diversity requirements, LADWP narrowed the list of potential strategic cases to two: one emphasizing solar resources, and the other emphasizing wind resources. These two strategic cases are referred to as the *RPS Solar Strategy* and *RPS Wind Strategy*, respectively.

- Accelerated GHG Reduction

The second key factor in developing the strategic alternatives was whether LADWP should accelerate GHG reduction. The strategies that assumed accelerated compliance are referred to as “GHG Reduction Focus” strategies.

- Base Case

The base case assumes that existing RPS contracts will not be replaced when they expire. This case represents a minimum expenditure level.

- Recommended Case Option

After consideration of various factors, including comments received during the public outreach process, a Recommended Case was developed. The Recommended Case includes all required and regulatory actions.

Table ES-2 summarizes each strategic case.

**Table ES-2: Resource strategy summary matrix**

Case ID	Resource Strategy	2020 RPS Target	GHG or SB1368 Compliance Date	New Renewable Capacity (MW) 2011-2030			
				Geothermal	Wind <sup>1</sup>	Solar	Generic
Base	Required Actions Only	13%	2027	0	100	130	0
A	20% RPS Strategy	20%	2027	160	250	660	0
B	20% RPS Strategy – GHG Reduction Focus	20%	2020	160	250	660	0
C	35% RPS Wind Strategy - GHG Reduction Focus	35%	2020	320	1,300	660	0
D	35% RPS Wind Strategy	35%	2027	320	1,300	660	0
E	35% RPS Solar Strategy - GHG Reduction Focus	35%	2020	320	850	1,560	0
F	35% RPS Solar Strategy	35%	2027	320	850	1,560	0
Recommended Case	33% RPS	33%	IPP 2027 Navajo 2014	320	680	970	160

1. Adds Milford II

## VI EVALUATION OF STRATEGIC CASE OPTIONS

Key assumptions were made when establishing and analyzing each strategic case option:

- EE/DR penetration
- Future energy demand
- Natural gas prices
- GHG emissions allowance prices.

Specific values used over the 20-year planning horizon for these assumptions are presented in Section 3 of this IRP.

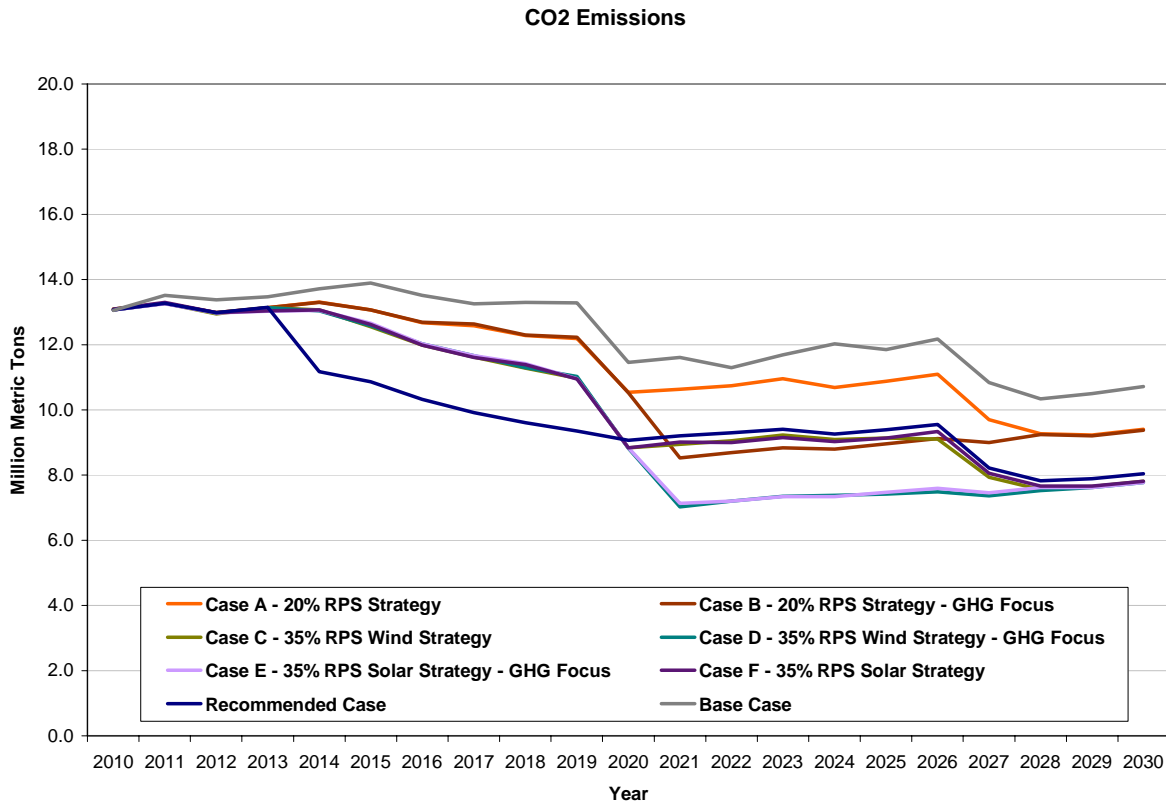
Through rigorous analysis, this IRP assessed the reliability, economic impacts, and GHG reduction benefits of LADWP's alternative resource strategies. Production cost modeling was utilized to simulate LADWP's Power System operations under different scenarios with different generation resource portfolios. The production model evaluated each case over the IRP's 20-year planning horizon.

### Reliability

Each case assumes an integrated strategy of renewables and the necessary infrastructure to ensure a reliable system. Quick response gas-fired generation along with customer DSR programs were added to maintain acceptable reliability levels, ensuring all case options have acceptable levels of reliability and conform to national reliability standards.

### GHG Analysis

Projected GHG emissions for each strategic case were modeled and are presented in Figure ES-1.



**Figure ES-1: Projected GHG emissions for each strategic case**

Financial Analysis

Financial analysis involves modeling each strategic case, accounting for their respective fuel expenses, purchased power expenses, and additional capital and O&M expenses. In order to ensure LADWP minimizes its financing costs, constraints are placed on several financial metrics. These constraints include maintaining debt service coverage of 2.25, adjusted debt service coverage of 1.75, full obligation coverage of 1.40, and a capitalization ratio not exceeding 60 percent. LADWP subsequently evaluated each strategic case and determined the rate adjustments required to satisfy these constraints.

LADWP retail revenue stems from three billing factors: (1) base rate, (2) energy cost adjustment (ECA), and (3) reliability cost adjustment (RCA) factors.

The ECA is used to cover fuel, purchased power, and RPS and energy efficiency-related expenses.

The RCA is used to cover power reliability related expenses.

The base rate is traditionally used to cover non-fuel, non-purchased power, and non-renewables related expenses.

Figure ES-2 shows the annual bulk power cost forecasted for each strategic case, including the Recommended Case.

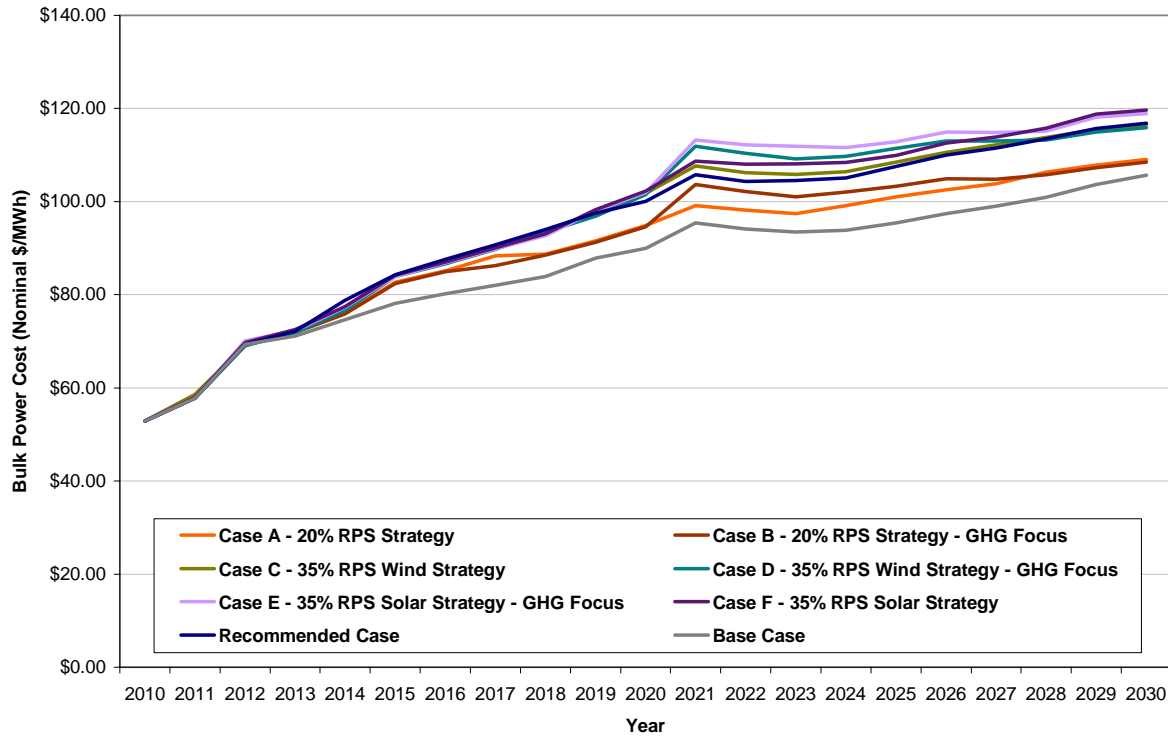


Figure ES-2: NPV of bulk power costs for each strategic case

The retail electric rates for all eight cases are shown on Figure ES-3 below. The retail rates incorporate all three billing factors discussed above. Factors driving the increases over the twenty-year period are: rising fuel price, increased power reliability program spending, replacement of aging basin generating units to meet South Coast Air Quality District emission requirements, replacement of coal generation to lower CO<sub>2</sub> emissions, installation of renewables generation according to legislative mandates, and payment for emission allowances due anticipated CO<sub>2</sub> cap-and-trade program requirements.

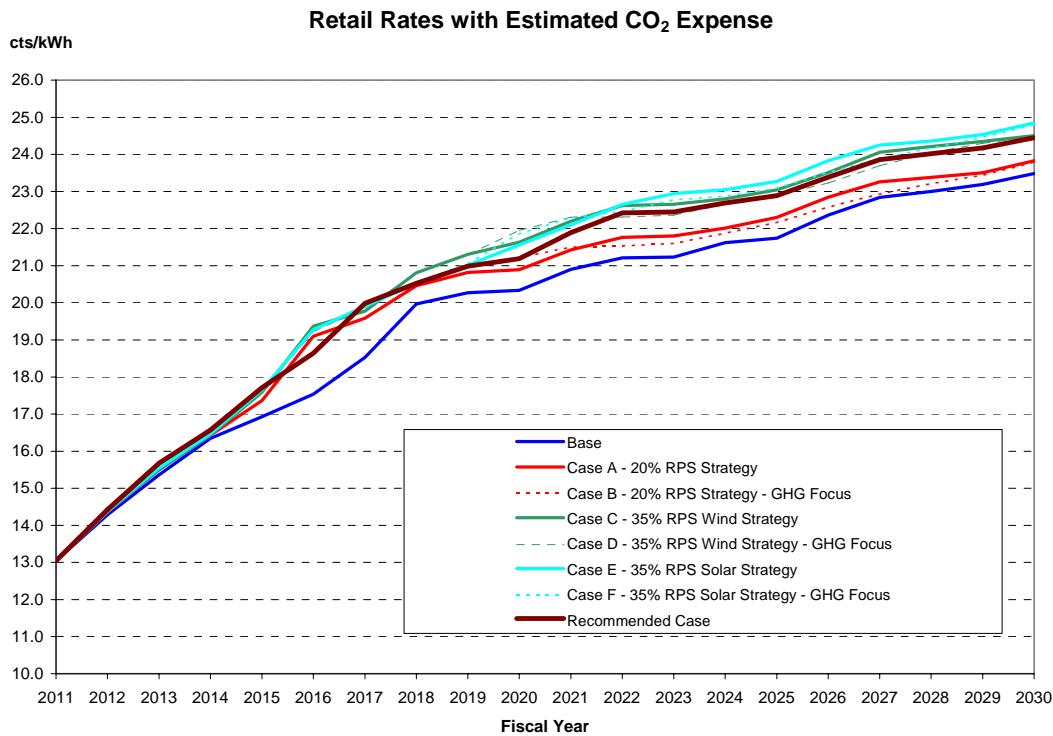


Figure ES-3: Electric rate impact for each strategic case (in nominal dollars)

Sensitivity Analyses on the Recommended Case

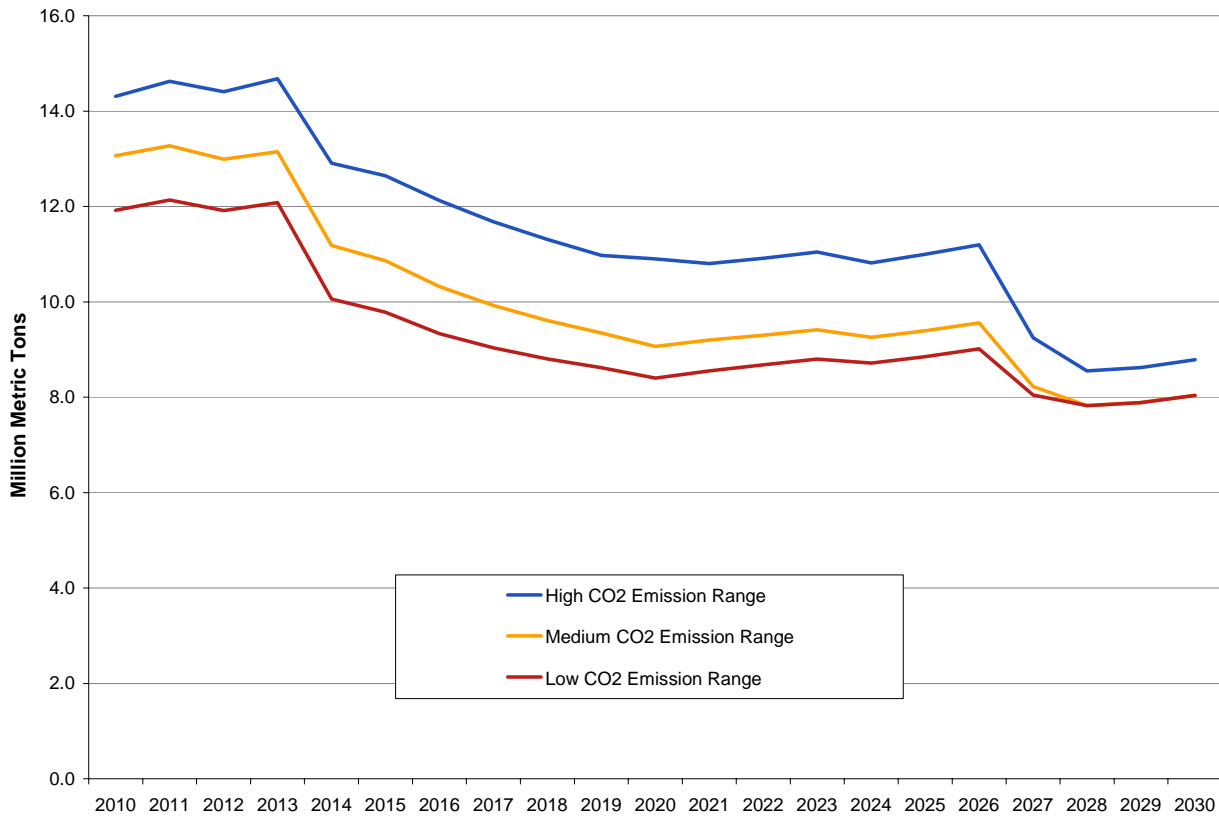
Assumptions used to model effects on CO<sub>2</sub> emissions and retail rates can change. In order to reflect the variability in model assumptions, a sensitivity analysis was performed to determine a realistic range of CO<sub>2</sub> emissions and rate impact trajectories for the Recommended Case.

Figure ES-4 shows the possible high and low range of CO<sub>2</sub> emissions in the study period for the Recommended Case. The high CO<sub>2</sub> emissions scenario analysis assumes

- Lower penetrations of energy efficiency programs
- High penetrations of plug-in hybrid electric vehicles

Conversely, the low CO<sub>2</sub> emissions scenario assumes

- Aggressive use of energy efficiency programs
- Low penetrations of plug-in hybrid electric vehicles



**Figure ES-4: Recommended Case CO<sub>2</sub> Emission Scenarios**

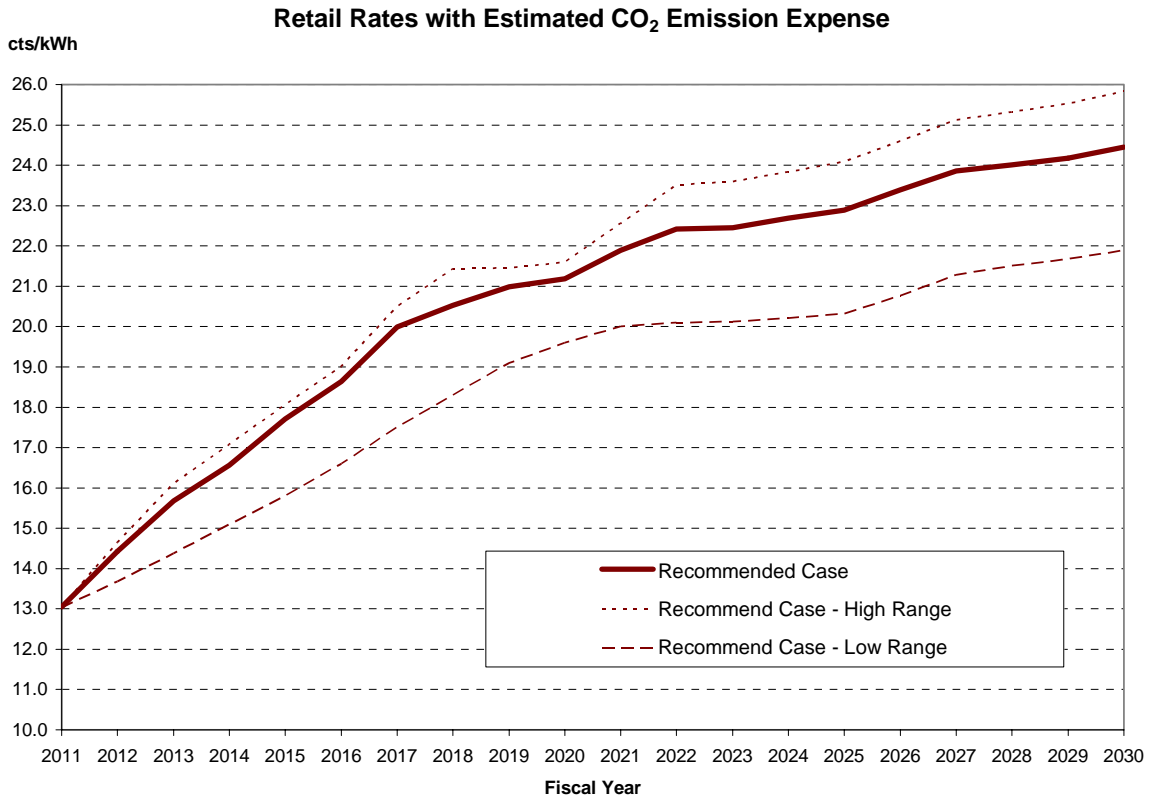
Figure ES-5 shows retail prices of the Recommended Case bounded by a high and low range. Electric rates are expected to rise between 5 percent and 8 percent over the next five years and between 2.8 percent and 3.7 percent over the next twenty years.

The high range assumes

- Higher natural gas prices
- Higher CO<sub>2</sub> costs.

The low range assumes

- CO<sub>2</sub> costs fall to zero
- Energy efficiency costs diminish
- Lower natural gas prices
- The Power Reliability Program is implemented at the lowest possible level
- Policy changes regarding financial metrics are enacted by the Board of Water and Power Commissioners.



**Figure ES-5: Retail price impact of the Recommended Case bounded by high and low range**

## VII SUMMARY

The IRP is one element of an overall LADWP Strategic Plan that identifies LADWP's strategic mission, values, and goals. The IRP is the plan to ensure that necessary investments are made in a timely manner to keep LADWP's system reliable through the best mix of generation resources to meet demand from a fully integrated system perspective. This IRP works with companion plans such as the Power Reliability Program plan, the 10-year Transmission Plan, and other tactical plans to fulfill the requirements of the Strategic Plan.

Beyond the basic generation, transmission, and distribution investments required under the IRP, the main drivers of further rate increases come predominately from investments in the electric infrastructure through the Power Reliability Program, investments in renewable energy sources to achieve the recommended RPS level of 33% by 2020, investments in energy efficiency and demand reduction, and funding for local solar programs. These investments will result in a more reliable electric system, greater diversity in the generation supply, substantial reductions in GHG, and will encourage job growth in the local economy.

Some elements of the plan will take five to ten years to implement. It is important to commit to a direction so that critical time and resources are not lost. Subsequent IRPs will refine the direction as additional information becomes available. The recommended plan allows for flexibility to incorporate necessary adjustments over time. It is also important to set a steady course and pace to allow for reasoned and deliberate action by LADWP staff, Board, or City Council to avoid situations leading to unfavorable pricing or rate impacts. The IRP implementation must be viable from a technical and financial perspective to best balance all the priorities of reliability, environmental stewardship, and cost.

This 2010 IRP identifies actions that are central to the continued reliability of LADWP's Power System, and will occur regardless of the composition of the long-range resource portfolio ultimately selected. LADWP staff will develop working-level tactical plans to implement the objectives of this IRP.

Integrated resource planning is an on-going process. LADWP will continue to adapt and refine the IRP as uncertainties are better understood, and policy direction and requirements are solidified. A new IRP will be issued in 2012, and every two years thereafter.