SAN DIEGO INTERNATIONAL AIRPORT

LET'S GO.

August 2019

# STRATEGIC ENERGY PLAN

## AN INTEGRATED APPROACH TO ENERGY RESILIENCE


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# EXECUTIVE SUMMARY

## Introduction

San Diego County Regional Airport Authority (Authority) is committed to building an enduring and resilient enterprise by effectively managing its financial, social and environmental risks, obligations and opportunities.

As reflected by the achievement of the Terminal 2 West Expansion (Green Build) as the first Leadership in Energy and Environmental Design (LEED) Platinum Airport Terminal, the Authority is widely recognized as a leader in sustainability, both regionally and across the airport industry. As operators of San Diego International Airport (Airport), the Authority recognizes the complex link between energy performance and the security of their airport enterprise, and are keenly aware that this interdependence warrants a bold vision and strategy to ensure sustainability into the future.

The Strategic Energy Plan establishes the Authority's approach of achieving its goal of being a leading, world-class thought leader in the provision of cost-effective energy strategies that are environmentally responsible and fully aligned with Airport operation and development.

## An Integrated Approach to Energy Resilience

The purpose of the Strategic Energy Plan is to provide a framework for rethinking how the Authority manages their energy resources while preparing to accommodate passenger growth, development projects, and the added variability of a changing climate.

Specifically, the plan addresses key issues of energy efficiency and conservation, on-site energy generation and storage, enhanced monitoring of key energy metrics, and mechanisms to actively engage the broad spectrum of Airport stakeholders. The plan presents an integrated approach that will enable the Airport to grow its operations while protecting the San Diego region's limited resources.

The Strategic Energy Plan establishes key long-term goals and supporting strategies across the broad spectrum of energy programs, leveraging timely opportunities presented by the Airport Development Plan (ADP) and ongoing Capital Improvement Program (CIP) to minimize the impact of unplanned expenditure on the Airport's budget.

The Strategic Energy Plan is a core element of the Airport's overarching Sustainability Management Plan (SMP), which directly implements its Sustainability Policy and is aligned with the Authority's Organizational Strategies.

The Strategic Energy Plan provides a roadmap to help guide the Authority toward energy independence, enhanced operational resilience, and carbon neutrality, in a manner that is fiscally responsible and aligned with the Airport Development Plan and the Capital Improvement Program.

# Steps to Achieving a Robust Energy Program

The Strategic Energy Plan provides a roadmap for the Authority that defines the energy goals of one of the world's most sustainable airports in a manner that balances the provision of specific, operationally aligned actions with the flexibility to accommodate the inevitable changes in Airport operation, climate, and technology that will occur over the next 20 years.

The Strategic Energy Plan is a "living" document that will evolve as the design, operation, and environment of the Airport changes. Reviewed and updated every five years or as necessary, the Strategic Energy Plan will require ongoing engagement with both internal and external stakeholders to ensure that it remains aligned with the overall vision of the Authority.

Through multi-functional meetings and workshops, the Authority has identified five primary goals that are intended, when combined, to cover the full spectrum of topics necessary to provide a robust, comprehensive energy program. The five goals are summarized in **Figure 1** below.

## 1 Conservation and Efficiency

A. Sub-Monitoring
B. Energy Auditing
C. Retro-Commissioning
D. Monitoring Strategy
E. Energy Conservation and Stewardship Incentives
F. Energy Performance Design Targets
G. Engagement and Education

## 2 Carbon Neutrality

A. Cost Effective Renewable Energy Generation
B. Green Energy Procurement
C. Maximized Synergies Between Systems (e.g. energy, water, waste, transportation)
D. Sustainability Management Plan and Airport Carbon Accreditation

## 3 Interdependence and Resilience

A. On-Site Energy Generation and Storage
B. Airport Critical Systems are Prioritized to Ensure Continued Operations
C. Redundant Systems to Minimize Disruptions to Operations
D. Cost of Resilience Measures Balanced with Benefit of Undisrupted Operations

## 4 Cost Containment

A. Demand Side Management
B. Funding Mechanisms
C. Identification of Effective Metrics
D. Project Assessment, Implementation, and Evaluation
E. Planning for Vehicle Electrification

## 5 Regional and Industry Leadership

A. Third Party Certification
B. Best Practices Knowledge Share to Build Industry and Regional Momentum
C. Engagement with Business Partners in Energy and Sustainability Goals
D. Innovation through Big Data
E. Periodic Strategic Energy Plan Validation
F. New and Emerging Technologies

**Figure 1: Strategic Energy Plan Goals**

# INTRODUCTION

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## Creating the Resilient Airport

### Introduction

The San Diego Airport Regional Airport Authority is a globally recognized leader in sustainability. As operators of the Airport, the Authority recognizes the critical role that energy plays in present and future operations. The Airport was the first airport to achieve LEED Platinum certification for a major terminal development project for the Green Build project. This project was also the first airport development project to receive a ISI Envision Platinum award for its landside operations. Additionally, the Airport was the nation's first to issue an annual sustainability report, based on Global Reporting Initiative standards.

The Authority is constantly striving to exceed expectations, enhance the resilience of its operations, and support the stewardship of its energy resources. It recognizes that it is important to identify the need to improve energy efficiency; generate independent, clean power; modernize to meet future demands; prepare for rising costs; and create a more resilient Airport.

The Authority understands its responsibility to combat climate change through reduction of greenhouse gas (GHG) emissions, and ultimately through striving to operate as a carbon neutral airport, while proactively strengthening energy security and maintaining the Airport's commitment to providing quality airport services for the region.

The Strategic Energy Plan provides a framework to help guide the Authority in meeting these commitments. It establishes long-term goals and strategies for best utilizing energy and conservation practices while aligning with the vision presented in the ADP and CIP. These goals will ultimately allow the Airport to establish more dependable energy sources while offsetting GHG emissions. The Authority will pursue these goals in a way that appropriately contains costs and that allows the Airport to be financially prudent with energy expenditure, as energy costs rise in the future.

## Energy Through The Regional Lens

With an increasing population and a growing need for energy, California is today faced with an unparalleled energy deficit. In 2017 the state imported roughly 85,000 gigawatt-hours from neighboring states[1]—the equivalent to 29% of its annual electricity consumption and enough to power nearly 11,000,000 homes.[2] While recent weather patterns such as El Niño have helped mitigate the effects of droughts and increase the state's hydroelectric power generation, the closure of the San Onofre Nuclear Generating Station continues to contribute to the state's electricity deficit by removing 3,000 megawatts (MW) from the state's power supply.

To service the energy demands of its residents, California will, in the short term, continue to rely on neighboring states to import energy. The longer-term vision is to pursue aggressive energy efficiency and renewable energy goals that will both reduce the overall demand and increase in-State capacity.

With the signing of SB-100, the 100 Percent Clean Energy Act of 2018, the energy landscape in California has taken a significant evolutionary step. The Renewable Energy Portfolio Standard, to which San Diego Gas and Electric (SDG&E) along with the other California Energy Utilities are held, was extended to require all retail electricity to be 100% renewable and zero-carbon by 2045.

The California Title 24 Energy Code, which outlines the requirements for new construction, is set on an aggressive path towards Zero Net Energy (ZNE), with the following targets having been approved by the California Public Utilities Commission:[3]

- New Residential Buildings:  ZNE by 2020
- New Commercial Buildings:  ZNE by 2030
- Existing Commercial Buildings: 50% ZNE by 2030

Locally, the City of San Diego recently prepared a Climate Action Plan (CAP) that emphasizes reducing in GHG emissions through the implementation of energy strategies. The CAP also discusses San Diego's growing focus on renewable energy and new "eco-districts," and presents several implementation and monitoring goals to meet the City's goal of using 100 percent renewable energy city-wide by 2035.[4]

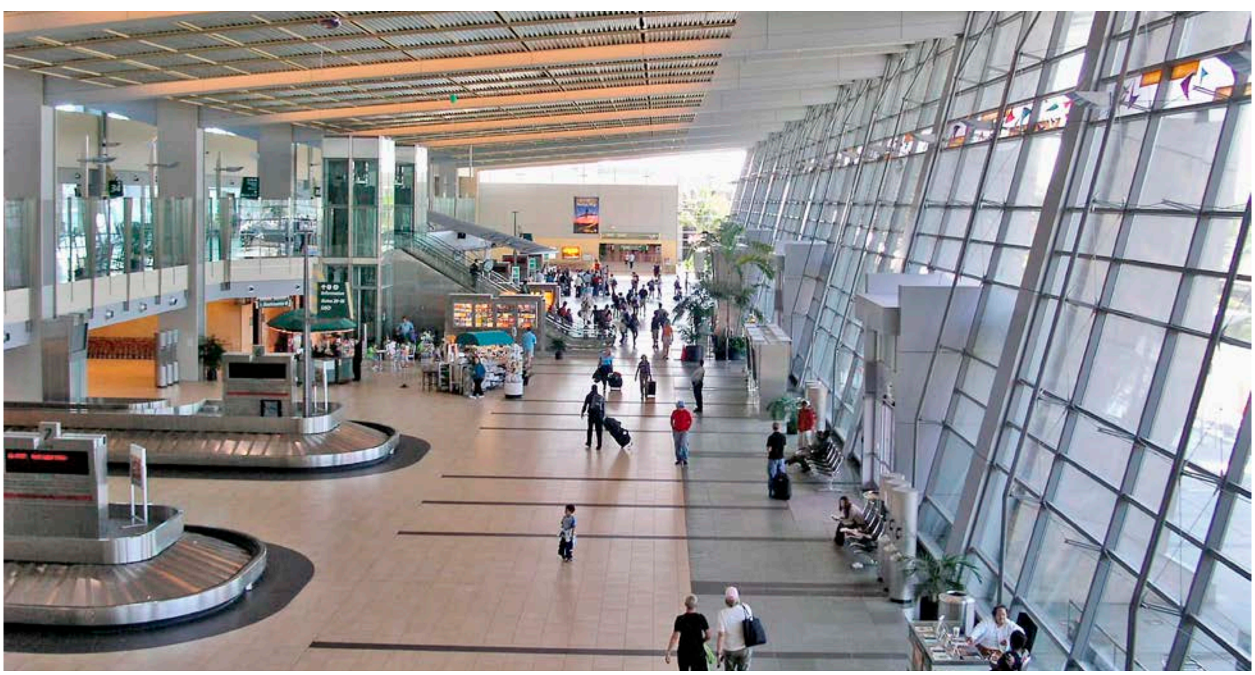
The Airport is actively engaged in multiple local energy and sustainability initiatives, including the San Diego Association of Governments (SANDAG) Energy Working Group which was set up to help facilitate the creation of region-wide energy plans.

1 California Energy Commission. QFER CEC-1304 Power Plant Owner Reporting Database. June 22, 2018. Available at: http://www.energy.ca.gov/almanac/electricity_data/total_system_power.html.

2 US Energy Information Administration. 2015 Residential Energy Consumption Survey (RECS), Table CE2.1. Released May 2018. Available at: https://www.eia.gov/consumption/residential/.

3 http://www.cpuc.ca.gov/ZNE/

4 City of San Diego. Climate Action Plan, December 2015. Available online at https://www.sandiego.gov/sites/default/files/final_december_2015_cap.pdf, accessed on May 2, 2016.



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## Energy Through The Industry Lens

The airport industry is increasingly recognizing the role of sustainability and the need to reduce GHG emissions. The Airport Carbon Accreditation (ACA) program encourages airports to work together towards not only reducing GHG emissions, but eventually becoming carbon neutral. The ACA was initiated in Europe and was extended to North America, and ultimately globally, in 2014. More than 200 airports are currently accredited globally, representing over one-third of global air passenger traffic.[5] The program provides four levels of accreditation and identifies focus areas such as energy efficiency, green energy sources, and green practices to reduce emissions. The Airport was recently certified through the ACA accreditation program at "Level 3", and is one of only 11 accredited commercial airports in North America at this level or above.

As a member of Airport Council International-North America (ACI-NA), the Airport is committed to achieving the ACI-NA energy goal of developing an energy management plan for minimizing the energy demand of their infrastructure and operations, and moving towards less polluting modes of energy and fuel use, including generating and using energy from renewable sources. The four sub-goals upon which the Airport is periodically evaluated are:

- **EN-1: Inventory Energy Use and Generation:** Energy baseline inventories identify an airport's opportunities for improved energy management performance.
- **EN-2: Implement an Energy Management Program:** Reduce energy consumption, increase efficiency, increase use of renewable generation, and link to carbon (or GHG) management plan. The airport develops its own objectives and targets and has a program to move towards these airport-specific goals.
- **EN-3: Optimization:** Engage airport tenants, vendors, and passengers to reduce airport related energy consumption, increase efficiency, increase use of renewables, link to a carbon management plan, and encourage the same from the broader community. To promote business continuity as well as energy efficiency, the airport can undertake a risk analysis or develop an energy strategy.
- **EN-4: Verify and Report Performance:** Verify energy management performance and report to stakeholders in the interest of accountability and continuous improvement.

5 https://www.airportcarbonaccreditation.org/airport/participants/ (accessed 21 Nov 2018)

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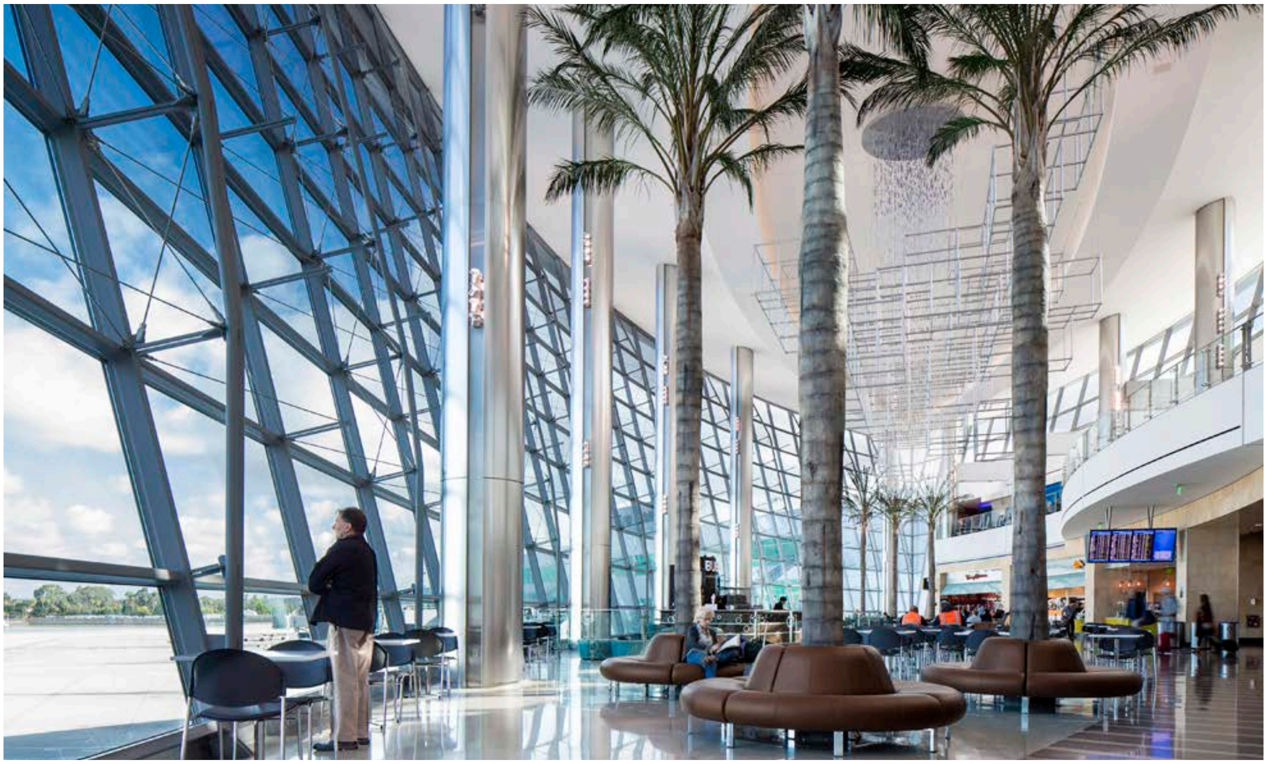
The Airport is committed to achieving the Airport Council International-North America's energy goal of developing an energy management plan for minimizing the energy demand of their infrastructure and operations and moving towards less polluting modes of energy and fuel use.

## Energy Through The Airport Lens

A Memorandum of Understanding (MOU) established between the Authority and the State of California Attorney General recognizes the mutual interest in reducing GHG emissions at the Airport. The MOU sets forth reduction measures for GHG emissions and identifies the need for cooperation with regulatory agencies. Specific measures identified in the MOU to reduce on-ground aircraft GHG emissions include the provision of landside power and preconditioned air at all new gates constructed under the Airport DevelopmentMaster Plan; retrofitting of existing gates with landside power and preconditioned air; provision of landside power at new hangars and cargo facilities; retrofitting of existing hangars and cargo facilities with landside power; usage of landside power by cargo and general aviation aircraft; and reduction in energy-using aircraft movements. Green materials and sustainable design will also be implemented through cool roofs, solar panels, cool pavements, and LEED Silver or better certification. Green construction methods and equipment will be utilized and tenants will be encouraged to address GHG emissions.[6]

6 State of California Attorney General. Memorandum of Understanding between the Attorney General of the State of California and the San Diego County Regional Airport Authority Regarding the San Diego International Airport Master Plan. Available online at: http://ag.ca.gov/cms_attachments/press/pdfs/n1556_agreement.pdf, accessed May 2, 2016.

# INTEGRATIONWITHAIRPORTINITIATIVES



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## Integration with Ongoing Airport Initiatives

### Airport Development Plan

The Authority is currently planning for the future. Phase 1 of the ADP, the Programmatic Design Document (PDD) of the Terminal 1 Replacement Program (T1RP), is expected to be completed in 2018 and will set forth recommended improvements at the Airport to meet demand through 2035. The ADP process involved extensive public outreach and is now undergoing environmental analysis. Focus areas of the ADP include: the T1RP PDD; the Airport Support Facilities (ASF) PDD; placement of the international gates and expansion of the associated Federal Inspection Services (FIS); development of the former Teledyne-Ryan property; and incorporation of plans by SANDAG to create an Intermodal Transit Center (ITC).[7]

7 San Diego International Airport. Airport Development Plan, 2016. Available online at: http://www.san.org/Airport-Projects/Airport-Development-Plan, accessed May 2, 2016.

### Capital Improvement Plan

The Authority's has a rolling 20 year CIP which identifies upcoming projects, including several projects directly related to the Airport's energy usage. Major construction projects include the North Side Cargo Facility and the Bus Fueling Facility. Other future facilities include the air cargo warehouse and remote processing center. The CIP includes projects tied to energy conservation and generation, such as the installation of preconditioned air at cargo gates; charging units for electric vehicles; improvements at Terminal 2 East; modernization of the heating, ventilation, and air conditioning (HVAC) systems; a sky bridge between Terminal 1 and Terminal 2 East; and upgrades to


**Figure 2: How the Strategic Energy Plan Integrates with Current Airport Initiatives**

LED lighting. These planned improvements help the Airport move towards the ultimate goal of carbon neutrality.

The Green Build was the largest project undertaken thus far in the Airport's history, with construction occurring between 2009 and 2013. It was so named because of the Authority's commitment to sustainability, the environment, and positive economic impacts. The project included the construction of ten new gates, a dual-level roadway, enhanced curbside check-in, expanded concessions, and additional security lanes. The project received LEED Platinum certification for its sustainable design.[8]

8 San Diego International Airport. The Green Build, 2016. Available online at: http://www.san.org/Airport-Projects/The-Green-Build#134085-fact-sheet, accessed May 3, 2016.

## Airport Sustainability Plans

The Airport has developed a robust, multi-faceted Sustainability Management Plan (SMP) that spans the breadth of Airport operations. In addition to the annual Sustainability Report, the SMP includes a number of related sub-plans, of which the Strategic Energy Plan is one. Others include the Water Stewardship Plan, the Air Quality Management Plan, the Clean Transportation Plan and the Cabron Neutrality Plan. Given the synergies between these focus areas, the Airport has developed these plans in unison to optimize coordination and developed solutions that balance overall Airport performance and cost. **Figure 2** shows how the Strategic Energy Plan integrates with current Airport policies.

# Existing Energy Infrastructure

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## Creating An Electrical Microgrid

The Airport is tied into the local utility grid, operated by SDG&E, through three substations: Old Town C-124, Kettner C-457, and Point Loma C-496. The capacity of this existing incoming electrical infrastructure, including recent upgrades, is considered to be sufficient to meet all of the Airport's energy needs for the next 20 years.

As part of an infrastructure upgrade program, in 2014 the Airport invested in the provision of a 12 kilovolt (kV) loop throughout the Airport campus in order to provide a microgrid distribution network. Use of a microgrid allows for local management of power, both when connected to the local SDG&E grid and when disconnected (as in the case of a power outage). This upgrade to the Airport's energy infrastructure provides value for the Airport in terms of increasing efficiency, reliability, and resilience while reducing utility costs through meter consolidation.

The investment in the 12 kV infrastructure provides the main backbone to the energy infrastructure and provides the Airport with a tremendous opportunity to create a campus microgrid that allows for maximum synergies between future energy efficiency and on-site generation efforts. The microgrid provides more control and flexibility in both the mix of the energy sources used as well as the strategy for energy generation.

The Airport's control systems, augmented by the microgrid, allow for shifting loads during power crises, reducing consumption during peak times, and identifying problems in the distribution system. This powerful system will be a cornerstone of the Airport's energy management actions, allowing for lower operational costs and increased energy system resilience, limiting unnecessary blackouts.

## Creating a High Performance Building Portfolio

The Airport recognizes that its facility portfolio is both the largest consumer of energy and provides the greatest opportunity for enhancing performance through the deployment of energy efficiency and generation strategies. As part of the Airport's MOU with the State, the Airport strives to ensure that all new buildings will achieve minimum LEED Silver certification, which is evident in recent building projects that have met or exceeded this goal (Receiving and Distribution Center, FBO, Green Build, and the Smart Curb). Concurrent with the new build program, the Airport has also pursued a number of efforts to enhance the energy performance of the existing portfolio, having undertaken energy auditing and retro-commissioning efforts in recent years.

The Authority recognizes that its facility portfolio is both the largest consumer of energy and provides the greatest opportunity for enhancing performance through the deployment of energy efficiency and generation strategies.

## The Heart of The Airport

The passenger terminals are currently served by a Central Utility Plant (CUP). Constructed in 1996 and extensively upgraded as part of the Green Build project, the CUP supplies chilled water and heating hot water to each of the existing terminals. The CUP meets the existing heating and cooling demands of the terminals and has the ability to accommodate some additional capacity that will allow for future growth within the Airport campus. Thermal energy comprises both a significant demand and significant opportunity in the Airport's energy portfolio and forms a critical area of focus for the energy roadmap. By focusing on efficiency targets in the design of new facilities, the need to expand the CUP to accommodate new growth has been limited, saving significant up-front cost.

> The Airport currently provides over 10% of its energy demand from on-site solar generation.

## Embracing a Renewable Future

The Authority has made a significant commitment to on-site renewable energy at the Airport, with over 3.3 MW of solar photovoltaic (PV) energy recently installed on the roof of Terminal 2 West and on shade structures of the adjacent parking lot. The Airport has also executed a Power Purchase Agreement (PPA) for installing 2.2 MW at the Northside Economy Parking, increasing the Airport's total solar energy generation capacity to 5.5 MW. These existing installations offset over 10 percent of the Airport's annual energy consumption.

There is the option to further increase the Northside Parking lot PV capacity up to 5 MW, which, combined with a possible 3 MW PV array on the Rental Car Center (RCC) roof would allow the Airport to generate approximately 20 percent of current annual electricity use from on-site PV. It is noted, however, that solar capacity beyond 7 MW will likely generate more electricity than can be consumed during the peak sun times, leading to potential wasted energy. **Figure 3** summarizes the existing energy infrastructure located at the Airport.

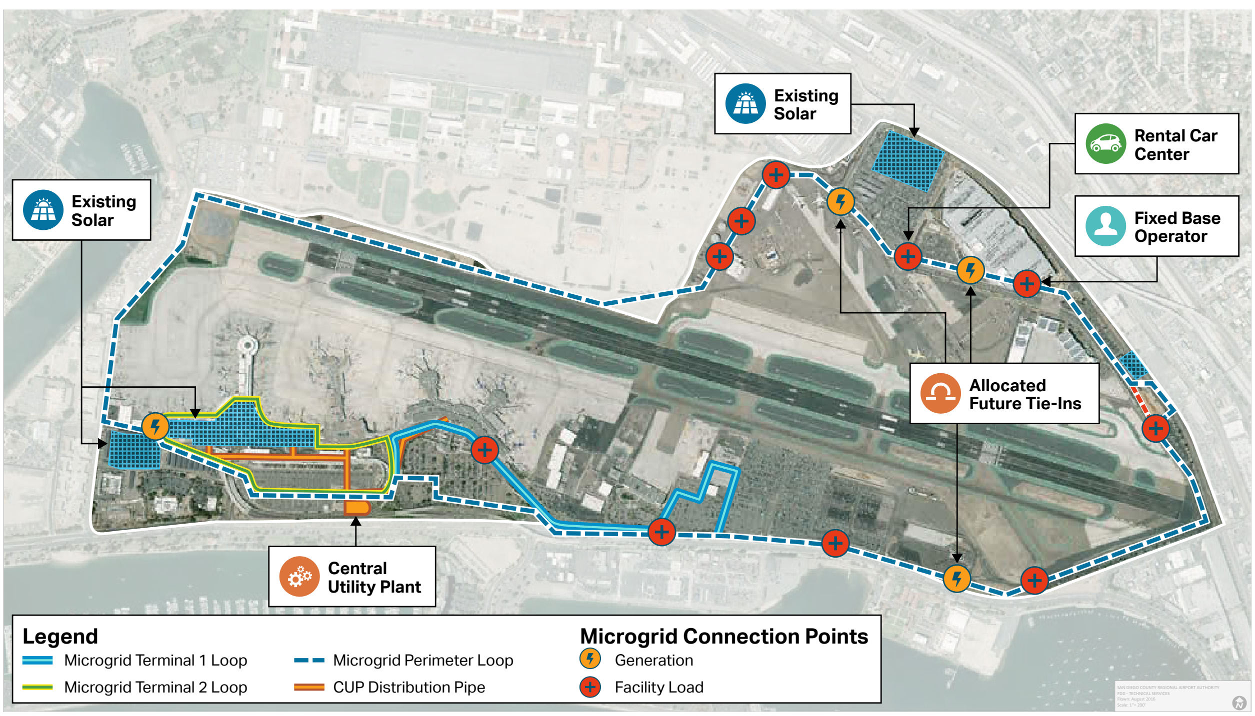



**Figure 3: Existing Energy Infrastructure at the Airport**

# Airport Energy Use

## Annual Energy Use Trends

As shown in **Figure 6**, energy use at the Airport has steadily increased over the past 6 years. This correlates with the increase in both the facility floor area and the number of passengers and operations per year. In Fiscal Year 2017, the Airport consumed approximately 55,000 megawatt-hours (MWh) of electricity and more than 400,000 therms of natural gas. However, energy-related GHG emissions has reduced relative to energy demand due to 'greener' grid-supplied electricity and increased on-site renewables. Additionally, the more efficient operation of newer facilities and installation of on-site PV has driven a decrease in Energy Use Intensity (EUI).

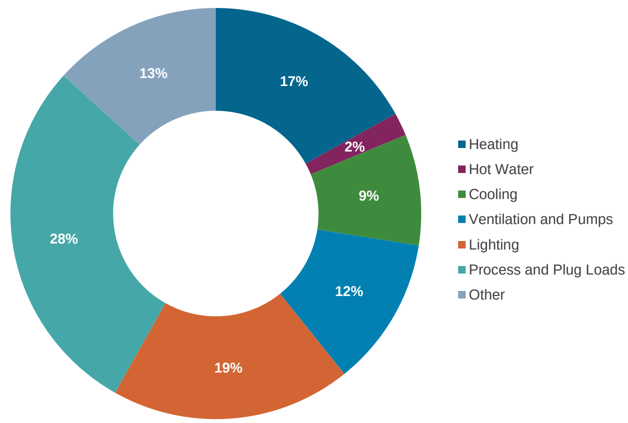



**Figure 4: Energy Use by End Use**

## Where Energy is Consumed

**Figure 5** shows the energy use at the Airport by facility. Terminals account for 75 percent of all energy use at the Airport. This includes the CUP, which generates hot and chilled water to meet terminal air conditioning demands. As shown in **Figure 4**, the majority of energy use at the Airport is derived from process use, such as ground power, jet bridges, baggage handling systems and plug loads (energy used by products like computers, which are plugged into wall outlets). Besides equipment, other primary categories of energy use include lighting, heating, cooling, hot water, and ventilation.

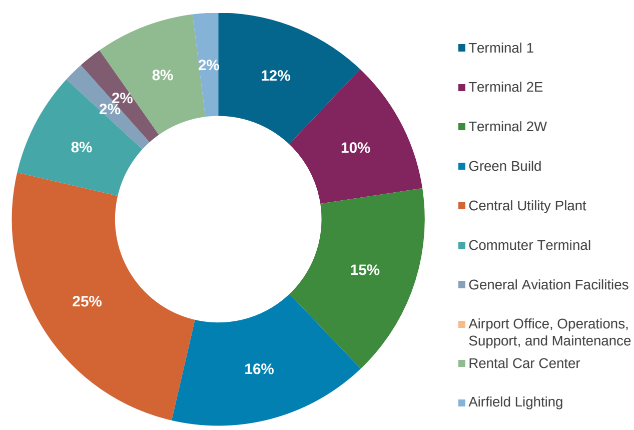



**Figure 5: Energy Use by Facility**

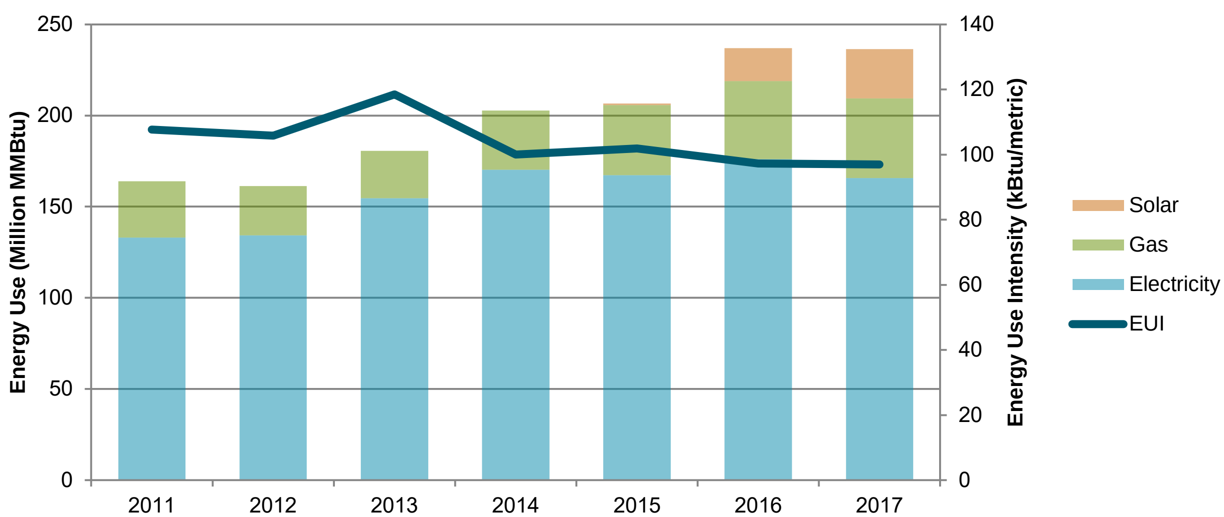



**Figure 6: Historical Energy Use Trend**

# AIRPORT VISION
# FOR ENERGY LEADERSHIP


**Figure 7: Historical Energy Use Trend**

## Airport Strategic Energy Planning Methodology

The Strategic Energy Plan has leveraged a 12 step process, shown in **Figure 7**, that focuses on exploring ideas and synergies centered around four underlying questions:

- Where are you?
- Where do you want to go?
- Where are your opportunities?
- How will you get there?

Through this holistic process, the Strategic Energy Plan is able to identify potential strategies that maximize collaboration with existing Airport initiatives; are as cost effective as possible; and emphasize progress towards the Airport's overall goals.

The Strategic Energy Plan calls for immediate actions, intentionally capitalizes on existing plans and strategies for the Airport, and allows for growth and refinement as the Airport evolves.

# Focused Energy Goals

The Strategic Energy Plan is comprised of five goals that provide a holistic approach to energy management at the Airport, incorporating opportunities for improvement at every level of energy use. They cover a wide array of project types, ranging from education and collaboration to major capital expenditures. The five goals of the Strategic Energy Plan are tied to the following categories:

1. Conservation and efficiency;
2. Carbon neutrality;
3. Interdependence and resilience;
4. Cost containment; and
5. Regional and industry leadership.

For each of these categories, the Airport has developed one or more explicit target metrics, that will be used to quantitatively assess the Airport's success in meeting its goals, The Airport has established several potential actions which support attainment of the particular goal. The Authority has also identified linkages between the Strategic Energy Plan and the ADP and/or CIP.

Finally, an implementation roadmap is presented to clearly identify the steps that the Airport can take to achieve the overall vision of the Strategic Energy Plan.

# Stakeholder Engagement

## AIRPORT STAKEHOLDERS

Stakeholder engagement has been a crucial part of the Strategic Energy Plan process, with a broad spectrum of Airport stakeholders actively engaged throughout the development of the energy roadmap.

A key mechanism leveraged to create the necessary collaboration and capture stakeholder views and ideas is the creation of a cross-departmental Utility Working Group (**Figure 8**) that incorporated members of the following departments:

- Facilities Management (FMD)
- Innovation & Business Development (IBD)
- Airport Design & Construction (ADC)
- Revenue Management (RM)
- Planning & Environmental Affairs (P&E)
- Airport Terminal Operatinos (ATOPs)
- Information and Technology Services (I+TS)

Meeting on a monthly basis, this group has been actively engaged in the development of the energy strategies and implementation roadmap.

In addition to the regular meetings, the Utility Working Group also participated in a focused charrette that was used to refine and expand the Airport's original energy goals that form the cornerstones of the Strategic Energy Plan and roadmap.

Beyond the creation of the original Strategic Energy Plan and Road Map, it is envisioned that the Utility Working Group will drive the ongoing strategic engagement and cross departmental coordination required to implement the actions identified and achieve the energy goals outlined.

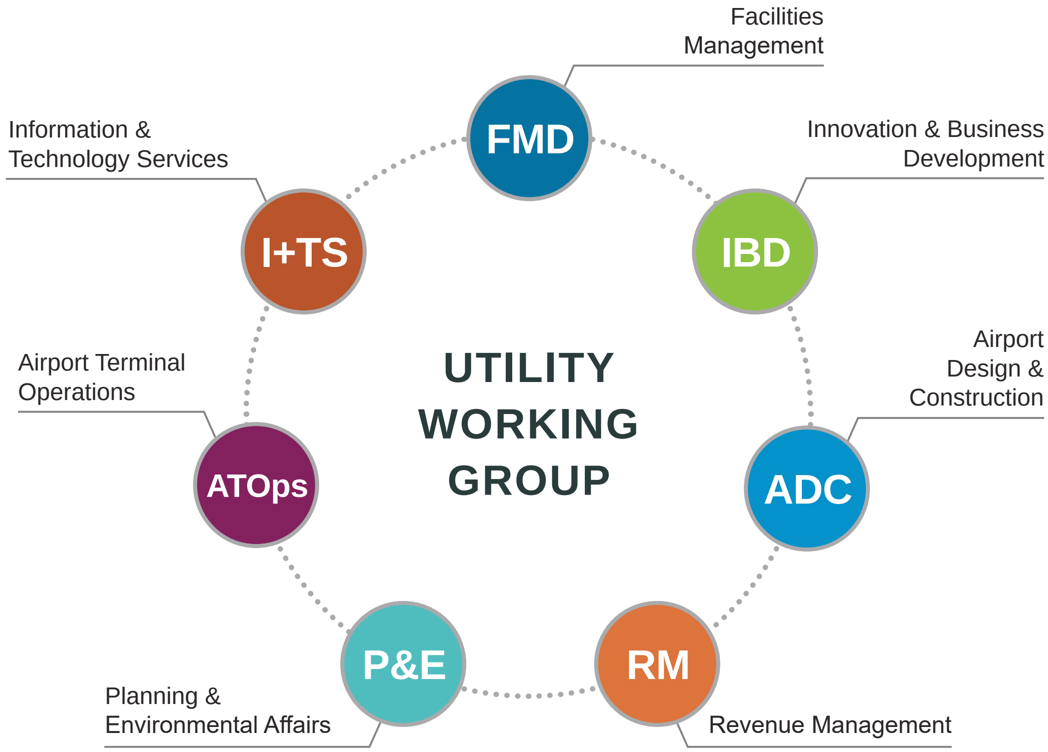



**Figure 8: Utility Working Group**

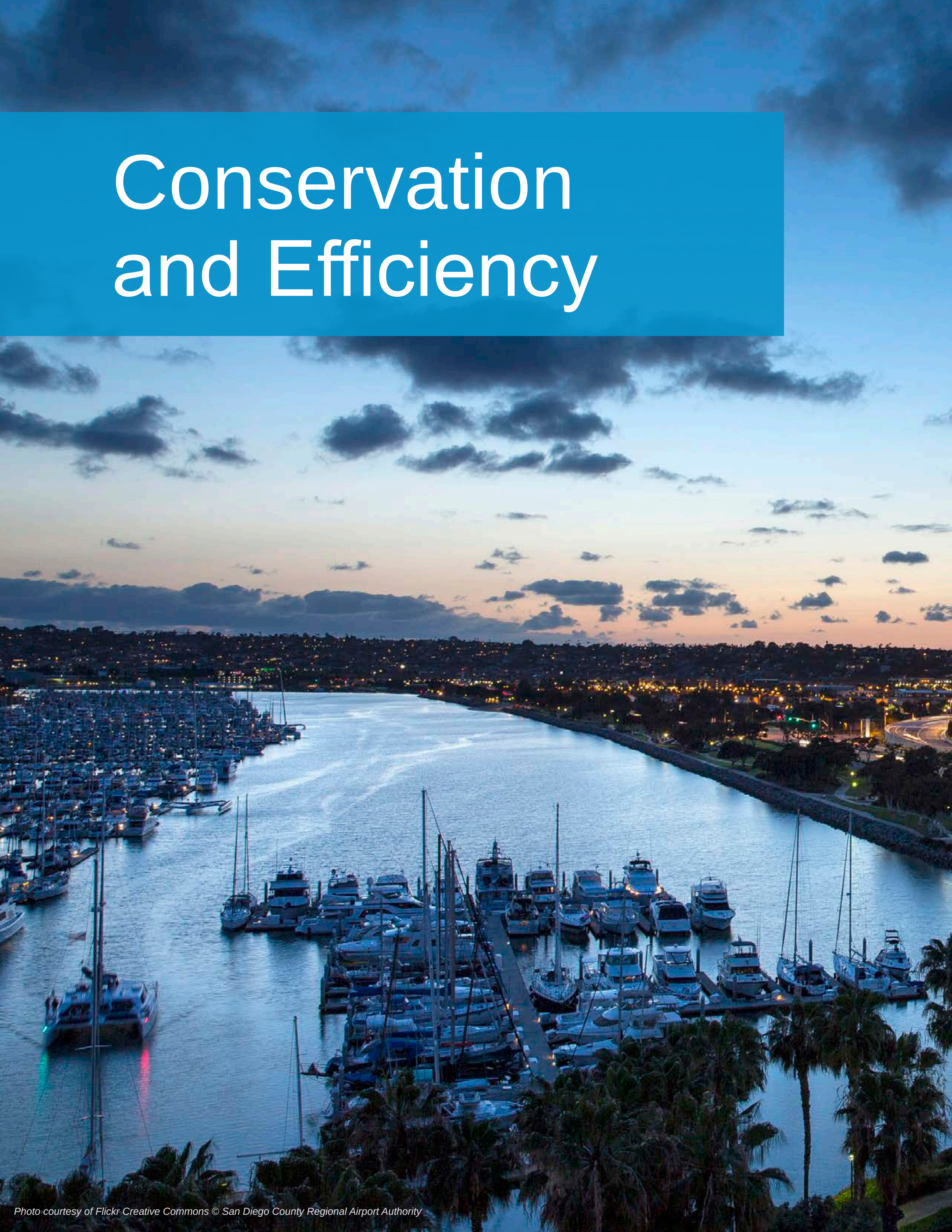
## AIRPORT TENANTS

Energy usage on the campus is linked not only to the Authority but also to all of the tenants, airlines, business partners, and members of the public traveling through the Airport. Effective and substantive engagement, tailored to each stakeholder, must occur in order for the Authority to maximize its energy goals and to successfully achieve its vision of becoming a sustainable organization. Each stakeholder plays a vital role in how energy is generated and consumed on the Airport campus. The Authority is uniquely positioned to be a leader in this effort, encouraging and supporting Airport stakeholders' endeavors as they work together to progressively grow the sustainability of the Airport campus and operations.

## IMPLEMENTATION ROADMAP

Each goal in the Strategic Energy Plan contains several actions that, when implemented, will help the Airport realize its potential for strategic energy management. By identifying a diverse array of actions that each help to reach these goals, the Airport sets a course leading towards carbon neutrality in a financially feasible manner, consistent with the ADP and CIP. The Strategic Energy Plan calls for immediate actions and growth, intentionally capitalizes on existing plans and strategies for the Airport, and allows for growth and adaptation as the Airport moves forward. The combination of flexibility and commitment contained within this plan ensure the growth of the Airport in terms of sustainable energy, while allowing innovation and other future variables to be integrated into the plan.

# Conservation and Efficiency



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# 1

# CONSERVATION AND EFFICIENCY

The Airport will actively promote a culture of energy efficiency and conservation through quantifiable metrics and demonstrated energy leadership.

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## Overview

The first steps towards an effective and comprehensive energy strategy are to minimize demand through conservation measures and to utilize energy in the most efficient manner possible. Energy conservation generally provides the best return on investment, and the Airport has identified a number of opportunities to better use and manage energy. Reducing energy use also reduces the demand for energy generation and therefore energy infrastructure, yielding a lower cost of investment. The Airport has effectively enacted energy conservation and efficiency opportunities in the past. The Strategic Energy Plan builds upon these by identifying additional opportunities that provide room for growth. The implementation of effective energy conservation methods will allow the Airport to select alternative energy generation options that are properly sized for its needs, thereby minimizing superfluous spending. This plan approaches energy conservation from several angles, including setting energy performance targets for new facilities; influencing the behavior of those who occupy and use the facilities; improving the controls in building systems; and upgrading equipment with new and more efficient replacements.

### Metrics

To track the performance of energy conservation efforts, two EUI metrics will be used to measure progress toward the reduction goals.

- Energy use (kBtu) per square foot (sf) of the overall airport facility portfolio within the Airport.
- Energy use (kBtu) per passenger who travels through the Airport.

The energy use per passenger metric will used to measure year-on-year change in comparison to the 2015 baseline year, with the intent to monitor overall program success and identify relevant trends. The energy efficiency targets outlined in **Table 1** were developed as ambitious but realistic targets for the Airport to achieve.

**Table 1: Energy Efficiency Target**

| Energy Use Intensity Reduction (2015 baseline) | Target Year | Timeframe |
|---|---|---|
| 10% | 2022 | Short-term |
| 20% | 2028 | Medium-term |
| 30% | 2035 | Long-term |

# Critical Areas of Focus

- A. Sub-Monitoring
- B. Energy Auditing
- C. Retro-Commissioning
- D. Monitoring Strategy
- E. Energy Conservation and Stewardship Incentives
- F. Energy Performance Design Targets
- G. Engagement and Education

## A. SUB-MONITORING

A vital component of effective energy conservation and improvements to efficiency is implementation of a robust sub-monitoring program in order to provide Airport stakeholders and tenants with energy performance analytics. Collecting more specific and detailed information will help apprise the Airport and its tenants of their energy usage and allow for more informed decision-making. Data collected by sub-monitors will cover peak, annual and day time usage trends. The move to the 12 kV microgrid provides a number of benefits to the Airport in terms of energy management including simplification of billing for energy through utility meter consolidation. However, meter consolidation provides less detailed information on consumption and usage activities as the only meters currently in operation are those located at incoming SDG&E connections.

Installation of sub-monitors will allow the Airport to gather detailed data on energy usage in order to identify, quantify and prioritize implementation of energy projects, and measure performance of projects once implemented. The current structure of most tenant leases does not directly account for the costs of utilities consumed by tenants. Monitoring tenant usage directly will allow for more equitable sharing of costs related to energy use between the Airport and its tenants, discouraging excessive energy consumption and potentially creating incentives to conserve energy. As part of the Airport's Green Build project, sub-monitors were installed in many of the new tenant spaces. However, not all of these sub-monitors are currently active. Implementation of a thorough sub-monitoring program will allow the Airport to better measure and monitor energy usage. Sub-monitors for water, electricity, natural gas, and chilled water are all an essential part of creating a robust and resilient view of energy and water use at the Airport.

## B. ENERGY AUDITING

Regular energy auditing provides a mechanism to ensure that all of the Airport's energy efficiency and conservation efforts are properly maintained and remain effective throughout their lifecycle. The energy auditing process will identify potential opportunities for energy performance improvement in facilities. Buildings function as complex machines, and generally become sub-optimal over time in terms of energy consumption. Energy auditing and subsequent retro-commissioning are not a one-time event, but rather a long-term, ongoing maintenance activity, providing periodic "tune-ups" for the facilities. Energy auditing is the first step in recalibrating and optimizing the buildings, ensuring they continue to operate at peak efficiency and that any issues are caught and addressed. Energy auditing provides a diagnostic tool to identify potential savings; further efforts are required to ensure that measures are actually implemented to capture cost and energy savings.

An effective auditing process will include reviewing all facilities at least once every five years, balancing the benefits of auditing with the costs to do so. The review results will be used to implement projects in a multi-tier approach, based on how long a project will take to pay back its cost in savings, with strategies bundled as required to achieve the optimal implementation timeline (see **Table 2**). This approach will allow small- and mid-scale measures to be implemented quickly through the existing CIP and maintenance protocols.

**Table 2: Implementation Timelines for Conservation Projects**

| Initial Investment Payback Period | Implementation Timeline |
|---|---|
| Less than 2 years | Within 2 years of identification |
| 2 – 5 years | Within 3 years of identification |
| More than 5 years | Follow standard Airport CIP timeline |

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SDG&E offers an energy auditing program that the Airport can leverage to enhance energy efficiency while minimizing costs. It also helps identify all available SDG&E incentives that can be leveraged to help facilitate the implementation of energy conservation strategies. A recent SDG&E sponsored energy audit on the Airport campus identified more than $1.5 million in annual energy cost saving opportunities. This highlights the value of energy auditing and emphasizes the substantial savings that can be obtained through regular and consistent upkeep of the facilities. The auditing process and commitment to follow-up will ensure continual enforcement of the Airport's efforts and continual improvement in efficiency. **Table 3** summarizes the results of the SDG&E audit.

Implementation of projects identified through the recent SDG&E audit, as well as future audit findings, may be best served through bundling of projects based on the criteria described above (grouping projects by time required for payback). In the case of the recent audit, bundling allows for the scope of projects that can be implemented immediately to be expanded from $939,227 in annual savings to $1,517,323 in annual savings. Timely implementation of measures identified in energy audits will allow the Airport to maximize energy savings.

**Table 3: SDG&E Energy Audit Results**

| Project Category | Electricity Savings (kWh) | Electric Demand Savings (kW) | Gas Savings (Therms) | Water Savings (kGal) | Cost Savings ($) | Estimated Net Implementation Cost ($) | Estimated Payback (years) |
|---|---|---|---|---|---|---|---|
| Immediate projects (payback < 5 years) | 5,624,339 | 373 | 72,323 | 428 | 939,227 | 2,042,458 | 2.17 |
| Central Plant Upgrade Projects | 447,704 | 437 | 4,935 | - | 109,455 | 2,559,453 | 23.38 |
| Alternative Energy Projects | - | 529 | - | - | 253,855 | 1,452,010 | 5.72 |
| Other CIP Projects | 2,295,009 | 331 | - | 1,612 | 324,241 | 4,103,724 | 12.66 |
| **Project Bundles** | | | | | | | |
| Bundle 1 (immediate plus other non alternative energy or CUP projects) | 7,919,348 | 704 | 72,323 | 2,040 | 1,263,468 | 6,146,182 | 4.9 |
| Bundle 2 (all except CUP) | 7,919,348 | 1,233 | 72,323 | 2,040 | 1,517,323 | 7,598,192 | 5.0 |

Notes: kWh = kilowatt-hours; kW = kilowatt; kGal = kilogallons. Source: SDG&E, 2016

## C. RETRO-COMMISSIONING

The energy audits discussed above will identify opportunities for new, higher efficiency technologies to be installed as well as for existing systems to be reset and operated in line with their original design parameters. When robustly implemented, retro-commissioning (Retro-Cx) commonly can achieve up to 10 percent reductions in energy consumption. Applying several recommendations will permit the Airport to maximize the effectiveness of Retro-Cx. SDG&E offers incentive funding to support Retro-Cx, an opportunity the Airport will likely be able to leverage as part of its energy efficiency efforts. There is also an opportunity for the Airport to expand its in-house commissioning expertise, developed through its previous efforts with the Green Build project, in order to effectively deploy Retro-Cx throughout the campus. The Airport will develop a robust commissioning program which provides templates usable for any of its needs. These include specifications and plans for commissioning and Retro-Cx, test protocols for major systems both prior to and during regular usage, and holistic test protocols that verify the inherent interactions between the various systems necessary for the effective operation of the Airport.

## D. MONITORING STRATEGY

In order to continually optimize energy performance as part of an ongoing commitment, the Airport must ensure that it has the best information to make effective decisions. This information must be effectively collected, filtered, and communicated to the proper recipients in a timely manner for these decisions to be feasible. The Green Build project incorporated the deployment of the Automated Infrastructure Monitoring and Management System (AIMMS), the first step in creating the Airport's monitoring platform. AIMMS captures data from multiple systems in the Airport via more than 2,000 data points, including systems that are critical to implementation of a strategic energy management system. However, system upgrades at the Airport have resulted in AIMMS not being fully operational. Recent attempts have been made to improve the AIMMS system, but it is not yet fully capable of viewing all data across the Airport in a clear and user-friendly manner.

As part of this Plan, it has been recommended that the energy-related functions of AIMMS be refined, and that the system be expanded beyond its existing location in order to incorporate other campus facilities. A good example of progress that has been made in this regard is the recent deployment of the Sky Spark Energy Dashboard. Sky Spark performs analytics on data pulled directly from the Building Automation System (BAS) and allows the Airport to create energy use dashboards, trends and reports. While Sky Spark is currently only monitoring the Chilled Water System at the CUP, the Airport is considering expanding it to monitor the Heating Hot Water System and tertiary pumps.

As energy monitoring and management expand, efforts will focus on two primary areas: tactical activities and strategic activities. Tactical activities are those activities which are associated with the day-to-day operation of Airport energy systems. Tactical energy management efforts are controlled through existing Airport building management systems. These are installed within each facility, allowing Airport staff to monitor alarms through this existing infrastructure.

Strategic activities are related to the overall energy activities and will be utilized to encourage rollout of the energy program. These activities will also monitor the ongoing success of the program. Implementation of strategic activities will require substantial amounts of data from several systems within the Airport, including passenger transit monitoring, freight transit monitoring, and both primary energy metering and sub-monitoring for all utilities. This information will be collected and evaluated to better recognize trends and metrics on energy usage, and can be used to better inform decision-makers.

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Several groups within the Airport organization will be able to put this data to use for strategic activities. FMD staff will be able to benchmark between similar energy consumers, such as the baggage handling systems and tenants. Outlier tenants will be identified, allowing for further investigation into energy usage. FMD staff will also be able to better understand the Airport's energy needs, providing guidance on the future plans for CUP improvements (for both optimization of the existing plant and design of any future plants).

P&E staff will be able to compare the energy usage information at monthly and yearly levels for the different end uses that consume energy, as well as the types of fuel used to produce energy. They may also evaluate actual performance against the Airport's energy goals and the broader goals of sustainability. Furthermore, this information will be valuable for informing the annual sustainability report for the Airport. Senior leadership will have access to a single portal for metrics and trend information related to energy, allowing them to see a snapshot of the Airport's performance in relation to the goals, and its progress in following the road map to a more resilient energy future. Strategic energy monitoring and management functionality could be deployed via several methods. **Table 4** describes three of these methods and highlights the specific benefits of each in comparison to each other.


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The Airport will solicit bids through a competitive process in order to determine which of the strategies can provide the needed functionality while balancing costs, for both initial capital investment and lifelong maintenance.

**Table 4: Potential Strategic Energy Monitoring and Management Methods**

| Solution | Solution Strategy | Benefits: Broad Business Intelligence Solution | Specialist Energy Solution | Expandable Solution | Proven Energy Focused Functionality & Analytics | Customizable Platform | Creation of Cross-functional Metrics | Ability to Sit Within Existing Platform | Ability to Scale Over Existing Portfolio |
|---|---|---|---|---|---|---|---|---|---|
| Enhanced AIMMS solution | Enhance existing AIMMS solution to provide access to all necessary information | ● | | ● | | ● | ● | ● | ● |
| Fully Customizable Business Intelligence and Analytics solution | Deploy a new business intelligence | ● | | ● | | ● | ● | ● | ● |
| Dedicated Energy Management solution | Deploy a specialist energy monitoring and strategic management tool | | ● | ● | ● | ● | | ● | ● |

Source: San Diego County Regional Airport Authority, 2017

## E. ENERGY CONSERVATION AND STEWARDSHIP INCENTIVES

The Airport plans to promote energy efficiency and conservation not only through new technology and smart management of facilities, but also through coordination with stakeholders. The Airport's wide range of tenants depend on energy to conduct business. Current tenant agreements do not emphasize energy conservation, despite the direct influence that tenants' energy consumption has on energy consumption for the whole campus. Rising energy costs make cooperation between the Airport and tenants an essential part of conservation.

A key opportunity to integrate these incentives is during the lease negotiation process (both new and existing). The Authority will work alongside tenants to identify areas where energy efficiency can be promoted without impacting the tenants' ability to perform their main functions.

The Airport is already exploring ways in which to further develop a green concessions program in conjunction with its existing Water Stewardship Plan. This type of program will reward adoption of sustainability principles in the offering of concessions, and provides passengers with an opportunity to support concessions with sustainable practices on the Airport campus. Energy is as critical as water to this program, and will be a central factor in the Airport's collaboration with its tenants. The Authority will enhance employee awareness about energy use, and recognize and reward tenants and their staff for conserving and using energy wisely.

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## F. ENERGY PERFORMANCE DESIGN TARGETS

Beyond incentivizing energy conservation in tenant lease negotiaions, the Airport will embed its stewardship mission into the design phase of capital projects - both new construction and tenant improvements. This represents a crucial time in the development process, before any construction occurs, where energy usage can be greatly controlled and limited through proactive design and at relatively lower costs by eliminating the need for retrofits.

For new construction, especially as ZNE capable buildings become more commonplace, an emerging trend is performance-based energy targets. Setting performance-based targets, such as a maximum EUI benchmark for the facility, enables flexibility in the design and construction of a project to achieve the desired outcome. This flexibility allows for greater opportunities in innovation and lifecycle cost savings to be uncovered by the design or design-build team that may have otherwise been missed. The Airport can consider implementing these requirements in all new projects, such as the upcoming T1RP and ASF programs.

For tenant spaces, tenant improvement guidelines are a central repository for design and operational considerations, and are an ideal vehicle for implementing energy efficiency and control standards for tenant-led projects. Design review teams will be educated on these guidelines and will review tenant projects in light of the Airport's goals for carbon reduction and energy conservation. Equipped with the technical knowledge to review the impact of projects on energy, staff will be able to influence energy usage through their review process.

## G. ENGAGEMENT AND EDUCATION

Tenants range from small kiosk operators to major aircraft maintenance facilities. Without its tenants, the Airport will not be able to perform many of its major functions, from moving passengers, cargo, and visitors to providing rental cars and feeding the public. However, the collective environmental footprint of the Airport's business partners is greater than the Authority's own footprint, and they therefore must be fully engaged in the Airport's energy management efforts. The Airport recognizes that in order to use energy in the most efficient way possible, engagement with all stakeholders is crucial. Energy education will be established as an initiative spanning all Airport stakeholders. The previously described sub-monitoring allows tenants to understand their energy consumption and how it relates to campus wide energy use, enabling incentives to integrate conservation measures into their business.

By providing a framework in which tenants can operate more sustainably, the Airport will further improve its energy efficiency by engaging the entire campus. The Airport will also integrate conservation and resilient design principles and specifications into tenant improvement guidelines and the design review process, and provide a green leasing strategy for tenants. As a global leader in sustainability, the Airport is well positioned to provide educational opportunities to all of its stakeholders, enabling them to leverage the energy and cost savings benefits of increased efficiency and conservation.

The Airport will utilize all of its engagement channels to reach its business partners, identifying opportunities where the Airport can make the greatest impacts towards its cumulative energy usage and shared progress towards conservation. The ultimate goal is to foster a strong culture of energy stewardship among all members of the Airport ecosystem, from the Authority's full organization to all of its business partners.

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## IMPACT AND IMPLEMENTATION

**Table 5: Conservation and Efficiency—Implementation Plan**

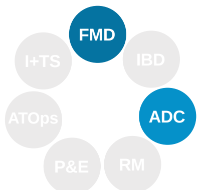
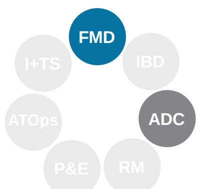
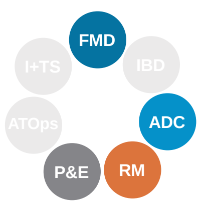
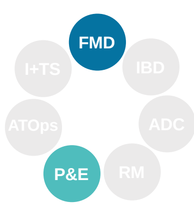
| Focus Area | Critical Activities | | Responsibility | Time Horizon |
|---|---|---|---|---|
| A. Sub-Monitoring   | A.1 | Identify sub-monitoring locations, based upon tenant lease lines and major systems energy consumption. | FMD / ADC | 2 years |
| | A.2 | Re-connect existing electrical sub-monitors that were installed as part of the Green Build. | FMD | 2 years |
| | A.3 | Develop sub-monitoring deployment strategy. | FMD / ADC | 2 years |
| | A.4 | Install sub-monitoring across all existing facilities. | FMD | 5 years |
| | A.5 | Incorporate sub-monitoring requirements within the Airport design specifications for all new construction projects. | ADC / ADC | 0 - 2 years |
| B. Energy Auditing   | B.1 | Leverage SDG&E's Energy Auditing program as the primary mechanism to implement the regular audits on a 5-year cycle. | FMD | 5 years |
| | B.2 | Refine procurement protocols to facilitate the expedited deployment of energy projects identified through the audit. | FMD / ADC | 2 years |
| | B.3 | Deploy energy projects identified through 2016 audit with a payback < 5 years. | FMD / ADC | 2 years |
| C. Retro-Cx   | C.1 | Develop standard Commissioning and Retro-Cx process for use within the Airport. | FMD | 2 years |
| | C,2 | Leverage SDG&E Retro-Cx incentive program to lessen the cost of implementation. | FMD / P&E | 5 years |
| | C.3 | Incorporate Retro-Cx requirements into tenant lease agreements. | RM | 5 years |
| | C.4 | Incorporate Ongoing Commissioning into the T1RP PDD | ADC | 5 years |
| D. Monitoring Strategy   | D.1 | Develop RFI process to explore potential strategies to facilitate the monitoring and strategic management of the Airport's energy performance. | FMD / P&E | 2 years |
| | D.2 | Develop RFP based upon information collected through RFI process to procure a new strategic energy management platform that will interact with the broader AIMMS platform. | FMD / P&E | 2 years |
| | D.3 | Deploy strategic energy management and monitoring platform. | FMD | 2 years |
| | D.4 | Provide education of Airport Authority stakeholders in the strategic energy platform . | P&E | 2 years |

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**Table 5: Conservation and Efficiency—Implementation Plan** *continued*

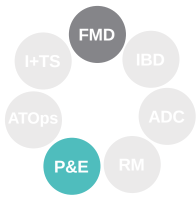
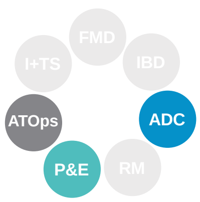
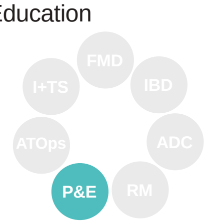
| Focus Area | Critical Activities | | Responsibility | Time Horizon |
|---|---|---|---|---|
| E. Energy Conservation and Stewardship Incentives   | E.1 | Enhance energy performance requirements, and incentives for efficient operation into Airport's new green concessions program. | P&E / FMD | 2 years |
| F. Energy Performance Design Targets   | F.1 | Incorporate performance-based energy efficient design targets into the T1RP PDD. | P&E / ADC | 0 - 2 years |
| | F.2 | Incorporate performance-based energy efficient design targets into Airport Design Standards. | P&E / ADC | 2 years |
| | F.3 | Incorporate energy performance requirements into Tenant Design Guidelines. | ADC / ATOPs | 2 years |
| | F.4 | Enhance internal design review process to include evaluation of energy performance of proposed tenant solutions. | ADC / ATOPs | 2 years |
| G. Engagement and Education   | G.1 | Create and deploy energy education program. | P&E | 2 years |

**Table 6: Conservation and Efficiency—Integration Plan**

| Focus Area | ADP Integration (L/M/H) | CIP Integration (L/M/H) |
|---|---|---|
| Sub-Monitoring | Low | Medium |
| Energy Auditing | Low | Medium |
| Retro-Commissioning | Low | Medium |
| Monitoring Strategy | Low | Medium |
| Energy Conservation and Stewardship Incentives | Low | Low |
| Energy Performance Design Targets | Medium | Medium |
| Engagement and Education | Low | Low |

# Carbon Neutrality

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# 2

# CARBON NEUTRALITY

The Airport will promote the use of low carbon energy sources by the Authority and its tenants.

*Photo credit © Pablo Mason*

## Overview

A multifaceted approach to energy usage must be initiated in order to meet the goal of carbon neutral Authority controlled operations. The Airport will generate its own renewable energy where technically and financially feasible, and will take advantage of existing and prospective contracting methods to purchase cleaner and more affordable energy. This increased reliance on renewable power will be complemented by further developing already successful environmental stewardship efforts at the Airport, including the electrification of the airside and landside vehicle fleet.

Participating in the ACA program, with a recent achievement of Level 3 certification, and developing an SMP specific to the Airport will provide further guidance for its stewardship of the environment. Partnering with the tenants and airlines in maximizing energy efficiency will be critical to the overall success of this goal.

### Metrics

A key metric for assessing the Airport's progress towards meeting this goal is the percentage of the Airport's energy supply portfolio that comes from renewable sources, both on-site and off-site utilities.

The metrics that will be monitored include:

- % of energy generated by on-site renewable energy sources.
- Total % of energy demand met by renewable sources (including off-site).

In addition to the creation of these metrics, the comparison against the 2015 Baseline year along with year-on-year change will be monitored to address overall program success and identify relevant trends. The carbon neutrality targets outlined in **Table 7** were developed as realistic and ambitious targets for the Airport to achieve.

**Table 7: Carbon Neutrality Target**

| Percentage of Renewable Energy | Target Year | Timeframe |
|---|---|---|
| 30% | 2022 | Short-term |
| 60% | 2028 | Medium-term |
| 100% | 2035 | Long-term |

# Critical Areas of Focus

A. **Cost Effective Renewable Energy Generation**

B. **Green Energy Procurement**

C. **Maximized Synergies Between Systems (e.g. energy, water, waste, transportation)**

D. **Sustainability Management Plan and Airport Carbon Accreditation**

## A. COST EFFECTIVE RENEWABLE ENERGY GENERATION

Alternative energy is already at the forefront of the Airport's sustainable development initiatives, as apparent in the incorporation of solar PV energy in their existing developments. With 5.5 MW of existing PV on the Airport campus, the Airport is establishing itself as a growing renewable energy user. Approximately 12 percent of the Airport's energy is currently generated by PV, a technology that is both clean and reliable. This technology is a 'zero carbon' power source, and thus a powerful tool to help reach carbon neutrality. The Airport can construct and operate approximately 7 MW of PV generation capacity before it reaches a point of over-generation, where more electricity is created than can be used at peak output. The potential for exceeding this capacity is substantial: based on the available rooftops and parking lot areas where PV could be installed, the Airport could generate up to 20 MW of electricty through PV arrays. While this capacity would over-generate if no additional measures are put in place – by 2035 a peak demand of approximately 12 MW is anticipated under business as usual (BAU) projections – there is significant potential for energy storage systems to be installed as well. These systems can capture the Airport's full on-site generating capacity, allowing the Authority to harness and utilize this power at any time of day.

The Authority also recognizes that on-site solar generation and battery storage only offer part of the solution for maximizing cost effective renewable energy generation, and is actively researching additional alternatives. Due to policies set at the State level, the electric grid in the San Diego region will continue to become more "clean," approaching 100% zero carbon by 2045. As this develops, the greatest source of carbon emissions from Airport facilities will be natural gas combustion for space and water heating. In the absence of replacing natural gas with renewable/biogas, to develop a truly carbon neutral Airport the Authority will need to consider converting natural gas systems to electrical. For example, converting boilers to heat recovery chillers or heat pumps and designing/upgrading facility heating systems to run on lower grade heat sources.

## B. GREEN ENERGY PROCUREMENT

A critical opportunity in meeting the Airport's goal of carbon neutrality is strategic leveraging of consumer choice opportunities. On the passenger side, in 2015 the Airport created "The Good Traveler" program. This award-winning program allows passengers to quickly and easily pay for offsets to the carbon emissions associated with their flight. This is achieved through financing of local carbon reduction and sequestration projects. As of 2017, The Good Traveler program has offset more than 12 million air miles at San Diego International Airport alone,[9] and in 2018 the program is expanding to include seven airports nationwide.[10]

On the operations side, the Airport is participation in the SDG&E EcoChoice program. An alternative to on-site renewable energy, the EcoChoice program is a simple charge added to SDG&E utility bills certifying that 50% to 100% of electricity purchased from SDG&E comes from renewable sources. The majority of the Airport's electrical system (approximately 97% of Airport power) is certified as 100% renewable through this program. The EcoChoice program is a simple and cost effective way to fill the "gap" in green energy left over from on-site generation.

9 San Diego International Airport Newsroom. "San Diego International Airport's 'The Good Traveler' Program Named Best Innovation in Sustainability." 28 April 2017.

10 https://thegoodtraveler.org/airport-partners/

In addition to The Good Traveler and EcoChoice programs, Direct Access (DA) and Community Choice Aggregation (CCA) may be viable strategies for procuring green power. DA programs allow the purchasing of power from electric service providers (ESPs) to obtain energy that may be cleaner, cheaper, or both. The Airport is contracted with a DA supplier of natural gas.

CCA programs allow local governments to buy electricity in bulk on behalf of local customers. This allows local residents and businesses to access cleaner, cheaper energy without ties to the standard utility provider, and permits customers to have a say in the fiscal and environmental cost of their energy. The City of San Diego recently announced the decision to establish a CCA as a strategy to meet their 100 percent by 2035 renewable energy goal.

The Airport's "The Good Traveler" program was recognized as the "Best Innovation in Sustainability" at the 2017 ACI-NA Airport Concessions Awards.

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## C. MAXIMIZED SYNERGIES BETWEEN SYSTEMS (E.G. ENERGY, WATER, WASTE, TRANSPORTATION)

The Airport's utility and transportation systems are fundamentally interconnected, and there is ample opportunity to leverage these synergies in order to reduce the Airport's overall environmental impact and carbon footprint. The cooling towers at the CUP are the single largest consumer of water on the Airport campus. The Authority is committed to exploring ways to reduce water consumption related to the HVAC system, and to utilize non-potable water in order to eliminate use of potable water where feasible. Action 2 of the Authority's Water Stewardship Plan further identifies HVAC condensate as a source of non-potable water.

The electricity use tied to transportation on the Airport campus is increasing rapidly. The Clean Transportation Plan outlines how electrical vehicle (EV) chargers, both for landside and airside use, will continue to increase, reducing direct GHG emissions but increasing Airport electricity demand.


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## D. SUSTAINABILITY MANAGEMENT PLAN AND AIRPORT CARBON ACCREDITATION

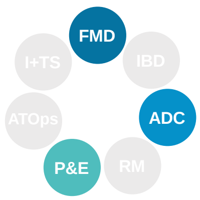
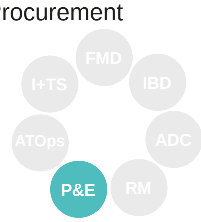
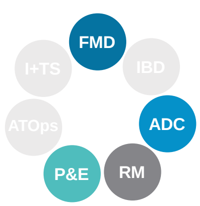
San Diego International Airport low-water landscaping.
*Photo courtesy of Flickr Creative Commons © San Diego County Regional Airport Authority*

The SMP outlines policies and measures that the Airport will enact in order to address climate change, including specific ways to reduce GHG emissions through the Air Quality Management Plan (AQMP). The SMP will also evaluate the impact of measures put in place to increase resilience to climate change. Developing an Airport SMP is a high priority in the Authority's comprehensive strategy to pave the way for a sustainable future. The Authority is committed to developing the AQMP portion of the SMP in 2017.

The Airport has recently been certified through the ACA accreditation program at Level 3. The program creates a framework that helps airports identify, manage, and ultimately reduce their carbon emissions. Level 3 certification recognizes the Airport as actively implementing a carbon management plan and reducing the emissions under its control. The annual emissions reporting process complements the Airport's commitment to implement metrics that track progress towards the Strategic Energy Plan's goals. Level 3+ certification further requires the tracking of Scope 3 emissions and engagement with stakeholders to actively reduce Scope 3 emissions.

## IMPACT AND IMPLEMENTATION

**Table 8: Carbon Neutrality—Implementation Plan**

| Focus Area | Critical Activities | | Responsibility | Time Horizon |
|---|---|---|---|---|
| A. Cost Effective Renewable Energy Generation  | A.1 (IR A.1) | Install approximately 4 MWh of battery storage to work in conjunction with existing solar installations. | FMD / ADC | 0 - 2 years |
| | A.2 | Identify set-aside areas for approximately 4 MW of future solar. | P&E | 0 - 2 years |
| | A.3 | Develop a plan to upgrade facility heating systems to run on lower grade heat, enabling electrification of space and water heating. | FMD / ADC | 2 years |
| | A.4 (IR A.4) | Procure an additional 4 MW of solar as part of the T1RP. | ADC | 5 - 10 years |
| | A.5 (IR A.5) | Procure an additional 4 MWh of battery storage as part of the T1RP. | ADC | 5 - 10 years |
| B. Green Energy Procurement  | B.1 | Monitor and engage with the City of San Diego's recently annouced CCA program to seek partnership opportunities. | P&E | 0 - 2 years |
| | B.2 | Monitor and engage with SDG&E on continued enrollment and support of their EcoChoice Program. | P&E | 0 - 2 years |
| C. Maximized Synergies Between Systems  | C.1 (CC E.2) | Investigate potential business models around the facilitation of charging for electric vehicles. | P&E / RM | 0 – 2 years |
| | C.2 | Interface with Clean Transportation Plan to support growth in EV charging infrastructure | ADC / P&E | 0 – 2 years |
| | C.3 | Optimize cooling tower operation to minimize potable water use. | FMD | 0 – 2 years |
| | C.4 | Collaborate with water stewardship team to explore opportunities to leverage HVAC condensate as a non-potable water source. | FMD | 0 – 2 years |

FMD Facilities Management · IBD Innovation & Business Development · ADC Airport Design & Construction · RM Revenue Management · P&E Planning & Environmental Affairs · ATOps Airport Terminal Operations · I+TS Information & Technology Services

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**Table 8: Carbon Neutrality—Implementation Plan** *continued*

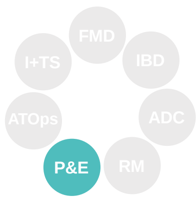
| Focus Area | Critical Activities | | Responsibility | Time Horizon |
|---|---|---|---|---|
| D. Sustainability Management Plan and Airport Carbon Accreditation   | D.1 | Calculate carbon footprint associated with Energy program. | P&E | 0 - 2 years |
| | D.2 | Leverage Strategic Energy Plan to develop energy section of the broader SMP. | P&E | 0 - 2 years |
| | D.3 | Leverage Strategic Energy Plan to develop energy section of broader ACA submittal. | P&E | 0 - 2 years |

**Table 9: Carbon Neutrality—Integration Plan**

| Focus Area | ADP Integration (L/M/H) | CIP Integration (L/M/H) |
|---|---|---|
| Cost Effective Renewable Energy Generation | High | High |
| Green Energy Procurement. | Low | Low |
| Maximized Synergies Between Systems | Medium | Medium |
| Sustainability Management Plan and Airport Carbon Accreditation | Low | Low |

# Interdependence and Resilience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# 3

# INTERDEPENDENCE AND RESILIENCE

The Airport will incorporate an energy section within the Airport Business Continuity Plan that describes the interdependence of the Airport with the local community and its infrastructure to support resilient Airport operations.

## Overview

The installation of the 12 kV microgrid at the Airport has laid the framework for developing a robust and resilient electrical system linking supply and demand across the entire campus. Existing on-site generation serves over 15 percent of the Airport's electricity demand and the existing CUP meets over 70 percent of the its thermal loads, representing a significant energy resource already present on-site.

Capitalizing on the strength of this infrastructure, the Airport will vastly increase the reliability, efficiency, security, and quality of its power supply with further investment into on-site energy generation and energy storage systems. To capture the benefits of this, it is recommended that the existing Business Continuity Plan be expanded to incorporate an energy resilience component.

The Performance Excellence in Energy Renewal (PEER) program, administered by Green Business Certification, Inc. (GBCI), measures and helps improve the performance of a sustainable power system, with a concentration on system reliability and resilience.

Implementing this rating system can serve to ensure a best practice resilient system is in place in addition to validating the Airport's credentials to the industry and the San Diego region.

### Metrics

The Airport will measure its success in increasing its energy resilience by monitoring the number of hours for which it can continue its operations in the event of grid power outages at varying levels of service.

The metrics that will be monitored will include:

- Number of hours of potential operation at each service level (normal, medium, and critical)
- Percent likelihood of normal, medium, and critical Airport service failures based on SDG&E's Annual Reliability Report.[11]

In addition to the creation of these metrics, the comparison against the 2015 Baseline year along with year-on-year change will be monitored to address overall program success and identify relevant trends. The resilience targets outlined in **Table 10** were developed as realistic and ambitious targets for the Airport to achieve.

11 Outage probability based on SDG&E Electric System Reliability Annual Report 2015. https://www.sdge.com/system-reliability.

**Table 10: Resilience Target**

| Service Level | Duration | Annual Chance of Grid Disruption |
|---|---|---|
| Normal | 2 Hours | 50% |
| Medium | 6 Hours | 17.5% |
| Critical | 24 Hours | 11.5% |

# Critical Areas of Focus

**A. On-Site Energy Generation and Storage**

**B. Airport Critical Systems are Prioritized to Ensure Continued Operations**

**C. Redundant Systems to Minimize Disruptions to Operations**

**D. Cost of Resilience Measures Balanced with Benefit of Undisrupted Operations**

## A. ON-SITE ENERGY GENERATION AND STORAGE

The Airport is in a prime position to enhance its facilities to provide a diverse and resilient infrastructure within the campus. As development project grow the site-wide energy demand, energy generation through on-site PV arrays can be maximized. The limit to this growth is constrained by physical space available for solar arrays at around 20 MW (nameplate capacity), which correlates with excess mid-day generation during the spring and autumn months. Battery energy storage (BES) can help with this by charging on excess generation during the day and discharging during peak hours. While the proposed 8 MWh BES was selected for its positive return on investment (ROI) from demand management services alone (charging at night and discharging during peak demand and peak time-of-use (TOU) hours), it is approximately the right size for making full use of excess generation as well. Operating the BES to serve both functions will simultaneously improve the business case for installing the system and improve the energy resilience of the Airport by enabling more on-site PV capacity (without mid-day over-generation).

More solar and storage is not enough to establish a resilient Airport on their own, however. Solar PV is considered a "variable" energy resource due to the intermittent availability of sunlight, and it does not guarantee adequate power supply for critical loads in the event of an outage. While BES can help shift some of this renewable electricity to non-daylight hours, it is insufficient to ensure an adequate supply of power at all times to support unexpected outages. For this, a degree of "dispatchable" power is required. The Airport already has dispatchable power for critical loads through diesel generators, but there is an opportunity to enhance the performance of these generators, and improve the resiliency of Airport operations, by interconnecting them with PV and BES resources via the Airport's 12 kV microgrid loop.

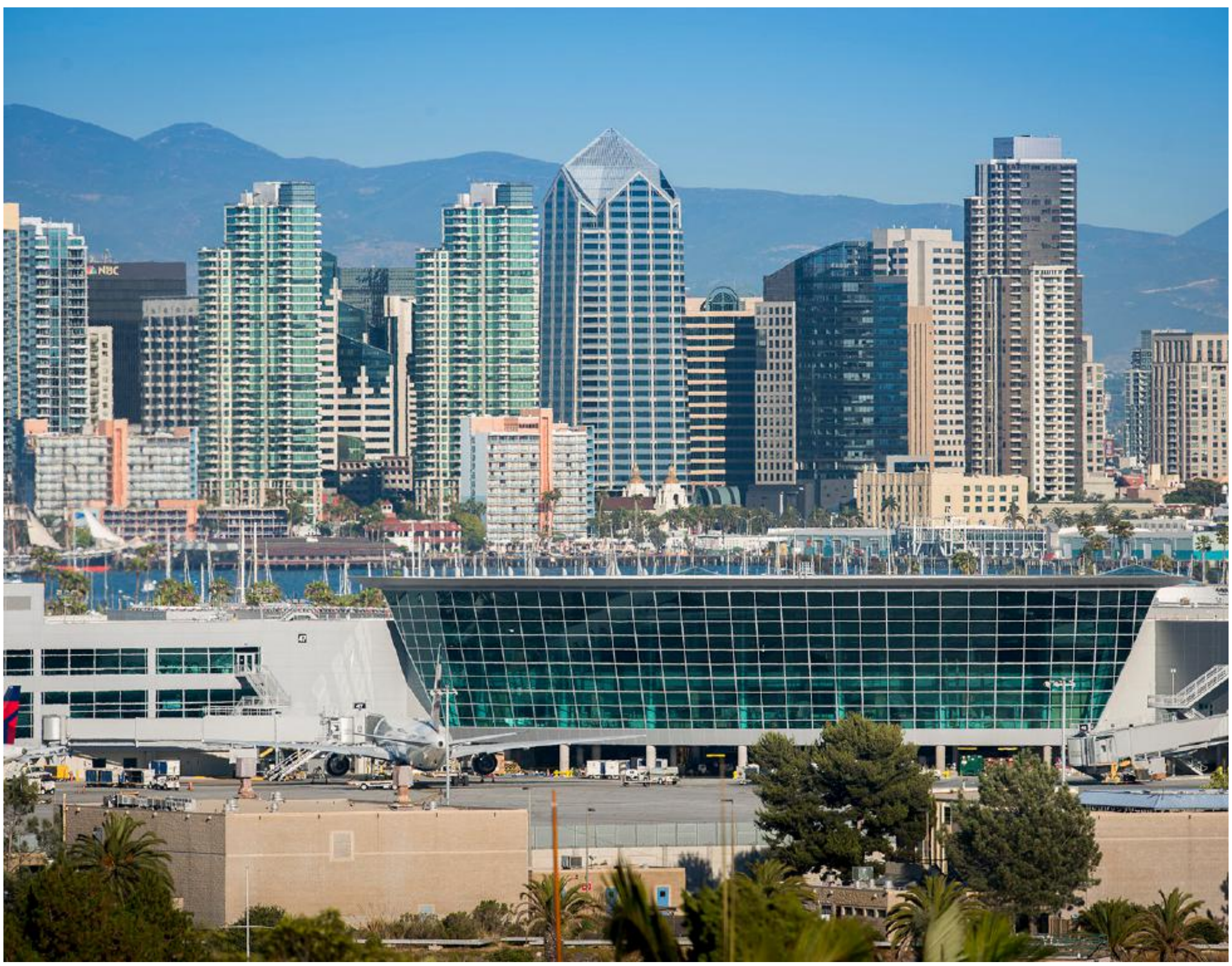
> The ability to store energy onsite will provide considerable flexibility in how and when the Airport uses clean power generated by its PV systems.

As they are currently constructed, the distributed power systems at the Airport are not realizing their full potential for interdependent operation. Although all major loads and energy sources are connected to the existing 12 kV microgrid loop, they are not currently configured to operate while "islanding" from the electric grid during an outage. For example, the existing PV arrays at the

Airport are set up to stop generating electricity whenever there is a grid power outage, regardless of sunlight availability. The BES system currently in development may similarly be planned to disconnect from the grid during an outage.

An alternative scenario for the Airport is possible, in which on-site energy resources can continue operations when the electric grid loses power. This includes all PV and BES systems being able to supply local power, but also the backup diesel generators being configured to operate critical loads such as the chillers at the CUP. Whereas all Airport critical loads are currently fed only by diesel generators, networking the generators through a centralized microgrid controller and interconnecting PV and BES would allow some critical loads to be fed by renewable resources and enable all generators to run at optimal efficiency.

It is recommended that the Airport conduct a microgrid optimization study to identify what changes are needed in the electrical distribution infrastructure to enable a fully islandable Airport microgrid built on the backbone of the existing 12 kV distribution loop. An islandable microgrid with networked generators and co-optimized distributed renewables would enable enhanced operational capacity at the Airport during an outage; reduce reliance on fossil fuels to withstand an outage; and allow for market participation in numerous value streams available primarily for microgrids (i.e., ancillary grid services).

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## B. AIRPORT CRITICAL SYSTEMS ARE PRIORITIZED TO ENSURE CONTINUED OPERATIONS

By reviewing its energy consuming systems, the Airport will identify facilities prioritized for continued operations based on how critical they are to the overall mission of the Airport. Facilities will be classified as life safety, mission critical, mission support, or non-essential facilities. This information will be used to prepare a load shedding strategy that will guide efforts by the demand response system to mitigate demand during an emergency event. This prioritization will allow effective continuation of operations should demand exceed capacity in an emergency event, and will be a critical step in the development and measurement of the stated resilience targets. This prioritization will need to be followed by capital projects to implement these changes in the electrical systems of existing facilities and to include it in the planning, design and construction of new facilities.

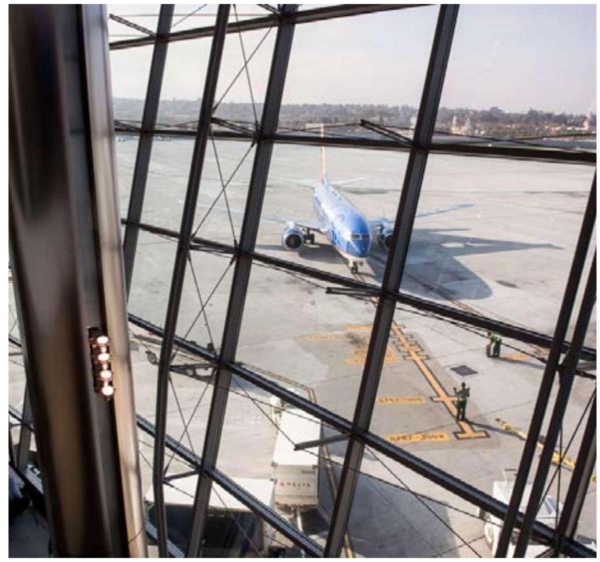


*Photo courtesy of Flickr Creative Commons © San Diego County Regional Airport Authority*

## C. REDUNDANT SYSTEMS TO MINIMIZE DISRUPTIONS TO OPERATIONS

In addition to providing a diversified portfolio of energy sources, it is critical to provide an appropriate level of redundancy to facilitate the continued operation of the various functions within the Airport.

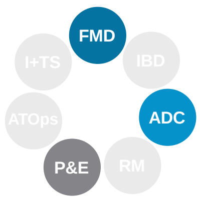
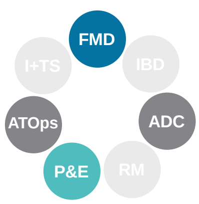
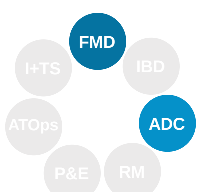
The proposed use of energy storage within the energy strategy not only provides energy cost benefits but also enhances the ability of the energy infrastructure to support the Airport's core functions in the event of equipment failure. Batteries, in particular, can be configured to store either excess renewable energy, or off-peak grid electricity at a lower rate, to be used to meet critical loads of the Airport during a grid outage.

To better understand the overall redundancy required to minimize disruptions to Airport operations, it is recommended that a redundancy study be conducted to identify where current spare capacity exists and where it is insufficient within the energy infrastructure. The resulting recommendations can be incorporated into the long term ADP and CIP strategic planning efforts to ensure that adequate budget and space are allowed.

## D. COST OF RESILIENCE MEASURES BALANCED WITH BENEFIT OF UNDISRUPTED OPERATIONS

Validating the cost effectiveness of proposed energy strategies is a critical part of the Strategic Energy Plan. In order to do this in a manner that is best aligned with the goal of creating a resilient, environmentally conscious Airport, it is proposed that the existing CIP evaluation process be updated to incorporate an evaluation of a project's ability to support and/or enhance the Airport's operational resilience. It is anticipated that this will likely include the estimated cost of consequential loss in the event of loss of power.

**Table 11: Interdependence and Resilience—Implementation Plan**

| Focus Area | Critical Activities | | Responsibility | Time Horizon |
|---|---|---|---|---|
| A. On-Site Energy Generation and Storage   | A.1 (CN A.1) | Install approximately 4 MWh of battery storage to work in conjunction with existing solar installations. | FMD / ADC | 0 - 2 years |
| | A.2 | Develop a microgrid optimization study to identify actions that enable fully islandable operations. | FMD / P&E | 2 years |
| | A.3 | Develop a chilled water generation and distribution strategy to support ADP program. | FMD / ADC | 2 years |
| | A.4 (CN A.4) | Procure an additional 4 MW of solar as part of the T1RP. | ADC | 5 - 10 years |
| | A.5 (CN A.5) | Procure an additional 4 MWh of battery storage as part of the T1RP. | ADC | 5 - 10 years |
| B. Airport Critical Systems are Prioritized to Ensure Continued Operations   | B.1 (CC A.1) | Develop prioritization matrix of Airport facilities and critical systems. | FMD | 2 years |
| | B.2 (CC A.2) | Develop energy load shedding strategy. | FMD / ATOPs | 2 years |
| | B.3 | Develop an energy chapter of the Business Continuity Plan. | P&E | 2 years |
| | B.4 (CC A.3) | Implement campus wide energy management and demand response system through energy storage and other capabilities. | FMD / ADC | 2 years |
| C. Redundant Systems to Minimize Disruptions to Operations   | C.1 | Develop redundancy study to identify where current spare capacity exists and where it is insufficient. | FMD | 2 years |
| | C.2 | Incorporate redundancy requirements into ADP project scope. | ADC | 2 years |
| | C.3 | Deploy additional redundancy measures to achieve the required redundancy needs. | FMD | 10 years |

FMD Facilities Management · IBD Innovation & Business Development · ADC Airport Design & Construction · RM Revenue Management · P&E Planning & Environmental Affairs · ATOps Airport Terminal Operations · I+TS Information & Technology Services

*Supporting Team*

**Table 11: Interdependence and Resilience—Implementation Plan** *continued*

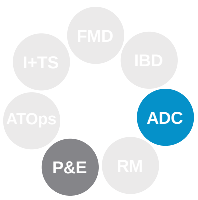
| Focus Area | Critical Activities | | Responsibility | Time Horizon |
|---|---|---|---|---|
| D. Cost of Resilience Measures Balanced with Benefit of Undisrupted Operations   | D.1 | Expand existing CIP evaluation process to incorporate consideration of its ability to support resilient Airport operation. | ADC / P&E | 5 years |

**Table 12: Interdependence and Resilience—Integration Plan**

| Focus Area | ADP Integration (L/M/H) | CIP Integration (L/M/H) |
|---|---|---|
| On-Site Energy Generation and Storage | High | Low |
| Airport Critical Systems are Prioritized to Ensure Continued Operations | Low | Medium |
| Redundant Systems to Minimize Disruptions to Operations | Medium | Medium |
| Cost of Resilience Measures Balanced with Benefit of Undisrupted Operations | High | High |

# Cost Containment

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# 4

# COST CONTAINMENT

The Airport is committed to achieving its energy goals in a financially responsible and feasible way.


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## Overview

The Strategic Energy Plan has been designed in a cost-conscious manner, assessing the viability of all proposed projects through the lenses of Total Cost of Ownership (TCO), which evaluates cost-benefit over the whole life of a project, and Sustainable Return on Investment (SROI), which expands TCO to include the monetized value of carbon savings. This reduces both ongoing energy costs and overall costs of the Airport's carbon reduction program. This evaluation will help the Airport pursue the goals and actions described in the Strategic Energy Plan in the most fiscally effective way. The Airport will manage every aspect of its energy generation and usage in order to realize efficiencies wherever possible, including proactive and continually adjusted energy demand management as well as strategic leveraging of the various funding mechanisms available to the Airport. The Authority is committed to conscientious planning assessment, implementation, and operational evaluation of Airport projects to ensure energy efficiency is maximized. Intelligent, proactive, and persistent refinement to the Airport's energy strategy will ensure that it minimizes cost overruns and focuses on energy projects and programs that are viable from a cost-benefit standpoint.

### Metrics

The Airport will measure its success in achieving its energy goals in a fiscally responsible manner by monitoring the energy cost per passenger (ECP), or the annual energy consumption divided by the annual Airport passengers, adjusted for escalation.

The metrics that will be monitored will include:

- Annual energy cost per passenger, adjusted for escalation (total and by fuel)
- Monthly energy cost per passenger, adjusted for escalation (total and by fuel)

In addition to the creation of these metrics, the comparison against the 2015 baseline year and year-on-year change will be monitored to address overall program success and identify relevant trends. The cost containment targets outlined in **Table 13** were developed as realistic and ambitious targets for the Airport to achieve.

**Table 13: Cost Containment Target**

| ECP Reduction (2015 Baseline) | Target Year | Timeframe |
|---|---|---|
| 10% | 2022 | Short-term |
| 20% | 2028 | Medium-term |
| 30% | 2035 | Long-term |

# Critical Areas of Focus

A. **Demand Side Management**

B. **Funding Mechanisms**

C. **Identification of Effective Metrics**

D. **Project Assessment, Implementation, and Evaluation**

E. **Planning for Vehicle Electrification**

## A. DEMAND SIDE MANAGEMENT

Airport electricity expenditure is predominantly broken down into two main categories: energy usage and demand charges. SDG&E demand and capacity charges, related to the peak electricity demand rather than total consumption, are significant components of the bill and equate to over 35% of the Airport's monthly electricity costs. The Airport intends to investigate the implementation of a demand response and management system, which will pull from the Airport's various building management systems and utilize predictive logic to reduce peak demand. This system will also limit electricity demand during peak hours, during which the SDG&E consumption charge is higher than at other hours, further reducing charges for electricity use. By measuring factors such as total energy use, time of use, trends for each quarter and year, and more, the Airport will be able to identify where energy and money can be used more efficiently, and where it can augment cost containment efforts. Through active use of the controls at the Airport's disposal, the Airport can continually refine its energy infrastructure to maximize its return on investment.

The Airport can enhance its cost management through implementation of a BES system. BES would capture energy generated by on-site PV arrays and discharge that energy to serve loads either during peak times, reducing energy cost, or during a utility outage to serve critical Airport demands.

Demand side management will not directly generate energy or reduce carbon emissions. However, it will reduce energy costs for the Airport and will increase resilience by ensuring that energy is used in the most effective manner.

## B. FUNDING MECHANISMS

The Airport will leverage alternative financing mechanisms in order to further contain costs. In the past, the Airport has primarily funded energy-related projects either through planned capital improvement projects or through regular operations and maintenance replacement projects. These projects have included efforts such as HVAC upgrades, lighting retrofits, and generator installation. More recently, for installation of PV technology, the Authority leveraged a third-party ownership mechanism called a power purchase agreement (PPA). Under the PPA, a third party is responsible for developing, constructing and maintaining the energy generation technology, allowing the Airport to simply purchase the electricity from the owner at an affordable rate without the capital costs of building the system themselves. The PPA allowed the Airport to obtain sufficient funding to plan and install PV technology without requiring a capital improvements expenditure which would impact the CIP. In order to realize full implementation of the Strategic Energy Plan, the Airport will need to incorporate alternative funding sources as part of its broader capital procurement initiatives.

There are several funding mechanisms that can potentially be leveraged in order to implement energy projects. As described above, the Airport already has experience with PPAs, and these continue to represent a viable method for obtaining renewable energy at or below utility prices, without the significant capital expenditure and risks required to construct and operate PV systems. The Airport will also pursue opportunities from the State of California and SDG&E to leverage incentive programs that may reduce net outlay (reducing the costs of investing in sustainable infrastructure). Incentive programs also include energy saving performance contracts (ESPCs), which allow the implementation of energy efficient projects with no up-front capital costs, leveraging the energy savings over a 10 – 15 year period to fund the initial capital costs. Power Efficiency Agreements (PEAs) present another approach to demand management. These PEAs allow for on-site energy storage to be installed and operated with no up-front capital costs and no customer risk, in exchange for the financier receiving a share of the electrical bill savings. The Authority has also investigated shared savings agreements and lease + performance guarantees for BES procurement.

SDG&E also provides zero percent interest on-bill financing (OBF) for funding energy efficiency retrofits, provided that the simple payback of the measures is less than 1 year. As the findings of the SDG&E audit suggest a significant number of energy efficiency opportunities that satisfy this criteria, OBF is likely to be a key funding mechanism for the Airport.

The Airport will further explore the many existing funding opportunities as it continues to enhance its green infrastructure.

## C. IDENTIFICATION OF EFFECTIVE METRICS

Creating performance metrics will facilitate the Airport's efforts to monitor the success of its energy management efforts. These metrics will identify whether the Airport is successfully supporting its core functions and implementing the airport industry's best practices. The energy use intensity metric is utilized in a majority of energy programs and the Airport will adopt this approach. This metric evaluates energy use per square foot, and because of its widespread use, it will allow comparison of Airport facilities to other facilities. However, secondary metrics are needed to account for the Airport's unique functions as a travel hub. For instance, the energy use intensity metric does not account for increased energy consumption due to increases in the number of passengers that the Airport serves. The Airport will also track and measure energy use per passenger for passenger facilities. To that end, the Airport will also evaluate energy use per flight, looking at both incoming and outgoing freight and passenger flights.

## D. PROJECT ASSESSMENT, IMPLEMENTATION, AND EVALUATION

The Airport will drive its project implementation with a robust process that ensures both that full assessment of projects prior to implementation and that the road to implementation is feasible. TCO principles will guide the Airport's investments in energy efficiency, taking into account all costs of a project, and the return on these investments made relative to those costs. Taking a whole systems approach to energy management will require effort on behalf of Airport decision-makers. Policies and decisions must consider the whole life cycle of the building or system which is under consideration. This perspective accounts for not only capital construction costs, but also the costs of operations, ongoing maintenance, and even replacement costs over the lifespan of a building, facility, or system. In compliance with the Airport's Sustainability Policy, staff will "analyze the life cycle operating costs and impacts of... facilities, operations, and services," and will base project feasibility and economic sustainability evaluations on this concept.[12] Future actions will also be required to integrate TCO throughout their decision making process. This commitment will ensure that every step of asset management, from initial planning and budgeting through construction all the way to operations and maintenance, is properly taken into account.

The framework for calculating capital and long-term maintenance costs is readily available through a variety of models. With these flexible tools, the Airport can evaluate the costs of not only its assets and infrastructure but also its best management practices. Airport finance and operations staff and design firms alike will be able to adapt and use these systems to make intelligent project decisions and to prepare

In recognition of the broader environmental benefits of energy projects, the Airport is committed to investigating the potential of enhancing its project evaluation and selection process.

budgets in light of TCO. The end result will be the incorporation of energy performance as an intrinsic part of financial and operating decisions.

Usage of enhanced project evaluation techniques such as SROI will help to identify the environmental benefits of projects and assist the Airport in allocating funding where it is most effective. Traditionally, an energy project's viability has been judged solely on its cost effectiveness through basic metrics: internal rate of return, evaluation of net present value, or simple payback. In recognition of the broader environmental benefits of energy projects, the Airport is committed to investigating the potential of enhancing its project evaluation and selection process.

SROI will function as a core component of this larger picture of the value of energy projects and includes, among other factors, the value of carbon reduction as an important aspect of project viability. An example of this is the monetization of renewable energy in the form of Renewable Energy Certificates (RECs). RECs are non-tangible, tradable commodities representing renewably-sourced electricity that can be sold to another user or utility meet their respective renewable energy commitments, providing a revenue stream for the generator.

12 San Diego County Regional Airport Authority Policy 8.31

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## E. PLANNING FOR VEHICLE ELECTRIFICATION

The nexus between energy and transportation on the Airport campus is growing. Currently there are 22 electrical vehicle (EV) charging stations (44 ports) in various Airport parking lots, accounting for roughly 50 MWh/year of electricity, or about 0.1 percent of the Airport's electrical consumption (see **Table 14**). Several initiatives and trends are in place to increase this volume of EV charging in coming years.

Statewide, the California Air Resources Board (CARB) is considering a target to replace all existing Ground Support Equipment (GSE) with 100% zero-emission (ZE) GSE by 2032.[13] Additionally, Executive Order B-48-18 calls for 5 million zero-emission vehicles (ZEV) by 2030.[14] This will mean significant growth in EV charging demand for both airside and landside functions. Internally, the Airport's Clean Transportation Plan is developing strategies to address these trends, as well as building additional initiatives such as electrification of the Airport shuttle fleet.

These trends will result in increased electricity demand and consumption at the Airport, as off-site liquid fuel purchases are internalized to on-site EV charging. To stay proactive about these changes and to mitigate associated capital and operational costs, continued coordination between the Strategic Energy Plan and the Clean Transportation Plan is encouraged. Coordination, such as appropriately factoring EV charging growth into utility forecasting for infrastructure upgrades and energy cost planning, can help improve cost containment for these changes.

13 https://www.arb.ca.gov/msprog/offroad/gse/gsemtgs.htm

14 https://www.gov.ca.gov/2018/01/26/governor-brown-takes-action-to-increase-zero-emission-vehicles-fund-new-climate-investments/

Another potential for cost containment includes leveraging EV charging as a service to customers, to either recover the cost of infrastructure upgrades or to provide a new revenue stream for the Airport. Third party charging companies currently gain a significant profit margin through the provision of EV chargers. This represents a considerable potential funding source, and the Airport will investigate how best to leverage this business opportunity. Options include direct management of EV chargers by the Airport or operation of EV chargers by third parties who pay an infrastructure fee to the Airport. This is a considerable opportunity to fund further energy efforts such as ongoing energy programs or energy program management. If, for example, the Airport receives 10 cents per kWh, it would raise $500,000 of additional revenue each year.

**Table 14: Existing EV Charging Station Statistics**

Existing EV charging stations: **22**

Number of charging events in 2015: **6,676**

Average plug time: **9 hours, 39 minutes**

Average charge time: **1 hour, 37 minutes**

Total electricity consumed in 2015: **46,811 kWh**

Estimated cost of electricity consumed: **$6,975**

Potential revenue:
- Hourly charge ($1/hr. market rate):
  - Plug time: **$64,500**
  - Charge time only: **$11,082**
  - Valet Charge (assumes 2x on charge time): **$22,164**
- Unit rate (35c/kWh market rate): **$16,383**

## IMPACT AND IMPLEMENTATION

**Table 15: Cost Containment— Integration Plan**

| Focus Area | ADP Integration (L/M/H) | CIP Integration (L/M/H) |
|---|---|---|
| Demand Side Management | Low | Medium |
| Funding Mechanisms | Low | Medium |
| Identification of Effective Metrics | Medium | Medium |
| Project Assessment, Implementation, and Evaluation | Low | Medium |
| Planning for Vehicle Electrification | Low | Low |

**Table 16: Cost Containment— Implementation Plan**

| Focus Area | Critical Activities | | Responsibility | Time Horizon |
|---|---|---|---|---|
| A. Demand Side Management | A.1 (IR B.1) | Develop prioritization matrix of Airport facilities and critical system. | FMD | 2 years |
| | A.2 (IR B.2) | Develop energy load shedding strategy. | FMD | 2 years |
| | A.3 (IR B.4) | Implement campus wide energy management and demand response system through energy storage and other capabilities. | FMD | 2 years |
| B. Funding Mechanisms | B.1 | Investigate expanded use of PPAs currently used for the solar projects for other technologies including fuel cells and battery storage. | FMD | 2 years |
| | B.2 | Maximize use of SDG&E, local, and state grants and incentives to reduce capital cost of energy projects. | P&E | 2 years |
| | B.3 | Investigate potential use of Energy Savings Performance Contracting (ESPC) to expedite implementation of energy projects. | FMD | 2 years |
| C. Identification of Effective Metrics | C.1 | Expand existing criteria used to evaluate the benefit of a proposed project to include the whole life performance. | ADC | 2 years |
| | C.2 | Expand existing criteria used to evaluate the indirect benefit of a proposed project to include the whole life performance, such as reduction in carbon emissions, through the use of the SROI metric. | ADC / P&E | 2 years |
| | C.3 | Educate project review committee on the value of these enhanced metrics and the overall energy goals of the Airport. | ADC / P&E | 2 years |
| D. Project Assessment, Implementation, and Evaluation | D.1 | Establish a standard for assessment and evaluation of life cycle SROI performance of projects impacting Airport facilities, operations, and services. | ADC / P&E | 2 years |
| E. Planning for Vehicle Electrification | E.1 | Coordinate with the Clean Transportation Plan to ensure growth in EV charging is factored into utility forecasting for electricity demand. | P&E | 0-2 years |
| | E.2 (CN C.1) | Investigate potential business models around the facilitation of charging for electric vehicles. | P&E / RM | 2 years |

FMD Facilities Management · IBD Innovation & Business Development · ADC Airport Design & Construction · RM Revenue Management · P&E Planning & Environmental Affairs · ATOps Airport Terminal Operations · I+TS Information & Technology Services

*Supporting Team*

# Regional and Industry Leadership

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# 5

# REGIONAL AND INDUSTRY LEADERSHIP

The Airport is committed to leading the region and industry in sustainability through the deployment of a robust, innovative, and cost effective energy program which fully supports Airport operations.


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## Overview

The Airport's commitment to and successes in sustainability are validated by the third party certifications already received, such as LEED certification, and the Airport will similarly validate its energy plan through ISO 50001 certification. The Airport's mission is not limited to changing its own campus for the better. As an industry and regional leader in sustainability, the Airport is both responsible and privileged to lead those in its sphere of influence through knowledge sharing, best practices, and lessons learned. The infrastructure and organization of the Airport campus provide a valuable test bed for energy management, which will be used to lead and partner with Airport stakeholders, neighbors, and industry colleagues. The Authority is well aware that it does not operate in a vacuum, and will partner with its sister agencies in making a more sustainable San Diego region. The Airport remains open to revising and upgrading its strategy to ensure it is always prepared to meet the needs of its customers, region, and environment.

### Metrics

The Airport will measure its continued regional and industry leadership by monitoring the following metrics:

- Number of conference and/or community presentations made related to energy and sustainability
- Number of articles, Airport Cooperative Research Program (ACRP) reports, and other published materials highlighting the Airport's energy and sustainability leadership
- Level of engagement with local and regional energy initiatives

In addition to the creation of these metrics, the year-on-year change will be monitored to address overall program success and identify relevant trends.

# Critical Areas of Focus

**A. Third Party Certification**

**B. Best Practices Knowledge Share to Build Industry and Regional Momentum**

**C. Engagement with Business Partners in Energy and Sustainability Goals**

**D. Innovation through Big Data**

**E. Periodic Strategic Energy Plan Validation**

**F. New and Emerging Technologies**

## A. THIRD PARTY CERTIFICATION

The Airport will seek to obtain third party certification wherever possible in order to validate the credibility of Airport sustainability practices. In addition to the ACA certification described previously, the Airport will consider other third party certifications such as LEED, PEER, Parksmart, Envision, and ISO 50001 compliance. The Airport's existing commitment to LEED is well documented in previous actions, with a pledge to obtain LEED Silver or better certification on all new facilities. The Airport will likely exceed the energy performance required by code as part of future LEED certification.

The PEER program, introduced previously, provides another growth opportunity for the Airport. PEER is a system for evaluating power system performance. This rating system measures and helps improve the performance of a sustainable power system, including system reliability and resilience; energy efficiency and environmental responsibility; operational effectiveness; and customer contribution. Implementation of this rating system will not only benefit the implementation of a sustainable power system but will also validate the Airport's credentials to the industry and the San Diego region.

ISO 50001 specifically focuses on energy management and provides certification that the Airport has adhered to certain standards. The Airport will investigate implementing an Energy Management Program which complies with ISO 50001, providing a strong framework for monitoring energy performance. This effort and its associated certification will move the Airport towards achieving its Strategic Energy Plan goals. The Airport's industry peers are utilizing ISO 50001 more and more frequently, and implementation will help ensure the Airport remains competitive and at the forefront of sustainability in its industry. The Airport will evaluate the approaches used and lessons learned by energy projects at other airports as part of this process.

The new consolidated Rental Car Center has achieved LEED Gold certification.
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## B. BEST PRACTICES KNOWLEDGE SHARE TO BUILD INDUSTRY AND REGIONAL MOMENTUM

The Airport is a leader in the field of energy, as shown in its recent investment in critical energy infrastructure. The 12kV microgrid highlights this leadership and enables deployment of technologies which may not otherwise be economically viable. The campus layout and structure of the Airport lends itself to microgrid implementation, and the microgrid in turn creates an excellent test bedtest bed for techniques in energy conservation, renewable energy generation, and management and optimization of energy.

The Airport is committed to sharing the knowledge and best practices that it gathers and develops in order to benefit the airport industry and to encourage regional efforts to improve energy management and sustainability. This sharing of best practices and knowledge will occur through a range of channels and in a variety of settings ranging from professional conferences to public outreach. The Airport will develop information packets and other tools to easily communicate this vision, collaborating with its sister agencies in the region to create a common vision for San Diego's future. Widespread public outreach will be critical to assist not only the energy community but also the general public. It is the Airport's responsibility and privilege as a leader in this field to collaborate with other agencies and organizations, as well as the citizens of the region, to assist them in cultivating their own sustainability.

As a major consumer of electricity in the San Diego region, the Airport has both a responsibility and an opportunity to influence the region's vision for its collective energy future, participating in a number of regional initiatives, including:

- CleanTECH San Diego
- SANDAG Energy Working Group
- ACI-NA Sustainability Working Group
- CA Airport Council Environmental Working Group
- San Diego Regional Climate Collaborative
- San Diego Regional Clean Cities Coalition

The Authority is one of the largest single energy consumers in San Diego County and thus plays a key role in meeting local energy goals. The Airport's timeline of carbon neutrality parallels the City of San Diego, whose ambitious goals include reaching Net Zero Energy by 2035. In addition to the City, the San Diego Unified Port District has also set ambitious energy consumption and generation goals. These sister agencies will work alongside one another to ensure their energy goals are aligned and that public outreach messages are consistent and complementary. These agencies have a powerful capability to work together in producing and communicating a unified regional energy goal and encouraging the whole region to join in their sustainability efforts.

## C. ENGAGEMENT WITH BUSINESS PARTNERS IN ENERGY AND SUSTAINABILITY GOALS

The Airport has positioned itself to be a leader in guiding sustainability goals throughout its international sphere of influence. Airport staff and leaders will engage with one another to ensure sustainability remains a high priority. The Airport will continue to refine its goals and involve stakeholders, ensuring effective implementation and imparting of shared knowledge. The Airport is committed to setting industry trends in energy management, capitalizing on its existing global leadership in airport environmental stewardship.

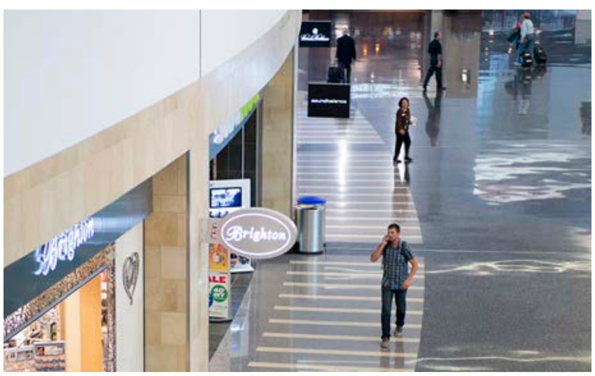
A key component of this leadership will be to facilitate a training program to educate the broad airport community in the various elements of the energy initiative and sustainability program. It is anticipated that this will be a multi-faceted program that leverages certification such as LEED, Certified Energy Manager (CEM), and Envision; and actively promotes attendance at SDG&E Energy Innovation Center (EIC) free training sessions.

## D. INNOVATION THROUGH BIG DATA

Big Data represents a great opportunity for the Airport to leverage its existing data with inventive tools that will optimize usage and conservation of energy. The existing energy monitoring system is comprised of more than 2,000 data points and will create a constantly growing data set of energy information. This raw resource of data will provide a valuable tool in innovation and exploration in the field of Business Intelligence and Analysis. The Airport recently supported a "hackathon," where specific Airport challenges were presented to computer programmers to find a workable solution by the end of the event. The richness of the energy data sets means that this data can be made available during events like this, and that energy optimization and opportunity identification can be a core focus of programming objectives. A hackathon and similar events can also provide a "farm" from which potential ideas can be harvested and further explored by the Airport's recently established Innovation Lab.

These experimental approaches, which can tap into the experience of local universities and other institutons, will allow the Airport to pilot and evaluate potential new operational technologies and strategies to improve energy efficiency. This commitment to innovation will keep the Airport at the forefront of regional and industry leadership, and will increase the knowledge and best practices which can be shared with collaborators, neighbors, and industry contacts.

## E. PERIODIC STRATEGIC ENERGY PLAN VALIDATION



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The Strategic Energy Plan will be a living document, with the Authority planning to re-validate this plan every five years, to ensure that the stated goals remain valid and that energy performance is trending in the right direction. Re-validation will also allow the Authority to evaluate emerging technologies and ensure that the current roadmap does not prevent the Airport from using the latest and best technology. The Airport's ongoing stakeholder engagement will be also enhanced through the periodic updates and review of the Strategic Energy Plan.

## F. NEW AND EMERGING TECHNOLOGIES

With the continued innovations in the energy generation, storage, controls, and electrification, it is essential that the Airport actively monitor new and emerging energy technologies to determine their applicability and cost effectiveness for implementation within the Airport. This includes tracking growth of EV demand for both airside and landside uses, and interfacing with the Clean Transportation Plan to expand EV charging infrastructure as appropriate.

Technologies that will be monitored will likely include:

- Generation
  - Micro-wind
  - PV solar
  - Sea water air conditioning
  - Fuel cells
- Storage
  - Battery storage
  - Power to gas
- Control
  - Demand response
  - Machine learning/ big data integration
- Electrification
  - Electric Vehicles
  - Electric Buses
  - Heat Recovery Chillers

## IMPACT AND IMPLEMENTATION

**Table 17: Regional and Industry Leadership—Implementation Plan**

| Focus Area | Critical Activities | | Responsibility | Time Horizon |
|---|---|---|---|---|
| A. Third Party Certification | A.1 | Develop ISO 50001 roadmap. | P&E / FMD | 2 years |
| | A.2 | Implement ISO 50001 program. | P&E / FMD | 2 years |
| | A.3 | Develop minimum energy credit requirements for use within projects seeking LEED certification. | ADC / FMD / P&E | 2 years |
| B. Best Practices Knowledge Share to Build Industry and Regional Momentum | B.1 | Actively engage in the local energy initiatives. | P&E | 2 years |
| | B.2 | Share lessons learned and energy innovations at regional and industry conferences. | P&E | 2 years |
| | B.3 | Create a common vision within the region through collaboration with sister agencies. | P&E | 2 years |
| C. Engagement with Business Partners in Energy and Sustainability Goals | C.1 | Develop a training program to educate the airport community in the various elements of the energy initiative and sustainability program. | P&E | 2 years |
| D. Innovation through Big Data | D.1 | Facilitate periodic innovation outreach to leverage the Airport's data set to identify and solve problems. | P&E | 0 – 2 years |
| | D.2 | Partner with UCSD and other research agencies to investigate opportunities to implement pilot projects at the Airport. | P&E | 0 – 2 years |

FMD Facilities Management
IBD Innovation & Business Development
ADC Airport Design & Construction
RM Revenue Management
P&E Planning & Environmental Affairs
ATOps Airport Terminal Operations
I+TS Information & Technology Services

*Supporting Team*

**Table 17: Regional and Industry Leadership—Implementation Plan** *continued*

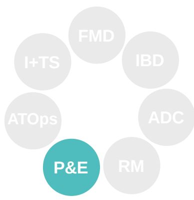
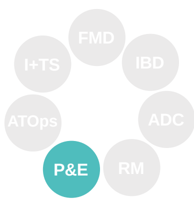
| Focus Area | Critical Activities | | Responsibility | Time Horizon |
|---|---|---|---|---|
| E. Periodic Strategic Energy Plan Validation   | E.1 | Update the Strategic Energy Plan every 5 years. | P&E | 0 – 5 years |
| F. New and Emerging Technologies   | F.1 | Leverage relationships with local academic institutions and industry bodies to monitor new and emerging technologies. | P&E | 0 – 2 years |
| | F.2 | Investigate opportunities to pilot new technologies at the airport. | P&E | 0 – 2 years |

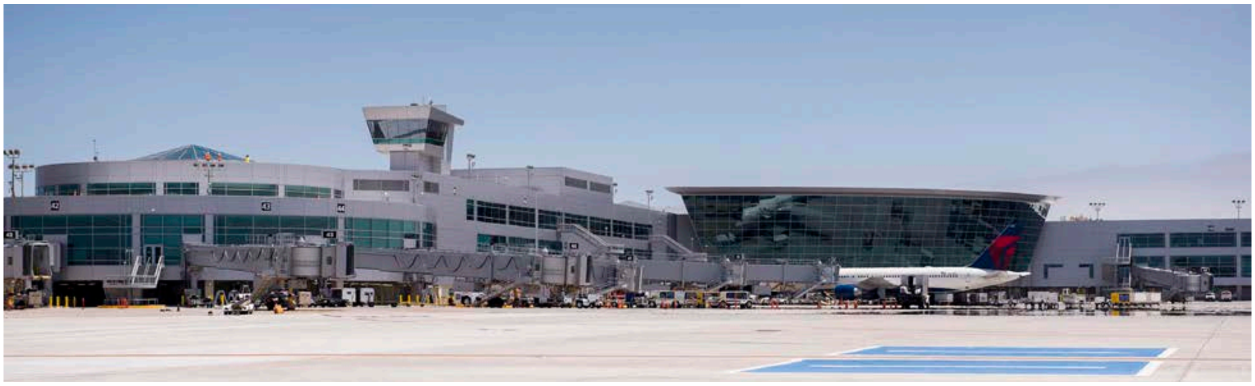
**Table 18: Regional and Industry Leadership—Integration Plan**

| Focus Area | ADP Integration (L/M/H) | CIP Integration (L/M/H) |
|---|---|---|
| Third Party Certification | Low | Medium |
| Best Practices Knowledge Share to Build Industry and Regional Momentum | Low | Low |
| Engagement with Business Partners in Energy and Sustainability Goals | Low | Low |
| Innovation through Big Data | Low | Low |
| Periodic Strategic Energy Plan Validation | Medium | Medium |
| New and Emerging Technologies | Low | Low |

# Implementation Roadmap

*Photo courtesy of Flickr Creative Commons © San Diego County Regional Airport Authority*

# IMPLEMENTATION ROADMAP



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## Status Quo

In the event that the Airport does not implement a robust energy program, the Airport's energy footprint will continue to grow in response to a number of factors, most notably the planned expansion of the Airport and the impact of climate change.

### Impact From Planned Airport Development

As of November 2018, the ADP has identified over 5 million square feet of new facilities and parking that will be constructed over the next 20 years, with over 1,000,000 square feet of facilities demolished in the process, as shown in **Table 19**. Despite future improvements to the Title 24 energy code, this increase in the Airport's built environment will result in significant increases in both annual consumption and peak demands, if not offset by energy efficiency measures within the existing portfolio.

**Table 19: Airport Development Projects**

| Project Type | Project Description | Floor Area (SF) | Year |
|---|---|---|---|
| New Construction | Fueling Maintenance Facilities (North Side) | 44,000 | 2020 |
| | FMD Campus | 113,000 | 2020 |
| | Airline Belly Cargo, GSE Maintenance, Provisioning and Storage | 270,000 | 2020 |
| | T1 Parking Plaza East | 1,500,000 | 2022 |
| | T1 - 22 Gates | 810,000 | 2022 |
| | Airport Administration Building | 150,000 | 2022 |
| | T1 Parking Plaza West | 1,280,000 | 2024 |
| | T1 - 8 Gates | 400,000 | 2024 |
| | Commercial Development Opportunity (CDO) | 400,000 | 2036 |
| | T2 West (Stinger) - 7 Gates | 450,000 | 2036 |
| | T2 East (Connector) - 7 Gates | 250,000 | 2038 |

**Table 19: Airport Development Projects** *(continued)*

| Project Type | Project Description | Floor Area (SF) | Year |
|---|---|---|---|
| Demolition | Air Cargo Facilities Total | -79,000 | 2021 |
| | General Aviation Facilities | -29,500 | 2021 |
| | Airport Office, Operations, Support and Maintenance facilities | -217,000 | 2021 |
| | Commuter Terminal | -132,000 | 2021 |
| | T1 - Gates 1, 1A, 2 | -36,000 | 2021 |
| | T1 - Remaining Area | -300,000 | 2023 |
| | T2 East | -350,000 | 2037 |

## IMPACT OF CLIMATE CHANGE

By leveraging the climate projections developed by the Weathershift™ methodology[15], it is anticipated that the Airport will see significant changes in both the heating and cooling demand over the next century as a result of climate change.

As **Figure 9** shows, the analysis suggests that by 2050, annual cooling is likely to increase by 35% with an 18% increase in peak cooling demand, due solely to climate change. Conversely, there is likely to be a 45% reduction in annual heating consumption and a 22% reduction in peak heating demand.

As such, the Airport will likely experience an increase in capital expenditure for new equipment, and HVAC systems will have to work harder for longer periods of time to meet growing demand, thereby shortening equipment life span. This may also mean that energy efficiency solutions that impact cooling have a faster payback.

15 http://www.weather-shift.com/

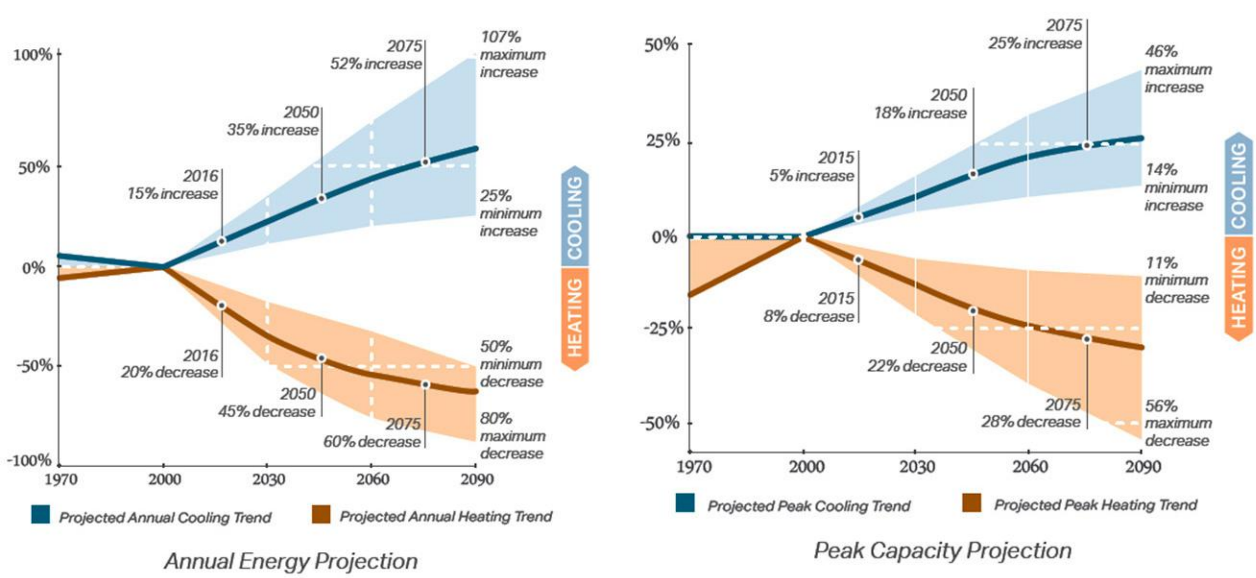


**Figure 9: Impact of Climate Change**

# Integrated Strategy

To mitigate the impacts of the planned growth at the Airport to operation, budget, and the environment, and to achieve the five overarching energy goals that the Airport has set forth, an integrated strategy has been developed through this energy master planning process that:

- Reduces the environmental footprint
- Reduces operational costs
- Enhances the resilience of Airport operations

To achieve this, an optimized strategy has been developed that balances opportunities to conserve, generate, and control energy at the Airport. To best align with the growth of the Airport, a phased implementation strategy has been developed.

The first component of this strategy involves the deployment of various enabling mechanisms through which to manage the implementation and validation of energy strategies and technologies required to achieve the Airport's energy goals. **Table 20** summarizes these energy enabling mechanisms and which Strategic Energy Plan Goals they address.

**Table 20: Energy Enabling Mechanisms**

| Energy Enabling Mechanisms | Frequency | Funding Mechanism | Goal: Energy Efficiency | Goal: Carbon Neutrality | Goal: Interdependance and Resilience | Goal: Cost Containment | Goal: Energy Leadership |
|---|---|---|---|---|---|---|---|
| Incorporate performance-based energy efficient design targets into T1RP PDD | 0 - 2 years | N/A | • | • | • | • | • |
| Implement Energy Master Plan | 2018 then every 5 years | Operating Budget | • | • | • | • | • |
| Energy Auditing Program | 2018 then every 5 years | SDGE Incentives | • | • | • | • | • |
| Retro-Commissioning | 2018 then every 5 years | SDGE Incentives | • | • | • | • | • |
| Deploy ISO 50001 Energy Management System | 2018 then ongoing | Operating Budget | • | • | • | • | • |
| Deploy Airport-wide Energy Monitoring System | 2018 then ongoing | Operating Budget | • | • | • | • | • |
| Incorporate enhancements to the CIP project review process | 0 – 2 years | Operating Budget | • | • | • | • | • |
| Route Phase 1 through the CIP process for approval | 0 – 2 years | N/A | • | • | • | • | • |
| Recruit additional Airport personnel to effectively manage delivery of energy projects | 0 – 2 years | Operating Budget | • | • | • | • | • |

# Energy Projects — What / When / How

Having implemented the mechanisms noted above, the Airport will pursue opportunities for energy conservation, generation, and storage. **Table 21** lists strategies that are likely to be most effective for Phase 1 deployment. These projects have been identified as having a payback of less than 5 years or have alternative funding mechanisms and are not in conflict with the long term ADP.

**Table 21: Phase 1 Energy Projects**

| Phase 1 Energy Project | New Capacity | Year | Funding Mechanism | Goal Alignment: Energy Efficiency | Carbon Neutrality | Interdependance and Resilience | Cost Containment | Energy Leadership |
|---|---|---|---|---|---|---|---|---|
| Battery Storage (ongoing) | 4 MWh | 2018 | PEA / Other | | ● | ● | ● | ● |
| Energy Efficiency projects identifies through auditing process | | Every 5 years | On-bill financing / CIP | ● | ● | ● | ● | ● |

In addition to these initial projects, **Table 22** lists a number of identified projects that will be deferred until an increase in energy demand (such as that associated with the new Terminal 1) enhances their cost effectiveness and overall viability.

**Table 22: Phase 2 Energy Projects**

| Phase 2 Energy Project | New Capacity | Year | Funding Mechanism | Goal Alignment: Energy Efficiency | Carbon Neutrality | Interdependance and Resilience | Cost Containment | Energy Leadership |
|---|---|---|---|---|---|---|---|---|
| Existing Central Plant Upgrade | + 900 tons | 2022 | T1RP Funding | ● | | ● | ● | |
| Photovoltaic Solar | 2 MW | 2023 | PPA / CIP | | ● | ● | ● | ● |
| Battery Storage | 4 MWh | 2023 | PPA / Other | | ● | ● | ● | ● |
| Photovoltaic Solar | 2 MW | 2025 | PPA / CIP | | ● | ● | ● | ● |
| Re-Evaluate Potential for Additional Photovoltaic Solar | 2 MW | 2025 | PPA / CIP | | ● | ● | ● | ● |
| Energy Efficiency projects identifies through auditing process | | Every 5 years | On-bill financing / CIP | ● | ● | ● | ● | ● |

# Integrated Roadmap

*Photo courtesy of Flickr Creative Commons © San Diego County Regional Airport Authority*

**Figure 10** demonstrates the Airport's anticipated energy profile over the next 20 years, or energy roadmap. The projection takes into consideration:

- Planned new construction
- Planned demolition
- Recommended energy efficiency and conservation measures
- Recommended on-siteon-site generation projects
- Impact of climate change
- Change in grid power source composition

The roadmap shows the Airport meeting or exceeding the goals outlined in the Strategic Energy Plan.

A 40 percent reduction in annual purchased energy consumption from the status quo scenario can be achieved by 2035 though energy efficiency, on-site generation and a commitment to the ongoing optimization of the energy systems.

The implementation of the on-site power generation systems outlined in this plan contribute to a significant reduction in non-renewable energy use.

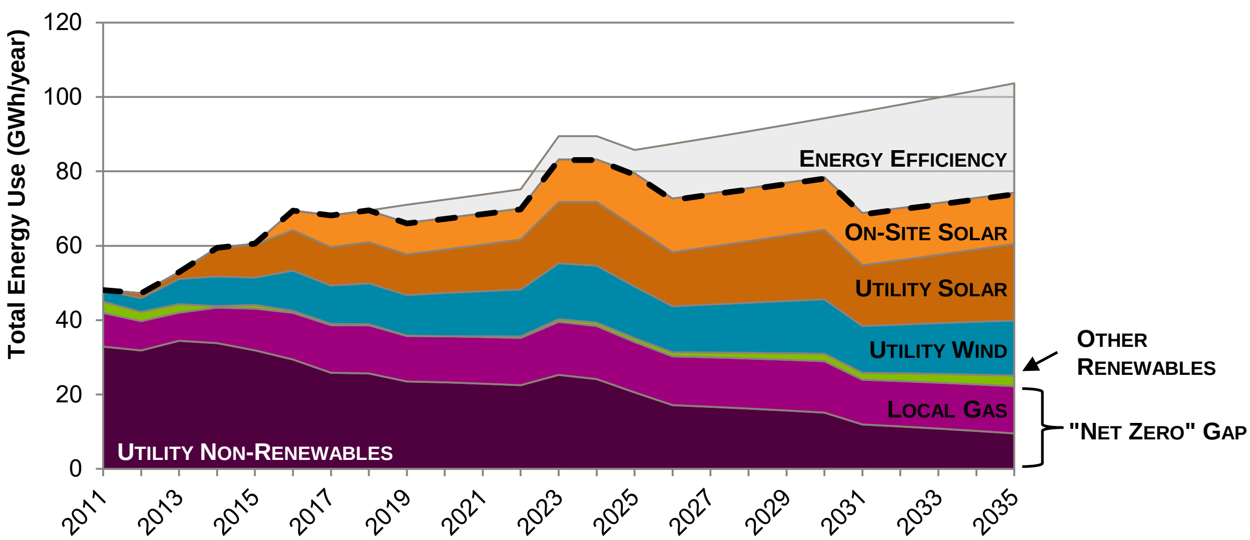


**Figure 10: Integrated Roadmap**

## Enhanced Resilience

The proposed energy roadmap combines the savings from an aggressive commitment to energy efficiency with the deployment of various on-site generation and storage technologies that provide a greater level of control over the energy infrastructure and supply.

**Figure 11** shows the projected change in energy supply source through 2035, and how the strategies identified for implementation work together to increase the proportion of on-site generation and increase resilience. The growth in on-site generation via PV coupled with battery storage allows approximately 18% of the annual energy demand of the Airport to be met independently from the grid.

Through the phased deployment of the identified projects, the Airport can further refine the existing SCADA-controlled load shedding protocols and will significantly improve the ability of the energy systems to support core Airport functions. With support from the SCADA system and a  microgrid controller, on-site solar, storage and back-up generators connected to the microgrid would be able to work together to meet the critical demands on-site. While a detailed load shedding strategy is required to optimize how the energy is best used to serve Airport critical functions, managing flexible loads, solar, and storage in concert with back-up generators can enhance the functionality of the Airport during an outage (e.g. natural disaster) and extend limited diesel fuel supplies.

# 18%

## of the Airport served by on-site renewable energy

It is important to note that the analysis supporting the future energy use projections has concentrated on developing a strategic view of the Airport's future demand, but does not serve as a power supply study. As such, the demand projections outlined in the Strategic Energy Plan do not match those of previous load assessments undertaken to inform future infrastructure planning, but instead build upon them to highlight key operational considerations of future Airport energy use.

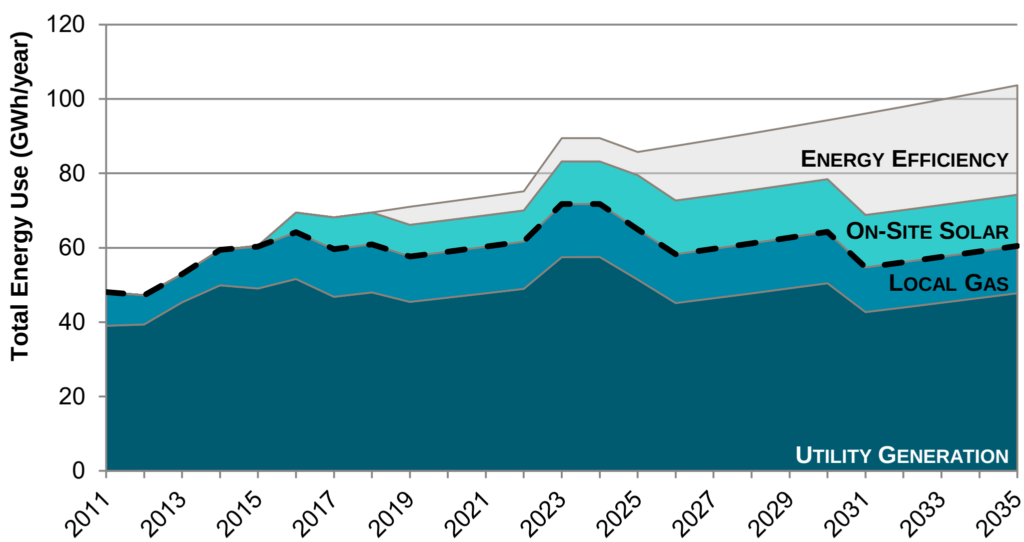


**Figure 11: Energy Resilience**

## Enhanced Cost Control

The preliminary cost benefit analysis undertaken as part of the Strategic Energy Plan development suggests that there are significant operational cost savings that can be achieved as a result of implementing the proposed roadmap.

The timeline of strategy implementation is combined with ADP implementation and passenger growth in **Figure 12**. Avoided costs are primarily tied to enhanced energy efficiency, less expensive energy from cleaner sources both on- and off-site, and the mitigation of demand charges through optimized demand management and energy storage.

The roadmap implementation is estimated to result in:

- Operational energy cost savings of more than $8 million annually by 2035.
- Limited capital outlay by leveraging other financing mechanisms such as PPAs and on-bill financing to fund the implementation of the recommended projects

# 40%

## reduction in operational energy costs

The mitigation of peak demand, and therefore of peak demand charges of Airport energy use is shown in **Figure 13**.

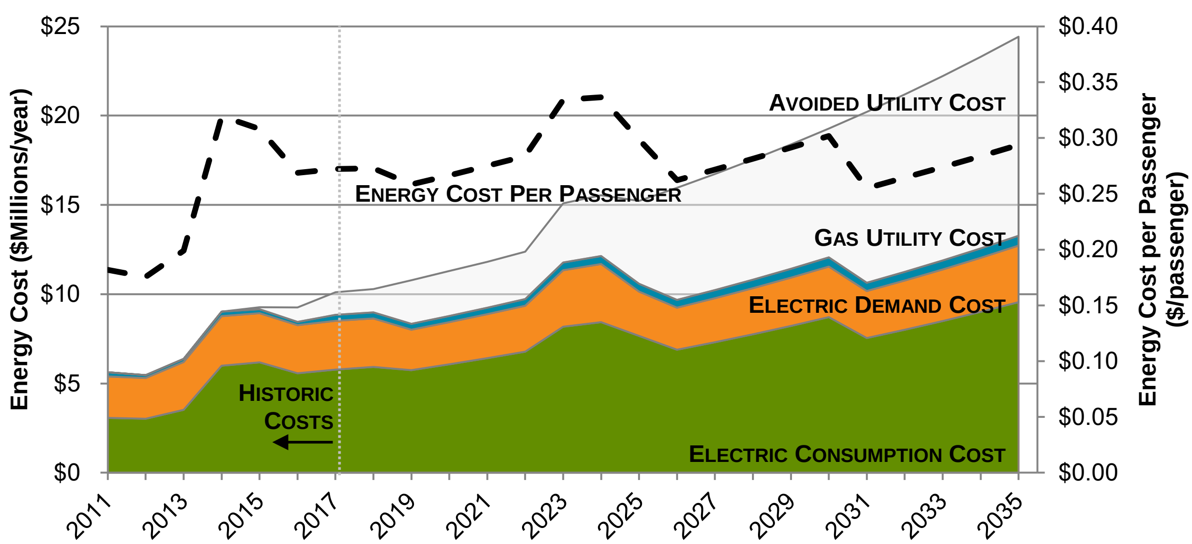


Figure 12: Energy Cost per Passenger

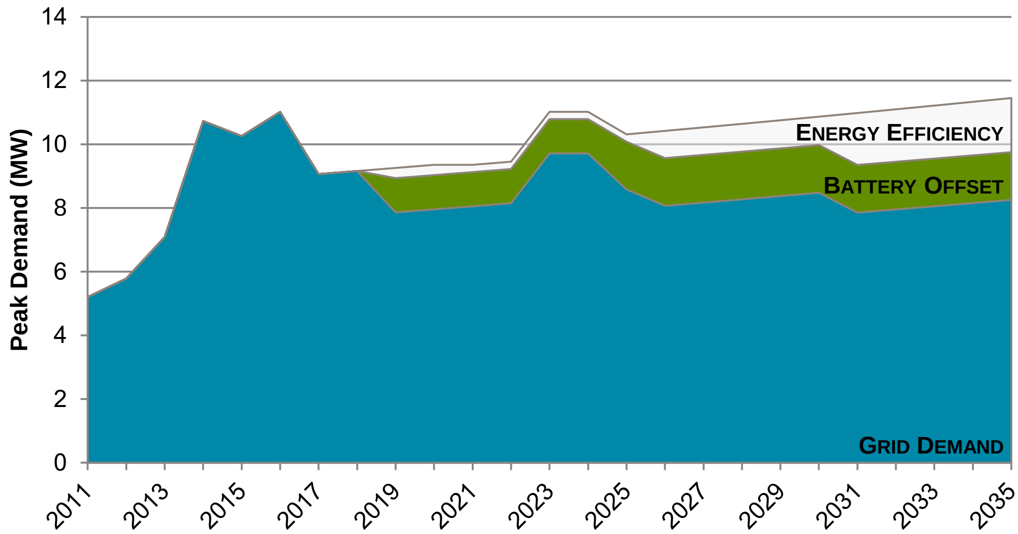


**Figure 13: Peak Demand**

## Enhanced Monitoring

In order to achieve the maximum benefit of the strategies identified through this energy master planning process, it is imperative that the Airport has a robust energy monitoring platform. This will allow the Airport to track its performance against its strategic goals, ensuring successful implementation in the long term.

This monitoring system will also help automatically generate identified metrics that provide the capability to benchmark performance with regional and industry peers.

Enhanced monitoring is key to effectively deploying energy conservation and generation projects and is critical to the ongoing success of the overall energy program. Therefore it is recommended that this platform is created as an immediate focus, either by fixing and expanding AIMMS or deploying a new solution.

100%
of key facilities
connected to AIMMS

This enhanced monitoring capability will also serve as a core component of the ISO 50001 certified Energy Management program, an emerging industry approach for airports seeking to monitor and control their long term energy performance.

## Reduced Environmental Footprint

The Airport will be able to significantly improve its environmental footprint, achieving approximately 7,000 metric tons in annual carbon dioxide equivalent emissions savings through the use of carbon neutral fuel sources, gains in energy efficiency, enrollment in the SDG&E EcoChoice Program, and additional Off-site carbon offsets. This equates to the carbon footprint of a 747 airplane flying nearly 110,000 miles per year.[16]

**Figure 14** shows the result of project implementation on energy-related carbon emissions over the next 20 years. In alignment with the Airport's carbon neutrality goal, all remaining opeational energy-related emissions by the end of 2022 will be mitigated by purchasing green power and carbon offsets.

# 100%

## Carbon Neutral by 2022

[16] (0.06153 MT CO2 PER MILE).

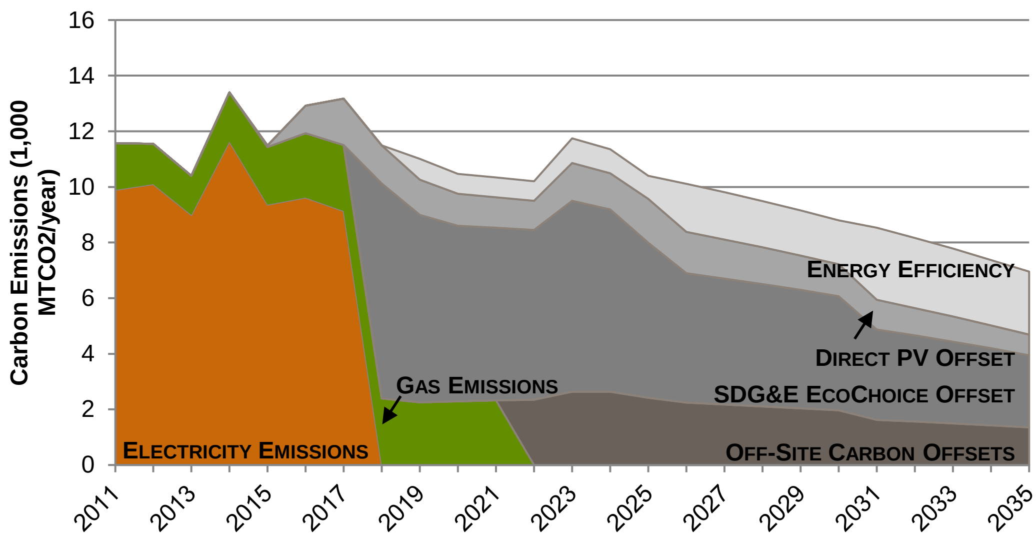


**Figure 14: Energy Carbon Emissions**

# Integration With Airport Development Plan

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As **Table 23** outlines, the recommended roadmap to enhanced energy security requires integration with the broader ADP in a number of ways, including:

- Allocation of space adjacent to the existing CUP for a battery storage yard.
- Allocation of a green infrastructure zone within the ADP for expanded BES capacity. Note: battery storage must lie adjacent to the 12kV loop.
- Allocation of rooftop space for expanded PV capacity.

**Table 23: Integration with the ADP**

| Energy Project | Space Allowance | Recommended Location | Required Coordination |
|---|---|---|---|
| Phase 1 Battery storage | 2,000 SF | Adjacent to CUP | Parking Plaza |
| Phase 2 Existing Central Plant Upgrade | 0 SF | CUP | T1RP |
| Phase 2 Photovoltaic Array | 2 MW: 150,000 SF<br>2 MW: 150,000 SF | Parking Structure and Terminal Rooftops | T1RP |
| Phase 2 Battery storage | 2,000 SF | Identified Green Infrastructure zone within T1RP boundary | T1RP |

# Immediate Actions

The following actions are identified as immediate next steps:

- Incorporate an energy performance design target into the T1RP PDD.
- Continue engagement with the ADP team to ensure that the required space is allocated within the T1RP.
- Continue engagement with the Parking Plaza team to identify the location necessary for the Phase 1 equipment identified above.
- Develop an RFP for the enhancement of the Airport's monitoring program, with the goal of implementing the selected solution by 2018.
- Develop an RFP to deploy the energy conservation measures identified through the recent energy audit that, when bundled, will achieve a payback of less than 5 years, with the goal of implementing the projects in 2019.
- Develop RFP for battery storage with the goal of implementing a project in 2018.

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