Utility cost savings helping airports in the pandemic

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Abstract

COVID-19 is impacting health, economics and operations around the world. As airports consider strategies to be resilient from this worldwide event, utility cost-savings projects are still tools to support this effort. Some airports are demonstrating that utility-savings projects work in different settings and locations. In addition to reducing energy and water costs, these projects also support sustainability efforts by reducing emissions and supporting other sustainability and resiliency goals. This paper presents some examples of how some airports are achieving this.

Keywords

COVID-19, energy, water, savings, projects, sustainability, resilience

INTRODUCTION

The year 2020 is proving itself to be one of constant upheaval due to the COVID-19 pandemic, volatile economic markets, political strife and natural disasters. According to the World Health Organization (WHO), on 14th July, 2020, there were 12,964,809 confirmed cases of COVID-19 and 570,288 deaths.[1] The WHO declared COVID-19 a public health emergency of international concern on 30th January, 2020. By March 11, WHO declared the outbreak a global pandemic. As the world faced this deadly impact, many operations ceased around the world, including those at airports. The International Air Transport Association reported that the estimated aviation losses between January and June 23rd are US$84.3bn from the US$419bn in total revenue losses. Demand has decreased 54 per cent as 7.5 million flights were canceled.[2]

In short, the economic impact of reduced demand for air travel is significant. Airports are forced to make prudent decisions regarding continuity of operations and sustainable fiscal health. Airports that have trimmed unnecessary costs are in a much better position to withstand the effects of the pandemic and other shocks and stressors that may arise. The Airports Council International (ACI), a nonprofit organisation representing the world's airports, lists the following as primary airport costs: personnel; insurance claims and settlements; materials, equipment, and supplies; lease,

rent, and concession fee payments; maintenance; general and administration; communications, utilities, energy and waste; and contracted services. There are a number of ways to view costs savings (historic savings, budget savings, technical savings, cost avoidance and a combination of any of these), but for the purpose of discussion, the focus is on historical savings, which compare savings in the future to a fixed point in time. In reality, there may be realisation of any or combinations of the mentioned types of cost savings. One of the vital operational costs is utility costs, so identifying projects that reduce energy and water usage can contribute to a healthier bottom line. Using certification systems can provide the framework for airports to take advantage of physical and behavioural actions that result in reduced energy and water costs as well as other benefits that support airport operations and organisational objectives.

UTILITY COSTS

Typical utility costs are difficult to quantify due to variability of operation parameters at each airport, such as location, altitude, type of aircraft, age and design of facilities and use method. According to the ACI, airports have seen some improvement in reducing utility costs. From 2014 to 2016, as reported in 2020, utility costs changed from 8 per cent[3] to 3.1 per cent[4] of operating expenses. This is a broad statistic as every airport is unique. It does, however, indicate a trend to reduce utility costs while continuing to support operations. Although utility costs for airports have reduced industrywide, each airport has its own set of circumstances that affect utility costs and the impact on its operating budget. Addressing this 3 per cent to 8 per cent portion of the operating budget supports airport resiliency by managing and optimising its utility costs. In 2019, the number of scheduled passengers boarded by the global airline industry reached 4.54 billion people.[5] Each passenger contributes to the overall financial health of the airport because they contribute to nonaeronautical revenue, such as parking and concessions. With COVID-19 negatively affecting the number of passengers moving through airports, the effects on other critical operational budget line items can be lessened with reduction of utility costs.

UTILITY COST-SAVING PROJECTS

In today's climate, focusing on public safety is a priority. Therefore, airports must prioritise safety concerns with ageing infrastructure and development for the future. Like all pandemics, while they may cause much havoc, there is an expectation of recovery and returning to normal operations. Airports must be ready to operate efficiently when passengers return to prepandemic levels. Airports must meet sustainability requirements. Airports must prepare themselves to be more resilient. In this discussion, optimising utilities makes sense, and taking advantage of capital programmes to develop more energy- and water-efficient infrastructure will prepare airports to be more competitive. Here are some projects that can be included in retrofit, rebuild and new build construction projects:

- LED lighting
- Daylighting
- Smart buildings
- Efficient Heating, ventilation, and air conditioning (HVAC) systems

- Low-flow water fixtures
- Occupancy and time-controlled sensors for lighting and equipment
- Variable speed drives on motors
- Programmable thermostats
- Temperature control strategies
- Smart power strips
- Purchase energy-efficient appliances and equipment
- Solar PV (photovoltaic) systems and battery storage
- Cogeneration and tri-generation
- Boiler upgrades and optimisation
- Demand response systems
- Building management systems
- Building automation
- White roofs
- Building envelope improvements (eg doors, windows and insulation)
- Water pumping and treatment
- Recommissioning, retro-commissioning and continuous commissioning
- Certification system implementation and compliance
- Water recycling
- Utility rate reduction

Implementing energy-conservation measures can reduce utility costs, maintenance costs and emissions, as well as improve asset performance and increase asset value.

Energy and water efficiency is not only applicable to an airport, but also applies to commercial and residential applications. Here is an example of a nonairport commercial facility that could also be an airport facility. Between August 2011 and December 2012, the National Resources Defense Council and Administrative Staff College of India reviewed Godrej Bhavan, an office building constructed in South Mumbai in 1972, between August 2011 and December 2012, see Table 1. Seven energy-efficient measures, including the energy audit, were implemented at the cost of US$99,704 in this 3,826 square-metre (41,185 square feet) facility consisting of six floors and a rooftop terrace. The energy-conservation measures for this project are as follows:

Two years after the retrofit, electricity use dropped to 527,160 kilowatts (kWh), an 11.4 per cent savings in electricity use. In the second year, the savings were 12.3 per cent. The payback period for this project is 4.7 years under the actual Godrej Electricity Bill Scenario. This project earned the 2011 Leadership in Energy and Environmental Design (LEED) Award, which was the first building in Mumbai and the sixth building in India to receive the LEED Gold certification from the United States Green Building Council under the Existing Buildings Operations and Maintenance category.[6]

Table 1 Energy conservation measures at Godrej Bhavan, (Office Building) in South Mumbai

Energy-Conservation Measures and Audit	Cost ($ USD)
1. HVAC-system replacement (including the building energy-management system)	92,593
2. Water-flow meters	444
3. Energy-metering system	963
4. Auto blow down controller at the cooling tower	537
5. High-reflectance paint for the terrace surface	1,148
6. Energy audit	833
7. Lights with energy-efficient tube lights	3,185
Total cost of the Energy-Efficiency Measures installed	**99,704**

HVAC, heating, ventilation, and air conditioning.

Minneapolis–St Paul International Airport, owned and operated by the Metropolitan Airports Commission, partnered with Ameresco, an energy-saving performance corporation dedicated to identifying and implementing energy- and water-conservation measures. This airport invested US$37m for a 4.3 MW solar PV facility with 11,835 solar photovoltaic (PV) panels, retrofitting 12,632 light fixtures converted to light-emitting diode (LED) technology, and eight electric vehicle charging stations installed at Terminal 1. The project reduced emissions by 9,464 metric tons of CO_2 annually and resulted in a positive annual cash flow of US$267,000.[7]

Even one good energy-conservation project can make a significant impact on the asset's total energy cost. In 2011, the Atlanta Better Buildings Challenge (ABBC) was launched at the Clinton Global Initiative as one of the first cities to participate along with Los Angeles, Seattle, Denver, Washington D.C., Sacramento and Houston. The programme's overall goal is to reduce energy use (kbtu/sf) by 20 per cent by 2020. As part of the ABBC, Hartsfield–Jackson Atlanta International Airport, owned by the City of Atlanta, retrofitted metal halide light fixtures with LED lighting in the north and south domestic parking decks. Nearly 4,000 175-watt fixtures were replaced with 80-watt LED lights in 2012. This project remained as one of the top performers in energy for public facilities in the ABBC. It even earned the 2018 ABBC MVP Award for producing the highest level of energy savings in 2016.

Another example is Atlanta's airfield project, in which all airfield lights were retrofitted with LED lighting. This project saved approximately 33 per cent on energy costs.

Here is a nonexhaustive list of projects around the world:

Europe

- 86 per cent of the survey respondents reporting having electric vehicles as part of their vehicle fleet.
- 61 per cent of the survey respondents produced renewable energy on-site.
- 65 per cent of the airports purchase electricity from renewable sources
- 82 per cent of the surveyed airports were certified to an international standard such as European Parliament
- Environmental Management System (EU EMAS), ISO 140001, or ISO 50001.[8]

United States Statistics

- 39 US airports were identified in 2013, as having electric vehicle charging on-site.[9]
- One US airport, Chattanooga International Airport, is reporting producing enough solar energy to power 100 per cent of its power needs.

There are numerous examples from around the world that we could present here. The point of presenting these examples is, however, to show that investment in utility-saving projects can provide airports, companies and organisations tangible cost savings that can directly impact the operating budget. Considering that utility costs can make up three to eight per cent of an airport's budget, how impactful could 12.3 per cent savings be to an organisation like the Mumbai example. The Minneapolis–St Paul example adds US$267,000 to the bottom line of the airport-operating budget. Combined with other projects, these seemingly small amounts can turn into millions in annual savings. Some call this low-lying fruit, but like fruit, to enjoy the sweetness, it must be harvested

and eaten. It does you no good if the fruit remains on the tree. One method of harvesting savings for short capital operations is the use of energy savings-performance contracts.

ENERGY SAVINGS-PERFORMANCE CONTRACTS

In the age of limited capital, an energy savings-performance contract (ESPC) through an energy savings performance corporation (ESCO) can help airports identify energy-conservation measures and assist in implementation. The ESPC is primarily a finance mechanism that leverages 'guaranteed savings' identified by engineering standards. These savings are used to finance the capital through a third-party financing company or the ESCO. A contract or ESPC is developed to ensure that savings materialise over the term of the contract through periodic measurement and verification. The structure of the agreement is developed in partnership between the client (airport) and the ESCO. With an investment of US$207m in capital, the Hawaii Department of Transportation Airports Division in partnership with Johnson Controls is expected to generate over US$600m in guaranteed savings over a 20-year term. Completed in 2019, the project included the installation of more than 24,000 solar PV panels and includes replacing 98,000 light fixtures with LED technology and energy-efficient lighting and upgrading ventilation and air-conditioning systems.[10]

OWNER-SPONSORED PROJECTS

Owner-sponsored energy and water projects can be implemented using the airport's capital fund. For some airports, there are grant opportunities that can provide funding for typical and extraordinary energy- and water-savings projects. In either case, the airport will need to plan, design, construct and operate the energy-conservation measure. In cases where airports have established construction programmes, this choice works very well. If, however, there are deficiencies in the airport's ability to execute, contracting this effort may be worth the extra funds. In the marketplace, there are many instruments to accomplish this, such as power purchase agreements (PPAs) or energy efficiency as service. PPAs will use their capital to implement projects and agree to sell the power back to the owner of the asset for a contracted price that is typically competitive to utility power prices. Energy as a service allows the airport implement energy- and water-efficiency projects with no upfront capital expenditure. The energy as a service company pays for the project development, construction and maintenance costs for a fee, often competitive when compared to the benefit of the savings provided to the airport. If the airport does not have expertise, there are individuals and firms around the world who will identify and implement utility-conservation measures as turnkey projects.

CERTIFICATION SYSTEMS

As mentioned earlier, the implementation of certification systems is a systematic method to achieve energy and water savings through prescribed methodologies. The systems approach involves the entire organisation providing opportunities for other operational efficiencies along with the energy and water savings. The Mumbai example used the United States Green Building Council's Leadership in Energy and Environmental Design

(LEED) use of a point system to ensure sustainability is designed into facilities. Projects can earn certified silver, gold or platinum level certifications based on the points that the project earns. Points can be earned based on the sustainability of the facility site, water efficiency, energy and atmosphere impacts, materials and resources used in the project, indoor environmental quality and innovation design.

There is also an operational certification system within the LEED certifications that takes into account how facilities are operated. Other certification programmes are as follows: Energy Star–US, Building Research Establishment Environmental Assessment Method (BREEAM), Green Globes, BIT Building System, Living Building Challenge, National Green Building Standard, GreenGuard, WELL Building Standard, NABERS-Australia, Green Star-Australia, and Comprehensive Assessment System for Built Environment Efficiency (CASBEE) — Japan. In addition, the International Organization of Standards (ISO) has developed the ISO 50001 Energy Management System standard that also provides a guide to implement a systematic approach to energy management that is based on continuous improvement and systemic change, producing long-term energy savings. There are also campus- and district-wide certifications like EcoDistrict® and LEED for Communities that take into account more sustainable categories such as transportation, equity, health and wellness and emissions.

Hartsfield–Jackson Atlanta International Airport became the first airport in the United States to certify its energy-management system to the ISO 50001 Energy Management Standard. The ISO 50001 system provided a framework to identify opportunities within facilities to improve energy performance. Measurement and monitoring protocol within the system ensures that targets and objectives are reached. A performance contract is being implemented at its Rental Car Centre, a significant energy user at the airport. The plan entails upgrading the HVAC performance at the Rental Car Centre (and other facilities) as well as retrofit the lighting to more efficient LEDs throughout the airport. With a guaranteed annual savings of over US$600,000 over the life of the contract, this effort provides financial benefit to the operating costs of this particular facility along with the other facilities included in the ESPC.

SUSTAINABILITY

Sustainability is a term that has taken on many meanings around the world. Some simplify it to mean how we treat the earth today for people inhabiting the earth tomorrow. Some define sustainability as finding balance between the triple-bottom line: people, planet and profit (social, economics and environmental). In 2015, the United Nations General Assembly called for companies to play a role in achieving the 17 Sustainable Development Goals (SDGs) by 2030, see Table 2.

Although there are several SDGs that could be implemented, the following goals are primarily related to utilities use:

- Goal 6: Clean water and sanitation
- Goal 7: Affordable and clean energy
- Goal 9: Industry, innovation, and infrastructure
- Goal 13: Climate action

Efficient use of water and the management of sewage reduce costs and support local health objectives. Effective

Table 2 United Nations 17 Sustainable Development Goals (SDGs)

1. No poverty	10. Reduced inequality
2. Zero hunger	11. Sustainable cities and communities
3. Good health and wellbeing	12. Responsible consumption and production
4. Quality education	13. Climate action
5. Gender equality	14. Life below water
6. Clean water and sanitation	15. Life on land
7. Affordable and clean energy	16. Peace and justice strong institutions
8. Decent work and economic growth	17. Partnerships to achieve the goal
9. Industry, innovation and infrastructure	

use of potable water supports airport and community water goals. Use of renewable energy and other sources of energy helps reduce energy costs and emissions associated with the production of that energy. Resilient airports powered effectively by utilities support the resiliency of communities, regions and countries. All of these efforts support the worldwide effort to combat climate change and the impacts of emissions on global climate conditions.[11] In many cases, sustainability is a voluntary option for airports, but there are regulations that exist in many places to ensure more sustainable activities.

Some countries continue to impose regulations to guide the development of more sustainable energy use. For example, the Standing Committee of the National People's Congress of China passed a comprehensive renewable energy law on 28th February, 2005, that set a 15 per cent goal for China's energy to come from renewable sources by 2020. In 2008, over two-thirds of its energy was produced from coal.[12] Germany has developed legislation enforcing regulations on energy use: 1976 Energy Saving Act, 1977 Thermal Insulation Ordinance, 1978 Heat Appliances, 1981 Heating Costs ordinance, 2002 Energy Saving Ordinance, and Energy Saving Law Amendment in 2005.[13] In the United States, many cities and states are embroiled in water rights due to scarcity of water from shared tributaries. On 23rd April, 2020, the US Supreme Court ruled 6-to-3 forbidding polluters from releasing waste into navigable waters like oceans and streams without a permit, even if the pollution travels through groundwater (refer to County of Maui vs Hawaii Wildlife Fund). There are many examples where laws have been created to regulate energy and water use or where courts have ruled on laws affecting water and energy throughout the world.

Whether forced or voluntary, energy and water conservation can help airports reduce operating costs as well increase resiliency. In addition to cost savings, reduced emissions can significantly benefit our world. Many airports are making intentional efforts to reduce their emission levels to improve air quality. For example, at Hartsfield–Jackson Atlanta International Airport, opening Taxiway V in 2007 reduced aircraft taxi-out emissions and enhanced airfield safety. The end-around taxiway provides the infrastructure to reduce the number of runway crossings, which can increase the risk of collisions on the ground and add to the taxi time required for aircraft on the airfield. Charlotte–Douglas International Airport recently completed an environmental assessment

on constructing a new fourth parallel runway including end-around taxiways by 2028, as recommended in its Master Plan update.[14] The benefits of an end-around taxiway are reduced fuel use for the airlines as well as reduced emissions.

CONCLUSION

The devastating spread of COVID-19 around the world has impacted airports globally in a shocking manner by reducing flights, commercial activity and overall financial health that reverberates throughout the aviation industry. Addressing opportunities that can identify and implement energy- and water-conservation measures can help airports reduce costs to withstand the shocks and stressors of events like COVID-19. Whether airports utilise certification systems to systemically implement energy and water improvements or use individual construction programmes, the outcome is the same: reduced energy and water costs and other environmental benefits. For those airports that have legal and regulatory requirements, managing utilities is an important part of airport operations and supports resiliency efforts. Today, it is COVID-19 that is impacting airport operations, but tomorrow may bring about other shocks and stressors. Therefore, implementing sustainability practices is not only good for airports and their surrounding communities, but the world.

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