TRB Webinar: Airport Energy Resilience Roadmap

December 3, 2024

12:00pm-1:30pm

NATIONAL ACADEMIES Sciences Engineering Medicine

TRB TRANSPORTATION RESEARCH BOARD

ACRP AIRPORT COOPERATIVE RESEARCH PROGRAM

Today's Learning Objectives

(1) Develop a customized plan for their airport using the provided step-by-step process for airport staff and stakeholders

(2) Generate support for the implementation of individual resiliency roadmaps by sharing data with decision-makers

(3) Understand the importance of energy resiliency roadmaps in the context of airport development and planning processes

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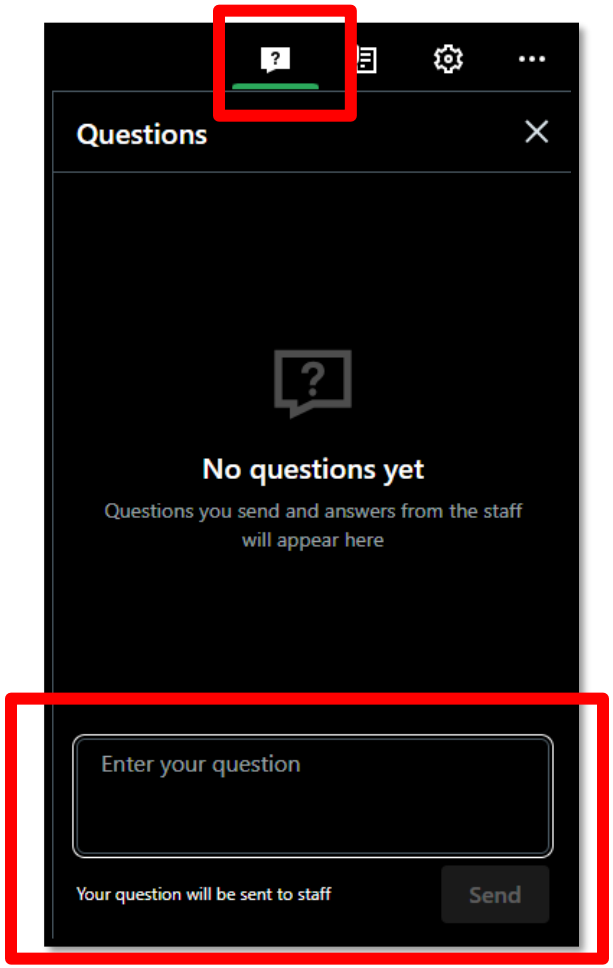
Questions and Answers

Please type your questions into your webinar control panel

We will read your questions out loud, and answer as many as time allows

#TRBwebinar



Erin Cooke
San Francisco International Airport

- San Francisco International Airport's (SFO) first Sustainability & Resilience Director
- Board of Directors of the Institute for Sustainable Infrastructure
- Airport Council International World Environment Standing Committee
- Previously served the City of Cupertino as its Deputy City Manager

Today's Speakers

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Kathleen Ledoux
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Susan JH Zellers, PE, AAE, ENV SP
Principal Investigator

- Senior Project Manager and Aviation Planning Lead, Hanson Professional Services Inc.
- 30+ Years Aviation Planning for more than 60 airports
- Professional Engineer, IN, IL, KY USVI
- Licensed instrument rated private pilot

ACRP Report 260 Oversight Panel

Katherine B. Preston, HMMH, Panel Chair

Erin Cooke, San Francisco International Airport

Anthony Costanzo, TRC

Knut Herrmann, City of Phoenix Aviation Department

Jaime Pabon, San Juan Luis Muñoz Marin International Airport

Alan L. Rao, OST-R/Volpe Center

Aydin Tabrizi, New York State Office of Information Technology Services

Alan W. Strasser, FAA Liaison

Christopher J. Oswald, Airports Council Internal – North America Liaison

Marci A. Greenberger, Manager ACRP

Is Your Airport Ready for is Energy Future?

Airports Face

- Growing facilities
- Transition to electric buildings
- Transition to electric ground service equipment, airport vehicles and customer vehicles
- Supporting electric aircraft
- Competition for power from surrounding businesses
- Airports may experience
  - Brown or black outs
  - Weather and climate risks
  - Equipment failures

Why Airport Energy Resiliency?

Airports need energy to serve their customers.

- ✈ Relying on energy infrastructure without understanding its reliability makes an airport vulnerable.
- ✈ Pursuing energy resiliency helps
  - Ensure public safety
  - Positions the airport as a community leaders
  - Enhances its brand

Research goal: provide airports with a tools to develop an energy resiliency roadmap

Research Approach

Literature Review

- Two Foci
  - Airport energy resiliency
  - Background for case studies

Case Studies

- Interviews with 17 airport operating entities, representing 20 airports
  - Cross section of airports by size and location
- Several community groups
- Two military bases

Research Key Findings

Airport Energy Resiliency

- Ability to withstand and recover from an incident
- Ability to address short- and longer-term increases in energy demands

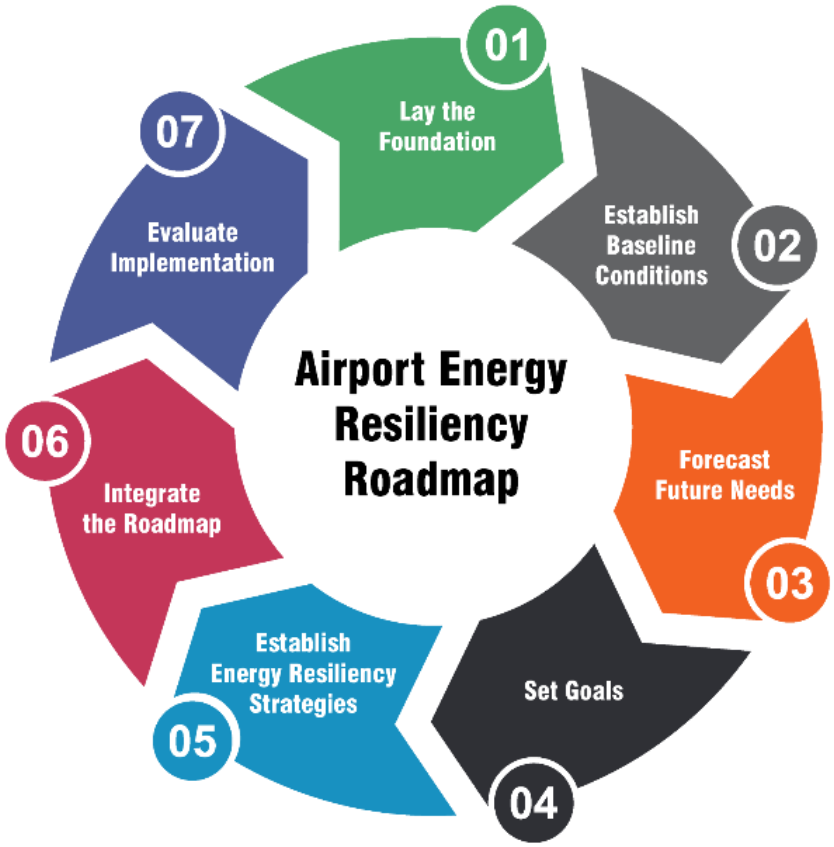
Goal

- Adequate dependable primary energy infrastructure and supply
- Properly sized and reliable backup energy system(s) for critical infrastructure

Airport Energy Resiliency Roadmap

Use Roadmap to

- Assess airport's energy systems
- Plan for future energy demands and improvements
- Resiliency and Sustainability are distinct concepts
  - Can be achieved independently or jointly



Source: ACRP Research Report 260

Lay the Foundation

Garner leadership support

Designate a champion

Identify roadmap stakeholders

- ✈ Airport internal (staff)
- ✈ Airport external (tenants)
- ✈ External agencies and utility
- ✈ Community

Build relationship with utility

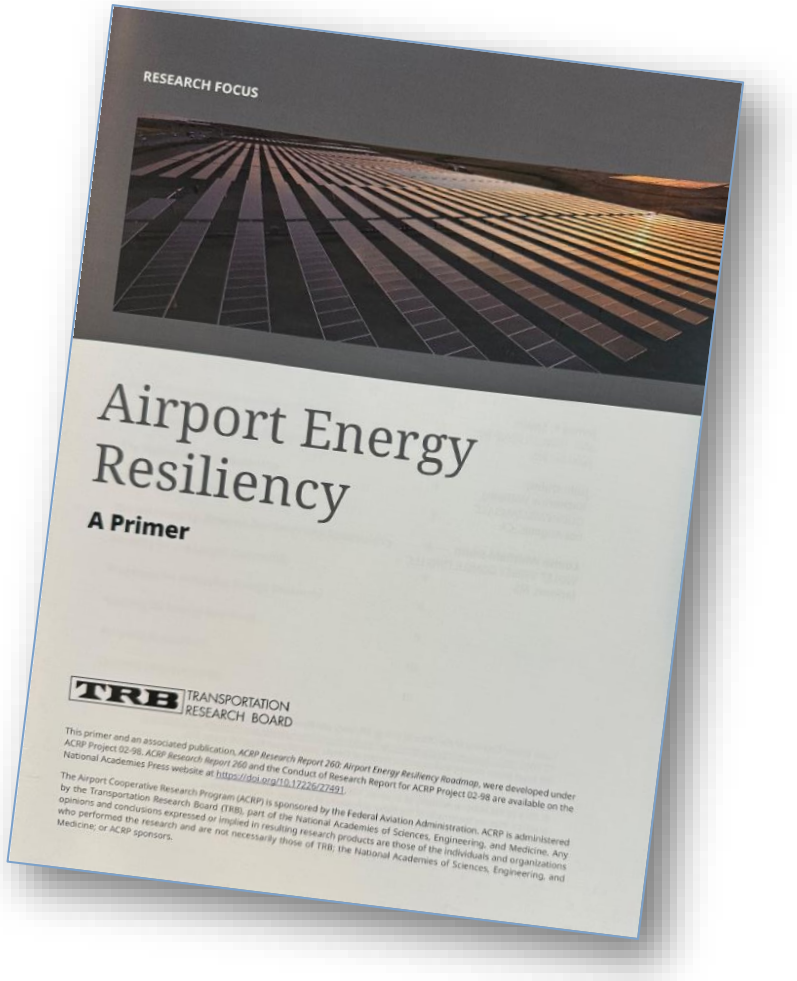
Stakeholders

Source: ACRP Research Report 260

ACRP Report 260 Primer

- Targeted to airport leadership
- Build support for airport energy resiliency roadmap

- https://www.trb.org/Main/Blurbs/183268.aspx



Establish Baseline Conditions

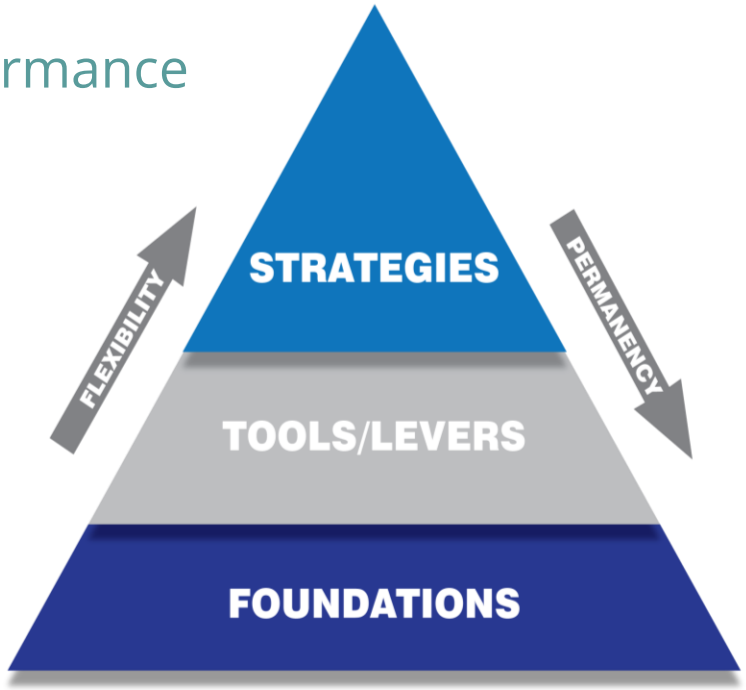
- Set boundaries
- Gather energy demand data – total and peak
- Categorize critical loads
- Assess supply conditions – on and off airport
- Identify if regulated or deregulated utilities
- Identify vulnerabilities
- Identify no-cost/low-cost opportunities to reduce baseline

Forecast Future Needs

- ✈ Project improved efficiency
- ✈ Identify future energy demands
- ✈ Evaluate total and peak loads
- ✈ Identify gaps based on risks

Set Goals

- Establish foundational goals
- Identify tools and levers with performance targets
- Formulate strategies
- Identify potential funding sources
- Build business case
- Prioritize strategies
- Integrate energy plans into other airport plans



Source: ACRP Research Report 260

Tools/Levers

Energy Efficiency
Higher-efficiency equipment can result in reduced energy needs, but the cost of the efficiency improvements must be considered.

Energy Resiliency
If an energy service is disrupted, what critical facilities at the airport need to continue to operate, for how long, and at what level of service?

Reliability of Service
- How reliable is the current service and utility's future ability to meet the airport's evolving energy needs?
- Are there opportunities to improve the service through additional feeds or on-site infrastructure upgrades?

Energy Independence
- How much independence from the local grid is desired?
- What energy generation or storage systems are needed to provide this independence?

Regulatory Compliance
Are there federal, state, or local regulations for renewable energy or emissions tied to energy use that an airport needs to meet as part of its energy resiliency plan?

Renewable Energy
Are there renewable energy goals potentially tied to other airport/community planning?

Energy Cost Control
- Energy demand is anticipated to continue to rise and likely so will costs.
- How much control over peak/base energy costs does the airport desire?

Source: ACRP Research Report 260

Potential Funding Opportunities

- Local
- AIP, VALE, BIL Grants
- Other grants
- Power purchase agreements
- Performance contracting
- Energy as a service
- Rebates (from utility)

Establish Energy Resiliency Strategies

Potential Strategies

- Additional grid connection
- Energy Efficiency improvements
  - Commissioning/retro-commissioning
- Renewable energy use
  - Solar, Geothermal
- New construction considerations
  - Establish building standards
- Use certifications as guide (LEED, Envision, PEER, Green Globes)
- Microgrid energy dependence
- Fuel and energy storage (BESS)
- Peak shaving using stored energy

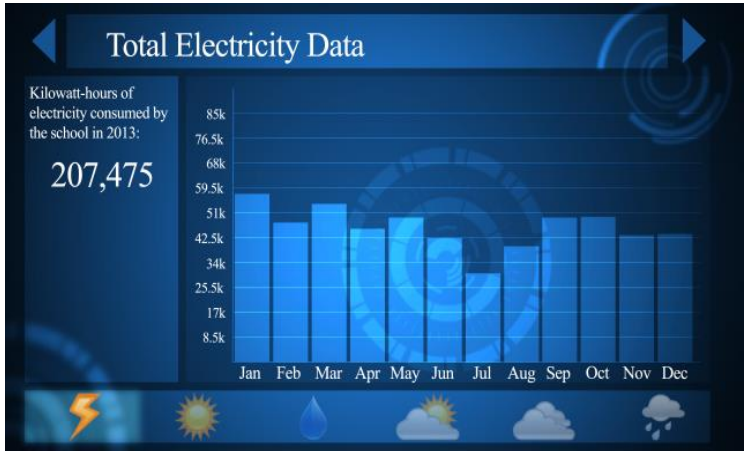
Integrate the Roadmap

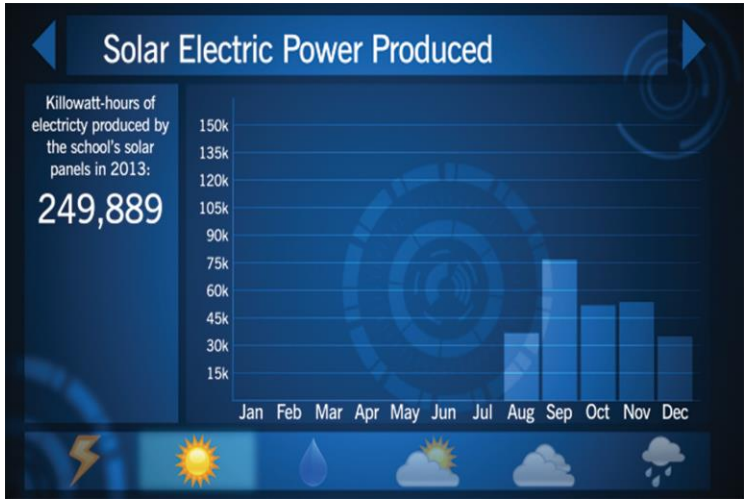
- Align with strategic plan
- Consider sustainability and climate action plans
- Incorporate into master plan and facility plans
- Address in operations and workforce plans

Source: ACRP Research Report 260

Evaluate Implementation

- Metrics
  - Operational
  - Strategic
- Key performance indicators
- Data management tools
- Adapt smart metering
- Communicate success
- Review performance and update as needed





Key Performance Indicators

- Reduction in energy demand
- Reduction in energy use intensity
- Percent renewable energy
- Energy per passenger or operation
- Days of fuel (for generators)
- Reduced recovery times
- Charging capacity

Evaluate and Adjust

- Update baseline as improvements occur
- Use KPI and metrics to guide adjustment
- Changes in forecast demand
- Upgrade utility service
- Review tools/levers and strategies
- New funding opportunities available
- Technology maturity
- Changes in sustainability goals

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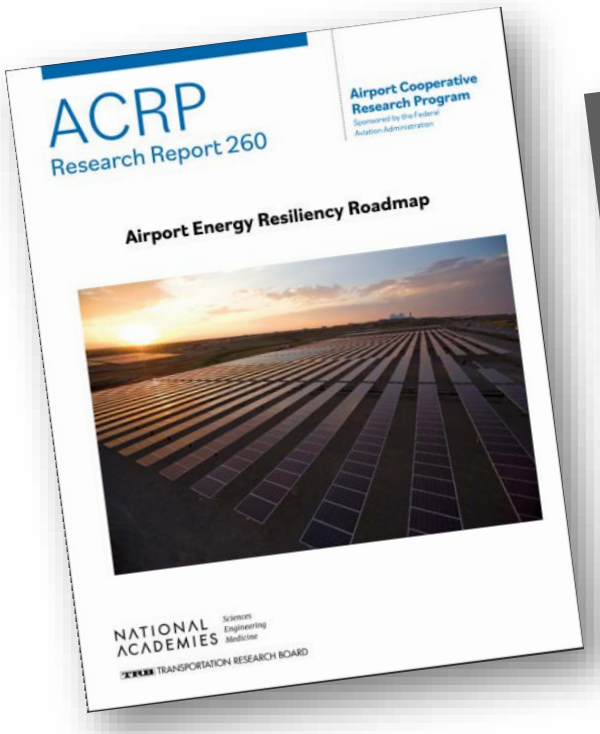

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https://www.trb.org/Main/Blurbs/183268.aspx

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Bill Bradford, PE

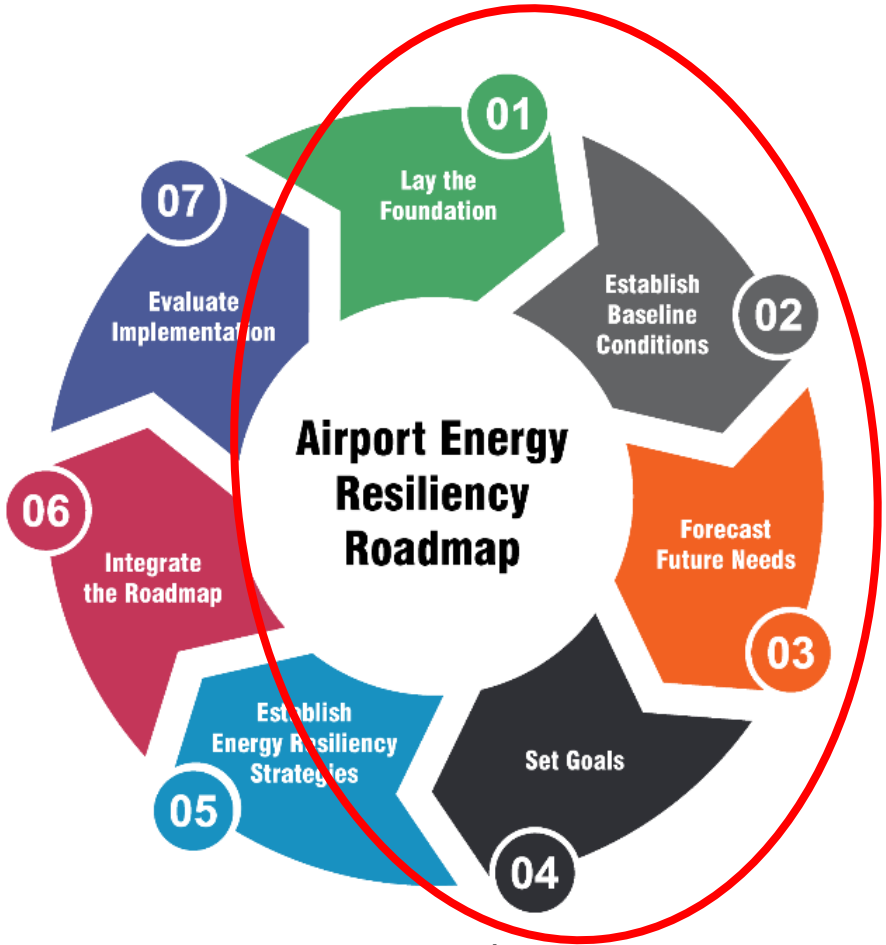
- Senior Vice President/ Principal – Energy Sustainability & Resiliency
- Co-chair, ACEC Energy Committee
- Creator and former chair of ACEC – Florida Energy Committee
- Creator and author, “Forming the Future” energy blog
- Creator “Discussions with Energy Leaders” YouTube Interview series

Energy and Resiliency Roadmaps – A Holistic Approach

- Begin with the end in mind.
- Use a "10,000-foot view" of your energy footprint.
- Develop a solid, repeatable step-wise approach.
- The roadmap is a business case for an internal strategic plan.
- Create a "Living Document."

Energy and Resiliency Roadmaps – A Holistic Approach

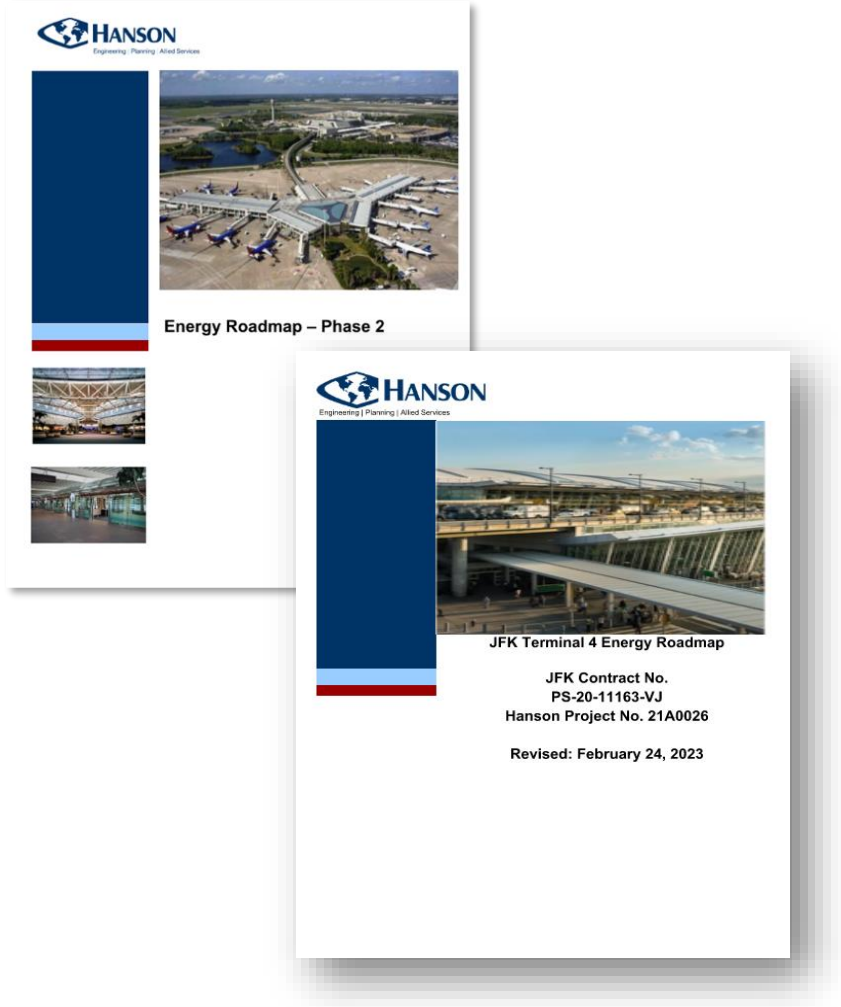
- Initial Steps (items 1-4)
  - Lay the Foundation
  - Establish Baseline Conditions
  - Forecast Future Needs
    - Project Improved Efficiency
    - Identify Future Energy Demands
    - Evaluate Total and Peak Loads
    - Identify Gaps Based on Risks
  - Set Goals



Source: ACRP Research Report 260

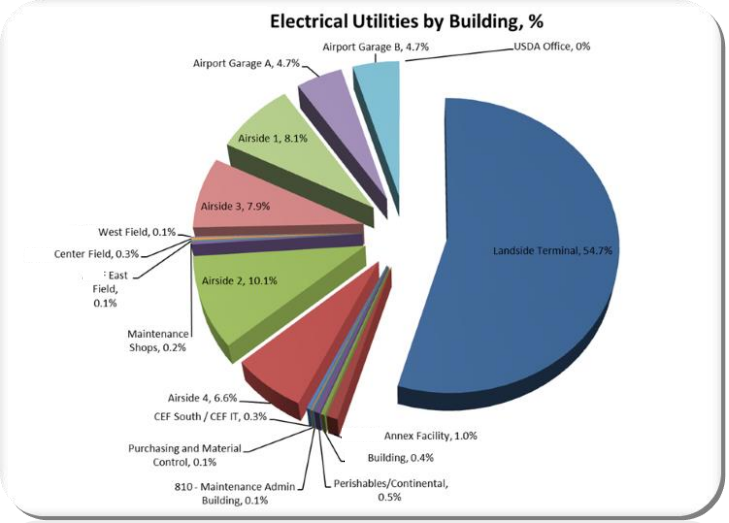
Energy and Resiliency Roadmaps – A Holistic Approach

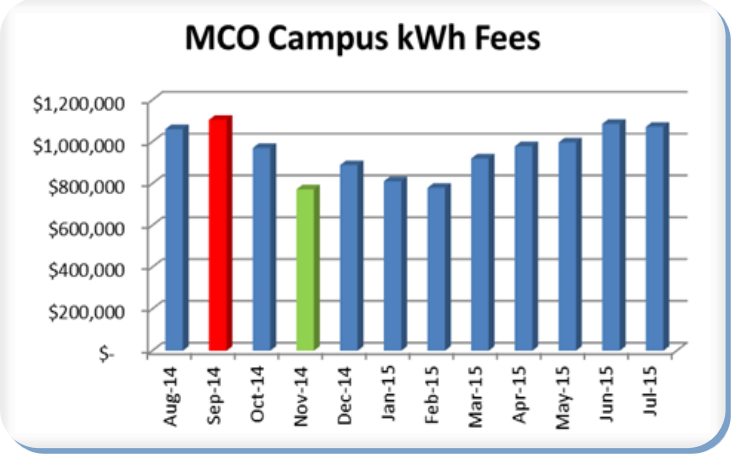
- Energy forecasts
- Energy analysis of existing assets
- Energy audits
- BAS and EMS Analysis
- Retro-commissioning plans
- Analytics
- Integration with Sustainability and Resiliency Master Plans



Energy Roadmap – MCO

- Existing Consumption & Demand
  - Consumption: $11.4M, 167M kWh
  - Demand: $3.1M, 51.4-Megawatt peak
- Benchmarking
  - 85.5% of GOAA Utilities Benchmarked
- Targets for Reduction
  - Goal: 10% reduction
  - $1.46M annual savings target
  - 5-year payback criterion
- Projected Growth Scenarios
  - South Airport Complex: 16,000 kVA service
  - Increase of 56M kWh, 9.3 MW Peak demand
  - Anticipated Utility Budget Impact of SAC: $4.5M/year

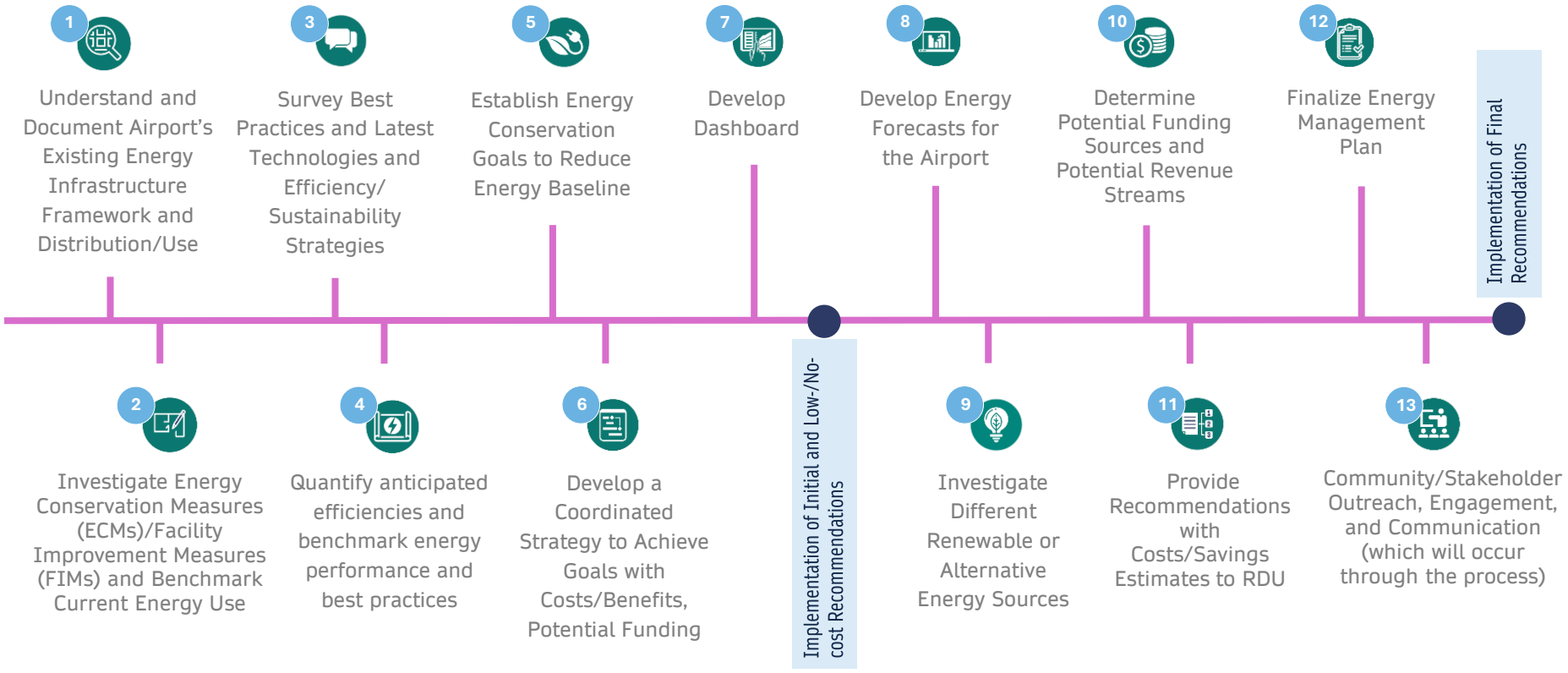




Energy Roadmap – JFK IAT 4

- Task 1 – Review existing Energy Audits, RCx Reports and active projects
  - Create an initial list of Facility Improvement Measures (FIMs)
  - Develop a concept M&V Plan
  - Evaluate potential for NYSERDA (and other) rebate programs
- Task 2 – Develop Energy Audits
  - Perform Energy Audits to identify FIMs
  - Create FIMs Report
- Task 3 – Energy Forecasts for the Facility
  - Review historic energy demand, consumption and growth
  - Review effects of upcoming projects and planned affect
- Task 4 – Develop the Energy Roadmap
  - Provide recommendations for prioritizing energy tasks for future years

Energy Roadmap – RDU

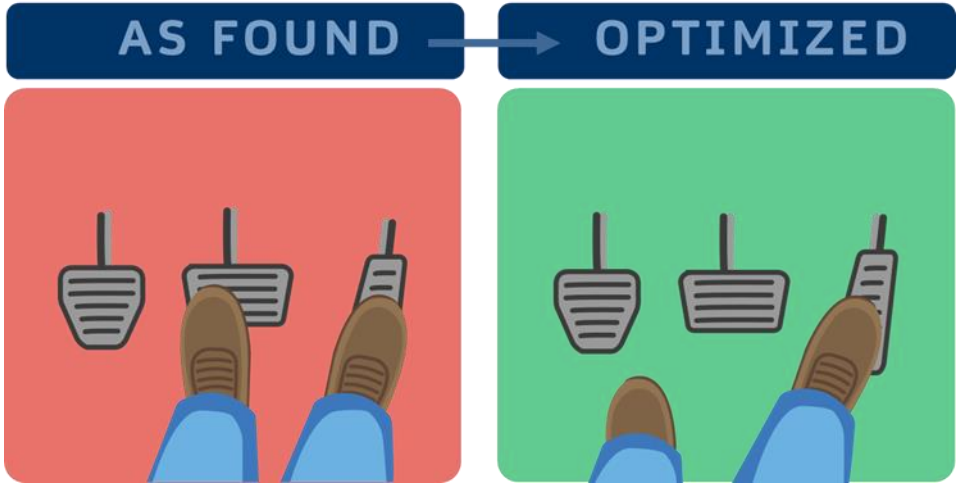


Persistence Strategies

- Project commissioning
- Continuously update design standards
- Public awareness and education
- “Big Data” analytics (FDD) for Energy Dashboards and Monitoring Based Commissioning (MBCx)
- Building documentation
  - Systems Manual and As-Built Documentation
- Operator training

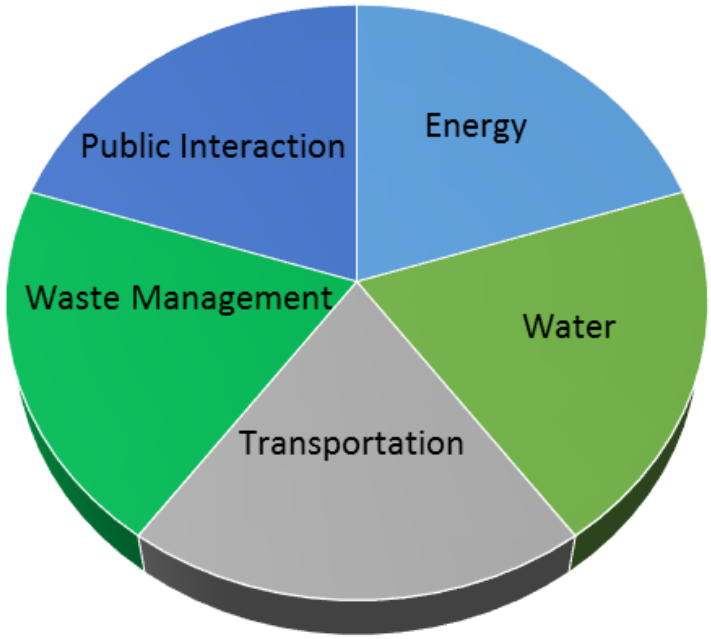
Commissioning/Retro-commissioning

- Commissioning – make sure new buildings are operating efficiently
- Retro-commissioning – make sure existing buildings are operating efficiently
- Equipment efficiency degrades 2-4% per year
- Establish a regular recommissioning program



Integration with Sustainability Master Plans

- Tenant Interaction
- Public Relations Outreach
- Interactive Sustainability Messaging
- Greenhouse Gas Emissions Reporting
- Green Building Labels, Awards and Recognition



Setting your goals

- Understand your existing energy infrastructure, distribution and use
- Benchmark current energy use and investigate potential facility improvement measures
- Develop energy forecasts
- Survey best practices and latest technologies
- Establish energy efficiency goals to reduce energy baseline
- Develop a coordinated strategy to achieve goals
- Take advantage of “low hanging fruit”

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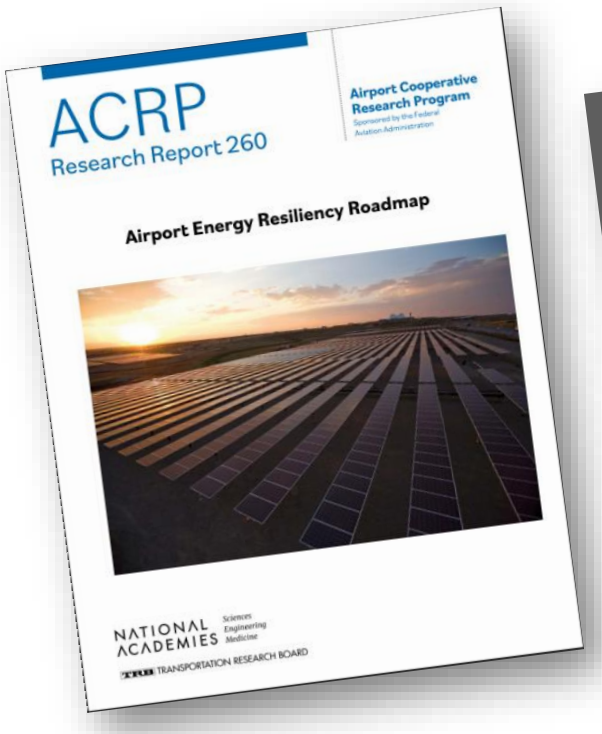

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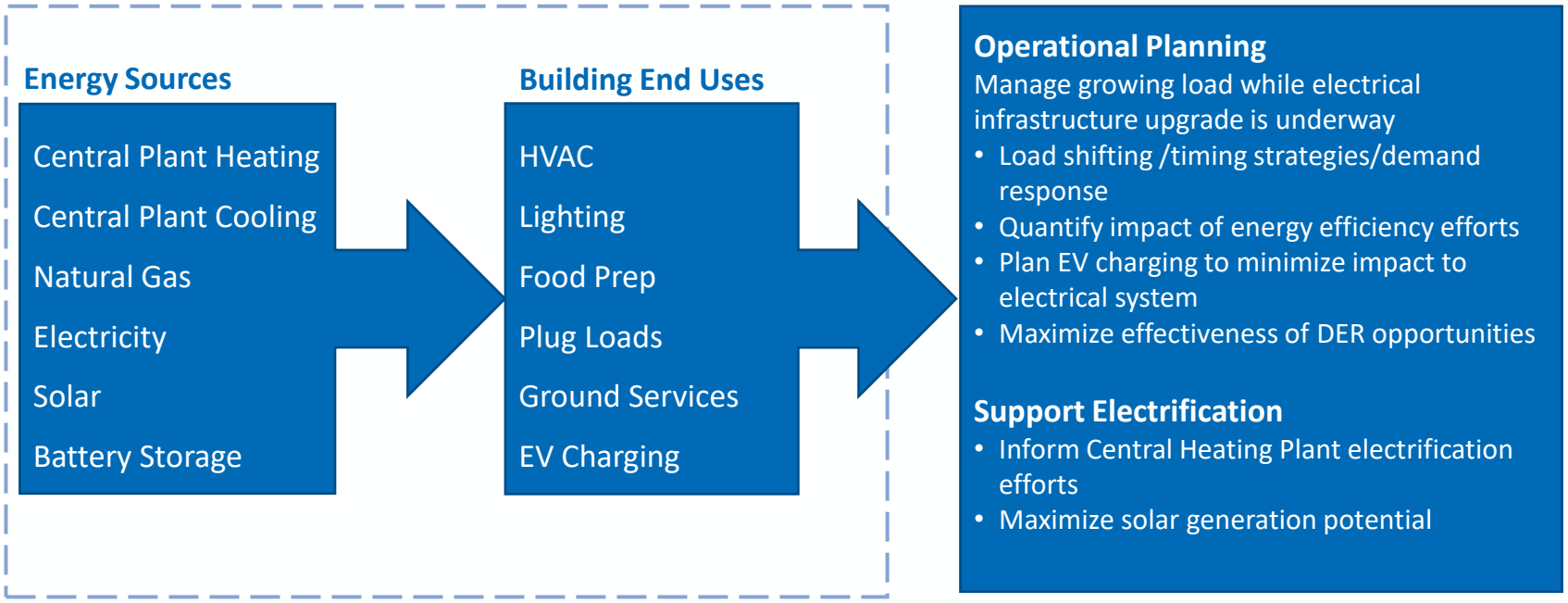
Transportation Research Board (TRB) Webinar
Airport Energy Resiliency Roadmap
ACRP Research Report 260

12.03.2024

How can airports manage growing electrical load?

Demand Study



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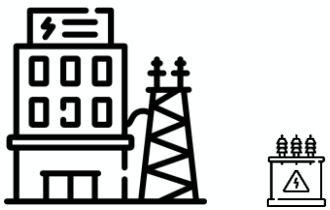
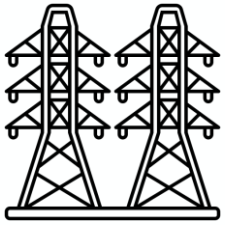
In-front of and behind-the-meter operations

Utility studies support in-front of the meter operations



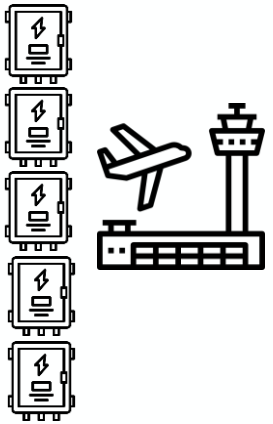
Generation



Transmission

Distribution

Demand studies support behind-the-meter operations



Transformers and Utility meters

Future Electrification Scenario Planning

Modeling various combinations of scenarios will help determine a feasible roadmap to electrification

- Electrification of heating
- Future Solar Implementation
- Impact of energy conservation measures
- Impact of transportation and ground services electrification (airside and landside)
- Expansion of local infrastructure
- Capital improvement program implementation

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Today's Speakers

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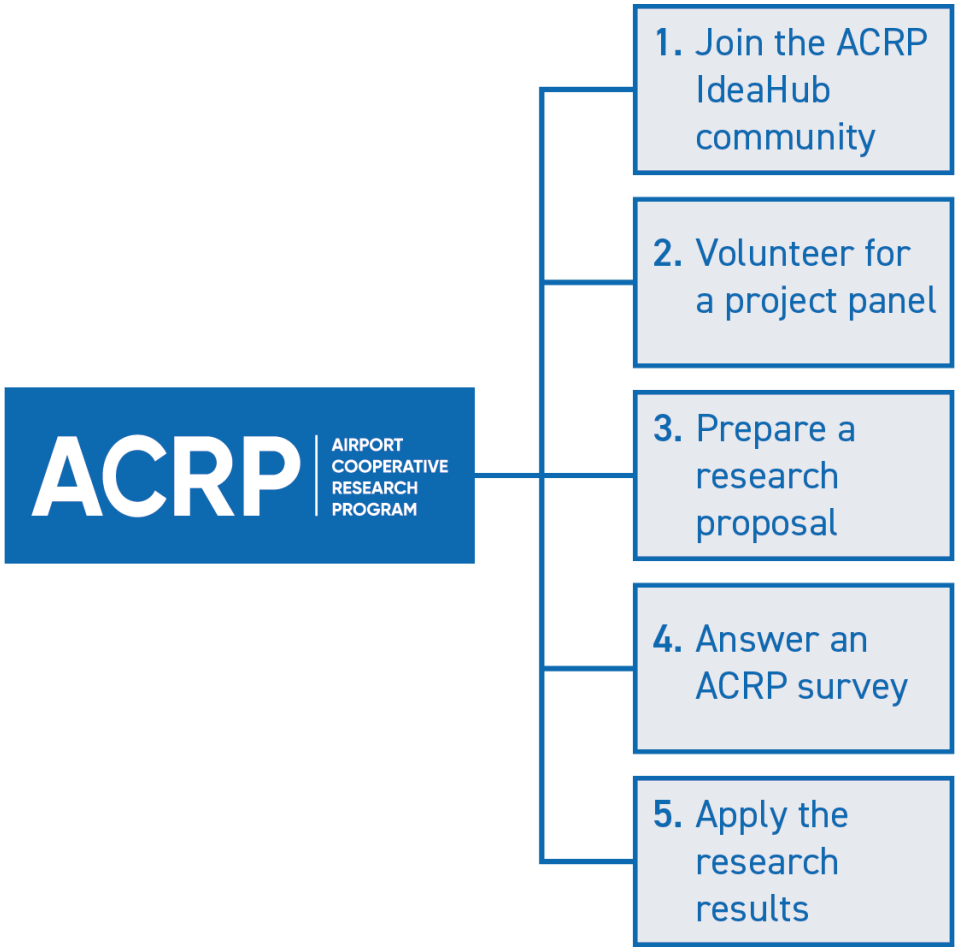

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