



# WHAT DRIVES ENERGY REDUCTION AT O'HARE?

David Robbins  
Projects Administrator  
Chicago Department of Aviation

**April 22, 2015**

AAAE Airports Energy Efficiency Forum  
What Makes Energy Efficiency & Renewable Energy Programs Happen at Airports?



Rahm Emanuel  
Mayor



Rosemarie S. Andolino  
Commissioner



# CLIMATE SUMMIT

WHAT IF IT'S A BIG HOAX AND WE CREATE A BETTER WORLD FOR NOTHING?

- ENERGY INDEPENDENCE
- PRESERVE RAINFORESTS
- SUSTAINABILITY
- GREEN JOBS
- LIVABLE CITIES
- RENEWABLES
- CLEAN WATER, AIR
- HEALTHY CHILDREN
- ETC. ETC.



JOEL PETT  
12/19 USA TODAY  
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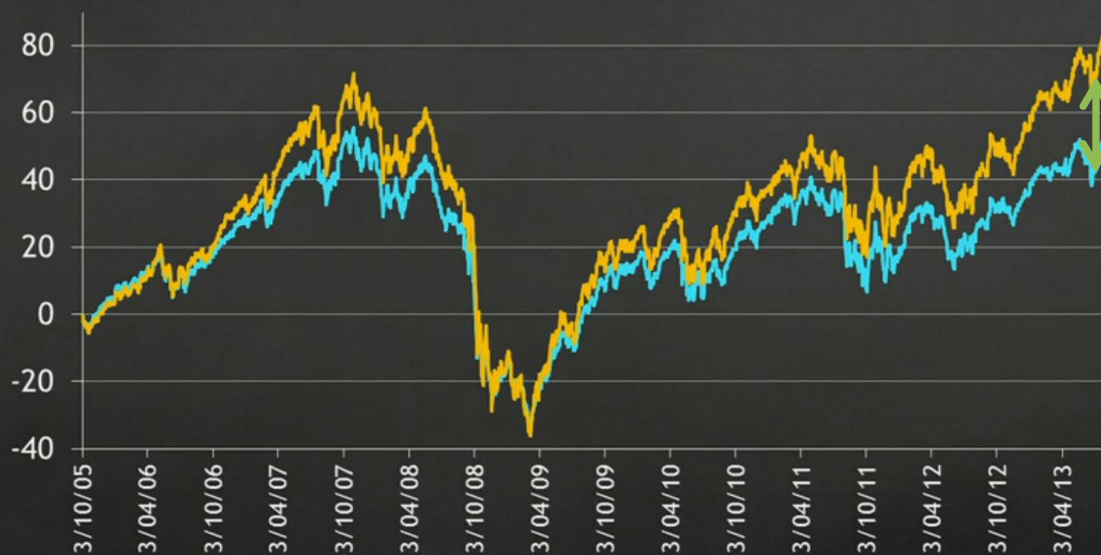




There are risks and costs to a program of action.  
But they are far less than the long-range risks and costs  
of comfortable inaction.

- John F. Kennedy

## Good returns from climate leadership



Source: CDP, Bloomberg

✈ ESG + F drives results

- Environmental
- Social
- Governance
- Financial

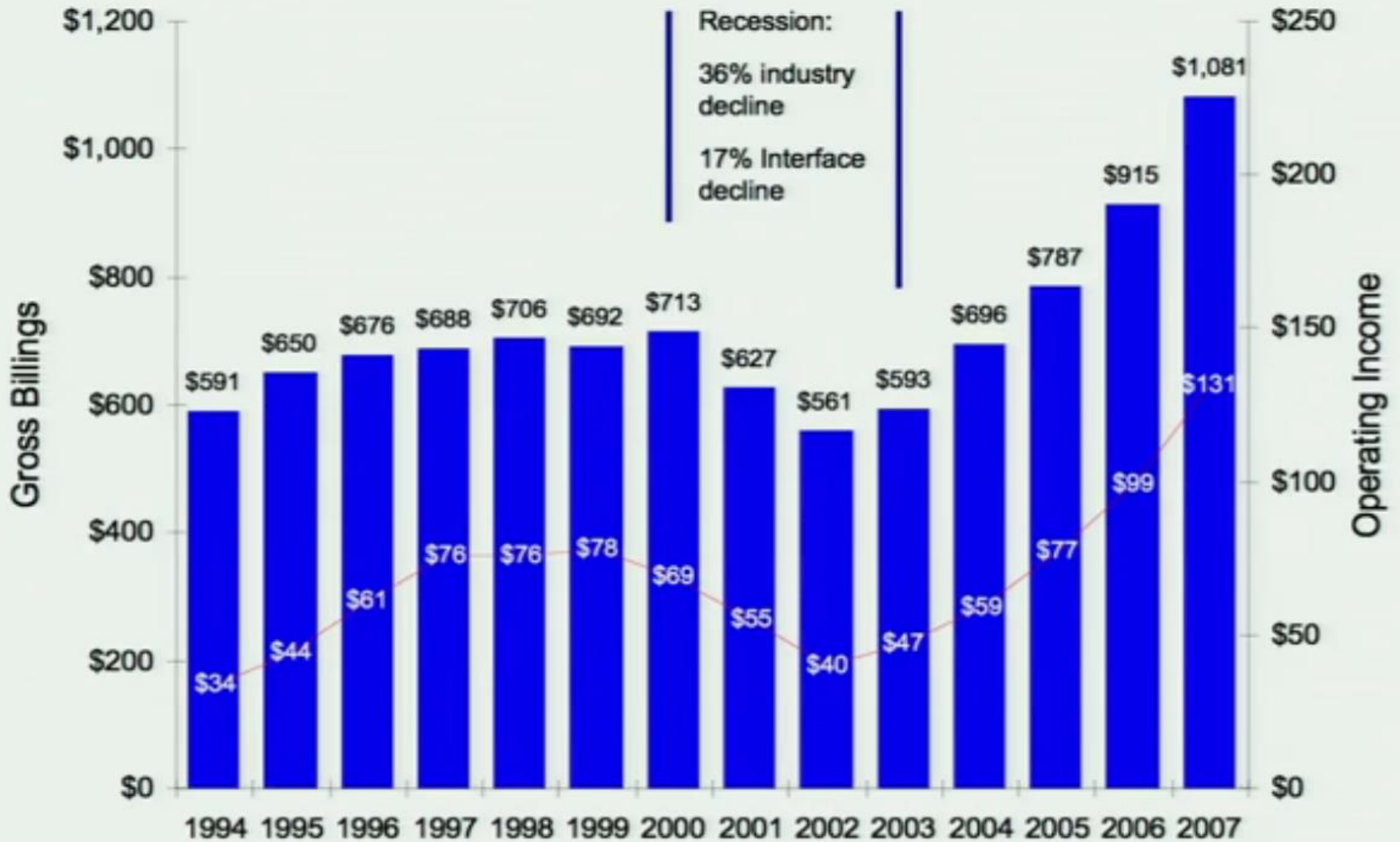
Plan for the future because  
that's where you are going to  
spend the rest of your life  
- Mark Twain

**Gold:** Companies incorporating best practices in climate change and risk management (ESG)

**Blue:** Fortune 500 companies

*Revenue = Resource*

# Interface, Inc. (Consolidated) Sales and Profitability from Continuing Operations (\$ in millions)





# WHAT DRIVES ENERGY REDUCTION?



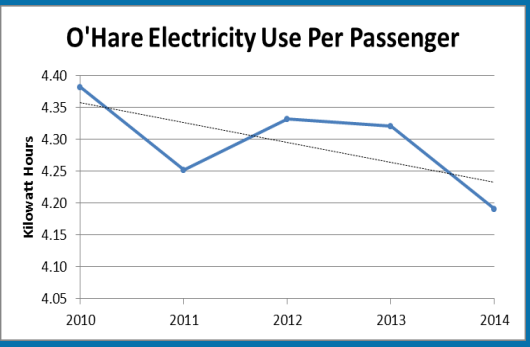
✈ Leadership



✈ Policy



✈ Partnerships



✈ Information



✈ Aging Infrastructure

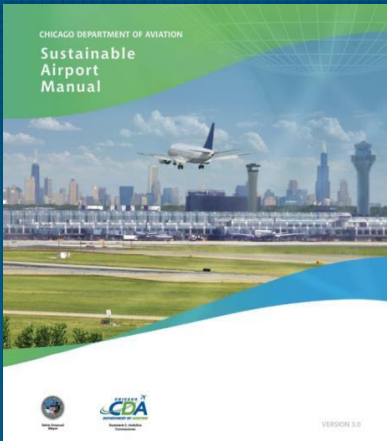


✈ Opportunistic Mindset





# LEADERSHIP



1<sup>st</sup> airport development sustainability manual & rating system



1<sup>st</sup> LEED airport rental-car branch



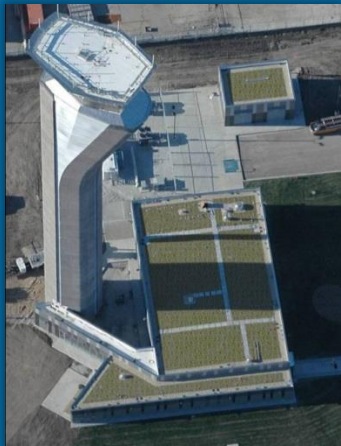
1<sup>st</sup> airport Green Concessions Policy



1<sup>st</sup> U.S. airport to use recycled asphalt shingles in runways & taxiways



Largest U.S. airport green roof



1<sup>st</sup> green roof on an FAA airport facility









## POLICY

✈️ CDA's *A Sustainable Path* – 2010 to 2015 targets:



REDUCE ENERGY USE **15%**



Reduce potable water use **10%**



Divert **50%** of waste from landfills



Maintain a fleet of at least **20%** green vehicles



Reach the Airport Service Quality's **Top Ten** ranking for passenger experience

✈️ Supports City of Chicago sustainability guidance

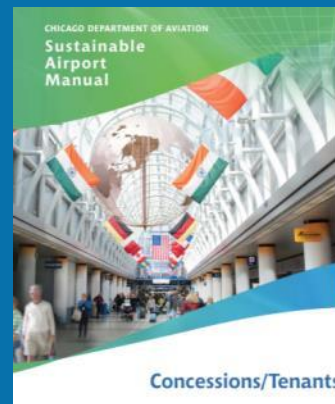
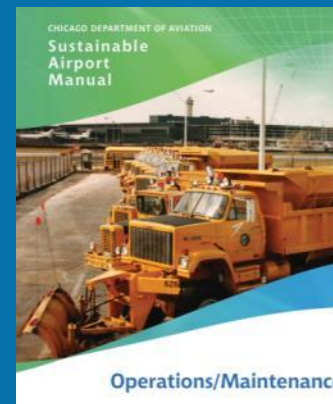
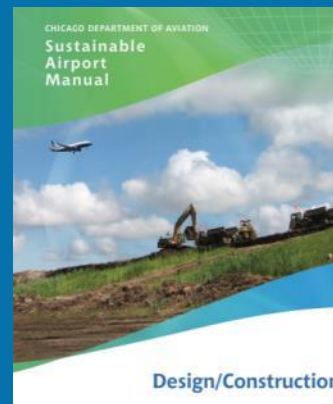
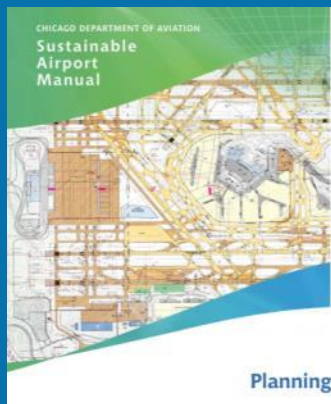
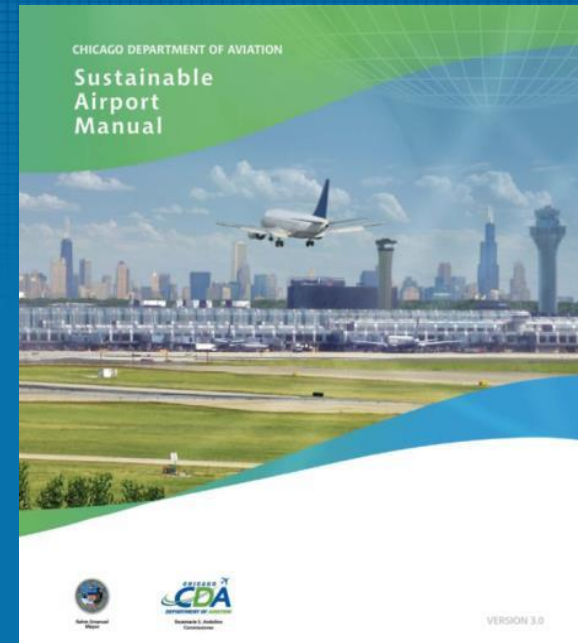






# POLICY

- ✈ Sustainable Airport Manual (SAM)
- ✈ Sustainability required in all CDA & tenant projects
- ✈ Standards and specifications, checklists, a rating program, and award recognition
- ✈ Input from 200+ stakeholders
- ✈ Compliance tied to payment
- ✈ Covers all airport functions:





- Green Airplane Certifications
- Recognize sustainability achievements
- Scale of 1 to 5 “green airplanes”
- Over 180 projects reviewed and rated



CHICAGO DEPARTMENT OF AVIATION  
**SUSTAINABLE AIRPORT MANUAL**  
 GREEN AIRPLANE CERTIFICATION



**CONSOLIDATED RENTAL CAR FACILITY**  
 CONSTRUCTION AWARD

**100<sup>th</sup> GREEN AIRPLANE CERTIFICATION**



CONTRACTOR:  
**Walsh Construction**

- Green Roof**
  - » 14,076 sq. ft. vegetated green roof covering 100% of QTA building
- On-Site Renewable Energy**
  - » Grid-tied photovoltaic panels and 9 horizontal axis wind turbines generating up to 37.5 kW of electricity or 6% of the facility's energy needs
- Stormwater Runoff and Water Use Reduction**
  - » 1 million gallon cistern and rainwater collection system for landscaping and vehicle washing
  - » Low-Flow fixtures reducing potable water use by over 30%
- Optimize Energy**
  - » Anticipate a 27% reduction in overall energy usage
  - » 100% interior and exterior LED lighting installed
  - » Building Automation System for ongoing energy management and reporting
- Innovation and Menu Items**
  - » Installation of a five-story exterior Green Wall
- LEED Certification**
  - » LEED Silver Certification

M  
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W  
A  
Y







# POLICY

- ✈ SAM integrates energy goals into airport projects where LEED® doesn't apply
  - Unoccupied buildings, runways, parking
  - Airport-owned and tenant projects
- ✈ Single rating system despite a variety of projects
- ✈ Incentives and green airplane ratings drive results

SAM Credit	% Energy Reduction Over Baseline*			Points
	New Buildings	Existing Buildings	Civil**	
4.4.1	12%	8%	8%	1
4.4.2	14%	10%	16%	2
4.4.3	16%	12%	24%	3
4.4.4	18%	14%	32%	4
4.4.5	20%	16%	40%	5
4.4.6	22%	18%	48%	6
4.4.7	24%	20%	-	7
4.4.8	26%	22%	-	8
4.4.9	28%	24%	-	9
4.4.10	30%	26%	-	10
4.4.11	32%	28%	-	11
4.4.12	34%	30%	-	12
4.4.13	36%	32%	-	13
4.4.14	38%	34%	-	14
4.4.15	40%	36%	-	15
4.4.16	42%	38%	-	16
4.4.17	44%	40%	-	17
4.4.18	46%	42%	-	18
4.4.19	48%	44%	-	19

**TABLE 2 –SAM Green Airplane Rating System (Construction)**

Green Airplanes	Prerequisites	Civil-Airside	Civil-Landside	Occupied Buildings	Unoccupied Buildings	Reference LEED 2009 Rating System:
	8	8	13	12		
	2-22	2-23	2-46	2-37		
	23-28	24-29	47-58	38-46		Certified
	29-33	30-35	59-69	47-56		Silver
	34-45	36-47	70-93	57-75		Gold
	46-63	48-66	94-129	76-104		Platinum
<b>MAXIMUM</b>	<b>63</b>	<b>66</b>	<b>129</b>	<b>104</b>		



## POLICY

- ✈ 2015 City of Chicago Energy Benchmarking Ordinance
  - Municipal and commercial buildings > 50,000 ft<sup>2</sup>
    - Aviation Admin Building (*completed*) ✓
  - CDA can encourage tenant compliance
    - E.g., O'Hare Hilton







# PARTNERSHIPS

- ✈ Illinois Department of Commerce & Economic Opportunity (DCEO)
- ✈ University of Illinois Sustainable Technology Center:
  - Waste to energy, energy efficiency, DCEO rebates
- ✈ United Airlines:
  - Lighting retrofits & HVAC upgrades, biofuels, DCEO rebates
- ✈ Metropolitan Water Reclamation District of Greater Chicago (MWRD)
  - Waste to energy
- ✈ Mayor's Office
- ✈ Midwest Aviation Sustainable Biofuels Initiative
- ✈ Airports Going Green
  - Input from 200+ stakeholders





# PARTNERSHIPS

- ✈ Prairie Research Institute
- ✈ University of Illinois
  - Help improve CDA's ability to track, process, store, and analyze energy data
  - Identify an energy benchmarking and dashboard tool







## PARTNERSHIPS

✈ Received > **\$880,000** in DCEO rebates since 2010

- Terminal & airfield lighting
- Variable frequency drive motors/fans
- Flight Information Displays

✈ Savings from 2010-14 rebates are > **\$450,000 ANNUALLY**

- Over **5.4 million** annual kWh saved / energy to power 583 homes each year

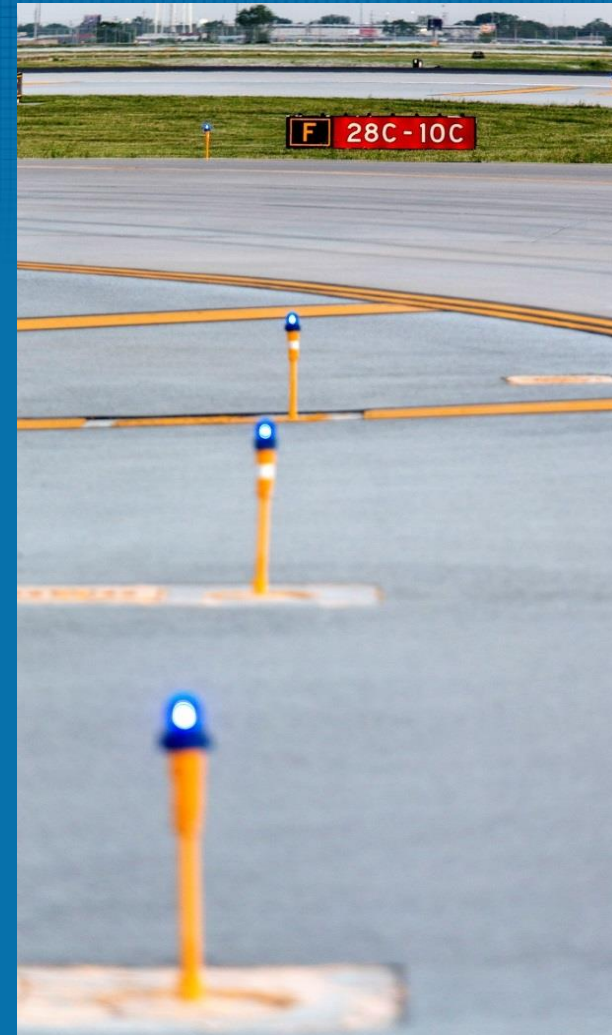
✈ **\$675,000** anticipated in rebates for 2015/16 DCEO projects

- Estimated to generate **\$350,000** in annual savings



**Illinois**  
**Department of Commerce**  
& Economic Opportunity

Bruce Rauner, Governor





- Replaced 1,000 runway & taxiway lights with LEDs
- Saves 735,000 kWh and \$47,000 annually
  - *The annual electricity use of 70 homes*



**Illinois**  
**Department of Commerce**  
& Economic Opportunity

Bruce Rauner, Governor

**\$180,000 DCEO rebate**



CONNECTING THE WORLD  
TO CHICAGO





# PARTNERSHIPS

## ✈️ O'Hare Elevated Parking Garage:

- 6.6% of total O'Hare energy use
- Light for cars, not people

## ✈️ Replacing over 5,000 light fixtures with LEDs

- 21st century solution

## ✈️ \$180,000 DCEO rebate

## ✈️ Annual savings:

- \$300,000
- 5 million kWh
  - 27% reduction
- 3,800 tons of CO2



**Illinois**  
**Department of Commerce**  
& Economic Opportunity

Bruce Rauner, Governor







# INFORMATION

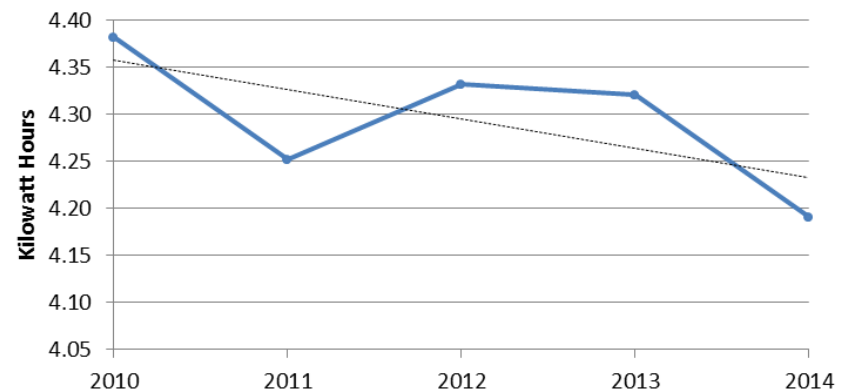


O'Hare H&R Plant

Info encourages action

- Search for anomalies
- Obtain complete data to visualize the full picture

### O'Hare Electricity Use Per Passenger





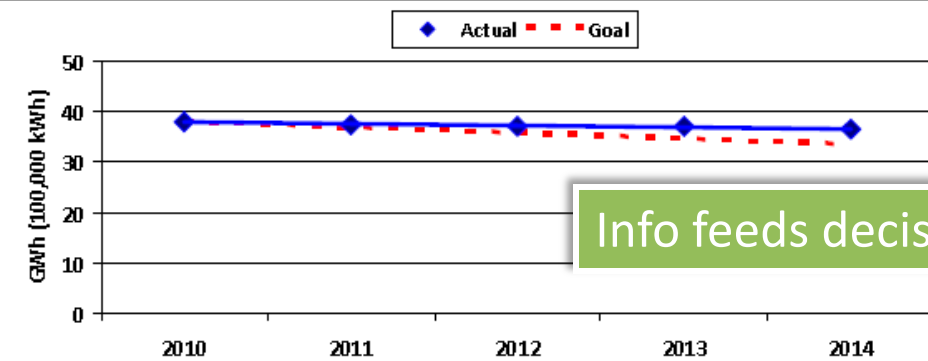
# High-Level View of Electricity Consumption Breakdown at O'Hare



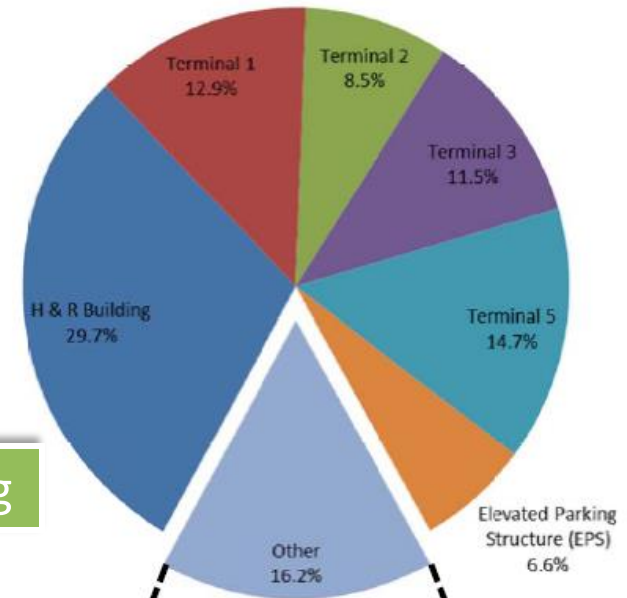
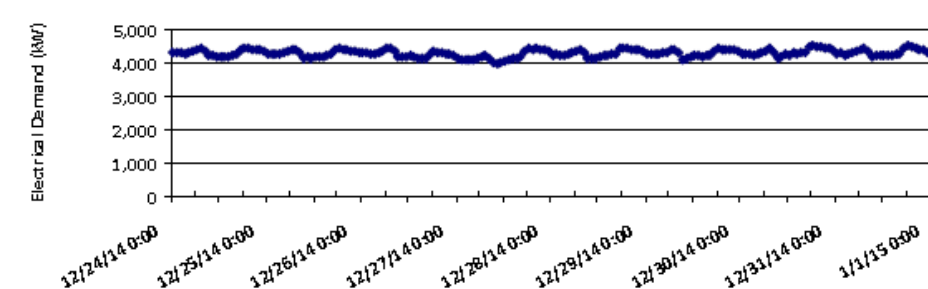
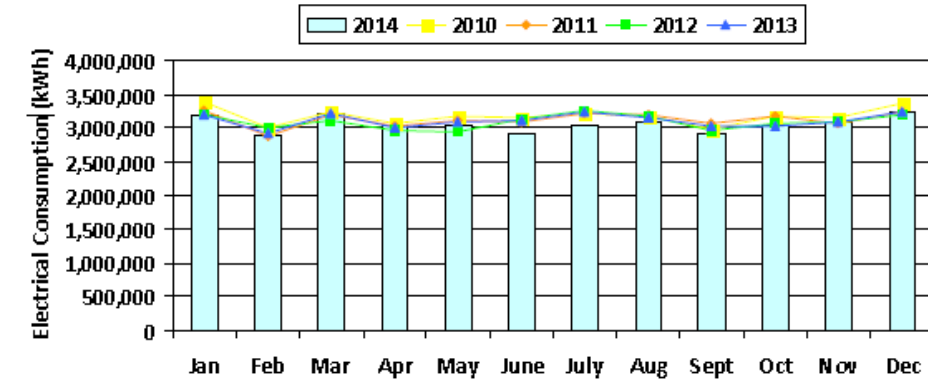
## INFORMATION



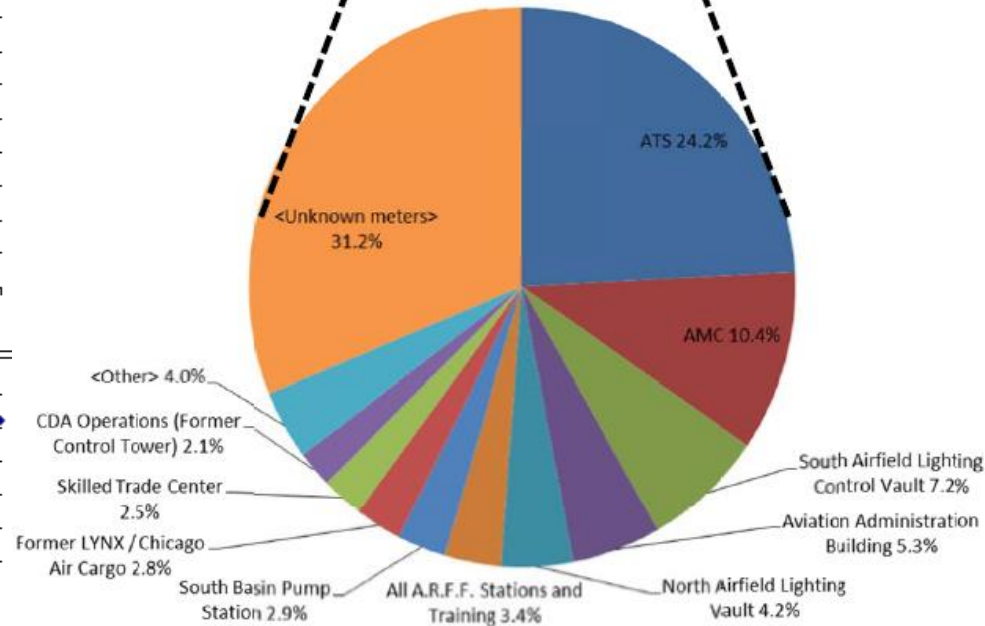
Building Number:	121	EUI (kWh/sf)	
		2014:	28.7
Building Name:	Terminal 1	2013:	29.3



Info feeds decision making



### Details of the Other Sector





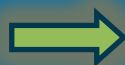
# AGING INFRASTRUCTURE

✈ 20<sup>th</sup> century construct

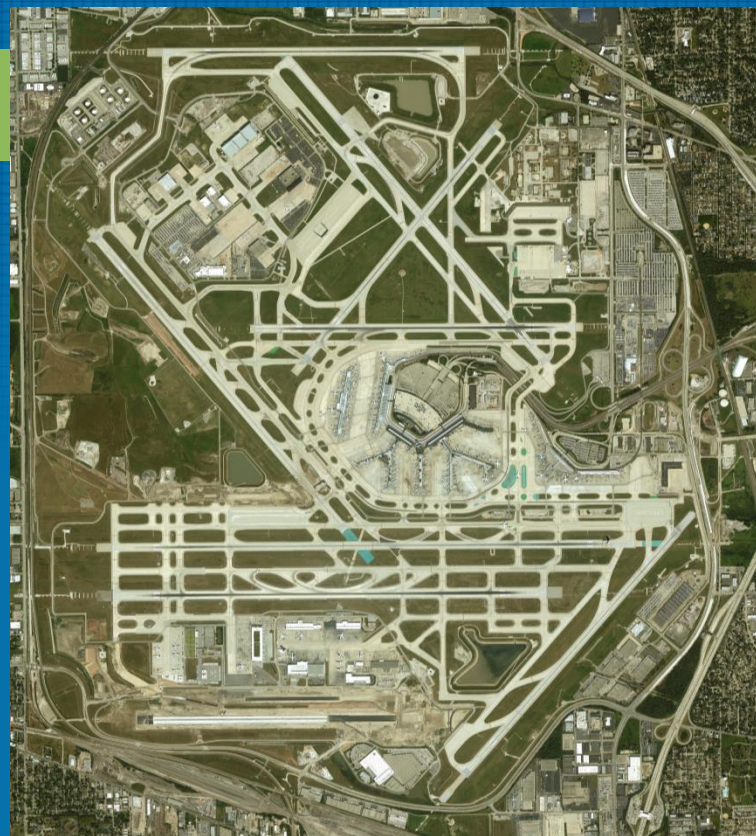
- Opportunity for a 21<sup>st</sup> century solution



O'Hare Airfield c. 1945



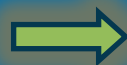
Major  
Upgrades



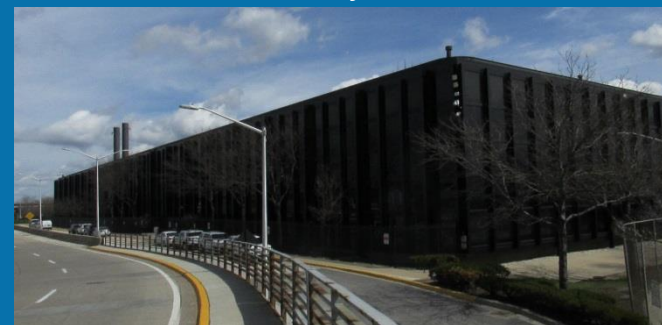
O'Hare Airfield 2014



O'Hare H&R Plant c. 1970



Minor  
Upgrades



O'Hare H&R Plant 2015





# AGING INFRASTRUCTURE



- ✈ MDW - Built in **1920s** for airmail flights
- ✈ World's busiest airport 1931-1961
- ✈ Now the fastest growing U.S. airport
  - **"Busiest square mile in aviation"**



- ✈ Singapore Airport
  - Project Jewel (mall & terminal): 2018
  - Butterfly garden, rooftop pool, movie theaters, slide



- ✈ ORD = **OR**char**D** Field
- ✈ Built in 1940s as a WWII Army Air Corps C-54 production facility
- ✈ Now **"World's Busiest Airport"**

Competing with airports built in the 'modern era' of infrastructure and aviation



- ✈ Denver Airport
  - Only major U.S. airport built in last 25 years (1995)





# AGING INFRASTRUCTURE

## - Different Eras of Aviation -

### 1945 – O’Hare

No jet airliners (1952)

No FAA (1967)

First modern airliners

First flights across the pacific (1936)

5,000 homes have TV sets (1945)



Boeing 247 (1933) vs. Boeing 777 (1995)

### 1995 – Denver

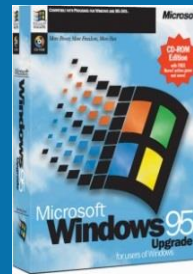
Galileo spacecraft lands on Jupiter

US Atlantis docs with Russian space station

Polyakov spends 438 days in space

First airline tickets sold on internet

First feature-length animated film





Denver...25 years later

Non airline revenue!





# AGING INFRASTRUCTURE

- ✈️ O'Hare Chillers – all pre-1988
  - Reduced reliability & efficiency
    - +100°F heat wave during 2012 NATO Summit
  - Hard to find replacements parts
  - High maintenance costs



- ✈️ Replacing Chillers 1-5 with four larger units
  - 4,000-4,500 tons each
  - 1.5x capacity
  - Could reduce energy costs **\$700,000** per year
- ✈️ Installing variable frequency drives

Tag	Capacity (tons)	Year	Age
CH-1	2,000	1961	53
CH-2	2,000	1961	53
CH-3	2,000	1961	53
CH-4	2,000	1971	43
CH-5	4,500	1974	40
CH-6	4,500	1986	28
CH-7	4,500	1988	26
CH-8	4,500	1988	26
CH-9	4,500	1988	26
<b>TOTAL</b>	<b>30,500</b>		





# AGING INFRASTRUCTURE

## ✈ O'Hare Cooling Towers (3)

- Reduced reliability, efficiency, and potential leaks after **20+** years
- Previously not operating at full capacity; high maintenance costs



North Cooling Tower



South Cooling Tower



East Cooling Tower

Tag	Design Capacity (tons)	Actual Capacity (tons)	Year	Age
East*	13,500	<b>12,000</b>	1988	<b>26*</b>
South	8,000	8,000	1994	<b>20</b>
North	9,000	9,000	2006	<b>8</b>
<b>TOTAL</b>	<b>30,500</b>	<b>29,000</b>		

Photo and data source: Burns & McDonnell, 2012





# AGING INFRASTRUCTURE

- ✈ O'Hare High Temperature Water Generators (8)
  - Reduced reliability and efficiency after 30 years
- ✈ Replace ALL generators and pumps
- ✈ Match peak winter and summer loads with multiple sizes
  - Chicago = cold, snowy winters and hot, humid summers

Tag	Capacity (MBH)	Year	Age
HTWG-1	75,000	1969	45
HTWG-2	75,000	1969	45
HTWG-3	75,000	1969	45
HTWG-4	75,000	1969	45
HTWG-5	75,000	1979	35
HTWG-6	75,000	1986	28
HTWG-7	75,000	1988	26
HTWG-8	75,000	1988	26
<b>TOTAL</b>	<b>600,000</b>		



✈ Cost: \$67 million





## AGING INFRASTRUCTURE

### ✈ Standby Power System Generators (6)

- 1-5 are **40+** years old
- Hard to find replacement parts

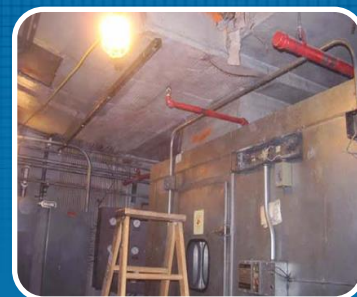
### ✈ System upgrade:

- Replace generators 1-6
- 18 MW will replace 5.2 MW system
- Construct new building
- Cost: **\$32.5 million**





# AGING INFRASTRUCTURE



Project	Estimate
Upgrade East Cooling Tower	\$9,700,000 <i>(Complete)</i>
Upgrade Chilled Water System	\$61,000,000
Upgrade Stand-By Power System	\$32,500,000
Terminal 1, Concourse H/K and Building 8C HVAC Upgrades	\$107,000,000
Upgrade HTW System	\$67,000,000
Replace Rotunda AHUs	\$18,500,000
<b>TOTAL</b>	<b>\$295,700,000</b>





 OPPORTUNISTIC MINDSET



New project = new opportunity to incorporate sustainability





## OPPORTUNISTIC MINDSET

- ✈ LEED® Silver Buildings
- ✈ ORD North ATCT
  - 1<sup>st</sup> FAA LEED tower; 10% energy savings
- ✈ ORD FedEx World Services Center
- ✈ ORD Signature Flight Support
- ✈ ORD Enterprise Rent-A-Car
  - 1<sup>st</sup> airport rental car branch to achieve LEED for New Construction
- ✈ MDW CONRAC





 OPPORTUNISTIC MINDSET

O'Hare South Control Tower (*in progress*)

Supports Runway 10R/28L

\$40M project

October 2015 Commissioning

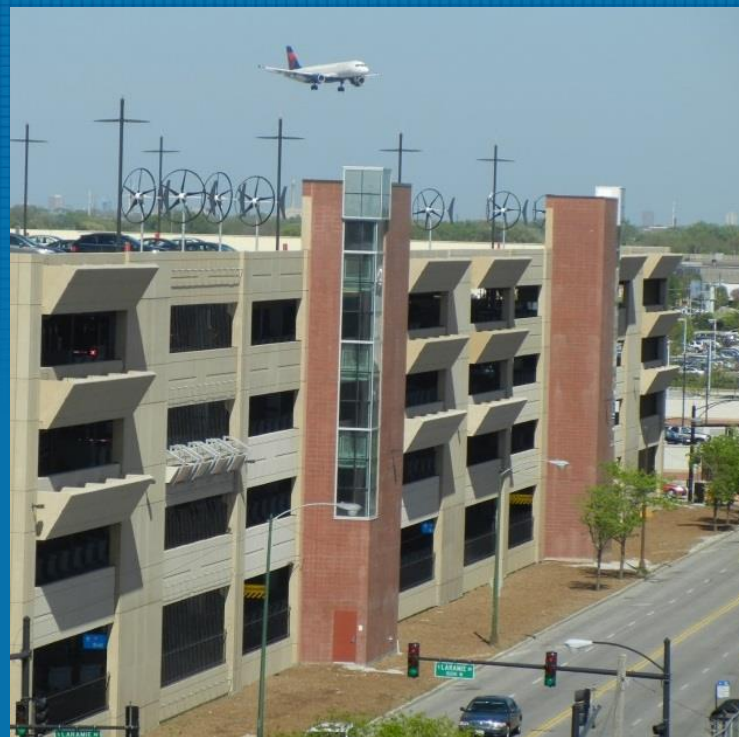
LEED Gold anticipated





## OPPORTUNISTIC MINDSET

- ✈ Solar hot-water panels (+ green roof) on ORD Fire Station #3
- ✈ 24 wind turbines on MDW Economy Parking Structure
- ✈ MDW CONRAC solar and wind turbines
- ✈ ORD South ATCT geothermal
- ✈ 35% of energy for MDW CONRAC purchased from renewable energy sources







## OPPORTUNISTIC MINDSET

*Houze  
opportunity*



- Installed separate meters in 22 Terminal 5 tenant spaces to incentivize energy efficiency

*Westfield*

33



# SAVE THE DATE



## Airports Going Green

CONFERENCE



CHICAGO  
**CDA**  
DEPARTMENT OF AVIATION



OCTOBER 26-28 HOLIDAY INN CHICAGO MART PLAZA

> 400  
ATTENDEES

20 INTERNATIONAL  
ATTENDEES

> 30  
AIRPORTS

11 COUNTRIES  
REPRESENTED







VISIT [airportsgoinggreen.org](http://airportsgoinggreen.org)  
[www.flychicago.com](http://www.flychicago.com)



@fly2ohare  
 @fly2midway



#flyohare  
 #flymidway



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