



THE NE CHAPTER OF THE CHP ALLIANCE

TWA HOTEL, JFK AIRPORT – CASE STUDY REVIEW

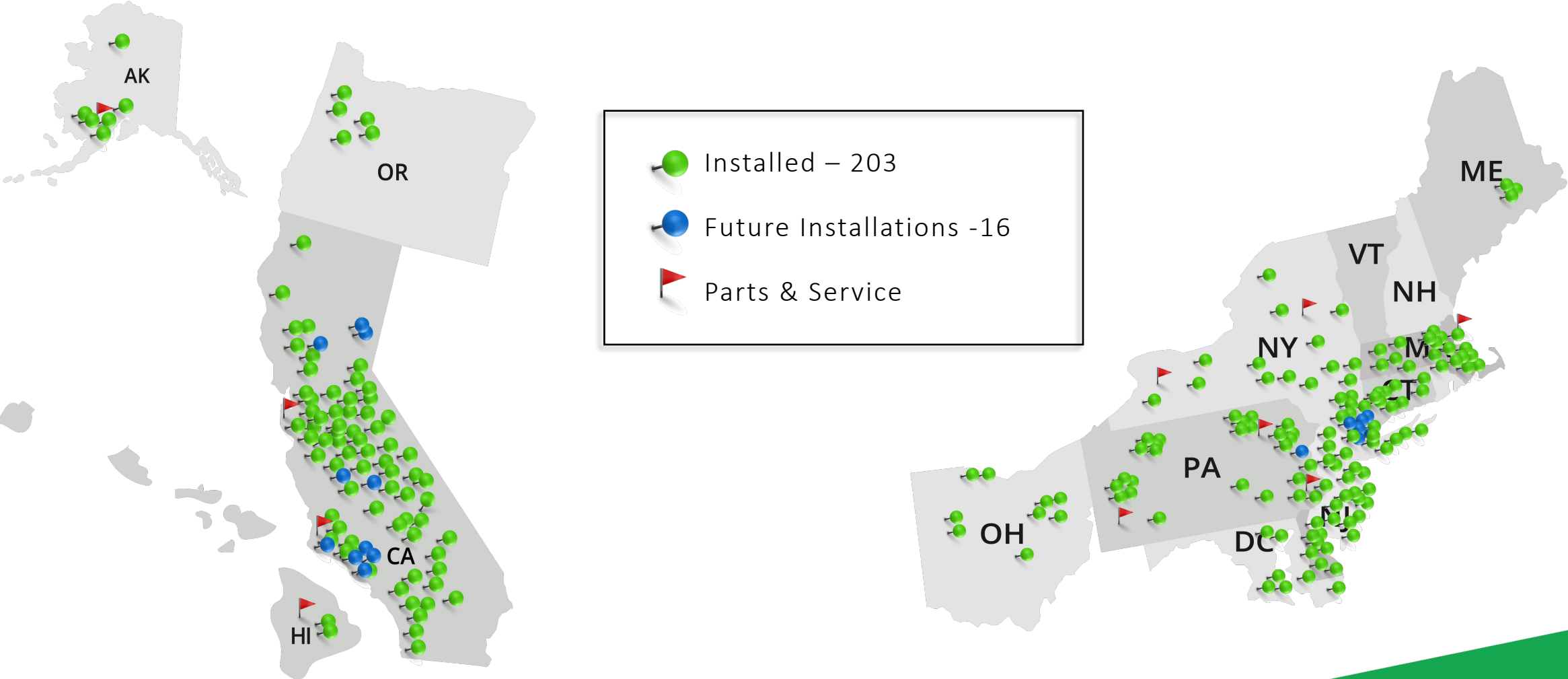
SEPTEMBER 13, 2023

Today's discussion

- Northeast-Western Energy Systems
- TWA Hotel - Introduction
 - Design Challenges
 - The Hybrid CHP Solution
 - Design and Execution
- TWA Hotel – Performance Review
 - Key Performance Indicators
 - Project SWAT Analysis
- Q & A



NES-WES installed base of Jenbacher gas engines



TWA HOTEL AT JFK AIRPORT

Then ...



1956 Lockheed Constellation
as restaurant and bar

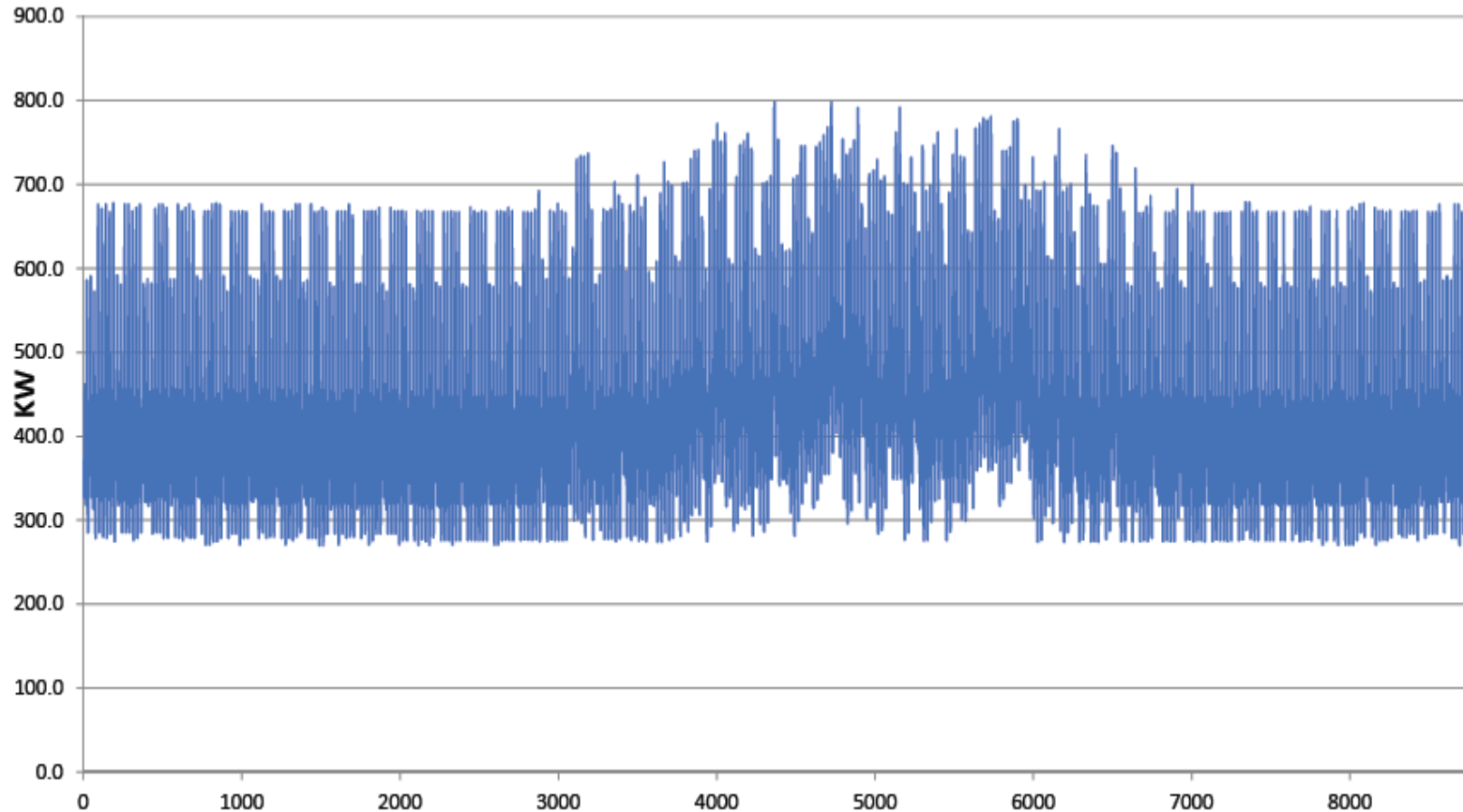


Now ...



THE DESIGN CHALLENGE

Electric Load Requirements



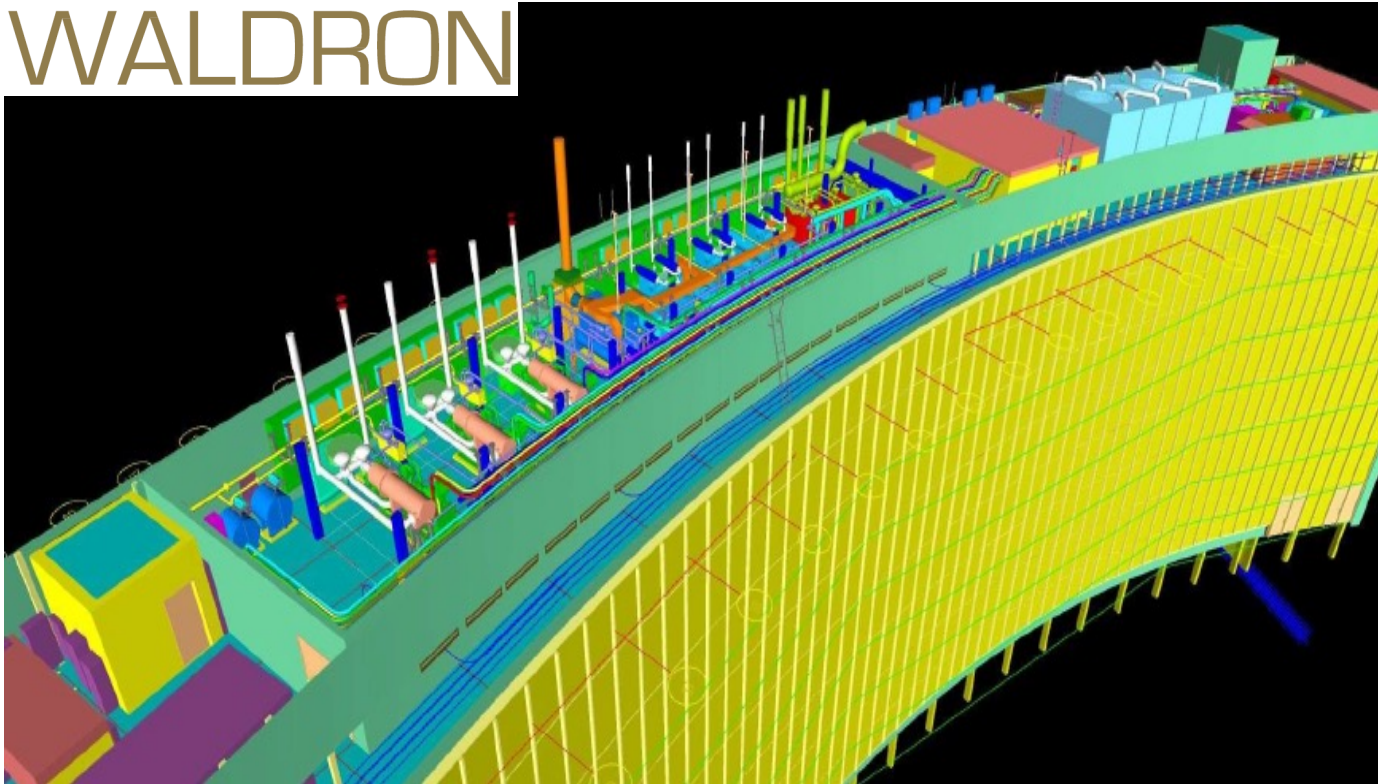
Customer requirements

- Central utility plant
- No connection to the electric utility
- High reliability & resiliency
- Fit on the roof of North Tower
- Strick vibration requirement
- Reduce their energy costs!

THE SOLUTION

The Plant Design

WALDRON



Solution

- Hybrid CHP plant
- 3 x JMS 208 Gas Engines
 - 1005 kW Electrical Output
 - 1923 Mbtu/hr Thermal Output
- 560 kW / 1.0 MWh energy storage
- 750 kW diesel emergency generator
- Completely islanded
- Entire Central Utility Plant (CUP) on North Tower
- CUP = 9,000 SF footprint
- Natural gas only input

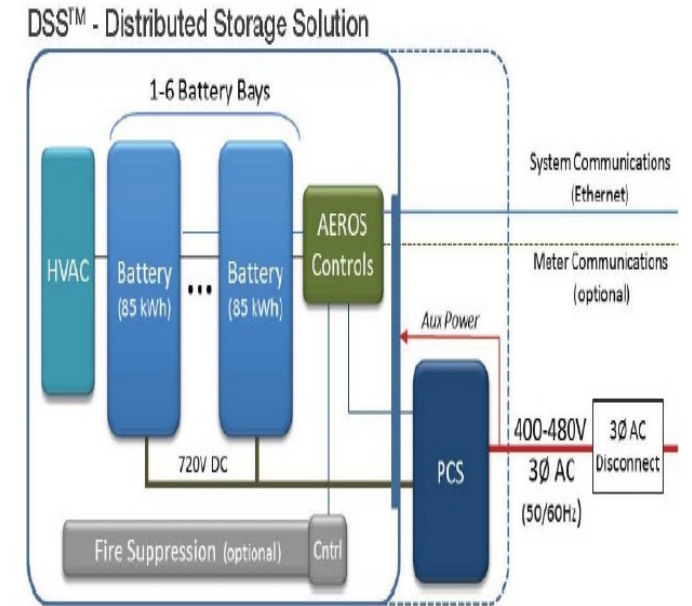
HYBRID CHP SOLUTION – LEVERAGING THE BEST OF BOTH TECHNOLOGIES

Jenbacher Gas Engines



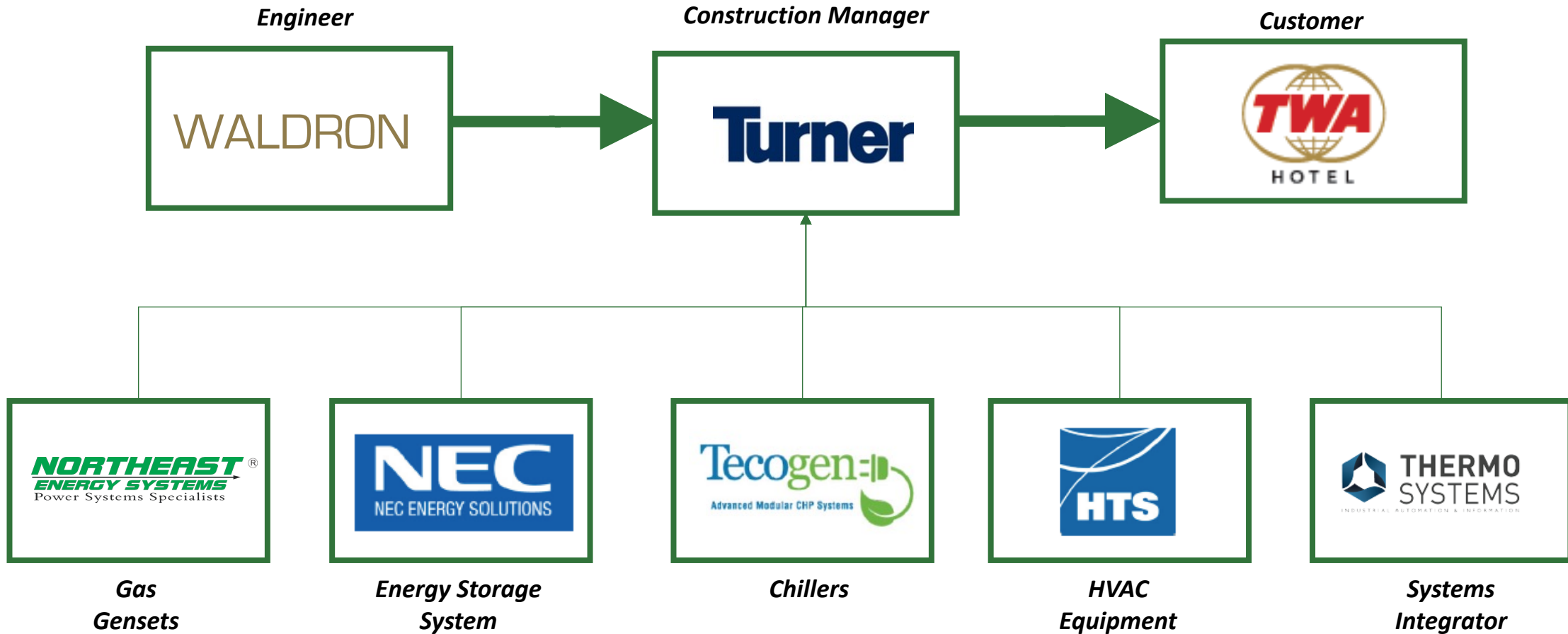
- ✓ Three (3) Jenbacher J208 gas engines
- ✓ 1.0 MW CHP installation

NEC Energy Storage System



- ✓ 560 kW / 1,000 kWh Energy Storage System
- ✓ Lithium ion based system

DESIGN AND EXECUTION - THE SOLUTION TEAM



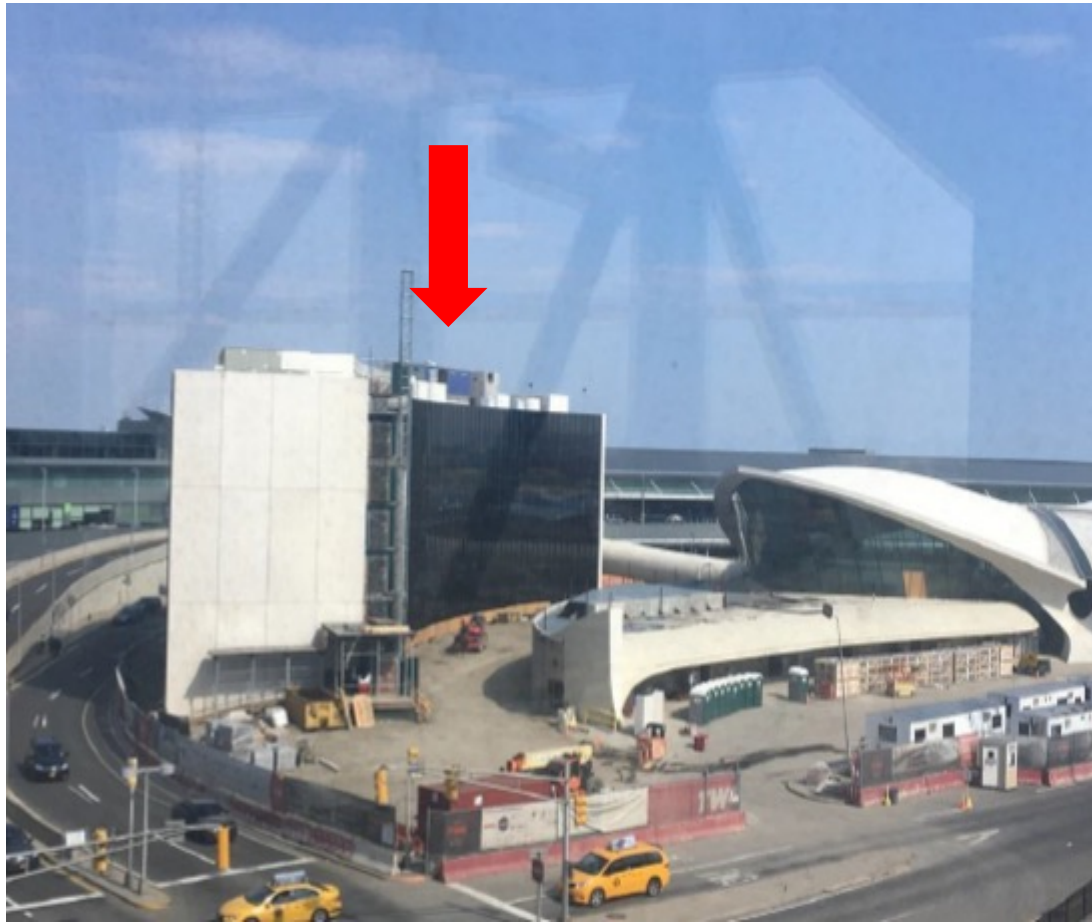
DESIGN AND EXECUTION - INSTALLATION



- ✓ *All systems fabricated & installed offsite in module enclosures*
- ✓ *Delivered in 11 shipping containers*



DESIGN AND EXECUTION – START UP JANUARY 2019



PERFORMANCE REVIEW – KEY INDICATOR

- INNIO myPlant – Average Data per engine over 4 years and 8 months of operation:
 - OPH: 29,100 OPH
 - Utilization: 69 %
 - Electrical Energy: 4,500 MWh
 - Engine starts: 850

Dashboard for TWA Hotel JFK showing 3 engines. Key metrics: 467 kW, 87,353 h, Asset. Location: New York, US. End Customer: TWA HOTEL.

STATUS	SERIAL NUMBER	DESIGN NUMBER	ENGINE ID	TYPE	LOAD RATE	OPH	STARTS	COMPONENTS	OIL
<i>Filter</i>	<i>Filter</i>	<i>Filter</i>	<i>Filter</i>	<i>Filter</i>					
RUNNING	I332616	V416	TWA 1	208	69 %	29872 h	739	✓	
RUNNING	I332610	V416	TWA 3	208	69 %	28045 h	834	✓	
AVAILABLE	I332614	V416	TWA 2	208	0 %	29434 h	924	✓	

PERFORMANCE REVIEW – SWOT ANALYSIS

Strengths	Weaknesses	Opportunities	Threats
65% or greater overall efficiency.	At peak demand, the system is not an N+1 design	Continue improving operations practices.	Maintenance requirements when all three engines need to be operated during summertime at hotel full occupancy.
Lower emissions vs. grid-powered electricity and boilers for hot water	The Microgrid control system is an early design version.	Control philosophy could be improved.	
The hotel can fully function even if grid power is down for weather events.	Battery integration was not ideal.	Upgrading battery system	Difficulty replacing battery cells from the out of business supplier

Thank You

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*“When you do business with us you get more than just equipment,
you get a partner.” – Al Clark, Founder & CEO*