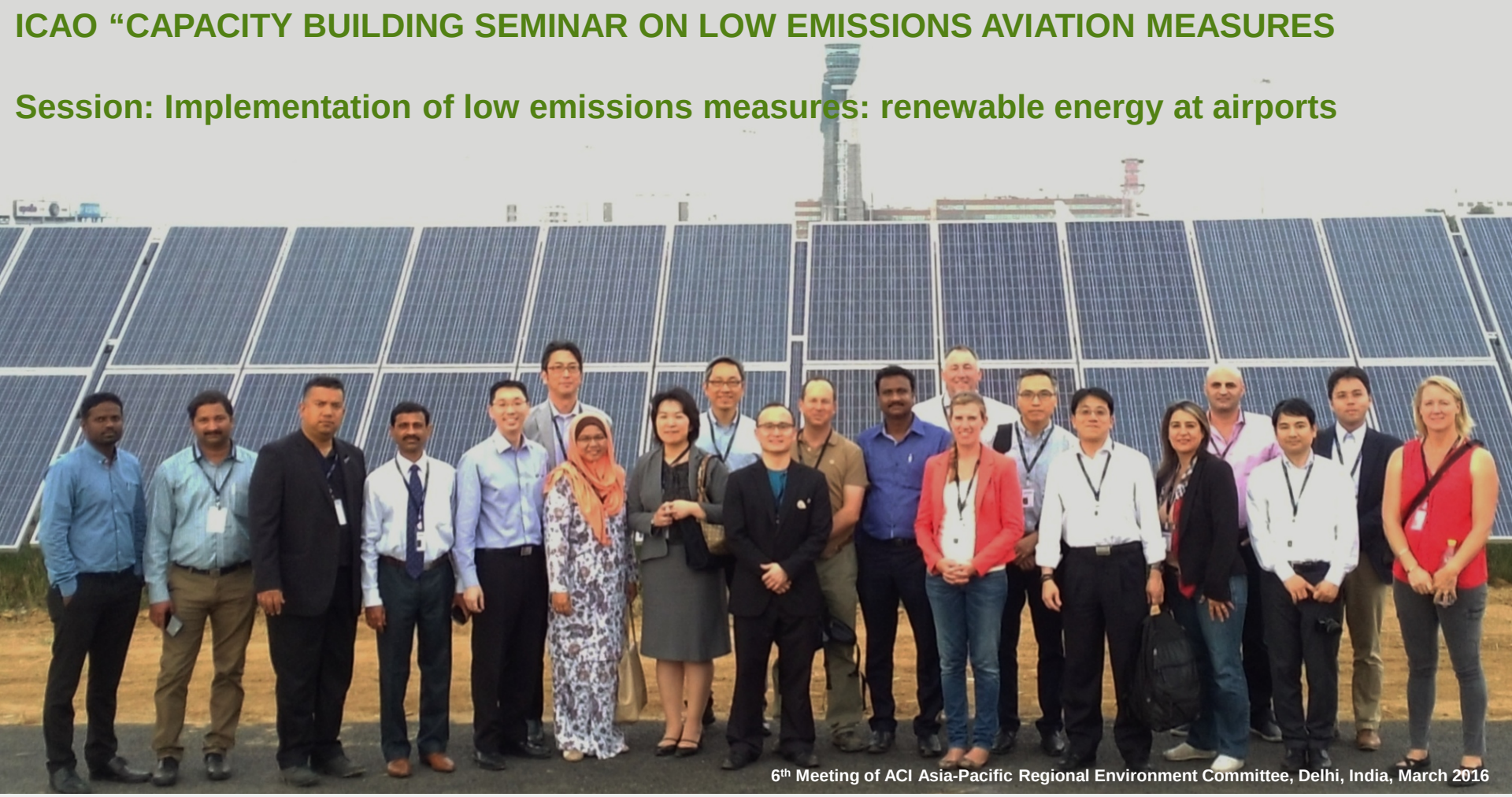
ICAO “CAPACITY BUILDING SEMINAR ON LOW EMISSIONS AVIATION MEASURES

Session: Implementation of low emissions measures: renewable energy at airports



6th Meeting of ACI Asia-Pacific Regional Environment Committee, Delhi, India, March 2016

Mr. Ken Lau, Senior Manager, Technical Affairs, ACI Asia-Pacific

23 May 2018

ACI ASIA-PACIFIC
AIRPORTS COUNCIL INTERNATIONAL

The voice of the world's airports

Leading, representing and serving the global airport community

ACI Membership

- 641 members operating 1,953 airports in 176 countries
- Asia-Pacific: 106 members, 604 airports in 49 countries

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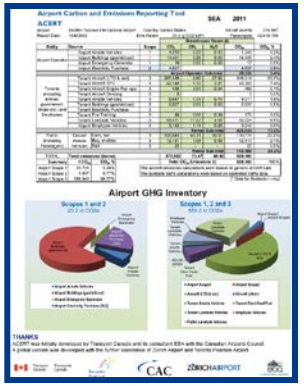
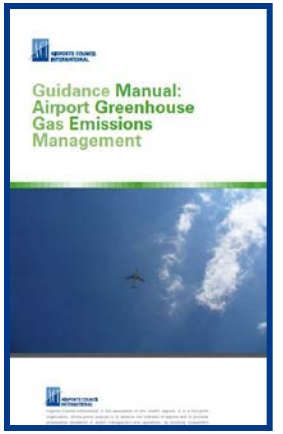
Publications



Publications, complimentary copies for all members

- Regular news (*World Report*, *Airport World*, annual report, Asia-Pacific Airports)
- Special bulletins on important issues
- Handbooks for operational and planning purposes
- Statistics tools (monthly and annual traffic statistics, 20-year forecast, surveys)

airport carbon accreditation



Renewable Energy - Overview

Type	Pros	Cons
Solar	• **Easy to install** • **Minimum maintenance** • **Technology Innovation**	• **Require large space** • **Unstable supply** - Seasonality, Weather
Wind	• **Space saving** • **Technology Innovation**	• **Unstable supply** • **Noise** (wildlife impact) • **Interference with radars**
Geothermal	• **Stable supply of energy**	• **Location specific** • **High Initial Cost**
Marine (Tidal, Wave)	• **Stable supply of energy**	• **Location specific** • **High Initial Cost** • **Early stage**

Cost of Renewable Energy
Is it still expensive?

LCOE (Levelized Cost of Energy)

$$\text{LCOE} = \frac{\text{Lifetime costs}}{\text{Lifetime power output}}$$

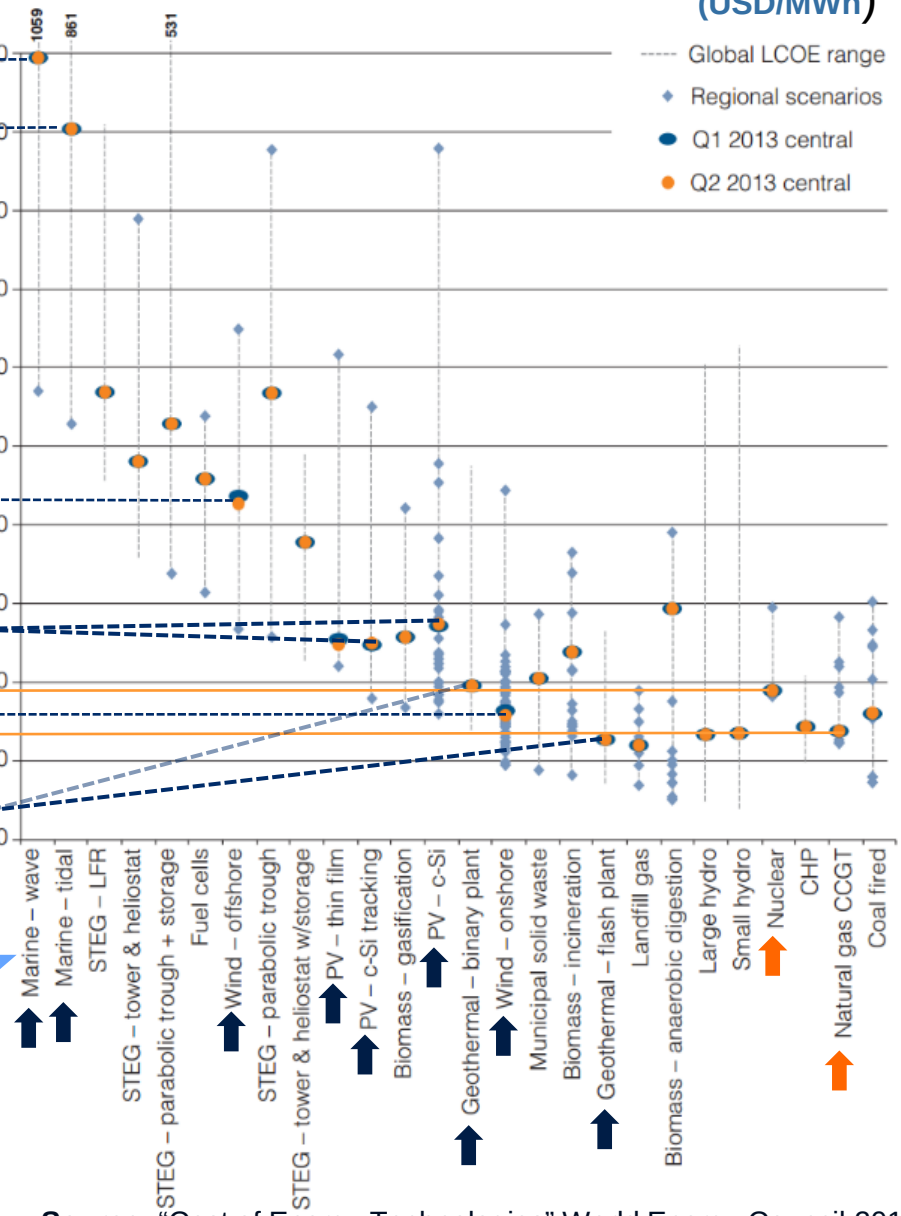
- + Construction
- + Financing
- + Fuel
- + Maintenance
- + Taxes
- + Insurance
- - Incentives (financial support)

etc.

Nuclear
Natural Gas

Wave
Tidal
Wind (Offshore)
Solar PVs
Wind (Onshore)
Geothermals

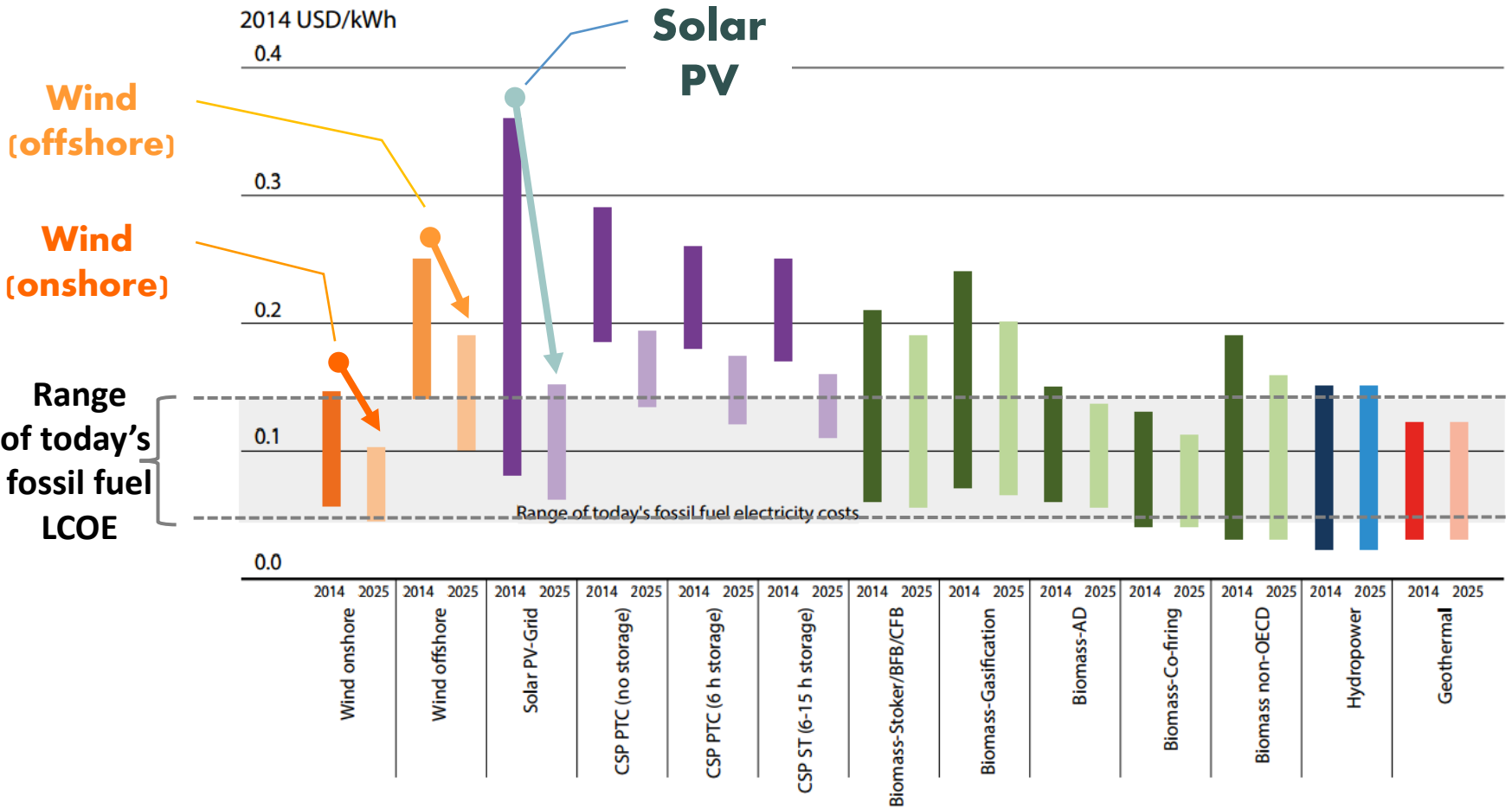
Lower LCOE



Source: "Cost of Energy Technologies" World Energy Council 2013

Renewable Energy costs are expected to go down dramatically

FIGURE 10.1: LCOE RANGES BY RENEWABLE POWER GENERATION TECHNOLOGY, 2014 AND 2025



Source: "RENEWABLE POWER GENERATION COSTS IN 2014" International Renewable Energy Agency

Solar PV
Compatible with Airports

Source: Solar Frontier

- Easy to design into an existing space,
- Make use of underutilized land
- Design to minimize reflection of glare

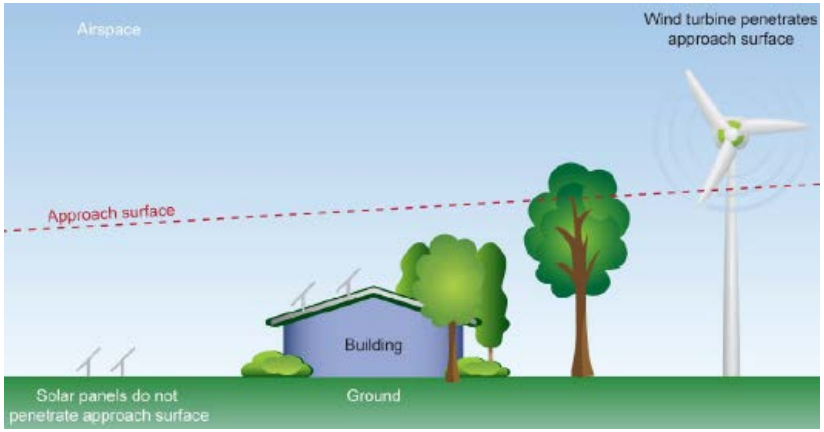
Case Study: Kansai International Airport (KIX)

- PV array size: 120,000 m2
- Thin-film modules with anti-glare property
- Capacity: 11.6MW
- Accommodate approx. 2,100 households

Source: New Kansai International Airport Corporation (NKIAC)

Wind Turbines
Not compatible with airports?

- **Physical obstacle to flight operations**



Source: FAA Solar Guide" 2013, Federal Aviation Administration

- **Interference with air traffic radars**

Smaller-scale wind project

New Technology

Case Study : Boston Logan International Airport

- Project size: $140,000
- 20 x 10 ft tall wind turbines
- Generated electricity: approx. 100,000 kWh/year
  - 3% of total consumption of the building
- **SAVE $13,000/year** - 12-13 yrs for cost recovery
- LEED Gold Certificate

Photo: AeroVironment, Inc.

Geothermal energy at airports

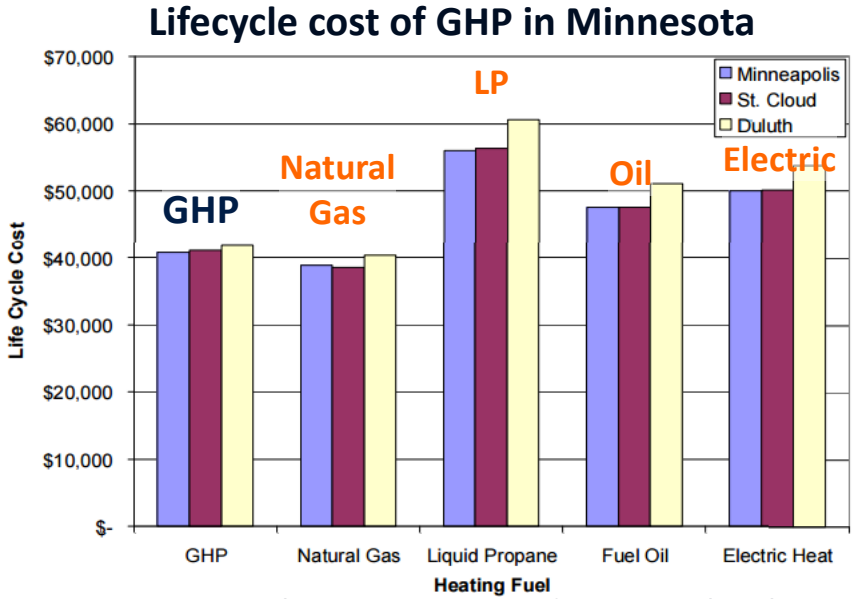
Direct use of geothermal energy for heating

Multi Purposes

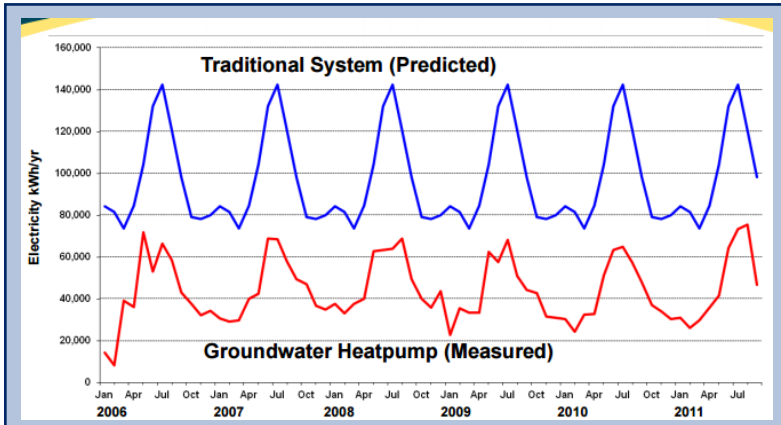
- Ground heating system
- Terminal & Building heating system

Competitive Costs

- High initial cost, Low operating cost
- Economically competitive in the long run e.g. GHP (Geothermal Heating Pump)



Source: Minnesota Department of Commerce (2008)



Source: MWH NZ Ltd

Case Study : Dunedin Airport, New Zealand

- Geothermal Heat Pump to heat and cool the terminal (10,100m2), utilizing the ground water
- **70% less electrical energy** than an equivalent air source chiller/heat pump system

Activities in Renewable Energy

- *Airport Carbon Accreditation*
  - 273 Accredited airports worldwide
  - 44 Accredited airports, 6 Neutrality airports in Asia Pacific

- Biennial ACI Asia-Pacific Environmental Survey 2017
  - Registered 42% of responded airports adopted Renewable energy

Activities in Renewable Energy

- Annual Green Airports Recognition
  - Green Airports Recognition 2017-Energy Management
  - 16 submissions
  - 6 trophies in 2 size categories
  - 6 in ICAO Eco-airport toolkit

(Renewable Energy at Airports)

ACI ASIA-PACIFIC
GREEN AIRPORTS
RECOGNITION

Activities in Renewable Energy

- ACI Asia-Pacific Resolution

  At 13th ACI Asia Pacific Regional Assembly, recently held in Narita, Japan, adopted a resolution to encourage its members to adopt renewable energy

  For Cost saving!
  For CO_2 reduction!

THANK YOU

Airports Council International Asia-Pacific Region

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