



ICAO

ENVIRONMENT

ICAO CAPACITY BUILDING SEMINAR ON LOW EMISSIONS AVIATION MEASURES Supporting the implementation of Renewable Energy

ICAO – European Union Assistance Project



Eduardo Caldera-Petit

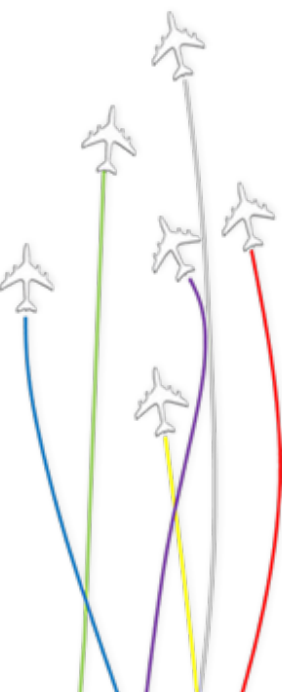
Programme Coordinator

PROJECT FUNDED BY



European Union

- ICAO-European Union Assistance Project
- Airports and Solar
- Piarco Airport Solar Study
 - Electricity use and cost trends
 - Airport existing and future activities
 - Sensitive environmental resources at airport
 - Recommended sites and project characteristics
- Results and Outcomes



Capacity Building for CO₂ Mitigation from International Aviation

6.5 Million Euros

1^{st.} Agreement for assistance

In the area of ENV at ICAO



ICAO - European Union Joint Assistance Project



36+ focal points and
130+ stakeholders involved
in Africa and the Caribbean

OBJECTIVE 1

ACTION PLANS DEVELOPMENT:

Improved capacity of the National Civil Aviation authorities to develop an Action Plan on CO₂ emissions reduction from international aviation in accordance with ICAO recommendations

OBJECTIVE 2

AVIATION ENVIRONMENTAL SYSTEMS (AES):

Efficient CO₂ emissions monitoring system for international aviation developed in each selected Member State

OBJECTIVE 3

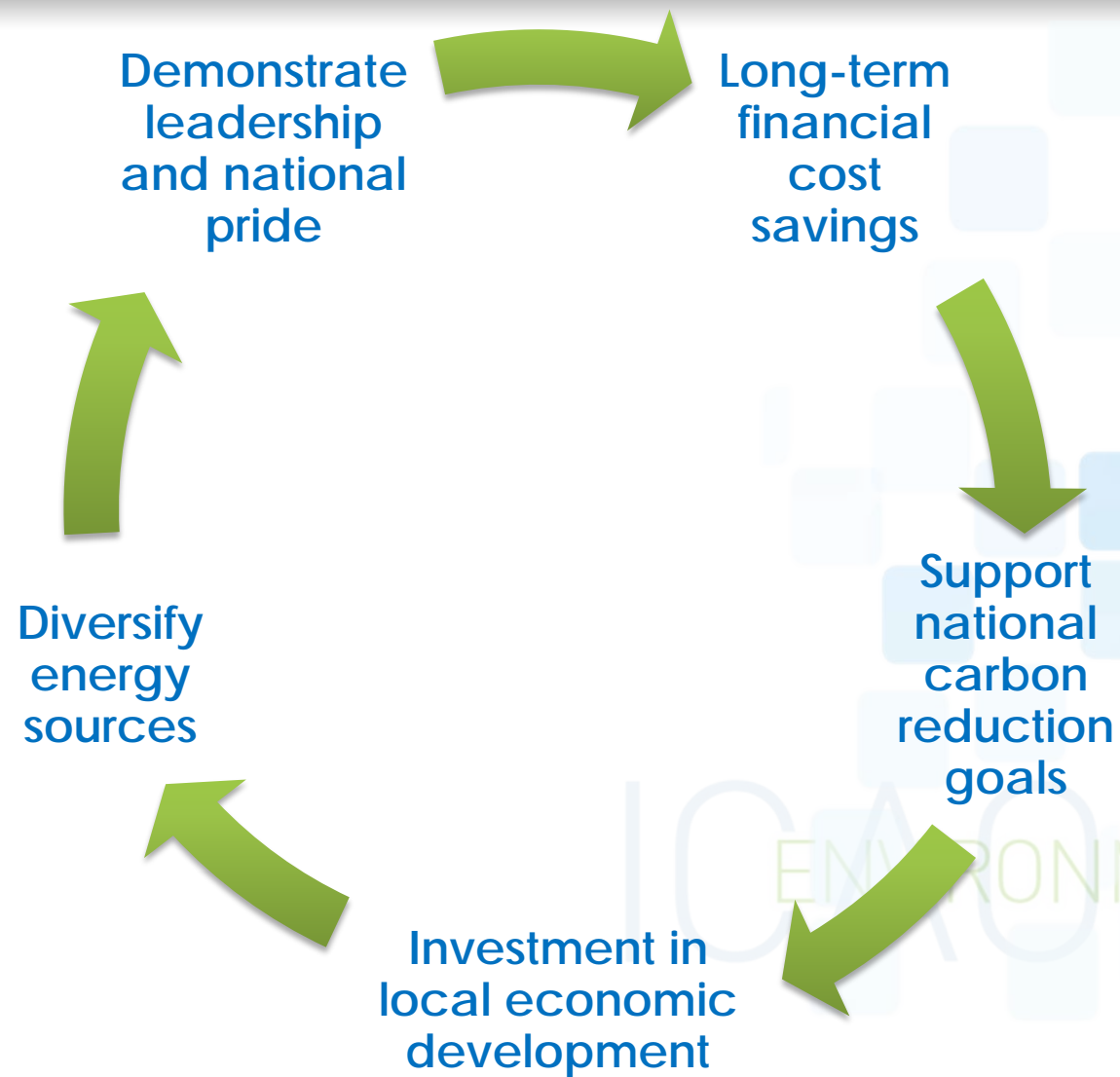
IMPLEMENTATION OF MITIGATION MEASURES:

Priority mitigation measures identified, evaluated and partly implemented

- States have climate mandates, lack national policies
 - International Agreements with climate change goals
 - Many states do not have renewable energy policies
- Feasibility study as roadmap for the project and policy
 - Specific site options compatible with airport identified
 - Cost estimates generated to be used for funding requests
 - Steps for project planning/execution are specified
- Solar Project at airport acts as a catalyst
 - Solar at airport is a showcase project for the State
 - Highly visible, demonstrates national commitments

Example: Piarco International Airport, Trinidad and Tobago

Why Airport Solar?

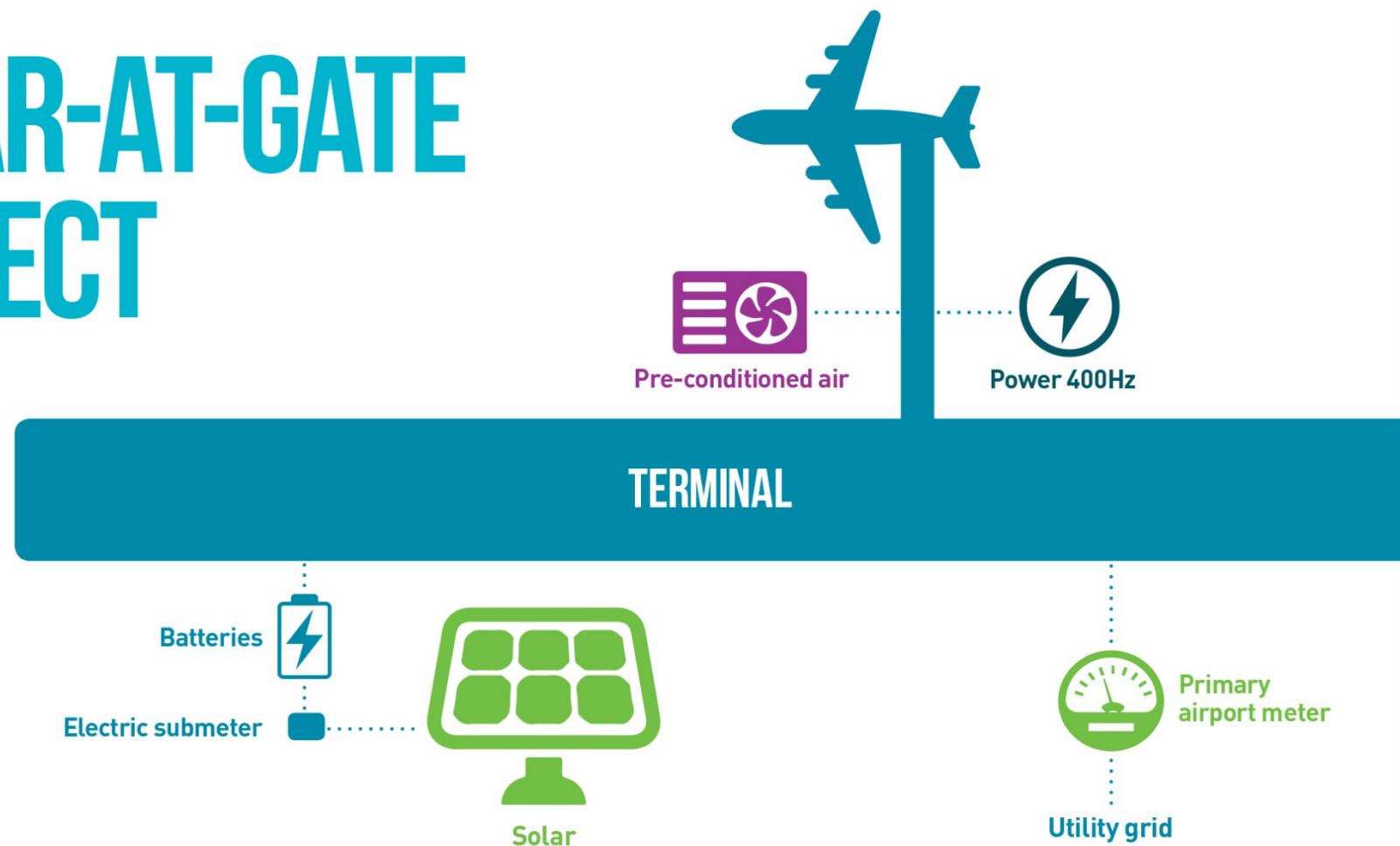


Airport Solar Around the World

AT LEAST 100 AIRPORTS WORLDWIDE HAVE SOLAR POWER PLANTS:



SOLAR-AT-GATE PROJECT





Piarco International Airport Feasibility Study on the installation of a Solar PV facility



Airport Electricity Usage

2006-2016

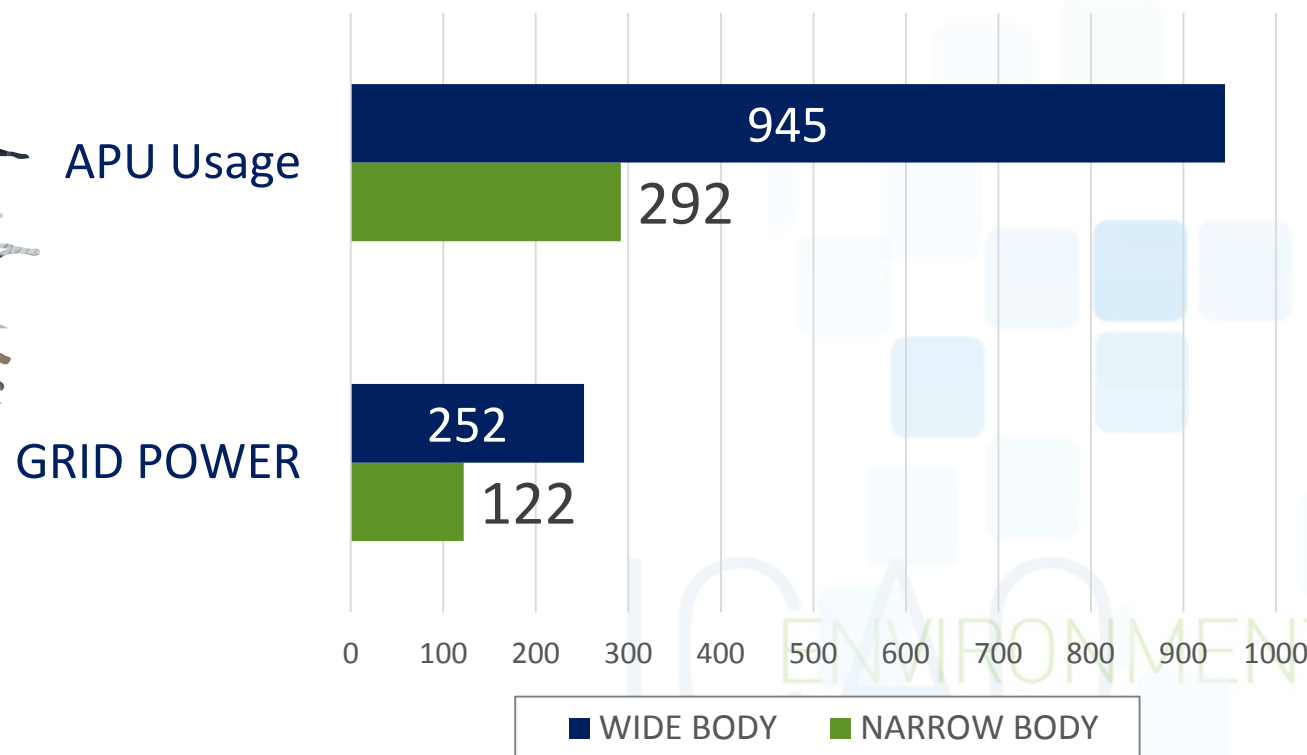


*6% increase in electricity demand annually

**2013 is likely incorrect data

CO₂ emissions reduction by switching to solar power

Emission / Turn (kg CO₂)



* Turn refers to the occurrence of an aircraft at the gate between arrival and departure / an average turn of 1 hour was assumed)

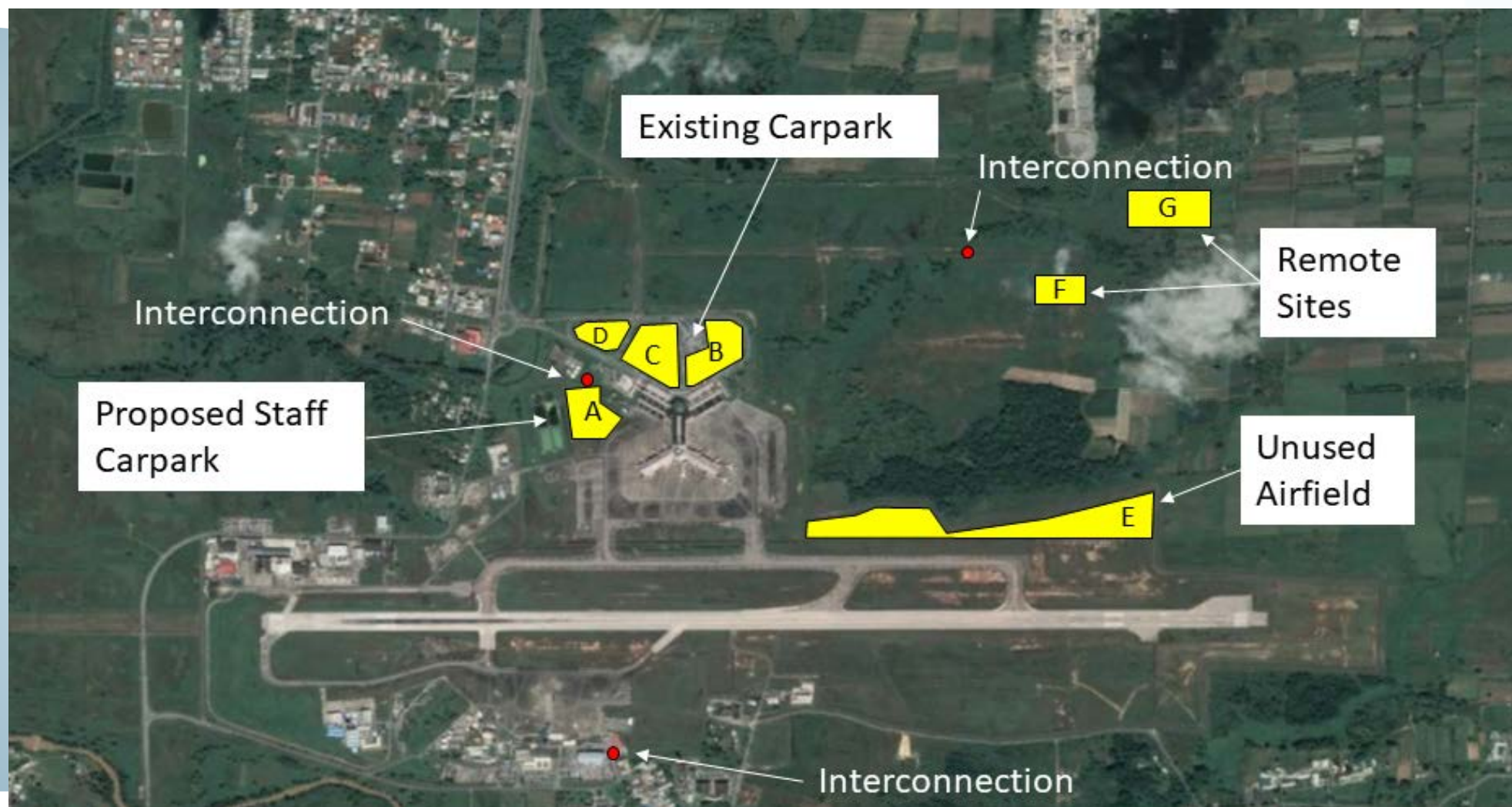




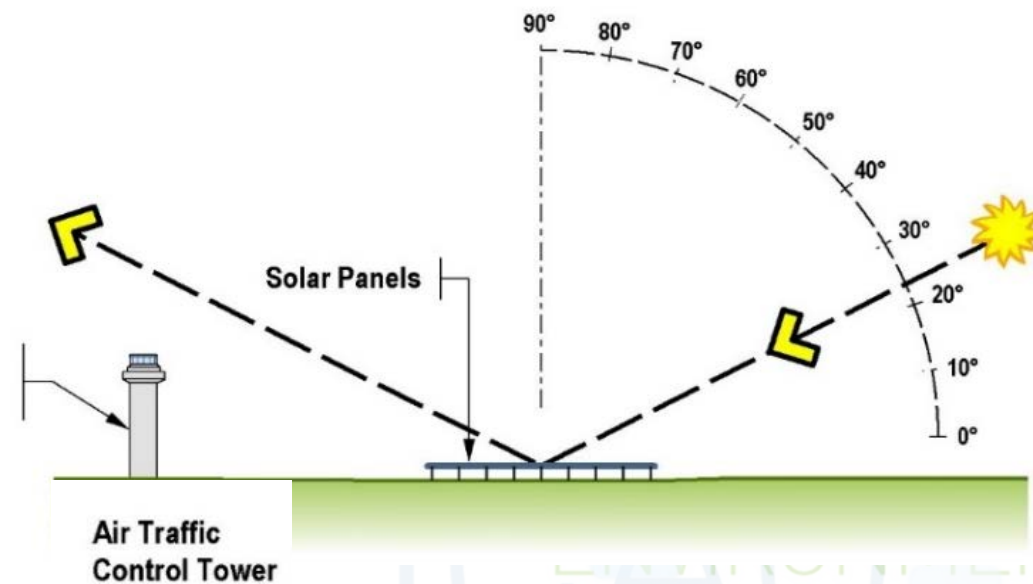
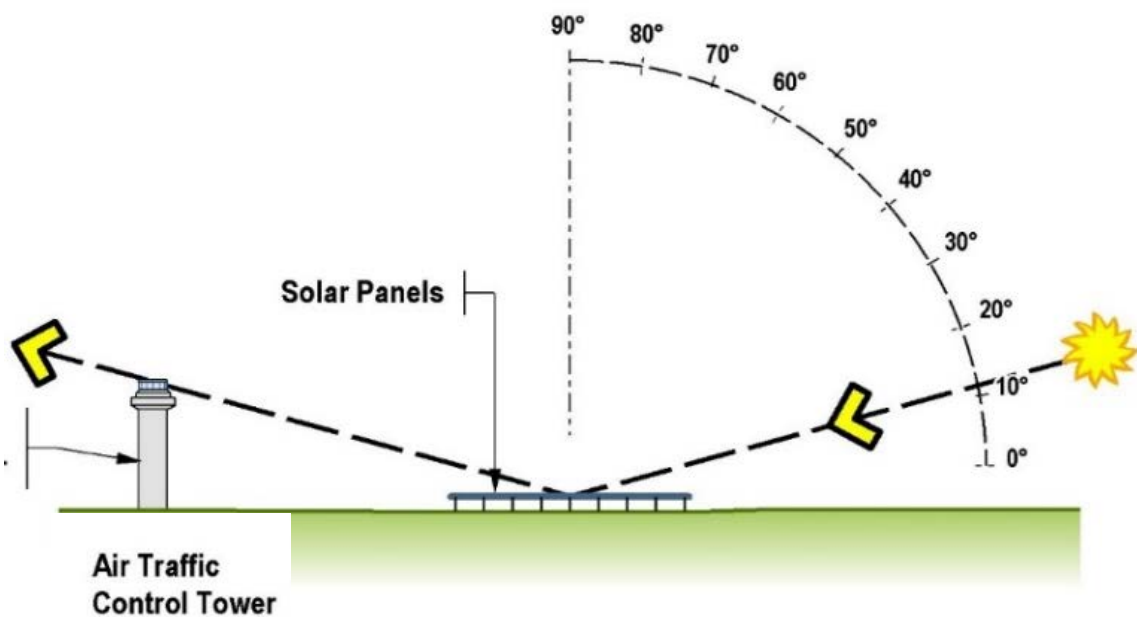


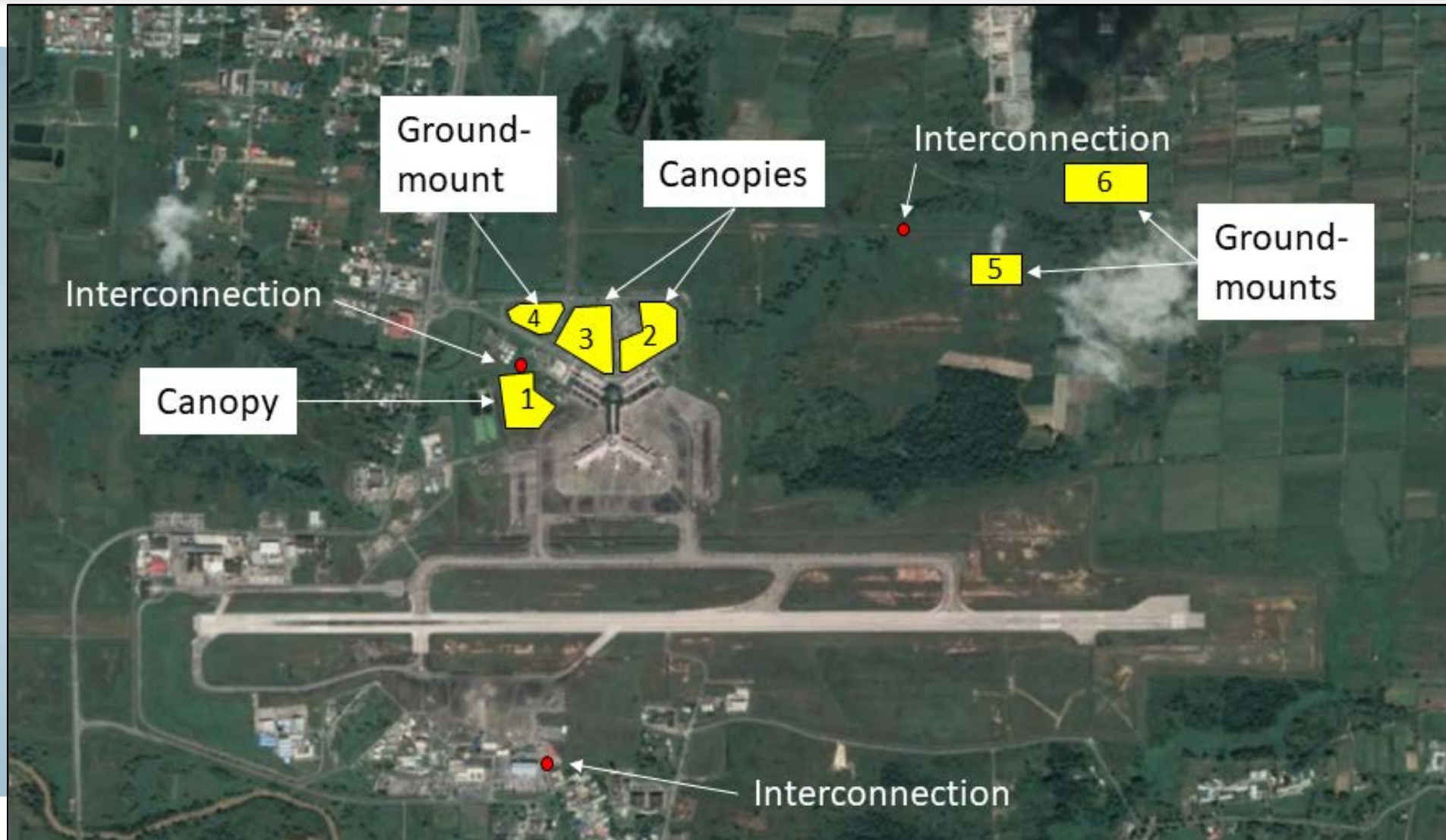






Glare Evaluation





| # | Site Name | Project Design | Size (hectares) | Nameplate Capacity (kW) | Annual Generation (kWh) | % of Airport Total |
|---|----------------------------|----------------|-----------------|-------------------------|-------------------------|--------------------|
| 1 | Proposed Employee Car Park | Canopy | 1.88 | 1,719 | 2,545,950 | 12.6 |
| 2 | Existing Car Park – East | Canopy | 2.70 | 2,469 | 3,649,927 | 18.1 |
| 3 | Existing Car Park – West | Canopy | 3.11 | 2,844 | 4,208,904 | 20.9 |
| 4 | Existing Car Park – Open | Ground-mount | 1.54 | 972 | 1,443,830 | 7.2 |
| 5 | Remote Site – South | Ground-mount | 3.37 | 2,127 | 3,159,491 | 15.7 |
| 6 | Remote Site – North | Ground-mount | 9.57 | 6,041 | 8,973,430 | 44.5 |

| # | Site Name | Annual Generation (kWh) | CO ₂ Avoided (kg) |
|---|----------------------------|-------------------------|------------------------------|
| 1 | Proposed Employee Car Park | 2,545,950 | 1,781,401 |
| 2 | Existing Car Park – East | 3,649,927 | 2,553,854 |
| 3 | Existing Car Park – West | 4,208,904 | 2,944,970 |
| 4 | Existing Car Park – Open | 1,443,830 | 1,010,248 |
| 5 | Remote Site – South | 3,159,491 | 2,210,696 |
| 6 | Remote Site – North | 8,973,430 | 6,278,709 |

| # | Site Name | Nameplate (kW) | Cost Factor (USD/W) | Installed Cost (USD) | Annual Generation (kWh) | Electricity Cost (USD/kWh) | Simple Payback (Years) |
|---|----------------------------|----------------|-----------------------------|----------------------|-------------------------|----------------------------|------------------------|
| 1 | Proposed Employee Car Park | 1,719 | \$2.17 (\$1.75 + \$0.42) | \$3,730,230 | 2,545,950 | \$0.05 | 29 |
| 2 | Existing Car Park – East | 2,469 | \$2.17 (\$1.75 + \$0.42) | \$5,355,560 | 3,649,927 | \$0.05 | 29 |
| 3 | Existing Car Park – West | 2,844 | \$1.92 (\$1.50 + \$0.42) | \$5,458,560 | 4,208,904 | \$0.05 | 26 |
| 4 | Existing Car Park – Open | 972 | \$1.75 | \$1,701,000 | 1,443,830 | \$0.05 | 24 |
| 5 | Remote Site – South | 2,127 | \$1.75 | \$3,722,250 | 3,159,491 | \$0.05 | 24 |
| 6 | Remote Site – North | 6,041 | \$1.50 | \$9,060,000 | 8,973,430 | \$0.05 | 20 |

Power of the Feasibility Study



Workshop conducted with stakeholders to present results of the study



Side meetings conducted with airport decision makers and cooperating agencies



Consensus on using the feasibility study to pursue project funding



Project presented to European Union representative for funding



Project presented for Funding

- ➡ Site 4 -1MW
- ➡ Ground-mount
- ➡ Airport entrance



George Airport, South Africa



- ➔ ICAO is assisting States to reduce emissions from international aviation, including the use of renewable energy
- ➔ Solar-at-Gate projects could achieve environmental benefits and also economic sustainability of airports
- ➔ Feasibility Study could be used to engage interest of funding partners
- ➔ ICAO looks at the replication of these projects



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A WINDOW FOR A **GREENER FUTURE**



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European Union