

South China Renewable Energy Project

CCS GIEC GEI 2018/05/28

Summary

 Presentation of GIEC
 Pilot Project - Huangpu Economic Development Zone

Next Steps

About GIEC

- Key Laboratory of Renewable Energy, CAS
- Key Laboratory Conversion
- Guangzhpuesenzer foregas Hydrate Research, CAS
- International R& D Center of Renewable Energy, Most
 International R& D Center of Renewable Energy, Most
- National Energy Research Crenter Geo Bipefuelan ENEA
- Suangdong Kas Laboratory of New and Renewable Energy
- Sustander Engio (Pha Dist Telenica 58) nter of Biomass Energy
- Guangdong CDM Research and Service Center





Energy Strategy Research Center

Energy development strategy and policy

Energy management, environmental impact assessment

Assessment and optimization in the process of energy use

- Energy model, the life-cycle assessment
- Renewable energy development strategy
- Energy development strategy
- Low carbon economy







Pilot Project - Huangpu Economic Development Zone

Project Overview

Local Resource Assessment

Selection of RE technology application and sector

Selection of Target Area

Implementation and Business Model For Industrial Rooftop

Pilot Results

Next Steps

Pilot Guangzhou Case Overview



Pilot Project on RE Implementation

Industrial Rooftop PV

Guangzhou Technological and Economic Zone in Huangpu District (Huangpu EDZ)

6

6/12/18

Guangdong Province Solar Resource Assessment



Guangdong Province Solar Resource Assessment

| Data Layer | Description/Notes | Source | URL |
|-------------------------------------|--|--|---|
| Administrativ e Boundaries | Guangdong Province Level 3 | GADM database of Global Administrative Areas | http://www.gadm.org/ |
| Land Cover | 300-meter, 2015 | European Space Agency Climate Change Initiative | https://www.esa- landcover-cci.org/ |
| Land Slope | 30-meter digital elevation model, 2000, Space Shuttle Radar Topography Mission | USGS Earth Explorer | https://earthexplorer.usg s.gov/ |
| Protected and Sensitive Areas | Protected Area Profile for China from the World Database of Protected Areas, 2017 | Protected Planet, UNEP- WCMC | https://protectedplanet.n et/country/CHN |
| Solar Insolation | Global Tilted Irradiation (GTI): irradiation for optimally tilted surface (kWh/m ²) | Global Solar Atlas, The World Bank Group | http://globalsolaratlas.inf o/ |
| Photovoltaic Power Potential | Amount of energy, converted by a PV system into electricity (kWh/kWp), based on local conditions | Global Solar Atlas, The World Bank Group | <u>http://globalsolaratlas.inf</u> <u>o/</u> |

Selection of Target Area



Selection of Target Area

Guangzhou Technological and Economic Development Zone in Huangpu District

Considerations from GIEC:

- Less obstructions during the technology implementation
- 302MW Solar Energy target by 2020 in Huangpu District
- Long-term relationship with local administration and power supply agencies

Selection of RE technology application and sector

Using GIS tool to support RE technology applications analysis in the RE Technology MCA Tool

In Huangpu pilot project, use QGIS to analyze the technical potential of solar resource

11

Urban Land Analysis and Sector Zones Disaggregation



Panel 1: Land cover data, urban land shown in red.

Panel 2: Urban land cover manually corrected based on satellite image.

Panel 3: Grid squares created in urban area, yellow squares show random selection of grid squares.



Digitizing Rooftops to Estimate Potential Installation Areas by Sectors



For other REs:

- Biomass: Areas of agricultural land by crop type or production of specific agricultural product, or livestock population, within a specified radius around a proposed location of a biomass generation unit;
- Micro-hydro: Potential generation based on elevation change and streamflow characteristics along streams and rivers in a specific location;
- Wind: Amount of area of suitable land cover, elevation, and wind speed within a specified distance of transmission infrastructure.

Selection of RE Technology Applications

RE Technology Application MCA Tool provides quantitative analysis for each technology applications for reference



Selection of RE Technology Applications

Industrial Solar rooftop PV is selected



Baseline Conditions



Sino-Singapore Knowledge City

 Total planning installed capacity in Huangpu:302MW by 2020

- Newly built Solar PV stations in 2016:34(28,3MW)
- Total installed Capacity:43.7MW(2015)
- Biggest planning area:
 - 155MW in Sino-Singapore Knowledge City
 - 70MW in Yunpu Industrial Park

Yunpu Industrial Park

Project Goal

- Help Huangpu district achieve its RE target by 2020
 - BAU condition:185MW
 - 120 MW installed by our program

2. Install 320 MW by 2025

- Based on the technical potential for industrial rooftop solar PV in the Huangpu EDZ: 505 MW
- Scale of the project : 130 solar PV systems

Implementation Model for Industrial Rooftop PV

7 Phases

Parties include GIEC, Guangzhou Municipal Development and Reform Commission, Power supply bureau of the Huangpu district(China South Power Grid), industrial facility owners, Solar PV companies as project developers and Banks as lending institutes

Implementation Model for Industrial Rooftop PV

| Phase | 1 | 2 | 3 | 4 |
|--|---|--|---|---|
| Phase Name | Complete Program Feasibility Assessment | Partner Assembly | Program Marketing | Define Projects |
| Parties Involved | GIEC Power Utility Power supply bureau of the Huangpu district | GIEC Industrial Facility Owners Solar PV Company, Bank Guangzhou DRC Power supply bureau of the Huangpu district | GIEC Solar PV Company Industrial Facility Owners | Solar PV Company Industrial Facility Owners GIEC |
| Steps: Legal, Policy, Administrative, and Financial Mechanisms | GIEC works with the Power supply bureau of the Huangpu district to assess technical feasibility of integrating the new distributed generation achieved by the program. GIEC and Power supply bureau of the Huangpu district address any identified feasibility issues. | GIEC presents the Program and its expected impacts to each partner and gains their support for the program and agreement on their role, timing, etc. Solar PV Company prepare a standard financing package(s) to facility owners. | Solar PV company conducts the marketing program to facility owners. GIEC and Solar PV company provide support to interested facility owners to understand the benefits of the program. | Solar PV Company provide proposals to Facility Owners. GIEC provides technical support to Facility Owners to evaluate proposals. Facility Owners select a winning bidder among the proposals submitted (contingent on receipt of funding) |
| Analytical Requirements | GIEC: Detailed local industrial electricity demand and solar PV supply assessment Power supply bureau of the Huangpu district: Integration assessment of new solar power with the local grid | GIEC and Solar PV Company: Additional financial and other risk analyses for projects of different types of Industrial Owners (state-owned enterprise, listed companies or privates enterprises)and product(explosive or corruptive materials). | GIEC and Solar PV company develops a listing of industrial facility contacts for marketing the program | Solar PV Company develop preliminary design and cost estimates for use in their proposals to Facility Owners. |

Implementation Model for Industrial Rooftop PV

| Phase | 5 | 6 | 7 |
|--|--|---|---|
| Phase Name | Program Funding | Program Implementation | Program Scale-Up |
| Parties Involved | Bank Industrial Facility Owners Guangzhou DRC Solar PV Company | Industrial Facility Owners Solar PV Company Guangzhou DRC Power supply bureau of the Huangpu district | GIEC Guangdong DRC South China Power Grid Industrial Facility Owners Solar PV companies |
| Steps: Legal, Policy, Administrative, and Financial Mechanisms | Solar PV Company completes the financing package and sends it to Facility Owner. Solar PV Company provides support to Facility Owners to understand the package. Facility Owner reviews and conducts any follow-up with Solar PV Company . Facility Owner signs designing and business contract(s). Lending Institution provides funds to Solar PV Company consistent with contract requirements. Guangzhou DRC can apply the distributed PV power generation subsidy for the project. | Industrial Owners get approval of the China South Power Grid to build their solar PV installation Solar PV Company install PV systems for Facility Owner. 3. Connect the solar system on the grid. | 1.Contact and assemble the factory owner that listed in the Guangzhou Distributed Solar PV Generation Planning 2. Contact the power supply bureau of other districts. 3. Solar PV company and GIEC do the Phase 1- 6 in a city scale and even provincial scale in the future. |
| Analytical Requirements | Facility Owner reviews design and cost proposals from Facility Owner or GIEC complete standard financial analysis (e.g. using the Financing Tool) for inclusion in the financing package. | Guangzhou DRC do the project recording and information gathering of the project. | |

Business Models for Industrial Rooftop PV

Fund Flow and Role of Partners



Subsidies Policy and Economic Benefit

| National Subsidy | | | |
|--------------------|--|--|--|
| Distributed | 0,42RMB/kwh(20 years) | | |
| City level subsidy | | | |
| Investment subsidy | 0,2RMB/W, maximum 2 million RMB for a single project | | |
| Generation subsidy | 0,1RMB/kwh(10 years) | | |

| Power connection type | Measured Power Generation Price(RMB/kwh) | Payback Period(years) |
|---|--|--------------------------|
| All on-grid | 1 | 10.05 |
| For own use, sell the remaining power to the grid | 1.2 | 8.38 |

Pilot Results

Show list of analysis results for all key variables

- Energy and Emissions Results
- RE Technology Market Assessment
- Program Financial Assessment

Guangdong Solar Resource Assessment Whitepaper

Technology Implementation Document

Partners' Role

CCS

- Provide RE planning methodology and toolkit to GIEC
- Guangdong Solar Resource Assessment
- Technology Implementation Document

🛠 GEI

- Marketing the methodology and toolkit to other developing countries
- Coordination work in the project
- Technology Implementation Document

Achieve current pilot results thanks to the cohesive cooperation of CCS, GEI and GIEC

Next Steps

- Finalizing the Huangpu pilot project TPID
- Develop Solar PV technology implementation approaches for Guangdong Province
- Biomass resource assessment for Guangdong Province
- Develop Biomass technology implementation approaches for Guangdong Province



Thanks!

- Zhang Yueqi, Guangzhou Institute of Energy Conversion, zhangyq1@ms.giec.ac.cn
- Liao Cuiping, Guangzhou Institute of Energy Conversion, liaocp@ms.giec.ac.cn



CHINESE ACADEMY OF SCIENCE GUANGZHOU INSTITUTE OF ENERGY CONVERSION