Promoting Bilateral Mechanisms in Asia and the Pacific
A Workshop on the Joint Crediting Mechanism
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10MW SOLAR PHOTOVOLTAIC PLANT IN DARKHAN CITY
(JOINT CREDIT MECHANISM PROJECT)

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1. About JCM
2. Project Structure and Details
3. Technical Details of the Project
4. Power Generation Estimates
5. Calculation of the Emission Reductions
6. Conclusion
The Joint Credit Mechanism (JCM)

About the JCM – Basic Concept

A governmental supporting scheme aiming to facilitate the diffusion of low carbon technologies and products from Japan to contribute to the sustainable development of developing countries.

The Japanese government will grant financial support up to 50% of total project cost to relevant JCM projects and in turn, gain 50% of the CO\textsubscript{2} credits from the project.

JCM Partner countries: Mongolia, Bangladesh, Ethiopia, Kenya, Maldives, Viet Nam, Laos, Indonesia, Costa Rica, Palau, Cambodia, Mexico, Saudi Arabia, Thailand and Philippines.
The Darkhan PV 10MW PV Project

Technical design and Engineering of the Darkhan 10MW Solar PV Plant

- Darkhan City
- Darkhan 10MW PV Plant site
- N49° 23'52.40" E105° 56'13.52" altitude 715m
- N49° 23'51.46" E105° 56'38.18" altitude 709m
- 110kV Grid connection
- 220/110/35kV Substation of National Transmission Network Company
- Distance: approx. 70m
- N49° 24'07.24" E105° 56'41.78" altitude 737m
- N49° 24'08.46" E105° 56'15.22" altitude 733m
- Khongor Soum
## Project Summary

<table>
<thead>
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<th>Darkhan Project</th>
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<td><strong>Capacity</strong></td>
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| **Site/Access** | 10 min drive from Darkhan City, beside Darkhan 220/110/35kV Substation
260km North of Ulaanbaatar city-Capital of Mongolia
3-4 hours by car from Ulaanbaatar city-Capital of Mongolia |
| **Sharp Scope of Work** | ① Supply of equipments (PV modules, mounting structures, inverters, combiner boxes, etc.)
② System design
③ Technical Advice, Project Supervision (Test running etc.) and Commissioning PV plant |
| **SPI Scope of Work** | ① Obtaining necessary permits, licenses (project development)
② PV plant installation and construction work |
| **Shigemitsu Soji Scope of Work** | • Project Financing
• Expected date of Commissioning is by December 2016 |
| **Timeframe** | • Subsidy application completed on Jul 2016.
• Project completion by Dec 2016 |
| **Grid** | 110kV, Central Energy System (connected to Russia)
PV plant will be connected into 220/110/35kV Substation which is 70m from PV plant site |
| **PPA rate** | Energy Regulatory Agency has approved Feed-in Tariff is USD 0.165/kWh, 25 years.
Payment will be done in MNT, but will refer to the USD/MNT exchange rate at the time of the payment. |
# The Darkhan 10MW PV Project Technical Summary

<table>
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<tr>
<th>Project name</th>
<th>Darkhan 10MW PV Plant</th>
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<tbody>
<tr>
<td>Type of PV Module</td>
<td>Multicrystalline Si, SHARP, 310Wp</td>
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<tr>
<td>PV Plant Output Power, kWp</td>
<td>10,004,940kWp</td>
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<tr>
<td>Annual Power Generation, kWp</td>
<td>14,367,296kWp</td>
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<tr>
<td>Internal Power Consumption (daytime)</td>
<td>126,848kWh/year</td>
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<tr>
<td>Internal Power Consumption (Night time)</td>
<td>258,699kWh/year</td>
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Global Solar radiation map at tilted angle 45° degree
Estimated Power Generation for 20 years

- Estimated Power Generation
- PV Module Aging Degradation Ratio

Year 1: 16,000,000 kWh
Year 2: 15,000,000 kWh
Year 3: 14,000,000 kWh
Year 4: 13,000,000 kWh
Year 5: 12,000,000 kWh
Year 6: 11,000,000 kWh
Year 7: 10,000,000 kWh
Year 8: 9,000,000 kWh
Year 9: 8,000,000 kWh
Year 10: 7,000,000 kWh
Year 11: 6,000,000 kWh
Year 12: 5,000,000 kWh
Year 13: 4,000,000 kWh
Year 14: 3,000,000 kWh
Year 15: 2,000,000 kWh
Year 16: 1,000,000 kWh
Year 17: 0,000,000 kWh
Year 18: 0,000,000 kWh
Year 19: 0,000,000 kWh
Year 20: 0,000,000 kWh

SHARP
Shigemitsu Shoj
Reference emissions are calculated by the following formula:

\[ \text{RE}_p = \text{EG}_{PE,p} \times \text{EF}_{\text{grid}} \]

where

- \( \text{RE}_p \) – Reference Emission (tCO\(_2\)/year)
- \( \text{EG}_{PE,p} \) – Amount of Electricity Generation (MWh/year)
- \( \text{EF}_{\text{grid}} \) – Rgrid Emission factor in given year (tCO\(_2\)/MWh)

*p = 1 year*
Project emissions are calculated by the following formula:

\[ PE_p = EG_{AUX,p} \times EF_{grid} \]

where

- \( PE_p \) – Project Emissions (tCO\(_2\)/year)
- \( EG_{AUX,p} \) – Auxiliary power consumption (MWh/year)
- \( EF_{grid} \) – Grid Emission factor in given year (tCO\(_2\)/MWh)
Emissions Reduction are calculated by the following formula:

$$ER_p = RE_p - PE_p$$

where

- $ER_p$ – Emissions reductions (tCO$_2$/year)
- $RE_p$ – Reference emission (tCO$_2$/year)
- $RE_p$ – Project emission (tCO$_2$/year)
Estimated amount of Net Electricity Generation:

13,910.476 MWh/year

(Electricity Generation - Grid Electricity Consumption)

Grid emission factor: 1.0601 tonCO$_2$/MWh

Estimated amount of Emission Reduction is:

$13,910.476 \times 1.065 = 14,746$ tonCO$_2$/year
Conclusion

1. 1\textsuperscript{st} Mega-scale-grid-connected PV plant in Mongolia and also 1\textsuperscript{st} JSM applied PV project
2. The estimated amount of annual production is 14,367 MWh/year
3. Estimated amount of Emission Reduction is: 14,746 tonCO\textsubscript{2}/year
4. Estimated payback time is \sim 9 years and project is feasible
THANK YOU FOR YOUR ATTENTION

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