SHARP

Mega Solar Projects in Mongolia under JCM Program

7 November 2018
Sharp Energy Solutions Corporation

Agenda

1. Introduction of Sharp Solar
2. Outline for the JCM projects
3. Issue and request for the project implementation
4. Potential Projects in the future

1. Introduction of Sharp

DNA OF "ONE-OF-A-KIND"

~ World's first and Japan's first~

Sharp's founder

1912

Belt Buckles

1915

Mechanical Pencil

1925

Crystal Radio

1953

Japan's First TV Set

1964

All-transistor Calculator

1973

LCD Calculator

Make products that other companies want to imitate

For 105 years

1992

LCD Viewcam

2000

Camera-equipped Mobile Phone

2004

Superheated Steam Oven

2008

108-Inch LCD Monitor

2014

Healsio Ocha-Presso

2016 RoBoHoN

Sharp Solar more than 50years

59 years of Experience

1959	1963	1967	1970	1981	2008	2012	2018
Start R&D of Crystalline PV cells	Start mass production of Crystalline PV cells	Start R&D of Space-use PV cells	Start mass production of Space-use PV cells	Start operation in Katsuragi factory	Start sales of Black Solar	Development compound cell with 31.17% efficiency	

Sharp's 1st Solar

More than 2,800 Light house installations in Japan*

* As of Apr 2010

Source : JAPAN COAST GUARD

Equipped with more than 160 satellites*

Source : JAXA

IEEE milestone recognition

Sharp PV Production History

First IPP Plant
by SHARP

83MW NED Plant in Thailand

Satellites: 46 years experience, installed 160 satellites : JAXA

Houses: No,1 share in Japan

Lighthouses: 50 years experience, over 2,800 sites (as of March 2013)

(1953: Si PV invented by Bell Laboratory)

Total installation, more than 400MW as EPC in Japan, 450MW in Asia

2015: Establish Sharp Solar Solution Asia

2013: Start IPP business in Japan

2012: Completion of 73MW Solar plant in Thailand

2000: No.1 PV manufacturer in the world

1967: development of space-use c-Si PV cells

1963: Started mass production of PV cells

13.1GW
(Amount until 2017)

14.0GW
12.0GW
10.0GW
8.0GW
6.0GW
4.0GW
2.0GW
0.0GW
(GW)

1959 1963 1966 1970 ≈ 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017

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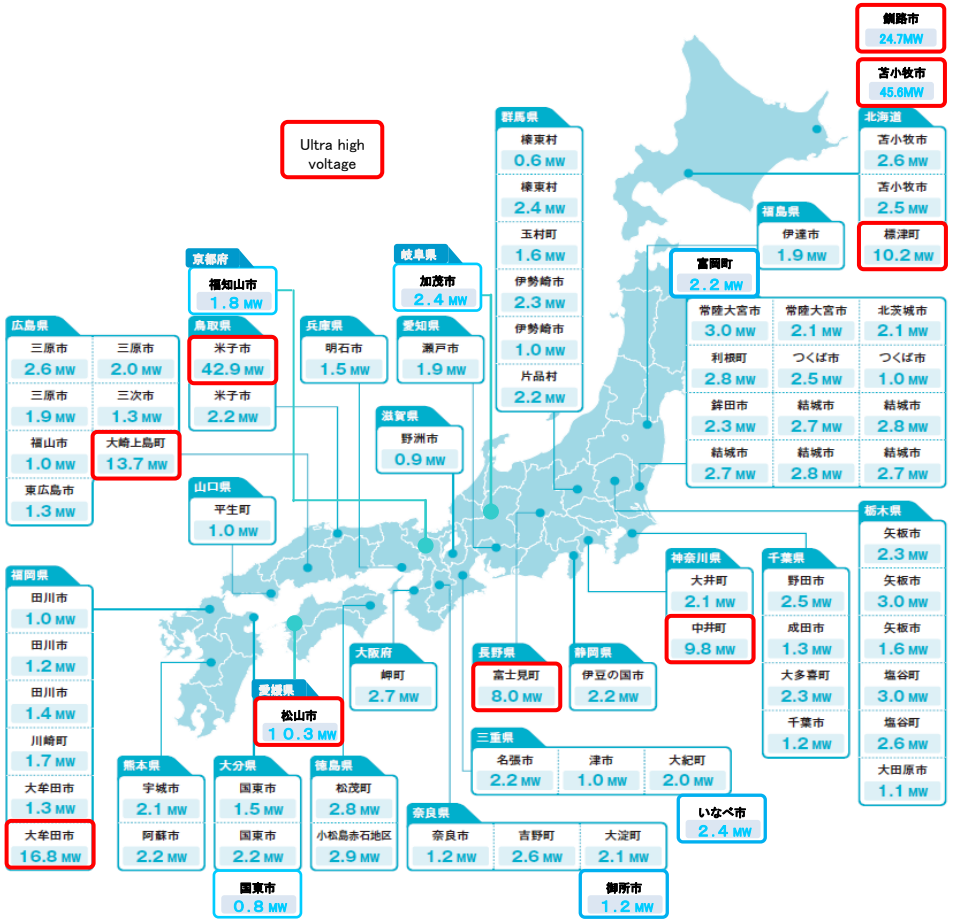
Project reference of EPC/IPP in Japan

Completed(and under construction) Plants…210 plants

Installed Capacity…Approx. 766MWdc

Sharp Assents…Approx. 194MWdc

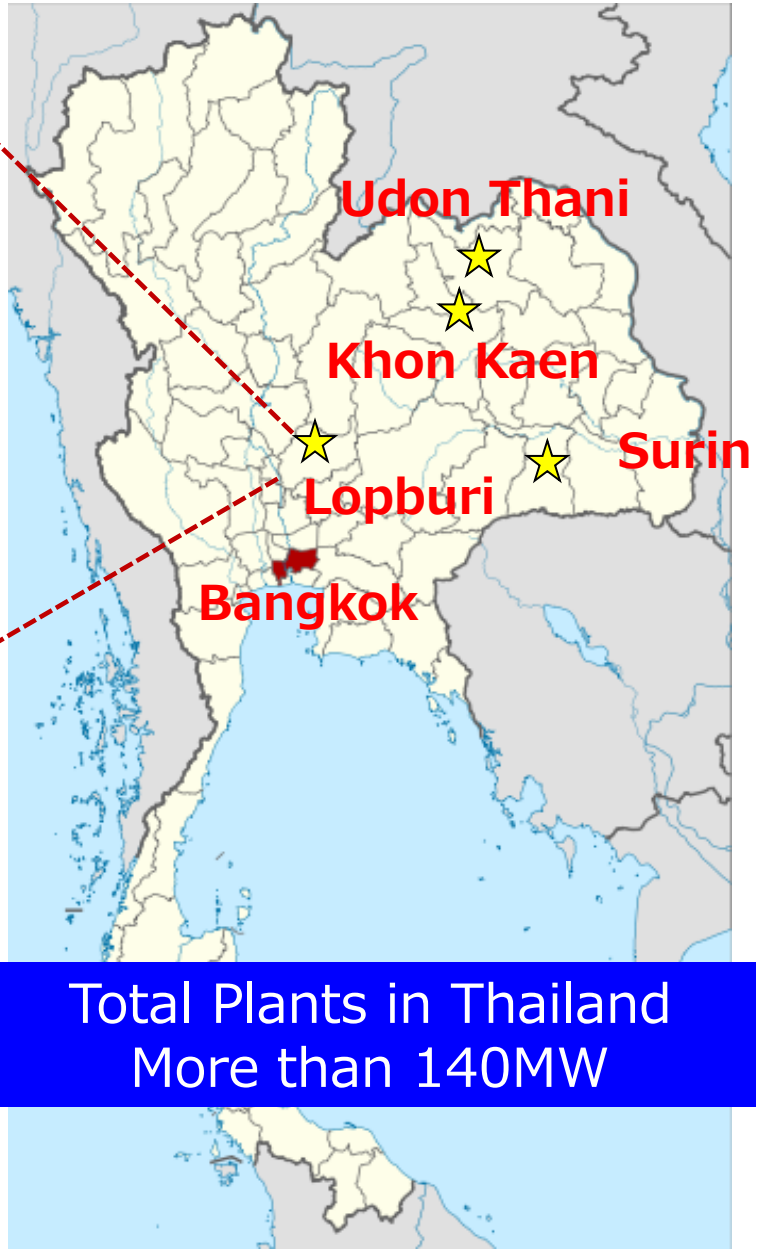
Since July 2012 till end March 2018



Project reference of EPC（Thailand）

Capacity : 73.2MWdc +10.3MWdc
COD : Mar 2012 / May 2013

Capacity:52MWdc/COD:Jan 2015



Total Plants in Thailand
More than 140MW

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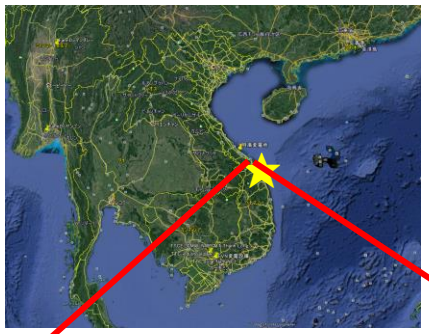
Project reference of EPC（Vietnam）



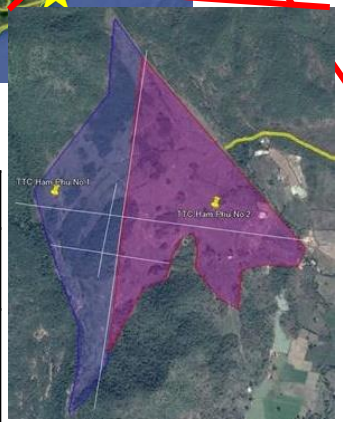
Project	Phong Dien Solar Power Plant
Capacity	48MWdc / 35MWac
Expected power generation	Approx. 61,570MWh/Year
Expected CO2 reduction ($0.333t\text{-}CO_2$ /MWh)	Approx. $20,503tCO_2$/Year

Site Location : My Hoa Village,
Dien Loc Commune, Phong Dien District, Thua Thien Hue Province, Vietnam

Innuguration Ceremony

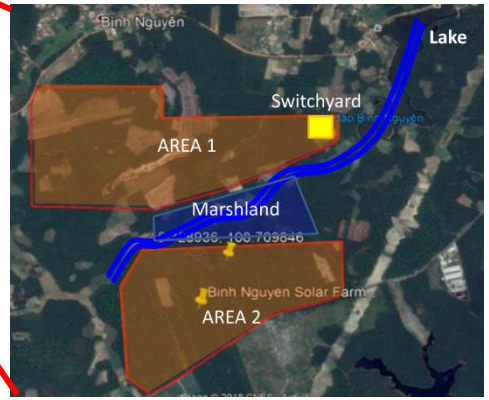
Project reference of EPC（Vietnam）

3rd Project	
Capacity	49MWdc / 41MWac
Expected power generation	Approx. 70,630MWh/Year
Expected CO2 reduction (0.333t-CO_2 /MWh)	Approx. 23,520tCO_2/Year



2nd project	
Capacity	49MWdc / 41MWac
Expected power generation	Approx. 74,610MWh/Year
Expected CO2 reduction (0.333t-CO_2 /MWh)	Approx. 24,845tCO_2/Year

4th Project	
Capacity	49MWdc / 41MWac
Expected power generation	Approx. 70,940MWh/Year
Expected CO2 reduction (0.333t-CO_2 /MWh)	Approx. 23,623tCO_2/Year



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2. JCM Projects

Contribution of CO2 reduction by Energy Solution

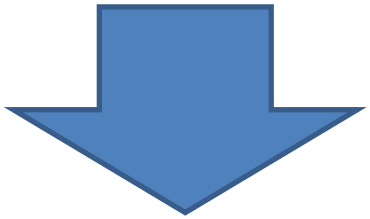
JCM projects executed by Sharp

- 10MW Solar Power Project in Darkhan City (FY2015)
- 1.6MW Solar PV Power Plant Project in Jakabaring Sport City (FY2015)
- Introduction of 27MW Rooftop Solar Power System to Large Supermarkets (FY2016)
- Thailand / Introduction of 3.4MW Rooftop Solar Power System to Air-conditioning Parts Factories (FY2016)
- Introduction of 15MW Solar Power System near New Airport(FY2017)
- Introduction of 20MW Solar Power System in San Luis Potosí (FY2017)
- Mexico / 30MW Solar Park Project in Guanajuato (FY2017)
- 20MW Solar Power Project in Darkhan City Khongor Soum, Mongolia (FY2017)
- Mongolia / 21MW Solar Power Project in Bayanchandmani (FY2018)
- Palau / Introduction of 0.4MW Rooftop Solar Power System to Supermarket (FY2018)
- Philippines / Introduction of 4MW Rooftop Solar Power System in Tire Factory (FY2018)

Source: Google, INEGI

CO_2 Reduction by Solar

Power Generation by Renewable Energy



Power Generation without CO_2 Emission

Power generation by fossil fuel goes down thanks to Solar in the country ＝Contribution of CO_2 reduction

Project in Mongolia – Needs

①Increase of Electrification

⇒Reduction of imported electricity

②Improve of Environment

⇒Reduction of dependency by coal fire

③Technology of stable operation under tough condition in Mongolia

⇒Technology under low temperature

Environmental Concern in Mongolia

Gas emission by coal fired heat and power plant at Ulaanbaatar

Exhaust from Ger

Project Overview -Darkhan 10MW

The project aims to reduce CO2 emissions by constructing a 10MW Solar Power Generation Plant in Darkhan City and can reduce fossil fuel by supplying the generated electricity through the power transmission network.

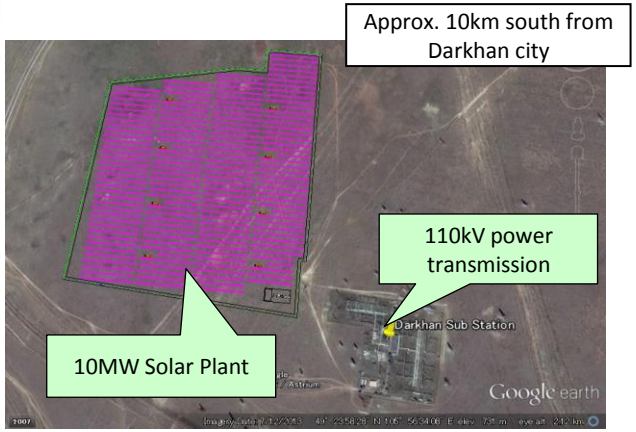
Capacity : **10MWdc**

Location : **Darkhan city**
(Locates approximately 230 km North of the capital city Ulaanbaatar)

Completion : Dec 2016

Project Life: 17 years
From Jan 2017～

CO2 reduction : 14,746tCO2/Year



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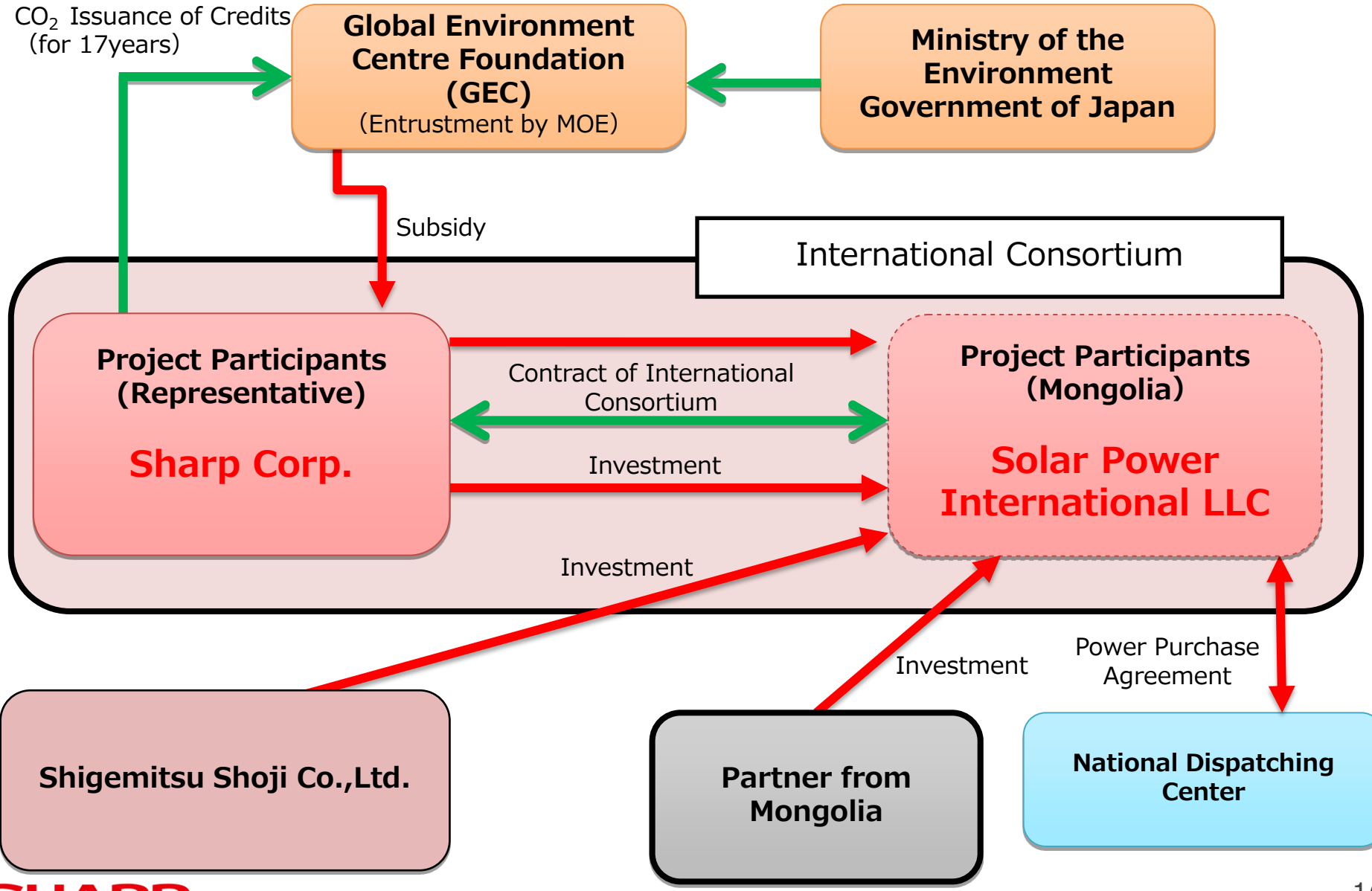
Project Overview – Scheme



Project Overview – Project Site

Finished PV module installation

- Completion before winter season

(as of end of Oct 2016)

Completion on Dec 2016, and started operation since 1st Jan 2017

Project Overview -New Airport 15MW

The project aims to reduce CO2 emissions by constructing a 15MW Solar Power Generation Plant near New Airport and can reduce fossil fuel by supplying the generated electricity through the power transmission network.

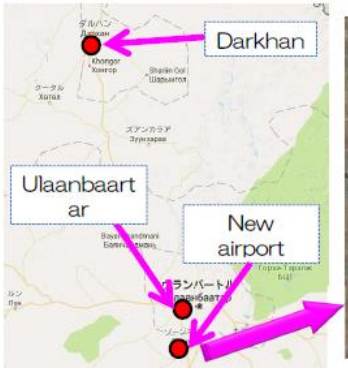
Capaci : 15MWac/16.4MWdc

Location : KHUSHIG KHUNDII
(Locates approximately 230 km North of the capital city Ulaanbaatar)

COD : Dec 2018

Project Life: 17 years
From Dec 2018～

CO2 reduction : 24,025 tCO2/Year



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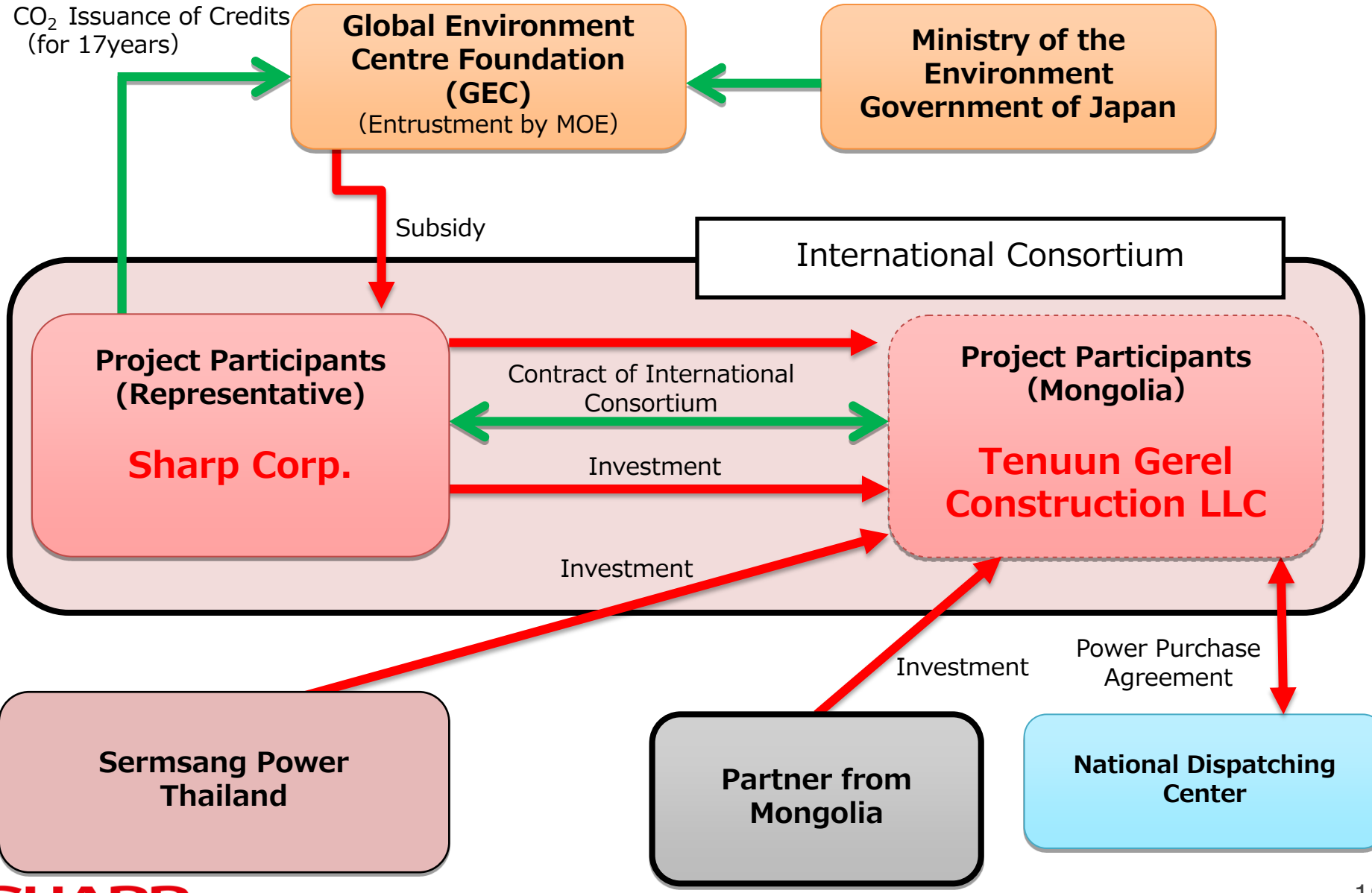
Project Overview – Scheme



Project Overview – Project Site

Finished major construction works.

- Completion before winter season

  (as of end of Nov 2018)

Completion in Nov 2018, and will start operation from 1st Dec 2018

Project Overview –Darkhan II 20MW

The project aims to reduce CO2 emissions by constructing a 20MW Solar Power Generation Plant in Darkhan City and can reduce fossil fuel by supplying the generated electricity through the power transmission network.

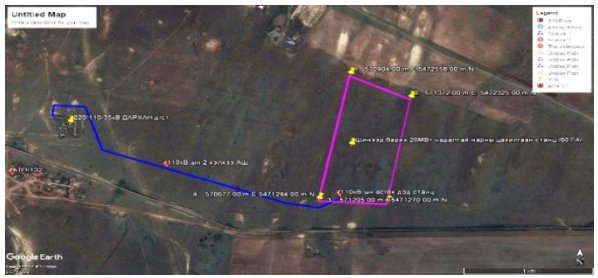
Capacity : 20MWac/20MWdc

Location : Darkhan city
(Locates approximately 230 km North of the capital city Ulaanbaatar)

Completion : Nov 2019

Project Life: 17 years
From Dec 2019～

CO2 reduction : 22,927tCO2/Year



Project Overview –Bayanchandmani 21MW

The project aims to reduce CO2 emissions by constructing a 21MW Solar Power Generation Plant in Bayanchandmani and can reduce fossil fuel by supplying the generated electricity through the power transmission network.

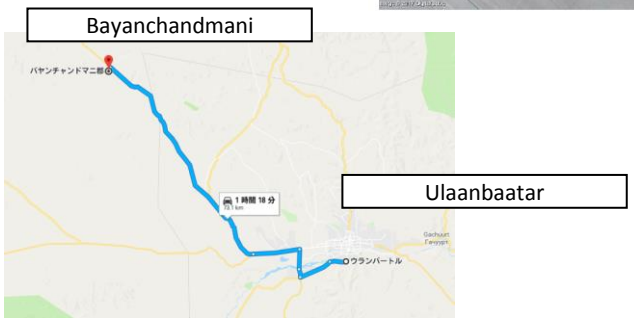
Capacity : 21MWac/21MWdc

Location : Bayanchandmani
(Locates approximately 1.5 hour from the capital city Ulaanbaatar**)**

Completion : Dec 2019

Project Life: 17 years
From Dec 2019～

CO2 reduction : 23,557tCO2/Year



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3. Issue and request for the project implementation

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Policy related to Renewable Energy in Mongolia

1. Establishment of firm/long term policy

2. Smooth and continuous operation under the policy

3. Issue and request for the project implementation

Simple and clear procedures are required

Three step commissioning

- **a. checking during construction**
- **b. technical commissioning**
- **c. governmental commissioning**

4. Potential Projects in the future

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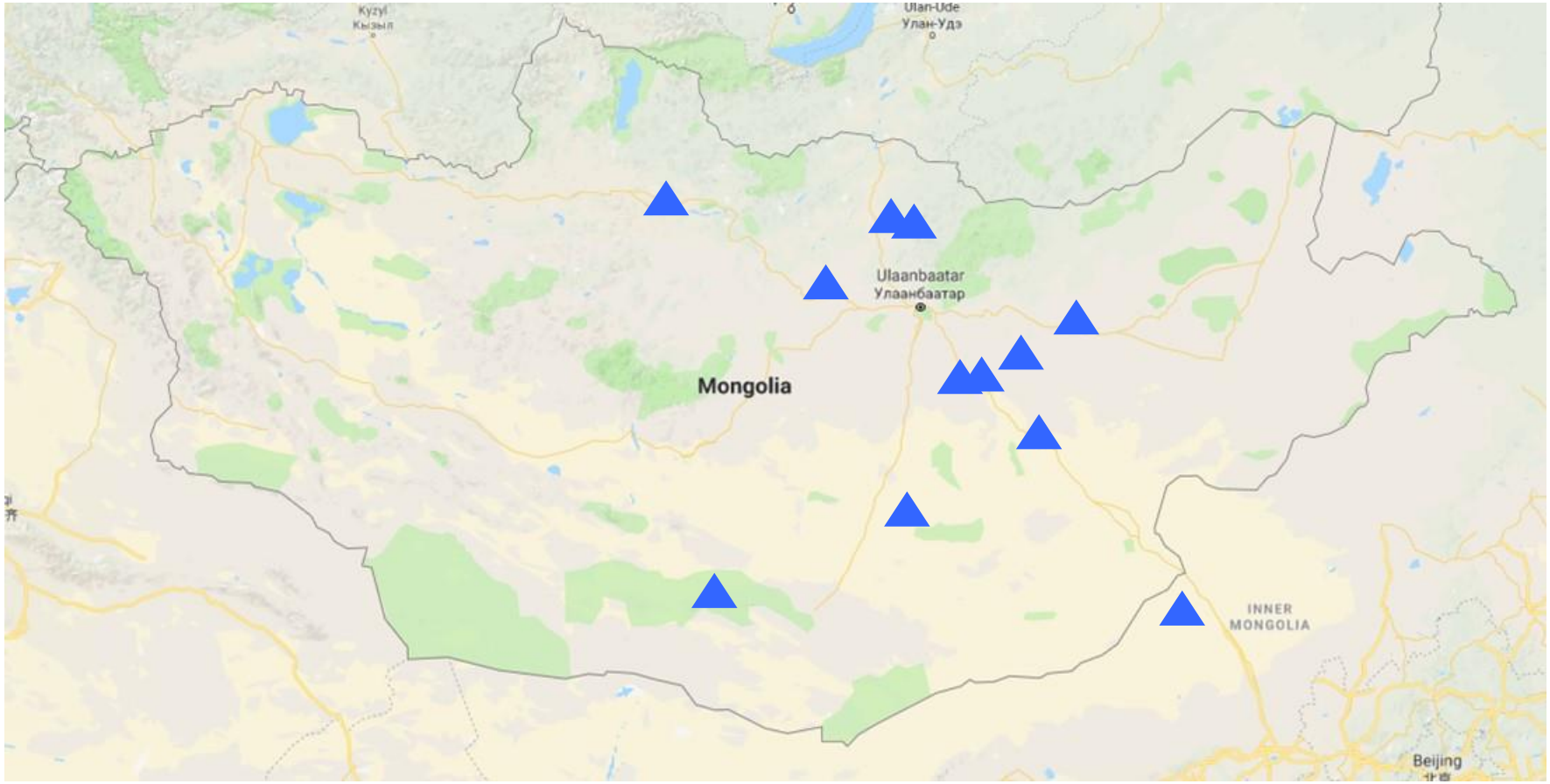


Thank you very much
for your attention !
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