

## GETTING POWER FROM WIND AND SUN

International Workshop

Tokyo, March 08, 2017



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## Wind and Solar Power for NEAsia

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# NEA POWER INTERCONNECTION

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## Transmission Line Component

## Voltage [kV]

Gusinozerskaya GRES (Russia) – Darkhan (Mongolia)	220
Kharanorskay GRES (Russia) – Choibalsan (Mongolia)	110
Chadan (Russia) – Khandagaity – Ulanngom (Mongolia)	110
Blagoveshensk (Russia) – Heihe (China)	220/110
Sivaki (Russia) – Sirius /Aigun (China)	110
Blagoveshensk (Russia) – Sirius /Aigun (China)	2*220
Amurskay (Russia) – Heihe (China)	500





# NEA POWER INTERCONNECTION

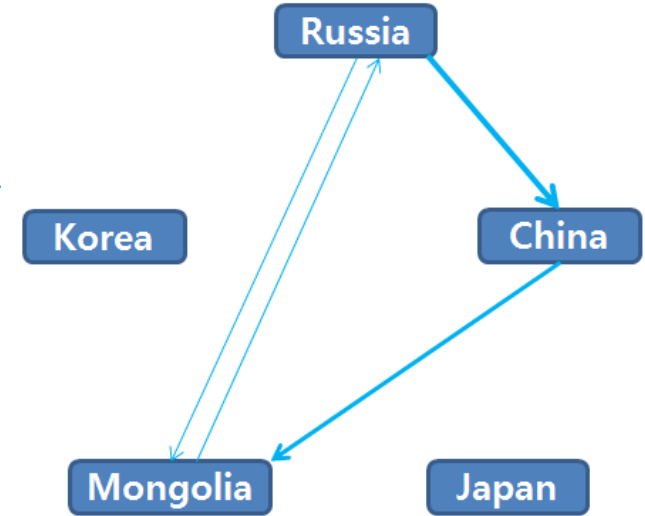
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## •Electricity Export and Import in NEA

- Unit: mil. kWh
- Source: UN Comtrade

World Export	NEA Export	NEA/World(%)
713,069	4,749	0.7



	Korea	Russia	China	Mongolia	Japan	Sum
Korea						-
Russia			3,299	284		3,584
China				1,115		1,115
Mongolia		51				51
Japan						-

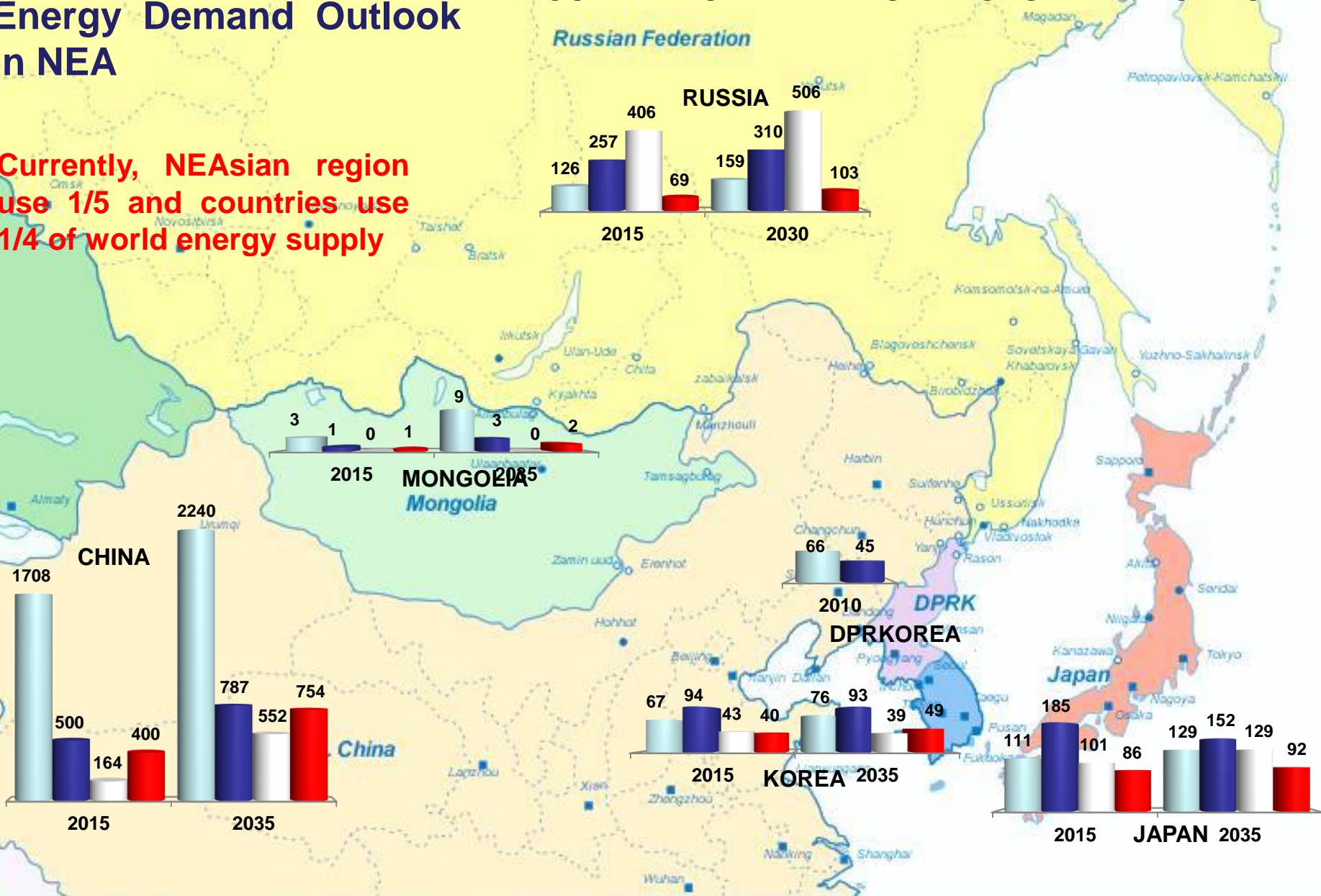
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# Energy Demand Outlook in NEA

Currently, NEAsian region use 1/5 and countries use 1/4 of world energy supply

■ COAL ■ OIL ■ NATURAL GAS ■ ELECTRICITY



•Unit: Mtoe

•Source: ADB 2013





Russian Federation

Kazakhstan

Mongolia

Urumqi

Harbin

Changchun  
Jilin

TAKLAMAKAN  
DESERT

GOBI DESERT

Baotou

Beijing

Shenyang

Korea, Dem. Rep.

Taiyuan

Dalian

Korea, Rep.

Kashmir

China

Zibo

Yantai

Japan

Lanzhou

Jinan

Qingdao

Xian

Zhengzhou

Chengdu

Nanchong

RUSSIA

Irkutsk

Lake Baikal

CAZAKHSTAN

Altai Mts.

Ulan Bator

MONGOLIA

Manchuria

Nepal

Bhutan

Chongqing

Guyang

Xia

Kunming

GOBI

Jining

Beijing

India

Bangladesh

Myanmar

40° North latitude

Taklimakan Desert

Qilian Mts.

Baotou

Hohhot

Kunlun Mts.

TIBET

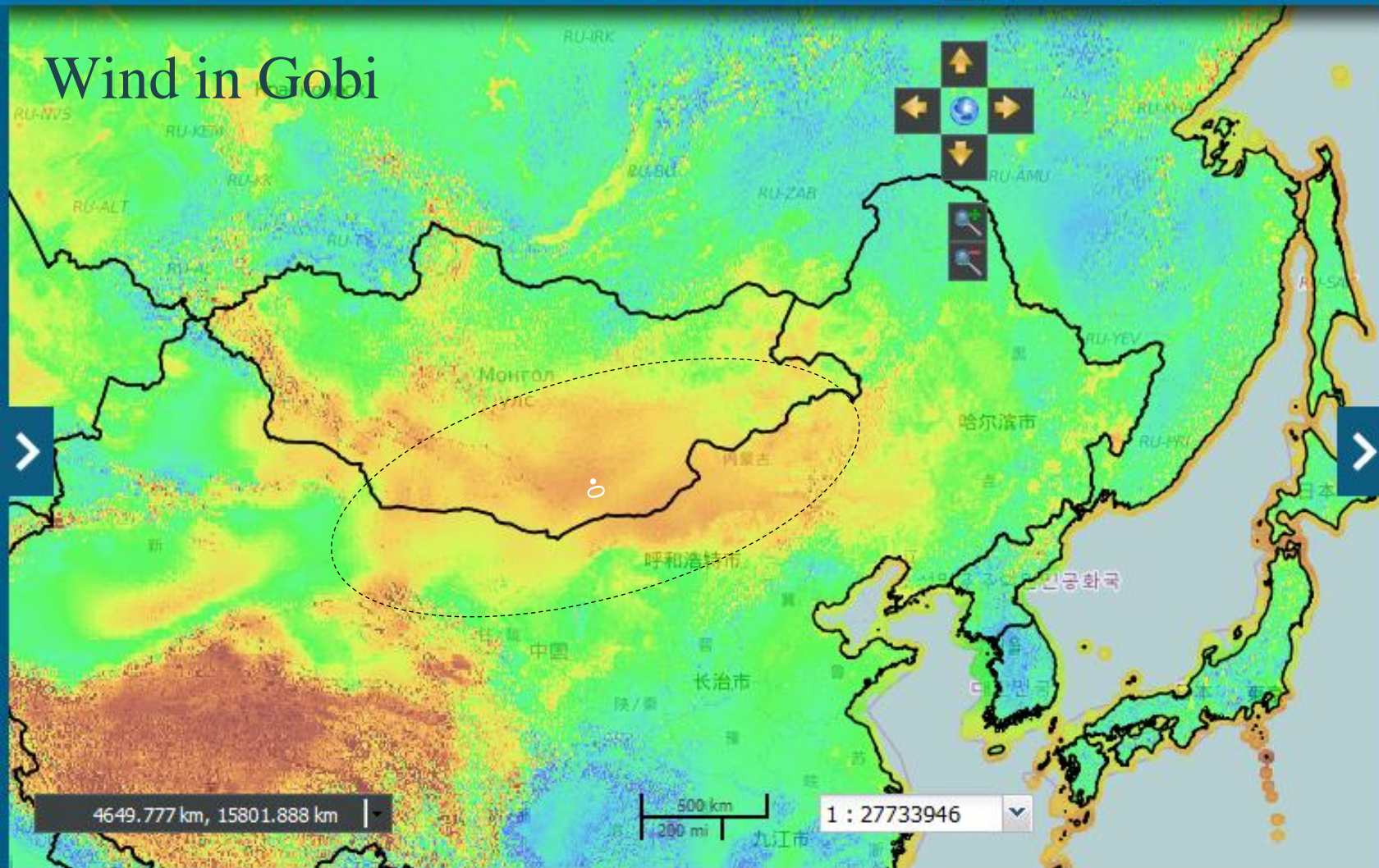
CHINA

Lao PDR

Shanghai



# Wind in Gobi












## Tools & Services

Legend Tools

Country Borders

 Global Wind Atlas wind speed mean 1km at 100m height DTU 2015

Edit Legend

-  2 m/s
-  3 m/s
-  4 m/s
-  5 m/s
-  6 m/s
-  7 m/s
-  8 m/s
-  9 m/s
-  10 m/s

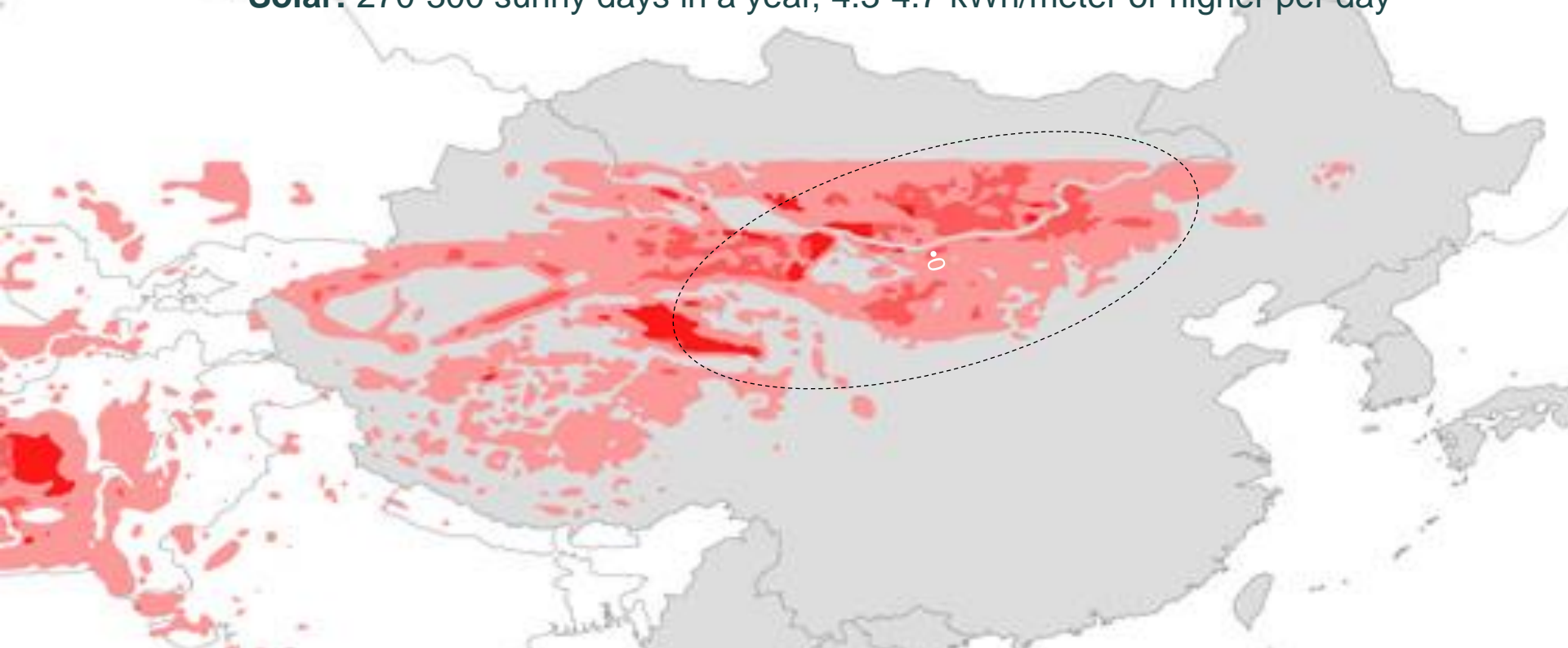
4649.777 km, 15801.888 km

500 km  
200 mi

1 : 27733946

# Solar in Gobi

– **Solar:** 270-300 sunny days in a year, 4.3-4.7 kWh/meter or higher per day



Estimated kWh/ m <sup>2</sup> /day	Applicable land (km <sup>2</sup> )	Total Power: GWh/year
3.4	5,269.5	654,000
3.8	3,924.7	544,000
4.1	4,210.6	630,000
4.5	4,514.8	742,000
5.4	5,541.9	1,092,000
<b>Total</b>	<b>23,461.5</b>	<b>4,774,000</b>

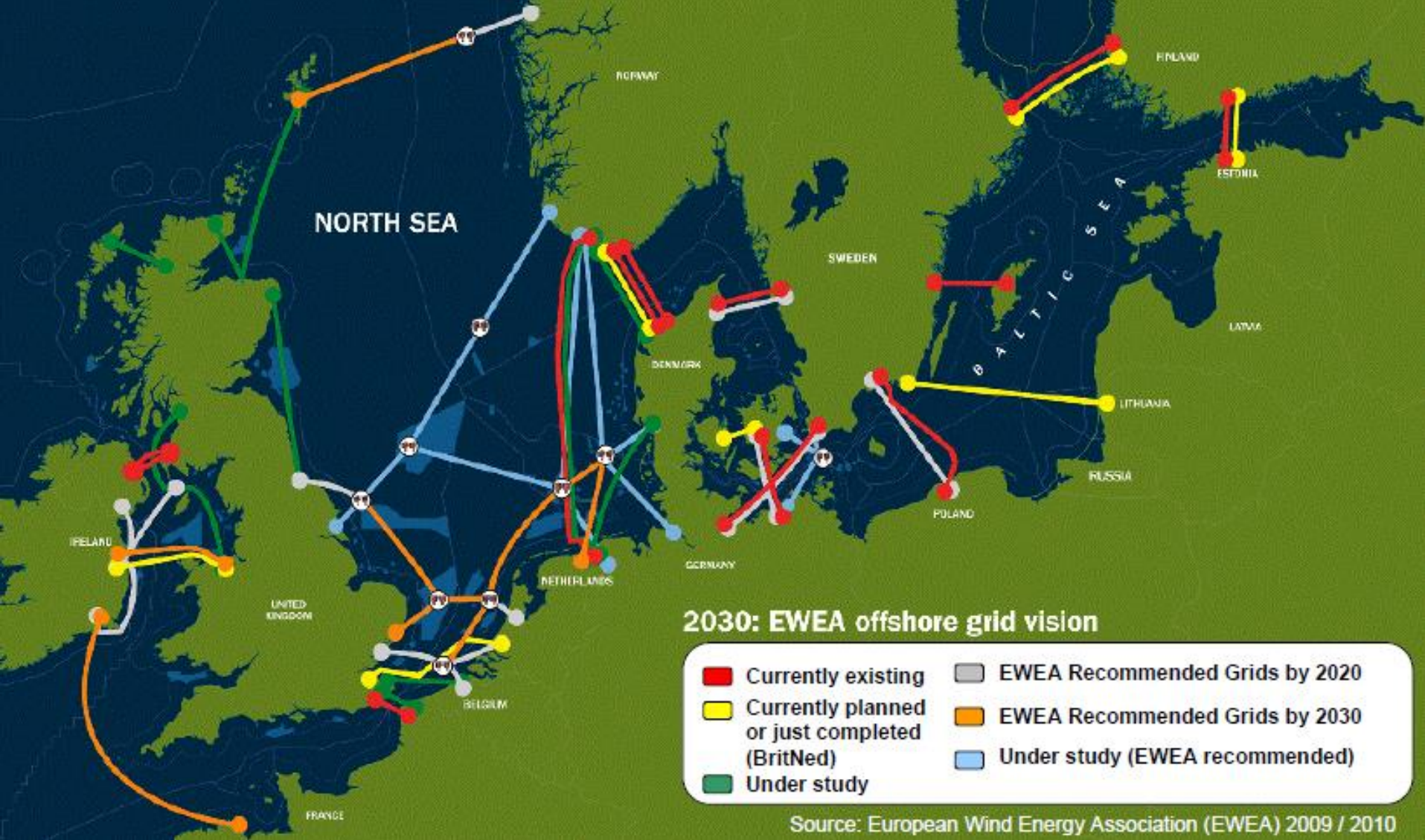
•Source: US National Renewable Energy Laboratory, National Renewable Energy Center of Mongolia





# The DESERTEC Concept (for EU-MENA)





# The SEATEC Concept (for Northern Europe)

European offshore super grid: Transmitting electricity through HVDC interconnectors within Northern Europe Source: European Wind Energy Association (EWEA) 2009 / 2010



# GOBITEC INITIATIVE (NORTHEAST ASIA)





•NEW INITIATIVES



- Gobi Tec and Asia Super Grid Initiative

•(Renewable Energy Institute, previously, Japan Renewable Energy Foundation)





## •Energy Cooperation in Northeast Asia: Intergovernmental mechanisms

### •Intergovernmental Collaborative Mechanism on Energy Cooperation in North-East Asia (ECNEA):

- established by DPRK, Mongolia, ROK and Russia in 2005 and operated by KEEI and ESCAP
- Facilitated dialogue under Senior Officials Committee (SOC), Working Group on Energy Planning and Policy (WG-EPP), Working Group on Coal (WGC) and Government– Business Dialogue, and produced reports on Energy Policy and Statistics in North-East Asia
- In 2015, Decided to change its status from intergovernmental to interagency mechanism. The mechanism is named as **NEA Energy Forum** today

•**Greater Tumen Initiative (GTI - China, Mongolia, ROK and Russia) Energy Board**: Created in 2007 to serve as an advisory board to GTI governments as well as an institutional tool to facilitate energy cooperation in NEA. Approved research proposals during the last 4 Board Meetings, but has not made significant progress yet.





## Recent major progress for Power interconnections

- September 2015: the Proposal to Establish Global Energy Internet** by President Xi Jinping during UN Sustainable Development Summit
- March 2016: MOU** by Global Energy Interconnection Development and Cooperation Organization (GEIDCO), Korea Electric Power Corporation, ROSSETI of Russia and SoftBank Group of Japan for grid interconnection study
- September 2016: the proposal for “East Asia Super Energy Ring”** and an **Intergovernmental Working Group** by the Russian President Putin during the Eastern Economic Forum
- October 2016: Northeast Asia Regional Power Interconnection Mechanism Initiative first meeting (RPIC)** by the China State Grid Corporation and China Electricity Council
- October 2016: North East Asia First Energy forum**, hosted by Korea energy economic institute. Former Intergovernmental Collaborative Mechanism on Energy Cooperation in North-East Asia (ECNEA):
- June 2017: first workshop of “Strategy for Northeast Asia Power System Interconnection” project** is organized in Ulaanbaatar sponsored by Asian Development Bank



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# Road to Very Large Scale PV

- MW-scale PV system : *already 'proven'*
- 100MW PV system : *now realizing!*
- GW-scale PV plant : *within a years!*



**GW-scale to 'TW electricity'**



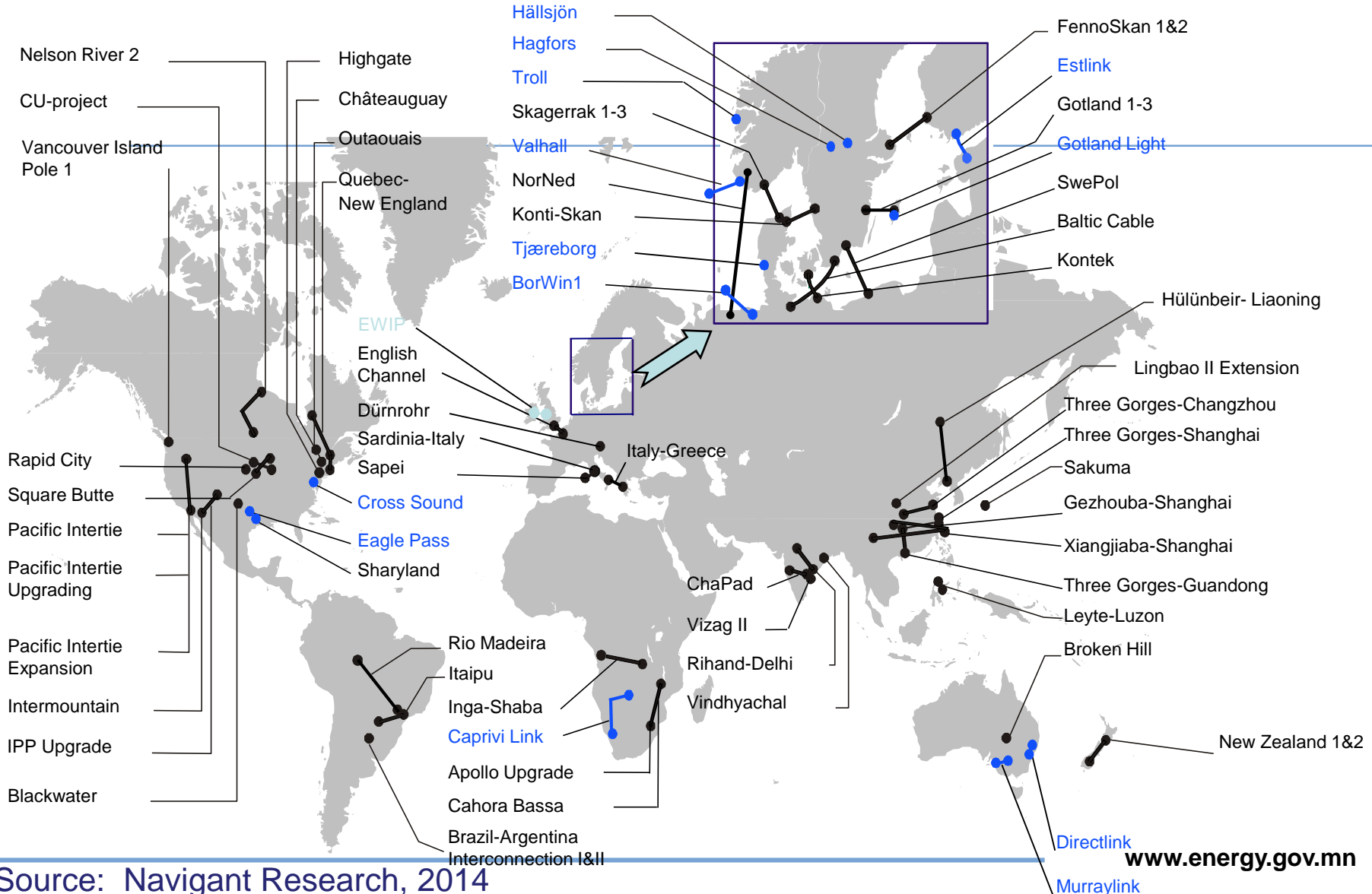


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# HVDC projects in Worldwide



**HVDC technology is not new, there has been realized many projects**





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## To conclude

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- ❖ NEA countries has rich solar, wind and hydro energy resources and potential of RE resources are sufficient to power all Northeast Asia several times
- ❖ In order to harness the full potential of RE sources and realize ASG:
  - the governments need s to have high level political commitment and agreement for energy cooperation and integration
  - a better policy and regulatory framework for cross- border energy trade, as well as consolidated regional and national transmission network planning for energy integration is needed to be developed
- ❖ Power system interconnection in Northeast Asia is one of the key driver to develop renewable energy in regional level.





# Thank you for your attention

## References:

- Gobitec and Asian Super Grid for Renewable Energies in Northeast Asia, 2014, [www.encharter.org](http://www.encharter.org)
- [www.gobitec.org](http://www.gobitec.org)

