Unleashing Energy Cooperation Potential in Northeast Asia: Trilateral and Multilateral Perspectives

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• China-Mongolia-Russia energy cooperation: Power of Siberia II
Energy trilemma in NEA

**ENERGY SECURITY**
- Import independence
- Diversity of electricity generation
- Energy storage

**SUSTAINABILITY**
- Final energy intensity
- Low carbon electricity generation
- CO2 emissions per capita

**ENERGY EQUITY**
- Access to electricity
- Electricity prices
- Gasoline and diesel prices

### Energy Trilemma Index (2022)

<table>
<thead>
<tr>
<th></th>
<th>Trilemma score (/100)</th>
<th>Energy equity</th>
<th>Energy security</th>
<th>Sustainability</th>
</tr>
</thead>
<tbody>
<tr>
<td>China (PRC)</td>
<td>71.8</td>
<td>66.3</td>
<td>59.4</td>
<td></td>
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<tr>
<td>Japan</td>
<td>94</td>
<td>59</td>
<td>74.8</td>
<td></td>
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<td>Korea (ROK)</td>
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<td>62.2</td>
<td>66.1</td>
<td></td>
</tr>
<tr>
<td>Mongolia</td>
<td>63.1</td>
<td>47.6</td>
<td>46.7</td>
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<tr>
<td>Russia</td>
<td>81.4</td>
<td>69.9</td>
<td>63.9</td>
<td></td>
</tr>
</tbody>
</table>

Source: World Energy Council
Net zero requirements and challenges

Energy efficiency
Improvement of energy intensity (per GDP unit) must triple

Electrification
Over half of final energy consumption must be electrified

Behavioral changes
Mandated and consumer-driven changes

All countries must cooperate toward the goal

Technological development
Battery storage, hydrogen, CCUS, bioenergy, among others

Political, regulatory, and public support
Permitting reform, legal framework, NIMBYs

Investment
R&D, capital expenditure in clean energy must grow severalfold
Climate targets require overhaul of existing energy mix

Primary energy supply under carbon neutrality scenario (exajoules per year)

Source: APEC Energy Demand and Supply Outlook
World final energy consumption (2019)

(Million tonnes of oil equivalent)

- Hydro: 370
- Nuclear: 727
- Renewables: 314
- Natural gas: 3,258
- Coal: 3,737
- Bioenergy: 1,354
- Oil: 4,098

Flows/values of less than 25 Mtoe are not shown.

** Other energy sector** *covers the use of energy by transformation industries and the energy losses in converting primary energy into a form that can be used in the final consuming sectors.* (IEA)
Global electricity mix today

(Million tonnes of oil equivalent)

Hydro 370
Nuclear 727
Renewables 314
Natural gas 3,258
Coal 3,737
Bioenergy 1,354
Oil 4,098

Power sector 5,532 -> 2019

Buildings 3,084
Industry 2,927
Transport 2,920

2019
Global electricity mix under net zero

(Million tonnes of oil equivalent)

- Hydro 717
- Nuclear 1,457
- Renewables 5,493
- Natural gas 406
- Natural gas CCUS 1,027
- Coal 72
- Coal CCUS 334
- Bioenergy 2,436
- Oil 310

IEA Net Zero 2050

Power sector 8,861 -> 4,108

Buildings 2,054
Industry 3,822
Transport 1,911

Flows/values of less than 25 Mtoe are not shown.

**Other energy sector “covers the use of energy by agriculture, transformation industries and the energy losses in converting primary energy into a form that can be used in the final consuming sectors.” (IEA)
Role of low-carbon baseload capacity, low energy intensity, small population, regional interconnectivity

62 Countries Where Over Half of Electricity Comes from Non-Fossil Energy Sources (2020)

- Hydro
- Solar & Wind
- Geothermal
- Nuclear
- Biofuels & Waste
- Fossil Energy

Data: IEA World Energy Balances

Hydropower-based countries where at least a third of power generation is from that source

Nuclear
Solar, Wind Combined
Mixed
Geothermal
Power generation capacity in NEA (GW)

Electricity generation by fuel source (2020)

Data: World Resources Institute (2021)
Ensuring energy security in energy transition

Hydrocarbon self-sufficiency in NEA

Data: IEA World Energy Balances
Possible energy cooperation scenarios in NEA

No cooperation / balkanization

Bilateral cooperation

Fragmented multilateralism

Integrated multilateralism

Single NEA grid

Level of cooperation
Possible energy cooperation scenarios in NEA

**Fragmented multilateralism**

- **Most probable**
  - China-Russia-centered hydrocarbon network
    - Power of Siberia 2?
  - US-Japan-Korea(+Mongolia) network
    - J-K partnership in semiconductor supply chain
    - US-Korea-Mongolia critical mineral partnership
  - Occasional trilateral cooperation on extra-regional issues
    - US-Japan-China on Vietnam

**Integrated multilateralism**

- **Most desirable**
  - Regional formal energy dialogue mechanism
  - Energy facilitator organization
  - Joins energy projects with multiple NEA stakeholders
  - Regional energy security response mechanisms / emergency stock sharing
  - Training, capacity building

**Single NEA grid**

- **Most aspirational**
  - Integrated regional power grid
  - Convergence of regulatory frameworks
  - Pool funds for regional UHV transmission infrastructure
  - Regional electricity regulator
  - Existing research
    - Asian Super Grid
    - North-East Asian Power System Interconnection (NAPSI)
    - North-East Asian Energy Interconnection (NEAEI)
Finding realistic solutions to promote trilateral & multilateral energy-sector cooperation in NEA

**Short- & medium-term**
- Track 1 platform or mechanism for NEA periodic dialogue
- Regional independent, intergovernmental organization (similar to the IEA)
- Joint investment in low-carbon projects

**Long-term**
- Regional energy security response mechanisms (critical minerals, LNG, oil)
- Increased intra-regional low-carbon energy trade (hydrogen, electricity, gas)
- Expanded infrastructure connectivity (pipelines, transmission lines)

**Anything else?**
China-Mongolia-Russia Energy Cooperation: Power of Siberia II

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China-Mongolia-Russia Energy Cooperation

- Belt and Road Initiative
- Trans-Eurasian Railway Network
- Steppe Road

China-Mongolia-Russia Economic Corridor

**Electrical Interconnections and Domestic Power Generation in NEA, 2018**

**Source:** ADB
China’s natural gas demand scenarios

Reference and Aspirational Scenarios of China’s Gas Demand

According to the China Natural Gas Development Report 2021 (NDRG), China’s gas demand will reach 550-600 bcm in 2030 and grow steadily through 2040.

China: Coal still dominant vs. natural gas

![Graphs showing gas consumption in industry as a % of coal consumption and power generation by fuel: coal vs. gas (2000-2019).]

EPRINC figure based on data from IEA World Energy Balances and China Energy Statistical Yearbook 2020
PoS1, Altai gas pipeline, Soyuz Vostok

Original Altai pipeline

New (proposed) Power of Siberia 2 route

Source: https://globalriskinsights.com/

Sources: Gazprom