


# The DPRK as a Participant in Northeast Asia Regional Energy Cooperation: Benefits and Challenges

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By David Von Hippel and Peter Hayes

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## **I. Introduction**

In this policy forum, the authors argue, "Resolution of the DPRK nuclear weapons and related issues would open opportunities for regional cooperation on energy issues that heretofore have been stymied, at least in part, by the difficulties in including the DPRK in regional projects. There remain, however, many different opportunities for developing regional energy infrastructure and for energy cooperation activities—many of which could involve the DPRK—that would potential benefit a number of regional parties on many levels."

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## **II. Policy Forum by David von Hippel and Peter Hayes**

The robust industrial economy of the Republic of Korea (ROK) is almost entirely fueled with oil, natural gas (in the form of liquefied natural gas, or LNG), coal, and fuel for nuclear reactors imported by sea, much of it from distant regions. The Russian Far East (RFE) and adjoining Siberia have a wealth of oil, gas, coal, and hydraulic resources available for development, but very low regional energy demand because of a small and dispersed population. As such, Russian and Korean officials and researchers have for many years explored infrastructure projects—including powerlines and pipelines—that would allow RFE energy resources to be provided to the ROK, thus lessening the ROK's reliance on fuel from outside the region. Geographically between the ROK and RFE, however, lies the Democratic People's Republic of Korea (DPRK). Most RFE-to-ROK infrastructure proposed would transit the DPRK, requiring bilateral and multilateral arrangements for powerlines and pipelines to do so. Resolution of the DPRK nuclear weapons and related issues would open opportunities for regional cooperation on energy issues that heretofore have been stymied, at least in part, by the difficulties in including the DPRK in regional projects. There remain, however, many different opportunities for developing regional energy infrastructure and for energy cooperation activities—many of which could involve the DPRK—that would potential benefit a number of regional parties on many levels.

Power grid interconnections linking the RFE, DPRK, and ROK have been under discussion, on and off, for many years. Power from hydro, coal, gas, and/or nuclear plants in RFE—mostly from plants yet to be built—would be carried to the ROK and DPRK. Interconnection of the power systems of the three countries, however, is not a simple matter. The RFE alternating current (AC) system uses a different frequency (50 cycles per second, or Hertz—Hz) than the ROK system (60 Hz), so one or (likely) more stations converting AC power to DC (direct current) power and back to AC power of the proper frequency would be needed. Alternatively, a DC line—DC lines have lower transmission losses over large distances than AC lines—could be used to transfer power from the RFE to the ROK, with a DC-AC converter located near the ROK border with the DPRK. In exchange for hosting the powerline on its territory, the DPRK will require payments, power from the line, or a combination of

the two. The DPRK power grid is in poor condition, however, and will need substantial rebuilding in order to accept significant amounts of power, or power from the line could go to one or more totally new local or regional grids in the DPRK.

Discussions on potential gas pipelines from the Russian Far East and Siberia to the ROK through the DPRK have been continuing between the potential partners, on and off, for many years.<sup>[1]</sup> The Russian TASS news agency reported on talks by Russian Foreign Minister Sergey Lavrov with DPRK counterparts in November, 2014, saying that “North Korea is ready to consider projects to use its territory as a transit route for Russian gas and electricity deliveries to South Korea”, following a pilot coal shipment to the ROK via the DPRK port of Rajin, a part of the Rason Special Economic Zone.<sup>[2]</sup> As with electricity transmission lines, a gas pipeline from the RFE to the ROK via the DPRK would pay some “rent”, in the form of monetary payments and/or gas deliveries, to the DPRK in exchange for the transit of its territory. At present, however, the DPRK has little or no infrastructure for domestic gas use.

These “big infrastructure” projects have potential to contribute to the ROK’s energy security by diversifying its energy supplies, but will be very complex to negotiate, build, and operate. For example, an electricity interconnection with a capacity of 5 GW (5 billion Watts), at 80% annual capacity factor, could offset about 7% of the ROK’s 2012 net generation, though the net cost to the ROK would depend on a number of factors. Electricity imports from the RFE over such a line could reduce ROK greenhouse gas (GHG) emissions by maximum of about 5%, but this assumes that only ROK coal-fired power is displaced, and only hydro and/or nuclear power are used to supply the line in the RFE; other assumptions will result in much less overall GHG emissions reduction (counting emissions in both the RFE and ROK). On the other hand, a pipeline carrying 12 billion cubic meters of gas per year to the ROK from the RFE, as has been proposed in the past, could offset 23% of the ROK’s 2012 gas use<sup>[3]</sup> OR 51% of gas used for electricity generation OR 28% of coal-fired generation. By displacing coal use for generation, gas from the RFE could be used to reduce the ROK’s GHG emissions by up to 7%, but the reduction would be at a net cost to the ROK, since pipeline gas is likely to be more expensive than coal. If pipeline gas displaces LNG imports, the ROK might save money, but there would be little net effect on the nation’s GHG emissions. Although these multi-billion dollar infrastructure projects can contribute toward enhancing the ROK’s energy security, and may (or may not) save money or help to achieve national climate goals, they are far from total solutions by themselves.

Considering the potential for big infrastructure to contribute to DPRK energy sector redevelopment, about 10% of the output of a 5 GW could displace all of the DPRK’s estimated coal-fired generation, based on Nautilus’ 2010 estimate<sup>[4]</sup>, but, as noted above, transfer of this much power would require rebuilding the DPRK grid. Assuming the installation of new combined-cycle generation, a few percent of the output of an RFE-DPRK-ROK gas pipeline could displace all of the DPRK’s current coal-fired generation, but again would require a DPRK grid rebuild. So large powerline or pipeline projects will not be, in and of themselves, panaceas for DPRK “energy insecurity”.

Not to be overlooked are the host of difficult issues that must be surmounted by the partners in these projects, including agreeing on electricity or gas pricing and transit fees, deciding which labor and environmental regulations should govern the construction, operation, and management of the facilities—note that powerlines or pipelines from the RFE to the ROK would likely pass through areas that include sensitive wildlife habitat—and deciding upon a multi-nation organizational structure to control the operations of the powerline or pipeline. In short, there may well be economic and climate benefits associated with RFE-DPRK-ROK energy infrastructure projects, but the difficulty of these projects—underlined by long period over which they have already been considered—should not be underestimated.

As well as opportunities to more easily implement international infrastructure, additional markets for all types of technologies (and services) would open if the political issues involving the DPRK are addressed and the DPRK undertakes economic redevelopment—which is already happening to varying degrees, and with steps both forward and back, at the grassroots level. In fact, the redevelopment of the DPRK will provide a considerable opportunity to install efficient end-use equipment and renewable energy systems, as much of the DPRK economy (and infrastructure) will need essentially to be rebuilt from the ground up. Such projects could potentially be aided and financed by international programs such as Clean Development Mechanisms. The development of renewable energy and energy efficiency technologies have been of keen interest in many countries of Northeast Asia and beyond—with Germany and post-Fukushima Japan[5] as particularly interesting recent examples. Cooperation in these areas could take advantage, for example, of technology, research and development infrastructure, and financing from the ROK, Japan, and possibly the United States, mass manufacturing infrastructure, labor, and quite likely financing from China, labor from the DPRK, renewable resources in varying availability across the region, energy efficiency potential in all nations, and potentially huge combined regional markets.

Potential benefits to the DPRK of regional cooperation initiatives such as those above could include gaining access to energy resources that would be difficult to develop on its own, obtaining “rents” in exchange for allowing energy infrastructure to transit its territory, and obtaining better access to conventional energy, energy efficiency, and renewable energy, and related technologies, allowing the more rapid and cost-effective redevelopment of the DPRK economy. In addition, cooperation would oblige the DPRK to work with the countries of the region to negotiate access rights and fees, tariffs, and other parameters of cooperative projects. Lessons learned through those projects would help both the DPRK and the international community in subsequent interactions.

Overall, international projects involving the DPRK will be even more difficult to manage than cooperative project involving other Northeast Asian countries. Involving the DPRK in such projects, however, can offer significant benefits in terms of engagement of the DPRK with the international community, even apart from their energy and economic benefits.

Big regional infrastructure projects (powerlines/ pipelines) are very difficult and expensive, and are much more so with the DPRK involved. A great deal of patience on the part of all partners will continue to be required to bring them to fruition. Although it is worthwhile working to move ahead with such big projects, but it is essential to ALSO:

- Pursue energy sector capacity-building with North Korean counterparts;
- Emphasize cooperation in energy-efficiency and renewable energy sources to help transform DPRK energy demand and supply during redevelopment (essentially “leapfrogging” to the green growth future that the ROK government has advocated);
- Initiate quick, fast, cheap (and probably some not-so-cheap) cooperation projects in the DPRK with combined benefits for the energy sector, economic development, and humanitarian aid; and
- Build upon economic (such as private sector entrepreneurship) and energy (such as household renewables) trends already ongoing in the DPRK.

News articles and the testimony of observers[6] suggest that many aspects of life in the DPRK are changing, as outside influences continue to seep in. These trends can be built upon by carefully exploring cooperation options both big and small, and by moving forward with attractive, well-planned cooperation projects when opportunities arise.

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### III. References

- [1] See, for example, a series of news postings, stretching back more than a decade, on proposals for gas pipeline transiting the DPRK, compiled by *North Korea Economy Watch* as “Russia-Korea gas pipeline compendium” (most recent post, June 5, 2014), available as <http://www.nkeconwatch.com/2012/10/04/russia-korea-gas-pipeline-compendium/>.
- [2] TASS Russian News Agency (2014), “North Korea ready to discuss transit of Russian gas to South Korea — Lavrov”, dated November 20, 2014, and available as <http://itar-tass.com/en/economy/760867>.
- [3] ROK energy use from Korea Energy Economics Institute (KEEI, 2013), *2013 Yearbook of Energy Statistics*.
- [4] See, for example, David F. von Hippel and Peter Hayes, *An Updated Summary of Energy Supply and Demand in The Democratic People's Republic Of Korea (DPRK)*, published as Hanyang University Center for Energy Governance and Security Working Paper 2014-2, and available from [http://www.egskorea.org/sub/sub2\\_2.asp](http://www.egskorea.org/sub/sub2_2.asp).
- [5] Andrew DeWit (2014), “Japan’s Radical Energy Technocrats: Structural Reform Through Smart Communities, the Feed-in Tariff and Japanese-Style “Stadtwerke””, NAPSNet Special Reports, December 02, 2014, available as <https://nautilus.org/napsnet/napsnet-special-reports/japans-radical-energy-technocrats-structural-reform-through-smart-communities-the-feed-in-tariff-and-japanese-style-stadtwerke/>.
- [6] See, for example, the recent Monitor article by the authors, “Private Purchases of Solar Photovoltaic Panels in the DPRK: Signs of Green Growth on the Way?”, as well as the summary of the recent book by Felix Abt, *A Capitalist in North Korea: My Seven Years in the Hermit Kingdom*, available at <http://www.a-capitalist-in-north-korea.com/>.

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