

Growing Risks to PJM Network's Gas-fired Projects

Are Japan and Korea Ready?

Executive Summary

Over the past decade, overseas investors have been drawn to what had been deemed a 'golden age in U.S. gas' and invested in the U.S. natural gas complex. International strategic and financial investors found U.S. gas-fired power assets to be a particularly attractive infrastructure opportunity: long-dated returns; cheap and plentiful local inputs; a well-regulated and legal backstop; and political support. Japanese investors were early participants. Korean investors arrived more recently.

Japanese and Koreans investors made large commitments to gas-fired power within the Pennsylvania-New Jersey-Maryland (PJM) system. IEEFA estimates Japanese interests invested several billion U.S. dollars (USD) into PJM gas-fired assets since 2000, while Korea invested nearly half a billion USD in the past three years alone.

**The 'golden age of gas'
looks to have ended.**

However, both the PJM market and U.S. political environment are evolving, and the 'golden age of gas' looks to have ended. U.S. public and private market questions about methane emissions from gas along a leaky supply chain now delay new projects and shorten investment return periods.

Against this backdrop, IEEFA and the Applied Economics Clinic (AEC) recently examined the growing risks to PJM gas-fired power projects, both general and specific to PJM. The risks can be broadly grouped into two buckets: efficiency (renewable competitiveness and PJM overcapacity), and policy (global warming, gas prices, government actions, and local opposition).

Japanese and Korean investors may be aware of many of those risks from their home markets, but less prepared for them overseas. The Japanese and Korean governments have increased their focus on climate risks, and both have committed to net zero emissions by 2050. But that does not mean their investors have the same appreciation for those risks overseas. While many now have seasoned U.S. teams, less experienced Japanese and Korean investors may not appreciate the speed and magnitude of these risks in either the PJM system or even the U.S. more generally.

Japanese and Korean investors should reassess and recalibrate the risks to their investments in PJM gas-fired power. Japanese investors are arguably as prepared as anyone within the PJM system to confront these accelerating risks. Korean investors appear less ready for what's coming.

The Push to Invest Offshore

U.S. gas and gas-fired power only entered its 'golden age of gas' in the last decade.¹ By that time, many Japanese investors had already been invested in the U.S. and into PJM gas-fired assets for years. Conversely, the Koreans only arrived in the last few years. While they both appear to be investing on the same theme, Japan and Korea had distinct domestic forces that pushed their capital offshore into PJM gas-fired power.

Japan

Japan began to deregulate its energy market in 1995 and has continued that process at a glacial pace ever since. Local Japanese power companies became incentivized to import knowledge from developed, deregulated, and more competitive markets abroad.² At the same time, Japanese energy investors viewed offshore investments as long-term growth offsets against continued deregulation at home.

The majority of Japanese equity investors in overseas gas projects have either been domestic power utilities or subsidiaries of major keiretsu trading conglomerates. The only thing they have in common is they've seen their stakes as strategic, rather than financial. Japan's keiretsu like Sumitomo and Toyota are collections of sprawling portfolios of diverse and complementary international businesses, of which U.S. gas power assets might be one. Mitsubishi is one of Japan's largest keiretsu and made some of the earliest offshore power investments through its Diamond Generating subsidiary. Mitsubishi also now happens to be one of the world's largest gas turbine manufacturers as well.³

Many of Japan's power utilities also came to the U.S. market early, with a few taking stakes in U.S. power assets as far back as the early 2000s. Both Japan's keiretsu and power utilities have picked up the pace of their investments over the past decade. More than a dozen Japanese players have now invested tens and sometimes

¹ The IEA coined the phrase in its initial 2011 report, [Golden Age of Gas](#), then followed with its [Golden Rules for a Golden Age of Gas](#) in 2013. The latter set out political conditions necessary for public trust in an unconventional (ie, shale) gas industry, which US federal and state governments largely established. Once unconventional gas gained support, investment research houses began to see upside to gas-fired utilities (among other sectors) from cheaper gas – Citi's April 2015 report, [The New American \(Gas\) Century II: Disruptive and Durable](#) was just one example.

² While each Japanese corporate had its own idiosyncratic motivations as well, the Development Bank of Japan (DBJ) summarized this common motivation in its [press release for participation in South Field Energy](#), a project in Ohio: "DBJ is acquiring knowledge related to financing in the deregulated US market, which is a leader in the deregulation of the electric power generation industry. DBJ is looking to pass on this knowledge to the electric power market in Japan, where deregulation is expected to accelerate further out."

³ There are only three major manufacturers of gas turbines for power generation in the world: General Electric, Siemens, and Mitsubishi. Ansaldo is sometimes mentioned as a fourth. The market has not been growing, and competition is increasingly fierce. Consolidation has been steady and continuous as a result. Mitsubishi and Siemens even discussed a merger of their gas turbine divisions at one point. (Financial Times. [Gas Turbine Competition Heats Up](#). 16 August 2018.)

hundreds of millions of USD in equity at a time into U.S. gas-fired power projects.

Korea

Korea's gas investment experience was initially quite different from Japan's. Korean banks only began financing PJM gas-fired power plants around 2016⁴, but are now quite active. The country's first equity investments into U.S. gas-fired power appeared in 2017 and were financial, rather than strategic.⁵ Korea's domestic investment market has been relatively moribund over the past decade and access to local infrastructure investments has been limited.⁶ State-owned KEPCO's virtual monopoly in Korean power made domestic power asset investment opportunities extremely rare. This low return environment and limited long-dated domestic options drove Korean financial investors to look for opportunities offshore.⁷

It was only a matter of time before the Koreans would look for strategic U.S. gas-fired stakes. However, they would arrive without the benefit of Japan's experience in the global and U.S. gas value chain. KEPCO and its subsidiaries have made substantial coal-power investments in many countries – especially around Asia – but gas-fired power investments have been less frequent.⁸ Korea is also a late entrant to the gas turbine industry via Doosan Heavy, which only produced its first commercial product this year.⁹ A Korean independent power producer (IPP) made the country's first investment into a substantial U.S. gas-fired power project only in 2018, with the purchase of a 5% minority stake in an existing asset.¹⁰ One year later, two Korean investors became majority shareholders in one of the largest U.S. gas-fired power project investments made by any Asian player so far.

⁴ Kim, Yeonhee. [US Gas Power Projects Lure Korean Private Loan Investors: Report](#). Korea Economic Daily. 23 December 2016.

⁵ This doesn't include financial investments through third party infrastructure fund structures, eg: Kim, Yeonhee. [Starwood Energy to Raise \\$200m from Korea to Fund \\$760m US Deal: Report](#). The Korea Economic Daily. 7 October 2016.

⁶ The contrast between Japan and Korea equity and FX has been stark. While the Nikkei returned 9.8% CAGR locally since 2010, the KOSPI only returned 2.3%. The JPY has meanwhile seen real swings over that time, while the KRW has been remarkably stable.

⁷ Tam, Nila. [Korean Institutionals In Overseas Investment Drive](#). Infrastructure Investor. 4 November 2015.

⁸ According to KEPCO's [website](#) and [latest October 2020 presentation](#), over two thirds of KEPCO's overseas investments have been into coal and oil/diesel fired power, vs only 13% for gas (all based on KEPCO's owned capacity). Of its [six power generation subsidiaries](#) there are more than two coal and oil/diesel projects for every one investment into gas-fired power.

⁹ Patel, Sonal. [South Korea Forays into Gas Turbine Manufacturing](#). Power Magazine. 3 August 2020.

¹⁰ In fact, [Korea East-West Power \(EWP\)](#) made Korea's first investment into US gas-fired power in 2011 when it purchased California Power Holdings and its small capacity [44.8 MW Red Bluff and 49.6 MW Chowchilla Power plants](#) in California. We ignore these assets given their size and the fact that EWP has made no further investments into either of those two facilities or into other gas-fired assets.

Risks from Efficiency and Policy

U.S. attitudes toward greenhouse gas emissions and the drivers of gas-power profitability are evolving rapidly, and not in investors' favor. The original thesis of U.S. natural gas as a clean energy alternative, or even merely a transition fuel, is falling apart.¹¹ Both North Asian investors now confront threats to their PJM gas-fired power investments. These assets may not be stranded tomorrow, but they're unlikely to have the earnings profile originally forecast.

The IEEFA/AEC report, **Risks Outweigh Rewards for Investors Considering PJM Natural Gas Projects**¹² provides a clear examination of these risks within the context of the PJM system.

PJM is the largest independent power system operator in the U.S. It coordinates the power flow from generators to local utilities across all or parts of 13 states.¹³ PJM is divided into 21 transmission zones, and each zone has its own energy prices based on locational marginal pricing.

PJM is one of the world's largest and most competitive energy pricing markets but remains behind the curve on renewable power. Over the past decade, gas power has tripled its contribution to PJM's generation mix from 12% to 36%, while renewables remain only 6% as of year-end 2019.

PJM's market fundamentals are poised to change. IEEFA/AEC's report finds the decade-long expansion in gas-powered plants will be reshaped by six major risks. We have simplified the most salient concerns into two main buckets: efficiency and policy. These risks threaten not only gas' status within the PJM system, but in the rest of the U.S. and throughout the world as well.

PJM gas-fired power assets are unlikely to have the earnings profile Japanese and Korean investors originally forecast.

¹¹ Bloomberg recently reported on Morgan Stanley research analyst Devin McDermott's work on US renewable penetration. McDermott thinks gas use by power generators will decline for most of the rest of this decade. (Eckhouse, Lin, Malik, and Merrill. [Peak Gas Is Coming to the U.S. Sooner Than Anyone Expected](#). Bloomberg. 22 October 2020.)

¹² Stanton, Wamsted, and Woods. [Risks Outweigh Rewards for Investors Considering PJM Natural Gas Projects](#). IEEFA & AEC. October 2020.

¹³ Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, as well as Washington D.C.

Efficiency

IEEFA/AEC's report points to demand stagnation and renewable energy cost competitiveness as key risks to gas-fired power investments – risks that Asian investors should not underestimate.

U.S. retail, commercial, and industrial energy consumption has become increasingly sophisticated, making energy efficiency a key factor in product, property, and process assessment. PJM's peak demand of 150.8 gigawatts (GW) in 2002 grew less than half a percent to 151.3GW in 2019, despite regional population growth of 7% and collective GDP growth of 77% over the same timeframe.¹⁴

Over the same period, renewable sources continued to improve. Wind power is now competitive with gas, while solar is already cheaper. Going forward, the U.S. National Renewable Energy Laboratory forecasts solar and wind costs/megawatt hour (MWh) will continue to fall, while gas power costs/MWh will trend higher. PJM's most recent capacity auction (2021-22) saw more new solar capacity cleared than in any of the four previous auctions, while no new gas-fired units cleared. While consumption efficiency is unlikely to reverse, the price of renewable power will continue to fall. This two-pronged efficiency improvement presents a growing challenge to gas-fired power investments in the PJM system.

One thing that has yet to change is PJM's flawed capacity market. As the report points out, part of PJM's overcapacity problems can be attributed to its wholesale market and an overestimation of peak load requirements. In 2019 PJM's installed capacity of 198GW was nearly 50GW higher than its peak load.¹⁵ PJM's base residual auction prices energy three years in advance, and thus sets a floor for plant revenues whether they provide electricity or not.¹⁶ This has led to significant overbuild, specifically in gas-fueled generating assets. PJM has been trying to reform its pricing market since 2014 but has yet to find the right formula. Until then, investors will be making a bet that consumers will continue to happily subsidize PJM's wasteful overcapacity.

PJM gas-fired power assets are unlikely to have the earnings profile Japanese and Korean investors originally forecast.

¹⁴ Population based off St. Louis Fed's [FRED](#) website data, while GDP calculation based off [Bureau of Economic Analysis](#) website data (current USD).

¹⁵ Stanton, Wamsted, and Woods.

¹⁶ Martin, Richard. [Overpowered: PJM Market Rules Drive an Era of Oversupply](#). S&P Global Market Intelligence. 3 December 2019.

Policy

Non-native overseas investors may be even less able to appreciate the rapidly evolving U.S. political and policy risks. Federal and state policy, as well as local political actors, continue to adjust to the evolving view of gas-fired power as a problematic fuel source.

PJM has the greatest share of new greenhouse gas (GHG) emitting electric generation of the seven major operators in the U.S. so its risk of stricter GHG legislation is elevated. The new Biden administration and the growing recognition of climate risks in PJM states could produce tougher federal, state, and local policies. At the same time, well-funded and highly organized local opposition groups, unrestrained by politics and bureaucracy, have already been responsible for numerous project delays and could pose more immediate challenges to PJM gas-fired investments.

These political risks are coming from the ground up and look unlikely to recede. Yale's School of the Environment program on Climate Change Communication has used a large dataset of over 25,000 responses to estimate U.S. attitudes toward climate change down to the state and local level.¹⁷ An analysis of PJM's 13 states and Washington DC shows attitudes largely in-line with national averages. However, when asked about political responsibility, PJM respondents want their local officials and governor to do more about global warming by a 4:1 ratio to those who think they should do less. While that ratio drops to 3:1 for congressional representatives, 60% of PJM respondents think the President should do more about global warming – an over 5:1 ratio.¹⁸ In the wake of Biden's win, of course, PJM's support for more action to combat global warming gains increased significance.

Risk Magnitude and Timing

The IEEFA/AEC report focuses attention on 11 specific gas-fired PJM power projects most at risk from evolving efficiency and policy risks. These projects have experienced significant delays, sometimes unexplained and sometimes due to local resistance. While all 11 projects remain in limbo, public and private market opinion on gas as a transitional fuel continues to move against them. As U.S. federal and individual states impose or accelerate emission reduction goals, every week or month of delay shortens the payback period for a new gas power project.

¹⁷ Analysis based on data downloaded from [Yale Climate Opinion Maps 2020](#). Yale School of The Environment Program on Climate Change Communication. 2 September 2020.

¹⁸ It should be noted that PJM area respondents prefer a private market solution, with 70% in favour of corporations and industry doing more to address global warming by an over 7:1 ratio against those opposed. The threat of local action is only growing.

Table 1: IEEFA – PJM Gas-Fired Plants in Development but at Risk

New Jersey	Ohio	Pennsylvania	West Virginia
Deepwater	Cadiz*	Allegheny Energy	Brooke County**
West Deptford		Archbald Energy	Harrison County
		Beech Hollow	
		ESC Tioga County	
		Good Spring	

*Cadiz may yet be resurrected as a green hydrogen plant after EmberClear commissioned Mitsubishi Power to supply hydrogen-compatible gas turbines.¹⁹

**Brooke County has hit a dead end since the PJM report came out. Nothing ever seems certain or permanent with these projects, but this project looks like another casualty of both local action (although from coal) and financial constraints.²⁰

Source: IEEFA.

North Asian lenders are active in the financing of PJM gas-fired power projects. Japanese and Korean banks have been regular sources of PJM gas-fired plants’ acquisition finance, construction loans, and refinancing requirements. Some Korean loans have been sold to domestic institutions and repackaged into structured products.²¹ Even though credit terms rarely exceed seven years, lenders need to carefully consider these threats from efficiency and policy. Medium-term lending should be repriced, if not reconsidered. We have assembled an indicative list of banks and other lenders which regularly appear on PJM plant financing announcements, below.

Table 2: North Asian Lenders Active in PJM Gas-Power Project Financing

Korea	Japan
Hana	MUFG
Kookmin	Chubu Electric Power
NongHyup	JERA
Mirae	TEPCO
JB Asset Management	Nomura
Industrial Bank of Korea	SMBC
Woori	Development Bank of Japan
Shinhan	

Source: Various press releases and press coverage, available on request.

¹⁹ Hering, Garrett. [Mitsubishi Lands 3.3 GW of New US Hydrogen-Compatible Gas Turbine Orders](#). S&P Global. 3 September 2020.

²⁰ Severino, Joe. [Company Says Brooke County Power's Gas-Fired Plant Project Off for Now](#). 9 October 2020.

²¹ Lee, JiHoon and Kim, Daehun. [Korean Institutions to Invest \\$600 MN in Two US Gas Power Plants](#). Korean Economic Daily. 23 January 2017.

Some of the same Korean lenders moved to equity investments in 2017, again with the intent to syndicate their exposure back home into repackaged retail insurance and retirement products. We found two principal investments into PJM gas-fired power assets in 2017, and one in 2018. All of them involved the financial services group of Korea's National Agricultural Cooperative Federation, NongHyup Bank, as well as NongHyup's NH-Amundi infrastructure fund and Kiwoom Asset management. It's possible these participants are only part of the picture as Korean asset managers may have invested into international infrastructure fund structures as well.

The bottom line is that Korean onshore professional as well as retail investors now hold products backed by PJM gas-fired power assets. These assets face accelerating climate risks that are difficult for even U.S. players to model and monitor. As the return profile becomes increasingly uncertain, the Korean institutions that created these products have a fiduciary responsibility to their clients to update them on risks confronting PJM gas-fired power assets. Korea's financial regulators may also wish to consider whether assets which carry such embedded climate risks are suitable for retail products, whether structured or plain vanilla.

PJM gas-fired power assets face accelerating climate risks that are difficult to model and monitor.

As mentioned above, Japanese strategic investors into PJM gas-fired capacity came early and charted a step-wise progression from initial acquisitions of minority interests in mid 2000s to full blown project sponsorship today. The U.S. market, and especially the PJM network, was understood to be the competitive training ground from which Japan's sheltered players could learn lessons. Japanese strategic investors have built up experience within PJM and often hold multiple gas-fired power assets.

J-Power's estimated USD800m commitment to build the 1,298MW Jackson combined cycle gas turbine (CCGT) plant outside Chicago is the largest equity investment yet by any single Asian entity into a PJM gas-fired power project.²² J-Power began to study the PJM market more than 20 years ago²³ and this latest

²² This is a rough estimate. [Sequoia's June 2019 Economic Infrastructure Income Fund Limited Investment Update](#) noted in its Market Summary section that there was a "\$1.6bn financing for 1.2GW Jackson Generation CCGT plant in Illinois" outside the fund's investment activities. [Credit Agricole's July issue of its Energy and Infrastructure Capital Markets Newsletter](#) then notes a total of USD790m of hybrid financing (USD100m senior secured, USD690m bank loans) closed for the project.

²³ Hori, Takahide. [Creating the Wholesale Market for Electricity in Japan: What Should Japan Learn from Major Markets in the United States and Europe?](#) MIT Center for Energy and Environmental Policy Research. June 2001.

venture comes 14 years after J-Power's first acquisition of a PJM stake in a gas-fired power asset in 2006. J-Power proceeded from study, to minority stakes in existing assets, to partial (max 50%) interests in new projects. This is the first time J-Power will take 100% interest in a PJM project.

J-Power has been planning this project since 2016 and designed Jackson with a view to PJM's ongoing shift to renewable energy sources in mind.²⁴ Mitsubishi's TOMONI Very Low Load (VLL) technology will be used with two of Mitsubishi's most advanced turbines for the first time. VLL technology allows the turbines to function like quasi-peaker capacity: during times of high wind and solar generation, the turbines can operate at very low (20-25%) output and stay within emissions compliance; when renewable resource production drops off, the capacity ramps back up quickly.²⁵ This kind of flexibility with emission compliance is critical as the penetration of renewable energy sources improves, but has proven elusive as most combined cycle turbines emit significantly higher emissions when they bottom out around 40% output idling level.²⁶

J-Power designed Jackson with a view to PJM's ongoing shift to renewable energy sources in mind.

Going forward, Japanese strategic investors will face the same risks from efficiency and policy that any PJM investor does. However, the bulk of Japan's investors have taken a deliberate and studied approach to entry into PJM assets. The biggest Japanese players are now among the most experienced in the PJM network. While this doesn't guarantee sound decision-making, Japanese strategic investors are arguably as informed and prepared as anyone within the PJM system to confront the accelerating risks to its gas-fired power projects.

In contrast to the Japanese, Korean strategic investors only arrived recently but increased their investment size quite rapidly. The country's first strategic investment into a gas-fired PJM asset came in 2018, when Korean IPP GS EPS purchased 10% minority interest in the decades-old Linden, New Jersey project. Less than one year later, Daelim and KEPCO subsidiary Korea Southern Power (KOSPO) committed over USD400m to take an 80% equity interest in the construction of the 1,000MW Niles project in Michigan. Niles marks the second

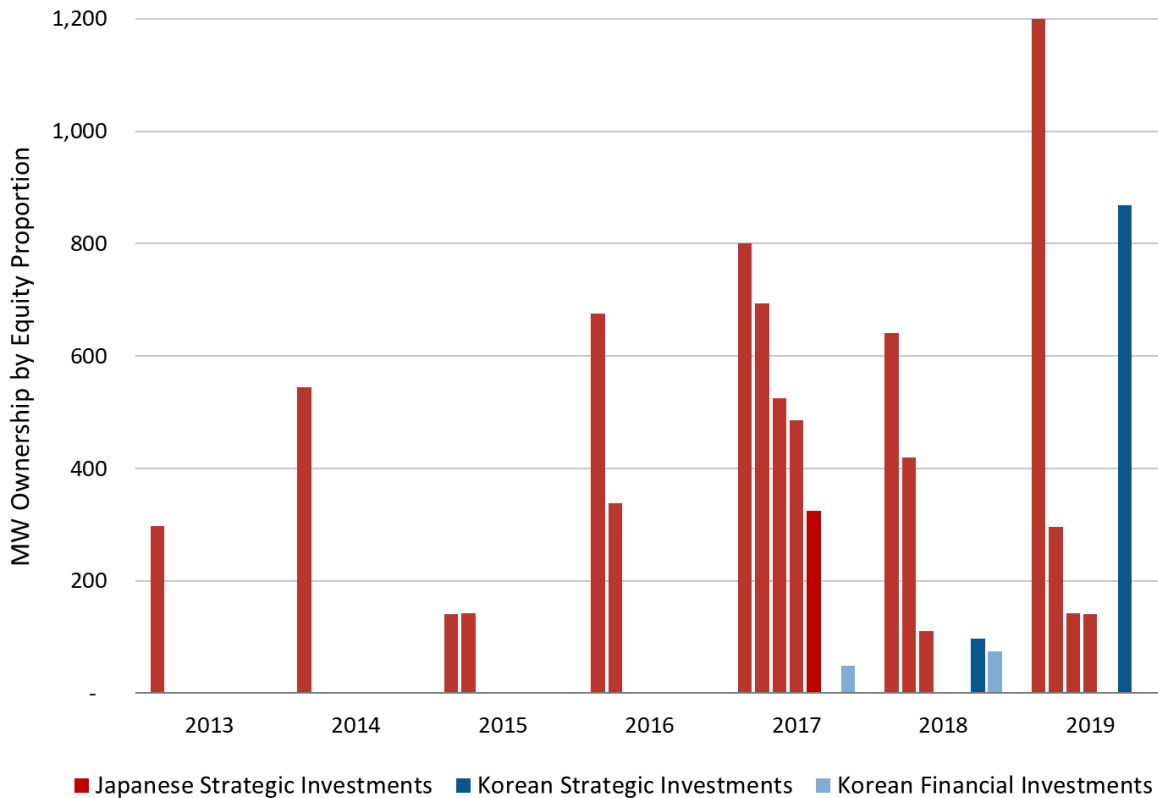
²⁴ Press Release. [Jackson CCGT Project in USA](#). J-Power. 28 June 2019.

²⁵ Mitsubishi Electric. [J-Power Orders Two MHPS JAC Gas Turbines to Continue the Decarbonization of Illinois' Electric Power Grid](#). 1 July 2019.

²⁶ IRENA. [Innovation Landscape Brief: Flexibility in Conventional Power Plants](#). International Renewable Energy Agency. 2019.

largest commitment (behind Jackson) of any collective or individual (KOSPO) Asian investor in a PJM gas-fired project.

Figure 1: Japanese and Korean PJM Gas Investments, in MW (2013-19)



Sources: This chart is our best effort to reconstruct recent PJM gas-fired power investment history. We do not claim that this is exhaustive and offer only as indicative. Strategic investment history reconstructed from corporations website, press releases, annual reports, and presentations of Toyota Tsushu, Chubu Electric, J-Power, Development Bank of Japan, Osaka Gas, Itochu, Tokyo Electric, JERA, Kyushu Electric, Showa Shell/Idemitsu, Sumitomo, Marubeni, Kansai Electric, Mitsubishi, Tokyo Gas, Sojitz, Shikoku Electric, Chugoku Electric, Nippon Oil, GS EPS, Daelim, and Korea Southern. Korea’s financial history reconstructed from articles from The Korea Economic Daily.²⁷

The Niles project was originally proposed by Indeck Energy in 2001 but had been shelved due to high gas prices. Indeck resurrected the project in 2016²⁸, gained both permitting as well as cleanup subsidies in 2017²⁹, but then saw multiple delays to

²⁷ Kim, Daehun. [Korean Investors To Provide \\$440m Financing in Their Largest US Power Plant Investment](#). The Korea Economic Daily. 12 September 2017.

²⁸ Booker, Ted. [Stars Align for Natural Gas Plants in Michiana](#). South Bend Tribune. 14 December 2016.

²⁹ Devereaux, Brad. [State Lets Power Plant Developers Capture \\$34M in Local, School Taxes](#). MLive Michigan. 19 December 2017.

ground-breaking due to financing.³⁰ At the end of the first quarter in 2019, KOSPO and Daelim Energy were announced as equity partners. KOSPO would invest USD250m³¹ for a 50% stake and Daelim would invest USD150m for a 30% stake.

KOSPO attached Korean content requirements for some of the construction, and those Korean-made parts have since arrived by ship to a port on Lake Michigan in Northern Indiana.³² Korea doesn't yet have turbine technology, but it can supply boilers and transformers. Following their commitment to Niles, KOSPO set up a foreign trade promotion vehicle (KPGE) to secure preferential guarantees from Korean state trade promotion vehicles – the Trade Insurance Corporation and the Technology Finance Corporation.³³ NongHyup arranged almost all of the financing as it continued to seek overseas alternative investments.³⁴

There is nothing inherently wrong with complicated and concentrated financing, nor in using Korean content. However, it does raise questions and concerns. KOSPO's ability to shoehorn Korean-made capital goods³⁵ into the buildout, despite necessitating travel halfway around the world and through the St Lawrence Seaway, suggests a lack of cost-sensitivity and concern for engineering efficiency. At the same time, the magnitude and complexity of Niles' financing displays an elevated risk appetite from a player with no PJM market experience and no track record of managing regulatory risk in Niles' jurisdiction.

KOSPO's Niles project fails to anticipate any change in PJM's energy mix going forward.

Korean strategic investors' rush into PJM stands in contrast to Japan's methodical and deliberate path. Without the benefit of Japan's U.S. market experience, Koreans now hold substantial execution, operational, political, and therefore longevity risk on a project that has seen a troubled history. For such a massive undertaking, the Niles project also fails to anticipate any change in PJM's energy mix going forward. While KOSPO, Daelim, and Indeck all make the case for the plant as a replacement

³⁰ Spalding, Mary Beth. [Indeck Might Not Break Ground on Niles Natural Gas Power Plant Until 2019](#). South Bend Tribune. 10 July 2018.

³¹ KOSPO is viewed as backed by KEPCO and therefore by the Korean government, so easily placed USD300m in senior unsecured Australian bonds in 2019 to be used for overseas investments – specifically Niles. Herh, Michael. [KOSPO Successfully Issues US\\$300 Mil. in Kangaroo Bonds in Australia](#). Business Korea. 29 October 2019.

³² [Ports of Indiana Handles Project Cargoes for Michigan Power Plant Project](#). Marine Log. 25 August 2020.

³³ [KOSPO Establishes KPGE to Spur SME's Overseas Market Entry](#). NewsWorld. 24 December 2019.

³⁴ Chung, Joo-won & Kim, Hyo-jin. [NH Bank Arranges Nearly Half of Funding for \\$1.05b Niles Power Plant Project](#). Pulse News. 8 May 2019.

³⁵ Korea has been historically reticent to offshore manufacturing, while Japan has localized production in the US for decades. Mitsubishi has manufactured gas turbines in Florida since 2014.

for coal-power, we have seen no indication from any of them on where they think this project fits within a PJM system increasingly served by cheaper renewables.

Conclusion

The U.S. golden age of gas was seen as a relatively sound investment theme until recently. Japanese investors came early and are now established players, while Korean investors have arrived within the last few years.

However, IEEFA and AEC's work on PJM highlights the accelerating and expanding risks to gas-fired power project development from efficiency (renewable competitiveness and overcapacity) and policy (global warming, gas prices, government actions, and local opposition).

It will be telling whether the Japanese strategic investors' patient and deliberate long-term strategy over 10-20 years has provided them with the necessary experience to navigate the approaching challenges. On the other hand, Korea has entered PJM's highly competitive market only within the last few years, has distributed substantial financial exposure back to onshore investors, and has now made one of the most concentrated bets on one of the largest investments of any Asian player into a troubled PJM project.

The risk to Korea's financial and strategic investors is objectively higher than to investors from Japan.

About IEEFA

The Institute for Energy Economics and Financial Analysis (IEEFA) examines issues related to energy markets, trends and policies. The Institute's mission is to accelerate the transition to a diverse, sustainable and profitable energy economy. www.ieefa.org

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