U.S.-ROK CIVIL NUCLEAR COOPERATION AGREEMENT:
OVERCOMING THE IMPASSE

Remarks by

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The United States and Republic of Korea have enjoyed a strong partnership for over 60 years – a partnership that has contributed to peace, security, and prosperity in the southern half of the Peninsula. It's an impressive success story of which Koreans and Americans can be proud.

A significant part of that success is our cooperation in the civil uses of nuclear energy. That cooperation started out as a one-way street, with the U.S. supplying the ROK with equipment and technology to get it started in the nuclear field. The U.S. was clearly the senior partner back then.

But over the years, the big brother, little brother relationship has been completely transformed.

The U.S. still has more nuclear reactors than any other country – 103. But South Korea has one of the largest and fastest growing programs in the world, with 23 operating reactors and plans to nearly double both that number and the share of ROK electricity generated by nuclear power.

The ROK has emerged as a major player in the worldwide nuclear market, with its $20 billion deal with the UAE and hopes to export about 80 reactors by 2030.

U.S.-ROK nuclear cooperation is no longer a one-way street. Instead, the two partners are interdependent. Westinghouse is a sub-contractor to KEPCO in the UAE project. ROK firms, especially Doosan, are providing reactor vessels and other heavy components to the AP1000 reactors being built in the states of Georgia and South Carolina.

In nuclear energy research and development, South Korea is one of America's major partners, if not the major partner.

But in the last couple of years, a question mark has appeared over this vibrant partnership. It has appeared because of difficulties in concluding a successor agreement to replace the current civil nuclear agreement between our countries – the so-called 123 agreement.

With the clock running out on the current agreement, and the two sides still divided on a central issue, the two governments decided earlier this year to extend the agreement for two more years. The extension would give them more time to find a solution and to ensure that nuclear cooperation can continue without interruption.

The two governments met earlier this week in Washington. I understand they made further progress on secondary issues. But differences remain on the central issue.

Some observers have seen this disagreement as a clash of competing and incompatible objectives and a litmus test of our alliance. Some have predicted a train wreck. I don't share this gloomy assessment of the situation.

Yes, the issues are difficult, and the stakes are substantial. And the disagreement does have the potential to disrupt our nuclear cooperation and become a significant irritant in our bilateral relationship.

But I am confident the impasse will be overcome and that agreement will be reached in time. And not only will the successor agreement allow our mutually beneficial nuclear cooperation to continue -- it will elevate that cooperation to a new level.

I am confident of this not only because our enduring bonds of friendship have always enabled us to overcome seemingly intractable difficulties in the past. I am also confident because time works in favor of finding a mutually acceptable solution.

That's because for the most pressing, near-term challenges, we have proven, well understood solutions. For longer-term challenges that require more research and collaborative effort to understand available options and make the right choices, we can afford to take more time.

As most of you know, the main stumbling block to reaching a successor 123 agreement has been the issue of reprocessing and enrichment -- two dual-use technologies that can be used either in the civil fuel cycle or in the production of weapons-grade uranium or separated plutonium for use in nuclear weapons.

The ROK wants the successor 123 agreement to provide U.S. advanced consent for South Korea to reprocess U.S.-origin spent fuel and enrich U.S.-supplied uranium.

The U.S. doesn't want to provide that consent now. Instead, it wants to keep the issue under review and defer a decision on consent until later -- when we better understand key technologies, evolving market conditions, and the implications for the proliferation of nuclear weapons.

The ROK would like to have a green light on a technology called pyroprocessing. South Korean nuclear scientists believe pyroprocessing is proliferation-resistant because it doesn't separate pure plutonium from spent reactor fuel.

The U.S. considers pyroprocessing to be a form of reprocessing and only slightly more proliferation-resistant than traditional reprocessing because, with additional chemical processing that can be performed by most states, the product can readily yield pure plutonium.

ROK scientists see pyroprocessing as a long-term solution to South Korea's increasingly urgent spent fuel management problem because it can reduce the volume of nuclear wastes. Moreover, they believe it can contribute to meeting the ROK's long-term energy needs because the product of pyroprocessing can be used to fuel future fast reactors.

The ROK also wants the capability to enrich uranium domestically in order to ensure that South Korea will have a reliable source of enriched fuel for its growing fleet of light water reactors.

It also thinks domestic enrichment will strengthen the competitiveness of South Korea's nuclear industry in the global nuclear market because the ROK will be able to offer customers a package of both reactors and fuel, as some of its competitors are able to do.

President Park, who has strong technical credentials herself, took a keen interest in the 123 issue when she assumed office earlier this year. She has repeatedly stated three goals:

1. Alleviate the spent fuel storage problem;
2. Ensure reliable access to enriched uranium to fuel the ROK's nuclear reactors; and

3. Promote the competitiveness of South Korea's nuclear industry in global markets.

The United States fully support those goals. And it believes they can be achieved without taking a decision -- at this time -- to provide advanced consent on pyroprocessing or enrichment.

First, spent fuel storage. All recognize this is a serious problem. Storage pools at ROK reactors will run out of storage capacity by around 2024.

But pyroprocessing cannot possibly solve the immediate and middle-term storage problem.

Pyroprocessing is still an experimental technology. It has been demonstrated on a laboratory scale. But it has yet to be proven on an industrial or commercial scale.

The economics of pyroprocessing are still unknown. Traditional reprocessing has proven to be a very expensive way to manage spent fuel. Japan's Rokkasho reprocessing plant cost $20 billion and will have an operating cost of about $2 billion a year. Its operating date has been delayed many times and is still in doubt.

Other reprocessing programs, including in Europe, have also been uneconomical. That's a major reason why several countries that initially pursued reprocessing eventually decided to abandon it. They include Argentina, Belgium, Germany, Italy, Spain, Sweden, Taiwan, the U.K., and notably the United States.

At a minimum, the economic case for pyroprocessing has yet to be proven.

Also unclear are the nonproliferation implications of pyroprocessing. Preliminary discussions have taken place between the IAEA and South Korea on whether a large-scale pyroprocessing plant can be adequately safeguarded -- in other words, whether the IAEA can verify that no nuclear materials have been diverted to non-peaceful uses. Reprocessing facilities are among the most difficult facilities to safeguard -- and the answers for pyroprocessing are not yet available.

Given these uncertainties, the U.S. and ROK agreed to begin an unprecedented joint examination of the technical and economic feasibility and nonproliferation implications of pyroprocessing and other spent fuel management methods. Called the Joint Fuel Cycle Study, it is scheduled to take 10 years. It got underway in 2011.

To enable the sharing of sensitive technology necessary to carry out the study, the two governments recently concluded the Nuclear Technology Transfer Agreement, an agreement the United States has never concluded with any other government – an indication of its respect for its nuclear partner. The study is now entering phase 2. The U.S. participants are pleased with how it is proceeding and impressed with the capabilities of their South Korean counterparts.

To address ROK concerns that the current 123 agreement doesn't provide for advanced consent, the successor agreement will explicitly provide for a joint review of the consent issue on the basis of the findings of the Joint Cycle Study.

But even if the study leads to a decision to provide consent for pyroprocessing – indeed even if a decision were made today to proceed with pyroprocessing -- pyroprocessing would not help resolve South Korea's near-term spent fuel problem.

The ROK's previously published plans do not call for building a relatively large-scale pyroprocessing facility until 2026 at the earliest. I understand that such a plant would have the planned capacity to process 100 tons of spent fuel a year. That is not nearly the capacity required to process the spent fuel expected to be discharged from Korean light water power reactors at that time.

So in addition to all the spent fuel that would need to be stored when pool capacity fills up by around 2024, there would be a large amount of newly irradiated spent fuel that could not be handled by planned pyroprocessing capacity in the 2026 timeframe and beyond.

In addition, there is major uncertainty over the timing of fast reactors. Much of the spent fuel management and fuel conservation benefits advertised for pyroprocessing come from using the product of pyroprocessing to fuel fast reactors.

But the schedule for commercializing fast reactors has slipped significantly in countries throughout the world, and doubts have arisen whether the technology will ever be commercialized. This has especially been the case for the Monju fast reactor in Japan.

I've seen estimates that a commercial-scale fast reactor will not be operational in the ROK until the 2040-2050 period at the earliest. That would mean there could be a sizable gap between the start of large-scale pyroprocessing and the consumption of the products of pyroprocessing as fuel in fast reactors. The result would be a growing accumulation of pyroprocessed material – material that can be converted into bomb-making material – without a ready disposition path.

The U.S. Argonne laboratory is working with KAERI on the design of a prototype sodium-cooled fast reactor. Hopefully their collaboration will increase chances for success. But in any event, realization of an advanced fuel cycle involving pyroprocessing and fast reactors -- if it proves feasible and economically viable -- is at least several decades away.

In the meantime, South Korea needs to store its spent fuel. Everyone agrees. Whatever the future of pyroprocesssing and fast reactors, interim spent fuel storage is necessary. Fortunately, a well-established and economical solution is available.

The United States has had extensive experience in dry cask storage of spent fuel. It is safe, effective, and affordable. Dry cask storage is now available at reactor sites in the United States, and we are currently exploring dry cask facilities at centralized locations. Estimates of the lifespan of dry cask storage have continued to grow. The Nuclear Regulatory Commission has concluded that they are safe and effective for as long as 100 years.

Dry cask storage is not new to the ROK. Dry casks are used at CANDU-type heavy water reactors around the world, and are presently located at the Wolsong reactor site. South Korea's highly capable nuclear industry and engineering firms clearly have the capacity to manufacture dry casks.

In response to President Park's desire to move expeditiously to address the spent fuel storage problem, the U.S. Department of Energy has begun a program of cooperation with ROK partners to share our experience and work jointly to develop practical solutions to the spent fuel storage problem, including the use of dry casks. An initial workshop was held in July and another meeting is planned next month.

So on the first of Madam Park's priorities -- spent fuel management -- a near-term solution is available, even while joint research continues and options are kept open on pyroprocessing and fast reactors as a longer-term solution.

On the second of her priorities -- reliable assurance of enriched uranium to fuel ROK reactors -- there is not an immediate problem. For many years, South Korea has pursued a successful strategy of satisfying its enriched uranium requirements by purchasing LEU in the international market.

It has wisely diversified its sources of supply to minimize commercial, technical, and political risks, dividing its purchases among the United States, France, and Russia. The market has worked well. There have been no disruptions.

Today's market -- with demand and prices low -- is a buyers' market. Although market conditions can be expected to change -- as, for example, Japan's reactors come back on line -- the market is likely to remain well supplied in the future. There is plenty of excess enrichment capacity in the world today.

Although all indications are that the market will remain a reliable and reasonably priced supplier of enriched uranium, there are steps South Korea could take to gain additional assurance. A promising approach, in my view, would be to acquire an equity share in an advanced, foreign enrichment operation.

While such an arrangement would not give South Korea access to enrichment technology, it would provide guaranteed access to uranium supplies and substantial control over production in the plant in which it is an investor. My understanding is that such an approach is being actively explored by the ROK.

An alternative option of seeking enrichment within South Korea has serious drawbacks. For commercial and geopolitical reasons, it is extremely unlikely that the most advanced foreign enrichment organizations like URENCO or Areva would construct an enrichment plant in the ROK – even a so-called black box arrangement designed to deny host country access to enrichment technology.

Recent conversations I've had with some of these companies have reinforced the impression that they are not interested in locating an enrichment plant in South Korea. I think South Koreans have gotten the same message from them.

There is also the option of South Korea developing its own enrichment technology and building its own enrichment plant. But I've heard great skepticism from experts that this would be a cost-effective approach for the ROK.

No doubt South Korean scientists and engineers could develop effective centrifuges. But enrichment companies that have been in the business for decades – repeatedly improving their methods and centrifuge designs – are at a huge advantage. It is very difficult for a newcomer to compete with them in terms of price or efficiency.

I'm told that, for a new entrant into the field, it is virtually impossible to produce enriched uranium more cheaply than it can purchase it.

The Japanese example is instructive. Japan has done research and development on centrifuges for over 40 years and spent billions of dollars. But it has not been able to produce a competitive design. I've seen estimates that its cost to produce enriched uranium is about 2.5 times the world market price. At most, it has produced 10% of its enriched fuel requirements. Currently it is producing much less than that.

I guess a country could decide to pay a very high price for the security of knowing that the fuel for its reactors was being produced on its own soil. But in the highly diversified, competitive, and well supplied international market for enrichment services, the risks of a supply cutoff or squeeze are extremely low – and could be reduced further by such approaches as part ownership in a foreign enrichment operation, building up an enriched uranium stockpile or reserve through foreign purchases, or subscribing to an international fuel bank.

So President Park's second priority goal – assuring a reliable supply of enriched uranium – seems readily achievable for the foreseeable future. And assurance of supply can be made even more reliable through various strategies, such as acquiring an equity stake in an existing enrichment operation.

Madam Park's third priority goal is to promote the competitiveness of the ROK nuclear industry as an exporter. It has been argued, in this connection, that a South Korean domestic enrichment capability could enhance the ROK's ability to sell reactors by allowing it to offer indigenously produced enriched uranium as part of the reactor deal – as Russia's Rosatom and France's Areva are able to do.

But in today's market there is little need for a reactor vendor to produce the enriched uranium for the reactors it sells. It – or the buyer – can acquire the necessary enrich uranium from a third country. Indeed, that is a common industry practice.

Moreover, if indigenously produced enriched uranium is more expensive than what can be obtained on the market – which will typically be the case for newcomers to the field – then bundling domestic enrichment services with reactor sales will hardly make an offer more attractive.

It is worth recalling that South Korea didn't need to offer enrichment services as part of the package in order to win the highly lucrative reactor deal with the United Arab Emirates.

Neither GE/Hitachi nor Westinghouse/Toshiba think they need to offer a package that includes enrichment services in order to compete in the reactor market.

And even if the ROK were able to produce and sell enriched uranium much more cheaply than other enrichers – which is quite unlikely – a key factor to consider is that the total cost of enrichment is a very small share of the total cost of nuclear power.

What is most crucial to competitiveness is the ability to build a high quality, reasonably priced reactor on time and on budget – not the ability to offer indigenously produced enrichment services bundled together with reactors. Korea's reputation as a reliable, efficient builder of safe, well-performing nuclear power plants will be the decisive factor in winning contracts – with or without the ability to provide enriched uranium produced in the ROK.

It might be argued that domestic enrichment would provide security against cut-throat competition. What if, for example, Rosatom and Areva simply refused to sell enriched uranium to fuel ROK-supplied reactors as a way of casting doubt on the viability of South Korean reactor bids? In those circumstances, it might be argued that even very costly domestic enrichment would be justified as a means of ensuring the credibility of ROK reactor offers.

The problem with that argument is that enrichers have a strong incentive to sell their product, especially in today's market, and it is therefore very unlikely that such tactics would be employed. But if the ROK were nonetheless worried about such extremely competitive and unlikely practices, it could arrange for assured supplies from an enrichment organization that was not in the reactor business and was therefore not a competitor – an argument perhaps for seeking an equity stake in an organization like URENCO.

So these are President Park's three main civil nuclear energy goals. The United States understands and supports them. It believes they can be achieved without taking a decision – at the present time – to provide advanced consent for pyroprocessing and enrichment in the ROK.

I am also aware of other, less frequently discussed reasons why the ROK would like to see a successor 123 agreement that contains approval for advanced consent. The ROK sees itself, correctly, as one of the world's leading nuclear energy countries and a close friend of the United States. It asks why the U.S. should, for example, provide advanced reprocessing consent to the Europeans, Japanese, and even the Indians, but not to ally and nuclear energy partner South Korea.

This is a very reasonable question – one that deserves a reasonable answer. I'll try my best, although I know it may not be fully satisfactory or persuasive to South Korean ears.

As you know, the United States traditionally – and the Obama Administration in particular – is strongly committed to the nonproliferation of nuclear weapons. It is a matter of vital national security interest for us. We know the ROK shares our commitment to nonproliferation.

As part of our commitment to nonproliferation, several Democratic and Republican administrations have discouraged the spread of fuel cycle capabilities to countries that do not possess operating enrichment or reprocessing facilities. EURATOM, Japan, and India possessed operating facilities when they were granted advanced consent.

The issue is not any lack of trust in South Korea's intentions. Despite recent public comments by some South Koreans, I don't believe the ROK Government has any serious interest in acquiring nuclear weapons. I, for one, accept at face value South Korean assurances that it only wants fuel cycle capabilities for civil nuclear energy purposes.

The problem is the example and precedent it sets for others. More and more countries are now interested in nuclear energy. There is a growing queue of countries lining up for 123 agreements with the United States – among them Saudi Arabia, Jordan, and Vietnam.

They will all be watching the U.S.-ROK 123 negotiations. If a successor agreement provides advanced consent, especially if it does so soon, it will send a signal – to those countries and others – that the U.S. is comfortable with the spread of indigenous fuel cycle capabilities. This will be damaging to our shared nonproliferation goals.

We both also want to press North Korea to give up its nuclear weapons capabilities, and that will involve abandoning its fuel cycle capabilities. Given the present attitude of the DPRK regime, we know this will be very difficult and could take a long time. We also know they have consistently violated the 1992 North-South Denuclearization Agreement.

But as long as we are committed to the complete denuclearization of North Korea – and we are and will remain so – we know that this difficult task will be made even more difficult if the North Koreans can cite active fuel cycle programs in the South.

I recognize that a politically-charged and even emotional issue in South Korea is the desire for parity with Japan's 123 agreement, which provides advanced consent. I can understand ROK feelings on this point. But I would ask South Koreans to bear in mind three points.

First, the granting of advanced consent to Japan took place at a time when Japan already had an operational reprocessing capability, not an experimental program.

Second, at the time, U.S. and worldwide concern with the implications of the spread of fuel cycle capabilities was not nearly as great as it is now.

And third, and perhaps most important, the Japanese experience with both reprocessing and enrichment – the spending of many billions of dollars over several decades for programs that have provided little if any commercial value – is not one South Korea should want to emulate.

It is also important to emphasize that the United States is not saying "no, never." It is saying "not now." It is saying let's not make premature decisions on such consequential issues as pyroprocessing and enrichment.

It's agreed that there is much that is still not well understood about pyroprocessing. Let's take the time to work on it together and put South Korea in a better position to make a well-informed decision. Both sides should approach the issue with an open mind.

Fortunately, there is no rush. The ROK can address the urgent problem of spent fuel storage while continuing to examine the best course for the long run.

South Korea can also take steps now to ensure reliable access to supplies of enriched uranium and to maintain its competitive market position. And it can do so while continuing to evaluate the evolution of market conditions and keeping its options open for the future.

It would be one thing if the United States were asking the ROK to sacrifice its nuclear energy plans to support global nonproliferation goals. But it is not asking South Korea to do that. It believes that continuing to do purposeful, world-class research on critical nuclear energy problems – and deferring major decisions the ROK can afford to take additional time to understand better – is both sound nuclear energy policy and sound nonproliferation policy.

With the two-year extension, the current 123 agreement will not expire until early 2016. But given the time needed for legislative approval, especially in the U.S., the two governments cannot afford to relax. Most of the agreement is completed. But the few issues remaining are the hard ones.

Putting them off until the 11th hour would be risky. It could elevate the issue to the top of the bilateral agenda, become a major irritant, lead to a hardening of public opinion on both sides, and put our presidents in a difficult position.

So I think the governments should seek an early agreement. In my view, it should contain the following elements.

The current provisions on consent should be retained, at least for the present time.

But provision should be made for a serious review of the consent issue once the Joint Fuel Cycle Study is concluded -- or sooner by mutual consent.

If the two sides agree that certain criteria have been met, they could decide to revise the agreement and provide for advanced consent to pyroprocessing or enrichment. And if they do, there should be prearranged procedures for expeditiously designating facilities in Korea where agreed fuel cycle activities could proceed.

In advance of the review of the consent issue, the Joint Fuel Cycle Study should be actively pursued. Certain research and development activities relevant to decision-making on the pyroprocessing issue – activities not currently authorized to be carried out at ROK facilities – could be approved to take place at those facilities. This would not only provide a better basis for informed decisions on the consent issue, but would also provide useful practical experience, especially for South Korean personnel, should consent for full-scale pyroprocessing later be granted.

Looking to the longer term, KAERI and Argonne should move ahead promptly in their joint work on a prototype fast reactor – because the progress and timing of their efforts will have an important bearing on key fuel cycle choices.

And while research proceeds on pyroprocessing and fast reactors, immediate steps could be taken to address the goals identified by President Park.

In particular, assisted by ongoing cooperation between the U.S. Department of Energy and South Korean waste management experts, an urgent solution should be pursued to address the interim spent fuel storage challenge, perhaps employing dry casks.

And to meet the goal of reliable access to enriched uranium – whether to fuel ROK reactors or support South Korean reactor sales abroad – the ROK should actively explore options such as an ownership share of an advanced, foreign enrichment operation.

A successor 123 agreement will complement and support these efforts. It will help bring cooperation between our two advanced and increasingly integrated nuclear industries to an even higher level. And it will be another important symbol of a close and enduring bilateral relationship.

But reaching agreement will not be easy. It will require the ability of each side to understand the other's needs and to make appropriate adjustments. But if both sides give priority to challenges that must be addressed now and for which we have available solutions – and if they recognize that some other problems could benefit from further study and do not require early decisions – then I am confident that a mutually beneficial agreement will be achieved.

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