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Energy and Security in Northeast Asia

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edited by Michael Stankiewicz

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ENERGY AND SECURITY IN NORTHEAST ASIA

by Michael Stankiewicz

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Introduction

Since 1993, the Institute on Global Conflict and Cooperation (IGCC), a state-wide policy research institute of the University of California, has coordinated a series of high-level, track two consultations among security experts and officials from China, Japan, North and South Korea, Russia, and the United States.[1]
Known as the Northeast Asia Cooperation Dialogue (NEACD), this forum has sought to reduce mistrust within the North Pacific region, and to avert conflicts among the major powers in Asia through ongoing, multilateral dialogues about current security issues. The informality of the process allows the participants to air their concerns and brainstorm about new approaches to building cooperation and reducing the risk of conflict in Northeast Asia.

Over the course of four Dialogue meetings, one conclusion that emerged is that military confidence- and security-building measures (CSBMs) may be conceptually too narrow for the Northeast Asia subregion.[2] Given that Asia has no history of regional or multilateral security institutions, mutual reassurance measures (MRMs), i.e., broader measures to promote a basis for mutual confidence and reassurance that include but are not limited to military related measures, are more appropriate for Northeast Asia. In A Maritime Regime for North-East Asia, Mark Valencia described the increasing importance of “cooperative security” for confidence-building in the Asia-Pacific. It recognizes the NEACD philosophy that emerging security threats are represented more by problems confronted by all countries and increasingly less by threatening states and their militaries. As Valencia notes, the three elements of cooperative security are “security with one’s neighbors as opposed to security against them; a broad interpretation of security threats to include among other things environmental degradation and resource

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[1] Track two fora include academic and government participants in informal, off-the-record discussions. All government members, while actively serving in high-level positions within their government, participate in a private capacity and do not represent the official views of their government.
[2] For a complete description and history of NEACD, please see Appendix B.

access; and an emphasis on multilateral institutions and processes for managing regional issues and promoting habits of dialogue and cooperation."[3]

As an expression of this philosophy, the participants in NEACD devote at least one session of each of its meetings to discussion of a non-security issue to promote the importance of broad-based MRMs. Subjects of past NEACD discussions, in which the necessity for regional cooperation was identified and potential cooperative efforts examined, included economic complementarity, the environment, agriculture and food supply, and energy. Following a discussion of the security impact of energy issues at the Dialogue IV meeting in Beijing in January 1996, the participants of the NEACD decided to focus on energy and all its related elements as a perceived non-military security threat emerging in Northeast Asia. In conjunction with its next meeting in Seoul in September 1996, NEACD will host a two-day workshop on Northeast Asia energy issues that will bring together leading experts from the participating countries on energy demand and supply, nuclear fuel cycle concerns, and how these issues impact upon the security decision-making process in each country in the region. But energy is not only a possible threat, it is also one of the most promising areas for cooperative security. The workshop thus will explore the potential for regional cooperation in energy as a promising MRM in Northeast Asia.

The Looming Energy Crisis

Increasing competition for energy resources is one of the consequences of rapid Asian economic growth that is producing growing insecurity in the region. This connection is best described by Kent Calder in Pacific Defense, his 1996 analysis of growing insecurity in the Asia-Pacific and the U.S. role in the future of Asia.[4]

Economic growth gives Asian nations the resources to strengthen their military might, but it also results in rising energy demands, and the need to secure stable energy supplies in competition with one's neighbors increases global insecurity and a region-wide arms buildup.

Petroleum, coal, and natural gas continue to be in insufficient supply in Asia, which provides only 11 percent of global oil production and 4.5 percent of reserves.[5] Japan, with half the region's economic output, remains 95 percent dependent on oil imports. The growing Chinese economy's hunger for energy will soon make that country a net oil importer despite its status as the top supplier of energy in Asia (with Indonesia). And increasing demand among other countries in the region will intensify competition for oil supplies and raise insecurity about neighbors' plans to ensure a supply of energy.

Not only does this growth create greater dependence upon Middle East oil-producing nations (an East–West Center study estimates that Asia's share of oil imports from the Middle East will rise from 70 percent in 1993 to 95 percent in 2010), but, most importantly, it creates tension surrounding reliability of access to shipping lanes from the Middle East to Asia.[6] The approaches to the Strait of Malacca (for smaller tankers) and the Lombok and Makassar Straits in Indonesia (for larger tankers) are surrounded by Southeast Asian nations (Malaysia, Indonesia, and Singapore) which control those straits and surrounding waters with increasing naval might. And China's strengthening naval presence and territorial claims to waters of the South China Seas, reflecting its own desire to secure shipping lanes for its energy supply and trading routes, will likely further heighten tension in the waters of Southeast Asia.

One solution to the energy demand crisis in Northeast Asia is nuclear energy, but as Edward Fei of the United States Department of Energy notes in his section in this paper, growing civilian nuclear power programs raise the risk of diversion of nuclear materials for military purposes, as evidenced by the North Korea nuclear weapons production crisis of 1994, and the resultant Framework Agreement with the

[3] Please see Mark Valencia, *A Maritime Regime for North-East Asia* (Hong Kong: Oxford University Press, 1996), 10. Valencia points out that this is an extension of the concept of comprehensive security (security achieved through interdependence and increasing non-military cooperation).

[4] Kent E. Calder, *Pacific Defense: Arms, Energy, and America's Future in Asia* (New York: William Morrow, 1996). Particularly see chapter 3 (Looming Energy Insecurities) and chapter 4 (Asia and the Nuclear Threshold).

[5] Fereidun Fesharaki, Allen Clark, and Duangjai Intarapravich, "Energy Outlook to 2010," Analysis from the East–West Center, No. 19, April 1995, 2.

[6] Fesharaki, Clark, and Intarapravich, eds., "Pacific Energy Outlook: Strategy and Policy Imperatives to 2010," *East–West Center Occasional Paper, Energy and Minerals Series* no 1, March 1995.

United States. Northeast Asia contains three nuclear weapons states (the United States, Russia, and China), and Japan and South Korea maintain large and growing civilian nuclear programs which further contribute to anxieties in the region. But, Fei contends, security decision makers in governments are not sufficiently aware of these issues.

Potential for Cooperative Solutions

But the goal of the NEACD Energy Workshop is not to scare everyone about the impending doom that growing energy demand means for the region. While recognizing energy demand as a source of insecurity that will continue to grow in the near future, it also remains one of the most obvious areas for first-step MRMs under the visage of "cooperative security." As Michael May and Celeste Johnson illustrate in the first section of this publication, there is no economic reason why global supplies and reserves of energy cannot meet expected demand over the next 100 years. Energy problems remain the children of political, social, trade, and security constraints—nowhere is this more true than in Asia.

While the greatest energy demand in Northeast Asia lies in Japan, South Korea, and China, available resources are abundant in Russia, China, and the United States. But taking advantage of those resources requires cooperation between the countries in the region. For example, major projects to ship natural liquefied gas from Yakutsk in Russia and potential sites in the South China Seas such as the Natuna fields to the energy-hungry countries of Northeast Asia have been suggested.[7] But this requires tremendous capital for infrastructure, a high level of technology, and cooperation on the part of all governments to build such a complex infrastructure and to allow free access through sovereign territories.

Nuclear energy remains a viable alternative to help fill the energy void, but as Fei's paper discusses, diplomatic and technical cooperation is required to make sure that problems of nuclear waste, weapons-grade material stockpiles, and nuclear safety do not become a threat to security instead of a solution. Examples of other regions that have turned cooperation on nuclear issues into a positive confidence-building process include the EURATOM in Europe, the Korean Energy Development Organization in North Korea, and the Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC) in South America. In the final section of this policy paper, Tatsujiro Suzuki uses the EURATOM as a model to examine how a similar regional nuclear cooperation scheme in Asia might become an invaluable first-step MRM, and what lessons from the EURATOM experience apply to the different diplomatic circumstances in Asia.

Most importantly, it is building a concrete sense of cooperative security that is the foundation for solving the security crisis brought about by increasing energy demand in Northeast Asia. Thus, any first-step MRMs that move the cooperative, multilateral peace process in a positive direction, energy-related or not, play a vital role in this trend. That, ultimately, is the goal of the Northeast Asia Cooperation Dialogue, and we hope the Energy Workshop in Seoul, Korea, 11–12 September 1996, will contribute to this process.

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[7] Please see Allen S. Whiting, "Yakutiya Gas," in Mark Valencia, ed., *The Russian Far East in Transition* (Boulder, Col.: Westview Press, 1995), 111–123; Dr. Ken Asakura, Pre-Feasibility Study of the Trans-Korean Peninsula Pipeline, prepared for Northeast Asia Economic Forum Sixth Meeting, East–West Center, Honolulu, 18–20 January 1996; and Mark Valencia, ed., *Regional Transportation and Communication in Developing Northeast Asia: Status, Problems, Plans, and Priorities* (Honolulu, HI: Northeast Asia Economic Forum, 1994), esp. 70.

SOME THOUGHTS ON ENERGY, ELECTRICITY AND SECURITY

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Introduction

Rapid industrialization in developing countries will require an increasing amount of energy, particularly electricity. This increased demand will have a number of consequences, environmental, economic, and political. In particular, it is likely to cause security concerns in newly industrialized, rapidly growing economies as well as in developed economies. Concerns about the availability and accessibility of increasingly costly resources, the environmental consequences of increased electricity consumption, and the problems attendant upon the resultant growth in nuclear power, if not addressed, are potential sources of conflict. Cooperating governments can take several steps now to begin to address these concerns. In this paper, we discuss both the concerns and preliminary steps to relieve them, with particular attention to the case of East Asia, a salient example of security dilemmas arising from increased demand for energy and electricity.

Economic Growth and Energy Needs

Economic growth implies growth of energy demand, and is particularly associated with an increased need for electricity. Over the past few decades, the use of electricity world-wide has been coupled with economic growth as shown in Figure 1.

In developing countries, which started from a very low base, as Figure 2 shows, percentage growth in electricity use rose much faster than economic growth.

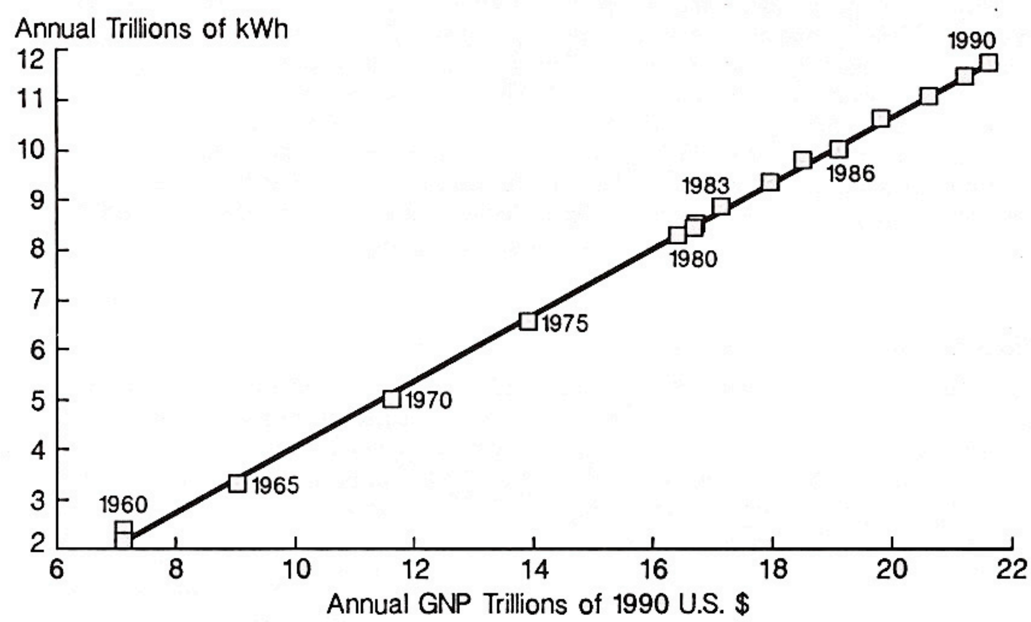

Figure 1: Growth of Worldwide Electricity Use versus GNP.

From Chauncey Starr, "Global Energy and Electricity Futures," *Energy* 18 (3): 225–237.

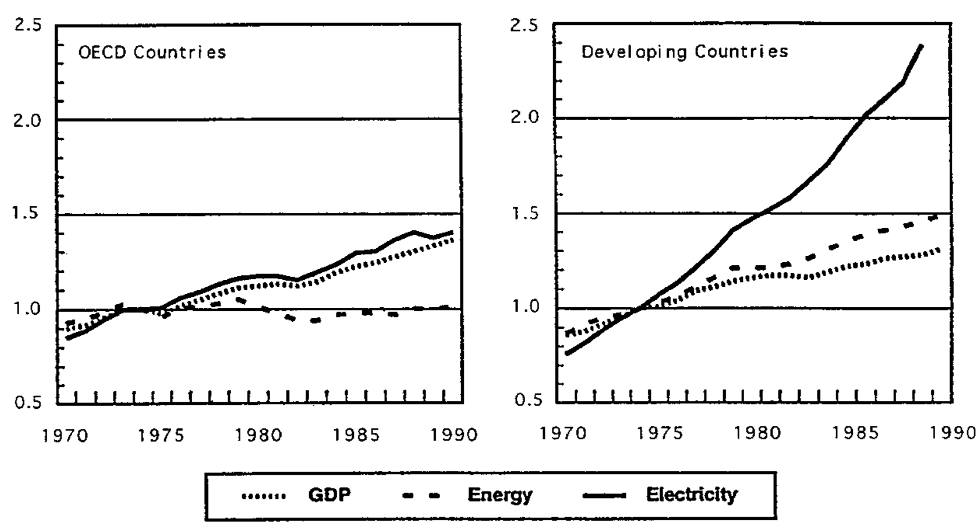

Figure 2: Growth in Energy Use, Electricity Use, and GDP over Time in OECD and Developing Countries (Per capita values; normalized to 1.0 in 1974).

From Jor-shan Choi, *A Regional Compact for the Peaceful Use of Nuclear Energy in East Asia*, Center for International Security and Arms Control Working Paper, 1996.

Even assuming a high level of conservation in the future and some increase in energy costs, it is hard to envision this trend changing. For example, in several important cases, conservation leads to increased use of electricity at the expense of other forms of energy. And a rise in fuel costs has less effect on the cost of electricity than on the cost of transportation or heating, because a larger fraction of electricity costs go to fixed plant and other infrastructure capital expenditures (e.g., railroads and port facilities).

As a result, under a set of conservative assumptions shown in Figure 3, installed electric capacity is estimated to increase two to five times in the next 50 years with most of this growth occurring in the now-developing countries.

At present, major disparities exist in electricity consumption between the developed and the developing countries, as well as disparities among the developed countries themselves, as illustrated in Figure 4. Some of these disparities will inevitably persist into the next half century and beyond. Economic growth will remain uneven throughout the world.

It could happen that the world as a whole will fail to achieve even the modest growth postulated above. In that case, the concerns discussed in this paper will not arise, but then worse security problems likely would arise. A lack of economic growth during periods of high expectations and modern military force development (as in Asia) has been a recipe for international conflict. Thus, from a security standpoint, the optimistic assumption to make is that average world economic growth will not fall below the figure quoted, which is roughly what it has been for the past 50 years. With this growth comes expanded use of energy, in particular electricity.

Concerns associated with this increased demand, as we shall see below, can only be addressed through coordinated action over the long term among countries. Unfortunately, the time horizon for this action is several decades, and other seemingly more pressing and more divisive issues dominate the agenda. Using East Asia as an example, we first outline some of the concerns associated with growth and next make some recommendations.

- World population in the 9–12 billion range
- World average economic growth remains around 2.3 percent
- Maximum conservation accounts for about 30 percent savings in total energy
- Only modest changes in real busbar costs of electricity

Figure 3: Some Assumptions for Predicting a Two-to-Five-Fold Increase in Installed Electric Capacity Worldwide

Security Concerns

Availability and Access to Energy Resources

The first concern is whether enough fuel resources will be available for the anticipated growth in all forms of energy consumption, specifically electricity consumption, at prices that will not raise the cost of electricity significantly. The answer is generally believed to be yes, if we take the world as a whole and if we consider all the coal, gas, oil, and uranium available at or near present costs. Figure 5 shows a recent assessment, including consumption through 1990.

While oil and gas prices are expected to increase in real terms in the next 50 years,[1] and while obtaining electricity from solar and biomass require significant development to be economically competitive in most parts of the world, coal and nuclear reserves (assuming reprocessing in the case of nuclear power, whenever it becomes economical, presumably in the next century) are sufficient to provide for the

[1] The Energy Information Administration (EIA) of the US Department of Energy (USDOE) projects that the real price of oil will rise from about $18 a barrel in 1993 to $24 a barrel (in 1993 $) by the year 2010. See EIA, *Annual Energy Outlook with Projections to 2010* (Washington, D.C.: EIA, Office of Integrated Analysis and Forecasting, USDOE, 1995). For a longer-term forecast, with prices reaching $50 (in 1993 $) in 2050, see *Second-Round Study Design for EMF 14: Integrated Assessment of Climate Change* (Stanford, Calif.: Stanford University Energy Modeling Forum, Terman Engineering Center, 1995), p. 8.

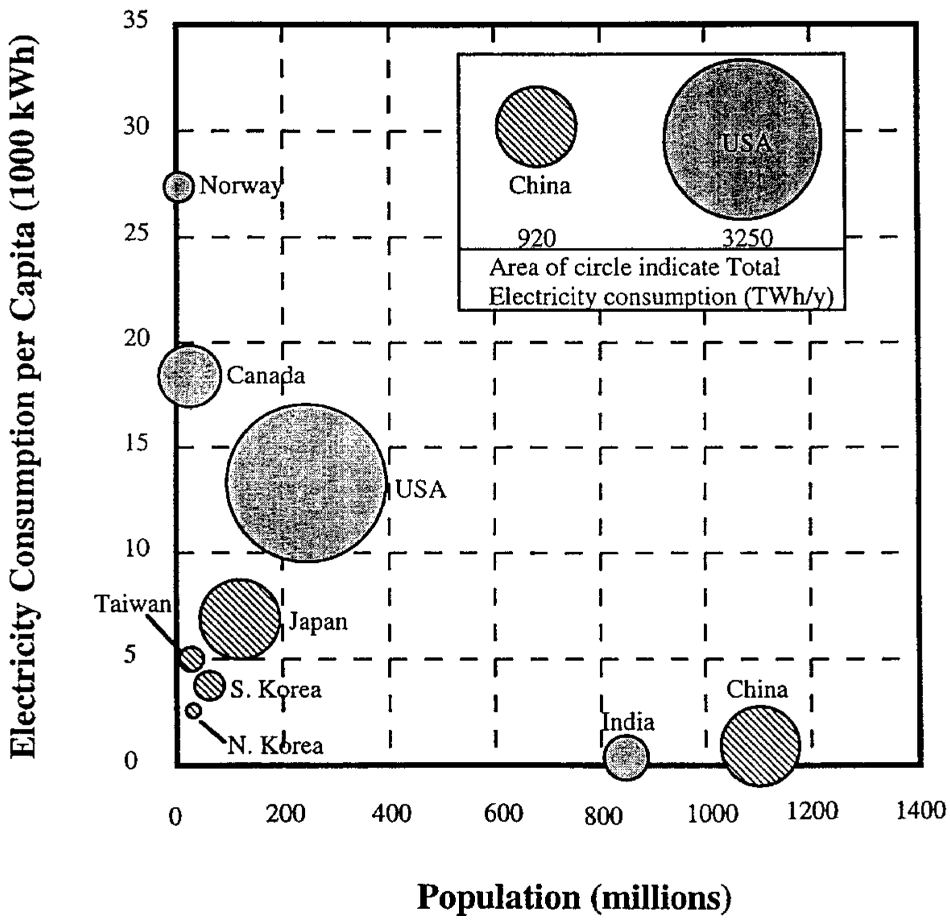

Figure 4: Electricity Consumption versus Population for Various Countries

From Jor-shan Choi, *A Regional Compact for the Peaceful Use of Nuclear Energy in East Asia,* Center for International Security and Arms Control Working Paper, 1996.

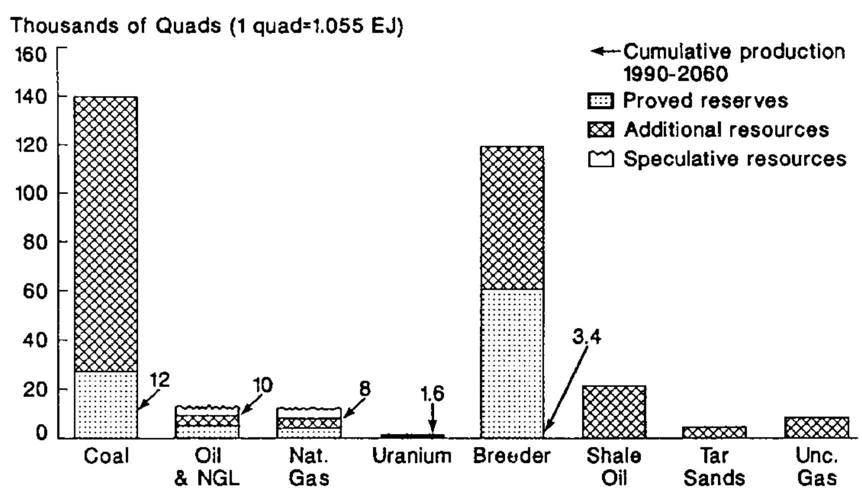

Figure 5: Mineral Energy Resources and Cumulative Production (1990–2060)

From Starr, Searl, and Alpert, "Energy Sources: A Realistic Outlook," *Science* 256 (1992).

energy needed for hundreds of years, even at higher rates of consumption.

But total reserves are only part of the story. The more important resources—coal, oil, gas—are not evenly distributed and are often not near the points of consumption or within the major consuming countries. Since most economic growth is slated to occur in the developing countries, patterns of international distribution are likely to change.

The developed countries, in addition to sizable if insufficient fuel reserves of their own, have well-established import agreements with suppliers all over the world. The more rapidly growing developing countries, on the other hand, will need to establish new supply arrangements with the regions that will have an exportable surplus of energy fuels, such as the Middle East and Central Asia. Despite sizable reserves, the East Asian countries, China in particular, must make arrangements for larger quantities of imported oil and gas.[2] The size of domestic oil and gas resources is not well established in China, the largest potential user in the world. Established reserves are insufficient to fuel Chinese economic growth. Exploration for remote (and potentially expensive) new oil resources has begun, and while natural gas so far has been neglected, new finds could change the resource picture significantly.[3] The growth of East Asian fuel imports starting this decade is likely to affect market conditions throughout the world.

While there is no economic reason why such new supply arrangements cannot be accommodated by markets in an efficient way, the anticipation of large new demands on limited low-cost resources can have a negative impact on security perceptions if the growth in demand is not planned for in a joint or at least transparent manner. Essential to such planning is the assumption of free flows of goods and money between resource-rich and resource-poor countries. The inability to make such an assumption led states in the past to arms races and wars. It is far from clear today to states with a larger demand for energy fuels whether they can make the assumption of continued free flow of fuels under all circumstances, or what military forces might be effective in guaranteeing supply under tomorrow's technological conditions. China and other East Asian states are investing in long-range navies and air forces with no clear idea as to their utility.[4]

In addition, trading weapons and technologically sophisticated components and systems for preferred or assured access to oil resources is a normal *modus operandi* between Western countries and favored Middle East oil suppliers. China and North Korea have the same incentives to carry on this trade as the West, and they have additional incentive that sales of weapons and technological systems can help relieve their hard currency shortage. Under the present close relations between the Gulf States and the West, and given the difficulty Iran has in securing weapons and technologically sophisticated components and systems from the West, it is not surprising that China and North Korea are establishing such a relationship with Iran. The same situation may develop in other states in Western or Central Asia. This will continue to lead to perceived security threats.

Availability of Capital

A second problem is the availability of capital to build electrical generating plants, or in some cases, to modify them to meet current safety standards. East Asia, with high-savings economies, should be able to finance the desired development if present savings and investment patterns continue. In addition, inter-Asian trade and capital flows are increasing among Asian countries. The questions to be resolved have more to do with priority and efficiency than with total capital available. Foreign investments are needed more as a step to acquiring needed foreign technologies than purely as capital.

But some non-economic factors, in East Asia as elsewhere, affect the availability of capital for power plants. Electricity shortages have been estimated at 30 percent in China, meaning that 30 percent more electricity could be sold there at prices that would repay investment. An Asian Development Bank estimate notes that the foregone income for each kilowatt-hour not provided in China ranges up to U.S. $0.30 while the additional price of electricity that

[2] Kent E. Calder, "Asia's Empty Tank," *Foreign Affairs* 75 (March/April 1996).

[3] See Jonathan Sinton ed., *China Energy Databook,* 1996, Chapters I and II. This work was published by the Lawrence Berkeley National Laboratory, Berkeley, California, under support by the Office of International Energy Policy of the U.S. Department of Energy.

[4] See Charles Wolf, Jr., *et al., Long-Term Economic and Military Trends, 1950–2010,* N-2757-USDP (Santa Monica, Calif.: RAND, 1989).

would attract investment is only U.S. $0.09.[5] While many businesses could pay the additional price for electricity, hundreds of millions of people, whose support of continued development is essential, could not. There is therefore a continuing need for "lifeline rates" lower than some business rates. This is common in many countries that provide electricity to less affluent populations at lower than economic rates for the purposes of both securing political support and bringing the rural population up to a standard of living, education, and health level that would make them more productive. But the problem in China, with its 300 million reaching-first-world population and its 900 million third-world population, is on a much larger scale than any previous one.

Table 1 shows the breakdown of electrical power generation in certain countries now and in 2010. The planned expansion in China would cost on the order of US$300 million.[6]

Environmental Consequences of Increased Energy Consumption

A third question to which much attention is being devoted today concerns the environmental consequences of the anticipated growth in energy consumption. The security aspects of these questions are associated with combustion of carbon-based fuels (oil, coal, and gas), and with the storage and disposal of spent nuclear fuel, with the land use associated with hydroelectric, biomass, and other diffuse forms of energy also raising concerns.

All sources of energy have "front-end" and "back-end" fuel cycle problems, which usually are not internalized in the cost of these resources (the back-end fuel cycle of nuclear energy is a partial exception). These problems include damage to land and streams and acid rain. In the past, the international aspects of these problems were felt mainly in the high-consumption small countries of Europe. But increasingly, the international aspects of these problems will be understood more widely.

All hydrocarbon fuels increase the emission of carbon dioxide into the atmosphere. It will be impossible to do away with or even reduce anthropogenic carbon emissions over the next 50 years. On the contrary, the rate of emissions is likely to increase beyond the current six billion tons annually. The connection between carbon emissions and global warming is being slowly clarified. As of now, the preponderance of evidence seems to point to warming between 1.5°C and 4.5°C when the atmospheric concentration of carbon dioxide doubles, which is expected within the next 100 years.[7]

The connection between global warming and human welfare remains shrouded in uncertainty, but it is likely not only to be significant but also geographically uneven. The atmosphere's total heat- and moisture-carrying capacities are two of a long and lengthening list of common pool resources which human activity is threatening to deplete. The social and political problems interfering with rational economic solutions to such problems are not easily overcome.

China will eventually be the largest emitter of carbon into the atmosphere, and given its huge population, China is bound to be first or second in nearly every measure of consumption and pollution. More significant is the fact that the citizens of China and East Asia are only the first of several billion people striving to achieve first world economic standards.

China could cut its carbon emissions significantly by modernizing its inefficient, aging coal-fueled power plants. It is estimated that the heat content-to-electricity efficiency of China's coal-fueled plants averages 20 percent versus the nearly 40 percent possible in modern plants.[8] But such conversion, as with construction of nuclear plants and every other method of cutting consumption and pollution, requires tremendous amounts of up-front capital.

Finally, China, as one of the largest geographic countries in the world, probably has the greatest hydroelectric potential of any country. This is only beginning to be tapped.[9] Large sites remote from the places where electricity is needed require high transportation costs and cause significant impact on land use policies.

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5 Binsheng Li and James P. Dorian, "Change in China's Power Sector," *Energy Policy* 23 (7).

6 Li and Dorian, *op. cit*.

7 IPCC , *Climate Change: The IPCC Scientific Assessment* (Cambridge: Cambridge University Press, 1990).

8 Li and Dorian, *op. cit*.

9 Jonathan Sinton, ed., *op. cit.*, p. I-3.

1995	China	Japan	S. Korea	N. Korea	Taiwan	Russia F.E.
Total electricity consumption, TWh	920	840	160	50	110	--
Per capita electricity consumption, kWh	760	6700	3600	2300	5000	--
Electricity generating capacity, GWe	206	190	23	7	21	--
%						
oil coal gas hydro nuclear	7.5 72.0 0.5 20.0 1.0	30 8 22 20 20	23 18 12 11 36	40 60 --	25 28 5 17 25	--
Nuclear capacity GWe (year) % Forcast:	2.1 (1994) 1% 17.0 (2010) 9%	38 (1994) 20% 70.5 (2010) 42%	8.2 (1995) 36% 20.4 (2010) 38%	0 (1995) 0% 2.0 (2010)	5.3 (1995) 25% 7.9 (2010) 21%	--

Table 1: Electrical Power Generation in Certain Countries of East Asia Now and in 2010

From Jor-shan Choi, *A Regional Compact for the Peaceful Use of Nuclear Energy in East Asia,* Center for International Security and Arms Control Working Paper, 1996.

Nuclear Energy

Nuclear power avoids many of the availability and environmental problems discussed above, but other problems arise from the perceived connection between nuclear power and nuclear weapons (please see pieces by Fei in this Policy Papers for further details about security implications of the nuclear fuel cycle). But this connection is weak to date. States acquiring nuclear weapons relied on making the fissile material in dedicated plants or diverting it from a research reactor rather than on diversion of fissile material from safeguarded nuclear power plants. We expect that safeguarding of power plants should become even more effective for both technical and political reasons. However, the connection between nuclear power and nuclear weapons remains important politically. In addition, spent nuclear fuel poses problems both because of public fears of radioactivity and because the spent fuel usually contains weapons-usable material.

The trend in some countries, led by the United States, has been away from nuclear power, because of concern about the spread of nuclear capability and nuclear fuels, as well as economic difficulties. The two reasons reinforce each other: while coal and nuclear power are generally competitive, nuclear power is more vulnerable economically to delays generated by political opposition, since a larger fraction of its cost must be paid (and borrowed) before operations begin.[10] Many utilities thus turned away from nuclear power when political opposition was strong enough to cause delays.

Deregulation of electric utilities in the United States, together with the availability of cheap gas, means that the trend is likely to re-

[10] *IAEA Yearbook 1994* (Vienna: International Atomic Energy Agency, 1994), p. C-15. This comparison does not take into account the full environmental costs of using coal or gas, nor the cost of improving the transportation infrastructure where that is needed.

main in the United States for some decades. In Europe, the situation is more mixed economically and politically. The current trend in East Asia is to plan and order nuclear power plants as a form of energy security in the absence of sufficient indigenous or convenient fossil fuels. All the leading economies in the region, Japan, South Korea, and Taiwan, are at least 30 percent dependent on nuclear energy for electricity and plan for higher dependence in the future. Elsewhere, nuclear energy is in the early growth stage: In China, for instance, the total proportion of electricity from nuclear is not slated to rise over a few percent in the next 20 to 30 years despite a planned ten-fold growth. Table 2 shows what exists now and what is planned for the next 20 years in East Asia in terms of nuclear reactors, fuel fabrication plants, and disposition of spent fuel.

Nuclear Fuel Cycle Activities in East Asian Countries

Nuclear Fuel cycle Activities in East Asian Countries

Fuel Cycle Activites	China	Japan	S. Korea	N. Korea	Taiwan
Natural U acquisition	Domestic	Foreign (US, Australia, etc)	Foreign (US, Australia, Canada, etc	Foreign (China, Russia)	Foreign (US, Canada, etc)
Conversion to UF6	Domestic	Foreign (US), and Domestic	Foreign (US)	–	Foreign (US)
Enrichment	Domestic	Foreign (US), and Domestic	Foreign (US)	–	Foreign (US)
Conversion & Fabrication	Domestic	Foreign (US), and Domestic	Foreign (US), and Domestic	Domestic	Foreign (US)
Reactor operation: 1996 capacity GWe, %, & types of reactor	2.1, 1% 3 PWRs	39.4, 21% 22 BWRs, 22 PWRs, 1 GCR, 1 HWLW, 1 ABWR, 1 FBR	8.2, 36% 10 PWRs, 1 PHWR	5 MWe graphite moderated reactor operated to produce weapons material	5.3, 25% 4 BWRs, 2 PWRs
Reactor operation: Forcast: GWe @ 2010, %	17.0 3%	70.5+ ~42%	20.4 (yr 2006) 38%	2.0 —%	7.9 21%
Spent fuel storage 1995 quantities, & Plan:	100 MgHM on-site. Central wet storage w/capacity 2100 Mg being constructed.	12,800 MgHM on-site. Central wet storage at reprocessing plant site w/capacity 3000 Mg.	2,600 MgHM on-site. An ISFSF w/capacity 3000 Mg to be built by 2001.	8,000 rods on-site	1,700 MgHM on-site
Fuel reprocessing	A reprocessing plant was built in 1970. A new 25 tU/y plant be operated by 2000.	Foreign (UK, France). Domestic (a 50tU/y at Tokai-mura, a 800tU/y @ Rokkasho by 2000).	No decision yet. Working with Canada on Dupic.	Suspected to have reprocessed some of the spent fuel rods.	No decision yet
Waste disposal	Prospective site for HLW repository at Lop Lur is planned for 2040.	vitrified HLW glass is currently stored, a repository is planned for 2030.	planning	on-site	discussion with China, Russia, & US for disposal.

Table 2: Plans for the Nuclear Fuel Cycle in East Asia

From Jor-shan Choi, *A Regional Compact for the Peaceful Use of Nuclear Energy in East Asia*. Center for International Security and Arms Control Working Paper, 1996.

While Japan and China already have much of the technology and some of the plants to fabricate fuel, close the fuel cycle, and store the spent fuel in some form, it is not likely to prove economical for all nuclear power users to develop and build such facilities. An expanded international system for the provision of nuclear fuel and for the disposition of spent fuel is likely to be needed and to come into existence.

Fabrication, storage, and transportation of nuclear fuel must take place under international safeguards and under suitable standards of security, transparency, and accountability regardless of when or whether the transition to plutonium recycling takes place. Much remains to be done before a sustainable system exists regionally (please see the piece by Suzuki in this Policy Papers for further details about proposals for Asian nuclear cooperation regimes).

An important question, not only economically but also politically and from a security standpoint, is whether such a system will be purely regional, such as EURATOM, or whether it also will include the United States and Canada. This decision will hinge in part on the cooperativeness of the United States and China on nuclear and other matters. Asian countries are likely to seek the best deal, with both economic advantage and political reliability playing roles in their choice of suppliers. At present, the United States, Canada, Russia, and France have arrangements with some of the countries involved. The United States has not implemented its 1978 agreement with China on civilian nuclear energy owing to human rights and nonproliferation concerns.

As shown in Figure 6, there is a growing wedge between total energy consumption under the assumptions made, minus a generous allowance for conservation, and the amount of fossil fuel which can be burned if emissions are to be consistent with, say, only a doubling of the yearly rate of emissions.

This wedge can only be filled by nuclear power, solar power, hydroelectric power, and biomass combustion over the next 50 years. There are practical limits on hydroelectric power and biomass combustion, as well as poorly understood and possibly serious environmental consequences of biomass combustion.[11] There are economic limitations on solar power although research has reduced those limitations in many special markets. Thus, the turn away from nuclear power on the part of major electricity users means that, over the next few decades, some of the assumptions underlying Figure 6 must be violated. Either more fossil fuel will be burned, more than doubling the rate of carbon emissions over the present rate and promoting faster, longer-lasting global warming, or less electricity will be consumed, leading to a slowdown in the rate of economic development, particularly in the developing countries which are less able to compete for more expensive fossil fuels.

No single conclusion can be drawn. The energy security situation and outlook are very different for the United States and Russia, with their vast energy resources, than for East Asia and Europe. They are also very different for developed countries facing moderate growth in energy consumption than for countries which must build most of a modern energy and electricity infrastructure over the next 50 years.

Either a slowdown in real economic growth in developing countries or increased pollution by both developed and developing countries is likely to yield more difficult security problems than would a continued expansion of nuclear power under adequate safeguards. A desirable nuclear policy for all the governments concerned would be to ensure cooperatively that nuclear power is developed in a safe, secure, and transparent fashion, rather than to oppose its increased use. The differences in demand and resources among countries, if understood and dealt with in a timely manner, can be a source of renewed mutual understanding rather than a source of tension.

Conclusions and Recommendations

Investigations into the future of energy supply and demand must look 50 years ahead, especially with regard to electricity supply and demand. But 50 years, approximately equal to the operating lifetime of an electrical generating plant, and not much longer than the length of time it takes for new technology to penetrate the power grid, is a very long time for political leaders. It is also consistent with conservative estimates of the time scale for major shifts in the present pattern

[11] See Laurie Michaelis, "The Real Costs of Liquid Biofuels," *The OECD Observer*, October/November 1994.

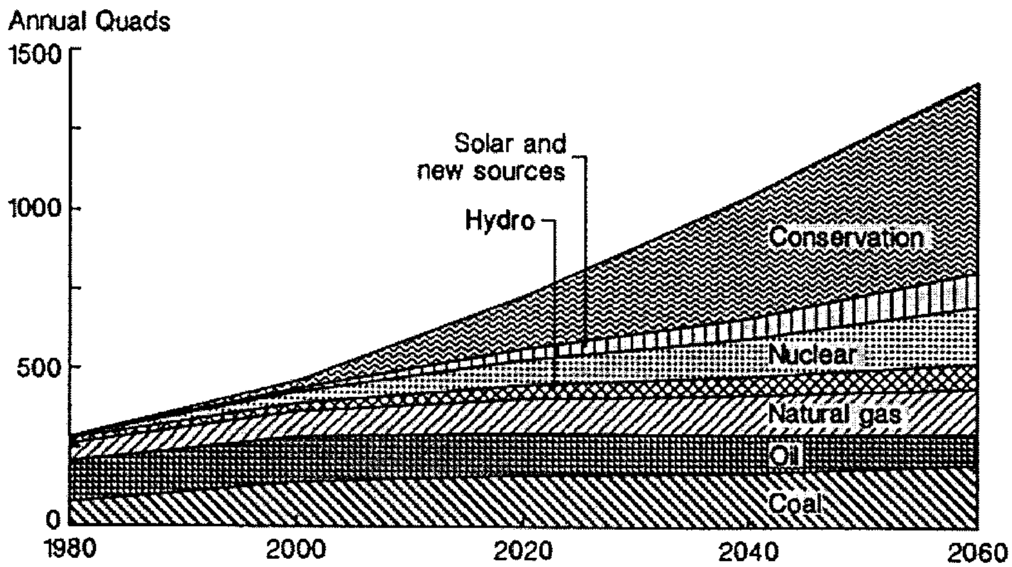

Figure 6: Global Primary Energy Production by Type, 1980– 2060
From Starr, Searl, and Alpert, *Science* 256 (1992).

of the world energy demand in the direction of the currently industrializing countries. Given that rapid economic growth is usually accompanied by a shift in relative political power, it is necessary to consider political as well as economic and technological dimensions of such changes to avoid them causing international destabilization.

In considering the problem of providing electricity, not only to a rapidly growing East Asia, but to the 9-12 billion people who are likely to demand it in 50-60 years, it is noteworthy that, while there are technical and economic difficulties and environmental uncertainties, these can be overcome by both capital and technology flowing where it is needed via an open world market supported by appropriate government actions. The essence of the problem is political and organizational. The same technical, economic, and environmental difficulties which can be handled without lasting damage to either populations or environment if a coherent, informed, balanced approach is taken are likely to lead to disasters without such an approach.

In closing, three recommendations are made—among many—that provide a start to ensure that the needed growth in electric power generation and consumption takes place with as few disruptions and risks as possible.

1. A more consistent and transparent international system for secure and safe transport and storage of nuclear fuels, both fresh and spent (including separated plutonium) is essential. The present system is satisfactory in some areas but fails to meet some needs. A current initiative, the Internationally Monitored Retrievable Storage System (IMRSS) is under study by utility representatives and academic observers and may be taken up by the governments involved. It could be helpful toward reaching this goal.
2. Capital and technology are needed in order to attain the conservation goals noted earlier in this paper. These goals are all technologically possible and economical on a levelized cost basis, but require start-up capital. Similarly, capital is needed to mitigate the detrimental health and environmental effects of burning coal. This is again something that only is limited by large capital needs. To the extent that fossil fuels can be replaced by nuclear energy, nuclear power is competitive. Domestic action within the countries concerned to allocate the economic benefits of additional electricity supplies to added returns on investments in electrical power on a cost basis (more than competitive if all costs are internalized) once again requires a large fraction of the cost up front. Meeting

these capital needs requires both plants, as well as free international flow of trade (including technology) and capital.[12] The latter presupposes a positive or at least a neutral political climate, which may be difficult to maintain as the developing countries provide what are perceived by the developed countries as shocks to existing economic and political arrangements.

3. Research on global warming (particularly on the carbon cycle, a key and comparatively uncertain factor) and on the local effects of such warming needs to be continued.[13] Research on the differential effects of global warming in different locations needs to be stepped up. While this research will not lead to certain and accurate predictions, it has high potential for identifying the immediate needs for remedial action.

All of these recommendations help governments provide what is now in part and will soon be perceived as globally needed public goods. Only government cooperation can provide them, but many political obstacles stand in the way of such cooperation. Unfortunately, emergencies are often required before collective action for the benefit of all can be taken by groups, whether groups of individuals or groups of governments.

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[12] For a discussion of financing nuclear power in developing countries see: *Financing Arrangements for Nuclear Power Projects in Developing Countries,* International Atomic Energy Agency, Technical Reports Series no. 353, 1993.

[13] Fortunat Joos, "Imbalance in the Budget," *Nature,* 21 July 1994.

NUCLEAR ENERGY AND FUEL CYCLE ISSUES IN EAST ASIA

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➢

Introduction

As evidenced in May and Johnson's section on global energy demand, civilian nuclear energy can play a critical role in meeting growing regional demand for energy in Northeast Asia. But the decisions that countries in Northeast Asia make on the use of nuclear energy have had and continue to have significant effects on regional stability. Because national decisions about nuclear energy and the management of spent nuclear fuel have international consequences, it is important that these decisions not be left solely to nuclear engineers and technicians. Foreign policy and national security officials must understand and participate in national decision-making on nuclear energy issues. Their participation may determine whether nuclear fuel cycle activities in Northeast Asia contribute to regional stability and cooperation, or on the contrary, lead to misunderstanding, disagreement, and international tension. While this paper will address the issue of nuclear proliferation, it will not address the issue of nuclear weapons themselves nor the nuclear weapons activities of the three nuclear weapons states in Northeast Asia—China, Russia, and the United States.

Background

Since the dawn of the nuclear age, countries struggled to secure the benefits of nuclear energy—and to control its risks. The fundamental problem is that the same fissile materials (uranium and plutonium) that are useful for nuclear energy are also used in nuclear weapons. To address this problem, many proposals and institutions have been developed to manage the international use of nuclear energy, including the Nuclear Nonproliferation Treaty (NPT), the International Atomic Energy Agency (IAEA), IAEA safeguards, the European Atomic Energy Community (EURATOM), and the Reduced Enrichment for Research and Test Reactor Program (RERTR).

International concern about the possible diversion of nuclear materials from peaceful use to non-peaceful use traditionally focused on national diversion—a country diverting peaceful nuclear activities for military purposes. However, recent events surrounding the dissolution of the former Soviet Union led to increasing concern about the possibility of sub-national diversions by terrorists or criminals. Consequently, more resources are being devoted to sub-national diversion, physical protection, and smuggling of nuclear materials .

Northeast Asia includes three nuclear weapons states, China, Russia, and the United States; Japan with advanced civilian nuclear technology; and North and South Korea, with significant nuclear programs. There are significant regional concerns arising from civilian nuclear activities, such as the Korean Framework Agreement, the possible misuse of research reactors, and reprocessing and the civil use of plutonium. At a lower level of direct security concern are regional disagreements over nuclear cooperation and concern about nuclear accidents and ocean dumping of nuclear waste.

Possible Sources of Conflict Growing Out Of Nuclear Fuel Cycle Activities

Four issues which could be the source of regional conflict or disagreement are:

- Nuclear export activities
- Nuclear waste management
- Nuclear fuel reprocessing and civil use of plutonium
- Nuclear safety

Each of these issues has been, or has the potential to be, the source of international disagreement and misunderstanding. Each of these issues can also be resolved through cooperative actions by members of the Northeast Asia Cooperation Dialogue.

Regional Nuclear Exports

Given the history of uneven and independent development of nuclear fuel cycle activities in Northeast Asia, peaceful nuclear cooperation is very weak within the region. States tend to cooperate mainly with states outside the region, including the United States, France, Germany, and Russia. The United States has been the main nuclear supplier to Japan, Korea, and Taiwan and the U.S. Congress had required adherence to the most stringent nuclear export control laws. Consequently, a case can be made that U.S. controls on its nuclear technology transfers to these countries, so-called U.S. consent rights, served to limit the development of destabilizing nuclear activities and as a reassurance measure for other states in the region. Stringent U.S. export controls which include controls on retransfer, explosive use, and IAEA safeguards, not only protected U.S. interests but also were a confidence-building measure for other states in the region.

One important point is that free trade in nuclear commodities does not exist. International nuclear trade is heavily regulated both by national laws and international treaties such as the Nuclear Nonproliferation Treaty (NPT). Exporting states worry that their nuclear exports may be diverted or used against them. But recipient states do not want to be overly restricted in their legitimate use of imports. In addition to the exporting state and the recipient state, neighboring countries often perceive imports into a region as threatening or destabilizing. Treaties and laws on nuclear commerce are supplemented by international guidelines which some states follow, such as the Nuclear Supplier's Guidelines and the Zangger Committee Trigger Lists. Obviously, international nuclear commerce is also subject to significant policy and political constraints.

One common standard that all members of NEACD have agreed to abide by is contained in Article III of the Nuclear Nonproliferation Treaty, which requires that all nuclear exports be subject to international safeguards. In addition, the NPT requires that nuclear weapons states, (Russia, China, the United States, France, and the United Kingdom) must have more stringent export control requirements than non-nuclear weapons states (Japan, North Korea, and South Korea). This is because Article I of the NPT says that Nuclear Weapons States will "not in any way assist, encourage, or induce a non-nuclear weapons State to manufacture or otherwise acquire nuclear weapons. . ." (full text, Appendix A, 1).

In this context, nuclear trade can be a source of significant tension within Northeast

Asia. Most importantly, states can violate international treaties or standards, deliberately or by mistake making exports that violate what they have agreed to do under the NPT. Such actions obviously would have a confidence-destroying effect.

A second major source of tension could be disagreement about appropriate export control standards. One contentious example is that some states have agreed that they will only engage in nuclear cooperation with non-nuclear weapons states that put all of their nuclear facilities under IAEA "full-scope" safeguards.

Finally, and ironically, events have demonstrated that nuclear cooperation sometimes is a source of considerable disagreement and complicated negotiations. The Sino–U.S. nuclear agreement for cooperation was negotiated, but has never been implemented. The U.S.–Japan agreement for cooperation was the subject of lengthy negotiations. The United States has had disagreements with the authorities in Taiwan over the operation of a U.S.–supplied research reactor, which was ultimately shut down. Plutonium shipment from Europe to Japan was subjected to intense scrutiny and controversy.

Nuclear Waste Management

Nuclear waste management can be a source of regional instability when the actions taken by one state impact its neighbors. One example is ocean disposal of nuclear wastes. If states within the region have different standards for waste disposal and ocean dumping, this can lead to disagreement over environmental consequences. Another example is international shipments of nuclear waste. Such shipments raise concerns about safety, accidents, and transit rights. Issues such as secrecy, physical security, and informing regional authorities all arise.

Nuclear Fuel Reprocessing and the Civil Use of Plutonium

Nuclear visionaries formerly supported a closed nuclear fuel cycle in which light-water nuclear reactors burn uranium as fuel. The spent uranium fuel is reprocessed to recover plutonium, which is then used to fuel breeder reactors, which in turn produce more plutonium than they consume, thereby assuring a constant supply of plutonium (see Charts 1 and 2). In reality, breeder reactor technology has proven to be technically difficult and too expensive relative to other energy sources. However, in anticipation of breeder reactors, several countries built reprocessing facilities to recover plutonium in spent nuclear fuel. Later, most of these countries abandoned reprocessing because there is no market for plutonium and because reprocessing has proliferation risks since it produces a material that can be used to make nuclear weapons.[1]

As a result, the world confronts a situation of massive stockpiles of civilian plutonium which have little use and which are of proliferation concern. Fortunately, most of these stockpiles exist in nuclear weapons states, or regions of relatively low proliferation concern, Western Europe and Japan. To address the plutonium problem, the U.S. National Academy of Sciences has proposed several necessary steps:

- Existing plutonium stockpiles must be safeguarded and protected
- Excess plutonium production should cease
- Long-term plans must be made to dispose of plutonium

The plutonium problem is particularly acute in the U.S. and Russia, where there are tons of plutonium from dismantled nuclear weapons. The United States has ceased all plutonium production and accepts that the management and disposition of this plutonium will be a very long-term and complicated process. The United States has set up an inter-agency task force to look at alternative disposition options. One U.S. goal is to make plutonium at least as safe as spent nuclear fuel and consequently the United States accepted the "spent fuel standard" for evaluating disposal options. The leading options include burning the plutonium in reactors as mixed oxide fuel or direct disposition. The United States also accepts that whatever option is chosen, it will represent a cost that the

[1] It is common international practice to consider uranium enrichment, spent nuclear fuel reprocessing, and plutonium fuel fabrication as "sensitive" activities because all of them involve either the production or handling of materials that can be used for nuclear weapons. International guidelines call for restraint in the international transfer of such technologies and international ownership is favored.

Chart 1: "Closed" Fuel Cycle

Chart 2: Low-Enriched Reactors: Once-Through Fuel Cycle

United States will have to pay to dispose of plutonium.

There are still hopes in Russia that their plutonium will have positive economic worth and can be used in breeder reactors sometime in the future. Currently, the Russian breeder reactor program faces an uncertain future.[2] Both the United States and Russia must continue for several decades to account for and physically protect large plutonium stockpiles.

Since the late 1960s, Japan has been committed to the development of breeder reactors and the civil use of plutonium. Currently, fuel from light water reactors was sent to England and France for reprocessing with the recovered plutonium and nuclear wastes to be sent back to Japan. Japan also has plans to build an industrial scale reprocessing plant at Rokkasho. But Japan's progress toward breeder reactors is slowing and under reconsideration. These developments include the cancellation of the Advanced Thermal Reactor, which was intended to be a stepping stone towards the Breeder; an accident at the Monju fast breeder reactor that may shut it down for an uncertain length of time; controversy over the shipment of plutonium from France to Japan; and the announcement of a considerable delay in the proposed start-up of the Rokkasho reprocessing plant.

Of primary concern is the buildup of Japanese plutonium stockpiles from reprocessing. Such plutonium stockpiles are costly to manage and raise regional concerns about Japan's intentions. In response, Japan announced a policy of balancing plutonium supply and demand, and has put increased emphasis on the value of reprocessing as a waste management technique and less on its value as a source of plutonium. In addition, Japan commendably stresses transparency and makes all of its actions open to public review.

South Korea has a major civil nuclear power program and like the U.S., has plans for a once-through nuclear fuel cycle. In addition, the North and South signed an agreement to avoid any reprocessing on the Korean peninsula, the North-South Joint Declaration on the Denuclearization of the Korean Peninsula. There is also interesting research in Korea on a so-called tandem fuel cycle, DUPIC (Direct Use of Plutonium in CANDU reactors). In the DUPIC cycle, the spent fuel from two or three light water reactors would be crushed and fabricated into fuel for a CANDU heavy-water reactor without any reprocessing.

North Korea, as is well known, has no civilian nuclear power plants, but has a research reactor and a large reprocessing plant. Under the Framework Agreement, activities at these two facilities are frozen, and they will be dismantled as North Korea acquires light water reactors from the Korean Energy Development Organization (KEDO.) North Korea and the U.S. Department of Energy are working together to ensure that the spent fuel pool in Yongbyon is operating properly, and eventually this fuel will be "canned" and stored underwater (see Appendix A, 2 for details about KEDO).

China, as a nuclear weapons state, has military reprocessing facilities and the ability to produce plutonium. China has plans for considerable expansion in the use of nuclear power to generate electricity. However, because China is only beginning to develop a civil nuclear fuel cycle, it does not need to decide the question of management of spent civil reactor fuel for about another decade. By that time, there probably will be more of an international consensus on the economics of reprocessing as compared to direct disposition of spent fuel. Plans or studies to build a commercial reprocessing plant at Langzhou and to do research on breeder reactors have been reported.

The challenge in Northeast Asia, then, is that the states which currently have a plutonium problem, Russia, the United States, and Japan, need to develop policies to safely protect, store, and reduce plutonium stockpiles. This must be done in a way that does not alarm other states in the region. The challenge for other states in the region, including China and Korea, is to understand the nature of the plutonium problem and not be unnecessarily concerned. Clearly it would be beneficial to have regular communication among regional states on their nuclear fuel cycle activities so that questions could be raised and unnecessary suspicions allayed.

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[2] On the subject of whether plutonium has any value, it is worth noting that in France, the country that is most committed to reprocessing, the French nuclear utility has decided that for accounting purposes it will assign zero value to its plutonium stockpiles. Analysts note that in reality plutonium has negative value because of storage costs.

Nuclear Safety

In light of the major accidents that occurred during operation of nuclear fuel cycle activities (e.g., Chernobyl, Three Mile Island), the safety of nuclear facilities became a major international concern. For example, the International Atomic Energy Agency now conducts OSART safety reviews at the request of member states.

The nuclear safety procedures within a state are a legitimate international concern if the consequences of an accident can affect other countries. A nuclear accident with a large release of radioactive material could affect many people in East Asia because of the population density. The nature of contamination depends upon wind patterns and the weather. Beyond the direct effect upon humans, another concern is that a certain radioactive particle that may released in a nuclear accident (cesium-137) acts like potassium and has a particular affinity for rice. A nuclear accident then can cause widespread agricultural losses

While each state has its own safety standards, neighboring states have an interest in reassuring themselves that the activities of their neighbors are safe. Such exchanges can occur through international organizations such as the IAEA, the World Association of Nuclear Reactor Operators (WANO), or bilateral exchanges about nuclear safety standards and practices. Some commentators have used the term "nuclear safety culture" to describe the environment in which operations occur. In addition to sharing information about their nuclear safety cultures, states might also discuss cooperative nuclear emergency response procedures.

As one example, in the event that there is a nuclear release anywhere in the world, the U.S. Department of Energy maintains at Lawrence Livermore National Laboratory a 24-hour-per-day capability to make projections about wind patterns anywhere in the world. This requires the use of large computers and continuous information. This capability was used during the Gulf War to project the flow of smoke from the oil field fires in Kuwait and also to predict the fallout patterns from Chernobyl. This is a capability that could be available to states in Northeast Asia in the event of an emergency.

A Regional Way Forward

The key nuclear fuel cycle question in Northeast Asia is whether states in the region will be able to pursue their peaceful nuclear programs without creating regional tensions and misunderstandings. Nuclear fuel cycle programs can potentially cause conflict or exacerbate existing conflicts. In addition to avoiding conflict, regional nuclear cooperation can create positive benefits. Cooperation might increase the sense of regional community, contribute to confidence building, and strengthen regional economic integration.

Regional Nuclear Management: Europe and Latin America versus Asia

In considering how to manage nuclear fuel cycle issues in Asia, a starting point is to compare Northeast Asia to other regions which also face the challenge of managing nuclear technology—namely Europe and Latin America. The first region to be considered is Europe, which represents the most advanced level of regional nuclear integration.

Europe

In Europe, the regional nuclear energy issues are managed by the European Atomic Energy Community (EURATOM—for a complete description of the applicability of the EURATOM experience to the Asia-Pacific, please see Tatsujiro Suzuki's section). EURATOM emerged from the aftermath of World War II, when nationalism was discredited, and it was hoped that regional organizations could help prevent the emergence of future conflicts. Like Northeast Asia, Europe is a region that has been wracked by conflict and includes both nuclear weapons states and non-nuclear weapons states.

The EURATOM, created in 1957, is headquartered in Brussels. It is the nuclear arm of the European Union and has a strong and far-sighted mandate which includes:

- Creating a common market to ensure free movement of nuclear capital and labor
- Uniform safety standards
- Nonproliferation
- Safeguards
- Ownership of fissile materials
- Research and dissemination of technical information

- Negotiation with other countries or organizations on the import and export of nuclear materials

EURATOM safeguards were in existence before IAEA safeguards and play an important confidence-building role among member states. For example, German inspectors can visit France, and British inspectors can visit Germany. These safeguards assure each member of EURATOM that every other member is fulfilling its obligations. EURATOM has about 200 safeguards inspectors. Nuclear cooperation between the United States and Europe is done through the EURATOM, which negotiated the new nuclear agreement for cooperation with the United States that will come into effect in 1996.

EURATOM clearly set the world standard for successful regional management of the fuel cycle. It has community ownership of fissile materials, community safeguards, and free movement of nuclear materials within the community. There are no suspicions within the community about nuclear intentions. But can it be duplicated in Asia?

Latin America

In Latin America, in contrast to Europe, rival military governments in Argentina and Brazil engaged in an incipient nuclear arms race for an extended period of time. The nuclear programs of Argentina and Brazil were of very great proliferation concern to each other and to states outside of the region. In the early 1980s, both countries pursued unsafeguarded nuclear activities, including uranium enrichment. In Brazil, there was an imported civilian nuclear fuel cycle under safeguards and a parallel indigenous military program that was not under safeguards. There was considerable suspicion that the indigenous program was in fact based upon imported technology in violation of safeguards.

The advent of civilian governments in Argentina in 1983 and Brazil in 1985 gradually led to a reduction in the nuclear rivalry. The manner in which the two civilian governments approached the problem of confidence building and diffusing an incipient nuclear arms race is most revealing. The two countries engaged in a series of high-level meetings leading to site visits that resulted in the creation of a regional safeguards organization, the Argentine-Brazilian Agency for Accounting and Control of Nuclear Materials (ABACC). ABACC has headquarters in Brazil, and a staff of 70 inspectors, half from each country. Argentines inspect Brazil, and Brazilians inspect Argentina. Inspections began at facilities not under IAEA inspection. ABACC is now coordinating its activities with the IAEA and is also engaged in extensive cooperation with the U.S. Department of Energy (see Appendix A, 3 for a more lengthy description of ABACC).

Latin America is a regional nonproliferation success story because the states in the region had a desire to terminate unsafegarded nuclear programs and devised their own program of confidence building and transparency through visits and inspections.

Northeast Asia

In contrast to Europe and Latin America, Asia has not been at peace since World War II, with major conflicts in Korea and Indochina. Strong nationalism in all countries (except perhaps Japan) and the nuclear programs of Northeast Asian states proceeded largely independently of each other, with some bilateral coordination between the United States and Japan, the United States and South Korea, and the United States and Taiwan. The United States and Russia have long had their own indigenous nuclear industries. China, while a nuclear weapons state of long standing, is just beginning a civilian nuclear power program. Japan and South Korea have very successful civilian nuclear power programs under full IAEA safeguards. North Korea has no nuclear power reactors. It received early assistance from the U.S.S.R. and has continued with its own research program until the advent of the Framework Agreement, which will provide civilian light-water reactors to North Korea in exchange for a shutdown of their indigenous reactors and reprocessing facilities (see Tables 1 and 2 on Asian nuclear fuel cycles and nuclear electrical power).

While both EURATOM in Europe and ABACC in Latin America are precedents that should be examined, Northeast Asia will have to develop its own unique regional approaches to nuclear fuel cycle management. At least three types of activities can be undertaken to promote regional stability and avoid unnecessary tension:

Asian Pacific Nuclear Fuel Cycles and Nuclear Capacities

Table 1: Nuclear Reactors and Fuel Cycle Facilities

Notes:
[a]Operating reactors/reactors under construction
[b]fuel cycle facilities include pilot, demonstration, and commerical-scale plants
[c]North Korea has separated plutonium for spent fuel using hot cells

Table 2: Installed Nuclear Electric Capacities and Percent Share, 1993–2010[a]

Notes:
[a]All figures in gigawatts, percent share takes into account electricity produced by coal, oil, hydro, and other. Sources drawn from *World Nuclear Industry Handbook,* 1994, data provided by EIA and NRC personnel, *Nuclear News,* March 1995, and *Nuclear Sites of Russia and the NIS of the FSU,* Septermber 1995.

- Promoting better understanding of nuclear activities
- Joint technical and economic nuclear research
- Joint nuclear activities and regional organizations

A first step is for states in the region to gain better understanding of each other's nuclear programs, including the underlying technologies, economic analysis, and safety cultures. Bilateral visits and discussions as well as regional meetings and conferences can be useful. The annual Japan Atomic Industry Industrial Forum (JAIF) meeting in Tokyo is an example. The recent nonproliferation conference in Tokyo under the sponsorship of the Power Reactor and Nuclear Fuel Corporation (PNC) is another example. An important point that emerged at this conference is that even between the United States and Japan, two states with a record of extensive trade and cooperation, there are still differences in views on the nuclear fuel cycle, and there are clear benefits in understanding to be gained from open discussion of these differences and sharing of information. Better understanding can include benefiting and learning from the success and failures of other states in the region.

Two particular points need to be made on promoting better understanding. Japan, more than any other state in Asia, has promoted transparency to build trust in its peaceful nuclear program. Japan might be a standard against which other states can measure themselves. Second, the United States and Russia, because of their joint activities in Cooperative Threat Reduction—the dismantlement and disposition of excess nuclear weapons and materials—are in a much better position to share information about all aspects of their nuclear programs.

Better understanding can be supplemented by joint technical and economic research on various topics, such as environmental effects of fuel cycle choices; regional cooperation in nuclear emergency response; nuclear material measurement, protection and control; regional spent fuel management and repositories; and the Reduced Enrichment for Research and Test Reactors (RERTR) program (see Appendix A, 4).

Finally, joint activities, regional organizations, and possibly joint ownership of nuclear or nuclear-related projects might significantly contribute to regional stability in the future. While there is little prospect for a EURATOM-type organization to emerge in the near future in Asia, a regional organization, a so-called ASIATOM or PACIFICATOM, with more limited functions is possible. The Nuclear Suppliers Guidelines encourage the development of multinational ownership of sensitive fuel cycle facilities such as enrichment and reprocessing and in Europe, multinational ownership of enrichment facilities (EURENCO and EURODIF) is the norm.

Lower level technical joint activities will be easier to establish, such as joint programs to study and share information on the medical and agricultural use of nuclear energy. The annual meetings of the RERTR program bring together research reactor operators from all over the world, and individuals from Korea and Japan have expressed interest in regional approaches to research reactor cooperation. In addition, the Japanese Atomic Energy Agency for several years has held annual three-day conferences on nuclear cooperation in Asia that discuss research reactors, medical and agricultural uses of radiation, and public acceptance. In addition, exchanges of nuclear researchers and seminars have been held in rad-waste management and nuclear administration.

A Regional Nuclear Organization—PACIFICATOM?

One indication of the current lack of regional nuclear integration is the considerable diversity of proposals for a regional nuclear organization. There is also uncertainty about whether the U.S., Canada, and Russia should be included. But a simple list of possible functions of a Northeast Asian regional nuclear organization follows:

- Setting standards for measurement and accounting of nuclear materials
- Setting standards for nuclear safety
- Studies on plant aging, dismantlement, and disposition
- Studies on the public acceptance of nuclear power

- Agreement on nuclear liability issues
- A clearing house for standards and information on nuclear materials transport
- Studies on the back end of the nuclear fuel cycle
- Regional safeguards both to increase regional confidence and to reduce the burden upon the International Atomic Energy Agency
- Nuclear emergency response (information sharing and cooperation)
- Studies and implementation of plans for regional repositories for spent nuclear fuel

This last idea bears some elaboration. At the recent PNC conference in Tokyo on nonproliferation, it was suggested that a regional nuclear organization might examine regional approaches to long-term interim storage of nuclear fuel, perhaps in Siberia. Siberia has the advantage of having very low population density. This would also be true of the Gobi Desert in China and parts of Australia (please see Appendix A, 5 for a longer description of proposals for an Asian regional nuclear organization).

Conclusion

Nuclear fuel cycle decisions have had and continue to have significant effects upon regional stability. The management of these issues in Northeast Asia is important both to avoid unnecessary conflict and to promote regional confidence building and security. It is important that senior foreign policy and national security decision makers be aware of these issues and participate in making national decisions on nuclear issues.

LESSONS FROM EURATOM FOR POSSIBLE REGIONAL NUCLEAR COOPERATION IN THE ASIA-PACIFIC REGION (ASIATOM)

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Background and Objective

A prospect for rapid increase in energy demand in the Asia-Pacific region has driven many countries to develop nuclear power. Japan, South Korea, and Taiwan already have significant nuclear power programs, followed by China and possibly by Indonesia and Thailand. Meanwhile, primarily triggered by the secret nuclear weapons program in the Democratic People's Republic of Korea (North Korea), there is increasing concern about possible nuclear proliferation in the region. Similar conditions existed in Europe during the 1950s when the European Atomic Energy Community (EURATOM) was created, and thus we have heard increasing discussion about a "EURATOM-type" regional cooperation scheme in the Asia-Pacific region (ASIATOM). However, the specific content and framework of such a regional scheme are not yet clearly defined. What aspects of EURATOM can or cannot be applied to the possible Asian scheme? Are there any needs, benefits, or costs of creating a regional scheme like EURATOM in the region? This paper discusses these issues by analyzing EURATOM's history and conditions in Asia for a similar organization.

Original Goals and Achievements of EURATOM

History: Origin of the EURATOM

We must analyze political and economic conditions surrounding Europe in the 1950s to understand the original motivations of the EURATOM. Increasing tensions between the U.S. alliance in Western Europe and the Soviet Union had precipitated the Cold War era. The Soviet Union had already tested its first atomic bomb in 1949, and the United States had started its Marshall Plan to redevelop Western European economies. The political as well as economic integration of Western Europe was one of the priorities for the U.S. alliance to cope with the potential threat from the East.[1]

In 1950, the first significant multinational regime, the European Coal and Steel Community (ECSC), was established, creating a "high authority" with strong decision-making authority that was binding over individual nation's policies.[2] Between 1951 and 1954, Western Europe tried to create a "European Defense Community (EDC)," under which a joint European army was envisioned. However, this did not succeed mainly because a European army under a supranational organization was still too sensitive.[3]

In 1953, American President Dwight Eisenhower made his famous "Atoms for Peace" speech at the United Nations, opening the era of peaceful use of nuclear power. The Atomic Energy Act of 1954 allowed U.S. industry to develop nuclear power technologies for peaceful use and to expand its export activities. At the same time, concerns about future availability of oil led many nations to seek peaceful nuclear power technologies as well as nuclear resources (i.e. uranium, which was also considered a scarce resource). These concerns led to the development of a regional organization specializing in nuclear power. The European Atomic Energy Community (EURATOM) concept was developed along with the concept of the European Economic Community (EEC) between 1955 and 1957. Both the EURATOM and EEC Treaties were signed in 1957, and EURATOM came into force on January 1, 1958. The original members of the EURATOM were Belgium, France, the Federal Republic of Germany (West Germany), Italy, the Netherlands, and Luxembourg.

EURATOM Motives and Goals

There were two major goals in establishing EURATOM, nuclear nonproliferation and establishment of civilian nuclear industry in Europe. In addition, efforts to establish EURATOM helped to improve confidence building in the region after the failure of EDC.

Nonproliferation in Western Europe

U.S. efforts to contain the proliferation of nuclear weapon started immediately after the end of World War II. Initial proposals in 1946, such as the Acheson-Lilienthal Report and Baruch Plan, were aimed at creating an international organization with strong authority over nuclear activities and materials. Initially rejected by the Soviet Union, the United States took an unilateral approach by passing the MacMahon Act (1946), which denied nuclear technology transfer to other countries. This denial policy upset allies such as the United Kingdom, France, and Canada, but despite this policy, the Soviet Union (1949) and the United Kingdom (1952) developed their own nuclear weapons.

Recognizing the difficulties of containing nuclear technology, the United States shifted its nonproliferation policy from "denial" to "control through peaceful use of nuclear technologies." The "Atoms for Peace" proposal was based on the idea that, by supplying its technologies and materials, the United States could control other countries' nuclear programs. The International Atomic Energy Agency (IAEA) was established to promote peaceful atomic energy and safeguarding technologies.

In Western Europe, the countries of con-cern were France and West Germany. A significant nuclear weapons program was already underway in France. France and the FRG worried each other, and smaller nations were also concerned

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1 The Economic Commission of Europe (ECE) was established in 1947, the Organization for European Economic Cooperation (OEEC) was established as a result of the Marshall Plan in 1948, and the Council of Europe was established in 1949.

2 Darryl A. Howlett, *EURATOM and Nuclear Safeguards* (New York: St. Martin's, 1990), p. 17.

3 Howlett, *op. cit*., p. 17. Even today, a joint European Army is still too sensitive.

about the intentions of these two powers.[4] The primary nonproliferation objective of EURATOM was to contain these two countries in Western Europe. The Soviet Union was uneasy about EURATOM since it could strengthen nuclear capability in Western Europe. This East–West rivalry served as the foundation for the establishment of EURATOM. These were also the primary reasons for the United States to give early support to EURATOM.

Development of Civilian Nuclear Industry in Europe

The "Atoms for Peace" policy announced in 1953 was a turning point for the United States and the rest of the world in terms of the development of a civilian nuclear industry for energy production purposes. The 1954 Atomic Energy Act allowed American nuclear suppliers to transfer nuclear technology to other countries. More importantly, the Act allowed the release of nuclear material (uranium) as nuclear fuel, considered scarce at that time.

Triggered by the Suez crisis in November 1956, Western European nations faced an "energy crisis" because of concern about supply security of conventional fuels (mostly oil and coal). The foreign ministers of EURATOM countries appointed a three-person commission to study the role of nuclear power in meeting increasing energy demand. The commission's report, known as the "Three Wise Men Report," concluded that there were urgent needs for new energy sources and recommended that the Community, in cooperation with the United States, establish a sizable nuclear reactor development program.[5]

While it was essential for European nations to have access to U.S. nuclear materials and nuclear technologies, it was determined among European nations that it was important to jointly develop nuclear power industry as an element of European economic integration. It was also beneficial for U.S. vendors to have access to a growing European market. Therefore, the EURATOM was mutually beneficial for both Europe and the United States.

The EURATOM as a Catalyst to Improve Confidence Building

The third objective of EURATOM was to improve confidence building, made even more vital by the failure to establish the EDC. The proponents of the EDC were eager to create another organization to dissipate regional concerns about potential conflict between old rivals France and Germany. This was heightened by French rejection of the EDC proposal during debate, and questions about West Germany's post-war rearmament.[6] A few months after the defeat of the EDC, fresh efforts were underway to "inject new life into the European movement."[7] Thus, efforts to establish the EURATOM were part of an ambitious, far-reaching goal of creating a truly integrated European organization. And regional dialogue to establish EURATOM and the EEC were critical confidence-building measures following the collapse of the EDC concept.

In 1957, both the EEC and EURATOM Treaties were signed and the EURATOM Treaty came into force on January 1, 1958, with France, West Germany, Italy, Belgium, the Netherlands, and Luxembourg as signatories.

Regional Safeguards Systems

Early History

EURATOM led to the creation of an unique concept of regional safeguards. The original concept of safeguards, such as material accounting and inspection, were developed by the United States and introduced through bilateral agreements between the United States and countries such as Japan. It was an essential condition of technology and material transfer to non-nuclear weapon states to ensure they would be used only for peaceful purposes. But the IAEA safeguards system was not fully developed yet at that time. When the United States and the EURATOM

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4 Germany would have liked to start a cooperative military program with France and Italy. France, which liked the idea originally, dropped from the program under President DeGaulle in the early 1960s. (personal communication with Dr. Annette Schaper, April 1996).

5 Louis Armand, Franz Etzel, and Francesco Giordani, "A Target for EURATOM," a report prepared at the request of the government of Belgium, France, the German Federal Republic, Italy, Luxembourg and the Netherlands, May 1957, quoted in Henry Nau, *National Politics and International Technology : Nuclear Reactor Development in Western Europe* (Baltimore and London: The Johns Hopkins University Press, 1974), p.104.

6 E. Fursden, *The European Defense Community: A History* (New York: Macmillan, 1980), quoted in Howlett, *op. cit.*

7 L. Sheinmann, "EURATOM: Nuclear Integration in Europe," *International Conciliation*563 (May 1967): 7, quoted in Howlett, *op. cit.*, p. 18.

started negotiating safeguards, EURATOM proposed its own regional safeguards system.

Why did EURATOM nations want to establish a regional safeguards system, instead of U.S. inspection or the under-developed IAEA system? The main motivation was commercial. They felt that U.S. inspections would be too intrusive and wanted to avoid far-reaching access to their own nuclear facilities by inspection officials from the U.S. (or from the nations outside Europe in the case of IAEA).[8] But the U.S. and the IAEA were concerned about whether an independent regional safeguards system could be reliable and secure.

To earn American confidence, EURATOM regional safeguards, mostly modeled on U.S. bilateral safeguards requirements, had stricter requirements than the IAEA safeguards currently employed under the Nuclear Nonproliferation Treaty (NPT). One of the most important aspects of the EURATOM safeguards was strong authority given to the EURATOM Agency, modeled after the ECSC. There were several important Articles to define the uniqueness of EURATOM safeguards.

Article 81, which applies to all member countries, even to Nuclear Weapon States (NWS) such as France and the United Kingdom, specifies that the EURATOM inspectors "shall at all times have access to all places and data and to all persons who, by reason of their occupation, deal with materials and equipment or installations."[9] Under the NPT/IAEA safeguards, NWS have no obligation to accept safeguards (voluntary submission), and this "universality" is a unique aspect of EURATOM safeguards.

On the other hand, Article 84 contains the "defense clause," which excludes materials intended for military use from the safeguards. Article 84 says that "the safeguards may not extend to materials intended to meet defense requirements."[10] This clause was inserted primarily to encourage French participation in EURATOM. France did not want to preclude their option to use nuclear materials for defense purposes, which it finally exercised in 1960. While the NPT/IAEA safeguards do not allow non-NWS to be engaged in any military activities, EURATOM safeguards do not prohibit the military use of nuclear materials.[11]

Finally, Article 86 specifies the legal ownership of special fissile materials, such as plutonium-239, uranium-235, and uranium-233. Article 86 states, "Special fissile material (SFM) shall be the property of the Community. The Community's right of ownership shall extends to all special fissile materials which are produced or imported by a Member State."[12] This provision is similar to the one originally included in U.S. legislation, and was similar to original U.S. proposals such as the Baruch Plan. But while EURATOM has exclusive ownership to those SFMs, it only has the right of option to other nuclear materials. Article 80 also says that the Commission may require that any excess special fissile materials recovered or obtained as by-products and not actually being used or ready for use shall be deposited with the Agency or in other stores which are or can be supervised by the Commission.[13]

EURATOM made its regional safeguards system as close to the original U.S. proposals which envisioned strong international authority over nuclear materials and activities.[14] But this system also provided a useful mechanism for Europe to limit U.S. intrusions into Europe's nuclear affairs. U.S. rights of intervention ended at the Community's external frontier as long as security commitments were honored.[15]

8 Howlett, *op. cit.*, p. 68.

9 The EURATOM Treaty, Article 81.

10 The EURATOM Treaty, Article 84.

11 Article 77 says the purpose of the EURATOM safeguards is to assure that the nuclear materials "are not diverted from their *intended uses* as declared by the users"(emphasis added). But Article 77 was vague as to whether military facilities are excluded from the safeguards.

12 The EURATOM Treaty, Article 86.

13 EURATOM even has the right to replace staff at utilities with its own personnel if it is not satisfied by materials accountancy. This once happened at a German nuclear reactor (personal communication with A. Schaper, April 1996).

14 In practice, however, those provisions are not as strong as the theory suggests (e.g. utility has a *de facto* ownership of the material, military materials are excluded from safeguards). Recently, EURATOM wanted to enforce its power: It denied its signature for a deal between a Germany utility and a supplier of Russian origin fuel and ordered the utility to take some French fuel instead. The German case is still pending at the European Court, but it seems likely that the utility will lose (personal communication with A. Schaper, April 1996).

15 W. Walker, "The U.S.–EURATOM Disagreement," The Royal Institute of International Affairs, Discussion Paper no. 55, 1995, p. 4.

EURATOM and IAEA/NPT Safeguards

When the NPT came into force in 1970, the IAEA and EURATOM negotiated a safeguards document (INFCIRC/193) designed specifically to accommodate the respective safeguards demands of both the IAEA and EURATOM.[16] Under Article 72, both organizations are responsible for collating safeguards information in the EURATOM (i.e., routine inspection is done by both EURATOM and the IAEA). In practice, however, IAEA inspectors participate in about half of all EURATOM inspections. The inspection also would take place under the principle of "observation," with EURATOM reporting nuclear material movements and inventories to the IAEA under the verification agreements between the IAEA, the EEC, and its member states. There is no limit on special inspections by the IAEA.

For sensitive facilities that involve large quantities of fissile materials, such as reprocessing, enrichment, and plutonium fuel fabrication plants, the IAEA and EURATOM agreed that the "principle of observation" would not apply. The two organizations would form joint teams (with a slightly larger EURATOM team) to inspect such facilities.

Although this "joint team" arrangement has worked well so far, the "principle of observation" often creates both duplication and conflicts since there are vague areas of overlapping responsibilities. In order to achieve more effective safeguards arrangements, the IAEA and EURATOM agreed in 1992 to implement a New Partnership Approach (NPA), which would:[17]

- improve the cooperation during the planning of and carrying out of inspections
- pool resources, to the extent possible, for inspectors training, procurement of materials, shared analysis, development of instruments, etc.
- once implemented, the IAEA will reduce its inspection effort in the NNWS of EURATOM countries by more than 50 percent (compared to 1990) and this reduction will be more than at places where a regional safeguards system does not exist.

As a result of this new approach, the burden on the IAEA is expected to be reduced significantly.

This regional safeguards concept was also applied to Japan. As a condition to ratify the NPT, Japan demanded similar safeguard arrangements. The agreement signed in 1973 was very similar to the EURATOM agreement, but required that Japan set up and maintain a national safeguard system as effective and "functionally independent" as that of EUR-ATOM.[18] Japan established the "Nuclear Material Control Center" to satisfy this condition.

U.S. Acceptance of Regional Safeguards

It was crucial for EURATOM to get American acceptance. It is important to understand why the United States accepted the EURATOM concept, in particular the regional safeguards system, given its security concerns about the Soviet Union, NATO integration, and containing France/Germany, as illustrated by the following quotes:

> "Under the system now envisaged, the United States could depend on French to watch the Germans, the Germans to watch the French, and the smaller nations to watch both the French and the Germans."[19]

> "The experiences gained in devising and operating such a comprehensive control system (i.e. EURATOM) will be of great benefit to the other nations—and to the IAEA—having a similar interest in effectively safeguarding atomic energy development. The ultimate objective. . . . is a worldwide system encompassing all fissionable material. The EURATOM regional control arrangement

[16] Howlett said that the document was based on the intense negotiations between the IAEA and the EURATOM, and the relationship between the two organizations "had suffered recurrent strains." Howlett, *op. cit.*, p. 214. In addition, INFCIRC/193 applies only to non-nuclear weapon states, and separate agreements had to be negotiated between NWS (France and the United Kingdom) and the IAEA. The separate agreements were based on INFCIRC/193 but significantly modified to account for the right of NWS to withdraw items from safeguards.

[17] Commission of the European Communities, "Report on the Operation of Euratom Safeguards: 1991–1992," July 1994.

[18] D. Fischer and P. Szasz, *Safeguarding the Atom: A Critical Appraisal,* J. Goldblat, ed.(London and Philadelphia : Taylor and Francis, 1985), p.73.

[19] K. Knorr, "EURATOM and American Policy. A Conference Report," Princeton University, 1956, quoted in D. A. Howlett, "Regional Nuclear Cooperation and Non-Proliferation Arrangements: Models from other Regions," paper for the Twelfth PPNN Core Group Meeting, "East Asia and Nuclear Non-Proliferation," Shizuoka, Japan, 28–29 November, 1992, p.64.

> could be a key element in any future system."[20]

In addition, U.S. commercial interests also played an important role. By reaching agreement with EURATOM, the United States was able to secure a majority of the Western European market for reactors and enrichment services through which the United States could exercise political control over recipient countries. At that time, the United States was much less concerned about reprocessing and plutonium use than enrichment technologies, and it refused to provide enrichment technologies. Plutonium recycling was encouraged by the United States to conserve scarce uranium resources. And plutonium from civilian spent fuels (reactor-grade plutonium) was thought to be useless for manufacturing a nuclear bomb. Therefore, the United States did not impose "case-by-case" approval rights for reprocessing within EURATOM, unlike other bilateral agreements it had. This exclusion of U.S. approval right of reprocessing became the major obstacle in renewing the U.S.–EURATOM agreement negotiations in 1994–1995.[21] The United States made some co n-cessions to get the EURATOM scheme going for both its security and commercial interests.

Given recent difficulties during the negotiation of the U.S.–EURATOM agreement, it is unlikely the U.S. will accept a similar regional scheme that can reduce U.S. influence over sensitive nuclear activities in Asia.

Civilian Nuclear Cooperation

Conflicts in Reactor Development

Regarding the civilian nuclear side, EURATOM countries succeeded in getting access to U.S. technology and materials while limiting the U.S. influence within the region. However, commercial conflicts among member countries, in particular Germany, France, and the United States, prevented the successful integration of technological development in Europe.[22] France refused to provide its gas-graphite reactor (GCR) technologies to other European nations. The U.S.–EURATOM agreement, signed in 1958, provided the other member nations with the U.S. light-water reactor (LWR) technology as well as cheap, enriched uranium fuel. In the early 1960s, construction of LWRs by Italian, German, and Belgian-French manufactures began. By the early 1970s, France had given up its indigenous GCR technology and adopted U.S. LWR technology, making it evident that the LWR would be the dominant reactor type in Europe (and the rest of the world).

Following the 1973 oil crisis, the U.S. Atomic Energy Commission (AEC) changed its enrichment contract policies, which led to European plans to develop its own enrichment capacity within Europe. Primarily because of the competition between France and Germany, two enrichment enterprises were established instead of a single European enrichment enterprise: Germany's URENCO and France's EURODIF. As the LWR market was growing rapidly, French, German and U.S. LWR vendors started to compete with each other outside the European market. Both the German vendor (KWU) and the French vendor (FRAMATOME) terminated their license contracts with the U.S. vendor (Westinghouse: WH) to compete independently in the world market. Each vendor won contracts in various parts of the world, including Brazil, Argentina, Pakistan, South Korea, and China. Each country developed its own nuclear industry and competed using similar technologies transferred from the United States. The commercial integration of the nuclear industry originally envisioned under the EURATOM was never achieved, leading one expert to state, "Looking at the hard economic and technical 'facts', one actually finds very little justification whatsoever for the existence of EURATOM."[23]

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[20] D. Dillon testimony, "Proposed EURATOM Agreements Hearings before the JCAE," Congress of the United States, 85th Congress, second session on the proposed EURATOM agreements and legislation to carry out the proposed cooperative agreement, Part 1, p. 84, 1958, quoted in D. A. Howlett, *ibid.*, p.64.

[21] See the detailed discussion in W. Walker*op. cit*. Under the new agreement, which has been signed by both parties, 30-year programatic approval of reprocessing and plutonium use is given to the EURATOM, and a similar condition given to the Japanese plutonium program.

[22] The original intention was to have an integrated reactor development programs in EURATOM. However, several countries (France, Germany and the United Kingdom) already had national reactor programs before the EURATOM. See the detailed discussion in H. Nau, *National Politics and International Technology: Nuclear Reactor Development in Western Europe* (Baltimore and London: The Johns Hopkins University Press 1974).

[23] A. Kramish, *The Peaceful Atom in Foreign Policy,* 1963, quoted in H. Nau, *op. cit.* p. 96.

Some Notable Successes

Multinational collaboration, however, did lead to some successful international ventures such as URENCO and EURODIF, both of which are successful enrichment corporations. And international cooperation in fast breeder reactor development was considered a success until the mid-1980s, when several countries decided against further development. Collaboration still exists in the form of the European Fast Reactor (EFR) project, currently led by the French. There is also a German–French collaboration on European Pressurized Water Reactor (EPR), although this is a commercial venture between two companies (FRAMATOME and Siemens) rather than a government-led effort. But research laboratories and institutes established by the Treaty so far have not played major roles in developing advanced nuclear technologies. Still, they provide useful examples of "shared and coordinated research and development programs" under a regional treaty. Currently, the joint research and development programs on actinide recycling and transmutation are good examples of such programs funded by the Community.

And more importantly, large reprocessing facilities in the United Kingdom and France have become de facto regional fuel cycle centers in Europe. Since the cancellation of the Wackersdorf reprocessing project in Germany, they are the only commercial-size reprocessing facilities on the continent. Although both proliferation and environmental concerns remain, existence of both facilities will be beneficial if they can provide regional long-term spent fuel storage as well as plutonium storage capacity. This would eliminate future expansion of reprocessing capacity as well as plutonium stockpiles in other countries.

Lessons from the EURATOM

It is important to summarize the benefits and costs of EURATOM as lessons for future regional schemes such as ASIATOM. First, the primary motivation and justification of EURATOM was political, although commercial interests did play important roles in formulating EURATOM. As noted by Nau, "EURATOM's origins and evolution would be eminently political, i.e., affected more by relational or contextual considerations than economic and technical factors."[24] Security interests against the Soviet bloc and political integration of Europe were the primary driving forces to establish EURATOM (and the EEC). A regional safeguards system was useful then for both Europe and for the United States, as IAEA safeguards were still underdeveloped. And efforts to establish EURATOM in the 1950s helped enhance confidence building in the region.

But EURATOM as a means to develop civilian nuclear industries in the region did not succeed. It provided some benefits to both European and U.S. nuclear companies, but it limited U.S. participation in the European industry, viewed as a "failure" by U.S. corporations. Some multinational collaboration did lead to successful international ventures within Europe.

Finally, potential sources of conflict remain in the field of civilian reprocessing and plutonium policies. Originally, the United States put lower priority on controlling the reprocessing, but this subject has become the one of the most sensitive issues between EURATOM and the U.S. government.

Conditions for an Asia-Pacific EURATOM

Similarities and Differences: Issues and New Justification

There are significant similarities and differences between the current Asia-Pacific region and EURATOM during the 1950s, some favorable and some not favorable to establishing such a scheme in Asia.

Political Background and Security Interests

First, the political background in Asia is significantly different from 1950s Europe. The end of the Cold War has reduced East–West tensions, the primary motivation behind the EURATOM. On the other hand, there is increasing momentum within Asia toward economic and political integration, such as the establishment of the Asian

[24] H. Nau, *op. cit.*, p.96. Nau also argues that the United States and the United Kingdom (who later joined the EURATOM but did not participate in the beginning) were in favor of certain types of integration which would serve their larger political interests but limit other types of integration which might threaten Anglo-American monopoly of nuclear weapons policy.

Pacific Economic Cooperation (APEC) organization. Although APEC is a much looser framework than the EEC, the trend in the region is favorable for establishing regional schemes.

The security relationships among the countries in the Pacific region are different now than those in 1950s Europe. The Cold War is over and there is no longer concern about a Russian threat, thus there may be less incentive for political integration against external threats. However, similar conditions also exist. There are concerns about possible regional conflicts such as between China and Taiwan and the Korean Peninsula, similar to concerns about East and West Germany and France in the 1950s. The relationships between Japan and the victims of Japan's military aggression during World War II have not completely healed. Neighboring countries are not only concerned about Japan's growing military capability, but also China's increasing military presence. In Europe in the 1950s, similar concerns existed about Germany. There is a clear and increasing need for confidence building in Asia, which justifies efforts to establish a regional scheme similar to EURATOM.

Nuclear Proliferation

The indefinite extension of NPT, along with the NWS' commitment to the Comprehensive Test Ban Treaty and Fissile Material Cutoff Convention are the biggest differences in nuclear proliferation since the 1950s. The global Nonproliferation regime is mature and solid, and most countries (except China, India, and Pakistan) in Asia accept full scope safeguards under the NPT regime.

However, new and significant proliferation issues are emerging in the region. Most notable is the revelation of a nuclear weapons program in North Korea. The recent establishment of the Korean Energy Development Organization (KEDO) under the Framework Accord between the United States and North Korea is a good model for future regional cooperation to lessen proliferation concerns.

Other concerns emerge from the expected expansion of civilian nuclear power programs. For example, Japan's plutonium programs have raised significant concerns among its neighbors. Despite Japan's efforts to increase transparency in its program and its "no plutonium surplus" policy, its potential weapon use capability is a target of concern among neighboring countries. More importantly, other nations in the region might follow Japan's plutonium programs. For example, China recently announced that it plans to build a 50 ton/year reprocessing plant by the year 2000, and plans for increasing capacity to 400–800 tons/year by 2010 exist. Japan, in addition to its existing Tokai (90 ton/year) reprocessing plant, is planning to complete its first commercial size (800 ton/year) plant in Rokkasho by 2003. South Korea and China also express interest in development of breeder reactors.[25]

The revelation of secret nuclear programs in Iraq and North Korea increased concern about the effectiveness of IAEA safeguards. Additional burdens from expanding civilian plutonium programs, safeguarding excess fissile materials resulting from nuclear disarmament by the United States and Russia, and IAEA zero-growth budget constraints mean that the IAEA safeguards system needs to improve its effectiveness.[26]

Civilian Nuclear Power Development

Unlike the 1950s, the global nuclear market is well established, and access to both technologies and nuclear materials are no longer an issue. More importantly, the United States is no longer the dominant supplier of nuclear technologies, materials, and enrichment services.

However, several important factors justify regional cooperation in the field of peaceful use of nuclear power in Asia. East Asia is the only region in the world where steady expansion of nuclear power is expected. As of 1995, total global nuclear capacity is 344 GWe, only 16 percent (57 GWe) in Asia (including South Asia). By 2010, this share is expected to increase to almost 30 percent. Eighty percent of the growth during that period (70 GWe out of 93 GWe) is expected to happen in Asia (see Table 1). Most of the growth in nuclear capacity is expected in Japan, China and South Korea. This demand for nuclear power primarily comes from increased energy demand in the region, concern about supply of fossil fuels, and environmental

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[25] Regarding Japan's plutonium programs and their proliferation implications, please see E. B. Skolnikoff, T. Suzuki, and K. Oye, *International Responses to Japanese Plutonium Programs* (Cambridge, Mass.: Center for International Studies, MIT, 1995).

[26] IAEA has been restructuring its safeguards system and came up with the new concept last year, "93 + 2", to improve cost-effectiveness and detection capability of clandestine programs.

Table 1: Nuclear Power Programs in the Asia-Pacific Region

(GWe)

	1995	2000	2005	2010
Japan	39.7	42.9	54.0	66.5
S. Korea	8.2	13.7	18.7	22.1
Taiwan	4.9	5.1	7.7	7.7
China	2.1	2.7	5.3	25.0
India	1.7	3.3	3.8	3.8
Others	0.1	0.1	1.4	1.4
Asia Total	56.7 (16.5%)	67.8 (18.3%)	90.9 (22.5%)	126.5 (28.9%)
N. America	115.9	115.9	116.6	107.6
W. Europe	123.5	129.3	128.5	129.1
E. Europe	43.7	52.2	62.1	66.2
Others	4.6	4.6	6.7	7.7
World Total	344.4 (100%)	369.8 (100%)	404.8 (100%)	437.1 (100%)

Source: Based on data from OECD/NEA, Nuclear News, Japan Atomic Industrial Forum.

concerns resulting from increased consumption of fossil fuels. This alone may justify regional cooperation on energy and security issues in Asia.[27] This situation resembles the energy situation in Europe in 1950s.[28]

Expansion of nuclear power in Asian countries increases the need for regional cooperation. In particular, safety, waste (spent fuel) management, and advanced technologies are the major issues that all nuclear nations face. Japan's Ministry of International Trade and Industry(MITI)'s Advisory Council published a 1995 report which recommended:

1. increased dialogue on nuclear safety, operation and spent fuel/waste management,
2. tighter controls consistent with international regulation, and
3. "one-set supply on safety"—both hardware and software need to be transferred to developing nuclear powers.[29]

At the recent Seventh "International Conference for Nuclear Cooperation in Asia," sponsored by the Japan Atomic Energy Commission, nine countries agreed to add "safety culture" as a new agenda for the next conference.[30]

Adaptation of the EURATOM Concept to Asia

Recently, various proposals made by Japanese and other experts for a regional cooperation scheme in peaceful use of nuclear power in Asia referred to EURATOM as a possible model and Japan as a possible leader to take such initiatives.[31] I will assess the potential applicability of these schemes with respect to the broad goals of nuclear nonproliferation and civilian nuclear power development.

Nuclear Nonproliferation

The primary nonproliferation goal of EURATOM was to contain proliferation within the region, important for both members of EURATOM and countries outside, especially the

[27] See, for example, Kent Calder, "Asia's Empty Tank," *Foreign Affairs* 75 (2): 55–69.

[28] The concern over oil supply in the 1950s, however, was only short-lived. The supply problem did not materialize until the oil crises in the 1970s, when expectation of nuclear power was heightened.

[29] MITI's Advisory Council on Energy, Sub-Committee on Nuclear Power, Report on International Cooperation in Asia, June 1995. (in Japanese)

[30] Denki Shimbun, March 6, 1996. The nine participant countries are Australia, China, Indonesia, Republic of Korea, Malaysia, the Philippines, Thailand, and Vietnam.

[31] See, for example, R. Imai, "A Call for Regional Cooperation in Nuclear Energy," *Japan Review of International Affairs* (Summer 1995): 266–271; K. Kaneko, "PACIFICATOM: A New Framework for Nuclear Cooperation in the Asia-Pacific Region"; T. Kano, "Economic Development of Asia and International Cooperation in Nuclear Energy: A Proposal for PACIFCATOM," paper presented at the Symposium Commemorating the Seventh APEC Ministerial Meeting, PECC/PBEC Joint Symposium, Osaka, November 18, 199; A. Suzuki, "Reducing Proliferation Risks— Expanding and Internationalization of Verification and Control Regime: IAEA and Others; Managing Proliferation Risks from Civilian and Weapon-grade Plutonium and Enriched Uranium," presented at the 45th Pugwash Conference on Science and World Affairs, "Towards A Nuclear-Weapon-Free World," Hiroshima, Japan, July 23–29, 1995; E. T. Fei, "Nuclear Energy and Nuclear Fuel Cycle Issues in East Asia," presented at the Northeast Asian Cooperation Dialogue IV, Beijing, January 1996; and R. Manning, "PACATOM: A Nuclear Cooperation Regime as Asian CSBM," prepared for Council for Security Cooperation in the Asia-Pacific Working Group on Confidence and Security Building Measures, Washington D.Cc, April 22–23, 1996.

United States. Similar interests exist among Asia-Pacific countries, as well as the need to improve confidence building. To enhance regional confidence, EURATOM safeguards must be modified to the Asian regional scheme. Some of the features that worth considering are:

1. legal ownership of special fissile materials (especially HEU and plutonium) by a regional authority
2. equal treatment among members including NWS (i.e., China should also accept safeguards for their civilian programs)
3. cost-saving measures for IAEA safeguards

The above features add considerable benefit to the existing NPT/IAEA safeguards regime.

A regional safeguards system can be based on the experiences of Japan's Nuclear Material Control Center. Current discussion about an "International Plutonium Management" scheme can also incorporate a regional safeguards system that would include materials from military programs, if necessary. In addition, Japan's voluntary nonproliferation policy is a good model for all countries to adopt.[32] Cooperation with existing regional safeguards regimes such as EURATOM is also advisable.

On the other hand, concerns exist about the credibility of regional safeguards. The U.S. may not accept a regional scheme, if it would reduce or weaken American influence over activities in the region, or if the regional scheme is designed to allow expanded reprocessing and plutonium programs without U.S. control.[33] However, the U.S. may support such a regime if significant nonproliferation benefits as described above are included. It is important to assess whether potential benefits of any program are sufficient for the U.S. to accept.

Other concerns exist about membership in an Asian-based regime.[34] Taiwan may not be able to join if China joins. Whether non–NPT countries such as India and Pakistan should join is another important issue.[35] And dealing with North Korea also would be sensitive, although the KEDO framework is a good base for a possible ASIATOM regime.

Potential for Civilian Nuclear Cooperation

The EURATOM experience suggests that regional integration of nuclear industry is too ambitious, and no need exists in Asia. Access to uranium is also not an important issue. Thus technical and economic reasons only do not justify an Asian regional scheme, as the EURATOM lesson suggests.

But all countries with nuclear power programs face common issues (i.e., radioactive waste (spent fuel) management, nuclear safety, and advanced nuclear research and development). One short-term goal is to develop a regional spent fuel storage facility.[36] This would reduce pressure on utilities and reduce unnecessary reprocessing. In the long-term, a regional fuel cycle center can be envisioned if such needs arise in the future.[37]

Establishing a common nuclear safety culture is another important goal. An accident in any country would seriously affect all nuclear programs in the region. Japan can play an important role in expanding "safety culture."[38] Safety culture includes effective physical

[32] It is reported that seven countries participating in the discussion of "International Plutonium Management Scheme" (Belgium, France, Germany, Japan, Russia, the U.K., and the U.S.) agreed in December 1994 that they would publish the data on the size, composition, and location of their stocks of commercial plutonium on a yearly basis. See A. Suzuki, *op. cit.*.

[33] Manning suggested a Japan–U.S. plutonium initiative in which Japan would cancel or defer its commercial plutonium programs. See Manning, *op. cit.,* 1996.

[34] Kaneko suggested the initial membership as follows: Australia, Canada, China, Indonesia, Japan, South Korea, Malaysia, Philippines, Taiwan, Thailand, the United States, and Vietnam. He suggested that India, Pakistan, and North Korea join if they accept the non-proliferation conditions specified by the PACIFICATOM. See Kaneko, *op. cit.* Kano and Imai suggested Russia, France, and the United Kingdom as other possible members.

[35] It is important to point out that France was not a member of NPT until very recentlybut was one of the original members of EURATOM.

[36] Kaneko stresses the importance of the "back end" of fuel cycle issues. International management of radioactive waste is also suggested by Kano, citing the proposal by the Republic of Marshall Islands whose national assembly voted unanimously in a special resolution to invite an international repository of high level radioactive waste. Fei also suggested Siberia, Gobi in China, and parts of Australia as possible candidates for international spent fuel (or waste) storage. See Kaneko, Kano, and Fei, cited above.

[37] Imai suggested that joint international management of fuel cycle facilities (enrichment and reprocessing) would be better in the Asian region. See Imai, *op. cit.*

[38] Imai suggested that Japan open its national facilities for research and training to people from Asian nations, as the United States did during the initial phase of nuclear power development. See Imai, *op. cit.*

Table 2: Status of International Treaties in Region

	NPT	IAEA Safe-guards (FSSG)	Nuc. Safety Convention		Nuclear Liability Law	Nuclear Emergency Convention		London Conven-tion (Waste)
			Sign	Ratify		Notify	Assist.	
Japan	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
China	Yes	No (voluntary)	Yes	No	No	Yes	Yes	Yes
Taiwan	No	Yes (IAEA/U. S.)	No	No	Yes	No	No	No
S. Korea	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N. Korea	Yes	Yes	No	No	No	No	No	No
Indonesia	Yes	Yes	Yes	No	No	No	No	No

Source: Japan Atomic Industrial Forum, "Genshiryoku Sangyo Shimbun (Nuclear Industry News)," June 15, 1995.

protection, material accounting, and environmental monitoring, also useful for nonproliferation purposes.[39] There are various international laws and conventions regarding nuclear safety, safeguards, liability, and waste (Table 2). It would be useful for all member nations in Asia to coordinate to develop consistent standards, regulations, and agreements to satisfy those international regulations.

Coordinated efforts on advanced nuclear research and development are another potential area of cooperation, although the EURATOM experience suggests this would be very difficult because of commercial interest and national prestige. However, research and development programs to develop the next generation of advanced reactors, including breeders, would be helpful. This would standardize the future reactor market and increase the transparency of research programs.

Conclusions

Significant differences between Europe in the 1950s and Asia in the 1990s exist. However, similarities and growing new needs justify an ASIATOM scheme based on the EURATOM model. In particular, ASIATOM could enhance confidence building within the region and improve the nuclear material safeguards system. For example, the universal nature of such a regime can improve safeguards among nuclear weapon states, the concept of "legal ownership of fissile materials" can help manage surplus materials, and a regional safeguards system can reduce increased burdens on the IAEA.

Potential benefits can emerge from coordinated efforts to solve issues related to civilian nuclear power development, such as sharing "safety culture" and coordinated efforts to solve spent fuel management issues. Coordinated research and development efforts to solve emerging energy and environmental issues are another area with much potential. But economic and technical needs alone do not justify ASIATOM. Efforts to establish a EURATOM-type organization in Asia are worth pursuing. To establish such a scheme, however, requires American acceptance. But understanding of these issues, continued dialogue, and coordinated efforts among interested nations are needed to get the process started.

[39] A. Suzuki suggested that by developing civilian plutonium technologies, Japan can contribute significantly to improving safeguards-related technologies. see A. Suzuki, *op. cit*.

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APPENDIX A

➢

Attachment 1

U.N.T.S. No. 10485, vol. 729, pp. 169-175.
TREATY ON THE NONPROLIFERATION OF NUCLEAR WEAPONS (1968)
ENTERED INTO FORCE: 5 March 1970

The States concluding this Treaty, hereinafter referred to as the "Parties to the Treaty",

Considering the devastation that would be visited upon all mankind by a nuclear war and the consequent need to make every effort to avert the danger of such a war and to take measures to safeguard the security of peoples,

Believing that the proliferation of nuclear weapons would seriously enhance the danger of nuclear war,

In conformity with resolutions of the United Nations General Assembly calling for the conclusion of an agreement on the prevention of wider dissemination of nuclear weapons,

Undertaking to cooperate in facilitating the application of International Atomic Energy Agency safeguards on peaceful nuclear activities,

Expressing their support for research, development and other efforts to further the application, within the framework of the International Atomic Energy Agency safeguards system, of the principle of safeguarding effectively the flow of source and special fissionable materials by use of instruments and other techniques at certain strategic points,

Affirming the principle that the benefits of peaceful applications of nuclear technology, including any technological by-products which may be derived by nuclear-weapon States from the development of nuclear explosive devices, should be available for peaceful purposes to all Parties to the Treaty, whether nuclear-weapon or non-nuclear-weapon States,

Convinced that, in furtherance of this principle, all Parties to the Treaty are entitled to participate in the fullest possible exchange of scientific information for, and to contribute alone or in cooperation with other States to, the further development of the applications of atomic energy for peaceful purposes,

Declaring their intention to achieve at the earliest possible date the cessation of the nuclear arms race and to undertake effective measures in the direction of nuclear disarmament,

Urging the cooperation of all States in the attainment of this objective,

Recalling the determination expressed by the Parties to the 1963 Treaty banning nuclear weapon tests in the atmosphere, in outer space and under water in its Preamble to seek to achieve the discontinuance of all test explosions of nuclear weapons for all time and to continue negotiations to this end,

Desiring to further the easing of international tension and the strengthening of trust between States in order to facilitate the cessation of the manufacture of nuclear weapons, the liquidation of all their existing stockpiles, and the elimination from national arsenals of nuclear weapons and the means of their delivery pursuant to a Treaty on general and complete disarmament under strict and effective international control, Recalling that, in accordance with the Charter of the United Nations, States must refrain in their international relations from the threat or use of force against the territorial integrity or political independence of any State, or in any other manner inconsistent with the Purposes of the United Nations, and that the establishment and maintenance of international peace and security are to be promoted with the least diversion for armaments of the world's human and economic resources,

Have agreed as follows:

Article I

Each nuclear-weapon State Party to the Treaty undertakes not to transfer to any recipient whatsoever nuclear weapons or other nuclear explosive devices or control over such weapons or explosive devices directly, or indirectly; and not in any way to assist, encourage, or induce any non-nuclear-weapon State to manufacture or otherwise acquire nuclear weapons or other nuclear explosive devices, or control over such weapons or explosive devices.

Article II

Each non-nuclear-weapon State Party to the Treaty undertakes not to receive the transfer from any transferor whatsoever of nuclear weapons or other instruments of ratification or accession after the 180-day period,. negotiation of such agreements shall commence not later than the date of such deposit. Such agreements shall enter into force not later than eighteen months after the date of initiation of negotiations.

Article IV

1. Nothing in this Treaty shall be interpreted as affecting the inalienable right of all the Parties to the Treaty to develop research, production and use of nuclear energy for peaceful purposes without discrimination and in conformity with Articles I and II of this Treaty.
2. All the Parties to the Treaty undertake to facilitate, and have the right to participate in, the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy. Parties to the Treaty in a position to do so shall also cooperate in contributing alone or together with other States or international organizations to the further development of the applications of nuclear energy for peaceful purposes, especially in the territories of non-nuclear-weapon States Party to the Treaty, with due consideration for the needs of the developing areas of the world.

Article V

Each Party to the Treaty undertakes to take appropriate measures to ensure that, in accordance with this Treaty, under appropriate international observation and through appropriate international procedures, potential benefits from any peaceful applications of nuclear explosions will be made available to non-nuclear-weapon States Party to the Treaty on a non-discriminatory basis and that the charge to such Parties for the explosive devices used will be as low as possible and exclude any charge for research and development. Non-nuclear-weapon States Party to the Treaty shall be able to obtain such benefits, pursuant to a special international agreement or agreements, through an appropriate international body with adequate representation of non-nuclear-weapon States. Negotiations on this subject shall commence as soon as possible after the Treaty enters into force. Non-nuclear-weapon States Party to the Treaty so desiring may also obtain such benefits pursuant to bilateral agreements.

Article VI

Each of the Parties to the Treaty undertakes to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control.

Article VII

Nothing in this Treaty affects the right of any group of States to conclude regional treaties in order to assure the total absence of nuclear weapons in their respective territories.

Article VIII

1. Any Party to the Treaty may propose amendments to this Treaty. The text of any proposed amendment shall be submitted to the Depositary Governments which shall circulate it to all Parties to the Treaty. Thereupon, if requested to do so by one-third or more of the Parties to the Treaty, the Depositary Governments shall convene a conference, to which they shall invite all

the Parties to the Treaty, to consider such an amendment.

2. Any amendment to this Treaty must be approved by a majority of the votes of all the Parties to the Treaty, including the votes of all nuclear-weapon States Party to the Treaty and all other Parties which, on the date the amendment is circulated, are members of the Board of Governors of the International Atomic Energy Agency. The amendment shall enter into force

for each Party that deposits its instrument of ratification of the amendment upon the deposit of such instruments of ratification by a majority of all the Parties, including the instruments of ratification of all nuclear-weapon States Party to the Treaty and all other Parties which, on the date the amendment is circulated, are members of the Board of Governors of the International Atomic Energy Agency. Thereafter, it shall enter into force for any other Party upon the deposit of its instrument of ratification of the amendment.

3. Five years after the entry into force of this Treaty, a conference of Parties to the Treaty shall be held in Geneva, Switzerland, in order to review the operation of this Treaty with a view to assuring that the purposes of the Preamble and the provisions of the Treaty are being realized. At intervals of five years thereafter, a majority of the Parties to the Treaty may obtain, by submitting a proposal to this effect to the Depositary Governments, the convening of further conferences with the same objective of reviewing the operation of the Treaty.

Article IX

I. This Treaty shall be open to all States for signature. Any State which does not sign the Treaty before its entry into force in accordance with paragraph 3 of this Article may accede to it at any time.
2. This Treaty shall be subject to ratification by signatory States. Instruments of ratification and instruments of accession shall be deposited with the Governments of the United Kingdom of Great Britain and Northern Ireland, the Union of Soviet Socialist Republics and the United States of America, which are hereby designated the Depositary Governments.
3. This Treaty shall enter into force after its ratification by the States, the Governments of which are designated Depositaries of the Treaty, and forty other States signatory to this Treaty and the deposit of their instruments of ratification. For the purposes of this Treaty, a nuclear-weapon State is one which has manufactured and exploded a nuclear weapon or other nuclear explosive device prior to 1 January, 1967.
4. For States whose instruments of ratification or accession are deposited subsequent to the entry into force of this Treaty, it shall enter into force on the date of the deposit of their instruments of ratification or accession.
5. The Depositary Governments shall promptly inform all signatory and acceding States of the date of each signature, the date of deposit of each instrument of ratification or of accession, the date of the entry into force of this Treaty, and the date of receipt of any requests for convening a conference or other notices.
6. This Treaty shall be registered by the Depositary Governments pursuant to Article 102 of the Charter of the United Nations.

Article X

1. Each Party shall in exercising its national sovereignty have the right to withdraw from the Treaty if it decides that extraordinary events, related to the subject matter of this Treaty, have jeopardized the supreme interests of its country. It shall give notice of such withdrawal to all other Parties to the Treaty and to the United Nations Security Council three months in advance. Such notice shall include a statement of the extraordinary events it regards as having jeopardized its supreme interests.
2. Twenty-five years after the entry into force of the Treaty, a conference shall be convened to decide whether the Treaty shall continue in force indefinitely, or shall be extended for an additional fixed period or periods. This decision shall be taken by a majority of the Parties to the Treaty.

Article XI

This Treaty, the English, Russian, French, Spanish and Chinese texts of which are equally authentic, shall be deposited in the archives of the Depositary Governments. Duly certified copies of this Treaty shall be transmitted by the Depositary Governments to the Governments of the signatory and acceding States.
IN WITNESS WHEREOF the undersigned, duly authorized, have signed this Treaty.

DONE in triplicate, at the cities of London, Moscow and Washington, the first day of July, one thousand nine hundred and sixty-eight.

Attachment 2

Information and Background Paper on KEDO

The Korean Peninsula Energy Development Organization (KEDO), founded on March 9, 1995, is the international organization established to implement most of the "Agreed Framework" signed by the United States of America and the Democratic People's Republic of Korea (DPRK) on October 21, 1994. The Agreed Framework addresses international concerns about nuclear activities in the DPRK, and, if implemented, will ultimately lead to the complete dismantlement of those aspects of the DPRK's nuclear program, including reprocessing-related facilities, that have threatened to undermined the viability of the international nuclear nonproliferation regime and the stability of the Asia-Pacific region.

The U.S.-DPRK Agreed Framework

The Agreed framework calls for the DPRK to:

Freeze and eventually dismantle its graphite-moderated reactors (Dismantlement will be completed upon completion of a light-water-reactor (LWR) project (see below))

Seal, cease activities at, and eventually dismantle all reprocessing-related facilities. (Dismantlement will be completed upon completion of LWR project)

Cooperate in finding a safe method to store existing spent fuel from the DPRK's 5 MW (e) experimental reactor and to dispose of such fuel in a safe manner that does not involve reprocessing in the DPRK

Allow the International Atomic Energy Agency (IAEA) to monitor the aforementioned freeze and to resume ad hoc and routine inspection of facilities not subject to the freeze upon conclusion of a Supply Agreement for the LWR project

Come into full compliance with the DPRK-IAEA safeguards agreement upon completion of a significant portion of the LWR project

Remain a party to the Nuclear Nonproliferation Treaty (NPT)

Engage in North-South dialogue, and take consistent steps to implement the North-South Joint Declaration on the Denuclearization of the Korean Peninsula

In exchange for implementing its commitments under the Agreed framework, the DPRK will receive:

- Two light-water, proliferation-resistant nuclear reactors (on a turnkey basis) with a total generating capacity of approximately 2,000 MW (e). KEDO will develop a delivery schedule for the LWR project aimed at achieving a completion date of 2003
- 150,000 tons of heavy-fuel oil for heating and electricity production by October 1995 and 500,000 tons annually thereafter until the start of full-power operation of the first light water reactor (LWR)
- Formal assurances from the U.S. against the threat or use of nuclear weapons

In addition to the above, the Agreed Framework calls for the U.S. and the DPRK to:

Reduce barriers to trade and investment, including restrictions on telecommunications services and financial services and financial transactions

Open a liaison office in the other's capital

Upgrade bilateral relations to ambassadorial level following progress on issues of concern to each side

KEDO's Obligations

KEDO's primary obligations are to:

Provide for the financing and supply of the LWR project

Provide heavy fuel oil to DPRK according to the schedule in the Agreed Framework

KEDO'S Budget

To fulfill its obligations over the next decade, including the supply of two LWRs and the provision of heavy fuel oil until completion of the first

LWR, it is estimated KEDO must raise between US $4 billion and US $5 billion.

Much of KEDO's costs are covered by Japan, the ROK, and the U.S., including all administrative costs. The ROK and Japan will finance a major portion of the LWR project, while the U. S. will contribute to the cost of heavy fuel oil and the safe storage of the DPRK's spent fuel. KEDO continues to need funding for the provision of heavy fuel oil.

KEDO's Composition

Current membership:

KEDO is currently composed of seven members: Australia, Canada, Finland, Japan, New Zealand, the Republic of Korea (ROK), and the U.S. Other countries have contributed to KEDO as non-members. KEDO expects membership to increase further over the next year.

Executive Board and staff

KEDO's Executive Board—consisting of representatives from the organization's three 'Original Members' (Japan, ROK, U. S.)—sets the general direction for KEDO. The executive Director, the Hon. Stephen Bosworth (U.S.), and two Deputy Directors, Dr. Choi Young-Jin (ROK) and Mr. Itaru Umezu (Japan) are responsible for day-to-day operations. KEDO's staff consists of 26 professionals and expert consultants drawn mainly, but not exclusively, from Japan, the ROK and the U.S. The KEDO Secretariat is located in New York.

General Conference and Advisory Committees:

Members of KEDO play an active role in KEDO through their participation in KEDO General Conferences, which are held at the discretion of the Executive Board at intervals **of no longer** than one year. The Executive Board intends to hold frequent meetings in the initial years of KEDO's operations.

All KEDO members may further participate in KEDO Advisory Committees, which are chaired by KEDO members other than Japan, the ROK, and the U.S. Advisory Committees meet at such times as they determine, and influence the decision making of KEDO through advice to the Executive Director and Executive Board. There are currently advisory committees for the LWR project, the safe storage and disposition of the DPRK's spent fuel, and the provision of heavy fuel oil to the DPRK.

What Nuclear Reactor Model Will Be Provided?

Following extensive negotiations between the U.S. and the DPRK in Kuala Lumpur in May-June, 1995, it was agreed the reactor model to be provided to the DPRK will be the Korean Standard Nuclear Power plant model currently under constructions. The reference plants will be Ulchin 3 and 4, based in Ulchin, ROK. These nuclear reactors are an advance version of US-origin design, and have undergone extensive safety analysis and documentation; they are considered among the best commercial plants available.

International Safety Conventions

Prior to the shipment of any fiJel assemblies to the DPRK, the DPRK is required to ensure that the highest nuclear regulatory standards and procedures are in place to promote the safe operation of the LWRs. This includes observing provisions set forth in the Convention on Nuclear Safety, the Convention on Early Notification of a Nuclear Accident, the convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, and the Convention on the Physical Protection of Nuclear Material. KEDO will assist the DPRK in developing the capability to operate and regulate its nuclear power facilities.

Site Surveys

KEDO site survey teams have undertaken two site surveys (Aug. 15-22, Oct. 24-Nov. 7) in the Kumho area of the Sinpo region in the DPRK. The survey area, 22 kilometers-squared in size, had previously been selected for a similar DPRK-USSR study for the same purpose. No formal designation of this site as the location of the LWR project has been made. A third site survey will take place in late December 1995 and early 1996.

Actions and findings:

The general area is believed suitable for the LWR project.

The exact location may be selected from four potential sites in the area

Table 1: Oil Shipments to the DPRK (through October, 1995)

DATE (1995)	METRIC TONS	TOTAL COST—U.S. $ (cargo, insurance, freight)
January 16*	22,428.000	2,393,574.90
January 19*	27,972.000	2,895,245.10
August 18	20,299.155	2,081,283.86
August 24	20,192.795	2,071,913.10
September 29	21,591.743	2,199,557.75
October 9	8,151.535	830,399.48
October 18	15,156.000	1,562,155.27
October 28	15,000.000	1,546,076.08
TOTAL	150,791.228	15,580,205.54

*Shipment arranged and funded by U.S. Department of Defense prior to KEDO's founding

KEDO survey teams have addressed potential concerns relating to seismology, environmental safety, and constructability. Following extensive consultations with the DPRK and onsite visual surveys conducted by KEDO experts, there do not appear to be any significant concerns that would impact construction of the LWR project. Seismic monitoring is underway

More site-specific data collection and analysis to determine site characteristics related to constructability and safety will be conducted during the next site survey. Site-specific safety analysis includes the effect on plant design of factors such as population density, industrial activity, regional weather conditions, and water levels in and around the potential location of the LWR project. Site-specific analysis is primarily intended to ensure that public safety and ecological issues are adequately accounted for in the design of the LWR project. Survey experts will address these and additional issues in the period leading up to and including the site preparation.

Attachment 3

The Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC)

ABACC as a Regional Confidence-Building Measure

ABACC is one of the best examples of a confidence-building measure in all of Latin America in that it solidifies the bilateral actions and declarations of each of its member states.[1] ABACC provides for transparency in two ways: Argentines and Brazilians (usually experts in the nuclear field) work together on a daily basis in the agency and inspectors from each country visit the nuclear facilities of the other country. Communication is established, information is shared. Also, the Joint System of Accounting and Control (SCCC), upon which ABACC bases the application of its safeguards, is "immersed in the context of technical cooperation in the nuclear area between the two countries".[2] Exchanges and training (technical cooperation) take place regularly between the national facilities and ABACC and between the national laboratories and ABACC. As such the human resources involved in the diverse [nuclear] applications, including the most sensitive, and the activities taking place in each country, are known by the other Party, which contributes to an increase in the efficiency of controls.[3] Much of ABACC's success results from its integration of Argentine and Brazilian technicians into the bilateral CBM process.

By having inspectors from the national facilities of one country visit and apply safeguards to similar facilities of the other country, technicians and nuclear specialists perfect their inspection as well as their operations capabilities. Current ABACC Secretary Jorge A. Coll claims that this aspect of ABACC's safeguards implementation causes the monitoring process to become increasingly more efficient and cooperative:

> An operations specialist that performs an inspection in the other country better understands the difficulties and inconveniences associated with the application of safeguards in this type of installation and, upon returning to his normal activities, seeks to perfect the safeguards elements in the same type of installation in his country...promoting a system of "revitalization" that perfects the application of the controls system.[4]

This also provides for the predictability factor that CBMs prescribe— each country knows the nuclear capabilities of the other. Uncertainties and suspicions are decreased.

ABACC provides the verification of the two countries efforts at building confidence with one another. During the dedication ceremony for ABACC Headquarters in Rio de Janeiro (December 1992), Argentine Foreign Minister Guido Di Tella emphasized the importance of the verification of agreements like the Guadalajara Treaty. According to Di Tella such bilateral accords "cannot be implemented unless there is an adequate supervision system." In this context, ABACC takes declaratory CBMs a step further— to implementation.[5] The establishment and functioning,

1 For a list of characteristics that tend to lead to successful CBMs please see Jack Child, "Medidas de confianza Mutua en America Central" in *Medidas de Confianza Mutua en America Latina* (Chile: FLACSO, February 1994),47-48.

2 Jorge A Coll, Secretary of ABACC, "Sistemas Regionales: El SCCC y La ABACC," paper presented at the Conference on Peaceful Uses of Nuclear Energy and Nonproliferation, Bariloche, Argentina, 19 April 1994), pp. 7–8.

3 Jorge A Coll, interview with author, facsimile, 27 July 1994.

4 Coll, 19 April 1994, 7.

5 "Pact to Control Nuclear Activities Implemented with Brazil" TELAM, Buenos Aires (10 December 1992); as translated in *Proliferation Issues,* JPRS-TND-92-048 (23 December 1992).

itself, of ABACC also creates the political statement that Argentina and Brazil are serious enough about their commitments to invest money and labor into an inspection agency.

ABACC as a Model

Certain characteristics of ABACC as an agency may also prove to be useful examples for other regional verification bodies. The aspects that tend to be advantageous to ABACC include:

> compatibility with international system; the incorporation of technicians and scientists in the nuclear monitoring process to complement political efforts in nuclear policy; mutual inspections; verification activities taking place in a context of technical cooperation, leading to transparency as well as mutually beneficial energy progress; outside, internationally-trusted technical training; and, a certain autonomy in the regional or bilateral context, creating trust locally.

ABACC—History and Operation

In 1991 Brazil and Argentina signed a Bilateral Agreement which is commonly called the Guadalajara Treaty. Article VI of the Bilateral Agreement created ABACC for the purpose of administering and applying the Joint System for Accounting and Control of Nuclear Materials (SCCC), introduced in Article IV of the same agreement. The SCCC is essentially an inventory system which provides the framework for verifying "that the nuclear material used in all nuclear activities is not diverted to the purposes prohibited by the [bilateral] agreement."[6] Soon after the bilateral accords, ABACC became part of a multilateral safeguards agreement, commonly known as the Quadripartite Agreement, between Argentina, Brazil, the agency and the IAEA. In this accord, IAEA uses the SCCC, which is applied by ABACC, as its foundation for safeguarding Argentine and Brazilian facilities. As such, ABACC has a vital bilateral verifying role within the Guadalajara Treaty and a similar, though *multilateral,* verifying role within the Quadripartite Agreement with the IAEA.[7]

ABACC is comprised of a governing or directive body, called a Commission, and a Secretariat, its implementing body. The Commission includes four representatives, two each appointed by the governments of Argentina and Brazil. Currently, these representatives are from the Argentine and Brazilian foreign ministries and their respective nuclear commissions. It is responsible for monitoring the implementation of the SCCC and supervising the activities and functioning of the Secretariat. The Commission also informs the states parties regarding ABACCs implementation of the SCCC and any discrepancies that may arise during verification activities.

At the head of the Secretariat, a Secretary and a Deputy Secretary alternate each year between a representative from Argentina and one from Brazil. The Secretariat staff consists of six Senior Professional Technical Officials, two Professional Administration Officials, four Auxiliaries as well as some 100 inspectors contracted from the national authorities of the states parties. In all cases Argentina and Brazil provide equal numbers of staff members. The responsibility of the Secretariat is to perform the implementation and administration activities of the SCCC, as directed by the Commission; to designate inspectors (from the Commission's list based on the Parties' recommendations); to evaluate inspections and inspection reports; to inform the Commission "immediately" of any discrepancy which becomes apparent from evaluations, and to report regularly to the Commission on its activities and the implementation of the SCCCs.[8]

ABACC contracts inspectors from Argentina and Brazil (50 from each country at present) to inspect the facilities of the other country. These inspectors are technicians, engineers and scientists from the national nuclear authorities. Nominated by the national authorities, the list of these inspectors is reviewed by the Commission whose final selec-

6 The Guadalajara Treaty, 18 July 1991.

7 See ANNEX I and II for the texts of the bilateral and quadripartite agreements [LAEA IM CIRC/395 and/435—the bilateral agreement details the guidelines of the SCCC and the establishment and functions of ABACC.

8 In case of discrepancies, the secretariat informs the commission which then informs the government of the nation in which the discrepancy was discovered. The nation should then rectify the problem. Any further difficulties in resolving that discrepancy may he reported to the Organization of American States (OAS) or the United Nations (UN) Security Council The Guadalajara Treaty, 18 July 1991.

tions are sent to the Secretariat which takes from this pool of inspectors as necessary. Each inspection team usually includes not only safeguards specialists, but also nuclear design and operation experts. Their job is to execute the inspections necessary to verify the accounting and control of nuclear materials in both countries in order to confirm that none is diverted from its exclusively peaceful use.[9]

Since 1992, ABACC has administered the Joint System for Accounting and Control of Nuclear Materials to nuclear facilities in both countries. This is essentially an inventory mechanism to monitor the non-diversion of nuclear materials to non-peaceful uses. The national nuclear authorities of Argentina and Brazil make initial declarations of their nuclear inventories and ABACC inputs that information into a data bank. This data bank information is updated periodically by further national authority reports of inventory variations. ABACC inspects each facility, first to verify its design information and initial inventory, then it conducts routine inspections to confirm the correctness of the SCCC reports. The inspection procedures for each facility are spelled out in facility attachments. ABACC activities for each facility are detailed in Implementation Manuals which are derived from confirmed design information. Routine inspections check the flow of nuclear material through the fuel cycle to compare with the accountancy of that material. Other ABACC activities include periodic inspections, the application of seals to containers, the analysis of reports issued by the Operators, and the taking of material samples for laboratory analysis.

Currently, ABACC has verified almost all design information completed for all nuclear facilities in Argentina and Brazil. In 1995, ABACC progressed to ad hoc inspections. From January to April 1995, ABACC inspectors performed 24 inspections including three design information verification, two initial inventory verification and 19 *ad hoc* inspections. It maintains centralized records of nuclear material accounts, receiving reports from the national authorities. Its inspectors continue to participate in international training exercises and ABACC's technical expertise and equipment base continue to grow.

ABACC, jointly with the IAEA and with the use of results from previous verification activities, verified the inventory of all nuclear material present at all 70 Argentine and Brazilian nuclear installations by May 1995, according to its statementto the IAEA General Conference in September 1995.

[9] ABACC, *Annual Report,* (Rio de Janeiro: comunicacao Atual Ltda., 1993).

Attachment 4

Reduced Enrichment for Research and Test Reactor (RERTR) Program

Since the 1950s, as part of the "Atoms for Peace" program, the United States has provided peaceful nuclear technology to foreign nations. A major element of this program was the provision of research reactor technology and the Highly Enriched Uranium (HEU) necessary to fuel the research reactors. Research reactors play a vital role in important medical, agricultural, and industrial applications. For example, research reactors are a vital tool in cancer therapy and radioimmunoassay blood testing. There are about 30,000 medical procedures per day in North America using medical isotopes produced in research reactors. Similarly, there are about 8,000 to 10,000 such procedures per day in Europe and a similar number on other continents.

To further reduce the danger of nuclear weapons proliferation, the United States in 1978 began the Reduced Enrichment for Research and Test Reactors (RERTR) program. It was aimed at reducing the use of HEU in civilian programs by promoting the conversion of foreign research reactors from HEU fuel to low enriched uranium (LEU) fuel. Research reactors had become the major civilian users of HEU as fuel. The key technical problem has been to develop high density fuels using LEU that can substitute for the HEU fuel that was originally used. As part of the RERTR program, the Department of Energy's Argonne National Laboratory in Chicago developed LEU fuel that can substitute for HEU fuel and consulted and assisted with foreign research reactor operators in modifying their reactors to run on such fuel.

The foreign research reactor operators who converted to LEU fuel did so in support of nuclear weapons nonproliferation objectives.

The RERTR program has been highly successful, and many foreign research reactors have been modified to operate with high-density LEU fuel instead of HEU exports from the United States to foreign research reactors. The RERTR program has enabled the United States to reduce its HEU exports by over 80%. Development of high-density LEU fuel has enabled all research reactors in Western Europe except three to convert.

Currently, 18 foreign governments and 41 reactors are participants in the program. Participants in Northeast Asia, are the United States, Japan, Russia and South Korea. China has agreed to participate in the future.

Attachment 5

Proposals for an Asian Regional Nuclear Organization

In 1995 there was considerable discussion of the possibility of creating an Asian regional nuclear organization. This paper will review some of these proposals.

One of the earliest was a proposal by Atsuyuki Suzuki, a professor of nuclear engineering at the University of Tokyo. He called for an "Asian equivalent of EURATOM " In his proposal regional nuclear programs, including their plutonium programs, would be made more transparent which would reduce concerns about plutonium stockpiles. This would allow decisions to be made on civil use, storage, or disposition of the plutonium.

Later in a paper presented in February, Hiroyoshi Kurihara, of the Tokyo Nuclear Material Control Center discussed the ASIATOM concept. He expressed a preference for a PACIATOM or PACIFICATOM in order to include the U. S, Canada, and Australia. Kurihara suggested that ASIATOM could have seven functions:

1. Regional cooperation and coordination of peaceful nuclear research and development
2. Regional enrichment and reprocessing, such as a regional fuel cycle center.
3. Coordination, information clearing, and enhanced transparency for regional nuclear activities.
4. Upgraded nuclear safety, radiological protection, nuclear material control, and physical protection in Asia.
5. A EURATOM-type regional safeguards system to reduce the burden on the IAEA.
6. Upgraded collective security in Asia.
7. Possibly, involvement with the concept of a nuclear-free zone.

Kurihala sees Japan, Korea, and China as the keys to the concept. He suggested that his ideas could be explored in expanded discussions at the annual regional nuclear conference sponsored by the Japanese Atomic Energy Commission.

In April at a meeting sponsored by the Japan Atomic Industrial Forum a senior Japanese official proposed a "Pacific Atom" concept with a different focus. His suggestion was that it would focus on improved market conditions for exporting nuclear power plants to markets in Asia.

In April Brad Roberts, an American, released a task force report associated with the non-governmental organization CSCAP, the Council for Security and Cooperation in Asia and the Pacific. He proposed an ASIATOM "akin" to EURATOM to establish regional arrangements for nuclear safeguards, nuclear safety, nuclear fuel supply, nuclear waste, and plutonium disposition. The last would be a regional approach to the management and disposition of plutonium, including reprocessing and storage. He saw this and regional spent fuel management as measures to allay security concerns in the region. He also suggested that ASIATOM might create a common market for electrical power and based on the Korean Energy Development Organization model, might engage in cooperative energy development in Asia.

Many of these ideas are also contained in a Japanese government report "A Multilateral Policy to Promote the Assurance of Safety of Nuclear Power Generation Under International Cooperation in the Neighboring Asia Region." issued in June 1995 by the Advisory Committee for Energy which reports to MITI. The report links regional concepts for safety to programs regarding radioactive waste. In the safety area the report proposes regional dialogues on safety assurance, education and training of power plant operators and refinement of safety control systems and standards, transfer of safety-related hardware and technology, coordinated transfer of "safety packages" or software and maintenance/ repair technologies, verification of safety standards in recipient countries, follow-on user support, and collaboration with the nuclear industries of Europe and America when appropriate. The report recommends the administration of necessary export controls and continued discussion of reprocessing and peaceful use of plutonium.

In late 1995 Margaret Ryan, Chief Editor of *Nucleonics Week,* endorsed Asian regional cooperation on safeguards. She suggested that the regional safeguards models of EURATOM and ABACC could be applied to the nuclear programs of Japan, the Korea, Indonesia, Malaysia, Vietnam, Thailand, and perhaps China. The idea would be to reduce the IAEA's safeguards burden by supplementing its operation in a cost-effective manner.

A broader endorsement of the ASIATOM concept was made in September by the head of the Atlantic Council of the United States' Nonproliferation Office, William Dircks. Dircks sees safety as an important function for an Asian regional nuclear organization, but he also considers nonproliferation functions—safeguards, export controls, and one or two large regional fuel cycle centers. He sees Chinese participation as key and suggests bringing in Australia, Canada, and perhaps the U. S. He calls his enlarged concept PACATOM. Dircks suggests a gradual buildup of functions starting with technical exchanges and support programs for safety, an clearinghouse for fuel supply, and regionally based plutonium management schemes and perhaps regional safeguards under an agreement with the IAEA. Later steps would include export control and regional fuel cycle management.

Makoto Ishii of Azabu University described another variation of the theme. He described ASIATOM as having four proposed roles:

1. Regional safeguards system
2. Regional nuclear fuel cycle
3. Nuclear power safety systems
4. Organization for cooperation on research and development

APPENDIX B

➢

About the University of California Institute on Global Conflict and Cooperation Northeast Asia Cooperation Dialogue

The Institute on Global Conflict and Cooperation (IGCC), a state-wide policy research institute of the University of California, is now planning the fifth in a series of high-level, track two consultations between China, Japan, North and South Korea, Russia, and the United States. Known as the Northeast Asia Cooperation Dialogue (NEACD), this forum involves government officials acting in a private capacity as well as non-governmental academics in the assessment of the region's security issues. We are now planning the fifth round of discussions which have sought, and continue to seek, to reduce mistrust within the North Pacific region, and to avert conflicts through confidence and security building measures. This fifth session will be held in Seoul, Korea, in September 1996.

Filling a Void

Northeast Asia contains a number of ongoing ideological and territorial conflicts that stem from the Cold War era. Four of the world's most powerful nations—the United States, Russia, China, and Japan—possess important interests in Northeast Asia and the Korean peninsula. Yet the region lacks multilateral fora for resolving long-standing security conflicts, let alone for averting new ones. The risk of instability at best, and direct military conflicts at worst, compels the search for new mechanisms to reduce the dangers and enhance cooperation in Northeast Asia. Until the establishment of the Northeast Asia Cooperation Dialogue, however, not even an informal consultative process existed to advance such important objectives.

While there are other broader regional processes, such as the ASEAN Regional Forum (ARF), that deal with a wider selection of nations in the Asia Pacific and their security concerns, the goal of the NEACD is to supplement these regional fora with a sub-regional approach; namely by involving the six nations with the largest militaries and the most at stake in the security situation in Northeast Asia. Generally, five representatives from each country participate in the NEACD meetings: one policy-level official each from the foreign and defense ministries, a uniformed military officer, and two participants from private research facilities, think-tanks, or universities. Participants from the United States have included deputy assistant secretaries for East Asia and the Pacific from the Defense and State Departments.

Format

The informality of the process allows the participants to air their concerns and brainstorm about new approaches to building cooperation and reducing the risk of conflict in Northeast Asia. At each meeting of the Dialogue, there is a session on national perspectives on security in Northeast Asia. One participant from each of the states concerned (almost always the foreign ministry representative) is invited to give a brief presentation to the group to outline his/her country's perspective about the security situation in Northeast Asia. The substance of the presentation is completely up to the presenter, but can include the country's policies in the region and its concerns about the policies of other states in the region. Emphasis is upon what has changed in the most recent eight months. Following each presentation, there is a question and answer period when any Dialogue participant can ask questions to the presenter or the presenter's colleagues from that country. Following the same format as this session is one focused on the military perspectives on security in the region, which includes presentations from either defense ministry officials or military officers. Presentations of military perspectives were introduced for the first time at the Moscow meeting; we believe this was the first time defense/military officials from this particular subregion engaged in this sort of discussion in a multilateral setting. At each meeting, a non-security issue also is the basis of discussion for at least one session, when potential options for regional cooperation are examined. Subjects of past discussions included economic complementarity, the environment, agriculture and food supply, and energy.

History

The first NEACD meeting, held in La Jolla in October 1993, focused primarily on security issues. Nonetheless, at this meeting, participants realized that cooperation on less confrontational issues, such as economic and environmental problems, might build the trust needed to tackle more sensitive international security problems. Twenty participants from five nations attended, agreeing that a number of specific CBMs deserved more discussion: maritime, nuclear, and land-based CBMs; crisis prevention centers; and issues of transparency. These, among other, topics were addressed at the second NEACD held in Tokyo in May 1994 under the co-sponsorship of IGCC and the Japanese National Institute for Research Advancement (NIRA). The third NEACD meeting was held near Moscow in April 1995, hosted by the Russian Academy of Science's Institute of Oriental Studies.

Study Projects

At the Moscow session, participants decided to establish two study projects to examine more deeply subjects discussed at the meeting: principles governing state-to-state relations in Northeast Asia and mutual reassurance measures (economic, political and military). A study project was comprised of one member from each of the participating countries. The goal of the study project was to prepare a set of suggestions in each area to present to the Dialogue members for discussion at the Beijing and following meetings. These two study projects met in Tokyo and Beijing in November 1995. Their suggestions were discussed at the fourth NEACD meeting in Beijing in January 1996, where it was decided to continue further study and discussion of these critical issues at the next Dialogue.

Continuing the Process

One conclusion that has emerged is that military confidence building measures may be conceptually too narrow for this region. Mutual reassurance measures (MRMs), broader measures to promote a basis for mutual confidence and reassurance that include but are not limited to military-related measures, may be more appropriate to Northeast Asia. Second, there was a unanimous understanding among participants that the NEACD process should continue. There currently exists no other channel, formal or informal, for this particular set of nations to come together in a multilateral setting. Third, participants see NEACD as open-ended: while over the long run, this forum may move toward an official multilateral process, this possibility remains premature for the near term.

Ensuring Full Participation

While North Korea is a founding member of the Dialogue, attended the July 1993 planning meeting, and has been involved in and commented upon all stages and meetings, it has yet to send representatives to the working sessions. In light of the framework agreement with the United States and the importance of North Korean participation in this process, we are hopeful that North Korea will choose to participate in the next Dialogue. On a positive note, North Korea asked to be sent full materials and notes from the Moscow and Beijing meetings. We hope that this will lead to its full-fledged participation.

Examining Potential for

Economic Cooperation: Energy

Following a short discussion at the Beijing meeting of the security impact of energy issues on Northeast Asia, the participants of the Dialogue decided to host a workshop on regional energy issues in conjunction with the next Dialogue meeting in Seoul. This workshop will bring together leading experts from the participating countries on energy demand and nuclear fuel cycle issues, and how they impact upon the security decision making process in the region. Finally, it is hoped that this workshop will explore the potential for regional cooperation in energy to build confidence in Northeast Asia.

NORTHEAST ASIA COOPERATION DIALOGUE IV

BEIJING, CHINA, 8–10 JANUARY, 1996

HOSTED BY:

CHINA INSTITUTE OF INTERNATIONAL STUDIES

CHINA INSTITUTE OF CONTEMPORARY INTERNATIONAL RELATIONS

SPONSORED BY:

UNIVERSITY OF CALIFORNIA INSTITUTE ON GLOBAL CONFLICT AND COOPERATION

NATIONAL INSTITUTE FOR RESEARCH ADVANCEMENT (JAPAN)

Chair's Summary

Purpose

The purpose of the Northeast Asia Cooperation Dialogue (NEACD) is to enhance mutual understanding, confidence, and cooperation among countries in Northeast Asia through dialogue. The Dialogue is informal: participants include private academics and government officials who act in a private capacity, not as government representatives. The Beijing session was the fourth meeting of the NEACD process. Previous Dialogue meetings were held in La Jolla, California, USA in 1993; Tokyo, Japan in 1994; and Moscow, Russia in 1995. The Beijing meeting included participants from the Republic of Korea, Russia, China, Japan, and the United States. The Democratic People's Republic of Korea attended the preparatory session in July 1993, and NEACD participants would welcome its participation in the Dialogue process.

Enhancing Cooperation, Peace, and Stability

The NEACD's fourth session sought to enhance cooperation, peace, and stability by discussing the following topics:

- National Perspectives on Northeast Asian Security
- Military Perspectives on Northeast Asian Security
- Principles Governing State-to-State Relations in Northeast Asia
- Mutual Reassurance Measures
- Regional Economic Cooperation: The Strategic Role of Energy

Study Projects

At the Moscow meeting, participants decided to establish two study projects consisting of one participant from each county to examine more closely mutual reassurance measures and principles governing state-to-state relations. These two study projects met in November, 1995, and presented their suggested options to this meeting.

Mutual Reassurance Measures

The participants discussed the suggestions of the MRM study project and agreed that MRMs are important to the maintenance of peace and stability and continued economic development in the region. They agreed to the following general approach for MRMs in Northeast Asia:

1. MRMs must be broad and comprehensive in concept, but focused in application. Civilian as well as military participants may come together in dialogues and discuss non-security as well as security issues.
2. MRMs are aimed at improving state-to-state relations and expanding security and economic cooperation. MRMs will be pursued through discussions and be focused on increasing exchanges, promoting understand ing, and eliminating misperceptions and hostility. MRM dialogues will be held in light of the interest and needs of all the participants; MRMs should start with the easy ones in a step-by-step manner.

The participants decided that the discussion of military perspectives at the next NEACD meeting will focus on military exchanges and cooperation. At that discussion, participants will put forward suggestions for military exchanges and cooperation.

The participants also concluded that discussion of economic issues can help promote mutual understanding in Northeast Asia. In that spirit, the group also decided to organize a day-long workshop (in conjunction with the next Dialogue meeting) that focuses on Northeast Asia energy problems and their security implications.

Principles of State-to-State Relations

The participants also discussed the suggestions of the study project on Principles Governing State-to-State Relations. Participants agreed that principles are important in building the confidence among nations for promoting cooperation in this region. They agreed to have further discussion of principles at the next meeting of the Dialogue.

The Fifth Meeting of the NEACD

The next NEACD meeting will be held in Seoul, Republic of Korea in September, 1996.

NORTHEAST ASIA COOPERATION DIALOGUE IV

Beijing, China

8–10 January, 1996

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THE UNIVERSITY OF CALIFORNIA INSTITUTE ON GLOBAL CONFLICT AND COOPERATION

The University of California Institute on Global Conflict and Cooperation (IGCC) was founded in 1983 as a multi-campus research unit serving the entire University of California (UC) system. The institute's purpose is to study the causes of international conflict and the opportunities to resolve it through international cooperation. During IGCC's first five years, research focused largely on the issue of averting nuclear war through arms control and confidence-building measures between the superpowers. Since then the research program has diversified to encompass several broad areas of inquiry: regional relations, international environmental policy, international relations theory, and most recently, the domestic sources of foreign policy.

IGCC serves as a liaison between the academic and policy communities, injecting fresh ideas into the policy process, establishing the intellectual foundations for effective policymaking in the post–Cold War environment, and providing opportunities and incentives for UC faculty and students to become involved in international policy debates. Scholars, researchers, government officials, and journalists from the United States and abroad participate in all IGCC projects, and IGCC's public a-tions—books, policy papers, and a semiannual newsletter—are widely distributed to individuals and institutions around the world.

In addition to projects undertaken by the central office at UC San Diego, IGCC supports research, instructional programs, and public education throughout the UC system. The institute receives financial support from the Regents of the University of California and the state of California, and has been awarded grants by such foundations as Ford, John D. And Catherine T. MacArthur, Rockefeller, Sloan, W. Alton Jones, Ploughshares, William and Flora Hewlett, the Carnegie Corporation, the Rockefeller Brothers Fund, the United States Institute of Peace, and The Pew Charitable Trusts.

Susan L. Shirk, a professor in UC San Diego's Graduate School of International Relations and Pacific Studies and in the UCSD Department of Political Science, was appointed director of IGCC in June 1992 after serving for a year as acting director. Former directors of the institute include John Gerard Ruggie (1989–1991), and Herbert F. York (1983–1989), who now serves as director emeritus.

ELECTRONIC PUBLISHING AT IGCC

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The year 1994–1995 saw several critical events in the publishing world:

- Paper costs rose 25 percent;
- Postal rates rose 10 percent;
- Federal Executive emphasis sparked explosive growth in public availability and use of Internet resources (the so-called "information superhighway").

With an ever-increasing demand for information about the Institute and its products, along with tightening of the California state budget, it was clear that we needed to expand worldwide access to our publications—right when we needed to hold down publishing costs in the face of rising expenses. "Online" publishing was the answer.

In cooperation with the University of California, San Diego Graduate School of International Relations and Pacific Studies, in December 1994 IGCC established a "Gopher" server. Thus, all text-based IGCC materials and publications (including informational brochures, newsletters, and policy papers) became available via the Internet.

In early 1995, IGCC joined the World Wide Web (the multimedia subset of Internet users), making not only text, but related full-color photographs, audio- and video clips, maps, graphs, charts, and other multimedia information available to Internet users around the globe.

Since "the Web" is expanding at a furious pace, with new sites (including, most recently, the U.S. Congress) added daily, the net result of our electronic effort has been (conservatively estimated) to quadruple circulation of IGCC materials with no increase in cost—and without abandoning printed mailings to those with no Internet access.

IGCC made a general announcement of its on-line services in the Spring 1995 IGCC Newsletter (circulation ca. 8,000).

Internet users can view information about or published by IGCC at:

- gopher: irpsserv26.ucsd.edu

or, for www users, at URL:

- http://www-igcc.ucsd.edu/igcc/igccmenu.html

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