



The Road Ahead for Nuclear Governance in the Indo-Asia-Pacific

A Conference Report of the
Nuclear Energy Experts Group Meeting

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Pacific Forum

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TABLE OF CONTENTS

ACKNOWLEDGMENTS	iv
CONFERENCE KEY FINDINGS	v
CONFERENCE REPORT.....	1

APPENDICES

APPENDIX A	A-1
APPENDIX B	B-1

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KEY FINDINGS & RECOMMENDATIONS

NUCLEAR ENERGY EXPERTS GROUP MEETING

The Pacific Forum CSIS, in partnership with the S. Rajaratnam School of International Studies (RSIS) of Singapore and the University of Sydney in Australia, and with the support of the Carnegie Corporation of New York, held a Nuclear Energy Experts Group (NEEG) meeting in Singapore on Jan. 22-23, 2018. It brought together approximately 40 specialists from 18 countries in the Asia Pacific and beyond, all attending in their private capacities. The participants joined a day and a half of not-for-attribution discussions on ways to build nuclear governance and improve nuclear safety, security, and safeguards culture in the region. Participants also reflected on the future of nuclear power development in the Asia Pacific and the regional networks that undergird trade and knowledge transfers in nuclear-related industries and institutions. Key findings from the meeting include:

Conceptualizing nuclear governance is a challenge. There is general agreement, however, that it should include both the peaceful and military use of nuclear technology and encompass all elements of the existing and emerging regime: norms and practices (e.g., the norm against nuclear testing), rules and agreements (e.g., Comprehensive Safeguards Agreements or the Southeast Asian Nuclear-Weapon-Free Zone), and arrangements and institutions (e.g., the Proliferation Security Initiative and the International Atomic Energy Agency, or IAEA).

International efforts to improve governance of nuclear materials have focused on the civilian sector, which accounts for slightly over 15 percent of all material. That means

nearly 85 percent of nuclear material considered to be for military use remains outside existing international regulations; they are managed exclusively by the governments of nuclear-armed states. Moreover, the production of weapon-grade nuclear material continues in several nuclear-armed states, partly because of a failure to negotiate a fissile material cut-off treaty. Creative work is needed to strengthen the safety, security, and management of military-use nuclear materials.

Good governance of nuclear materials requires a holistic approach to the “3 S’s”: nuclear safety, security, and safeguards. Such an approach is not challenge-free, however, because each “S” has distinct goals and is managed by a different community. Safety focuses on protecting people from a nuclear or radioactive accident and is the primary responsibility of nuclear operators and national authorities; security is aimed at protecting nuclear and radioactive materials from people with bad intentions, which falls under the purview of national authorities; and safeguards are designed to prevent proliferation and are managed mostly by the IAEA and other international bodies.

Further integration of the three “S” communities should be the focus of education and training programs. Because they offer uniquely specialized programs and have opportunities to innovate, the centers of excellence on nuclear security established in recent years are well positioned to encourage such integration. Coordination of work among the centers is critical to enhance the comparative advantages of each center and avoid duplication of work.

The 2010-2016 Nuclear Security Summit process was crucial in raising awareness of the weakest link of the three S’s—nuclear security—and initiating action to plug important gaps. Today there is uncertainty about leadership and ways to strengthen

nuclear security governance. Still, efforts have continued, with the development of important action plans by the United Nations, the International Criminal Police Organization, the Global Initiative to Combat Nuclear Terrorism, and the Global Partnership on Weapons of Mass Destruction. More work (and funding) is urgently needed, especially to address issues associated with cybersecurity and emerging technologies, such as 3-D printing.

Building nuclear governance at the regional level is important, if only to ease the burden of work conducted by the IAEA and other international bodies. Doing so comes with issues of its own, however, as the experiences of the European Atomic Energy Community (EURATOM) and the Brazil-Argentine Agency for Accounting and Control of Nuclear Material (ABACC) have shown. EURATOM has a broad inspection mandate, can impose sanctions, and cooperates and coordinates closely with the IAEA; it is regarded suspiciously by neighboring states, however, notably Russia. Meanwhile, ABACC has been pivotal in helping build confidence between Brazil and Argentina. Still, duplication of work has occurred because the IAEA remains concerned about Brazilian and Argentinian activities, in part because neither country has an additional protocol in force.

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between ASEAN regulatory agencies has grown through regular exchanges of best practices, capacity-building efforts, and assistance to member states to implement key international agreements. ASEANTOM has also conducted important work in nuclear emergency preparedness and response and in environmental radiation monitoring. It has also begun to address nuclear security issues, including nuclear forensics, measures to combat illicit trafficking and unauthorized transfer of nuclear and radioactive materials, and the return of recovered materials to the country of origin.

ASEANTOM requires assistance and funding to maintain and expand its activities. Other challenges to progress include the wide differences in nuclear knowledge and infrastructure among ASEAN member states. Further efforts are needed, therefore, to build capacity in the least developed Southeast Asian countries.

Recent developments suggest that nuclear power development in Southeast Asia will remain aspirational for the next decade or so. Time creates space to enhance capacity in the 3 S's in that region. For instance, the nuclear cooperation agreements that Southeast Asian states are currently concluding with third parties (notably Japan, South Korea, or Russia), be they for the construction of nuclear power plant construction, research facilities, or reactors, should include requirements that recipients comply with the main safety, security, and nonproliferation regimes. Action is also required *right now* because research shows that nuclear trade and research networks have expanded considerably in Southeast Asia in recent years. Without a more robust regulatory framework, the region will be vulnerable to illicit trafficking of nuclear materials and technologies.

A first step in improving nuclear governance in Southeast Asia is mapping existing and emerging nuclear trade and research networks, which include the movement of nuclear materials and radioactive sources and nuclear-related components, as well as “tacit knowledge”: expertise. Understanding these networks allows governments to create a nonproliferation and nuclear security policy framework capable of targeting key nodes to prevent illicit trafficking and sanctions evasion efforts. Mapping and monitoring these networks also creates opportunities to expand them, thereby enhancing trade, a first-order priority for most Southeast Asian states.

In terms of nuclear-related trade networks, Southeast Asian countries are already involved in the global nuclear trade, despite a lack of power reactors. All of the major countries in the region are suppliers of radioactive sources and nuclear components at some level, despite lack of membership in the Nuclear Suppliers Group. Singapore and Thailand in particular have the potential to serve as brokers and transshipment hubs, while Malaysia and Indonesia are active buyers of nuclear technology and radioactive sources. It would be valuable for regional governments to think about their role in nuclear governance as suppliers and brokers rather than simply as buyers, and to identify

trade relationships that may bear more scrutiny.

In terms of tacit knowledge networks, some Southeast Asian countries already have robust nuclear research enterprises, with Indonesia having long experience in reactor operations and Singapore and Malaysia excelling in modeling and simulation and radiation detection research. While Singapore and Malaysia have fairly densely interconnected networks at a researcher level, Indonesia’s research networks are connected by institutions, with less interpersonal interaction. These differences mean that different approaches are needed when passing on nuclear-related knowledge, in building nuclear research enterprises, and in developing cultures within countries that promote nuclear security and nuclear safety.

THE ROAD AHEAD FOR NUCLEAR GOVERNANCE IN THE INDO-ASIA-PACIFIC

CONFERENCE REPORT

The Pacific Forum, in partnership with the S. Rajaratnam School of International Studies of Singapore and the University of Sydney in Australia, and with the support of the Carnegie Corporation of New York, held a Nuclear Energy Experts Group (NEEG) meeting in Singapore on Jan. 22-23, 2018. It brought together approximately 40 specialists from 18 countries in the Indo-Asia-Pacific and beyond, all attending in their private capacities. The participants joined a day and a half of not-for-attribution discussions on ways to build nuclear governance and improve nuclear safety, security, and safeguards culture in the region. Participants also reflected on the future of nuclear power development in the Indo-Asia-Pacific and the regional networks that undergird trade and knowledge transfers in nuclear-related industries and institutions in Southeast Asia. The following report represents the view of its authors; it is not a consensus document.

Building nuclear governance

Trevor Findlay (*University of Melbourne, Australia*) launched the meeting with basic definitions, explaining that nuclear governance deals with all aspects of peaceful and military uses of nuclear technology and encompasses all elements of a global governance regime: norms and practices (e.g., the norm against nuclear testing), rules and agreements (e.g., nuclear safeguards), and arrangements and institutions (e.g., the Proliferation Security Initiative). It is important to note the existence of overlapping sub-regimes: nuclear safety (which aims at preventing nuclear accidents), nuclear security (which focuses on preventing

terrorists from acquiring nuclear and radioactive materials), nuclear nonproliferation (which is about preventing the spread of nuclear weapons to additional states), and nuclear arms control and disarmament (which deals with controlling/abolishing existing nuclear weapons). The nuclear governance regime is composed of multiple players (e.g., states, regional and international organizations, or civil society), each of whom have different roles and responsibilities.

Our speaker stressed that nuclear governance regime is fraught with numerous challenges. For starters, the regime manages inherently dual-use technology, which, in addition, has been associated with national prestige. The regime has also evolved in response to crises and immediate needs, which has produced some incoherence, and reform attempts have been ad hoc and additive, rather than fundamental or systematic. Moreover, the regime has been dominated by nuclear-weapon and nuclear-capable states to the detriment of others.

Manpreet Sethi (*Centre for Air Power Studies, India*) explained that the nuclear governance regime has developed over five decades, mostly in response to emerging threats, and that nuclear security is, and always has been, the least developed area. Nuclear security, however, is a common concern for all states, irrespective of whether they have nuclear holdings. The 2010-2016 Nuclear Security Summit (NSS) process helped make significant improvements. It raised global awareness of the threat of nuclear terrorism, encouraged national legislation and enforcement, enhanced national protection and control systems, encouraged adherence to key international benchmarks, and promoted voluntary national reporting and the sharing of information and best practices to facilitate international cooperation. Post-NSS there are concerns that the momentum will fade. Fortunately, several action plans have been established to build upon recent

achievements. Looking to the future, more work is needed to enhance cybersecurity, strengthen the security of emerging technologies (notably 3-D printing), find alternatives to the use of highly radioactive sources, and develop proliferation-resistant and more secure technologies and reactors.

Our speaker explained that the International Atomic Energy Agency (IAEA) is central to these efforts. So are the Nuclear Security Contact Group, the Review Process of the Convention on the Physical Protection of Nuclear Materials (CPPNM), the International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT), the Global Initiative to Combat Nuclear Terrorism (GICNT), and the national centers of excellence. To make more progress, these organizations need to continue to raise awareness of the threat of nuclear terrorism, take concrete actions, and balance between “soft” and “hard” measures. Capacity-building efforts, notably in the developing world, are particularly essential. There is tremendous need to share detection and nuclear forensics technologies as well as best practices and experiences in enforcement. Challenges will remain, however, because states do not share a common understanding of the nuclear terrorism threat and do not implement key treaties with the same rigor.

During the discussion, it immediately became clear that conceptualizing nuclear governance was extremely challenging. A key problem is that international efforts to improve governance of nuclear materials have focused on the civilian sector, which accounts for slightly over 15 percent of all material. That means nearly 85 percent of nuclear material considered to be for military use remains outside existing international regulations; these materials are managed exclusively by the governments of nuclear-armed states. Moreover, the production of weapon-grade nuclear material continues in some nuclear-armed states, partly because of a failure to

negotiate a fissile material cut-off treaty, or FMCT. Accordingly, creative work is needed to strengthen the safety, security, and management of military-use nuclear materials.

Meeting participants concurred that the NSS process was crucial in raising awareness of the importance of nuclear security and in initiating action to plug important gaps. Today, however, there is uncertainty about leadership and ways to strengthen nuclear security governance. Still, efforts have continued, with the development of important action plans by the United Nations, the International Criminal Police Organization, the GICNT, and the Global Partnership on Weapons of Mass Destruction. More work (as well as funding) is urgently needed, however.

Strengthening nuclear governance in the Indo-Asia-Pacific

Togzhan Kassenova (*Carnegie Endowment for International Peace, Washington, DC*) gave an overview of the European Atomic Energy Community (EURATOM) and the Brazilian-Argentine Agency for Accounting and Control of Nuclear Material (ABACC). Established in 1957, EURATOM’s mission is to promote research and disseminate technical information, establish standards to protect health, facilitate investment and ensure the establishment of the basic installations for nuclear energy, ensure that all users in the European Union receive equitable supply of ores and nuclear fuel, ensure that civil nuclear material is not diverted to other (military) uses, exercise the right of ownership (of special fissile material), and more generally promote cooperation in the peaceful use of nuclear technology. EURATOM gives the European Commission the authority to send inspectors to any facility with nuclear material (except to the United Kingdom and France’s military facilities) and to impose sanctions if necessary. While EURATOM performs

inspections at all civilian nuclear facilities in the European Union, the IAEA performs inspections in non-nuclear-weapon EU member states. EURATOM is regarded suspiciously by neighboring states, however, notably by Russia.

Established in 1991 because Brazil and Argentina had engaged in secret nuclear programs to compete against each other, ABACC has a much narrower mandate than EURATOM. Our speaker explained that its purpose is solely to verify that the nuclear materials used by the two countries are not diverted toward nuclear weapons. While ABACC has been pivotal in helping build confidence between Brazil and Argentina, duplication of work has occurred because the IAEA remains concerned about the two countries' activities, in part because neither country has an additional protocol in force.

Phiphat Phruksarojanakun (*Ministry of Science and Technology, Thailand*) pointed out that the ASEAN Network of Regulatory Bodies on Atomic Energy (ASEANTOM), a much newer organization, aims to strengthen nuclear safety, security, and safeguards within the ASEAN community by enhancing cooperation and complementing the work of the ASEAN Member States. ASEANTOM has six goals: the sharing of best practices and exchange of experiences in regulating nuclear and radioactive materials, building capacity through training courses and technical collaboration, assisting ASEAN member states to further implement and adhere to their IAEA commitments, mutually exchanging information to build confidence on nuclear activities, forging regional cooperation in key priority areas, and drawing on as well as improving regional expertise and resources.

Since its establishment in 2012, ASEANTOM has made significant progress. Cooperation between ASEAN regulatory agencies has grown through regular exchanges of best practices, capacity-

building efforts, and assistance to member states to implement key international agreements. ASEANTOM has also conducted important work in nuclear emergency preparedness and response and in environmental radiation monitoring. It has also begun to address nuclear security issues, including nuclear forensics, measures to combat illicit trafficking and unauthorized transfer of nuclear and radioactive materials, and the return of recovered materials to the country of origin.

ASEANTOM, however, requires assistance and funding to maintain and expand its activities. Other challenges to progress include the wide differences in nuclear knowledge and infrastructure among ASEAN member states. Further efforts are needed, therefore, to build capacity, especially in the least developed Southeast Asian countries.

Nuclear safety, security, and safeguards culture in the Indo-Asia-Pacific

Jorshan Choi (*University of California*) argued that good governance of nuclear materials requires a holistic approach to the “3S”: nuclear safety, security, and safeguards. This is essential because any nuclear-related issue has implications pertaining to the interfaces between safety-security, security-safeguards, and safeguards-security.

Such an approach is not challenge-free, however, because each “S” has distinct goals and is managed by a different community. Safety focuses on protecting people from a nuclear or radioactive accident and is the primary responsibility of nuclear operators and national authorities. Security is aimed at protecting nuclear and radioactive materials from people with bad intentions, which falls under the purview of national authorities. Safeguards, meanwhile, are designed to prevent proliferation and are managed mostly by the IAEA and other international bodies. Another challenge is that cultivating “3S” awareness is difficult in the Indo-Asia-Pacific

because regional states have traditionally given higher importance to safety and safeguards and have too often tended to regard security as “someone else’s concern.”

Julius Trajano (*S. Rajaratnam School of International Studies, Singapore*) stressed that enhancing nuclear safety and security culture in Southeast Asia is crucial because several regional states contemplate developing nuclear power at some point in the future, notably the Philippines, Indonesia, Malaysia, and Thailand; Myanmar, Laos, and Cambodia have also recently signed nuclear cooperation agreements with China and Russia. Even in the absence of nuclear power plants in Southeast Asia, strengthening nuclear safety and security culture in that region is essential because all regional governments use radioactive sources, and several have research reactors.

Drawing on the lessons of the Japanese and South Korean experiences, our speaker explained that Southeast Asian states should develop comprehensive national frameworks for nuclear safety and security (to bring together their various programs and initiatives that have too often developed in an ad hoc manner) and invest in education and training of key personnel. Because they offer uniquely specialized programs and have opportunities to innovate, the centers of excellence on nuclear security established in recent years are ideally positioned to encourage such integration. Coordination of work among the centers, however, is critical to enhance the comparative advantages of each center and avoid duplication of work.

The future of nuclear power development in the Indo-Asia-Pacific

Anton Khlopkov (*Center for Energy and Security Studies, Russia*) stressed that Russia is building nuclear power plants in Bangladesh, China, and India; and nuclear research facilities and reactors in China, Indonesia, Vietnam, and Thailand. Russia also supplies low-enriched uranium to India, Japan, South Korea, and

the United States; it provides nuclear fuel supply services and nuclear infrastructure development assistance to countries throughout the Indo-Asia-Pacific. According to Russian regulations, Moscow can supply nuclear fuel in the form of manufactured complete fuel assemblies for the whole period of operation of a nuclear power plant, and the spent fuel must be returned to Russia for temporary storage and reprocessing. Russian regulations also require recipient states to adhere to IAEA safeguards and the principal international nonproliferation and nuclear security standards.

Kaoru Naito (*Japan Engineers Federation*) explained that Japan is working relentlessly to ensure regional states that choose to invest in nuclear power development do so in a safe, secure, and proliferation-resistant manner. In Southeast Asia, Japan is committed to strengthening nuclear safety, security, and nonproliferation through bilateral, regional, and international frameworks. Japan’s bilateral nuclear cooperation agreements include strict requirements, and Tokyo has invested considerably in helping Southeast Asian states establish nuclear infrastructures and develop human resources. Bum-Jin Chung (*Kyung Hee University, South Korea*), for his part, pointed out that Seoul is becoming increasingly active in exporting nuclear products and services to the Indo-Asia-Pacific, notably in Southeast Asia. In the same way as Tokyo, Seoul imposes strict requirements for nuclear safety, security, and safeguards in its cooperative agreements with regional states.

Despite continued interest in nuclear power development by Southeast Asian states, and despite the willingness of several nuclear exporters to engage them, there will not be nuclear power plants in the sub-region in the foreseeable future. In other words, nuclear power development in Southeast Asia will remain aspirational for at least the next decade. Such time creates space to enhance capacity in the “3S” in that sub-region.

Nuclear trade and knowledge networks in Southeast Asia

Our NEEG meeting included presentations and a discussion based on the findings of a research project on nuclear trade and knowledge networks in Southeast Asia conducted by Phil Baxter (*Middlebury Institute of International Studies, California*), Adam Stulberg (*Georgia Institute of Technology*), and Justin Hastings (*University of Sydney, Australia*). The project's key takeaway is that, as highlighted in the previous session, it is paramount not to wait to enhance nuclear safety, security, and safeguards in Southeast Asia and do so *right now*, mostly because nuclear trade and research networks have expanded considerably in that part of the world in recent years. This is urgent because, without a more robust regulatory framework, the region will quickly become vulnerable to illicit trafficking of nuclear materials and technologies.

A first step in improving nuclear governance in Southeast Asia is mapping existing and emerging nuclear trade and research networks, which include the movement of nuclear materials and radioactive sources and nuclear-related components, as well as “tacit knowledge,” i.e., expertise. Understanding these networks allows governments to create a nonproliferation and nuclear security policy framework capable of targeting key nodes and prevent illicit trafficking and sanctions evasion efforts. Significantly, mapping and monitoring these networks also creates opportunities to expand them, thereby enhancing trade and economic development, a first-order priority for most Southeast Asian states.

In terms of nuclear-related trade networks, Southeast Asian countries are already involved in the global nuclear trade, despite a lack of power reactors. As indicated earlier, all major countries in the region are suppliers of radioactive sources and nuclear components on some level, despite lack of membership in

the Nuclear Suppliers Group. Singapore and Thailand, especially, have the potential to serve as brokers and trans-shipment hubs, while Malaysia and Indonesia are active buyers of nuclear technology and radioactive sources. Accordingly, it would be valuable for regional governments to think about their role in nuclear governance as suppliers and brokers rather than simply as buyers, and to identify trade relationships that may bear more scrutiny.

In terms of tacit knowledge networks, some Southeast Asian countries already have robust nuclear research enterprises, with Indonesia having long experience in reactor operations and Singapore and Malaysia excelling in modeling and simulation and radiation detection research. While Singapore and Malaysia have densely interconnected networks at a researcher level, Indonesia's research networks are connected by institutions, with less interpersonal interaction. These differences mean that different approaches are needed when passing on nuclear-related knowledge, in building nuclear research enterprises, and in developing cultures within countries that promote nuclear security and nuclear safety.

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APPENDIX A



**COUNCIL FOR SECURITY COOPERATION IN THE ASIA-PACIFIC
Fifth Meeting of the CSCAP Study Group on
Nonproliferation and Disarmament in the Asia-Pacific
Lotte Hotel, Seoul, Republic of Korea, April 3-4, 2018**

AGENDA

TUESDAY, APRIL 3, 2018

18:30 Welcome Reception

19:00 Opening Dinner

WEDNESDAY, APRIL 4, 2018

8:30 Registration

9:00 Welcome Remarks
(CSCAP Korea, CSCAP Vietnam, and USCSCAP)

9:05 **Session 1: Recent developments in nonproliferation and disarmament**
This session will focus on recent developments in nonproliferation and disarmament. Following accession to the Missile Control Technology Regime (MTCR) in 2016, India acceded to the Wassenaar Arrangement in December 2017 and the Australia Group in January 2018. What is the significance of India's membership of these groups for these export control regime? What are the next steps for nuclear security after the 2010-2016 Nuclear Security Summit process? What is the status of the five action plans developed following 2016 summit? What role does the IAEA Nuclear Security Series have in nuclear security governance? What are the prospects for the Intermediate-range Nuclear Forces (INF) Treaty, the New START treaty, and arms control more generally? What are the major issues to be addressed and the likely outcomes of the fourth CWC Review Conference in Dec. 2018?

Speakers: Manpreet Sethi
Victor Mizin

10:30 **Coffee Break**

10:45 **Session 2: The Korean Peninsula and denuclearization**
This session will examine the current situation on the Korean Peninsula. What are the respective parties' assessments of recent developments? What impact have new UNSC sanctions and strengthened unilateral sanctions by some

countries had? What other actions can or should be taken to improve the situation on the Korean Peninsula?

Speakers: Seung Whun Cheon
Shea Cotton

12:15 **Lunch**

13:30 **Session 3: The Comprehensive Nuclear-Test-Ban Treaty (CTBT)**

This session will focus on the role of the CTBT in reducing the salience of nuclear weapons. What is the status of the CTBT? What are the prospects for ratification of the treaty? What is the CTBT verification regime and how does it operate? What are the capabilities of the International Monitoring System (IMS)? What kind of capacity building assistance does Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) offer?

Speakers: Nikita Perflyev
Stephen Herzog

15:00 **Coffee Break**

15:15 **Session 4: NWS and NNWS Collaboration on Nuclear Risk Reduction**

The opening of the Nuclear Weapon Ban Treaty for signature has highlighted and created new animosity between nuclear weapon states and nonnuclear weapon states. What impact will this tension have on the upcoming NPT Review Conference? What can be done to reduce the tension? What avenues exist for greater collaboration between the nuclear deterrence and nuclear disarmament communities? What are the prospects for getting the NWS to accede to the Southeast Asia Nuclear-Weapon-Free-Zone (SEANWFZ) protocol? What is the status of the NTI Verification Pilot Project?

Speakers: Raymond Quilop
Nobu Akiyama
Paul Dean

16:45 **Wrap-up**

17:30 **Meeting Adjourns**

18:30 **Dinner**

APENDIX B



COUNCIL FOR SECURITY COOPERATION IN THE ASIA-PACIFIC
Fifth Meeting of the CSCAP Study Group on
Nonproliferation and Disarmament in the Asia-Pacific
Lotte Hotel, Seoul, Republic of Korea, April 3-4, 2018

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