

**APEC Ministerial Meeting
Vladivostok, September 5-6**

Joint Statement

ANNEX C

**Recommendations of the Innovation Technology Dialogue
on Nanotechnologies for Energy Efficiency**

We, the participants of the Innovation Technology Dialogue (ITD) on Nanotechnologies for Energy Efficiency, a pilot ITD mechanism to be further implemented within PPSTI if effective, have agreed on these recommendations in order to offer guidance to APEC economies with regard to development of nanotechnologies to increase energy efficiency as a means of addressing a number of challenges in our region.

A. Role of nanotechnologies in increasing energy efficiency

1. We believe that accelerating the development and application of key emerging technologies will produce efficient solutions to many problems facing APEC economies. We recognize the importance of expanding our cooperation in certain key technology areas. Technological innovation does not only strengthen the economy but also offers positive social implications and environmental protection benefits.

2. Nanotechnologies are likely among the main sources of innovative solutions for the APEC economies and will have a significant impact on all areas of material usage. One of the most important applications of these solutions is found in the energy sector, where nanotechnologies will help to address the high level of energy consumption in APEC economies.

3. The 2010 "APEC Growth Strategy" and the 2011 Leaders' Declaration set the goal of promoting energy-efficiency and low-carbon policies to achieve sustainable and green growth. The first ITD could bring us closer to the above goal and promote green growth in the APEC economies.

4. The continuing increase in the world's energy consumption and resulting problems (e.g. natural energy resources depletion, greenhouse gas emissions leading to climate change, energy security issues, etc.) call for efficient use of energy as a cornerstone of energy policies are important for all economies. Improved energy efficiency can enhance energy security by helping to offset increased energy demand. According to the International Energy Agency, enhanced energy efficiency in buildings, industrial processes and transportation could reduce the world's energy needs in 2050 by one third and help control global greenhouse gas emissions.

5. Nanotechnologies have significant potential to assist economies in meeting their energy efficiency goals, enabling adoption of new approaches, techniques and materials with a wide range of applications, from efficient usage of traditional energy sources to development and implementation of new generation technologies based on renewable sources. The nanotechnology impact is especially important for renewable energy, which together with energy efficiency are pillars of sustainable energy policy.

6. Nanotechnologies are becoming more widely used for composite materials and allow us to make lighter, more durable and stronger materials using the same resources as before, proportionally decreasing the energy consumption related to their use and transportation. A lot of materials currently in use are characterized by their low effectiveness and high energy consumption. Using nanotechnologies for the production of new materials can significantly raise the strength of construction in every field and lower the impact on the environment due to the lower-weight materials. Certain nanotechnologies are also important for ensuring energy efficiency at all stages of energy delivery to the consumer (generation, storage, transportation, consumption).

7. We recognize that development of nanotechnologies meets the priorities of the APEC agenda, for example, with regard to supply chains, environment, innovation, trade and investment. In order to

increase the efficiency of supply chains, it is possible to make vehicles lighter, which means less fuel-consumption and lower transportation costs owing to introduction of nanotechnologies. In the field of environmental protection, we can use emerging nanotechnologies for creation of environmentally friendly goods and production methods, which will ensure lower energy consumption and, as a result, lower emissions.

B. Recommendations for framing economic policies

We agree on the following recommendations with regard to development of nanotechnologies to advance the energy efficiency.

General recommendations

1. APEC economies should cooperate to address the energy efficiency challenges. It would be beneficial to have a broad range of WTO-consistent incentives for businesses involved in development and implementation of the energy efficient technologies and business solutions, as well as introduce measures to support replacement of older technologies and stimulate gradual transformation of businesses and households as they adopt energy efficient solutions instead of energy-intensive applications.
2. Developing scientific and technological cooperation, building relevant production capacities in energy efficiency related areas and considering best practices should be among the priorities of the APEC members in their aspiration to promote energy efficiency.
3. International cooperation in these areas may help to boost development, which may sustain and even strengthen the economic development of the region. A well-elaborated and coordinated approach may result in synergy in this field.

Policy steps

1. Establishment of long-term science and technology policies

Formulating domestic science and technology policies involves intensive work on the part of various government agencies and non-governmental organizations; therefore, elaboration of policies in the field of nanotechnologies requires effective interagency coordination and close cooperation with business and academia.

It could be effectively realized through adoption of long-term science and technology strategies outlining the roles for government agencies, business, academia and other stakeholders. Such instruments would enable long-term planning and, therefore, demonstrate positive market trends to the investors, as well as the options for long-term investment.

Policy directions

Emphasis should be put on long-term thinking but also include short- and medium-term demonstrations that direct policy decisions. There is an obvious need for the governments to support promising research in the long term, while they should avoid “picking winners”, and instead support the market-driven development of innovative technologies. In order to facilitate commercialization of new materials, economies may support policies encouraging change in the technological generation, fostering broader innovation and resulting in more efficient application of the existing research outcomes.

It is necessary to anticipate, to the extent possible the consequences of the development of nanotechnologies and create the required related markets. Economies, therefore, need to promote safe recycling and proper utilization of nano-enabled materials. Adaptation of the existing technologies to new materials and processes would help to develop and implement new business models and best business practices. Organizational innovation would thus contribute to development of product innovation.

2. Science and education policies

Education and science generate ideas for the innovation system, being the starting point for the innovation process. Thus, it is important to develop education and put emphasis on science not only in universities but also in schools. It is important to note that over the last decades research has become more complex, and modern scientific discoveries are made by scientific groups, not by individual ()scientists. At the discipline level multi-disciplinary teams are generally more efficient. Thus, we need to introduce measures to facilitate the development of the scientific potential of individual scientists and research groups by promoting interaction and cooperation among them, facilitating access to adequate funding and necessary competencies. That will reduce the risks and complexities associated with the creation of new technologies.

Policy directions

Due to the growing internationalization of science and research, it is crucial to scope out and reduce barriers for easy movement of scientists across borders. Possible steps in this direction could include promoting a more open system for scientific exchanges among the APEC economies, thus fostering availability of expertise.

Complexity of the research and necessity to support only broad areas to avoid stifling innovation means that individual economies should consider encouraging more flexible systems for research grant management that would maintain freedom of choice with regard to scientific research concentration.

Broader public involvement in and awareness of the nanotechnology research in the long-term supports markets, contributes to the demand for relevant goods as well as creates a steady inflow of researchers. It gives governments more freedom in investing in science. In this regard, substantial benefits could be obtained through promoting education of the public on new emerging nano-enabled materials in order to stimulate their use in the energy sector, including through launching nanotechnology public awareness programs for the younger generation.

Since many scientists are disconnected from the commercialization process and markets in general, it is important to develop policies that take into account motivations of scientists and foster technological entrepreneurship. This is also important to generate the greatest impact, especially from an environmental perspective, since environmental results are generally not observed at any significant scale until there is an adequate uptake of cleaner products and technologies.

3. Access to necessary equipment and expertise

Nanotechnology could be considered one of the most advanced areas of science; therefore, in order to make research in nanotechnology areas effective, scientists need special high-precision equipment, which some APEC economies lack or may not have the resources to maintain these specialized tools. Moreover, working with such equipment requires specialized knowledge and skills, which again not every APEC economy might have.

At the same time, some economies lack raw materials to produce nano-enabled components for their products. It also hinders the development of nanotechnologies.

Due to the fact that nanotechnology research requires access both to advanced equipment and expertise, promoting cooperation in this field would allow the APEC economies to produce breakthrough research increasing the potential of individual economies.

Policy directions

Facilitation of access to the necessary equipment and expertise could be achieved through enhancing cooperation among scientific institutions and research centers, taking shape of joint projects and academic publications, developing special rent schemes for equipment and infrastructure. Efforts should be made to promote trade in scientific research equipment and components through reducing the existing barriers to trade.

4. Entrepreneurial policy

Commercializing new technologies is often rather expensive and requires substantial funding. Private capital provides funding when it believes that the technology has potential for good returns on the investments made. Private business, therefore, better evaluates risks, analyzes consumer preferences and expectations, thus testing the technologies for potential commercial success. New technological solutions mostly focus on the market needs; therefore, effective entrepreneurship is key for small and medium-sized technology businesses to succeed on the market. In this regard, such entrepreneurship with the inclusion of start-ups and young entrepreneurs in economic activities, will certainly facilitate scientific development.

Policy directions

Governments should promote an environment that is conducive for funding from the private sector, which can ease the transfer of technologies from universities and scientific institutions to industries. As business is interested in particular results of research and development and is ready to invest in promising technologies, governments should create an environment conducive to such interactions.

APEC economies should cooperate in sharing expertise and encouraging venture capitalists to invest in nanotechnology projects. This could be achieved through the effective use of various existing mechanisms, such as stimulating dialogue between venture capitalists and inventors, promoting entrepreneurial education, stimulating technology transfer from universities and scientific institutions to businesses, creating business incubators in universities, encouraging business involvement to nurture nanotechnology research and speeding up the commercialization of new technologies.

In this regard APEC economies should collaborate to advance the Young Entrepreneurs Network (YEN) and the APEC Start-up Accelerator Initiative (ASA) proposed by SMEWG as to promote entrepreneurship, strengthen their access to financing, and enhance their capacity to internationalize.

5. Incentives

The nanotechnology sector is characterized by the need for high investments at the initial stage. Many nanotechnologies are also characterized by a rather long payback period. Businesses, however, often look for a quick return of their investment and are not eager to support projects with a lengthy commercialization cycle.

Thus, the desire of businesses to invest in innovative technologies is often dependent on external incentives encouraging them to invest in potentially successful products that could be commercialized in a mid-term or long-term period.

As governments have strategic vision and are concerned about the mid-term or long-term perspective with regard to development of technologies, they could provide such incentives.

Policy directions

Consistent with their international obligations, governments could make full use of the existing mechanisms, including subsidies and tax incentives, to incentivize development of innovative technologies and old technologies replacement, partnership of industrial companies with R&D centers or universities. The support program could provide long-term funding and should not be concentrated on a single set of technologies but rather support the broader technology trends, stimulating multilateral cooperation preferably on the precompetitive stage, thus allowing the market to choose the specific technologies.

Special incentives could be given to those industrial companies that partner with R&D centers or universities to bring nanotechnology to the market.

6. Safety policy for protection of human health and the environment

Emergence of new technologies can present environmental challenges, due to a lack of information on their effects on human health. Joint efforts are, therefore, needed to share information and exchange experience in managing environmental and health impacts to support the development of efficient safety policy.

Policy directions

Individual economies should encourage efforts to implement effective environmental, health, and safety policies and enhance development of the study of nanotoxicology to reduce possible harmful effects of nanotechnologies on the environment and health.

Safety policy for protection of human health and the environment are expected to provide consistent and predictable requirements for environmental impact of new products and manufacturing processes, which would facilitate the ability of industry to understand and follow regulations and ensure product safety for human health and the environment.

Safety regulations should play an important role in the development of nano-enabled materials and nanotechnologies, while making efforts for ensuring that they do not stifle innovation nor restrict access to technologies nor create unnecessary trade barriers.

7. Intellectual property awareness policy

Inventors often lack specialized knowledge on how to ensure protection and enforcement of their intellectual property rights that may result from their work. Governments should protect and enforce intellectual property rights to ensure that commercialization is fair and secure for inventors, and enhance the motivation of companies to innovate.

Policy directions

Enhancing public knowledge of intellectual property rights and policies could be done by carrying out efforts to raise awareness on tools available for successful intellectual property rights management, protection and enforcement.

Individual economies should also consider enhancing their cooperation in exchange of best practices in intellectual property protection and enforcement and how to develop necessary legal frameworks to accomplish this goal.

8. Household demand

Propensity to innovate largely depends on the level of demand. Use of energy efficient solutions should be an obvious advantage for households, creating demand for nanotechnology businesses, which, in its turn, would be an incentive for further development of energy efficient technologies and contribute to solution of the energy efficiency problem.

Policy directions

Governments should encourage households to use energy saving devices, which could be achieved by holding relevant campaigns and giving certain incentives. Diversification of energy sources, including the increase in the share of green energy should be also encouraged by the governments in order to stimulate research and development followed by commercialization of the energy efficient technologies.

9. Information exchange

Innovation often implies new unique combinations of the resources available. In order to create such unique combinations quickly and to stimulate economic growth in all economies, there is a need to coordinate resources of all the stakeholders. Information exchange is, therefore, an essential element for developing cooperation, combining efforts and resources to accelerate innovative growth in the field of nanotechnology.

Policy directions

Governments should promote education programs and cooperation among the APEC economies, especially postgraduate trainings since cooperation at these early stages would create a strong basis for future cooperation. Efforts should be made by the governments to educate more people and promote public awareness, in particular, train more young talents in the nanotechnology R&D.

Economies should foster cooperation among R&D centers, sharing best practices and promoting S&T networking, including through joint development and research.

Information exchange should be encouraged through active participation in the networking activities involving all the relevant stakeholders in order to bring the industry closer to innovators.

Policies on information exchange at the same time should appreciate matters of confidentiality both from a business perspective, as well as from the perspective of scientific researchers who wish to publish unique findings.

Innovation activities, including those in the area of nanotechnology, should be popularized at the economy-wide, regional and local levels of the government.