OECD Addresses Business Environment for Nanotechnology and Its Impact on Energy and Medicine Commercialization – Part 2

Insight on OECD WPN Workshop on Nanotechnology for Sustainable Energy Option & Challenges in the Innovation Environment of Nanomedicine, Feb. 22-23, 2010, Seoul, South Korea

Abstract:

This article highlights the discussions on the OECD workshops on nanoenergy and nanomedicine regarding to their business environment on aspects of R&D, financing, IP management, value chains and production, human resources, public perception, and EHS issues.

The two workshops discussed the business environment for nanotechnology specifically in the application areas of energy and medicine. To continue our previous article, we summarize and highlight more details on the discussion and recommendations came out of the workshops. There were intensive discussions at the OECD Working Party on Nanotechnology (WPN) Workshop on Nanotechnology for Sustainable Energy Options (Nanoenergy workshop) and recommendations being made which are also applicable to the OECD WPN Workshop on Challenges in the Innovation Environment of Nanomedicine (Nanomedicine workshop). The priority technology areas in nanoenergy and nanomedicine are summarized in Table.1. Areas deserved most discussions in nanomedicine are early stage diagnostics and non-invasive therapeutics; and in nanoenergy are PV and batteries for electrical vehicles applications.

The challenges experienced at the commercialization pathway raised in the discussions of both workshops include:

1) Regulation to support and create nano market – government policy makers need to work closely with companies to full understand nanotechnology and the value it provides and create policy to support nanotech sustainable development.
2) Funding - for the full value chain of nanotech development including Proof of Concept, Proof of Value, supporting grow phase of company, international marketing and expansion
3) Public Private Partnership- encourage private sector to co-fund R&D and promote innovation; tech transfer mechanism/practices – interdisciplinary team, communication and capability development
4) Infrastructure support – enable access of world-class facilities and platform for industry and academia collaboration
5) Intellectual Property Right (IPR) – government could help sharing the costs of IP application and

maintenance, regulate to encourage more innovation; collaborate with research institutes and reduce IP costs; build IP develop partnerships along the value chain; companies do not patent the keep trade secrets

6) Communication – being transparent, explain technology/products to the public through media and presentations at events/trade shows/exhibits (German Nano Truck, Taiwan Nano House; communicate with the regulatory body as early as the product concept was conceived
7) Information gaps - International Cooperation (database sharing, coordinate research efforts to avoid duplication), engage public communication
8) International cooperation and network – integrating global resources to allow access to infrastructures, financing, market, and manpower
9) Human Resource Development – internship programs nationally and internationally, HR mobility program
10) Form research and industry associations - to help with education, policy lobby, public acceptance, facilitate cooperation among players in different part of the value chain
11) Standardization and EHS Regulatory Issues – not enough information to regulate; no need to create new nanomedicine product regulation but integrate into the existing current regulatory pathway

Dr Bai Xu, CEO of Nanomed Devices, shared that "the world is flat, and globalization is rapidly growing in S& T development and global integration of resources would accelerate advancement of research and commercialization. Government needs to develop a balance strategy for facilitate academia and industry cooperation as the academia is long term looking, industry is shortsighted."

Taiwan stands out at the workshops for its very organized top down approach and developed infrastructures (at ITRI) for supporting commercialization.

I shared with the participants some of the unique government support mechanism in Singapore for facilitating nanotech commercialization in Singapore by attracting MNCs and SMEs from all over the world by building antechnology and industry ecosystem and international internship programs.

I am impressed by the leadership of Austria in setting up the European Center for Nanotoxicology based in Graz and the Austrian government is leading the WPN Nanomedicine project to explore challenges specific in nanomedicine and to identify global trends in key success factors and key barriers.

Italy stands out for its government support for setting up the European nanomedicine center in

Lombardia.

Thailand shows its ambition in advancing its medical tourism through nanomedicine.

The panelists stressed that global R&D and business network is instrumental for nanotech industry growth allowing access to resources including infrastructure, manpower, funding, IP and market.

A number of participating economies shared their public private partnership practices especially in co-funding schemes and open infrastructure access. Israel and Singapore seem to provide attractive incentives (up 85% co-funding from government) for nanoenergy and nanomedicine incubation phase R&D. Singapore government (IE Singapore) also provides funding for grow phase companies especially with their international business development and expansion.

Both MNC and SME representatives share their practices in close partnerships among companies in the full industry value chain.

Cima Nanotech shared its superior platform technology (in making flexible transparent conductive thin film with Nano silver) that provides simpler, cheaper and green manufacturing process to replace the existing costly processes and materials (such as ITO).

Bayer Materials Science led the CNT Industry Consortium in Germany shared its full value chain cooperation strategy in accelerating CNT commercialization and sustainable development of nanotechnology.

The participants also stressed the importance of promoting closer collaboration between the developing and developed world.

The panel recommended that OECD could facilitate policy in Standard and EHS issues, IP protection hindering innovation issues, and creating nanomarket.

The event concluded with the approval of the Austria's proposed nanomedicine project by the WPN committee members.

Appendix

Table 1 indicates the technology areas discussed at the two workshops. We summarize in Table 2 the challenges and recommendations made during the presentations and panel discussions at both

workshops and highlight discussions and recommendations in Table 3 provided by representatives from different economies and organizations.

NanoEnergy	Nanomedicine
LED (Vietnam, Korea, Japan)	Diagnostics
PV (Australia, Germany, Taiwan)	Imaging
Fuel Cell (Sony, ITRI)	Drug design
EV (LG, ITRI, Bayer)	Drug delivery (non invasive)
Printable Process (Sony)	Cell and gene therapy
ITO replacement (Cima)	Implants
Light weight and strong composite materials (Bayer, Hunion)	Regenerative medicine
	Artificial organs
	Biomaterials
	Preventative medicine

Table 1- Technology Areas discussed in the OECD WPN Nanoenergy and Nanomedicine workshops

Challenges	NanoEnergy	NanoMedicine
Policy	Develop policy to support nano energy companies, Singapore Green Mark initiative stimulates industry cleantech adoption	Extremely interdisciplinary; Government needs to develop a balance strategy for facilitate academia and industry cooperation as the academia is long term looking, industry is shortsighted
Funding		global integration of resources would accelerate advancement of research and commercialization"; 300M RMB for incubation program for start ups, 10MRMB/company as start up fund
Financing	Funding schemes support different phase of development, co-finance with industry and private investors	
Infrastructure	Develop worldclass facilities and allow industry and international partners to access and serves as a platform for industry academia cooperation	
Strategies to decrease market uncertainties		
Competitive Pricing		LG failed the glucose monitoring devices due to high cost and not covered by insurance companies due to a) regulatory side for new devices b) consumer not ready c) lack of marketing
IP management	13500 patents related to CNT today, no freedom to operate; form global alliance to allow development and access to IP; Protect the full value chain with "Picket Fence" approach but needs substantial funding to maintain such strategy; Open IP access to simulate commercialization specially to the developing world	

Challenges	NanoEnergy	NanoMedicine
Internationalization	building international alliance and network to access to global infrastructure, R&D capability, market and financing	
Tech transfer, scalability and industry awareness	Through People transfer; Poor process scalability- manufacturing tech and supportive infra; Developing world lacks experience & need partnership with	
SME issues (finance, value chain, partnerships, credibility, etc)	for research and industry alliance and international network	
Human Resource Development	interdisciplinary, Nanoengineering, nano-manufacturing; regional and global mobility; industry and international internship program (Sg)	
Standards and Regulatory aspects – policies impacting industry	involved in international organziation such as ISO and OECD as well as regional network to establish joint standards and regulations	need to engage the regulartory body at the product conceptiopn stage
Public perception and EHS	need transparent and international harmonized guidelines for various NT subareas	
Communication between stakeholders (companies, public sectors, tech/non-technical, etc)	Addressing Information Gap and streamline communication among all stakeholders from Day 1	
Challenge of covering the full value chain (from R&D to production and sales) - nanotechnology has to compete with existing technologies	Industry Consortium - Innovation Alliance Model covering the full value chain and facilitate tech transfer and HR exchange and mobility as well as IP management Provide funding schemes to support companies in different value chain; MNC and SME partnerships	

Table 2- Highlights of discussions and recommendations provided at the OECD WPN Nanoenergy and Nanomedicine workshops on the key challenges of nanotechnology commercialization

Country	NanoEnergy	NanoMedicine
Austria		Leading country to conduct the project exploring key challenges in nanomedicine commercialization; established European Center for Nanotoxicology
Australia	target to 20% electricty comes from renewable energy by 2021; renewable energy specific incentives such as the PV PR and usage payback schemes	
Canada	CAD 500M Substainable Development Canada started 2002. Create industry partnerships program called nanoWorks 50% funded by government	
China		Suzhou BioBay focuses on supporting SME in nanobio companies; Global resource
France		Nano risk which involved direct contact with human body is more of a concern
Germany	biomass, wind, PV growing, PV will be main source beyond 2050; An interconnected network of Politics, economy, society/environment are important for energy development for energy supply chain;	
Bayer	Raw Materials manufacturer with close collaboration with partners in the full value chain on CNT application in energy conversion, transport, storage	
Israel	80% co-funding to companies for R&D	
Italy	focusing on 4 sectors power generation, transport, industries and buildings - benefits from nanotech for energy use	European Center for Nanomedicine
Japan	PV, fuel cell, bio fuel cell, printable process, nano carbon	Nano-biotechnology & Biomaterials, industry invesmtent is 10 times of govnt
Sony	R&D and public communication – Sony Science Program	Integrating detection and therapy; molecular imaging and nanomedicine for early detection
Korea	focuses in products and productive processes; build core facilities and education to accelerate industralization; barrier to commercializatio include public acceptance and large investment required	
LG Electronics		LG leading mobile enabled personal healthcare delivery services; Nanomedicine enabled increasing sensitivity driving early detection of diseases and lower the cost of healthcare
Hunion		Ag Nanoparticle composites
KANC	Established worldclass facility serving as a platform for industry and academia collaborations on PV and LED	
LG Chem	Nanomaterials for Battery R&D for EV, mobile devices, power tool/source application; open innovation	
Korchip	nano carbon electrode for super capacitor application	

Country	NanoEnergy	NanoMedicine
Singapore	85% co-funding for innovative early stage R&D in companies; build complete ecosystem for renewable energy economy; build and hold IP in a safe and tax friendly venue, ensure commercial valuable investments; attract and support international MNC and SME to grow in Singapore	
Taiwan	Taiwan targets 15% renewable energy by 2025; Promote PV and EV (for E scooters); ITRI serves as an incubator for Taiwan high-tech industry; nanoMark and nano house help the public engagement	ITRI Build full ecosystem including R&D, POC/POV, Clinical Trial and Regulatory Framework
Thailand		NANOTEC addressing Medical tourism , DDS, EHS, NanoCosme
Vietnam	IMS/VAST focusing on CNT application in Lighting and heat dissipation reducing temperature of CPU	
USA	Build global network and access to infrastructure, R&D and manufacturing capability, and financing; need global efforts to launch a "Manhattan" solar program	

Table 3-Highlights of discussions and recommendations provided at the OECD WPN Nanoenergy and Nanomedicine workshops by representatives from different economies and organizations on the key challenges of nanotechnology commercialization