



Economic and Social Commission for Asia and the Pacific  
In collaboration with  
Ministry of Science and Technology, China  
Third China-Eurasia Expo

**Expert Group Meeting on Conceptualizing the Asian Energy Highway  
3-5 September 2013, Urumqi, China**

**- MEETING REPORT -**

**I. Background**

The Commission at its 68<sup>th</sup> session adopted resolution 68/11 Connectivity for Energy Security, which requested the Executive Secretary of ESCAP to identify policy options that member States may choose on regional energy connectivity, including an intergovernmental framework that could be developed for an integrated regional power grid which could be termed as the “Asian Energy Highway” to analyze the socio-economic and environmental benefits of each option as well as the challenges and opportunities towards the realization of each option.

Against this background, ESCAP convened an Expert Group Meeting on Conceptualizing the Asian Energy Highway met at Urumqi, China from 3 to 5 September 2013. xx number of experts participated from research institutions, the private sector, power utilities, intergovernmental bodies and financing institutions in Asia, as well as representatives from selected trans-boundary energy cooperation initiatives from Europe.

**II. Conclusions and Recommendations**

*Current Status*

Recognizing that the energy demand by 2030 will double in the region, the Meeting noted a challenge in enhancing energy security through diversification of the energy mix, as a pivotal contribution to the attainment of sustainable development and addressing climate change concerns. In this regard, whilst the region is fortunate to have abundant energy resources, experts were mindful of the need to increase the share of renewable energy in the energy mix. In this context, the Meeting recognized the important role that electricity will provide in supporting socio-economic development in an environmentally sustainable manner and the opportunities that exist within enhancing trans-boundary electricity trading for this purpose.

While it is possible to transport various fossil based energy resources, the Meeting recognised that the most efficient way to transport renewable energy resources is through power grids. In this regard the Meeting was encouraged by the latest technological breakthroughs in the utilization of long-distance transmission lines, with particular attention to high-voltage direct current (HVDC) technology. These included: (a) ongoing improvements in their efficient ranges, (b) reduced footprints and right-of-way

requirements, (c) opportunities to interconnect grids by either land or sea (using cables), (d) the development of hybrid HVDC breakers that can respond to power interruptions and emergency situations, also providing increased opportunity for network augmentation, (e) opportunity for asynchronous interconnections, and (f) developments in smart grid technology (with high capacity converter feeder transformers) that enhance opportunities for improvements in the geographical scale of grid interconnectivity, including intermittent renewable energy management through load smoothing.

The Meeting also recognized a range of on-going subregional level initiatives at various stages of implementation and, with diverse legal arrangements to promote trans-boundary electricity trade. These included the ASEAN Power Grid, CASAREM's flagship project - CASA 1000, the GMS Power Market, the North-East Asia Super Grid, the SAARC Market for Electricity, and the European Supergrid.

### *Challenges and Opportunities*

A need for effective communication between the various subregional initiatives on trans-boundary electricity trade/exchange was acknowledged by the Meeting. Key issues identified included a requirement to ensure cohesive developments paths between the diversity of stakeholders involved, the differences in development timelines and differences in development impetus between independent projects. Whilst it was acknowledged that the vision to establish an integrated regional power grid may take some time to eventuate in terms of necessary agreements between regional policy-makers, the Meeting also recognized that certain efforts could be made now to reduce both the obstacles and costs of future interconnections by the early pursuit of harmony from a technical and institutional standards perspective.

Fundamentally, it was highlighted that energy infrastructures have a long lifespan (typically 40-60 years), whose embedded legacies in terms of unconsolidated or uncoordinated investments in the near term, will continue to impact upon development opportunities over coming decades from a legacy perspective. Therefore, although the meeting participants recognized that the Asian Energy Highway is a long-term development agenda, significant benefits can be quantified now that merit the identification and removal of obstacles in the near term in order to reduce longer term costs and challenges.

A key opportunity derived from enhanced regional interconnectivity of power sectors was that of significantly scaling up exploitation of the vast renewable energy sources available in the region. Regional interconnectivity assists in ameliorating two key challenges in the use of renewable energy – intermittence and remoteness. The broadening in scale of power grids through transmission infrastructure development provides opportunities to move electricity to a wider market and improve confidence in developing large scale renewable energy projects in remote areas. Larger grids are also more capable of absorbing, the inherent intermittencies of renewable sources (e.g. solar and wind) , where such variances would tend to cancel out and the region as a whole could benefit from a smoothing out of supply and demand (also reducing the base load capacity requirements). In addition, with newer transmission technologies, a regional “backbone” HVDC grid could also establish demand and supply hubs without incurring substantial losses, improving overall reliability and security in terms of supply.

While a substantial number of benefits were discussed and noted for further research, key challenges were also identified. Especially in comparison to the leading example of European Supergrid, the Asia-Pacific region is diverse with different levels of development which currently lacks the structural capacity to move towards full integration, except for more progressed initiatives such as the ASEAN Power Grid (ASEAN Economic Community by 2015), limiting options in the near term for movement towards full

integration for the greater extents of the Asia-Pacific region. It was also recognized that there is neither the financial nor legal capacity at present to attempt full economic integration across the whole region. However, there was strong recognition of the fact that energy infrastructure has an asset life time of approximately 40-60 years and today's decisions will have a long-lasting impact on future power generation and on the well-being of future human generations. Therefore, a tailored roadmap for the Asia-Pacific region should ideally be developed, paving the way toward the eventual integration of the regions power sectors.

### *Suggestions on Way Forward*

The Meeting reached a general consensus that it is indeed desirable to realize the Asian Energy Highway concept and establish a regional integrated power grid. Participants acknowledged the importance of having a common goal in the region that becomes the basis for long-term planning to ensure sustainable development of the power sector.

Participants also acknowledged the need to promote multilateral and regional energy cooperation between ESCAP and key development partners, including private sector and civil society, as well as energy initiatives such as the Energy Charter.

Two policy options were identified: (1) the development of a top-down driven, integrated regional power grid, or (2) the strengthening of existing subregional initiatives and cooperative efforts, with a view to utilize and build upon these initiatives to eventually evolve into an integrated system. As experts deemed that political commitment towards integrated regional power grids is most needed at this point, it was suggested to choose the latter and take a more programmatic approach by building on existing subregional initiatives and learn from experiences in Europe and other regions where integrated power grids are in the process of being established and also from Energy Charter countries.

The immediate next step identified was to hold a policy dialogue for government officials, in order to communicate the Meeting's conclusions and hold a discussion on the AEH concept and ways to move forward. The identified steps of this process were:

- Raising awareness and interest of ESCAP member States to pursue the Asian Energy Highway in cooperation with stakeholders
- Gaining consensus on the need for further research and analysis in order to more comprehensively quantify the social, environmental and economic benefits of an AEH (including studies into how energy resources can be efficiently optimized as “resources for the region”).
- Build upon existing initiatives at the subregional level in terms of various ongoing interconnection projects - in particular their feasibility studies in order to learn from the experiences from other integration initiatives developing within the region.
- Investigate opportunities for a ‘flagship’ development project; and
- Identify ways to support the multi-year process of developing a roadmap for the Asian Energy Highway, in terms of human resources, financial resources and institutional arrangements.

### **III. Proceedings**

#### *Opening of the EGM*

The EGM opened with remarks from Mr. Kohji Iwakami on behalf of Mr. Rae Kwon Chung, Director of the Environment and Development Division of the United Nations Economic and Social Commission for Asia and the Pacific, emphasizing the need to have the energy sector contribute to sustainable development in the Asia-Pacific region where 628 million people live without access to electricity and 1.8 billion rely on traditional biomass. Mr. Chung explained that the Asian and Pacific Energy Forum (APEF) held in May extensively discussed energy connectivity and markets, including oil and gas, electricity, hydropower and renewables at large. He warmly welcomed all participants to the EGM, the first such meeting on the Asian Energy Highway following the ESCAP resolution on energy connectivity passed in 2012.

Mr. Adejiang Dawuti, Deputy Director-General of the Xinjiang International Expo Administration, thanked ESCAP for the cooperation to the expo for the second year in a row. He announced that almost 50 countries and several international organizations had joined this year's Xinjiang Expo, making it an international platform to discuss win-win economic trade, mutual trust and how to raise living standards in the Asia-Pacific region.

Mr. Zheng Fangneng, Director of the Energy Division at the Ministry of Science and Technology, China, shared the government goals of adding 250 GW in wind power and 100 GW in solar PV by 2020, which then raises the question of how best to link renewables to the grid. He welcomed the opportunity to co-organize the meeting and discuss regional energy cooperation to deal with climate change through the development of the AEH concept that can help alleviate the problem of unstable power supply from renewables. He further noted the urgency to have more experts participate in meetings like these to discuss issues of trans-border trade, e.g. development of key technology and equipment, investment and financing and policies so that we can realize the dream of using renewables from thousands of miles away.

Ms. Tian Min, Chief of the Reform and Development Commission of Xinjiang Uygur Autonomous Region, remarked on the importance of the meeting discussing the common challenge of enhancing energy security, reducing poverty and addressing climate change. She outlined the abundant natural resources of Xinjiang in coal, oil and renewable resources, which in 2012, generated 181 million GCE of electricity, 20 million tons of crude oil and enabled the construction of 20 thermal power plants and HVDC projects.

#### *Session 1 Introduction to the EGM and Asian Energy Highway*

The first presentation was given by Mr. Kohji Iwakami, ESCAP, to give the background and objectives to the EGM and to allow for self-introductions of the experts gathered in the room. He explained the mandate from ESCAP member states (ESCAP resolution 68/11) to discuss options for an integrated regional power grid and introduced other key driving forces behind the AEH concept – the Asian and Pacific Energy Forum's ministerial declaration and plan of action, the UN Decade on Sustainable Energy for All, the Rio+20 outcomes and the ongoing discussions on the post-2015 development agenda. As such, he requested participants to keep in mind appropriate development criteria, e.g. sustainable economic growth, poverty eradication and environmental sustainability. Also, in an effort to be paper-smart, the website with all meeting documents and presentations was shown.

In the second presentation, Mr. Derek Atkinson, ESCAP, provided an overview of key questions for the EGM to consider, drawing from the AEH concept paper he wrote (circulated to participants beforehand). When considering the collective power future for Asia and the Pacific, he emphasized the need to take the required steps now to reach a desirable outcome and that today's decisions will resonate for many years to come, especially given the growth of the region. He considered the various subregional initiatives currently underway, each with its own set of regulations, standards, pricing and planning, and highlighted that their common agendas contained the potential for a regional level of operating efficiency, should efforts to harmonize and achieve complimentary development be implemented. In this vein, a variety of scenarios were presented regarding the options available for regional integration: between cooperative energy trading and integrated energy markets, between an organic bottom-up approach supporting subregional initiatives towards gradual integration and a more top-down approach through a master plan, as well as the kind of market and institutional arrangements that would be most effective.

In the proceeding discussion, one of the points made was that in the case of power pools in the US, Scandinavia and Australia, the rate of development between the states or countries was quite similar whereas in Asia where there is very different capacity and maturity in the markets. Hence, participants generally agreed that an organic approach would be good to develop now, providing the groundwork and harmonizing between subregional initiatives (e.g. standards). An expected benefit to this approach would be that we would not be locking ourselves in an unsustainable infrastructure legacy and that gradual consolidated cooperation and flexible development would naturally facilitate integration in the future.

Also, the technological and geographical scope of the AEH concept was clarified in response to questions. The AEH concept was positioned as being resource-neutral with regards to promotion of any core energy technologies. Rather, the AEH was identified with a vision for the region to benefit as a whole from a more efficient and sustainable energy delivery system. Through the development of a regionally-scaled transmission network and power grid, both conventional and renewable energy resources could be optimized in terms of delivery, whilst also improving the scope for linking remote energy resources to demand centers (e.g. desert solar and wind power). In terms of the geographic scale, the AEH concept was positioned as a United Nations regional initiative, encompassing and seeking to benefit the 62 member countries of the Economic and Social Commission for Asia and the Pacific (ESCAP).

### *Session 2 Conceptual Feasibility: Benefits and challenges*

Mr. Xu Honghua of the Chinese Academy of Sciences made the first presentation titled "Integrating Renewable Energy Sources" highlighting long-term plans for integrating renewable energy sources into the national grid and the ambitious drive - backed by strong government planning and targets - for increasing wind and solar PV installed capacity in China through R&D and demonstration projects. The China 2050 renewable energy long-term strategy research aims for a renewables share of 60% in power generation by 2050.

Mr. Eric Kemp-Benedict, Stockholm Environment Institute, gave a presentation on the "Socioeconomic and Environmental Implications of an Asian Energy Highway" looking at the global challenge to keep within planetary boundaries, the need for better macroeconomics that gets the price right (address externalities) and considers non-economic social goals, income distribution and equity, and the real impacts of infrastructure on people and communities, necessitating an inclusive process of infrastructure

development. He explained that infrastructure is not neutral and the impact needs to be carefully thought through, for example, using energy return on investment (EROI) as an engineering feature of merit.

In Mr. Cheng Lu's presentation titled "Practice and Exploration of State Grid Corporation of China (SGCC) in promoting the development of new energy," he emphasized the significance of power interconnections to China due to the fact that more than 90% of new energy capacity (inc. wind and solar capacity) exist in the three northern regions (Xinjian, Inner Mongolia, Ningxia), thousands of km from demand centers. He also informed the EGM that there is ongoing work on a new energy standard system and improvements to the overall framework of smart grid demonstration projects.

Mr. Qianjin Liu, ABB Corporate Research Center in China, shared his perspectives in the presentation on "Asian Energy Highway: The power grid revolution" based on his experience in the latest research and development in the power sector. He clarified the advantages of DC over AC (e.g. the use of cables, even underground, makes public approval easier; less loss for >500km; and bigger capacity for power transmission) and the importance of a DC grid vs. a DC point-to-point system. Due to recent technological breakthroughs, he emphasized that the technology has become mature and that the timing is ripe for commercial application to meet the growing need and demand for renewables and alleviate pressures in right of way issues.

Ms. Huang Xinnan gave an overview of TBEA's history, portfolio and achievements in a presentation titled "Development and Cooperation of China Power Transmission and Transformation Technology," including bilateral projects overseas, many in Central Asia and Africa. She also provided a glimpse into the new, eco-friendly headquarters and technical research and development base where the EGM participants would be making a field visit on day 3.

In the discussion, participants first discussed the impact and opportunities with respect to renewables and touched on the link between grid development and access (e.g. by the poor, in rural areas). It was raised that renewable energy could start to be seen as a regional resource and that a region-wide study on the best appropriation of renewables depending on endowments, topography, etc. would be useful exercise. Also, the need to have emergency response systems with, for example, first-response thermal power plants was brought up in the context of ensuring reliability.

Experts raised the fundamental need to build trust for an AEH concept. Looking for increasing cooperation within and between subregions and projects would be sensible to nurture consensus and promote sector reform (e.g. in electricity pricing). It was noted that the institutional framework needed to support this long-term process of trust-building and addressing concerns on energy security and sovereignty should be carefully thought through.

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