

# OBOR (B&R), Interconnectivity for Energy, and Energy Markets in East Asia

Yanfei Li  
Energy Economist  
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[www.eria.org](http://www.eria.org)

Economic Research Institute for ASEAN and East Asia



# Outline

- The OBOR Initiative
- The energy infrastructure gap
- The energy interconnection: costs and benefits
- The interconnection of institutions and markets
- How to form synergy?

# History and Development of the Concept 1

- September 2013. Mr. Xi: a silk road economic belt
- October 2013. Mr. Xi: a 21<sup>st</sup> century maritime silk road
- Characterized by equality and inclusiveness
- Goals:
  - Maintain an open world economic system
  - Achieve diversified, independent, balanced, and sustainable development
  - Advance regional cooperation
  - Strengthen communications between civilizations
  - Safe guard world peace and stability
  - Build a human community of shared destiny

# History and Development of the Concept 2

- Means:
  - Form future-oriented consensus for international cooperation
  - Connectivity of infrastructure and facilities
  - Build a new system of global economic governance
  - Improve global trade and investment system
  - Shape a mutually beneficial global value chain
  - Efficiency in flow of (production) elements
  - In-depth integration of markets as well as financial system
  - Create a cooperation platform for economic policy coordination
  - Closer people-to-people ties (social and cultural linkages)

# History and Development of the Concept 3

- 2015: “Vision and Actions on Jointly Building Silk Road Economic Belt and 21<sup>st</sup> Century Maritime Silk Road”
  - A top level design and a grand blueprint
- In 2015, Shanghai Cooperation Organization announced its members’ support
- By 2016, 46 agreements with 39 countries and international organizations on connectivity, production capacity, investment, economy and trade, finance, science and technology, society, humanities, quality of life, and marine issues
- November 17, 2016, 193 UN members adopted a resolution by consensus, embracing economic cooperation initiatives including the Belt and Road Initiative

# History and Development of the Concept 4

- March 17, 2017, the UN Security Council unanimously adopted Resolution 2344, calling on the international community to strengthen regional economic cooperation through the Belt and Road Initiative.
- 2017: “Building the Belt and Road: Concept, Practice, and China’s Contribution”
  - Cooperation framework: from plan to practice/action
  - A leading group formed under NDRC
  - Bilateral cooperation plans
  - 5 routes, 6 Economic corridors, and six means of communication/physical connectivity
  - Policy communication is of crucial importance
  - Maritime cooperation: build a number of important ports and the key cities along the specified maritime routes

# OBOR Energy Cooperation

- A “Vision and Actions” document developed by NDRC and National Energy Administration (NEA) and published in May 2017
- It aims to:
  - improve regional energy safety
  - optimize the distribution of energy resources
  - integrate regional energy markets
  - push forward the green and low-carbon development of regional energy

# Principles of Energy Cooperation under OBOR

- Open and inclusive
- Mutual benefit
- Market-oriented
- Safe and secure
- Green and efficient
- Harmonious (in the social, cultural, and religious aspects)



# Priorities of Energy Cooperation under OBOR

- Policy coordination
- Unimpeded trade
- Energy investment cooperation
  - FDI, merger and acquisition, PPP
  - “Industry Plus Finance” pattern of cooperation
    - involvement of financial institutions in the lifecycle of energy cooperation projects
- Energy production capacity cooperation
  - Equipment; technology transfer and joint R&D; standardization
- Energy infrastructure connectivity
- Sustainable energy for all
  - the 2030 Sustainable Development Agenda and Paris Agreement
- Better global energy governance structure

# China in Action for OBOR Energy Cooperation

- Bilateral joint working mechanism
- Multilateral energy cooperation
  - Lancang-Mekong Cooperation Mechanism, the GMS, ASEAN-China, ASEAN+3, East Asia Summit, Asia Cooperation Dialogue
  - ASEAN-China Clean Energy Capacity Building Plan
  - East Asia Summit Clean Energy Forum
- List of potential projects to be extended
  - Oil and gas pipeline, high-voltage transmission lines, grid interconnection and trade of electricity, and power plants

# Energy Infrastructure Investment in ASEAN

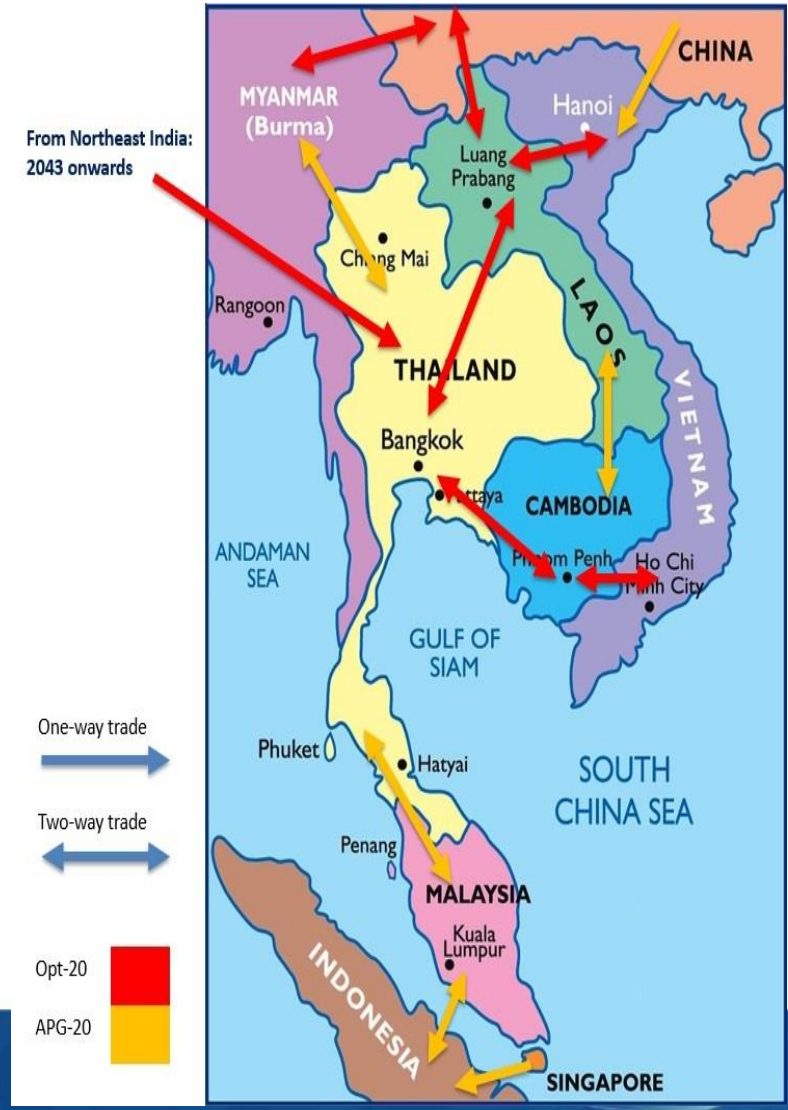
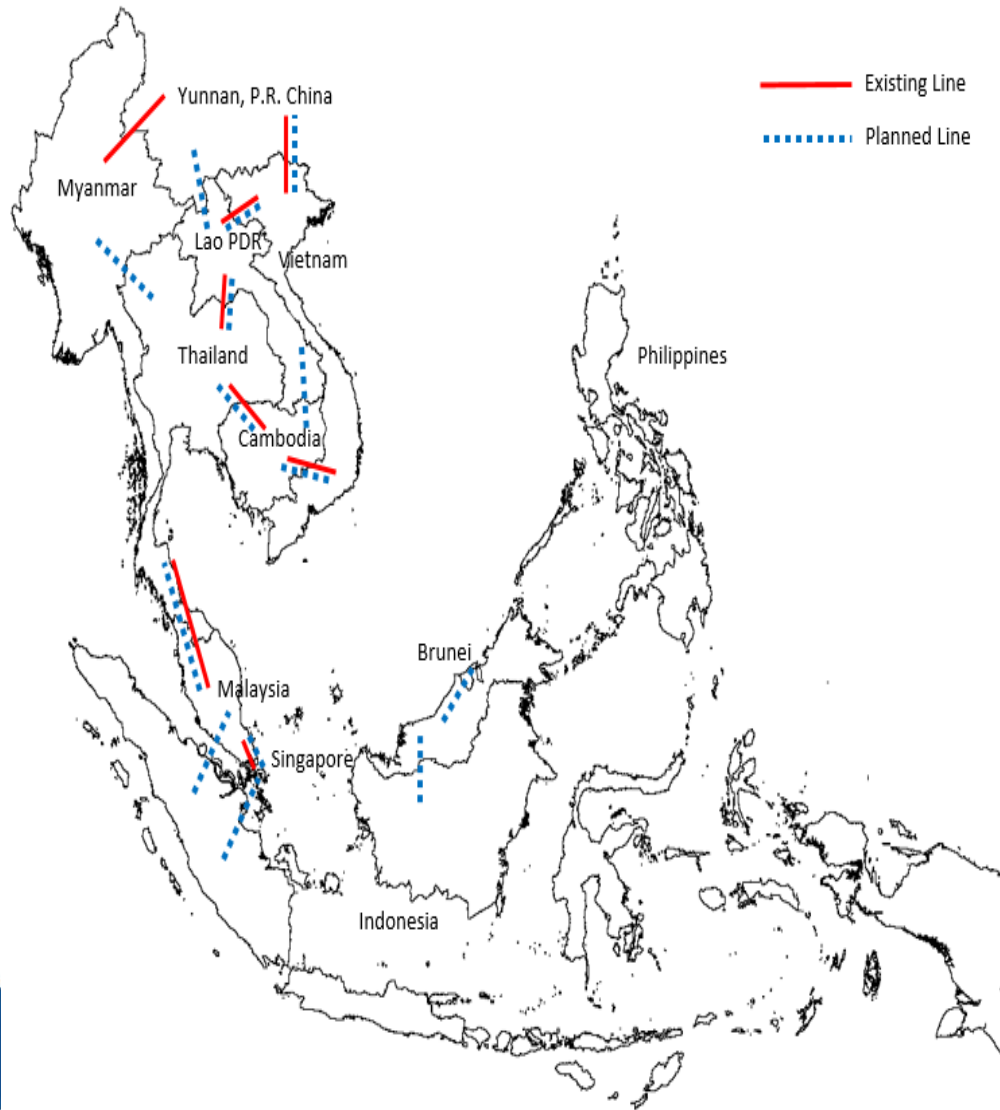
|  | Average annual investments |                       |         |         |         | Cumulative investments |         |
|--|----------------------------|-----------------------|---------|---------|---------|------------------------|---------|
|  | Historical                 | New Policies Scenario |         |         |         | NPS                    | 450     |
|  | 2000-13                    | 2014-20               | 2021-25 | 2026-30 | 2031-35 | 2014-35                | 2014-35 |

## Energy Supply (billion, year-2012 US dollars)

|                            | 2000-13 | 2014-20 | 2021-25 | 2026-30 | 2031-35 | 2014-35 | 2014-35 |
|----------------------------|---------|---------|---------|---------|---------|---------|---------|
| <b>Total</b>               | 52      | 79      | 78      | 87      | 105     | 1 909   | 1 855   |
| <b>Oil</b>                 | 14      | 18      | 13      | 12      | 15      | 331     | 282     |
| Upstream                   | 10      | 15      | 12      | 9       | 10      | 261     | 220     |
| Transport                  | 2       | 1       | 0       | 1       | 2       | 18      | 16      |
| Refining                   | 2       | 2       | 2       | 2       | 4       | 52      | 46      |
| <b>Gas</b>                 | 15      | 24      | 21      | 25      | 27      | 529     | 496     |
| Upstream                   | 10      | 21      | 17      | 21      | 22      | 446     | 416     |
| Transport                  | 4       | 3       | 4       | 4       | 5       | 83      | 79      |
| <b>Coal</b>                | 2       | 2       | 2       | 2       | 3       | 46      | 22      |
| Mining                     | 1       | 1       | 1       | 1       | 1       | 23      | 11      |
| Transport                  | 1       | 1       | 1       | 1       | 1       | 23      | 10      |
| <b>Power</b>               | 21      | 34      | 42      | 48      | 59      | 980     | 1 010   |
| Fossil fuels               | 5       | 9       | 9       | 11      | 14      | 229     | 162     |
| <i>Of which: Coal</i>      | 3       | 7       | 6       | 8       | 11      | 175     | 122     |
| <i>Gas</i>                 | 2       | 2       | 2       | 3       | 3       | 52      | 38      |
| Nuclear                    | -       | -       | 2       | 1       | 1       | 18      | 45      |
| Renewables                 | 5       | 6       | 9       | 10      | 11      | 189     | 375     |
| <i>Of which: Bioenergy</i> | 1       | 1       | 1       | 1       | 1       | 21      | 41      |
| <i>Hydro</i>               | 3       | 3       | 4       | 5       | 6       | 97      | 169     |
| <i>Wind</i>                | 0       | 0       | 1       | 1       | 2       | 19      | 56      |
| <i>Solar PV</i>            | 0       | 1       | 2       | 1       | 2       | 34      | 58      |
| Transmission               | 2       | 3       | 4       | 4       | 5       | 88      | 73      |
| Distribution               | 10      | 16      | 19      | 23      | 28      | 456     | 356     |
| Biofuels                   | 1       | 1       | 1       | 1       | 2       | 23      | 45      |

- For the total non-OECD Asia, the total investment required in energy supply and energy efficiency amounts to over 15 trillion USD (in 2012 constant price)
- For ASEAN, in addition, investment in energy efficiency costs another 192~490 billion USD

# Power Grid Interconnection and Trade Pattern Envisioned for ASEAN



# Our Research on APG

Quantitative  
Modeling and  
Cost-Benefit  
Assessment

Feasibility Studies  
of Selected Cross-  
border  
Transmission Lines

Beyond bilateral  
trade of electricity  
– removing technical,  
economic, and  
institutional barriers to  
multilateral trade

# Effective Investment of Power Infrastructure in EAS through Power Grid Interconnection I

Quantify benefits of the pan-regional power infrastructure

Draw policy implications toward investment decisions

## KEY FINDINGS

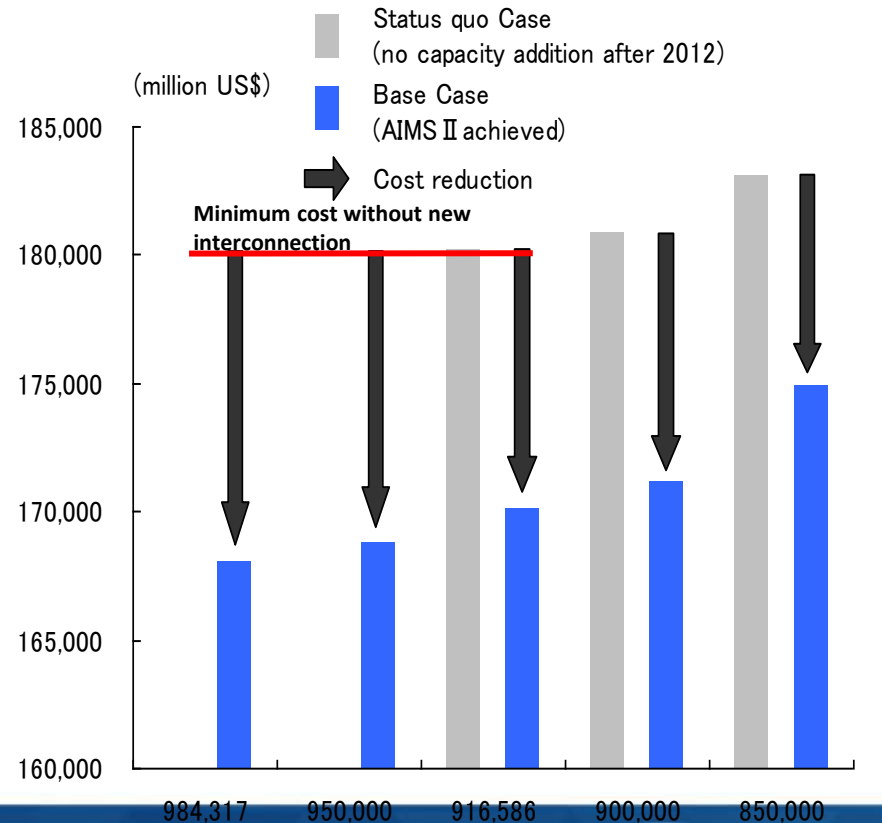
- Total generating cost of US\$ 12.1 billion in 2020 can possibly be reduced at the maximum due to the cost reduction effect of utilizing the international power grid.

## KEY RECOMMENDATIONS

- ERIA would like to suggest ASEAN countries to make a platform to ensure implementation of AIMS proposed by HAPUA.

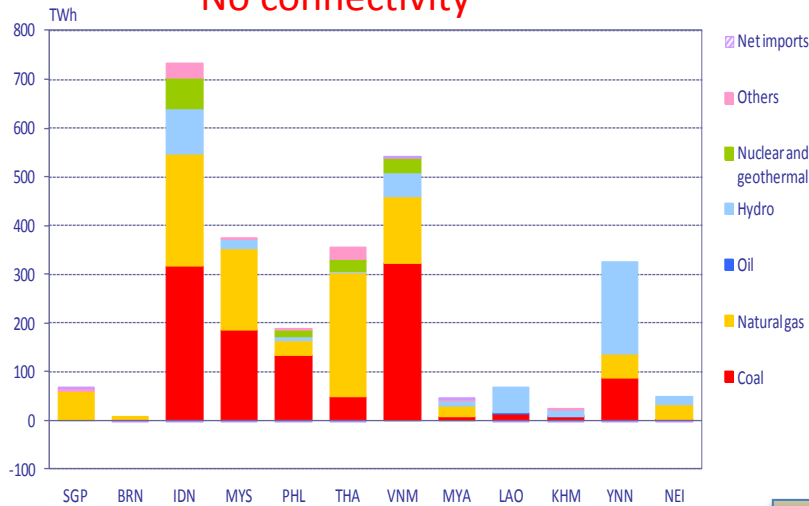
Source: ERIA (2013)

## Possible cost reduction in 2020

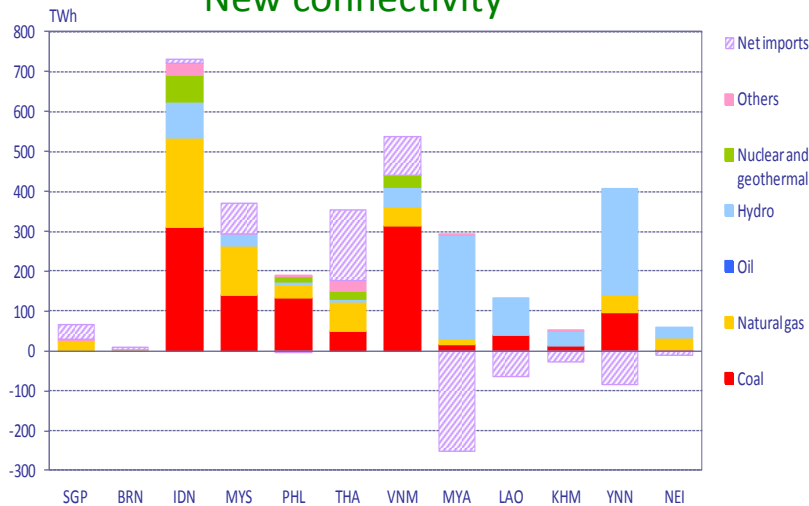


# Effective Investment of Power Infrastructure in East Asia through Power Grid Interconnection I

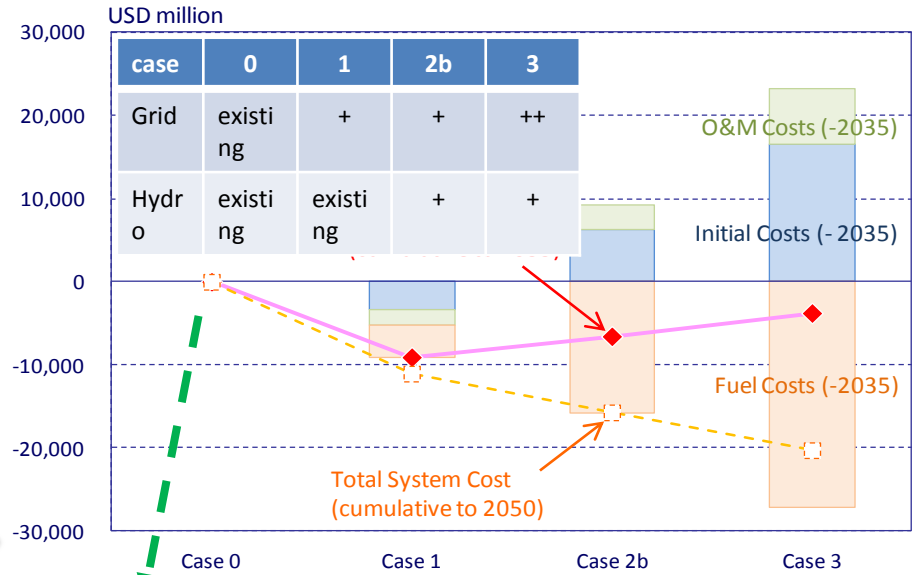
No connectivity



New connectivity



System costs and cumulative savings by case



Economics of the selected transmission

| Case | Estimated cost of transmission line [mil.USD] | Estimated range of net economic benefit [mil.USD] |                    |                      |
|------|---|---|--------------------|----------------------|
| A    | THA-KHM                                       | 162 -- 1,009                                      | 4,560 -- 5,470     | second priority      |
| B    | THA-LAO                                       | 728 -- 1,957                                      | 19,282 -- 20,604   | first priority       |
| C    | THA-MYA                                       | 2,244 -- 3,956                                    | (4,607) -- (2,766) | need careful assess. |
| D    | MYA-THA-MYS-SGP                               | 2,384 -- 6,272                                    | (1,118) -- 3,064   | need careful assess. |
| E    | VNM-LAO-THA                                   | 922 -- 2,885                                      | 21,604 -- 23,715   | first priority       |
| F    | MYS-IDN                                       | 1,790 -- 1,901                                    | 3,968 -- 4,087     | second priority      |
| G    | LAO-THA-MYS-SGP                               | 868 -- 4,273                                      | 23,217 -- 26,557   | first priority       |

# Effective Investment of Power Infrastructure in East Asia through Power Grid Interconnection II

## Policy Implications:

- With grid interconnection within the region, the region could improve investment efficiency for power infrastructure
- Economic rational for interconnectivity in power sector of the region stands true and valid
- Key barriers need to be removed:
  - ✓ Systems and regulations related to the grid interconnections of concerned countries differ
  - ✓ Making transmission infrastructure investment attractive to private companies and foreign capital



# APG: ATSO and AGTP

## Objectives

- ❑ To help initiate multilateral electricity trading to accelerate the realization of the ASEAN Power Grid by specifically supporting the formation of the APG Transmission System Operator Institution (ATSO), and APG Generation and Transmission System Planning Institution (AGTP).
- ❑ **In line with** the ASEAN ECONOMIC COMMUNITY BLUEPRINT 2025 under key element C.4 Energy “ASEAN Power Grid (APG): Initiate multilateral electricity trade in at least one sub-region in ASEAN by 2018”; and
- ❑ With the ASEAN PLAN OF ACTION FOR ENERGY COOPERATION (APAEC) 2016-2025 PHASE I: 2016-2020: Outcome-based strategy 2 of the ASEAN Power Grid: “Initiate multilateral electricity trading”, Action line (b): “Review recommendation to support establishing new APG Institutions by 2018, namely, the ATSO and the AGTP”

## Status Update

- ❑ **Proposed budget:**  
USD 764,172 for both AGTP and ATSO studies (USD 382,085.8 per component)
- ❑ **Proposed funding source:**  
Japan-ASEAN Integration Fund (JAIF) of the ASEAN Secretariat
- ❑ **Current Status:**  
Approved in ad-referendum by the ASEAN Committee of Permanent Representative (CPR) on 9 March 2017, and currently under Japan’s consideration for funding approval.

# Technical guideline for AGTP

Reviewing with ICs

Guide line  
(Draft)

- Principles
- Coordinated Process of PDP, TDP
- Role of Utilities
- Shearing of information planning outcome
- Communication technology: soft ware
- Other institutional arrangements
  - Number of key person
  - Tenure of key person
  - Functions
  - Authorities
  - Responsibilities

PDP: Power Development Plan, TDP: Transmission Development Plan

# Technical guideline for ATSO

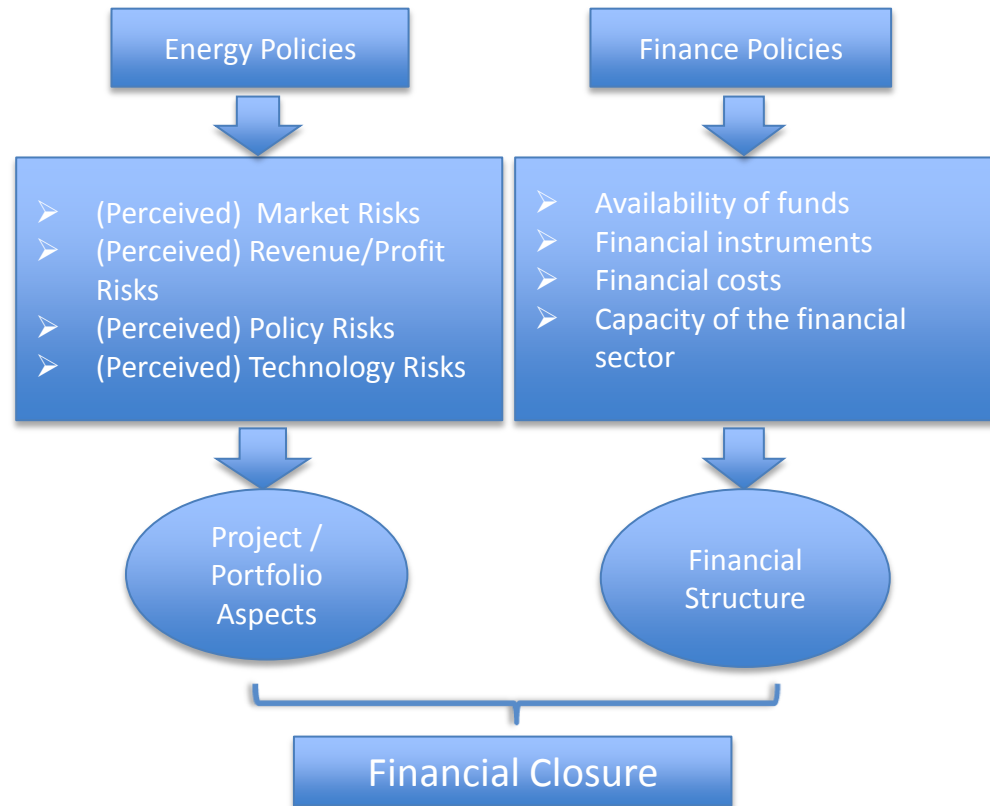
Reviewing with ICs



Guide line  
(Draft)

- Principles**
- Harmonized standard**
  - Limit of Voltages, Loadings, Frequency,...
- Operation procedures**
- Performance requirements**
- Agreement on open access**
- Other institutional arrangements**
  - Number of key person
  - Tenure of key person
  - Functions
  - Authorities
  - Responsibilities

# Financing Energy Infrastructure: Why Policy Coordination and Harmonization are Needed in Cross-border Projects



# Conclusions

- OBOR brings new opportunities for both China and the involved economies
- How to implement? Needs actions from all parties, not just China alone
  - Funds from China will need to leverage on international funds as well as host economy's own public and private financial resources
- Equal emphasis has to be put on “software” interconnection, such is how the investment in “hardware” interconnection will see maximum economic potential materialized
  - Policies, institutions, regulations, standards, procedures
  - Integration of markets
  - Integration of financial systems