

## EXECUTIVE SUMMARY

In the 16th meeting of the Energy Cooperation Task Force (ECTF)<sup>1</sup> meeting held in Vientiane, Laos on 25 August 2011, the Japanese government proposed several new ideas and initiatives for EAS energy cooperation. Responding to their proposal, the ECTF meeting endorsed the new areas and initiatives, which included the creation of an Energy Security Index for East Asian Countries. The Economic Research Institute for ASEAN and East Asia (ERIA) approved the proposal of the Japanese government that a study be conducted on the energy security index. As a result, a Working Group (WG) for the development of an Energy Security Index (ESI), and assessment of energy security, for East Asia Countries was convened. Members from all the 16 EAS countries are represented in the WG, led by Dr. Ken Koyama of the Institute of Energy Economics, Japan (IEEJ).

The first objective of the study was to develop an index that quantitatively indicated the energy security situation, and could therefore help policymakers to accurately gauge the energy security situation in their country. The second objective was to analyze the linkages between policies and the historical trends shown in the index, and thereby assess the impact that policies have on the energy security situation. The final objective was to offer policy recommendations to policymakers in East Asian countries on improving energy security based on the following analysis:

- What methods and approaches are effective for improving energy security
- What kinds of regional cooperation are useful for improving energy security

For this study, a Working Group was organized comprised of experts from East Asian countries. The WG convened twice to discuss data collection methods and analysis approaches, and to assess the findings calculated from the index.

As a first step, the WG disaggregated energy security components and reviewed indicators that could represent the situation of each component. These considerations also took into account the feasibility of obtaining data. Next, the data necessary for calculating the index were collected. In principle, publicly available statistics were

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<sup>1</sup> Energy Cooperation Task Force under the Energy Minister Meeting of EAS countries.

utilized, such as those produced by the International Energy Agency (IEA). Missing data were supplemented with the cooperation of WG members and through other means. The collected data were then used to calculate the index and to capture the historical trends of each indicator. Based on the averages of the OECD from the 1970s to the present, the indicators were given scores, and changes in the situation of each country were analyzed.

A list of the selected indicators is shown below.

Components	Quantitative Assessment	ESIs
Development of domestic resources	1. Self-sufficiency	1-1. TPES self-sufficiency ratio (including nuclear) 1-2. Reserve/production ratio 1-3. Reserve/consumption ratio
Acquisition of overseas resources	2. Diversification of import source countries 3. Diversification of energy sources 4. Dependence on Middle East	2. Diversity of import source countries (oil, gas and coal) 3. Diversity of energy sources of TPES / electricity 4. Middle East dependence of oil and gas
Transportation risk management	-	-
Secure a reliable domestic supply chain	5-1. Reliability of energy supply 5-2. Build supply infrastructure	5-1-1. Reserve margin of generation capacity 5-1-2. Power outage frequency / duration 5-2. Commercial energy access ratio
Management demand	6. Energy efficiency	6-1. TPES per GDP 6-2. TFEC per GDP
Preparedness for supply disruptions	7. Strategic reserves	7. Days of on-land oil stocks
Environmental sustainability	8. intensity	8-1. emissions per TPES 8-2. emissions per Fossil fuel 8-3. emissions per GDP 8-4. emissions per Capita

By following this process, the study yielded the following outcomes:

1. While there are limitations to obtaining data, it is possible to develop an index which quantitatively indicates the energy security situation. For example, in the case of the indicator for the diversity of energy sources, ERIA averages show a trend toward the concentrated use of specific energy across the years. In particular, this finding is consistent with the expanded use of coal for power generation.
2. Energy security is comprised of a variety of elements. Furthermore, the perspective from which a country is assessed varies widely depending on the situation that the country is in. There is thus no single absolutely correct indicator, and it is important to assess multiple perspectives through a combination of several indicators.
3. With the cooperation of WG members, it was possible to access data which are difficult to obtain through publicly available statistics, such as statistics produced by the IEA and BP, as well as to confirm and review data. This was one of the major outcomes of this study.
4. Calculating the index using the data yielded Energy Security Index (ESI) values which were widely distributed and which reflected the diversity of the countries.
5. For example, in the case of the self-sufficiency ratio, it was possible to quantitatively confirm that despite having no domestic resources, a country could improve its self-sufficiency ratio by expanding its use of nuclear energy, and, as a result, could improve its performance in terms of ESI. It is important that such policies underpinning the changes in indicator performance are analyzed.
6. For country analyses, ESI has made it possible to quantitatively assess how the energy security situation has evolved over past decades.
7. Some indicators have a trade-off relationship, and it may therefore be difficult to improve performance across all indicators simultaneously. This is observed, for example, in the case of self-sufficiency and the diversity of energy sources.
8. Country situations shown by ESI vary depending on the country's environment, including resource endowment, and the extent of energy demand increases. Nevertheless, a number of common trends were identified:

- Many of the countries with energy resources experienced decreases in their self-sufficiency ratios or R/P ratios. It is thought, in these cases, that new resource development has not caught up with the speed of energy demand increase.
- With respect to the supply of primary energy, and the diversity of energy sources, few countries performed well compared to the OECD average. It was observed, for example, that while increasing the use of domestic resources, such as coal and hydropower, is favorable for improving self-sufficiency ratios, this also limits the diversification of energy sources.
- While access to commercial energy is improving, at the same time this is causing a further increase in energy demand, including electricity demand.
- Although efficiency in energy utilization is improving in many countries, some countries still have low efficiency compared with OECD averages, and there remains room for improvement.