國際智庫動態報導

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INDIA HAS A 10-YEAR WINDOW IN WHICH NO NEW INVESTMENTS LIKELY IN COAL, GAS OR NUCLEAR CAPACITIES

Current generation capacity and that being built will be enough to keep India power sufficient till 2026

All new investments in power generation likely to go to solar/battery technology

印度在未來 10 年對於煤炭、天然氣或核能可能無新的投資

現有及建設中的發電量足以使印度到 2026 年都有充足的電力

所有新的發電投資都可能涉足太陽能/電池技術

The Energy and Resources Institute
Creating Innovative Solutions for a Sustainable Future

New Delhi, February 13, 2017: The Energy and Resources Institute (TERI) today unveiled the findings of its study report "Transitions in the Indian Energy Sector - Macro Level Analysis of Demand and Supply Side Options". This report was released alongside two others – one by the Electricity Transitions Commission (ETC), and

本期摘要(KEY INFORMATION)

◎印度能源和資源研究所（TERI）於 2017 年 2 月公佈了其研究報告「印度能源部門的轉型 —需求和供應方選擇的宏觀層面分析」，指出現有及建設中的發電量到 2026 年都能滿足用電需求，並預估在 2023 到 2024 年後，基於可再生能源的成本競爭力，以及電網吸收大量可再生能源和電池平衡電力，新的發電量可能全來自可再生能源。可再生電力及其儲存成本穩步下降，並可穩定在每千瓦小時 5 盧比。 這將使印度能果斷地邁向可再生能源發電。這意味著印度於未來十年在煤炭、天然氣或核能發電方面可能無新的投資，而發電脫碳也是將其他如運輸等碳基部門轉向電力的機會，從而使潔淨能源發電的益處倍增。

◎新加坡國立大學能源研究所(ESI)副研究員 Gautam Jindal 於 2017 年 1 月發表新加坡能源儲存制度相關評論，指出新加坡電力部門力行減少碳排放，已有超過 95%的發電來自複循環發電機，故新加坡需增加太陽光電占有率，以進一步達成減碳目標，其電力管制機構「能源市場管理局（EMA）」亦關切高滲透率太陽光電系統對電網穩定性的影響。根據太陽光電及風能占有率高的其他電力市場經驗，大範圍安裝可減少變異性與間歇性造成的影響。對於電力系統孤立的小國新加坡而言，能源儲存對於更高階的太陽光電布局將發揮重要作用。2015 年新加坡開放其電力市場，允許能源儲存制度(ESS)可出價提供「調節」服務，即頻率的平衡服務，用以校正 30 分鐘的交易期間內因負載變化及預測誤差引起的電力需求不平衡。ESS 可為發電機、電網營運者及消費者機動提供多種解決方案。新加坡目前正在尋求發展一個完整的政策框架，以管理電力市場中能源儲存解決方案的應用未知整合。

the other by the Indian National Academy of Engineering (INAE).

The reports were released by Shri Piyush Goyal, Minister of State (I/C) for Power, Coal, New and Renewable Energy and Mines, Government of India, as part of a day-long conference organised by TERI on Energy Transitions.

The TERI report indicates that current installed capacity and the capacity under construction would be able to meet demand till about 2026, keeping India power sufficient. The report estimates that no new investments are likely to be made in coal-based power generation in the years prior to that.

The TERI report also estimates that beyond 2023-24, new power generation capacity could be all renewables, based on cost competitiveness of renewables as well as the ability of the grid to absorb large amounts of renewable energy together with battery-based balancing power.

Speaking at event, Shri Piyush Goyal, Minister for Power, Coal, and Renewable Energy, Government of India, said, "Universal access to electricity is one of the primary aims of the Government, and meeting demand is a major facet of this initiative. We see India becoming the energy capital of the world. India is also committed to lowering the emissions intensity of its development in line with our INDCs towards the Paris Agreement. We are looking at several initiatives towards making solar energy price competitive to coal.."

Speaking on the occasion, Dr. Ajay Mathur, Director General, TERI, said "The target to achieve the UNFCCC commitments presents tremendous opportunity to put India at the forefront of economies transitioning towards low carbon growth. This includes improving electricity access, clean technology development, manufacturing, and job creation. Our report shows that the cost of renewable electricity and its storage is on a steady decline and could stabilise at around Rs 5 per KWh. This would enable India to move decisively towards renewables for future generation. What this ,means is that India has a ten-year window where no new investments are likely to be done in coal, gas, or nuclear energy generation.

The decarbonisation of power generation is also an opportunity to move other carbon based sectors like transport to electricity, thus multiplying the benefits of clean energy generation."

TERI's demand scenario suggests that the current installed capacity and the capacity under construction and after taking into account retirements, would be able to meet the demand till about 2026, or so. This suggests that there would be no new coal-based capacity investment that would be approved till about for years prior to that.

Between 2014 and 2024, India has a 10-year window. If in this 10 year window, the price of solar and battery reaches the Rs.5/ unit mark, all new capacity additions would be in renewables. In case, this price goal would be achieved, or nearly achieved, by 2023-24, if appropriate infrastructure to absorb large

amounts of renewable energy, together with battery-based balancing power, is in place.

The INAE report captures the Engineering Interventions Necessary for Achieving 175 GW of Renewable Power by 2022. Mr. BN Suresh, President, INAE, said "Indigenous manufacturing of renewable energy components such as solar PV cells and modules will benefit through job creation, reduce reliance on imported technology, and strengthen India‟s position as a manufacturing hub in line with „Make In India‟ initiative. Achieving high capacity target of renewables in a short time scale requires innovation in technology and cost reduction of project execution, operations, and maintenance."

A report by the Energy Transitions Commission highlights the need for a major shift in the mix of energy system investment, and a coherent and stable policy framework. Lord Turner, Chair-ETC, said, "If people in emerging economies, like India, are to attain the standards of living enjoyed today by the developed world, large increases in energy use per capita will be needed in many countries. But this increase cannot be met by an unchanged energy system. We must therefore transition to a global energy system that can ensure everyone has access to sufficient affordable modern energy to support a good standard of living and cut carbon emissions from the energy system."

The event was also graced by the presence of Mr. Pradeep Kumar Sinha, Cabinet Secretary, Government of India; Mr. Susheel Kumar, Secretary, Ministry of Coal; Mr. Pradeep Kumar Pujari, Secretary, Ministry of Power; Mr. Rajeev Kapoor, Secretary, Ministry of New & Renewable Energy; Mr. A N Jha, Secretary, Ministry of Environment, Forests & Climate Change; and Mr. Ashok Lavasa, Finance Secretary and Secretary (Expenditure), Ministry of Finance

原始連結：
http://www.teriin.org/files/press_release_130217.pdf

SINGAPORE LOOKING TO DEVELOP POLICY FRAMEWORK FOR ENERGY STORAGE

新加坡正為能源儲存尋求完整的政策框架

In order to fulfil its commitments under the Paris climate change agreement, Singapore's climate action plan includes a number of strategies, including reduction of emissions from its power generation sector. Already, Singapore generates more than 95% electricity using combined cycle gas generators; thus, it needs to increase the share of Solar PV to achieve further reductions.

However, Singapore's electricity regulator – the Energy Market Authority (EMA) – is rightly concerned about the impact of high PV penetration on grid stability. Experience from other electricity markets with relatively high percentage of PV and wind has shown that variability and intermittency impacts can be reduced by spreading the installation of these resources across large areas. Furthermore, strong interconnections with other power systems allow for increased balancing errors to be cancelled out and also allows for sharing of flexible conventional generators.

Thus, for geographically small, isolated power systems like Singapore, energy storage will play a vital role in supporting higher levels of PV deployment.

In 2015, Singapore opened its electricity market for energy storage systems (ESS) by allowing them to bid for offering "regulation" service. Regulation is a frequency balancing service which is used to correct the generation – demand imbalances within a 30-minute trading period caused by load variability and load forecasting error.

This followed a rule in 2014, which allowed PV systems that were paired with energy storage, to not be classified as "intermittent" and potentially participate in the wholesale market.

However, ESS' are very dynamic and can offer a number of solutions to generators, grid operators, and consumers. As per the Sandia National Laboratories, ESS can provide value in seventeen different types of applications such as price arbitrage, ancillary services such as voltage regulation and load following, facilitating demand side management, and firming up output from variable renewable energy sources.

Recognising this potential, Singapore is now looking to develop a holistic policy framework that will govern application agnostic integration of energy storage solutions in its electricity market.

The framework will seek to answer a number of questions such as – which applications of energy storage deployment can provide the most value in Singapore? How can commercial viable business models be developed for ESS? What changes to regulatory framework are required to accommodate certain unique characteristics of storage systems – such as should ESS be considered as a generation activity, as a load, or neither, or both?

An interesting question that the framework will answer is whether the current electricity market design can provide enough incentives for ESS to participate in the market. For example, studies have concluded that ESS can be much more effective in providing regulation service as compared to a combustion turbine, due to their high ramp rates and ability to accurately follow the AGC signal.

System operators in the US thus provide fast responding regulation providers with a performance payment in addition to the usual capacity payment, making regulation markets more profitable for ESS. Singapore's rule change on allowing ESS to participate in the regulation market notes this incentive, however its market

rules continue to treat ESS at par with other generation asset that provides regulation.

Energy storage has the potential to revolutionise Singapore's electricity market in the coming years; right from enabling Virtual Power Plants to facilitating demand response, to increasing number of prosumers with PV systems on their rooftops. However, this requires that Singapore develop a solid framework that provides investors with certainty and appropriate incentives to consider investing in energy storage applications that are expected to have the maximum economic value and market potential.

原始連結：http://esi.nus.edu.sg/publications/esi-publications/publication/2017/01/26/singapore-looking-to-develop-policy-framework-for-energy-storage