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RENEWABLE ENERGY RISES ACROSS ASIA

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Much of the world's energy transformation will hinge on the continent's fast-growing markets.

The world's largest continent is where renewable energy use is expanding fastest. It is where renewables have the most room to grow, along with driving development. Asia is also is where they can most decisively help to curb carbon emissions and mitigate climate change.

China's rise as a renewable energy powerhouse is indisputable. Others like Southeast Asia's "Tiger cub economies" (Indonesia, Malaysia, the Philippines and Thailand) are gaining valuable experience in the sector. Central Asian countries have recognised the value of renewables to spur future growth.

India, meanwhile, has started turning to renewables to meet its mushrooming energy demand sustainably.

Of the estimated 1.2 billion people who today lack access to modern energy services, more than 95% live in developing countries either in Asia or sub-Saharan Africa. Any way you look at it, Asia is a key factor in the world's pursuit of a sustainable energy future.

This edition of the *IRENA Quarterly Newsletter* explores the exciting challenges and opportunities in some of Asia's emerging renewable energy markets.

ASEAN countries rally behind energy transformation

By 2025, the ten countries in the Association of Southeast Asian Nations (ASEAN) will face a surging electricity demand, which is expected to double, and a 50% increase in the overall energy demand. To meet this demand some countries are planning to turn to their old energy standby, coal. Much of the other increases are planned to come from natural gas and oil, most of it imported. However, this approach is starting to be questioned by policy makers and industry across the region.

The combined population of the ASEAN region is forecast to increase from around 615 million in 2014 to 715 million by 2025. The economy will grow more than 5% per year on average, resulting in a rapid rise in energy demand. And in the future economic growth, urbanisation, electrification and population growth will ensure the relentless increase of energy demand for decades to come.

Although renewables are gaining ground worldwide, the continued reliance on fossil fuels, including the dirtiest, coal, will lead to rising carbon dioxide emissions and increased levels of local air pollution. Dependence on fossil fuel will increase emissions by 60%, resulting in health and pollution costs reaching USD 225 billion annually by 2025, according to analysis by the International Renewable Energy Agency (IRENA) and the ASEAN Centre for Energy. When considering these costs, renewable energy presents a more cost-effective option in pure economic terms.

ASEAN member states are currently on track to source 17% of their combined total primary energy supply from renewables by 2025. To reach 23%, however, the region has to roll out more renewables without delay.

In 2015, ASEAN ministers adopted an aspirational target of 23% renewable energy by 2025. This objective implies a two-and-a-half-fold increase in the region's modern renewable energy share, compared to 2014. The total power generation would have to double by 2025 to match energy demand growth.

Encouragingly, 62% of the world's renewable energy jobs are in Asia, including the ASEAN countries. China is the dominant player, followed by India. The ASEAN countries have pursued a similar route, as renewable energy technology manufacturers. Asia is fast becoming the global centre for solar PV fabrication, with installation and manufacturing jobs continuing to move particularly to Malaysia and Thailand.

"ASEAN Member States are endowed with some of the best renewable energy resources in the world," said Adnan Z. Amin, IRENA's Director-General. "Reaching the 23% target n the ASEAN region is not only feasible, but cheaper than the alternative. Doing so, however, will require more emphasis on renewables across all sectors, including heating, cooking and transport."

A joint study from IRENA and the ASEAN Center for Energy indicates the status of renewables in each country and outlines options to accelerate deployment. The study aligns with the ASEAN Plan of Action for Energy Co-operation 2016-2025. See **Renewable Energy Outlook for ASEAN: A REmap Analysis**.


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Thailand maximises policy impact by integrating energy plans

Thailand, like many countries, increasingly relies on imported energy. Today around 60% of its energy comes from imports and with proven reserves of oil and gas anticipated to last no more than a decade, this share will rise. Increasing imports not only challenges security of supply, but also has significant implications for the overall energy expenditure of the country.

The primary objective of the country's national energy policies is centred on enhancing energy security by diversifying the energy mix. The country's policies are also aimed at keeping energy prices affordable and reducing the negative effects of energy production and consumption on the environment and society.

Therefore, Thailand has set energy security as a top policy objective, followed by economic affordability, and environmental sustainability. These plans are detailed in the Thailand Integrated Energy Blueprint.

Policy makers are keenly aware of the country's growing energy demand, all the while depleting domestic reserves of energy resources. The blueprint is underpinned by separate energy plans from the Power Development Plan, the Energy Efficiency Plan, the Alternative Energy Development Plan, the Oil Plan, and the Gas Plan.

Moreover, the Government of Thailand has committed to reduce greenhouse gas emissions by 20-25% by 2030. This will require action for decarbonisation of the energy sector. Thailand has set a new renewable energy target of 30% of total final energy consumption by 2036 in its 2015 Alternative Energy Development Plan.

In 2015, the Thailand Integrated Energy Blueprint 2015-2036 was created through harmonising the five major energy plans into one integrated energy document.

> National policies aim to enhance energy security through diversification

At present, the blueprint serves de facto as the combined national energy policy and energy sector development plan. As there have been no updates to the official National Energy Policy since this blueprint. Thailand, like so many other countries, needs the right policy framework for effective use of renewables and needs to be able to react to the rapidly changing energy markets and the emerging low cost renewable power sources.

The long-term perspective and system approach taken in the blueprint could potentially change the way that energy policy is implemented in Thailand. It could yield the desired results, but crucially needs both an effective mechanism for inter-ministerial co-ordination and an implementation monitoring system in place.

The energy policy, along with the Alternative Energy Development Plan 2015, aims to increase the use of alternative energy sources, encourage energy technologies that are highly efficienct and scale up green alternatives among communities.

Plans call for modernising bioenergy and scaling up solar and wind use

Bioenergy remains the dominant renewable source in Thailand's end-use sectors. While biofuels can be used for heat and transport, the Alternative Energy Development Plan also recognises the important and growing role that solar photovoltaic and wind can play in the country.

Analysis shows that there is potential to replace traditional bioenergy with modern cook stoves and biogas digesters. That could reduce reliance on imported fossil fuels, such as liquefied petroleum gas, the current trend for replacing traditional bioenergy. Even by 2036 bioenergy will remain crucial for sectors of Thailand's energy system such as in industry.

To achieve the aims set out in the plan for bioenergy in a sustainable and efficient manner, better bioenergy accounting is needed.

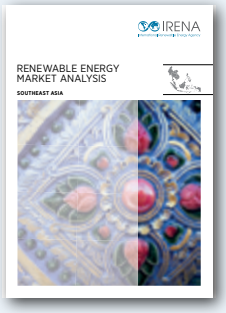
This can be achieved through a comprehensive review of the current supply and demand, including the scope of technologies covered and the ways in which data are collected, assembled, reported and analysed for renewable thermal energy.

The government of Thailand is now aiming to increase the amount of renewable power from solar PV and wind, with 2036 targets of 3 gigawatts (GW) and 6 GW respectively. However, analysis shows that these targets could increase significantly, with twice as much wind and three times as much solar PV installed over the next two decades.

Thailand is also exploring the use of electric vehicles as the demand for electricity in the transport sector could triple by 2036. The number of electric passenger vehicles on the road in Thailand by 2036 could total 1.5 million and electric two- and three-wheelers would total over 3.5 million.

The development of a long-term strategic development plan for the transport sector, including vehicles, fuel types and the necessary infrastructure, would help provide an alternative to petroleum-derived transport fuels in Thailand.

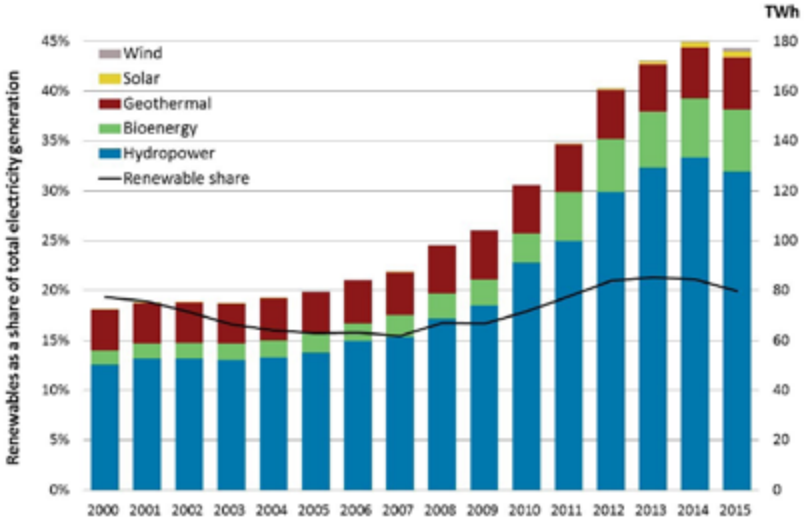
IRENA, in co-operation with the Ministry of Energy of Thailand, has conducted a combined Renewables Readiness Assessment (RRA) and REmap analysis of the country. See **Renewable Energy Outlook: Thailand**.



Forthcoming

RENEWABLE ENERGY MARKET ANALYSIS: SOUTHEAST ASIA

Renewable electricity generation in ASEAN countries between 2000 and 2015



The emerging contribution of bioenergy in Southeast Asia

In Southeast Asia, the development of renewable energy has followed a distinctive path, with relatively little deployment of wind and solar so far. Still, countries in the region were early adopters of renewables, with significant use of geothermal energy and bioenergy for electricity generation.

Thailand currently leads in the generation of electricity from bioenergy, with 15 terawatt-hours (TWh) generated in 2015 (equal to about 75% of all renewable generation in Thailand). Indonesia and Malaysia are two other major producers, with a combined 7.8 TWh of bioenergy generation in 2015.

Due to a five-fold increase in generation since 2000, bioenergy has now become the second most important source of renewable electricity in the region and it may also be used extensively for industrial heat production. However, its total contribution to heat and power production in Southeast Asia is probably under-reported for several reasons.

Autoproduction: Many countries currently do not collect any information about the electricity produced by enterprises for their own use (autoproduction). IRENA's statistics include some estimates of this and are, therefore, higher than the figures presented by many other agencies. Off-grid and small-scale bioenergy autoproduction, however, is probably missing from these estimates.

Industrial heat and solid biofuel use: A second area where bioenergy consumption may be under-reported is where it is used for industrial process heat. For a start, many of the countries reporting bioenergy generation do not report the fuel used or heat produced in the combined heat and power plants where most of this generation occurs.

In addition even fewer countries report direct use of bioenergy (as fuel) in industry, although biomass processing residues are often used to generate process heat in locally important industries, such as wood and food processing.

Biogas: The consumption of biogas is also expanding rapidly in the region, both as a clean cooking solution and as an alternative way of converting biomass wastes into energy. Some of this is captured in national statistics (*e.g.* if there is a national biogas programme), but most independent or small-scale projects are unlikely to be recorded.

Bioenergy is expanding rapidly in Southeast Asia due to the availability of rural labour, well-developed transport systems and the strength of local wood and food processing industries. IRENA has prioritised off-grid bioenergy data collection in this region, to fill some of the data gaps mentioned. As work continues with countries to check and improve upon these estimates, it is also expected that these figures will be revised upwards when new information becomes available.

For the latest estimates on renewable power-generation capacity, actual output and renewable energy balances for about 100 countries, see **Renewable Energy Statistics 2017**.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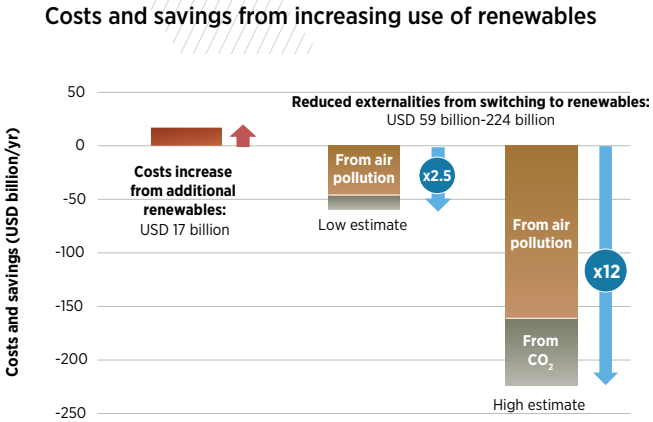


India tackles energy security

As population and economic growth attracts people into cities, India's urban population is set to grow from around 435 million in 2015 to nearly 600 million by 2030.

Although fossil fuels are still the main source of energy supply in India, the sheer need to scale up power generation capacity has created important opportunities for renewable energy deployment. The World Bank has praised Prime Minister Narendra Modi's commitment to renewables.

Meeting the resulting electricity demand, which has grown annually by 10% over the past decade, and attaining the country's ambitious economic growth targets, will require significant investments in power-generation capacity and associated infrastructure development.

"Balancing economic growth and development, environmental protection, and energy security is a real challenge in India that can be tackled by enabling more renewable energy deployment," says Dolf Gielen, Director of Innovation and Technology at IRENA.

One of the greatest challenges will be to unlock India's vast renewable energy potential, ensuring a clean and sustainable energy future,while enabling the country to fulfil its climate targets under the Paris Agreement.

Widespread poverty, means India already struggles to cope with its existing energy demand. Estimates suggest 80 million households — roughly 300 million people — have limited or no access to electricity. Yet certain renewable energy solutions, including solar photovoltaic and off-grid or mini-grid systems powered by renewables have improved energy access for poor communities and bolstered energy security through diversified, and largely indigenous and locally available, sources of supply.

Increasing renewable energy deployment could save the Indian economy twelve times more than it would cost by 2030, according to a recent REmap country report for India. Moreover, scaling up renewables can create jobs, reduce carbon dioxide emissions, and ensure cleaner air and water, with also significant savings on health-related costs.

Sufficient adoption of renewable energy technologies would lower the demand for coal and oil products by as much as 23% by 2030, compared to the existing plans and policies.

To integrate higher shares of renewables, the country needs to strengthen its transmission grids, reduce grid losses, and improve the overall resilience of the power system by investing in various flexible technologies.

Solar energy — both photovoltaic and thermal — will play a vital role. Solar could become the second largest renewable energy source at 16%, followed by wind at 14%, and hydropower at 7% of the country's total final renewable energy use by 2030, according to IRENA's REmap analysis.

Various forms of biofuels — which can be used across the end demand spectrum, such as for transport, electricity and heat generation — would account for 62% of total final renewable energy use by 2030.

See IRENA's REmap working paper, **Renewable Energy Prospects for India.**

Can the Philippines achieve energy independence?

The Philippines is a net fossil energy importer and depends heavily on imports of oil for transport, and coal for power generation. While energy independence has been a dream the Philippines has been pursuing for decades, ensuring sustainable, reliable, secure, sufficient and accessible energy supply with indigenous sources is a daunting task.

The Philippines offers great potential for geothermal, hydropower and ocean energy, and fairly good resources of solar and wind energy.

Since 1977, the Philippines has made efforts to develop this resources using its position on the Pacific "Ring of Fire". By 2015, the total installed geothermal electricity generation capacity reached about 1.9 gigawatts (GW), making the Philippines second only to the United States, according to the International Geothermal Association.

The Philippines generates 14% of total national electricity output from renewables and saves a significant amount of its budget through avoided fuel imports.

Moreover, the Philippines has accelerated the pace of deployment of other renewable energy resources, driven by setting the renewable energy target at 15.3 GW by 2030, a three-fold increase on the current country level. The country is pursuing this aim through feed-in tariffs and other support schemes.

The modular installations of, for instance, solar photovoltaic (PV) systems or small-scale biogas digesters suit the need for off-grid solutions, given there are still 4.2 million households without electricity and many of whom are in remote and small island regions. The potential for electrification through renewable-based mini- and micro-grid solutions are huge, if the challenges can be effectively addressed.

The challenges, both technical and non-technical, pose a risk for developers. This relates to maintaining sustainably operating mini-grid systems, having the knowledge to handle battery storage, detecting malfunctions or under-performance in the solar PV systems and other issues.

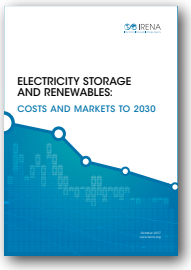
In part because of these concerns over technical challenges and tariff-related issues, the investors are reluctant to finance renewable energy mini-grids. In the Philippines, this concern is exacerbated due to a lack of guidelines on how to set up tariffs applicable to off-grid systems. Significant variation in conditions between islands necessitate a variety of renewable energy policies, including different feed-in tariffs. This situation calls for more incentives for off-grid electrification, such as relaxing regulations applied to off-grid, giving room for developers and the local communities to determine a reasonable level for tariffs, while following guidelines set by Energy Regulatory Commission.

Any benchmark tariff should include cost adjustments for site geography, size and technology. In addition, technologies should be allocated a differentiated tariff. With the advent of renewable energy hybrid applications, there is now a need to formulate tariffs for such situations and a need to develop a simplified tariff calculation.

See two recent studies:

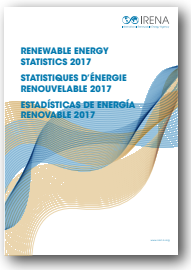
- **Renewables Readiness Assessment: The Philippines**
- **Accelerating the Deployment of Renewable Energy Mini-Grids for Off-Grid Electrification: A Study on the Philippines**

Recent publications



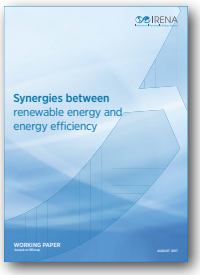
Electricity storage and renewables: Costs and markets to 2030

Battery electricity storage is a key technology in the world's transition to a sustainable energy system. This report discusses how battery systems can support a wide range of services needed for the future energy transition.



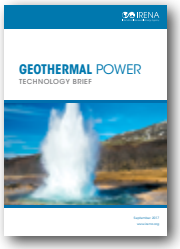
Renewable Energy Statistics 2017

This publication contains comprehensive, reliable data set on renewable energy capacity and use worldwide. The 2017 yearbook includes data from 2007-2016 for renewable power generation and renewable energy balances for 2014 and 2015.



Synergies between renewable energy and energy efficiency

This working paper considers how renewables and energy efficiency can work together to contribute to global energy decarbonisation by 2050. It also looks at how this synergy affects energy systems and technology costs, as well as the effect it has on air pollution and the associated costs.



Geothermal power: Technology brief

The world's installed capacity for geothermal power reached 12.7 gigawatts in 2016, with typical generation costs ranging between USD 1,870-5,050 per kilowatt. This technology brief provides technical background information, analyses market potential and barriers, and offers insights for policy makers on geothermal power generation.

www.irena.org/publications

About IRENA

The International Renewable Energy Agency (IRENA) is an intergovernmental organisation that supports countries in their transition to a sustainable energy future, and serves as the principal platform for international cooperation, a centre of excellence, and a repository of policy, technology, resource and financial knowledge on renewable energy. IRENA promotes the widespread adoption and sustainable use of all forms of renewable energy, including bioenergy, geothermal, hydropower, ocean, solar and wind energy, in the pursuit of sustainable development, energy access, energy security and low-carbon economic growth and prosperity.