

# Roland Berger

## Focus

January 2019

**Solar power:**

Shining prospects in Southeast Asia and India



---

# Management summary

The sun is shining brightly on Southeast Asia and India. Economies are booming and industrialization and electrification are occurring at a rapid pace. This is leading to a huge surge in power demand, with growth twice as fast as in China.

Southeast Asia is set to require more than 250 GW of additional capacity, and India 580 GW. But under existing policies, countries are struggling to meet demand. Solar power offers a solution.

The region is blessed with intense sunshine, and the fall in cost of solar equipment and batteries adds to the power source's appeal. India has already embraced the renewable and is making confident strides in bringing additional capacity online.

Southeast Asia, despite huge potential, is facing more hurdles. Our research shows that government policies have not been clear on renewables targets, for example, and regulation, financing and infrastructure are not geared to support solar.

But these issues are surmountable. As part of this report, we provide a framework for Southeast Asia to unleash its potential. This includes recommendations on promoting a broad mix of projects, developing infrastructure to support solar and de-risking.

The overall picture, however, is one of growth. And with growth comes opportunity. International investors are already taking advantage of solar's potential in India and Southeast Asia, with well-known names such as the Macquarie Group making investments in the region.

To help potential investors navigate the landscape, we identify five target segments based on the scale of projects and nature of the offtaker, or buyer. These range from solar auctions in India and Southeast Asia through corporate power purchase agreements to smaller rooftop and rural off-grid developments. For each, we provide the key factors that will be critical to a successful investment.

We conclude that with proper planning, investment in Indian and Southeast Asian solar projects provides shining prospects.

---

# Contents

<b>1. Electrifying potential</b> .....	<b>4</b>
Why power demand in Southeast Asia is booming and how solar can help meet the demand	
<b>2. A bright future</b> .....	<b>6</b>
Why solar is set to play a key role in Southeast Asia	
<b>3. Lighting the way</b> .....	<b>9</b>
How investors can reap the benefits of solar in India and Southeast Asia	

# 1. Electrifying potential:

## Why power demand in Southeast Asia is booming and how solar can help meet the demand

Together with Africa, Southeast Asia and India are expected to be the fastest-growing regions in terms of power demand. According to the International Energy Agency, demand over the 2016-2040 period is forecasted to grow, on average, by 3.2% in Southeast Asia and 3.8% in India. That's a growth rate more than twice as fast as China's.

The driving factor behind this impressive growth trajectory is economic: the bulk of the region, with the exception of Singapore and perhaps Malaysia, is still in its industrialization phase.

India's case is particularly interesting. To date, it has achieved most of its economic success through the growth of its service sector, but policy objectives are now shifting towards strengthening the manufacturing base. The "Make in India" initiative is a good example. It aims to increase the manufacturing sector's contribution to gross domestic product from 16% to 25% by 2025.

Other factors are also at work. In both Southeast Asia and India, a further contributor to power demand is expected to be increasing electrification. Indonesia, the Philippines, Cambodia, Myanmar and India are still not fully electrified, but have ambitious targets to provide universal access to power in the next decade.

All of this means that, even taking into account the effect of improving energy efficiency across the value chain, growth in demand is expected to be robust across the region. Estimates suggest that to meet the booming power demand, Southeast Asia will require more than 250 GW of additional capacity and India 580 GW by 2035. The two regions are taking different approaches to reach these targets. Power sector policies in Southeast Asia differ substantially from country to country, but on aggregate, they lag India in terms of building a coherent approach to develop new sustainable sources.

Several factors have prompted India to look at its renewable resources to rebalance the future power generation mix away from coal. These include the lack of availability of high-quality coal, concerns over environmental

impact, objectives to improve its trade balance and infrastructure investment plans.

Solar power, most commonly generated from photovoltaic (PV) cells, is in the driving seat. The IEA estimates that about 120 GW of new solar capacity and 80 GW of new wind capacity will come online in India by 2040. The country's government is promising 100 GW of solar and 60 GW of wind installed capacity as early as 2022.

India's solar capacity is growing fast thanks to a policy approach hinging on three factors: first, government support to de-risk development; second, the setting up of competitive auctions and third, promoting large projects.

This last point is particularly important: big projects are attractive to large solar companies and global utilities that are trying to move away from conventional generation. In addition, if large global players enter the market, they bring state-of-the-art engineering and project management capabilities and push down auction prices, ensuring competitive generation costs for solar.

India's plan to boost solar parks has so far added about 20 GW of new capacity, and the pipeline is flowing with several mega-projects in the 1 GW range. Such developments have seen offtake, or sale, prices fall as low as USD 0.0355 per kilowatt hour at auctions in 2018 – compared to prices hovering around USD 1 per kWh in 2015. In addition, the Indian government is increasingly focusing on promoting domestic manufacturing of solar components to boost the industry and reduce reliance on Chinese imports.

In contrast to India, installed capacity of solar in Southeast Asia amounts to a mere 5 GW, with most projects below the 50 MW size. This is despite Southeast Asia's attractive sunlight conditions. Irradiation averages 17.2 megajoules per square meter per day in the region, compared to 12.6 MJ/m<sup>2</sup>/day in Germany, which has 43 GW of solar capacity, and 16.2 MJ/m<sup>2</sup>/day in China, which has 126 GW of solar capacity. → [A](#)

Our research identified four key issues that have prevented solar power development in Southeast Asia. The first is policy, where there have been frequent changes to national plans for the energy mix or its targets have not even been defined (as in Myanmar, for example). In addition, renewable quotas have been limited, and long-term auction plans unclear.

The second issue is around regulation. There has been a lack of standardization in power purchase agreements, the contracts between providers and bulk buyers, and those deals that have been made often do not meet international standards. Regulatory hurdles in obtaining land and connection rights are another problem.

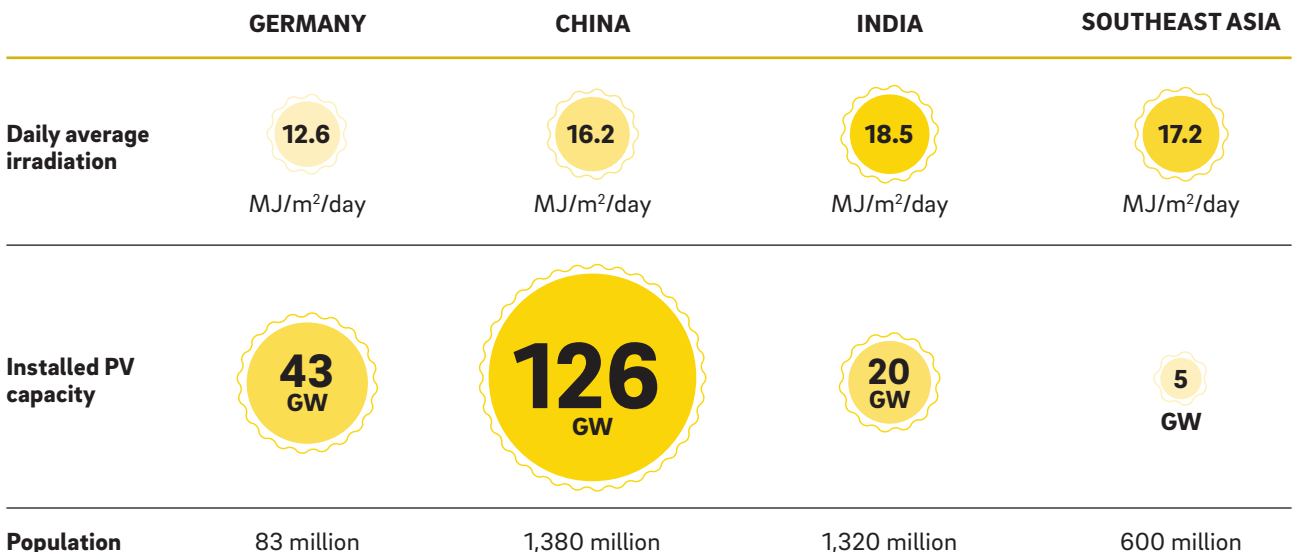
Third is financing, with projects in the region often too small to attract sizeable investment. Projects also

have low bankability due to regulatory uncertainty and credit risks of small developers. Finally comes infrastructure and technology. Local manufacturing and engineering, procurement and construction players often lack scale and expertise, and grid interconnections are insufficient to support large projects.

Overall, official energy roadmaps in Southeast Asia are still very much focused on exploiting coal resources and strengthening traditional transmission and distribution grids to increase electrification. Unfortunately, government plans for different Southeast Asian countries suggest that modern renewables may only play a marginal role in the region, with at most 35 GW of new solar capacity by 2040 compared to additional fossil fuel capacity of over 120 GW.

**A: Soaking up the sunshine all-year round**

Solar potential and installed capacity in selected countries/regions in 2017



Source: Conergy, Roland Berger

## 2. A bright future:

### Why solar is set to play a key role in Southeast Asia

Independent estimates based on economic potential suggest that, despite the hurdles outlined above, solar power has significant potential in Southeast Asia.

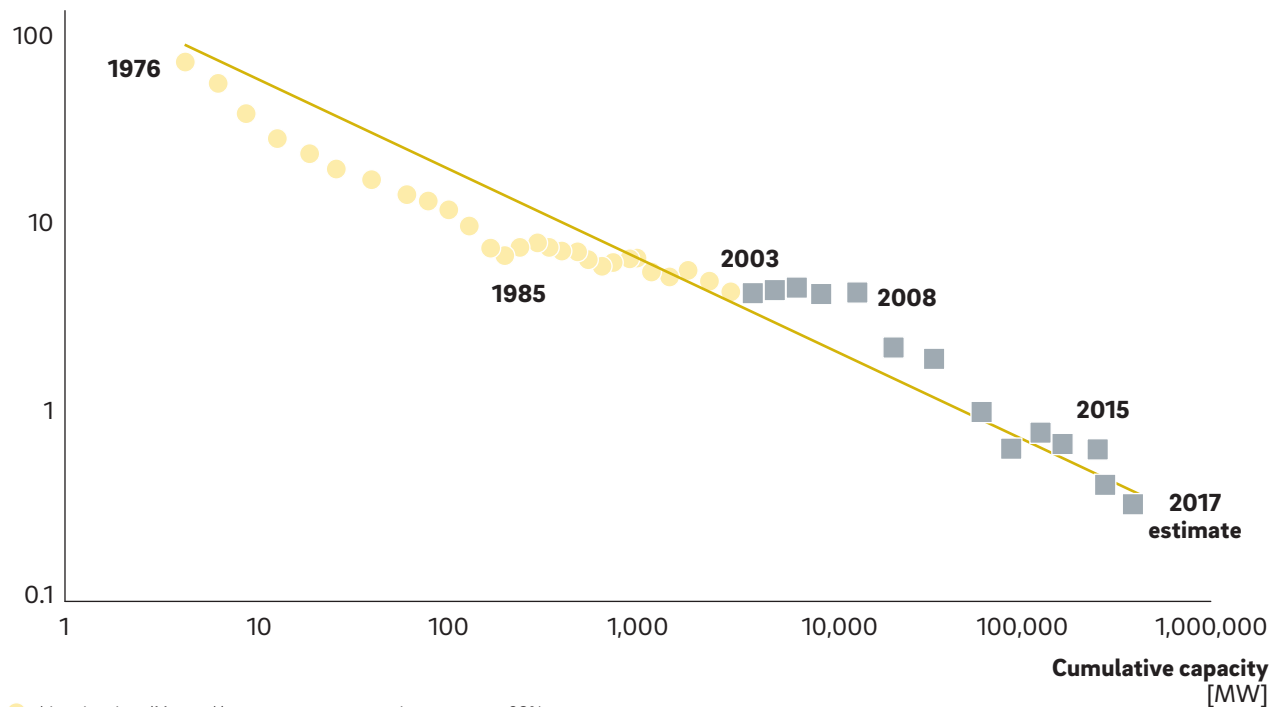
The cost of generation for solar PV has been decreasing exponentially thanks to increasing global capacity and efficiencies along the value chain. For example, the cost of solar modules has been decreasing at an annual rate of between 24% and 28% for the past 40 years. → [B/C](#)

Independent estimates by Bloomberg New Energy Finance suggest that solar PV may soon become cheaper than new coal-fired assets in certain areas of the region. In the Philippines and Thailand, where solar conditions are good and coal needs to be imported, the transition may happen in the next two years, while in Malaysia it may happen by 2025. In addition, in countries such as Myanmar, solar PV may play a fundamental

#### **B:** Getting cheaper all the time

The falling costs of solar power

**Solar experience curve**  
[USD/Wp]

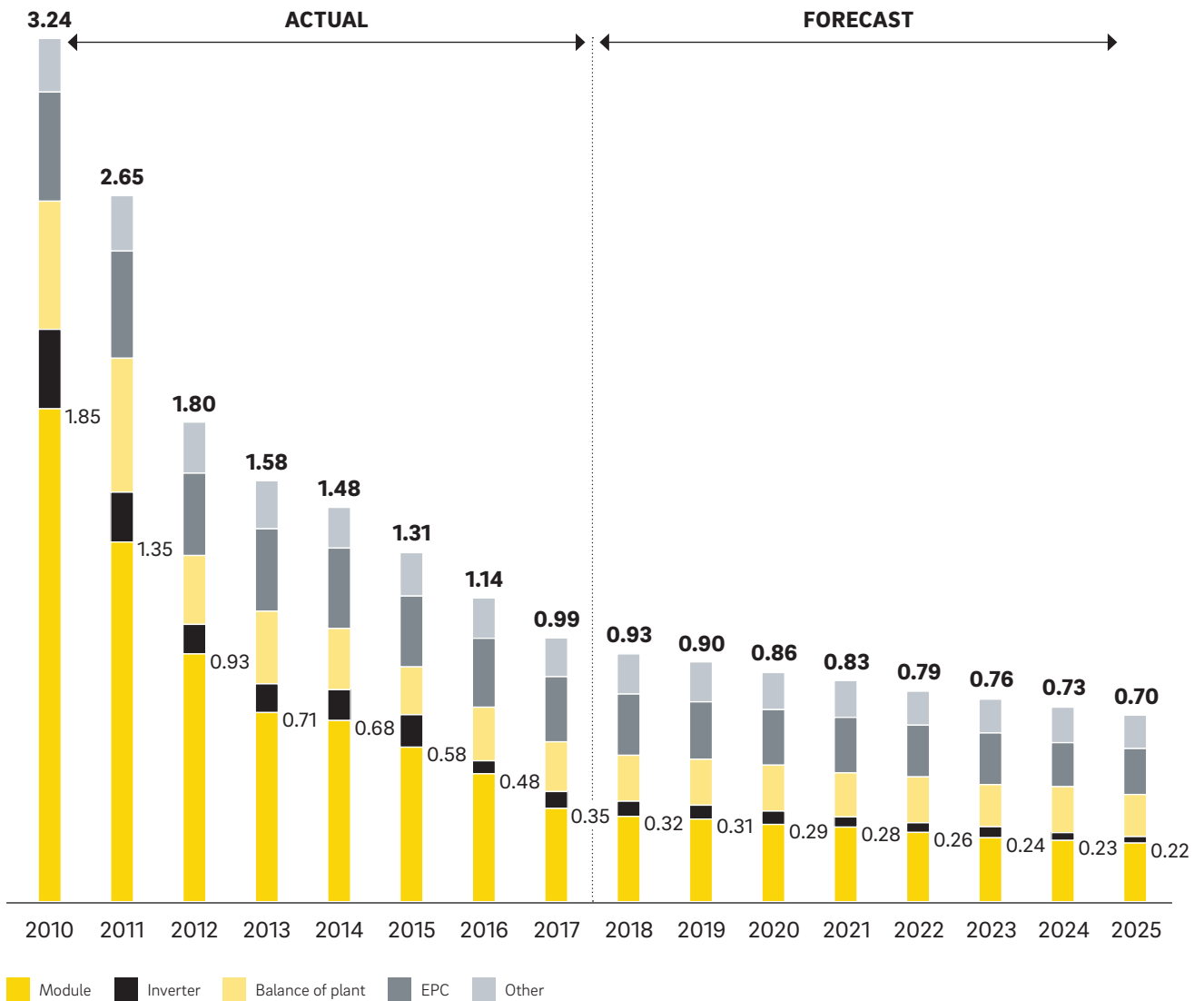


● historic prices (Maycock)      — experience curve at 28%  
■ Chinese c-Si module prices (BNEF)      ···· experience curve at 24%

Source: Conergy, Bloomberg New Energy Finance, Paul Maycock (PV Energy Systems, Inc.)

**C: Getting cheaper all the time**

Price benchmark for utility-scale PV systems [2016 USD W, DC]



Source: Conergy, International Energy Agency, Bloomberg New Energy Finance

role in ensuring rapid electrification of off-grid areas through micro- and mini-grids, and solar home systems. This is because equipment can be deployed quickly, it is cheaper than current off-grid diesel power generation and there is high potential for supplying isolated residential and non-residential loads such as remote villages and telecom towers. However, to unleash this potential for off-grid mini-grids in Myanmar, for example, a regulatory framework is needed.

As a result of all this, and irrespective of local government policies, solar PV may become a prominent alternative to coal in Southeast Asia. Estimates based on economic potential suggest approximately 90 GW of new capacity by 2040 – much higher than the 35 GW capacity from aggregated government plans.

## UNLEASHING THE SOLAR POTENTIAL

Based on our research, we have formulated five key approaches to help countries unleash solar power in Southeast Asia. → **D**

The first move is to pursue an appropriate mix of project sizes, which will help to attract large investors. Second, increase the auction and capacity targets for the next 3-5 years and communicate these plans transparently to investors. Third, support capability and infrastructure development by putting key enablers in place, including pursuing partnerships with international players. Fourth, develop standardized power purchase agreement (“PPA”) templates that meet international standards and that are suitable for a mix of projects. Lastly, address pre-development risks, for example by supporting regulation of third party access to power grids.

### **D: Shedding light on the issue**

Five ways to unlock Southeast Asia’s solar potential

<b>1.</b> <b>Promote appropriate mix of project sizes</b>	<b>2.</b> <b>Review targets and quotas</b>	<b>3.</b> <b>Support capability/ infrastructure development</b>	<b>4.</b> <b>Standardized PPAs</b>	<b>5.</b> <b>Pre-development de-risking</b>
<p><b>Change strategic direction in order to raise interest of large equity investors</b></p> <ul style="list-style-type: none"> <li>&gt; Openly support small distributed projects</li> <li>&gt; As well as promote larger projects</li> </ul>	<p><b>Set larger auctions and set clear path for the next 3-5 years</b></p> <ul style="list-style-type: none"> <li>&gt; Increase capacity allocated per single auction</li> <li>&gt; Release 3 to 5 years allocation plans to create certainty in investment community</li> </ul>	<p><b>Ensure key enablers are in place</b></p> <ul style="list-style-type: none"> <li>&gt; Support market entry and partnerships with international developers and EPC players to bring best practices</li> <li>&gt; Review transmission capacity development</li> </ul>	<p><b>Develop contract standardization</b></p> <ul style="list-style-type: none"> <li>&gt; Review and improve PPAs to meet international standards</li> <li>&gt; Develop suitable PPA templates for mix of projects</li> </ul>	<p><b>Take on key pre-development risks</b></p> <ul style="list-style-type: none"> <li>&gt; Consider supporting land acquisition</li> <li>&gt; Support regulated third party access to power transmission infrastructure through specific regulatory provisions</li> </ul>



### 3. Lighting the way:

#### How investors can reap the benefits of solar in India and Southeast Asia

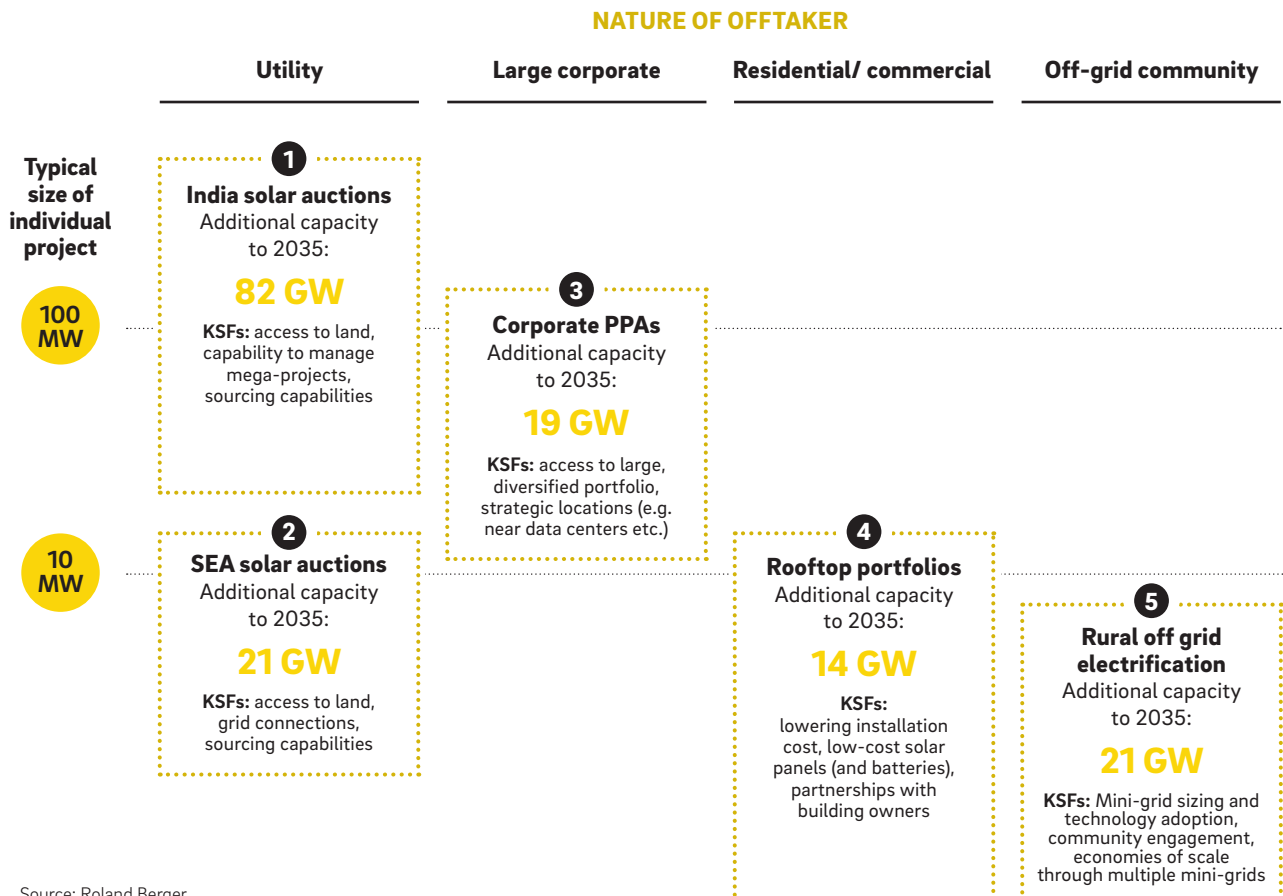
The growth in solar across India and Southeast Asia is likely to occur across a variety of different segments. As a result, investment opportunities are wide – and are already being tapped into. For example, Green Investment Group, the global renewable investment brand of Macquarie Capital, has recently acquired Conergy,

which has 500 MW of capacity across Asia. Also, Ayala, one of the Philippines' largest conglomerates, is investing in solar projects across Southeast Asia.

To help potential investors navigate the landscape, we have identified five target segments, and noted the key success factors (KSFs) for each. → [E](#)

#### **E: Lighting up the future of solar**

An overview of development in India and Southeast Asia



Source: Roland Berger

Utility-scale solar auctions in India are expected to remain the largest segment with more than 80 GW of capacity additions by 2035. These will include large to very large projects (gigawatt range) and will involve major solar developers and international utilities.

We predict that utility-scale solar will also take off in Southeast Asia, with approximately 20 GW of new capacity by 2035, including some large projects with capacities of more than 100 MW. Compared to India, there is likely to be stronger involvement of local mid-sized players (mainly solar EPC and operations and maintenance providers) that have a competitive advantage in securing land and grid connections.

Projects backed by corporate PPAs are also expected to become mainstream in both India and Southeast Asia, with a combined 19 GW of new capacity by 2035. Deals will typically be below 100 MW and involve, for example, large technology companies or data centers with green procurement policies.

Solar rooftop may also emerge as a sizeable segment, with numerous small projects (below 20 MW) throughout the region. Altogether, they could boost capacity by 14 GW by 2035.

Finally, rural off-grid projects may grow in India and certain parts of Southeast Asia, such as Myanmar, adding up to 21 GW by 2035. Here the key will be to combine multiple offtakers, or buyers, for each project to ensure large and stable demand; that is, find users beyond residential customers, such as telecommunication tower companies, telecommunication operators, or commercial customers.

## SHINING PROSPECTS

The rapid growth in power demand in India and Southeast Asia promises a healthy future for solar power in the region.

India's successful solar development is expected to continue. This is largely thanks to strong government

support and its focus on large-scale, low-cost projects that have helped to drive down prices. Despite current hurdles and development delays, an attractive and diverse solar market is also on the verge of emerging in Southeast Asia.

As a result, opportunities for international investors are wide – but not without difficulties. It will be crucial for players to develop a granular understanding of each segment and of country-to-country differences to formulate effective strategies. In addition, close engagement with governments will be important, especially in countries lacking effective legal and regulatory frameworks. Furthermore, proper de-risking mechanisms, such as government guarantees and effective PPA agreements, will be crucial to ensure bankability of projects. But with proper planning, investors in the region can be assured of shining prospects.

---

## About us

Roland Berger, founded in 1967, is the only leading global consultancy of German heritage and European origin. With 2,400 employees working from 34 countries, we have successful operations in all major international markets. Our 50 offices are located in the key global business hubs. The consultancy is an independent partnership owned exclusively by 230 Partners.

### Navigating Complexity

Roland Berger has been helping its clients to manage change for half a century. Looking forward to the next 50 years, we are committed to supporting our clients as they face the next frontier. To us, this means navigating the complexities that define our times. We help our clients devise and implement responsive strategies essential to lasting success.

## WE WELCOME YOUR QUESTIONS, COMMENTS AND SUGGESTIONS

### AUTHORS

#### **Jeffry Jacob**

Partner, Energy & Utilities Competence Center  
Mumbai Office, South Asia  
+91 22 6127 1519  
jeffry.jacob@rolandberger.com

#### **Dieter Billen**

Principal, Head of Roland Berger Myanmar,  
Energy & Utilities Competence Center  
Yangon Office, Southeast Asia  
+95 995 2811 464 (Myanmar)  
+60 19 629 2930 (Malaysia)  
dieter.billen@rolandberger.com

#### **Giovanni Bianchi**

Project Manager, Energy & Utilities Competence Center  
Singapore Office, Southeast Asia  
+65 9178 8137  
giovanni.bianchi@rolandberger.com

### PUBLISHER

#### **Roland Berger GmbH**

Sederanger 1  
80538 Munich  
Germany  
+49 89 9230-0  
www.rolandberger.com

---

**More information to be found here:  
[www.rolandberger.com](http://www.rolandberger.com)**

---

### **Disclaimer**

This publication has been prepared for general guidance only.  
The reader should not act according to any information provided  
in this publication without receiving specific professional advice.  
Roland Berger GmbH shall not be liable for any damages resulting  
from any use of the information contained in the publication.