ISSUE No. 3

IRENA
International Renewable Energy Agency

REVIEW FOR PARLIAMENTARIANS

A PERIODIC BRIEF ON RENEWABLE ENERGY

IN THIS ISSUE

Around the world, policy makers are pursuing renewable energy technologies not only for greater energy security or environmental considerations, but also for the socio-economic benefits they generate. The renewable energy sector has become a significant employer, with the potential for adding millions of jobs worldwide in the coming years.

As the ongoing energy transition accelerates, employment in the renewable energy sector will remain strong. While growth is likely to slow down with a maturing industry and rising labour productivity, IRENA estimates that doubling the share of renewables in the global energy mix would result in more than 24 million jobs worldwide by 2030.

This dynamism is partly triggered by the unprecedented cost decrease in the sector. Increasing economies of scale, more competitive supply chains and further technological improvements will continue reducing costs, especially for solar and wind power. The same factors will also boost the availability of these key renewable power sources at night and in varying weather conditions. While equipment costs will keep declining, reductions in balance-of-system, operation and maintenance and capital costs are becoming increasingly important drivers for overall cost reduction.

Moreover, saving on the externalities of air pollution and climate change by increasing the use of renewable energy, would further reduce the cost of energy. Doubling the global share of renewable energy by 2030 could save up to USD 4.2 trillion per year worldwide, 15 times the associated costs of doubling the share of renewables.

RENEWABLE ENERGY BENEFITS

JOB CREATION

» Renewables: A sector that increasingly generates employment opportunities along the value chain

» Enabling policy frameworks remain a key driver of employment

Renewable energy is becoming a relatively mature sector in many economies, with steadily improving technologies, increasingly complex supply chains, falling production costs and rising labour productivities.

The primary reason for increasing employment in the sector has been a substantial expansion of installed renewable energy capacity. It accounts for more than half of capacity additions in the global power sector since 2011.

The global renewable energy workforce encompasses a broad variety of occupations and specialisations in agriculture and forestry, manufacturing, construction, installation, and operations and maintenance. Jobs range from low to high skilled and differ widely in duration. Survey data also suggests that the sector employs larger shares of women than the rest of the energy sector. (See Point of View, p.5)

Technological leadership and the bulk of renewable energy manufacturing are found in a small number of countries, but as many additional countries are stepping up their investments and policies in support of renewables deployment, the majority of renewable energy jobs will be in installing, operating and maintaining renewable energy generation facilities, rather than in manufacturing equipment.

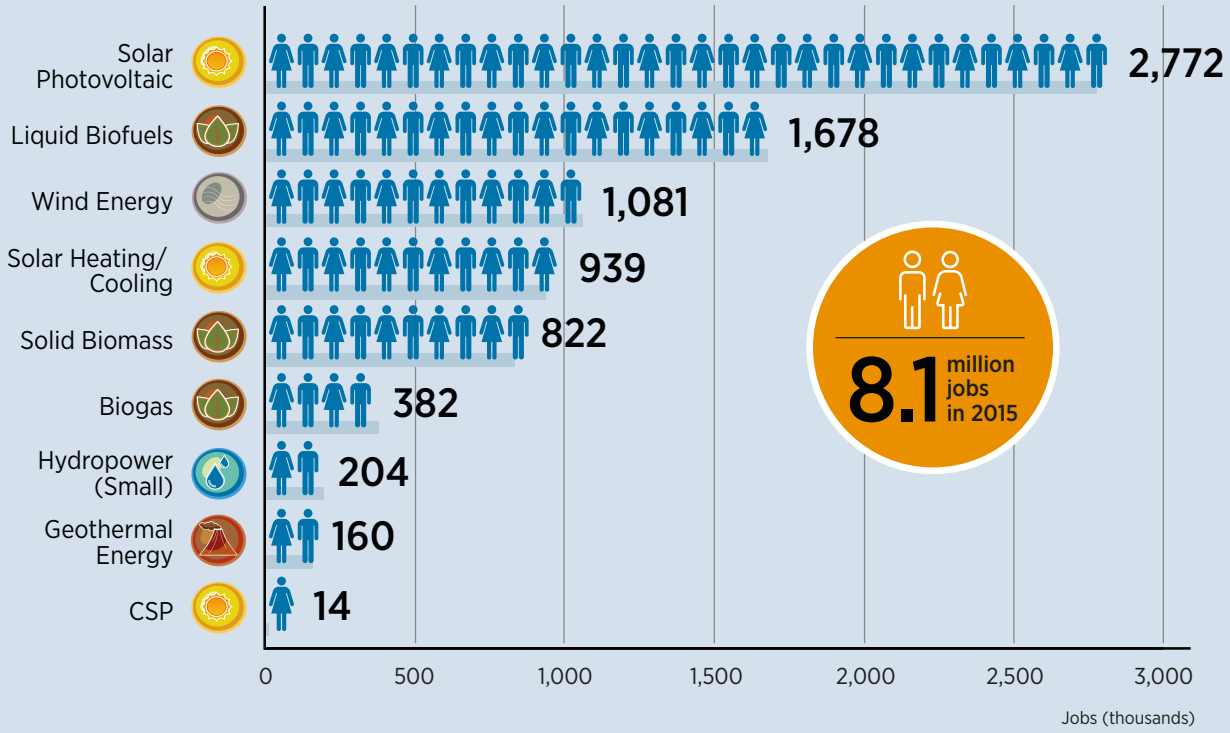
The current trend – In 2015, the total number of renewable energy jobs worldwide grew by 5%, in stark contrast with losses in other energy sectors around the globe. Renewables employed 8.1 million people, directly and indirectly, in this year. In addition, large hydropower accounted for another 1.3 million direct jobs.

Renewable energy supports around 8.1 million direct and indirect jobs worldwide

However, employment trends vary widely across renewable energy technologies. Solar PV, for example, is the largest renewable energy employer with 2.8 million jobs worldwide, an 11% increase from the 2014 account. This is consistent with a 28% increase in worldwide solar PV capacity since 2015, thanks to continued price drops and conducive policies. (see Renewable energy's plummeting costs, p. 6)

The policy context is critical – Meeting the increasing labour requirements of the renewable energy sector will require stable and predictable policy frameworks that encourage deployment, stimulate investments in local industries, strengthen firm-level capabilities and promote education and training.

Experience shows that a range of policies enable the growth of the renewable energy sector and thus assist renewable energy job creation. These include enabling the deployment of renewable energy technologies, guiding trade and investment links, strengthening



domestic capacities, fostering regional development and the formation of clusters and supporting R&D.

These policies are most effective when they are pursued in conjunction with each other and together with broader economic policies (industrial, labour, fiscal, etc.). While governmental support policies occasionally may need to be recalibrated in light of changing conditions and circumstances, the experience of recent years indicates how important it is to avoid abrupt policy reversals, which put renewable energy jobs in jeopardy.

Market-creating policies generally have proven to be very effective instruments. The stable framework provided by feed-in tariffs in several countries, for instance, has allowed renewable energy markets to develop and to attract investors, although governments also rely increasingly on other measures such as auctions.

Policies governing cross-border trade and foreign direct investments – and, specifically, enabling technology spillovers and other learning effects – are also important.

Local content requirement policies can help with the establishment of domestic renewable energy manufacturing industries; renewable energy deployment can be a boon for regional development, either to develop a renewable energy industry from scratch, or to reinvigorate a crisis-shaken area. To be successful, local content requirements should consider existing areas of expertise and link them closely to a learning-by-doing process. In addition they should be time-bound and complemented by other policy domains, notably industrial, fiscal, labour and educational policies.

The evidence from existing policies suggests that success in attracting investments, developing capacity, deploying renewable energy and generating employment requires a combination of policies and striking a careful balance between government regulation and market incentives.

Further reading:

The Socio-economic Benefits of Solar and Wind Energy (IRENA, 2014)

Renewable Energy and Jobs, Annual Review (IRENA, 2014, 2015, 2016)

POLICY COMPASS

Critical factors to boost employment in the renewable energy sector

1. The need to measure employment from renewable energy

» Systematic data collection and thorough analysis to estimate employment at the country level is essential to inform policy-making

» To the extent possible, countries should seek to harmonise methods and data reporting categories

» Data should distinguish between conventional and renewable energy employment (by technology and use), direct and indirect employment, and disaggregate among the main segments of the value chain (feedstock operations, manufacturing, construction and installation, and operations and maintenance) as well as provide occupational details (e.g. wages, gender, etc.)

2. Interactions between the different policy instruments in support of job creation

» A key requirement is that policies provide a stable, predictable framework that anchors investor confidence and supports job creation in the sector

» Efforts to maximise socio-economic impacts of renewable energy deployment, and job creation in particular, benefit from a tailored policy mix that entails coordination between deployment and other interaction policies, such as education, trade, regional development, industrial and labour

3. Renewable energy skills, education and training: a key enabler

» Facilitate the inclusion of renewable energy topics in existing and new educational programmes

» Increase awareness of the career opportunities in renewable energy

» Governments can provide financial support for renewable energy education and training at universities and other suitable institutions, and foster international and interdisciplinary collaboration (harmonisation of curricula, common quality standards for training programmes, etc.)

» The private sector is well placed to provide relevant technical skills through on-the-job apprenticeships; public and private sector actors should therefore collaborate

4. Off-grid solutions: catalysing local employment and economic growth

» Dedicated off-grid renewable energy policies are key to transforming rural economies. An integrated programmatic approach specifically targeting the sector should be encouraged to promote energy access whilst generating economic growth

» Data on rural renewable energy employment, both quantitative and qualitative are crucial. There is a need to develop a comprehensive framework to collect, analyse and disseminate the information

5. Gender dimensions of renewable energy employment

» Remove barriers to women's employment entry in the renewable energy sector

» It is essential to include gender perspectives in policies and support services (e.g. training, access to finance)

POINT OF VIEW

TRANSFORMING RURAL WOMEN INTO SOLAR EXPERTS:
A testimony by the Hon. Rosaline J. Smith of Sierra Leone

The government of Sierra Leone, with the support of the Indian government, sent uneducated women from rural areas for training in the installation and maintenance of solar panels in India.

Upon their return to Sierra Leone, the government built a rural centre for them to train other women in the installation and maintenance of solar PV panels. Currently, these women have installed over 1000 panels in homes in Sierra Leone.

As a female legislator, I am very proud to see our women folk, who never thought they would have such an opportunity; some had never even come close to connecting an electrical cable on the wall, others had never seen electricity in their lives, yet they have been trained to become self-sufficient and they are now being called "Solar Engineers", despite the fact that they have never been to school!

Honourable Rosaline J. Smith is an elected member of the House of Representatives in Sierra Leone since 2012.
She is also the focal point for the Inter-Parliamentary Union (IPU) in the Sierra Leone Parliament.

RENEWABLE ENERGY CREATES JOBS:
Member or Parliament Dieter Janecek of Germany on changing the narrative and the perception

In politics, jobs often count more than the climate, and are crucial for politicians seeking re-election. But numbers alone do not count for much — perception and visibility are key — and the renewable sector's problem is that its jobs tend to be less visible than those in the fossil sector, even when renewable employment figures are an impressive success story. In the U.S., solar energy jobs overtook those in oil and natural gas extraction for the first time. Employment in the U.S. solar sector grew 12 times faster than job creation in the rest of the economy.

There is a similar story in Germany, where the approximate 360 000 jobs in the renewable sector easily surpasses the coal industry's 70 000 jobs, but suffers from a lack of visibility. Sometimes perception is more important than pure numbers. For instance, fossil dominated utilities, coal industries and trade unions have formed powerful alliances to fight for their interests, whereas the renewable energy sector — traditionally dominated by small- and medium-sized companies and co-operatives — has less political weight because it has not formed similar alliances. Although the renewables sector has boosted employment in Germany, especially in more rural and economically poor areas of Northern and Eastern Germany suffering from high unemployment, the sector's role in job creation has not been sufficiently recognised. The fossil fuel industry and their allies have successfully framed the energy transition as a threat to the economy and the job market.

Support for renewable energy is high in Germany and many other countries, but few people believe in renewables' positive effect on the labour market. This has to change! Nailing down the fossil fuel industry's narrative as a myth is key in enabling the energy transition and unleashing the full potential of the renewable sector as a job booster, both in in Germany and around the world.

Dieter Janecek is an elected member of the German parliament (Bundestag) since 2013.
He represents his party on the Committee on Economic Affairs and Energy.
He co-founded the think tank "The Transformers" and he joined the cross-partisan network of scientists and parliamentarians known as "Energy Watch Group".
Mr Janecek has taken a role in the national debate on the German Energiewende (energy transition).

CASE STUDIES

A mix of different policies to create renewable energy jobs

TURKEY

Turkey represents an interesting example of co-ordination between Local Content Requirements and other policies including Feed-in Tariffs (FiTs), promotion of joint ventures and industrial upgrading programmes.

The Turkish *FiTs for renewable energy* is complemented by a payment for locally produced equipment used to develop the project. To ensure the transfer of appropriate technologies, the Turkish government introduced policies that support the establishment of joint ventures in the solar energy industry. A significant number of jobs has been created as a result. One such example is the joint venture between China Sunergy and Seul Energy Investment (Turkish solar system provider and project developer). The manufacturing plant for solar cells and modules that they have set up has created as much as 1 200 new jobs. In parallel, industrial upgrading programmes have been implemented to support small and medium enterprises (SMEs) gain competitiveness through technical assistance programmes. These include skill upgrading and accelerated training, dissemination of relevant information to SMEs, including about investments and support for entrepreneurships. These programmes are also contributing to enhancing local companies' attractiveness as potential partners for joint ventures.

MALAYSIA

The *National Renewable Energy Policy and Action Plan* (approved in April 2010) includes the following main elements: enhancing renewable energy research and technology, intensifying human capital development, and designing and implementing a renewable energy advocacy programme. The first part of the policy describes "the need for an R&D action plan that addresses the need for skilled people and adequate financing", the second part "proposes actions that are designed to build up local expertise and skills in renewable energy and to provide individuals with the appropriate incentives to acquire these skills", and the third "consists of communication efforts with stakeholders and the general public", aiming to increase renewable energy knowledge and understanding. The Action Plan should benefit from existing complementary policies, such as those focused on deployment (FiT), and those aimed at attracting Foreign Direct Investment (FDI), which resulted in a significant share of the global FDI flowing into the renewable energy manufacturing industry, thereby impacting employment creation.

GERMANY

Investment incentives, low interest loans and tax exemptions led to the emergence of *Solarvalley Mitteldeutschland*, an area of solar PV module, cell and water production in a region which had suffered from de-industrialisation and out-migration following German reunification in the 1990s. The region subsequently developed Europe's highest density of solar manufacturing facilities, benefitting from synergies of previous industrial activities, including a skilled workforce and highly developed supportive industries such as microchips and semiconductors, optics, chemicals and glass.

A collaborative arrangement emerged that involves some three dozen PV manufacturers and equipment suppliers, nine research organisations and a dozen institutions of higher education. Technology development, advanced training and cluster management are core activities in the region. In 2013, the *Solarvalley* area accounted for about 45% of German PV industry revenues and employed 10 500 people directly in the PV industry, plus another 2 500 in the supply chain.

POWER GENERATION IN FOCUS

THE PLUMMETING COSTS OF RENEWABLE POWER GENERATION TECHNOLOGIES

- Renewable power generation now competes with fossil fuel options head-to-head
- Policies need to adapt to reduce costs further
- Accounting for externalities will also reduce the relative cost of renewable energy

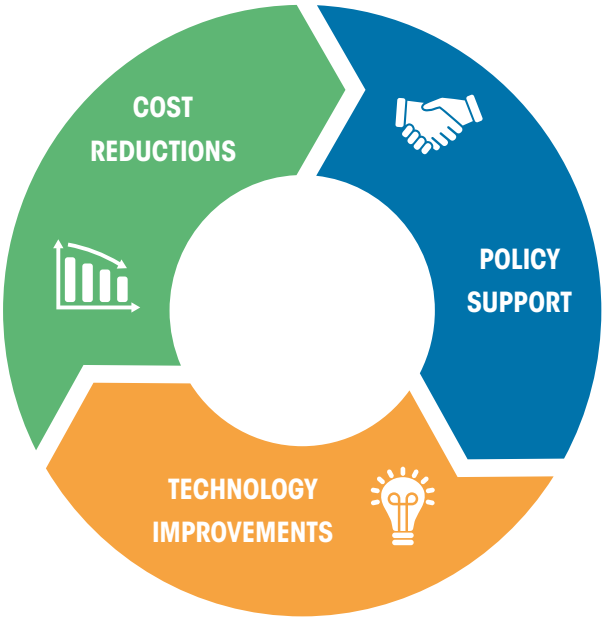
We are witnessing today the beginning of what will one day be the complete transformation of the energy sector by renewable energy technologies. This transformation is being driven by a virtuous cycle of long-term support policies accelerating the deployment of renewables, which leads to technology improvements and cost reductions. Solar photovoltaic (PV) module costs, for example, have fallen as much as 72-82% since the end of 2009, and wind turbine prices have fallen by almost a third since 2009. Historically, with every doubling in capacity the prices of solar PV modules have fallen by 18-22%, while for the cost of electricity for onshore wind the rate is at least 12%.

To date, this transformation is most visible in the power generation sector, where dramatic cost reductions for PV, and to a lesser extent for wind power, are driving high levels of investment into renewables.

Solar PV module costs have fallen as much as 72-82% since 2009, and wind turbine prices have fallen by almost a third

A competitive solution – Renewable power generation technologies are now competing head-to-head with fossil fuel-fired electricity generation options, without financial support for new capacity.

In fact, the competitiveness of renewable power generation technologies has reached historic levels; onshore wind power, solar PV and concentrating solar power (CSP) installed costs have continued to fall as their



performance has improved, significantly lowering the cost of electricity from these sources. Onshore wind is now one of the most competitive sources of electricity available with some projects delivering electricity for as little as USD 0.4/kWh, and recent power purchase agreements for future projects have been signed below this amount. Biomass, geothermal, hydropower and onshore wind are all competitive or cheaper in comparison with coal, oil and gas-fired power stations, even without financial support and despite falling oil prices.

Biomass, geothermal, hydropower, onshore wind are cheaper than coal, oil and gas-fired power stations, even without financial support

The range of conditions where renewable power generation technologies are economic is increasing not just due to falling costs, but also as a result of technology improvements. For instance, today's state-of-the-art large wind turbines have higher hub-heights and larger swept areas that are optimised to extract more electricity from the same resource (35% to 50% more than older turbines), allowing wind to be deployed economically in low wind speed sites.

Unlocking further cost reductions by adapting policies – Broader policy changes need to adapt to the market structure and align stakeholder incentives to minimise overall system costs. Yet, it is important to carry on supporting renewables in an equitable fashion while the externalities and risks of fossil fuels and nuclear power are still not realistically priced.

A system-wide approach – The increased competitiveness of renewables will require policy makers to shift their emphasis from individual technology support to a system-wide approach to facilitate the transition to a sustainable electricity sector. This shift will be vital due to integration issues which will require advanced planning as economies head towards 30% or more of variable renewables.

Data collection – Much more detailed cost data is required than that available and systematically collected today to identify the potential benefits of different policy options. This is a significant gap, as better information about cost reduction potentials and their sources allow governments to be more ambitious and efficient in their policy support for renewables.

Minimising transaction costs – In some markets, changes to existing policy settings will be essential in addressing persistent cost premiums. For example, governments need to be proactive in terms of setting the policy framework in such a way as to minimise transaction costs. Streamlined, yet comprehensive administrative procedures and approval processes based on pre-agreed national guidelines can help reduce project development costs. Much can be learnt from the sharing of best practice, yet this is an area where, with some exceptions, little collaboration takes place.

Incentivising all stakeholders to reduce costs – Further cost reduction potentials will depend less on equipment costs and will increasingly need to come from three sources: balance of system costs, operations and maintenance cost optimisation, and the reduced cost of finance. As a consequence, decreasing costs will also depend on a more diverse range of stakeholders, not just equipment manufacturers. Careful analysis will be needed to remove a myriad of small barriers, while policy settings must be tailored to ensure all stakeholders are incentivised and able to bring down costs.

Pricing in the true cost of fossil fuel to further reduce the relative cost of renewable energy – Declining costs mean the perceived economic trade-off of 'cheap vs. clean' is becoming less important. This false dichotomy becomes even more apparent as economists develop tools to measure the broader impact of power generation, such as the cost of pollution and fuel price volatility. For example, indoor and outdoor pollution caused by the burning of fossil fuels is killing millions of people worldwide. In Europe, where 600 000 people suffered from air pollution-related disease or premature death in 2010, societal costs were estimated then at USD 1.6 trillion.

Declining costs mean the perceived economic trade-off "cheap vs. clean" often no longer applies

There are also other heavy costs associated with fossil fuels and nuclear power that do not apply to renewable energy: oil spills, climate change impacts, radioactive waste storage and disposal, and ocean acidification for example. Yet most of these costs are not adequately factored into the price we pay for energy – instead it is paid for through taxes, health insurance premiums and with the degradation of public lands and seas.

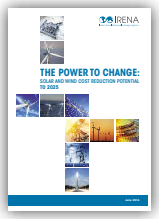
Effective analysis of the costs and benefits of different forms of energy should therefore take into account a much wider view, and factor in the positive macroeconomic benefits of renewables, such as a higher economic growth, trade advantages, industrial development, growth in GDP, employment, energy access and health. (See Renewable Energy Benefits: job creation, p. 2)

Further reading:

Renewable Power Generation Costs in 2014 (IRENA, 2015)

The True Cost of Fossil Fuels: Saving on the Externalities of Air Pollution and Climate Change (IRENA, 2016

SELECTED PUBLICATIONS



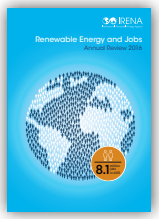
The Power to Change: Solar and Wind Cost Reduction Potential

Increasing economies of scale, more competitive supply chains and further technological improvements will continue reducing the costs of solar and wind power. The same factors will also boost the availability of these key renewable power sources at night and in varying weather conditions.

With the right policies in place, the cost of electricity from solar and wind power technologies could fall by at least 26% and as much as 59% between 2015 and 2025, finds this cost-analysis report from the International Renewable Energy Agency (IRENA).

The global weighted average cost of electricity could fall by 26% from onshore wind, by 35% from offshore wind, by at least 37% from concentrating solar power (CSP) technologies, and by 59% from solar photovoltaic (PV) by 2025, the report finds.

In energy markets around the world, rising competitive pressures that will drive continual innovation. While equipment costs will keep declining, reductions in balance-of-system, operation and maintenance and capital costs are becoming increasingly important drivers for overall cost reduction.



Renewable Energy and Jobs, Annual Review 2016

Renewable Energy and Jobs – Annual Review presents the status of renewable energy employment, both by technology and in selected countries, over the past year. In this third edition, IRENA estimates that renewable energy employed 8.1 million people around the world in 2015 (excluding large hydropower). This is a 5% increase from the number reported the previous year. In addition, IRENA conducted a second global estimate of large hydropower employment, showing approximately 1.3 million direct jobs in the sector.

While the growth in jobs slowed down compared to previous years, the total number of jobs in renewables worldwide continued to rise, in stark contrast with depressed labour markets in the broader energy sector.

Countries with the highest number of renewable energy jobs were China, Brazil, the United States, India, Japan and Germany.

Solar PV was the largest renewable energy employer with 2.8 million jobs worldwide, an 11% increase over 2014. Solar PV employment grew in Japan and the United States, stabilised in China, and continued decreasing in the European Union. Wind power witnessed a record growth year. Strong installation rates in China, the United States and Germany resulted in a 5% increase in global employment, to reach 1.1 million jobs.

Solar PV in Africa: Costs and Markets

Africa has abundant renewable energy resources. Traditionally reliant on hydropower, the continent is turning to solar photovoltaics (PV) to bolster energy security and support rapid economic growth in a sustainable manner. With recent substantial cost reductions, solar PV offers a rapid, cost-effective way to provide utility-scale electricity for the grid and modern energy services to the approximately 600 million Africans who lack electricity access.

According to this report, installed costs for power generated by utility-scale solar PV projects in Africa have decreased as much as 61 per cent since 2012 to as low as USD 1.30 per watt in Africa, compared to the global average of USD 1.80 per watt. The report shows that mini-grids utilising solar PV and off-grid solar home systems also provide higher quality energy services at the same or lower costs than the alternatives. Stand-alone solar PV mini-grids have installed costs in Africa as low as USD 1.90 per watt for systems larger than 200 kilowatt. Solar home systems provide the annual electricity needs of off-grid households for as little as USD 56 per year, less than the average price for poor quality energy services.

IRENA estimates that with the right enabling policies, Africa could be home to more than 70 gigawatts of solar PV capacity by 2030. The report discusses challenges in policy making and proposes a co-ordinated effort to collect data on the installed costs of solar PV in Africa, across all market segments. Such information will improve the efficiency of policy support and accelerate deployment.

For more: www.irena.org/publications

ANNOUNCEMENT

SAVE THE DATE

2017 IRENA LEGISLATORS FORUM

12-13 JANUARY 2017

ABU DHABI, UNITED ARAB EMIRATES

Members of Parliament interested in participating, are invited to send an email to: **legislators@irena.org** by 5 December 2016.

In January 2016, the International Renewable Energy Agency (IRENA) held its first meeting of legislators in Abu Dhabi, United Arab Emirates. 21 legislators from all over the world attended: Belgium, Costa Rica, the European Union, Germany, India, Jordan, Mauritius, Mexico, Pakistan, Romania, Serbia, Sierra Leone, Solomon Islands, Togo, Tunisia and the United Arab Emirates.

During the meeting, legislators exchanged best practices and learned from the experience of each other on the deployment of renewable energy and solutions that enable countries to meet their domestic energy needs. The forum facilitated a policy dialogue between legislators on the transformation of the global energy system.

Many legislators also attended the two-day IRENA Assembly, held the following couple of days, and received a comprehensive overview of the Agency's activities and initiatives. The sixth IRENA Assembly gathered around 1000 participants and global energy leaders from more than 150 countries.

The 2016 IRENA Legislators Forum identified eight key enablers supporting an accelerated deployment of renewable energy worldwide. These conclusions were reported to the sixth session of the IRENA Assembly.

Conclusion of the 2016 IRENA Legislators Forum

- Capitalize on the momentum generated by the adoption of the Sustainable Development Goals and the Paris Agreement to include climate protection into countries' Constitutions in order to strengthen its legal value.
- Adopt broad range renewable energy legislation to ensure a stable legal framework, which is one of the key enablers for investments, and establish financial instruments at the global level to lower the cost of capital for renewable energy investment.
- In the legislative approach, allocate as much importance to the transport and heating/cooling sectors as to the electricity sector.
- Couple energy efficiency and renewable energy laws to maximise impact.
- Put in place the necessary infrastructure at large: grids, mini-grids, district cooling/heating systems, etc.
- Promote fair markets that take into account externalities of fossil fuel use, and flexible markets that can adapt to an increasing share of renewables in the energy mix.
- Extend modelling to socio-economic benefits derived from renewables (jobs, health, trade balance, energy access, etc.).
- Make use of Parliaments to organise stakeholders.

REview for Parliamentarians: Issue 1

This first issue of REview for Parliamentarians examines the development in renewable energy and places a particular focus on solar PV power generation, a renewable energy technology that has emerged rapidly.

Français **Español**

REview for Parliamentarians: Issue 2

Issued in the aftermaths of the Paris Agreement, the second issue of REview for Parliamentarians analyses renewable energy as a mitigation tool for climate change.

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