Renewables Global Status Report 2017

Energías Renovables en América Latina y Caribe, Situación Actual

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Contenidos presentación:

1. La red REN21
2. El Renewables Global Status Report 2017
3. Panorama Global y Políticas
4. Energía Renovable Distribuida y Acceso a la Energía
5. Tecnologías Habilitantes
6. Curva de Carga
7. Inversiones en Renovables
8. Renovables y valor agregado
REN21 es una red global multi-actores, dedicada al rápido desarrollo de la energías renovables a nivel mundial

**NGOs:**
CAN, CEEW, FER, GACC, GFSE, Greenpeace International, ICLEI, ISEP, MFC, SLoCaT, REI, WCRE, WFC, WRI, WWF

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**Science & Academia:**
Fundacion Bariloche, IIASA, ISES, NREL, SANEDI, TERI,

**International Organisations:**
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**National Governments:**
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GSR Network:

- Over 800 active contributors and reviewers
- Tracking 155 countries
- Covering 96% of global GDP
- Representing 96% of global population
REN21 Renewables Interactive Map

- Research tool for tracking the development of renewable energy worldwide
- Complements perspectives and findings of REN21’s Global and Regional Status Reports with infographics and detailed, exportable data packs

www.ren21.net/map
Almacenamiento; Bombas

calor vehículos eléctricos
Total global capacity was up 9% compared to 2015, to more than 2,016 GW at year’s end (920 GW not including hydro)

- Solar PV - 47% of newly installed renewable power capacity in 2016
- Wind - 34%
- Hydropower - 15.5%
Tasas de Crecimiento Medio Anual - Capacidad Instalada en Energía Renovable, 2010-2015

Participación Renovables en Consumo Total energía, 2015

- Fossil fuels: 78.4%
- All renewables: 19.3%
- Modern renewables: 10.2%
- Traditional biomass: 9.1%
- Biomass/geothermal/solar heat: 4.2%
- Hydropower: 3.6%
- Wind/solar/biomass/geothermal power: 1.6%
- Biofuels for transport: 0.8%

RENEW 21 Renewables 2017 Global Status Report
Energía Renovable Global, crecimiento comparado con Consumo Total Final de Energía 2004 - 2014
### Annual Investment/Net Capacity Additions/Production in 2016

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment in renewable power and fuels (not including hydro &gt; 50 MW)</td>
<td>China</td>
<td>United States</td>
<td>United Kingdom</td>
<td>Japan</td>
<td>Germany</td>
</tr>
<tr>
<td>Investment in renewable power and fuels per unit GDP¹</td>
<td>Bolivia</td>
<td>Senegal</td>
<td>Jordan</td>
<td>Honduras</td>
<td>Iceland</td>
</tr>
<tr>
<td>Geothermal power capacity</td>
<td>Indonesia</td>
<td>Turkey</td>
<td>Kenya</td>
<td>Mexico</td>
<td>Japan</td>
</tr>
<tr>
<td>Hydropower capacity</td>
<td>China</td>
<td>Brazil</td>
<td>Ecuador</td>
<td>Ethiopia</td>
<td>Vietnam</td>
</tr>
<tr>
<td>Solar PV capacity</td>
<td>China</td>
<td>United States</td>
<td>Japan</td>
<td>India</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>Concentrating solar thermal power (CSP) capacity²</td>
<td>South Africa</td>
<td>China</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Wind power capacity</td>
<td>China</td>
<td>United States</td>
<td>Germany</td>
<td>India</td>
<td>Brazil</td>
</tr>
<tr>
<td>Solar water heating capacity</td>
<td>China</td>
<td>Turkey</td>
<td>Brazil</td>
<td>India</td>
<td>United States</td>
</tr>
<tr>
<td>Biodiesel production</td>
<td>United States</td>
<td>Brazil</td>
<td>Argentina</td>
<td>Germany</td>
<td>Indonesia</td>
</tr>
<tr>
<td>Fuel ethanol production</td>
<td>United States</td>
<td>Brazil</td>
<td>China</td>
<td>Canada</td>
<td>Thailand</td>
</tr>
</tbody>
</table>
Participación Renovables en Producción Eléctrica global, fin del 2016

Non-renewable electricity 75.5%

Renewable electricity 24.5%

Hydropower 16.6%

Wind power 4.0%

Bio-power 2.0%

Solar PV 1.5%

Ocean, CSP and geothermal power 0.4%

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By the end of 2016, China was home to more than one-quarter of the world’s renewable power capacity.
Solar FV Capacidad global y adición anual, 2006-2015

REN21 Renewables 2017 Global Status Report
Solar FV Capacidad global e incorporada 2016

China: +34.5
Japan: +8.6
Germany: +1.5
United States: +14.8
Italy: +0.4
United Kingdom: +2
India: +4.1
France: +0.6
Australia: +0.9
Spain: +0.1

REN21 Renewables 2017 Global Status Report
Concentración solar Térmica
Capacidad global, 2006-2016

World Total
4.8 Gigawatts

Rest of world
Spain
United States

REN21 Renewables 2017 Global Status Report
Energía Eólica,
Capacidad global, 2016

Added in 2016

2015 total

China
United States
Germany
India
Spain
United Kingdom
France
Canada
Brazil
Italy

Gigawatts

+23.4
+8.2
+5
+3.6
~0
+0.7
+1.6
+0.7
+2
+0.3

REN21 Renewables 2017 Global Status Report
25 GW of new hydropower capacity was commissioned in 2016.

More than one-third of new capacity commissioned in China.
Residential sector accounted for 63% of total installed collector capacity at the end of 2015.

Markets transitioning to large-scale systems.
176 countries had renewable energy targets
126 countries had power policies
68 countries had transport policies
21 countries had heating and cooling policies

Panorama de Políticas para las Energías Renovables

Number of Renewable Energy Regulatory Incentives and Mandates, by Type, 2014-2016

Note: Figure does not show all policy types in use. In many cases countries have enacted additional fiscal incentives or public finance mechanisms to support renewable energy. Heating and cooling policies do not include renewable heat FITs (i.e., in the United Kingdom). Countries are considered to have policies when at least one national or state/provincial-level policy is in place. A country is counted a single time if it has one or more national and/or state/provincial-level policies. Some transport policies include both biodiesel and ethanol. In this case, the policy is counted once in each category (biodiesel and ethanol). Tendering policies are presented in a given year if a jurisdiction has held at least one tender during that year.

Source: REN21 Policy Database.
Auctions are the most rapidly expanding form of renewable energy policy support.

Renewable energy auctions held in 34 countries in 2016 – more than double the year before
Most support for renewable heating and cooling was provided through financial incentives (grants, loans, rebates, tax incentives).


* Indicates countries with other policies that directly support renewable heating and cooling technologies, including rebates, tax credits, FITs, tenders, etc.

Note: Figure shows countries with direct support regulatory policies and financial incentives for renewable heating and cooling technologies. Countries are considered to have policies when at least one national-level policy is in place. These countries may have state/provincial-level policies in place as well. Diagonal lines indicate that countries have no policies in place at the national level but have at least one policy at the state/provincial level.

Source: REN21 Policy Database.
Biofuel blend mandates and financial support for biofuel blending programmes are most common forms of support for renewable energy in transport.
16% of the global population lived without electricity - approx. 1.19 billion people
Deployment of mini-grids accelerated in 2016
Market now exceeds USD 200 billion annually

### Status of Renewable Energy Mini/Micro-grid Markets, by Region

<table>
<thead>
<tr>
<th>Region</th>
<th>Autonomous Basic</th>
<th>Autonomous Full</th>
<th>Interconnected Community</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central America and the Caribbean</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>South America</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Northern Africa</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Central and North Asia</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>East and South Asia</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Middle East</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Oceania</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
</tbody>
</table>

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REN21 Renewables 2017 Global Status Report

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Energía Renovable Distribuida para el Acceso a la Energía
Global grid-connected and stationary energy storage capacity in 2016 totalled an estimated \textbf{156 GW}

Batteries (electrochemical), flywheels and compressed air (both electromechanical (e.g., molten salt, ice storage, etc.)
Global sales of EVs reached 775,000 units

More than 2 million passenger EVs were on the world's roads by year's end (1% of the light vehicle market)

So far, little linking of renewable energy and electric mobility

REN21 Renewables 2017 Global Status Report
Progresión del paradigma de la Base de la Curva de Carga hacia 100% Electricidad a partir de Renovables

B) The Early Transition

<table>
<thead>
<tr>
<th>Power generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand shift</td>
</tr>
<tr>
<td>to early morning lows</td>
</tr>
<tr>
<td>Peak</td>
</tr>
<tr>
<td>Intermediate and dispatchable</td>
</tr>
<tr>
<td>Baseload</td>
</tr>
<tr>
<td>Variable renewable energy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Coal-fired</th>
<th>Oil-fired</th>
<th>Diesel generator</th>
<th>Nuclear</th>
<th>Natural gas-fired</th>
<th>Hydro-power</th>
<th>Bio-power</th>
<th>Solar PV and CSP</th>
<th>Geothermal power</th>
<th>Wind power</th>
</tr>
</thead>
</table>

**RENEWABLES 2017 GLOBAL STATUS REPORT**
Inversión global en Capacidad eléctrica por tipo, 2012-2016

* CSP, geothermal, small-scale hydropower and ocean energy

Renewables 2017 Global Status Report

Source: BNEF
Driver Inversiones: reducción Emisiones CO2
Sectores y compromisos mitigación. AL&C

- Renovables
- Eficiencia Energética:
  - Generacion ee;
  - Transmision & Distrib
  - Consumo Eléctrico (ind e infraes.)
  - Transporte

Inversión global en Electricidad renovable y Biocombustibles, 2006-2016

REN21 Renewables 2017 Global Status Report

Source: BNEF
Inversión global en Renovables 2016

<table>
<thead>
<tr>
<th>Tecnología</th>
<th>developed countries</th>
<th>China</th>
<th>Other developing countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar power</td>
<td>17.6</td>
<td>56.2</td>
<td>57.5</td>
</tr>
<tr>
<td>Wind power</td>
<td>16.9</td>
<td>39.9</td>
<td>51.9</td>
</tr>
<tr>
<td>Bio-power</td>
<td>5.2</td>
<td>1.6</td>
<td>3.4</td>
</tr>
<tr>
<td>Small-scale hydropower</td>
<td>0.2</td>
<td>0.2</td>
<td>0.011</td>
</tr>
<tr>
<td>Biofuels</td>
<td>1.8</td>
<td>0.5</td>
<td>0.8</td>
</tr>
<tr>
<td>Geothermal power</td>
<td>0.8</td>
<td>2.0</td>
<td>0.011</td>
</tr>
</tbody>
</table>

Change relative to 2015:
- Solar power: -34%
- Wind power: -9%
- Bio-power: 0%
- Small-scale hydropower: 0%
- Biofuels: -37%
- Geothermal power: +17%
- Ocean energy: -7%

Source: BNEF
Inversión en AL&C 2015

En MMus$:
Brasil: 7.100
México: 4.000
Chile: 3.400
# Principales Inversores en Renovables

**AL&C 2014**

### TOP 20 LATIN AMERICA AND CARIBBEAN CLEAN ENERGY INVESTORS, 2014 ($m)

<table>
<thead>
<tr>
<th>Investor</th>
<th>Investment ($m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BNDES</td>
<td>3,175</td>
</tr>
<tr>
<td>World Bank</td>
<td>556</td>
</tr>
<tr>
<td>OPIC</td>
<td>363</td>
</tr>
<tr>
<td>Banco Santander</td>
<td>342</td>
</tr>
<tr>
<td>Banco Bradesco</td>
<td>250</td>
</tr>
<tr>
<td>IDB</td>
<td>225</td>
</tr>
<tr>
<td>CABEI</td>
<td>219</td>
</tr>
<tr>
<td>JICA</td>
<td>188</td>
</tr>
<tr>
<td>KFW</td>
<td>167</td>
</tr>
<tr>
<td>Banco do Brasil</td>
<td>162</td>
</tr>
<tr>
<td>DNB</td>
<td>143</td>
</tr>
<tr>
<td>FMO</td>
<td>128</td>
</tr>
<tr>
<td>Corpbanca</td>
<td>111</td>
</tr>
<tr>
<td>Goldman Sachs</td>
<td>102</td>
</tr>
<tr>
<td>Bank of America</td>
<td>102</td>
</tr>
<tr>
<td>Banco Espírito Santo</td>
<td>100</td>
</tr>
<tr>
<td>Itau</td>
<td>98</td>
</tr>
<tr>
<td>Banco do Rio Grande do Sul</td>
<td>91</td>
</tr>
<tr>
<td>US Exim</td>
<td>84</td>
</tr>
<tr>
<td>Sumitomo Mitsui</td>
<td>82</td>
</tr>
</tbody>
</table>

Source: Bloomberg New Energy Finance
Ejemplo: Clúster Eólico Argentino

agrupa fabricantes diversos
Esta cadena industrial tiene un (planteo de) desarrollo territorial federal.

PERO subastas SÓLO en caso de empate en precio por MWh ofertado (+/- un 3 por ciento entre un precio y otro) desempatará aquel proyecto con mayor integración nacional.
## Market shares de los principales fabricantes de turbinas eólicas, 2015

<table>
<thead>
<tr>
<th>Fabricante</th>
<th>Participación</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goldwind (China)</td>
<td>12.5%</td>
</tr>
<tr>
<td>Vestas (Denmark)</td>
<td>11.8%</td>
</tr>
<tr>
<td>GE Wind (USA)</td>
<td>9.5%</td>
</tr>
<tr>
<td>Siemens (Germany)</td>
<td>8.0%</td>
</tr>
<tr>
<td>Others</td>
<td>31.4%</td>
</tr>
</tbody>
</table>

### Cuatro líderes: 42%

- Gamesa (Spain) 5.4%
- Enercon (Germany) 5.0%
- United Power (China) 4.9%
- Mingyang (China) 4.1%
- Envision (China) 4.0%
- CSIC Haizhuang (China) 3.4%

Total sales = ~63 GW.

### Market shares of the main manufacturers of wind turbines, 2016

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Country</th>
<th>Market Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vestas</td>
<td>Denmark</td>
<td>16%</td>
</tr>
<tr>
<td>GE Wind</td>
<td>United States</td>
<td>12%</td>
</tr>
<tr>
<td>Goldwind</td>
<td>China</td>
<td>12%</td>
</tr>
<tr>
<td>Gamesa</td>
<td>Spain</td>
<td>8%</td>
</tr>
<tr>
<td>United Power (China)</td>
<td></td>
<td>4%</td>
</tr>
<tr>
<td>Envision (China)</td>
<td></td>
<td>4%</td>
</tr>
<tr>
<td>Mingyang (China)</td>
<td></td>
<td>4%</td>
</tr>
<tr>
<td>Enercon (Germany)</td>
<td>Germany</td>
<td>7%</td>
</tr>
<tr>
<td>Siemens (Germany)</td>
<td>Germany</td>
<td>6%</td>
</tr>
<tr>
<td>Nordex Acciona (Germany)</td>
<td>Germany</td>
<td>5%</td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td>25%</td>
</tr>
</tbody>
</table>

Cuatro líderes: 48%
Un ejemplo: Brasil mapeo Cadena Valor solar Fotovoltaica, 13 junio 2017

- Solar FV 32% matriz eléctrica brasileña 2040
- 75% provendrá de Generación Distribuida
- Prevén Inversiones por 94 mil millones us$ en 10 años - 205MM a 2040
  36% en generación
  64% en otros eslabones cadena de valor
- sistemas fotovoltaicos: 20% +más caros c/módulos ensamblados en Brasil (60% más caros q importados)
  - Baja competitividad: bienes Escala Internacional (silicio y celdas FV)
  - Media competitividad: módulos FV
  - Alta competitividad: ptos fabricados en Brasil útiles para otros segmentos e industrias: Molduras, Estructuras Metálicas y Componentes Eléctricos + acceso a financiamiento diferenciado por contenido local

Fuente: Camila Ramos CELA - Clean Energy Latin America, SEBRAE, BID y OEI ABSOLAR
Renewable Energy Policy Network for the 21st Century

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