Presentation overview

1 - The Global Goals on Renewables

2 – Global Tracking Framework’s outlook on Renewables

3 – Situation and perspectives of Renewables in LAC

4 – The ECLAC/MIT Study: “Fostering an Efficient Integration of Renewables in South America”
At the UN Sustainable Development Summit (Sept. 2015), world leaders adopted the 2030 Agenda for Sustainable Development, which includes 17 Sustainable Development Goals (SDGs) to be achieved by 2030 in order to:

- end poverty,
- fight inequality and injustice
- tackle climate change

The SDGs combine social and economic development with ecological sustainability. They also address issues such as peace and security, the rule of law and good governance, all of which are essential to sustainable development.

The SDGs are universally applicable. This means that all the countries in the world, according to their capacity, should contribute to achieving the goals.
S.D. Goal #7: Ensure access to affordable, reliable, sustainable and modern energy for all

- By 2030, ensure **universal access** to affordable, reliable and modern energy services
- By 2030, increase substantially the **share of renewable** energy in the global energy mix
- By 2030, double the global **rate of improvement** in energy efficiency
- By 2030, enhance **international cooperation** to facilitate access to clean energy research and technology, ...... and promote **investment** in energy infrastructure & clean energy technology
- By 2030, expand **infrastructure and upgrade technology** for supplying modern and sustainable energy services for all in developing countries
The Sustainable Energy for All (SE4ALL) initiative is a multi-stakeholder partnership between governments, the private sector, and civil society.

Launched by the UN Secretary-General in 2011, it has three interlinked objectives to be achieved by 2030:

- Ensure **universal access** to modern energy services.
- **Double the global rate** of improvement in energy efficiency.
- **Double the share of renewable** energy in the global energy mix.
The SE4ALL Latin America & Caribbean Hub

- The SE4All/Americas Hub is hosted by the Inter-American Development Bank (IADB) and its mission is to facilitate the implementation of the SE4All initiative in Latin America and the Caribbean (LAC) region.

- In Feb. 2015, the Hub launched a partnership between IADB, the UNDP and ECLAC, to implement strategic objectives on behalf of SE4All and help coordinate activities and information in the LAC Region.

- Main targets:
  - creation of knowledge products,
  - help with planning for universal access to energy,
  - coordination with national and international partners
  - monitoring the status & advances towards SE4All goals

Need for a goal-tracking system!
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Sustainable Energy for All – SE4ALL
Global Tracking Framework 2015

source: Global Tracking Framework 2015, WB
RATe OF PROGRESS TO ATTAIN SE4ALL Targets

Annual growth rates (%)

- Universal access to electricity
- Universal access to non-solid fuels
- Improvement in primary energy intensity
- Renewable energy share in total final energy consumption
- Modern renewable energy share in total final energy consumption

- Progress 2000–10
- Progress 2010–12
- Target rate SE4All

Source: Global Tracking Framework 2015, WB
2010 → 2012: PROGRESS TOWARDS SE4ALL TARGETS

c. Energy intensity, compound annual growth rate (%)

- Japan
- Indonesia
- Germany
- United States
- South Africa
- Saudi Arabia
- United Kingdom
- France
- Italy
- Canada
- China
- India
- Mexico
- Australia
- Korea, Rep.
- Russian Federation
- Iran
- Thailand
- Nigeria
- Brazil

-6 -4 -2 0 2

d. Modern renewable energy, compound annual growth rate (%)

- Nigeria
- China
- Korea, Rep.
- United Kingdom
- Australia
- Italy
- Iran
- Germany
- India
- United States
- Canada
- Turkey
- Spain
- Brazil
- Saudi Arabia
- Indonesia
- Russia
- France
- Mexico
- Japan

-5 0 5 10 15 20

source: Global Tracking Framework 2015, WB
Average annual increase of renewable energy share

Annual renewable energy share increase (%)

- 1990-2000: 0.08
- 2000-10: 0.04
- 2010-12: 0.17
- 2010-30 (SE4All) TARGET: 0.89

Very far...

source: Global Tracking Framework 2015, WB
2010 → 2012: Annual growth rate of renewable energy consumption VS total final energy consumption

source: Global Tracking Framework 2015, WB
2010→2012: net increment of modern renewables in total final energy consumption

source: Global Tracking Framework 2015, WB
### Annual Global Investment: Actual & Required (US$ billions)

<table>
<thead>
<tr>
<th>Annual Investment</th>
<th>Universal Access to Modern Energy Services</th>
<th>Universal Access to Modern Energy Services</th>
<th>Doubling the Global Rate of Improvement in Energy Efficiency</th>
<th>Doubling the Share of Renewable Energy in the Global Mix&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
<td>Electrification</td>
<td>Cooking</td>
<td>Energy Efficiency</td>
<td>Renewable Energy</td>
</tr>
<tr>
<td>Actual for 2012&lt;sup&gt;b&lt;/sup&gt;</td>
<td>9</td>
<td>0.1</td>
<td>130</td>
<td>258</td>
</tr>
<tr>
<td>Required to 2030&lt;sup&gt;c&lt;/sup&gt;</td>
<td>45</td>
<td>4.4</td>
<td>560</td>
<td>442–650</td>
</tr>
<tr>
<td>Gap</td>
<td>36</td>
<td>4.3</td>
<td>430</td>
<td>184–392</td>
</tr>
</tbody>
</table>

source: Global Tracking Framework 2015, WB
Annual Renewable Energy Investments, actual and required in the IEA’s 450 Scenario

source: IEA & Global Tracking Framework 2015, WB
Financing for sustainable energy needs to triple, to over US$ 1 Trillion annual !!!!
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Total Primary Energy Supply - 2012


OIL IS STILL THE KING...
Final Energy Consumption - 2012

Electricity Generation (by sources)

LCOEs by Regions, 2014 (USD/kWh)

Based on a 1500-projects database

Hydro is still the cheapest way to produce electricity....

Investments in Renewables

50% investments in Brazil...

Barriers to Renewables Investment in LATAM

**Macroeconomic barriers**
- Inflation
- Volatile of currency exchange
- Volatile economic growth & energy demand growth rates
- Less stable fiscal situation

**Barriers related to the structure and the organization of the energy sector**
- Inadequate RE pricing
- Subsidies and price control for fossil fuels
- Entry barriers for private investors:
  - Remuneration uncertainty
  - Long, complex and costly administrative processes
  - Insufficient infrastructure capacity
- Lack of qualified workforce
- Lack of technological standards and norms

**Barriers related to finance sector**
- High remuneration risks → high cost of private capital
- Scarcity of hedging instruments
- Insufficient diversification of capital sources
- Uncertainties about long-term deal flow
- Limited renewable energy finance expertise

THE KEY-ROLE OF ENERGY COMPLEMENTARITY IN THE SUSTAINABLE DEVELOPMENT OF LAC
Electricity Generation Mix in LAC - 2012

Complementarity: a win/win solution

- Enhance **economic performance** of the power system
- Enhance **reliability** of supply

EXPANSION: **modularity**

- **Implementation of generation infrastructure**
  - Modular NHRETs with short construction times can be built quickly to partially counteract circumstantial imbalances in supply/demand, especially if delays in implementation of hydro plants occur.

<table>
<thead>
<tr>
<th>(Delayed) Hydros</th>
<th>NHRETs</th>
<th>Consumers</th>
</tr>
</thead>
<tbody>
<tr>
<td>If delays penalties include obligation to purchase power on the short-term market, lower prices due to renewables built will reduce economic losses for assets.</td>
<td>Circumstantial imbalances are windows of opportunity for investors to develop NHRETs.</td>
<td>Lower price shocks due to construction delays. Higher supply reliability.</td>
</tr>
</tbody>
</table>

Implementation delays of hydropower projects in Latin America
- Large delays in hydro implementation allow implementation of small NHRETs.

<table>
<thead>
<tr>
<th>Project</th>
<th>Countries</th>
<th>Date</th>
<th>Capacity [MW]</th>
<th>Delay [months]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bayano</td>
<td>Panama</td>
<td>1970</td>
<td>190</td>
<td>18</td>
</tr>
<tr>
<td>Sixth Power Project</td>
<td>Honduras</td>
<td>1973</td>
<td>40</td>
<td>42</td>
</tr>
<tr>
<td>Playas</td>
<td>Colombia</td>
<td>1981</td>
<td>200</td>
<td>30</td>
</tr>
<tr>
<td>Itaipu</td>
<td>Brazil, Paraguay</td>
<td>1991</td>
<td>12,600</td>
<td>116</td>
</tr>
<tr>
<td>Yacyreta</td>
<td>Argentina, Paraguay</td>
<td>1994</td>
<td>3,100</td>
<td>108</td>
</tr>
<tr>
<td>Baixo Iguaçu</td>
<td>Brazil</td>
<td>2016</td>
<td>350</td>
<td>39</td>
</tr>
</tbody>
</table>

Hydropower’s flexibility counteracts short-term variability of NHRETs

- Hydropower plants with reservoirs are flexible assets and the costs of using such existing plants to counteract the short-term variations in the VRETs’ production is lower than that of other flexible generation technology.

Consumers
- Lower short-term volatility of prices
- Higher supply reliability

Hydro plants as cost effective providers of flexibility in Brazil

- The hydro plants in Brazil, with flexible generation at low costs, have been historically the sole provider of a large range of ancillary services, called secondary frequency control.

OPERATION: *diversification*

- **Portfolio diversification of non-dispatchable renewable energy plants**
  - The production of a diversified renewable energy portfolio of non-dispatchable renewable energy plants, including run-of-river hydro plants, is less volatile in the short-term than that of each individual plant.

  - **Run-of-river hydros**
    - NHRETS
  - Reduced variability in the portfolio's output of variable renewable generation plants results in lower price volatility and reduces commercial risks perceived by these technologies.

  - **Consumers**
    - Reduced short-term price volatility
    - Increased reliability of supply

- **100% Renewable portfolio target in Costa Rica**
  - Costa Rica aims at supplying 100% of its electricity need with renewable energy.
  - The diversified renewable portfolio (hydro, wind, geothermal and solar projects) managed in supplying for 75 consecutive days in the beginning of 2015, without any fossil fuels dispatch.

**OPERATION: complementarity**

- **Seasonal climatic complementarity**
  - Generation of hydro plants is lower during drier seasons, but the generation of some NHRETs is not reduced or even increases during these periods
  - What benefits does this mechanism bring?

  **Hydros**
  - NHRETs reduce seasonal price oscillations, hydros will purchase power during dry seasons to fulfill obligations at lower prices (if the contractual liabilities of hydros don’t vary with seasonal patterns)

  **NHRETs**
  - Capture higher energy prices during dry seasons, economic value of asset increases

  **Consumers**
  - Reduced seasonal oscillation of electricity prices Higher supply reliability

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**Seasonal complementarities in Panama**

- Observed complementarity between wind velocities and water flows of the same district, in the Pacific Coast of Panama

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The ECLAC/MIT study: *the “assets”*

The wind resource
The ECLAC/MIT study: the “assets”

The sun resource
The ECLAC/MIT study: the “assets”

The geo resource
The new non-conventional renewable sources enable diversifying the current mix of South American countries which is strongly based on hydroelectric generation and, therefore, vulnerable to climatic phenomena like El Niño/La Niña.

In addition, the increasing lack of clarity in the policies for granting permits for the construction of new hydro, combined with the increasing influence exerted by opposing groups to prevent the construction of reservoirs, has led to delays in the construction of these plants, which has negatively affected supply reliability.

RES are smaller projects which are geographically scattered, subject to fewer barriers for obtaining environmental permits, which enable the diversification of the energy mix.
• From an economic perspective - especially in the current context where financing capacity at global level has significantly declined - the smaller scale of the RES is a clear advantage.

• This is true, considering the large capital investment involved in large hydroelectric projects under construction in the region – e.g. Belo Monte plant (11,233 MW) in Brazil; Pescadero Ituango plant (2,400 MW) in Colombia; and potential projects like Aysén in Chile (2,000MW)

• For many countries in the region the output regime of RES can complement the hydroelectric output regime, which enables the creation of invaluable synergies for the system.
The key objective of this modelling effort is to assess the future impact of a significant deployment of RES in the operation and expansion planning of the power systems in the Region.

Given the spatially dependent nature of these resources, the analysis will include an assessment of the transmission and storage capacity requirements that would accompany these renewables.

The project will use power system modeling tools to examine what combination of additional power generation - including distributed, utility scale energy resources and transmission assets - will be required in the region to meet future electricity demand.
• Currently, the scale of regional interconnection along the South American region is limited.

• Efforts are afoot to open up greater links in the region including the creation of a regional power market.

• A comparative analysis of contemporary regulation in the region’s different countries will be carried out in order to assess their differences and provide guidance on how regional and national regulation can be optimized.

• The study will analyze how complementarity/integration developments – e.g. SINEA initiative - might aid in helping the region meet its growing electricity needs, in order to systemically leverages the region’s energy resources, particularly RES that have not yet been developed.
Thanks for you attention

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