LAWEA

Wind Energy Association
Latin America

LATIN AMERICAN
WIND POWER MARKET

TERNA Expert Dialogue Berlin Sep 18, 2008

www.lawea.org EMPOWERING WIND ENERGY IN LATIN AMERICA

Regional Energetic Scenario

↑↑ Energy Crisis ↑↑ ↓↓ Economic – Social growth ↓↓

$$$ Fossil fuels $$$
$$$ Electricity $$$
Energetic Independence desire
Uncertainty in fossil fuels supply
Energetic matrix diversification
Increasing energy demand 5% annual
Climate Change risks

= favorable atmosphere for RE

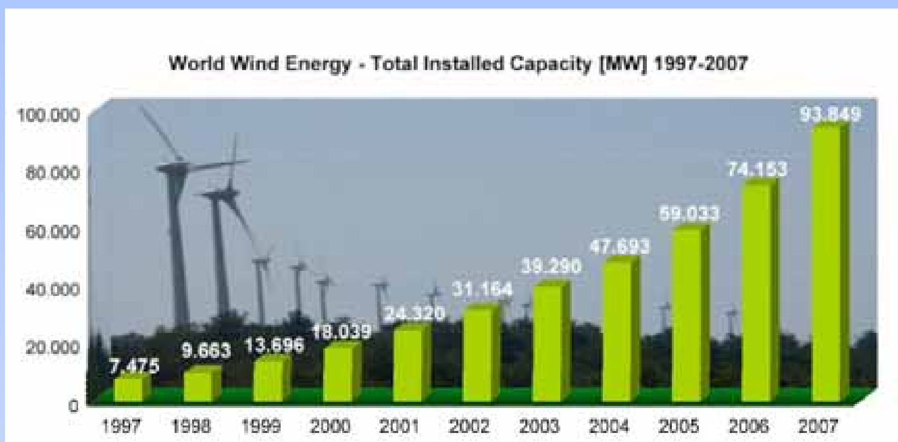
Technologies costs

Table 1. Status of Renewables Technologies—Characteristics and Cost

Technology	Typical Characteristics	Typical Energy Costs (U.S. cents/kilowatt-hour)
Power Generation		
Large hydro	*Plant size:* 10 megawatts (MW)–18,000 MW	3–4
Small hydro	*Plant size:* 1–10 MW	4–7
On-shore wind	*Turbine size:* 1–3 MW *Blade diameter:* 60–100 meters	5–8
Off-shore wind	*Turbine size:* 1.5–5 MW *Blade diameter:* 70–125 meters	8–12
Biomass power	*Plant size:* 1–20 MW	5–12
Geothermal power	*Plant size:* 1–100 MW *Type:* binary, single- and double-flash, natural steam	4–7
Solar PV (module)	*Cell type and efficiency:* single-crystal 17%; polycrystalline 15%; amorphous silicon 10%; thin film 9-12%	—
Rooftop solar PV	*Peak capacity:* 2–5 kilowatts-peak	20–80[*]
Concentrating solar thermal power (CSP)	*Plant size:* 50–500 MW (trough), 10-20 MW (tower); *Types:* trough, tower, dish	12–18[†]

Fuente: REN 21 Global Status Report

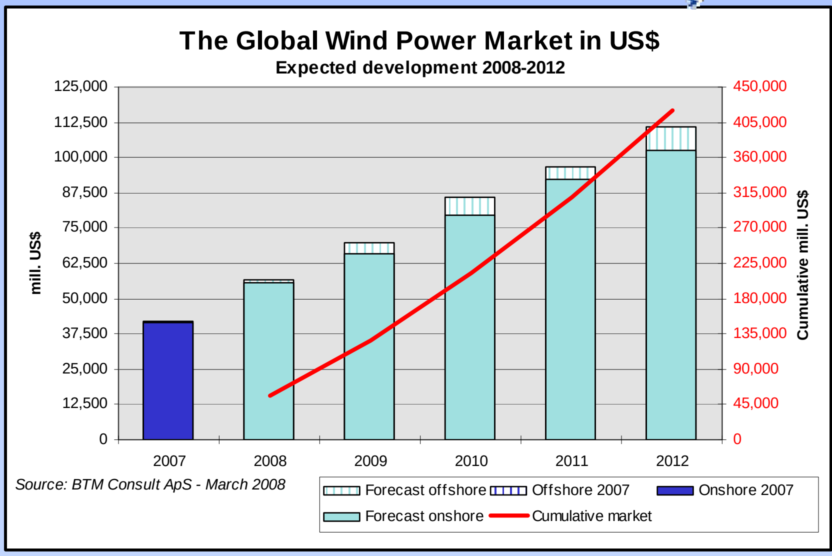
Sustained high speed growth



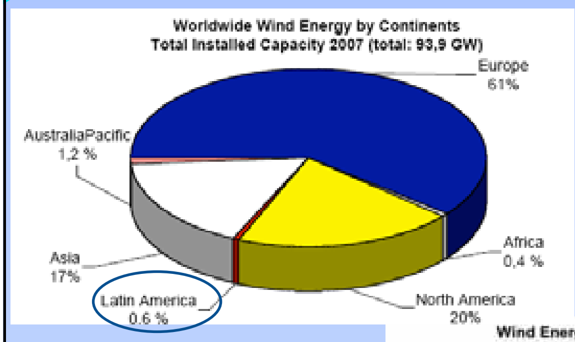
Fuente: World Wind Energy Association

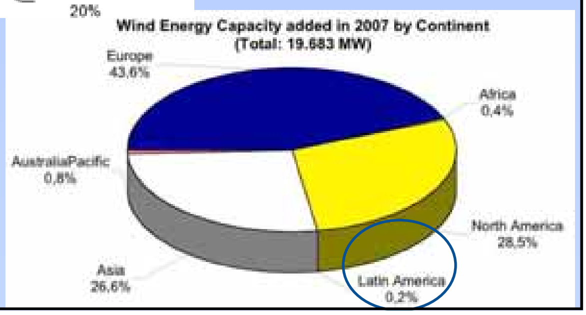
Sustained Growth bigger than 25 % in more than one decade

Expected market value



Wind Energy by Continent



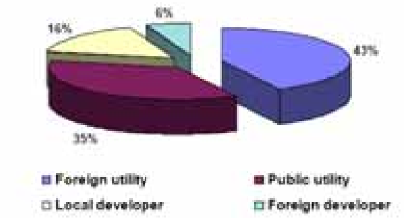


Source: World Wind Energy Association

LATAM total installed Capacity

PAIS	Mw
Brasil	247
Mexico	88
Costa Rica	74
Caribe	57
Argentina	29
Chile	20
Colombia	20
Cuba	7
Ecuador	2.5
Perú	1
Total	550 MW

Figure 2. Wind asset ownership structure in 2007: %

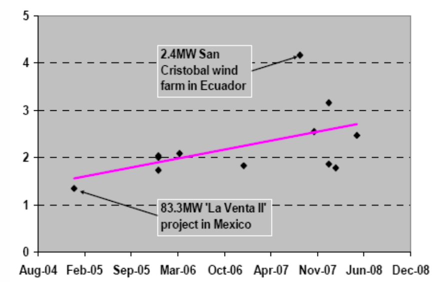


Note: Only 267MW of capacity have been included in the analysis.

Source: New Energy Finance

Wind power costs Latin America

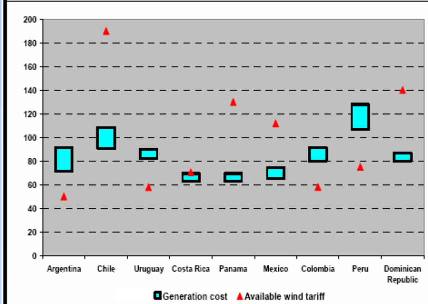
Figure 3. CAPEX cost evolution per MW in Latam 2004-2008: MW



Note: Deals in local currency have been converted to USD at the exchange rate of the same date.

Source: New Energy Finance

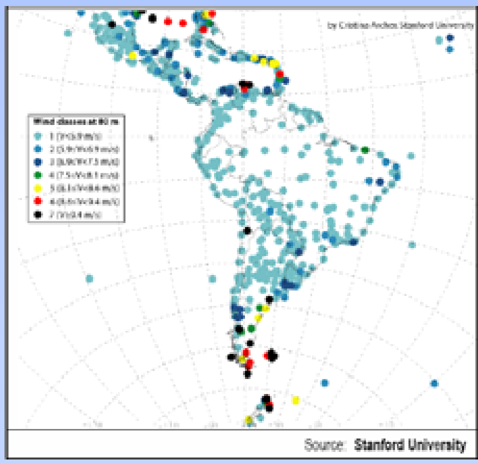
Figure 1. Generation costs and electricity prices in Latin American markets: $/MWh



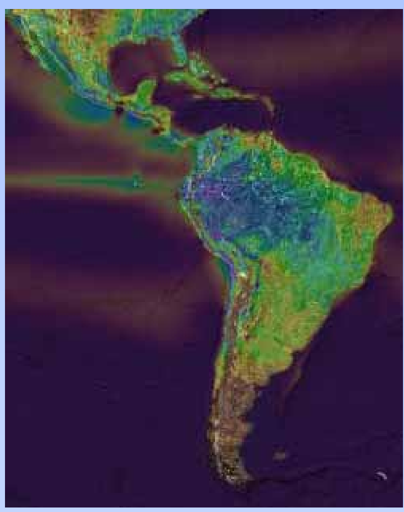
Note: We have assumed an average installation cost of $2.5/MW for all countries in the southern cone while $2.3m/MW for those countries in Central America. Available wind tariffs reflect the average spot price of 2007 for each country, plus the incentive in the case of Argentina, and industrial tariffs for Mexico, Costa Rica and Uruguay.

Source: New Energy Finance

Sources of generation vs. wind power potential



Wind Power Potential

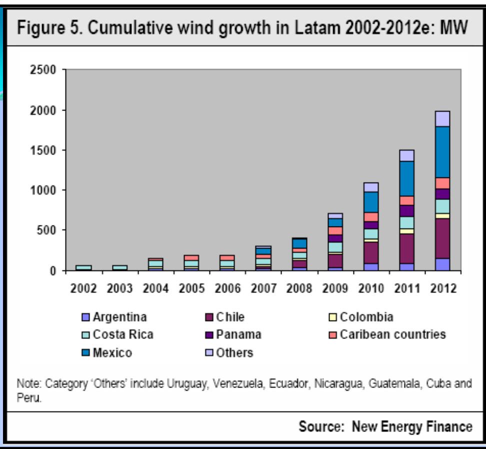


Mapa obtenido con FIRST LOOK, 3TIER
http://firstlook.3tiergroup.com/

Table 1. Wind resource by country

Country	Capacity factor	Location
Argentina	35%-45%	Santa Cruz, Chubut and southern Buenos Aires
Chile	25%-30%	Bio-Bio, Maule and Coquimbo
Uruguay	33%-35%	Sierra de los Caracoles and Rocha Lagoon
Peru	25%-32%	Piura, Arequipa, Ica
Colombia	38%-42%	Guajira penninsula
Costa Rica	38%-40%	Guanacaste
Panama	38%-40%	Cerro Tute
Mexico	35%-40%	Oaxaca, Baja California
Dominican Republic	36%-40%	Pedernales, Barahona

Source: New Energy Finance, local wind associations

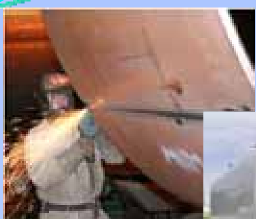


Expected Wind growth

	Cumulative installed capacity (MW) by end of in 2007	Installed capacity (MW) in 2007	Forecast 2008-2012 (incl. Offshore)					Installed capacity between 2008-2012	Cumulative installed capacity (MW) by end of 2012
	2007	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**Sum**	**Accu.**
Canada	1,845	**386**	1,000	1,200	1,500	2,000	2,500	**8,200**	10,045
USA	16,879	**5,244**	6,500	7,500	9,000	**10,000**	10,500	**43,500**	60,379
Other Americas	667	**185**	400	600	1,000	1,200	1,600	**4,800**	5,467
Total Americas	**19,391**	**5,815**	**7,900**	**9,300**	**11,500**	**13,200**	**14,600**	**56,500**	**75,891**

Source: BTM Consult ApS - March 2008

Availability



Manufactures of:
- -Nacelle
- -Towers
- -Blades
- •No too much technology development.
- •Opportunities of development and employment.

Project Financing

Selling Wind Kw in LATAM

	PPA	Spot Market
Debt level	Up to 70%	Marginal
Price vs. Market	Less	Market price
Energy took off	Constant	Real production
Risk Level	Lower	Higher
Potential Income	Planned	Higher

Renewable Energy Promotion Policies

Table 2. Renewable Energy Promotion Policies

Country	Feed-in tariff	Renewable portfolio standard	Capital subsidies, grants, or rebates	Investment or other tax credits	Sales tax, energy tax, excise tax, or VAT reduction	Tradable renewable energy certificates	Energy production payments or tax credits	Net metering	Public investment, loans, or financing	Public competitive bidding
Argentina	✓		✓	(*)	✓		✓			
Brazil	✓								✓	✓
Chile		✓	✓							
Costa Rica	✓									
Ecuador	✓			✓						
Guatemala				✓	✓					
Honduras				✓	✓					
Mexico				✓				✓		
Nicaragua	✓			✓	✓					
Panama							✓			

Fuente: REN 21 Global Status Report

Regulatory Frameworks and Incentive programs

Argentina: Ley 25019 (tax exemption)

Brazil: PROINFA + Stage 2

México: IRS incentives, Self supply projects, Exportation and IPP

Chile: Mandatory 5% @ 2014, 10% @ 2024

Cuba: “Energetic Revolution” 2020 : 500Mw

Venezuela: no specific inentives, PEDEVESA 4 x 100 Mw

Perú: Law 1002: Feed-in-tariff + prima

Colombia: 40% Capacity factor, RE promotion Law.

Costa Rica: Energy matrix diversification + Energetic independence

Panamá: 40% Capacity factor, Spot Market, No import tax for WTG

Dominicanan Republic: No import tax for WTG. 10% NCRE @ 2010

Uruguay: Energy importer, 35% Capacity factor

Brazil

- PROINFA – Financial Support Program for Investments in Alternative Sources of Electric Energy
- 3.3 GW of Renewable Energy
- long-term contracts of energy purchase
- 15 % of the annual growth in renewable sources of energy.
- Wind power Exclusive auctions

Chile

In 2010 the 5% of the generated energy will come from the RE and .5 % in the following years.

Regulative friendly framework with the foreign investments.


3 Aerogeneradores de 660kW – Off grid

Argentine

•Law 25019 (1998), investment hel exemption). The direct Subsidy o KW/h generated.

•They have not showed great imp after the economic crisis the laws context.

•Several provincial laws.

México

•The government is in charge of the generation and distribution of energy

•Its incentive for using wind energy based on investment help

•Tax exemption.

Projects to short and medium term

COUNTRY	MW
Brazil	4000 - 6000
México	2000 – 4000
Central America and the Caribbean	500-1.000
Argentina	1000 - 2000
Chile	200-500
Colombia	200 - 600
Perú	200 - 500
Venezuela	200 - 500

Source: LAWEA

Latin America will install more than 10,000 MW within the next few years.

Chile & Panama wind projects

Chile				Wind projects
Project	**Developer**	**MW**	**Development Status**	**Location**
Quillagua	**Constructora Pacifico**	100	Meduim	
El Tangue	**EPS Ingenieria**	100	Meduim	Coquimbo
Ovalle	**Ingenieria Seawind**	10	Medium	Coquimbo
Puclaro	**Ingenieria Seawind**	10	Meduim	Coquimbo
Vallecito	**Energy Focus**	15	Meduim	Coquimbo
Coast	**Coast Wind Energy**	9	Meduim	
La Capilla	**EPS Ingenieria**	8	Meduim	
Llay Llay	**EPS Ingenieria**	14	Meduim	
	Inversiones Espolon	40	Meduim	
Santa Guadalupe	**Branko Stambuk Ruiz**	9	High	
El Pangal	**Servicios Eolicos**	8.5	Meduim	O'Higgins
Huentelauquen	**Ingenieria Seawind**	9	Meduim	O'Higgins
Bellavista	**Soltec Energias Renovables**	9	High	Maule
Nuevos Aires	**Alexis Soto Pedraza**	20	High	Maule
El Curaco	**Leonardo Machado**	20	High	Bio Bio
El Rosal	**Leonardo Machado**	15	High	Bio Bio
Morhuilla	**Leonardo Machado**	20	High	Bio Bio
Negrete	**Servicio Evangelico**	20	Meduim	Bio Bio
Pullay	**Leonardo Machado**	15	High	Bio Bio
Punta Chome	**Ingenieria Seawind**	10	Meduim	Bio Bio
Total			**461.5**	

Fuente: New Energy Research

Panama				Wind Power projects
Project	**Location**	**Developer**	**MW**	**Status**
Alto de Piedra	Cerro Tute	Southern Energy Wind	**18**	**Licencia previa**
Cerro Delgadito	Cerro Tute	Generadora Eolica del Caribe	**19.5**	**Licencia previa**
Cerro Cabeza de Toro	Cerro Tute	Eolico Delgadito	**19.5**	**Licencia previa**
El Barrancon	Cerro Tute	Eolico Cerro Tute	**19.5**	**Licencia previa**
Hornitos	Hornitos	Generadora Electrica de Panama	**34.5**	**Licencia previa**
Alturas de Nuario	La Miel	N/A	**27**	**Licencia previa**
Pedasi	La Miel	Aerogeneradores Iberoamericanos	**20.4**	**Denied**
El Cope	El Cope	Eolico Cope	**9**	**Licencia previa**
Total			**167**	

Note: Licencia Previa is the first of the licenses granted by ANSP for projects undergoing licensing process.

Source: COPE

Mexico wind projects

MEXICO	Capacidad (MW)
Bii Nee Stipa Energía Eólica	23
Desarrolladores Eólicos Mexicanos	227.5
C.F.E.	505
Electricidad del Istmo	12
Eoliatec de México	160.5
Eoliatec del Istmo	142
Eurus	197
Fuerza Eólica del Istmo	50
Gamesa Energía	288
Parques Ecológicos de México	187
Preneal México	396
Unión Fenosa Generación México	227.5
Eléctrica del Valle de México	76
Baja California	870
Tamaulipas	650
Veracruz	430
Hidalgo	320
Quintana Roo	560
Otras	2,000

Brazil wind projects

Nome de la central	Potência (kW)	Município - Estado	Destino da Energia	Proprietario
Alegria I	51.000	Guamaré - RN	PIE	New Energy Options Ltda.
Alegria II	100.800	Guamaré - RN	PIE	New Energy Options Ltda.
BA 3 - Caetité	192.100	Caetité - BA	PIE	Energias Renováveis do Brasil Ltda.
Bom Jesus	55.800	Aracati - CE	PIE	SIIF Énergies do Brasil Ltda.
Bons Ventos	50.000	Aracati - CE	PIE	Servtec Energia Ltda.
Canoa Quebrada	78.000	Aracati - CE	PIE	Ventos Energia e Tecnologia Ltda.
CE 10 - Acaraú	49.300	Acaraú - CE	PIE	Energias Renováveis do Brasil Ltda.
CE 11 - Camocim	249.900	Camocim - CE	PIE	Energias Renováveis do Brasil Ltda.
CE 3 - Boca do Poço	79.900	Limoeiro do Norte - CE	PIE	Energias Renováveis do Brasil Ltda.
CE 4 - Lagoinha	49.300	Paraipaba - CE / Trairi - CE	PIE	Energias Renováveis do Brasil Ltda.
CE 7 - Icapuí	29.750	Aracati - CE	PIE	Energias Renováveis do Brasil Ltda.
Eólica Abais	29.700	Estância - SE	PIE	Eletrowind S/A
Eólica Água das Dunas	43.200	Extremoz - RN	PIE	SIIF Énergies do Brasil Ltda.
Eólica Água Doce	9.000	Água Doce - SC	PIE	Parque Eólico de Santa Catarina Ltda.
Eólica Ariós	16.200	Beberibe - CE	PIE	Eletrowind S/A
Eólica Canoa Quebrada	10.500	Aracati - CE	PIE	Rosa dos Ventos Ltda.
Eólica Crispim	60.000	Marapanim - PA	PIE	Guascor Empreendimentos Energéticos Ltda.
Eólica Fazenda Brígida	30.600	Jandaíra - BA	PIE	Eletrowind S/A
Eólica Icaraizinho	54.000	Amontada - CE	PIE	Eólica Icaraizinho Ltda.
Eólica Jericoacoara	100.800	Jijoca de Jericoacoara - CE	PIE	SIIF Énergies do Brasil Ltda.
Eólica Paracuru	23.400	Paracuru - CE	PIE	SIIF Énergies do Brasil Ltda.
Eólica Praias de Parajuru	28.800	Beberibe - CE	PIE	Eletrowind S/A
Eólica Santa Izabel	198.000	Galinhos - RN	PIE	SIIF Énergies do Brasil Ltda.
Fábrica da Wobben Windpower no Pecém	600	Caucaia - CE	PIE	Wobben Wind Power Industria e Comércio Ltda.
Fazenda Nova	180.000	Porto do Mangue - RN	PIE	SIIF Énergies do Brasil Ltda.
Fortim	93.600	Aracati - CE	PIE	Eólica Fortim Ltda.
Foz do Rio Choró	25.200	Beberibe - CE	PIE	SIIF Cinco Ltda.
Gameleira	27.000	São Gonçalo do Amarante - CE	PIE	SIIF Três Ltda.
Gargaú	39.950	São Francisco de Itabapoana - RJ	PIE	SeaWest do Brasil Ltda.

Challenges

Opportunities

Regulatory Frameworks.- Multilateral work groups (LAWEA, BID, AAEE, FERCCA, etc.)

Tariff Systems.- Better conditions for bank financing

Long Term Incentive Programs.- Sustainability, government changes survivability

Infrastructure.- Need of transmission lines

Technology + Equipment.- Local providers: Blades, WTG´s assembly lines, Cranes, Freight services, etc.

Training.- Skills development for local man power

O & M.- Idem.

Opportunities

Challenges

High electricity costs.- Wind power even more interesting

High costs and uncertainly of fossil fuel supply.- Electric Independence with cost stability

CDM financing opportunities.- Additional potential income

Working force availability.- Most LATAM countries advantage

Rural electrification.- Potential + unattended markets

Energy supply.- Certainty for Social and economic growth

Latin American Wind Energy Association

LAWEA
non profit organization
main headquarters in Guadalajara, Mexico

Colombia Brazil Nicaragua
UK Argentina Uruguay
USA Dominican Republic
Venezuela Spain

Board of Directors

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Brazilian Wind Energy Association
Chilean Renewable Energy Association
Central American and the Caribbean Renewable Energy Federation
Association of generator s with RE **Guatemala**

International:

European Wind Energy Association
World Wind Energy Association
International Green Energy Council
GTZ German Technical Cooperation

www.windexpo.org

THANK YOU !

LAWEA

Wind Energy Association
Latin America

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www.lawea.org