



Bundesministerium
für Wirtschaft
und Energie



Osinergmin

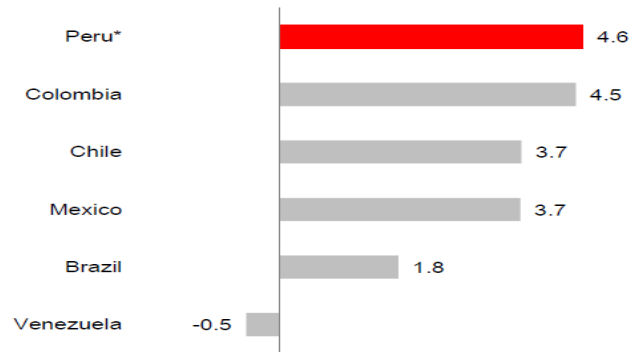
ORGANISMO SUPERVISOR DE LA INVERSIÓN EN ENERGÍA Y MINERÍA



ENERGY MARKET IN PERU – REGULATIONS AND PROMOTION WITH FOCUS ON RENEWABLE ENERGIES

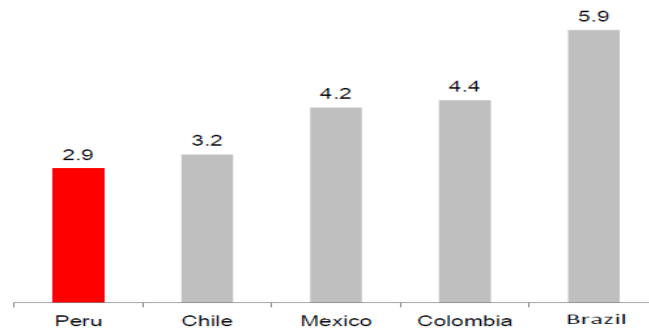
PERU – A COUNTRY OF OPPORTUNITIES

Real GDP – Forecasts for Latin America 2015-2016
(Annual Average Variation %)



Source: IMF / * in Peru case, source: BCRP

CPI – Latin America 2003- 2013
(Annual Average Variation %)



Source: Central Bank of Reserve of Peru, IMF

Investment grade
Latin America benchmarking

Country	S&P	Fitch	Moody's
Chile	AA-	A+	Aa3
Peru	BBB+	BBB+	A3
Mexico	BBB+	BBB+	A3
Brazil	BBB-	BBB	Baa2
Colombia	BBB	BBB	Baa2
Bolivia	BB	BB	Ba3
Ecuador	B+	B	B3
Venezuela	CCC	CCC	Caa3
Argentina	SD	RD	Caa1

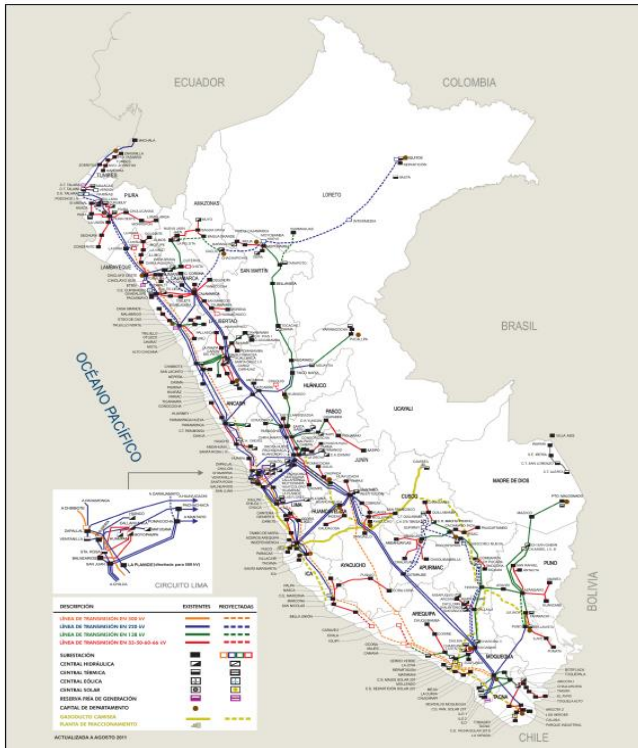
Source: Standard & Poor's, Fitch Ratings and Moody's.
Updated as of July 2015

Best countries for doing business
Latin America comparison

Posición LAC	Posición Mundo	Country
1	29	Chile
2	52	Peru
3	55	Uruguay
4	57	Costa Rica
5	61	Mexico
6	66	Panama
7	67	Colombia

Source: Forbes (December 2014)

ELECTRICITY SECTOR INDICATORS IN PERU



2014 – ANNUAL INDICATORS

Load: 5 737 MW
 Production: 41 796 GWh
 Installed Capacity: 8 718 MW
 H (38%) T (59%) O (3%)
 Transmission Lines: 17 126 km

Peru is Hydrothermal

- 2014: Hydro (50%) ; Thermal (48%); Other (2%)
- 2013: Hydro (53%) ; Thermal (44%); Other (0%)
- 2011: Hydro (58%) ; Thermal (42%); Other (0%)
- 2010: Hydro (59%) ; Thermal (41%); Other (0%)
- 2009: Hydro (63%) ; Thermal (37%); Other (0%)
- : : :
- 2001: Hydro (91%) ; Thermal (9%); Other (0%)

Source: OSINERGMIN (2014) *Monthly Report February 2014 – Electricity Sector Operation*

In Peru, the energy potential comes from a wide availability of water and natural gas resources that make possible to deal with the increasing demand. Historically, power generation has been supported by renewable energy.

ELECTRICITY SECTOR INSTITUTIONAL ARRANGEMENT

- **Ministry of Energy and Mining (MEM or MINEM):**
Grants concessions and establishes regulations.
- **Supervising Organization of Investment in Energy and Mining (Osinergmin):**
Sets tariffs and makes sure the energy industry complies with MEM regulations. May complement MEM regulations if needed.
- **Economic System Operation Committee (COES):**
Coordinates operations and determines payments between market participants. COES procedures are approved by Osinergmin.

THE ELECTRICITY MARKET FOR GENERATORS

- **Variable Costs:**

Marginal Cost of energy (CMg) as the cost (not bid) of the most expensive generator producing energy at the time.

- CMg is set every 15 minutes by COES in local currency.
- Energy payment is made on produced energy basis.

- **Fixed Costs:**

Additional capacity payment as per kW cost of investment on a diesel 2 gas turbine.

- Payment is made on firm capacity basis (availability of the unit every time when needed by COES).
- Set annually by Osinergmin in local currency (~ 5 US\$/kW-month).

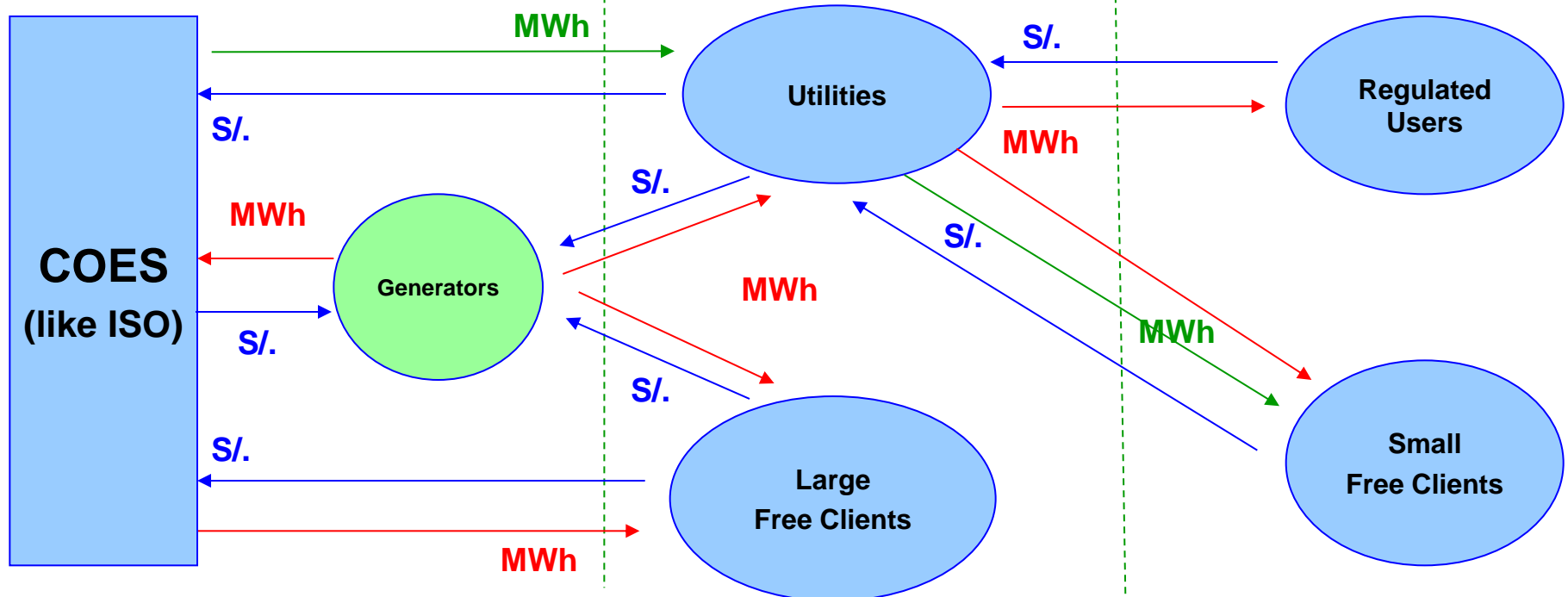
Every month COES establishes payment obligations between generators.

ELECTRICITY SECTOR: AGENTS AND MARKETS

Short Term Market (Spot)
(Marginal Cost. No contracts.
Buying and selling are “multilaterals”)

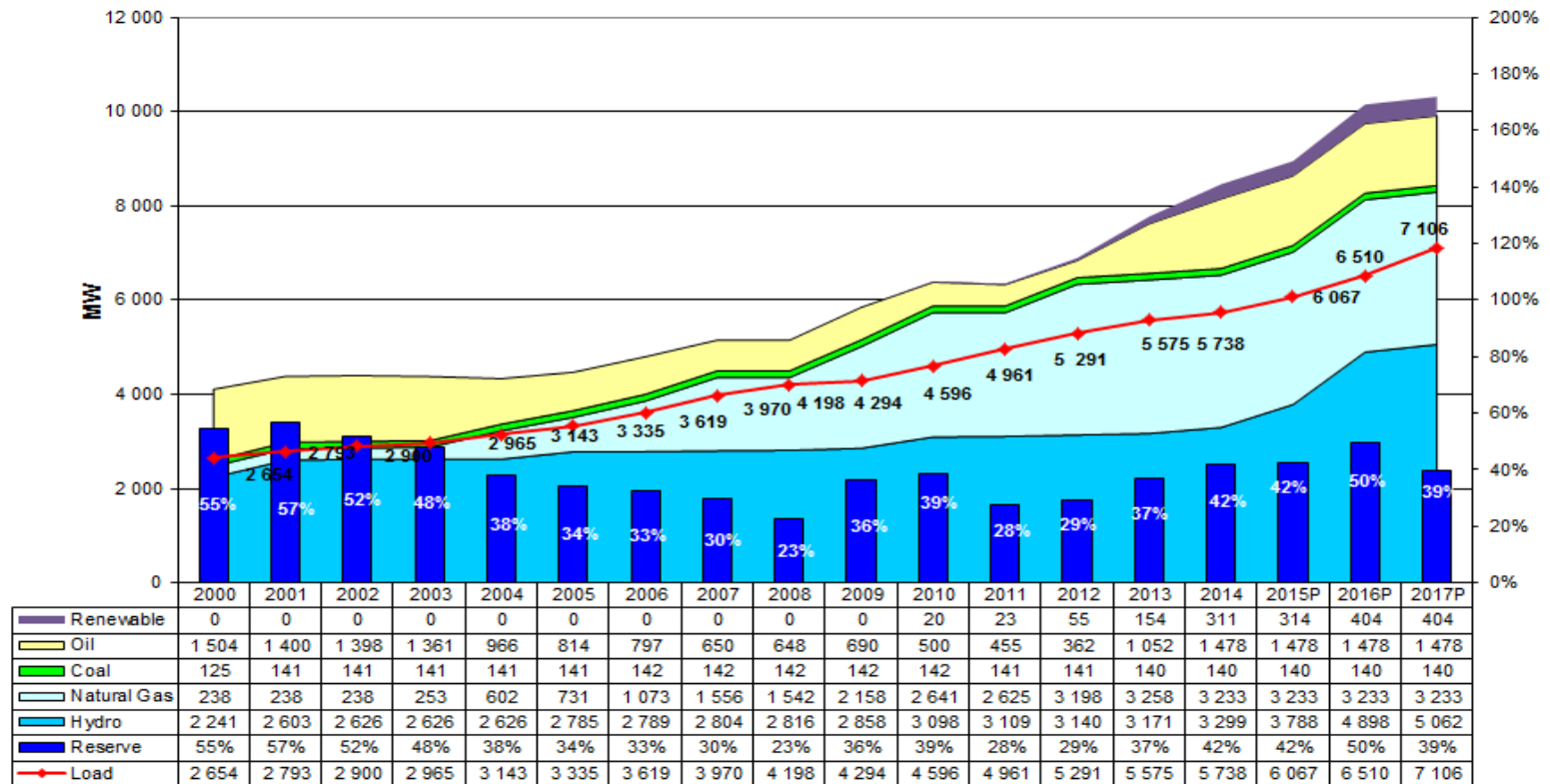
Wholesale Market
(Bilateral contracts’ prices)

Retail Market
(Bilateral contracts’ prices)



SUPPLY AND DEMAND BALANCE

Evolution of Supply and Load (2000 - 2017)



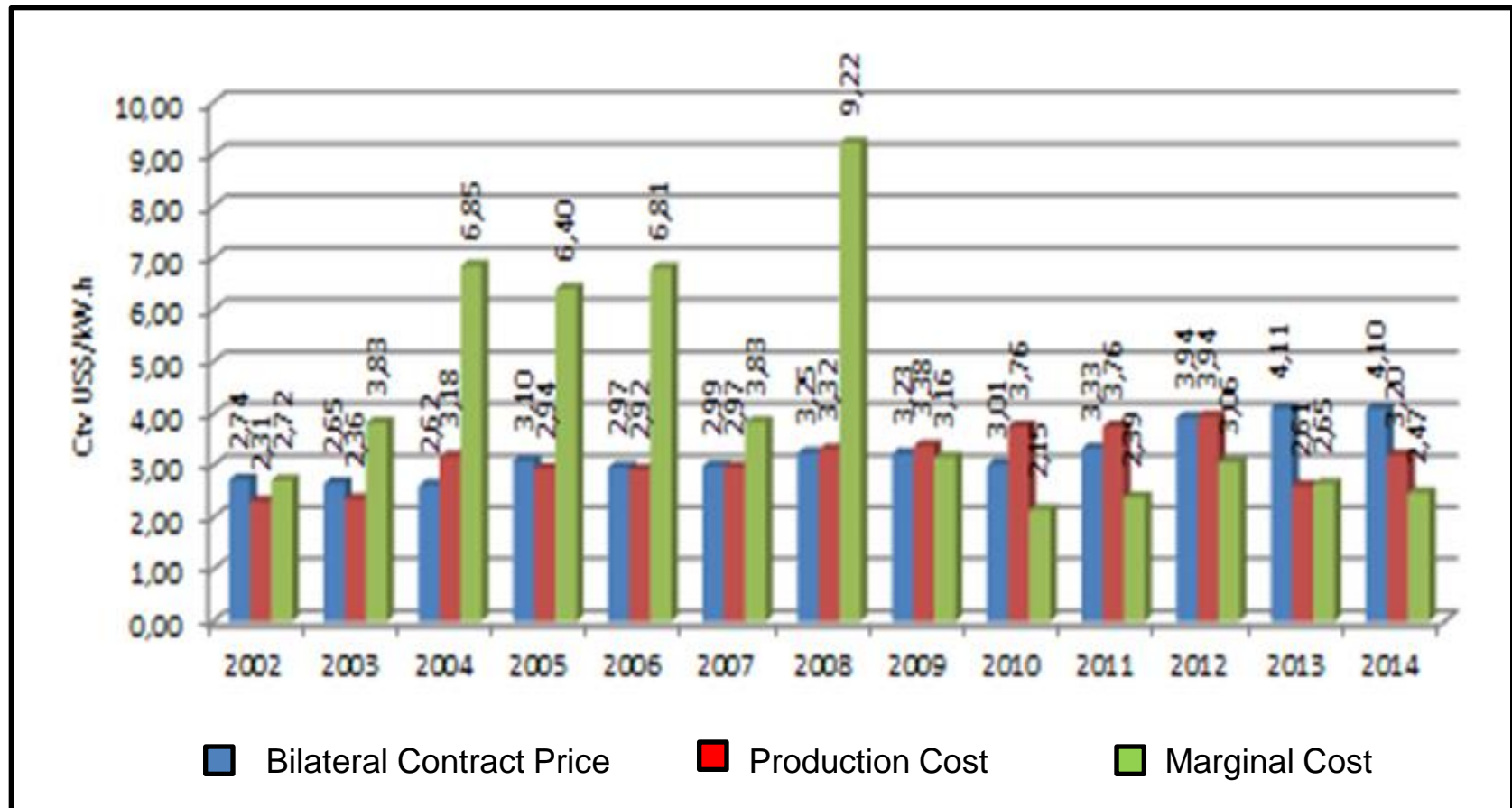
Source: Osinergrmin

ELECTRICAL GENERATION – ENERGY COSTS

Technology	Type of Input	Variable Cost (USD/MWh)	Peak Demand 2014		Annual Energy 2014	
			(MW)	%	(GWh)	%
Renewable	Biomass	---	13	0,2%	176	0,4%
	Solar	---	0	0,0%	200	0,5%
	Wind	---	93	1,6%	256	0,6%
Thermal	Diesel	157 - 251	0	0,0%	55	0,1%
	Fuel Oil	124 - 200	0	0,0%	33	0,1%
	Coal	35	0	0,0%	163	0,4%
	Natural Gas	23 - 47	2566	44,7%	19910	47,6%
Hydro	Water	0	3065	53,4%	21003	50,3%
DEMAND (LOAD)			5737	MW	41796	GWh

Source: Osinermin

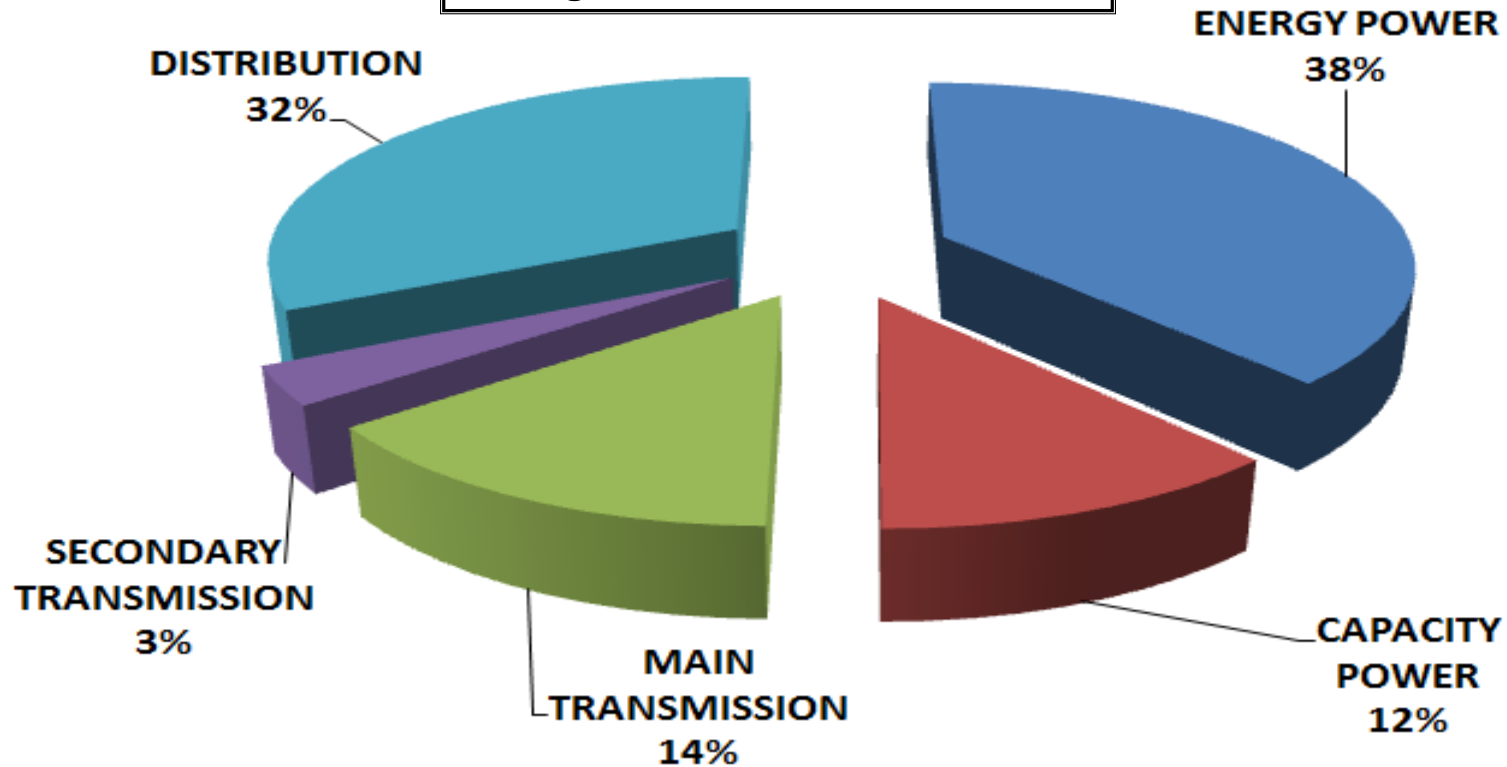
ELECTRICAL GENERATION – ENERGY PRICES



Source: Osinergmin (2015) Annual Report 2014 – Electricity Sector Operation

TARIFF COMPONENTS

Average Tariff = 14,4 US cents/kWh



Residential Tariff – Monthly Consumption 125 kWh – NORTHERN OF LIMA

HYDRO POTENTIAL

According to a recent study, usable potential for hydropower is about 70,000 MW.

86% comes from the resources of the Atlantic Basin, 14% from the Pacific Rim and 0.3% from Titicaca Lagoon Basin.



SOLAR POTENTIAL

Capacity not estimated in terms of solar power for generation projects.

The Solar Atlas ranges only contains records of average solar radiation for each month of the year.

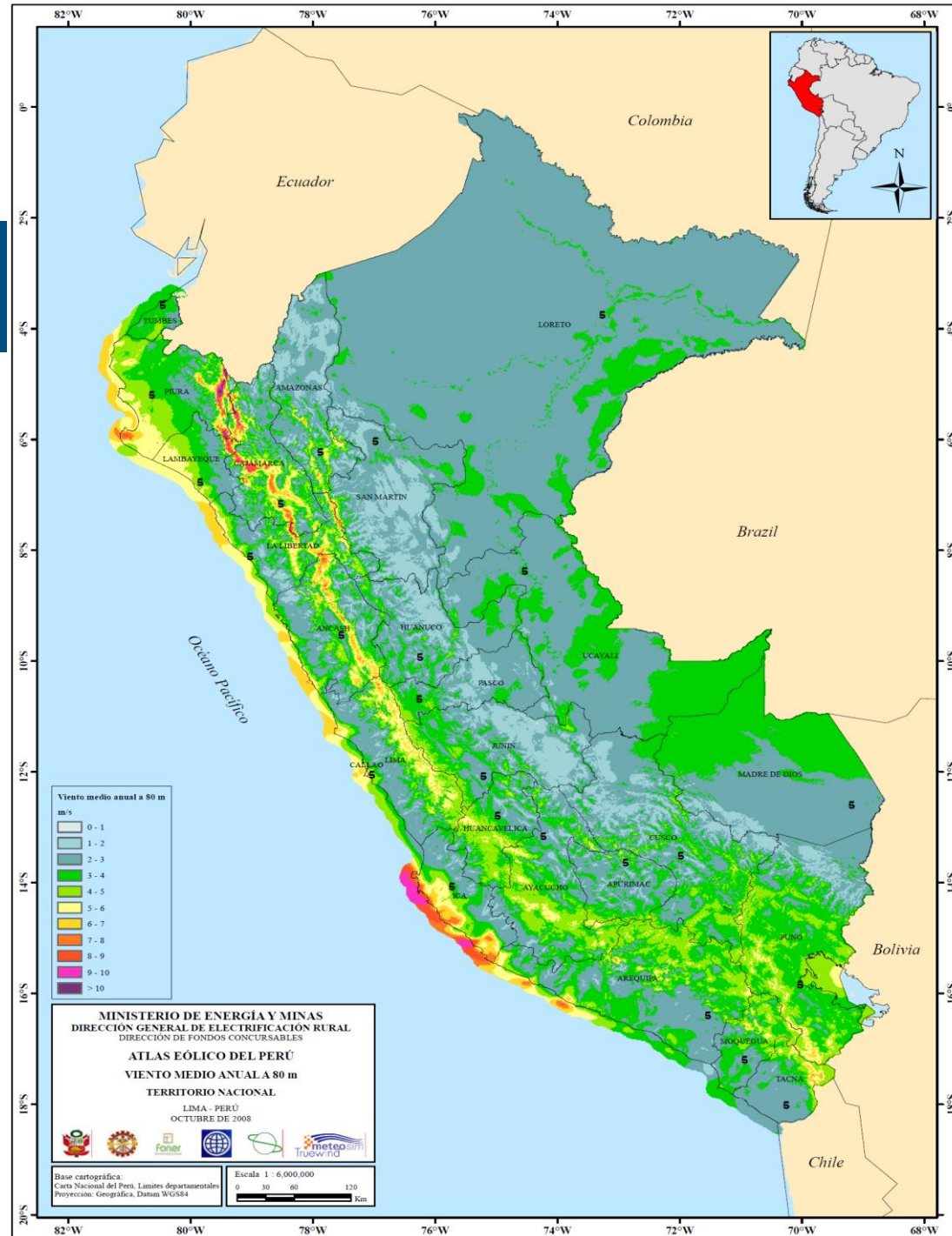
Highest solar irradiation levels in the southern of the country: 6,0 – 6,5 kWh/m²



WIND POTENTIAL

The highest wind potential is located on the coast of Peru, due to the strong influence of the Pacific anticyclone and the mountain range Andes, generating winds from the southwest across the coastal region.

The Wind Atlas estimates a potential of 77,000 MW, of which can be exploited more than 22,000 MW.



BIOMASS POTENTIAL

It is estimated to exploit 177 MW of conventional biomass and 51 MW using biogas.

This is obtained from data records, taking into account agro-industrial waste coming from processing plants of sugar cane, rice husk, cotton, wheat, asparagus and sawmills forest residues.



GEOHERMAL POTENTIAL

There are 6 regions with potential:

Region I: Cajamarca, La Libertad

Region II: Huaylas

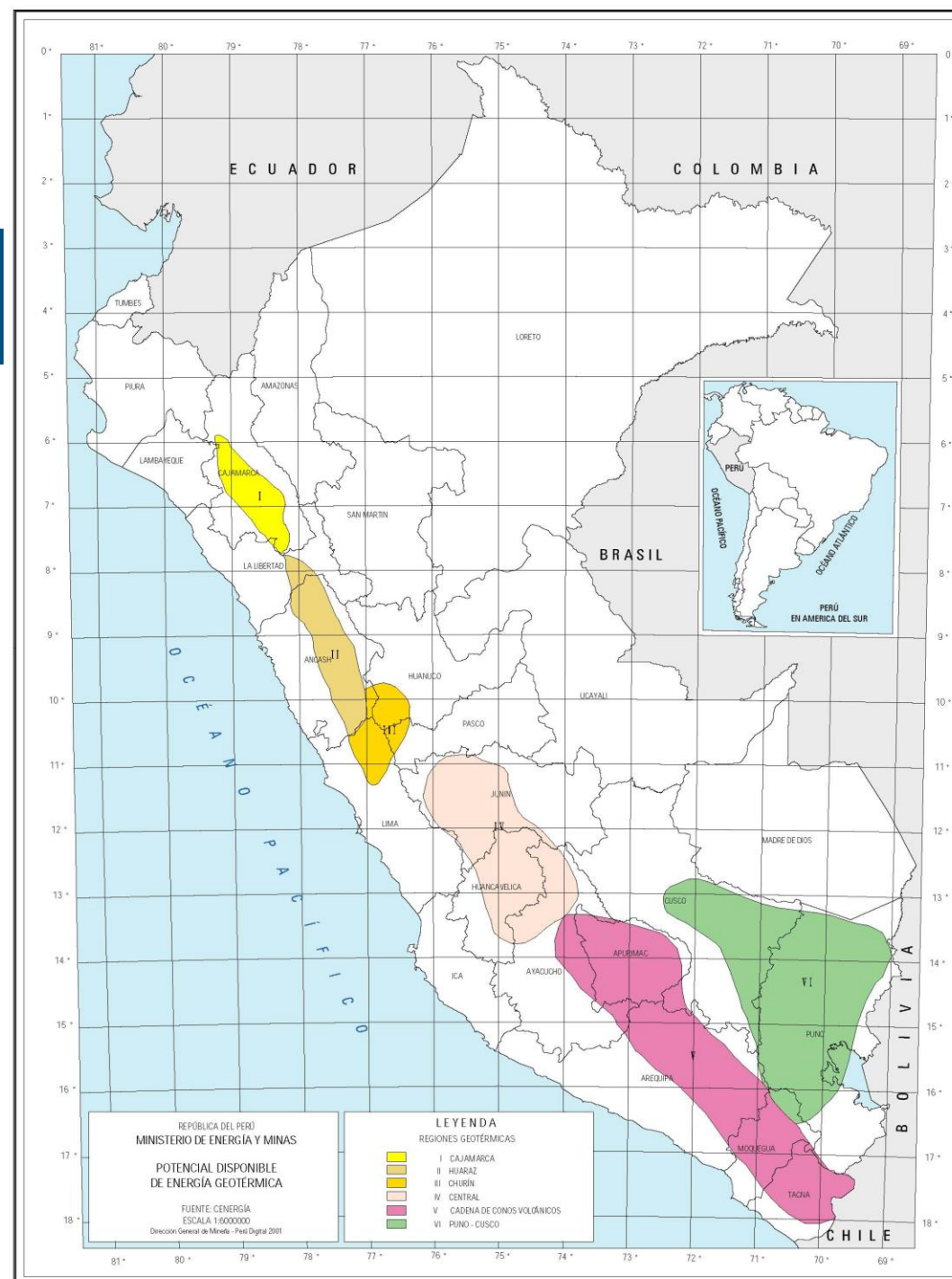
Region III: Churín

Region IV: Central

Region V: Southern Volcanic Chain

Region VI: Puno, Cusco

The greatest potential is in the southern area of the country, especially in the departments of Puno and Cusco.



RENEWABLE ENERGY LEGAL FRAMEWORK

- **Legislative Decree N° 1002 (may 2008) – DL1002**, declares of national interest and public need the development of electricity generation by means of renewable energy resources.
- **Supreme Decree N° 012-2011-EM (march 2011)**, approved DL1002 regulations.
- **Tender documents (2009, 2011, 2013, 2015)**, for each auction of electricity supply with renewable energy resources, originally approved by MEM.

RENEWABLE PROMOTION SCHEME: AUCTIONS

- **Target:** Nowadays on renewable is 5% of energy consumption (*).
- **Frequency:** Every two (2) years MEM sets renewable requirements.
- **Process:** Osinergrmin conducts an auction process to allocate renewable requirements.
- **Tender documents price:** 5000 USD (free available in web page).
- **Supply Contract:** For up to 20 years.
- **Offer:** All contestants must submit offers indicating an annual energy delivered obligation (MWh) and its associated energy price (in US\$/MWh).
- **Incomes:** Winners have the right to:
 - A minimum annual income equivalent to the price offered times the energy delivery obligation, if the obligation is fulfilled.
 - An additional income equivalent to the extra energy valued at CMg.
 - An additional income for reactive power supply.
- **Guarantee of faithful compliance:** 250000 USD/MW.

(*) This target does not include small-hydro energy requirement.

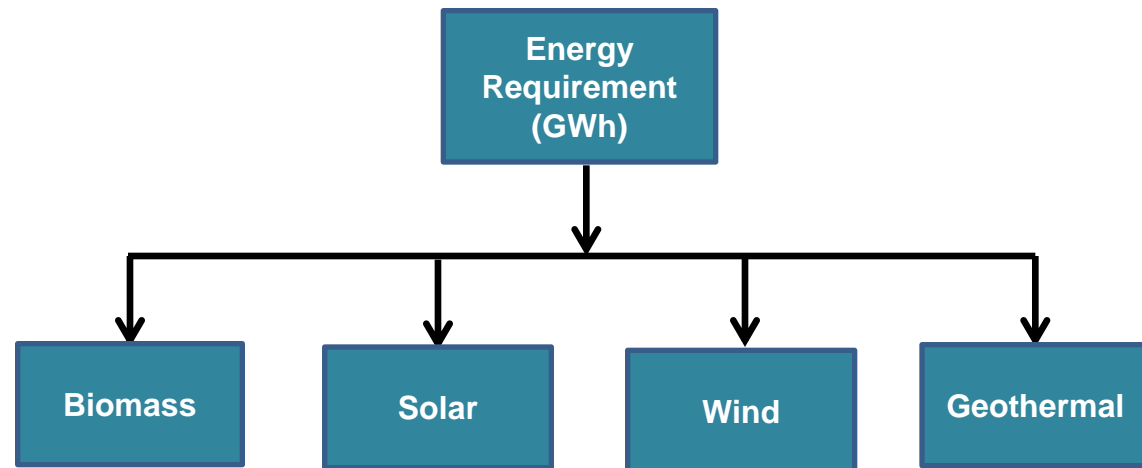
RENEWABLE PROMOTION SCHEME: AUCTIONS

1° MEM defines the total energy requirement

2° MEM assigns the required energy to each technology

3° Osinergmin conducts the auction

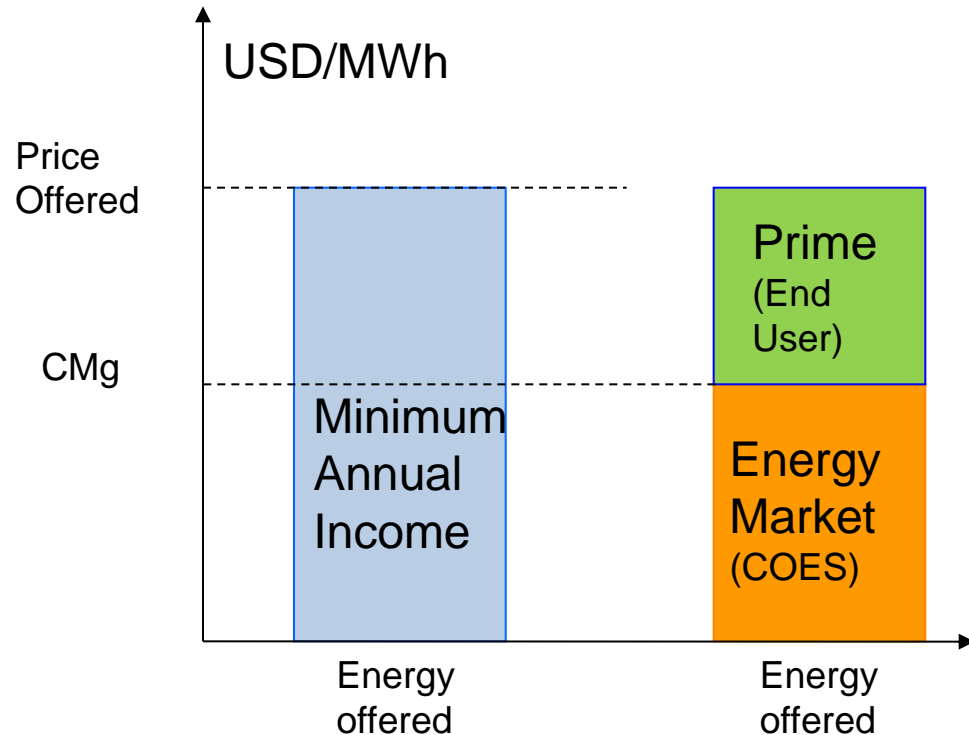
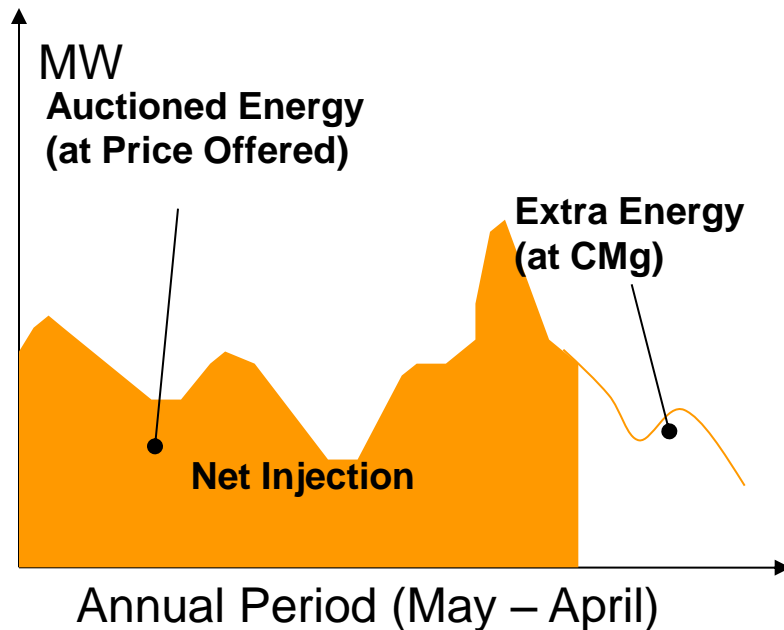
Auction is for each technology



RENEWABLE PROMOTION SCHEME: AUCTIONS

Payment of minimum annual income is made from two sources:

- “Charge of Prime” collected from end users
- Delivered energy (up to the annual obligation) at CMg plus annual capacity payment



AUCTIONS: RENEWABLE ENERGY REQUIREMENT

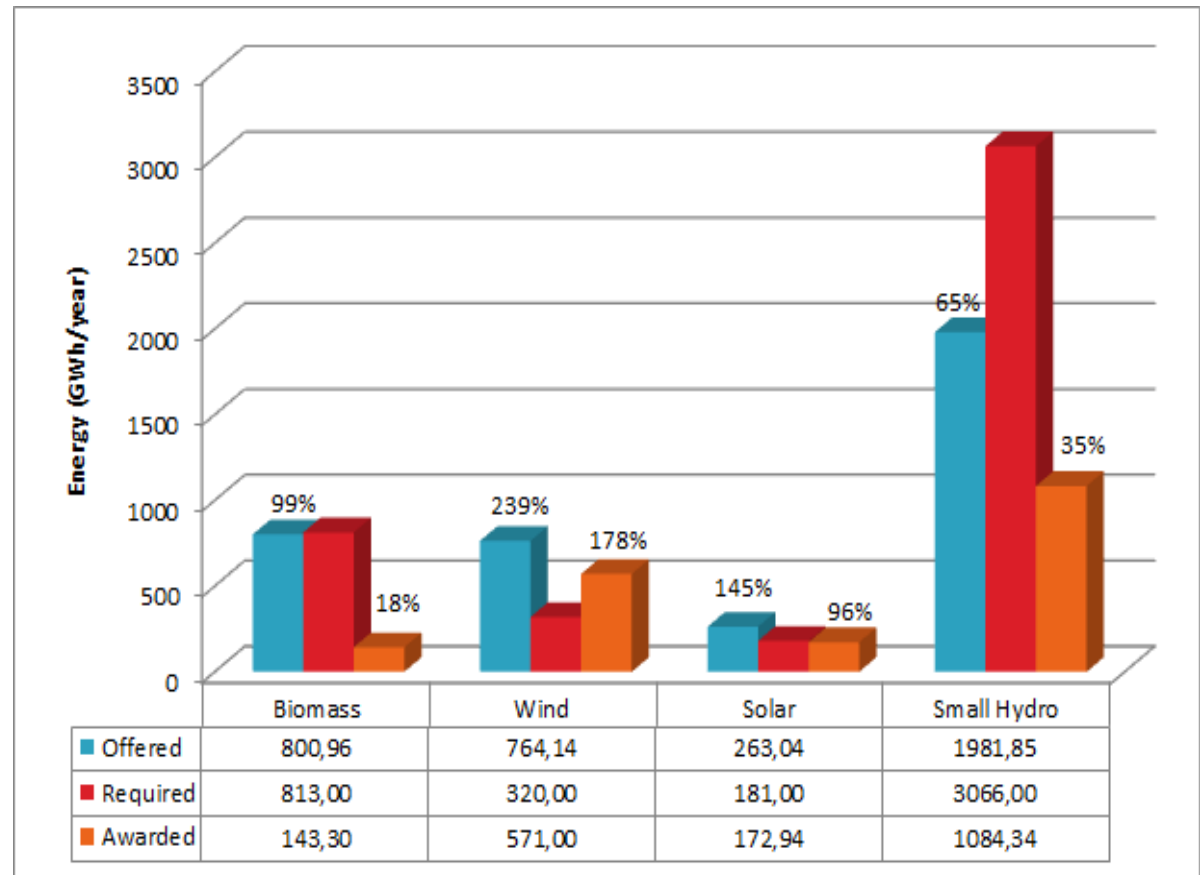
ENERGY REQUIREMENT (GWh/year)

Auction Process (N° / year)	BIOMASS	WIND	SOLAR	TOTAL	Additional SMALL-HYDRO
1 / 2009	813	320	181	1 314	3500
2 / 2011	828	429	43	1300	681
3 / 2013	320	-	-	320	1300

FIRST RENEWABLE ENERGY AUCTION

Quantity of projects:

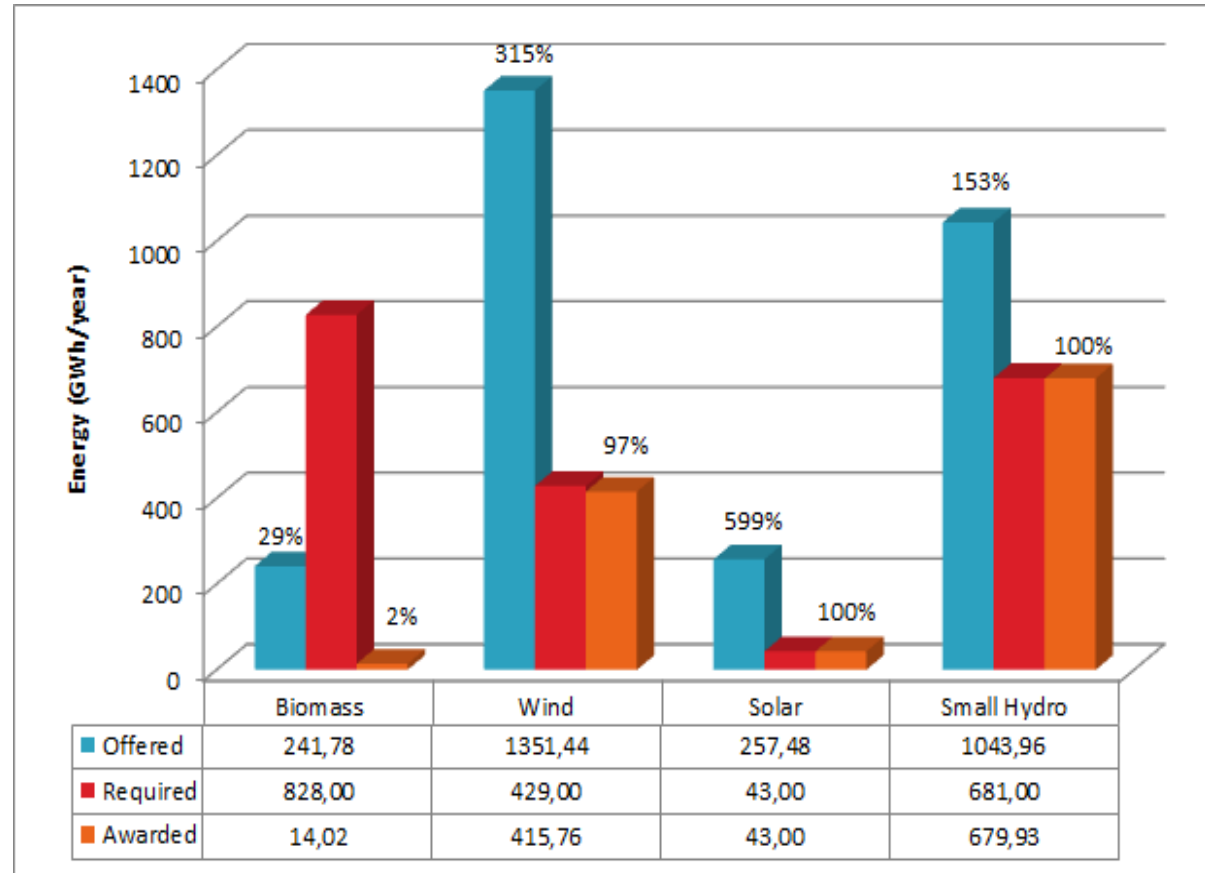
Type	N° Projects	%
Interested	101	
Participants	90	
Bids submitted	33	100%
Bids qualified	31	94%
Winners	26	79%



SECOND RENEWABLE ENERGY AUCTION

Quantity of projects:

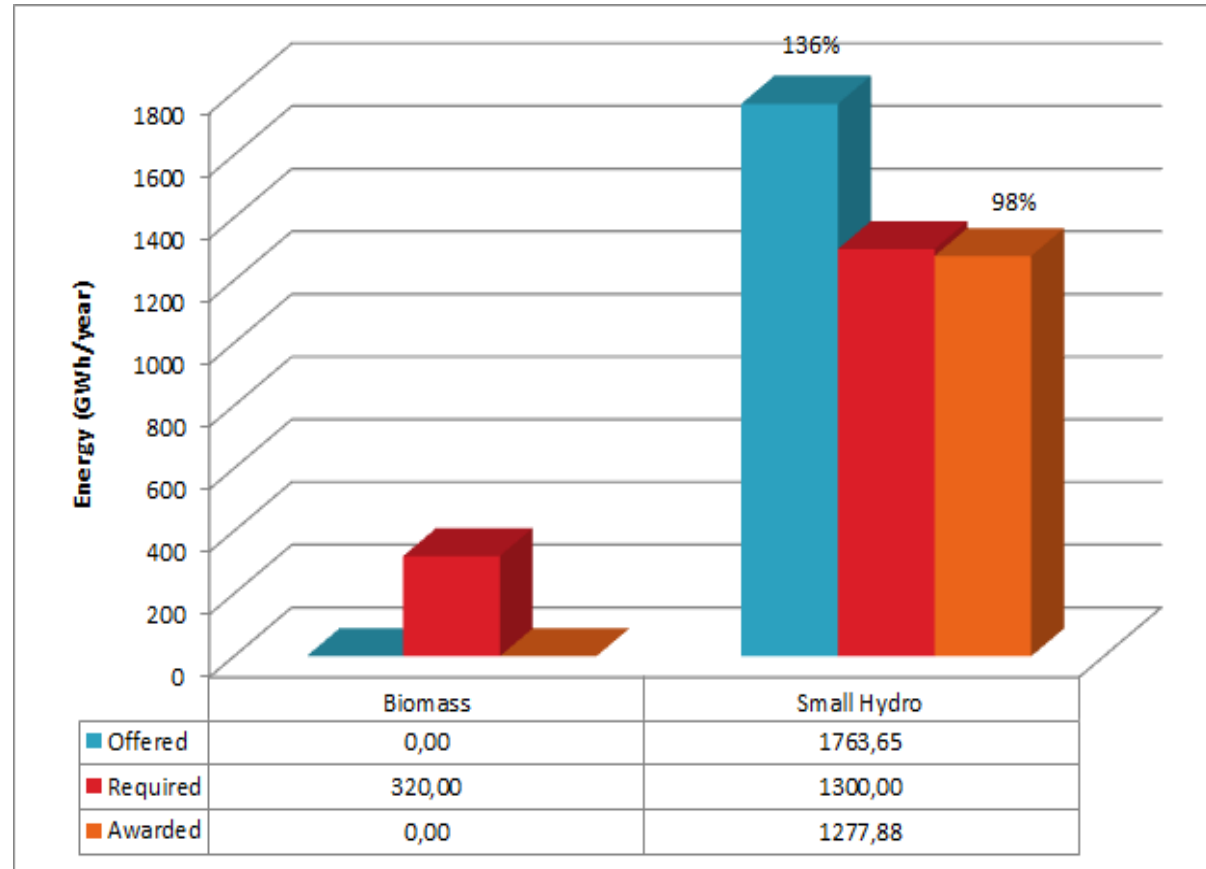
Type	N° Projects	%
Interested	144	
Participants	126	
Bids submitted	39	100%
Bids qualified	37	95%
Winners	10	26%



THIRD RENEWABLE ENERGY AUCTION

Quantity of projects:

Type	N° Projects	%
Interested	42	
Participants	34	
Bids submitted	26	100%
Bids qualified	24	92%
Winners	16	62%

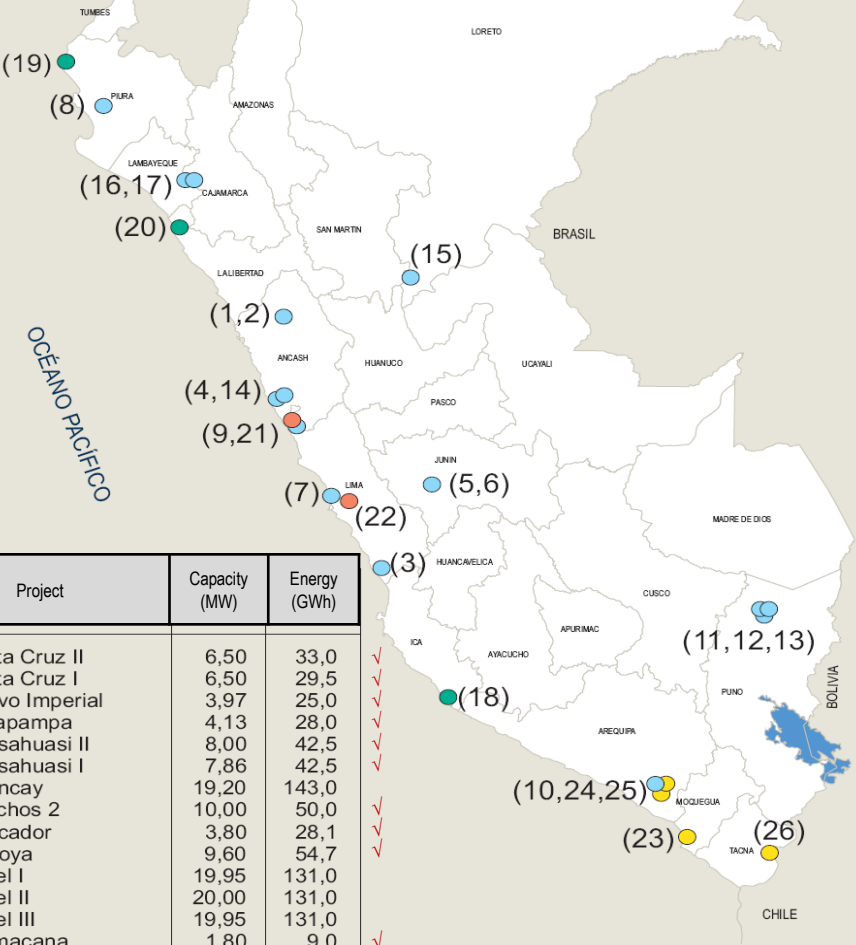


INSTALLED REP

Renewable Energy Projects (REP)

Awarded in the First
Renewable Energy
Auction

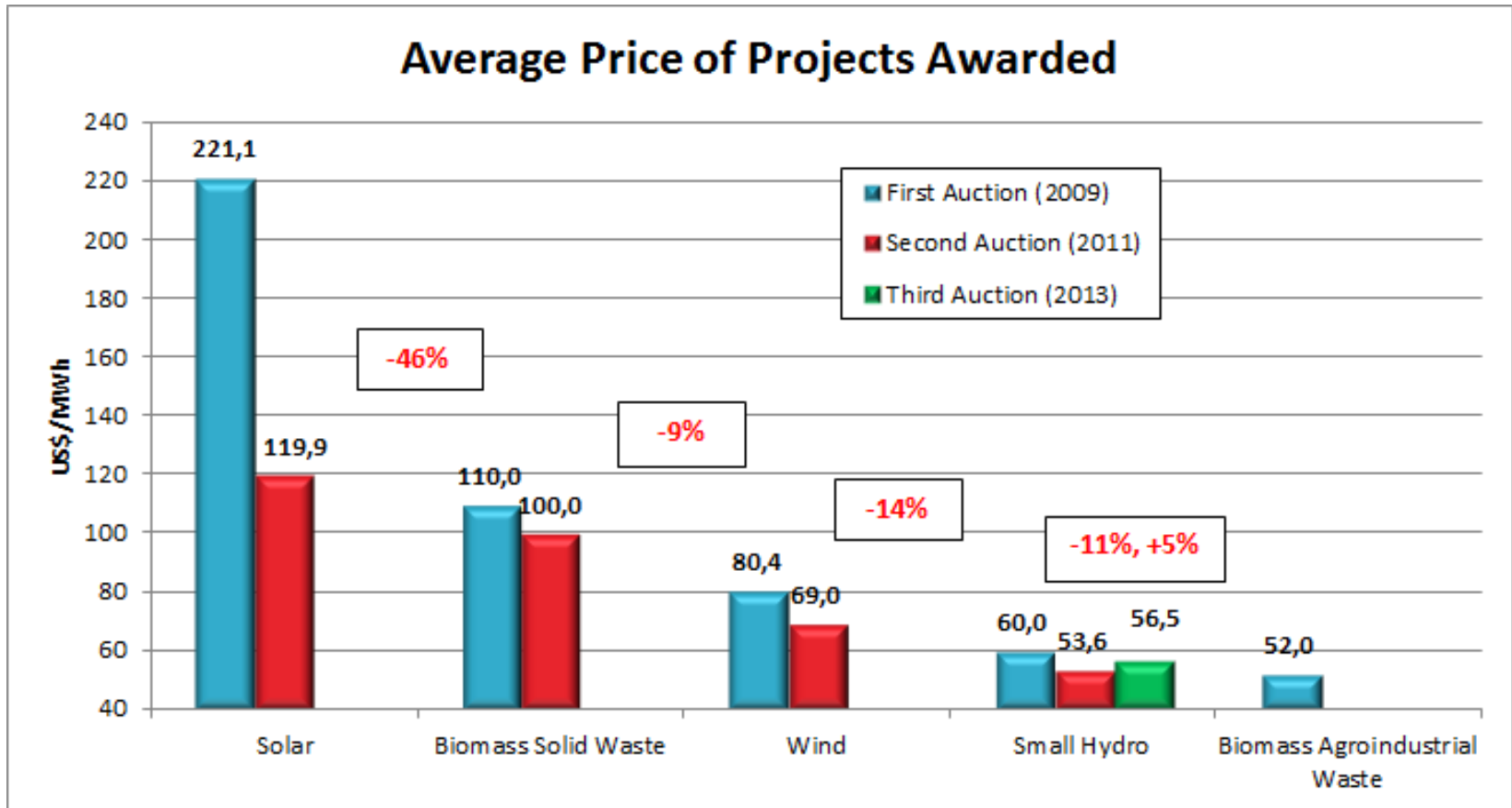
Technology	Project	Capacity (MW)	Energy (GWh)	
1	● Hidro	CH Santa Cruz II	6,50	33,0
2	● Hidro	CH Santa Cruz I	6,50	29,5
3	● Hidro	CH Nuevo Imperial	3,97	25,0
4	● Hidro	CH Yanapampa	4,13	28,0
5	● Hidro	CH Huasahuasi II	8,00	42,5
6	● Hidro	CH Huasahuasi I	7,86	42,5
7	● Hidro	CH Chancay	19,20	143,0
8	● Hidro	CH Poechos 2	10,00	50,0
9	● Hidro	CH Roncador	3,80	28,1
10	● Hidro	CH La Joya	9,60	54,7
11	● Hidro	CH Angel I	19,95	131,0
12	● Hidro	CH Angel II	20,00	131,0
13	● Hidro	CH Angel III	19,95	131,0
14	● Hidro	CH Purmacana	1,80	9,0
15	● Hidro	CH Shima	5,00	32,9
16	● Hidro	CH Carhuaquero IV	10,00	66,5
17	● Hidro	CH Caña Brava	6,00	21,5
18	● Eólica	CE Marcona	32,00	148,4
19	● Eólica	CE Talara	30,00	119,7
20	● Eólica	CE Cupisnique	80,00	303,0
21	● Biomasa	CTC Paramonga I	23,00	115,0
22	● Biomasa	CTB Huaycoloro	4,40	28,3
23	● Solar	Panamericana Solar 20T	20,00	50,7
24	● Solar	Majes Solar 20T	20,00	37,6
25	● Solar	Repartición Solar 20T	20,00	37,4
26	● Solar	Tacna Solar 20TS	20,00	47,2



RENEWABLE ENERGY RESULTS – AUCTIONS

Technology	Project	Capacity (MW)	Price (USD/MWh)	Capacity Factor (%)	Auction N° / Date	Enter Date	Estimated Investment (Mio USD)
Biomass	Paramonga	23	52,0	57,1	1 / 2009	2010	31,0
Biogas	Huaycoloro	4	110,0	73,4	1 / 2009	2011	10,5
	La Gringa V	2	99,9	80,0	2 / 2011	2015	5,1
Wind	Marcona	32	65,5	52,9	1 / 2009	2014	43,6
	Cupisnique	80	85,0	43,0	1 / 2009	2014	198,9
	Talara	30	87,0	46,0	1 / 2009	2014	71,1
	Tres Hermanas	90	69,0	52,7	2 / 2011	2015	185,7
Solar	Panamericana	20	215,0	28,9	1 / 2009	2012	87,0
	Majes	20	222,5	21,5	1 / 2009	2012	73,6
	Repartición	20	225,0	26,9	1 / 2009	2012	73,5
	Tacna	20	223,0	21,4	1 / 2009	2012	85,0
	Moquegua	16	119,9	30,5	2 / 2011	2014	43,0
Small hydro	17 plants	180	~60,0	~80,0	1 / 2009	2009-17	302,5
	7 plants	102	~53,6	~80,0	2 / 2011	2014-16	214,5
	14 plants	197	~56,5	~80,0	3 / 2013	2014-18	527,4
	Total	836					1952,4

AUCTIONS – AVERAGE PRICE RESULTS



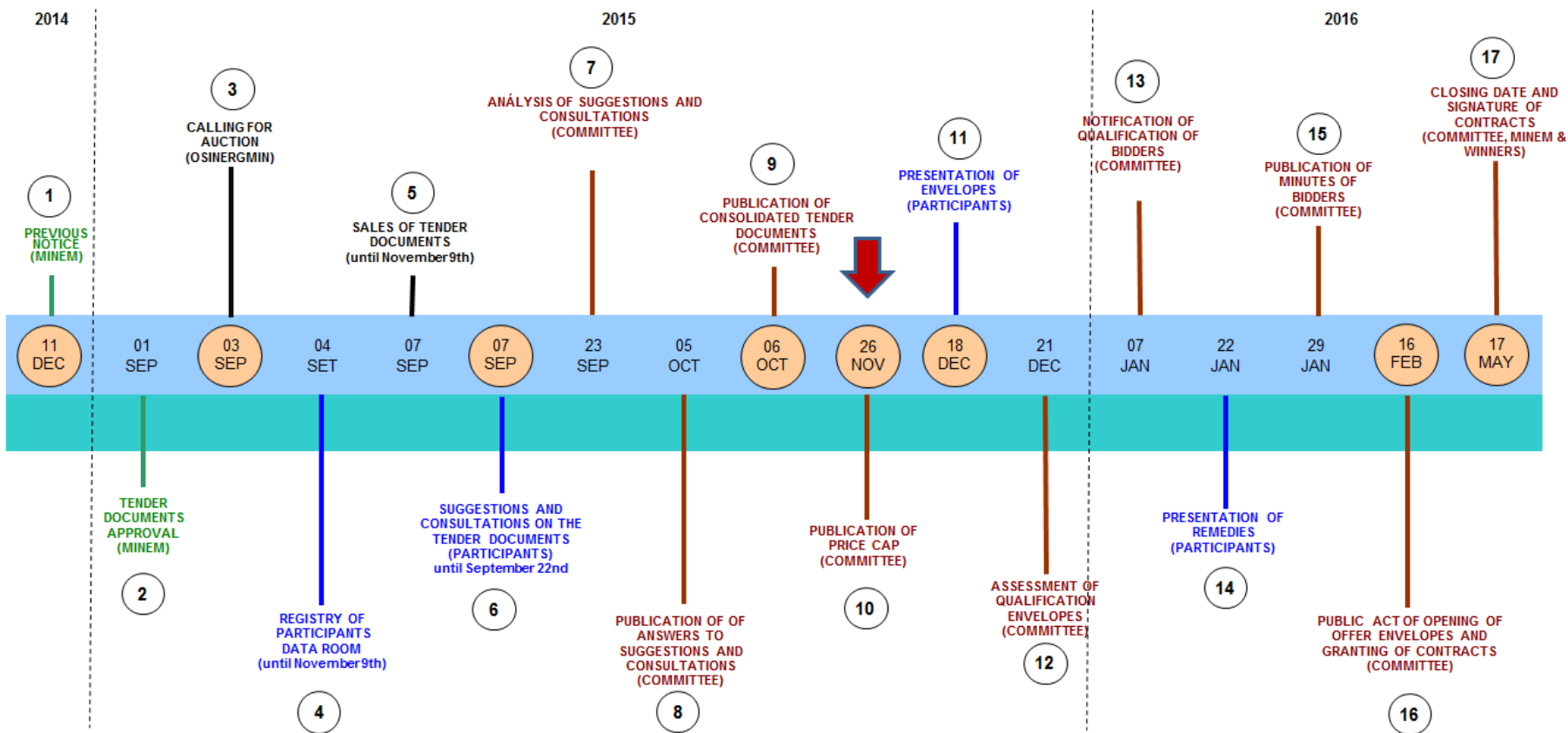
NEW: FOURTH RENEWABLE ENERGY AUCTION

ENERGY REQUIREMENT (GWh/year)

BIOMASS				WIND	SOLAR	TOTAL	ADDITIONAL SMALL HYDRO
Forestry Residues	Agricultural Residues	Solid Waste Incineration	Solid Waste Biogas				
125	125	31	31	573	415	1 300	450

Awarded generation projects must be enter to operate close to December 31th, 2018 (maximum date: December 31th, 2020).

RENEWABLE ENERGY AUCTION SCHEDULE



SUSTAINABLE ENERGY MATRIX PLAN

OPTION	BASE PLAN	NUMES PLAN
Electricity generation structure	Hydroelectric 70% Natural Gas 25% Renewable Energy Resources 5%	Hydroelectric 40% Natural Gas 40% Renewable Energy Resources 20%
Petrochemistry	Ica region, South	Base
Gas transmission	South and North	Base
Export	Existing contracts	Base NG, EE regional exports
Oil	Not develop heavy oil	Heavy crude develop
Biofuels	5% Diesel, 7,8% Ethanol	5% diesel, 10% ethanol
Gas hedges	14% to 2040	18% to 2040, maximum coverage
GNV Exploration	3 to TCF additional by five-year period	Base
Energy Efficiency	current situation	15% savings

CLIMATE INVESTMENT IN LAC

CLIMATESCOPE 2013

OVERVIEW INFOGRAPHICS FULL REPORT SOURCE DATA CASE STUDIES **ENG** ESP

RESET RESULTS

SHARE

KEY

Peru

GDP: \$326.7bn
6-year Compounded Annual GDP Growth Rate: 9%
Population: 30.5m
Installed Power Capacity: 9GW
Renewable Share of Capacity:
Clean Energy Generation:

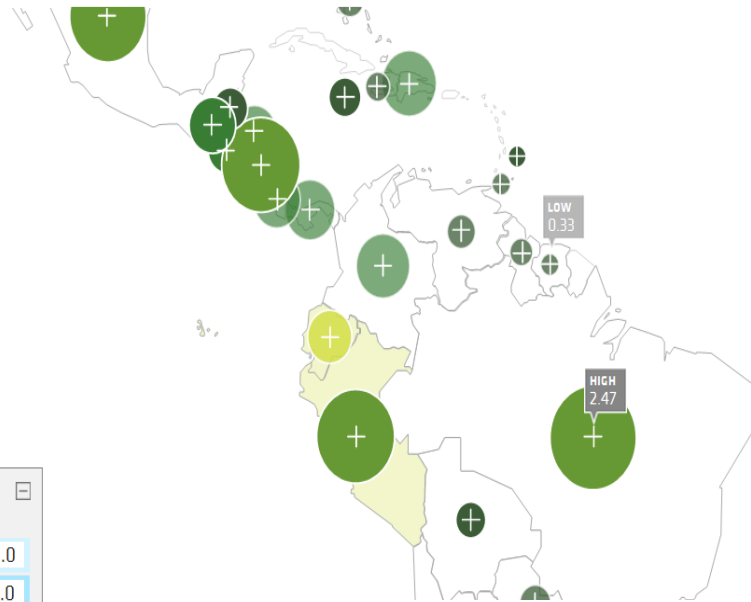
DOWNLOAD
PROFILE (PDF) DATA (Excel)

PARAMETER WEIGHTS (%)

Customize percentages by number or by scale bar

I. Enabling Framework	40.0
II. Clean Energy Investment & Climate Financing	30.0
III. Low-Carbon Business & Clean Energy Value Chain	10.0
IV. Greenhouse Gas Management Activities	20.0

Reset Weights



RANKING & SCORES		
1	2.47	Brazil
2	2.41	Chile
3	2.26	Nicaragua
4	2.25	Peru
5	2.19	Mexico
6	1.67	Uruguay
7	1.67	Argentina
8	1.58	Dominican Republic
9	1.54	Colombia
10	1.44	Panama
11	1.36	Costa Rica
12	1.34	Guatemala
13	1.27	Ecuador
14	1.23	Honduras
15	1.08	El Salvador
16	1.00	Belize
17	0.94	Jamaica
18	0.90	Paraguay
19	0.86	Bolivia
20	0.81	Venezuela
21	0.80	Bahamas
22	0.71	Haiti
23	0.67	Guyana
24	0.54	Trinidad and Tobago

SUMMARY

As one of the fastest growing Latin American economies, Peru repeated its strong performance on last year's *Climatescope*, landing fourth in this year's survey with a 2.25 score. The country performed well in all four parameters and placed no lower

solar installed capacity. A total of 80MW was commissioned in the arid south of the country. An additional 62MW of biomass and small hydro capacity was added that year, resulting in a 24% increase in clean energy participation of total national capacity.

Thanks to high economic growth and to local tenders held for clean energy power contracts, the South American country had an impressive year for clean energy investment and installations. It saw the fourth highest renewable installation growth in the region and the biggest jump in clean energy financial commitments. In 2012, Peru became the Latin American country with the most

Peru doubled its cumulative clean energy investment in 2012, to \$1.2bn compared with \$1.3bn over the whole 2006-2011 period. This was the first time that Peru passed the \$1bn annual mark in financing. In the short term, we expect the marked increase in installations to continue, as the country's first wind farms get commissioned in 2013 and energy demand continues to rise, powered by economic growth and the mining industry.

COMMENTS ABOUT RENEWABLE ENERGY AUCTIONS

- ✓ The democratic stability and a strong regulatory framework are fundamental for attracting investments (security in the long term).
- ✓ The government support has helped to overcome difficulties in the renewable energy development.
- ✓ Auctions have proved to be an effective mechanism to obtain efficient results based on encourage of competition between the different renewable energy projects.
- ✓ In short: Clear and simple rules and regulations have been the key of the success of the promotional scheme for renewables in Peru.

INFORMATION SYSTEM

The screenshot displays the Osinerghmin website interface. At the top left is the Osinerghmin logo and name. To the right are navigation links: Oficina Virtual, Noticias, Mapa de Sitio, and Transparencia. Below these are contact details: Lima: 01-2193410 and Provincias: 0800-41800. A search bar is located on the right side of the header.

The main content area features a navigation menu with 'Nosotros', 'Usuarios', and 'Empresas'. Under 'Empresas', there is a dropdown menu with the following items: 'Electricidad', 'Hidrocarburos Líquidos y GLP', 'Gas Natural', and 'Energías Renovables - Subastas'. The 'Energías Renovables - Subastas' item is circled in red.

Below the navigation menu is a large banner for the 'FACILITO' application, with the text 'Descarga la nueva aplicación FACILITO'. To the right of the banner is a 'CONSULTAS' section with a grid of service tiles: 'ELECTRICIDAD', 'GRIFOS', 'BALÓN DE GAS / GLP', 'GAS NATURAL', and 'MINERÍA'. Each tile has a corresponding icon.

Below the banner is a 'CONSEJOS' section with a featured article titled '12 OCT Cinco consejos antes de comprar combustible'. The article text reads: 'En el marco del Día Mundial del Consumidor, Osinerghmin recomienda a los conductores 5 sencillos consejos antes de cargar combustible:'. There is a 'Ver más consejos >' link below the article.

At the bottom of the main content area is a 'VIDEOS' section. To the right is an 'AGENDA' section with the title 'Próximos Eventos' and a featured event: 'I Foro de Energía - Perú', 'Del 4 de noviembre al 6 de noviembre'. Below the event title is the website 'www.foroenergia.com.pe' and a brief description of the forum's topics.

The bottom of the screenshot shows a Windows taskbar with various application icons and a system tray on the right displaying 'Intranet local | Modo protegido: desactivado', '100%' zoom, and the date/time '01:06 PM 22/10/2015'.

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Dankeschön

