



Federal Ministry
for Economic Affairs
and Energy



SAMI
Energy Consulting



Decentralized Energy Supply to Mining and Industry in Perú: Current Situation and Perspectives

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Facilitator

INDEX

1.- Peruvian Electric System

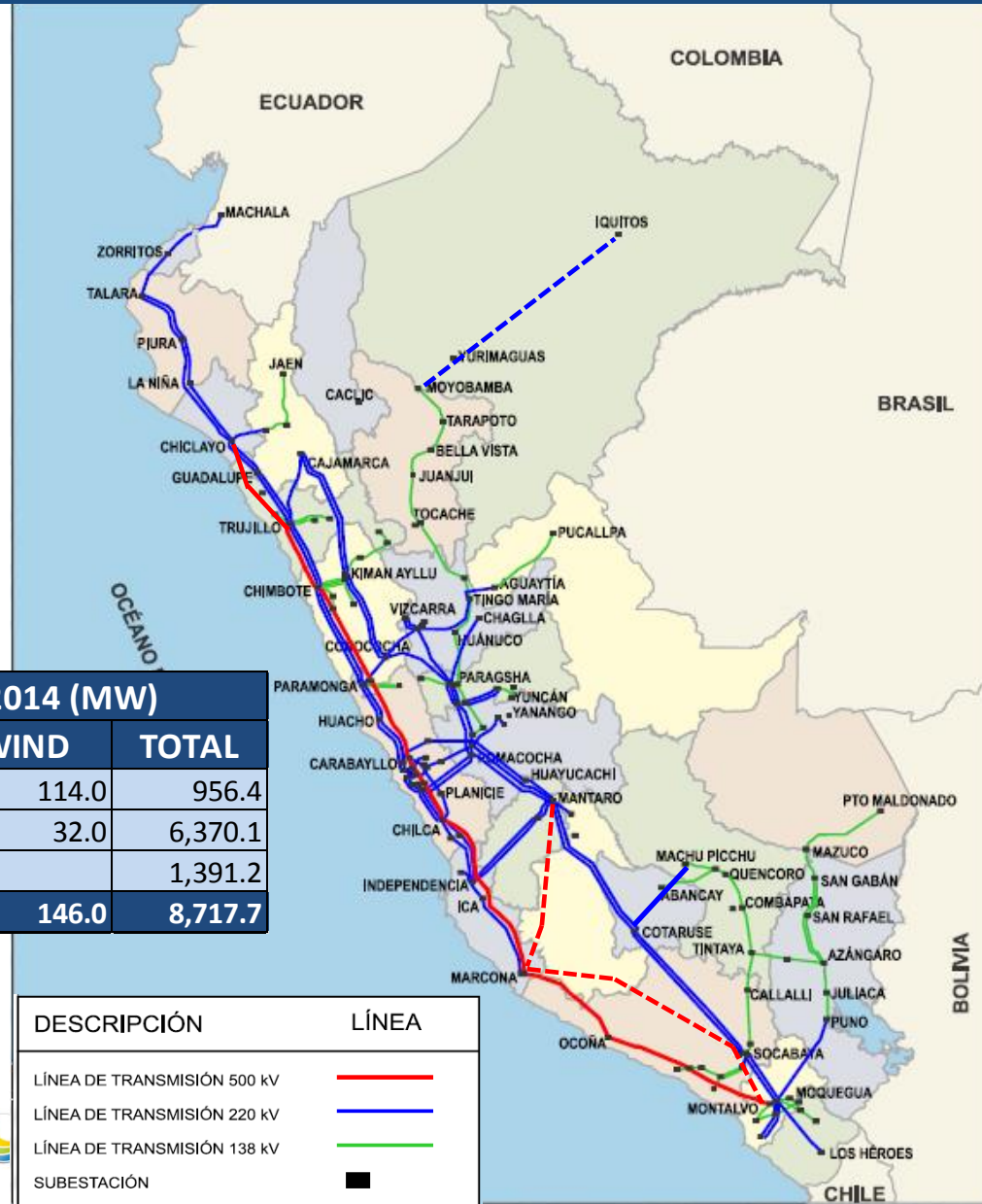
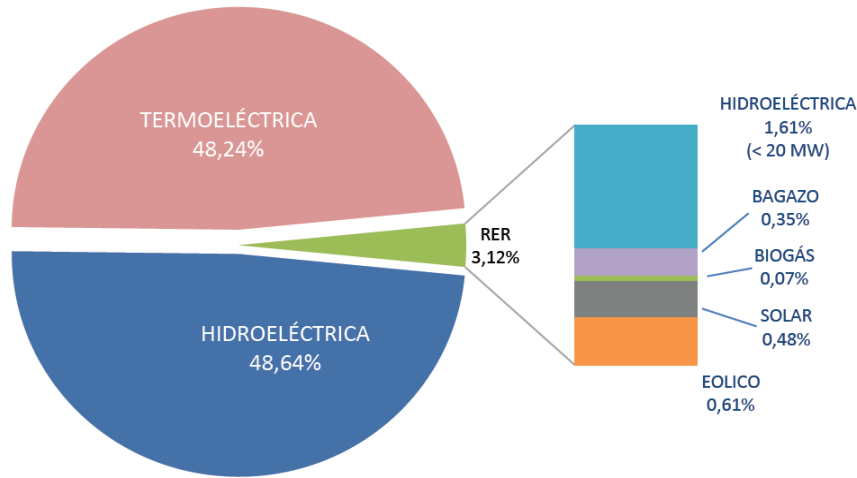
2.- Energy supply to the Mining and Industry

3.- Challenges and Opportunities of Renewables in mining

4.- Social and environmental contribution of renewables

PERUVIAN ELECTRICAL SYSTEM

in Energy. Year 2014: 41,796 GWh



AREA	EFFECTIVE POWER TO DECEMBER 2014 (MW)				
	HYDRO	THERMAL	SOLAR	WIND	TOTAL
NORTH	473.0	369.5		114.0	956.4
CENTER	2,412.1	3,926.1		32.0	6,370.1
SOUTH	427.2	868.0	96.0		1,391.2
TOTAL COES	3,312.3	5,163.6	96.0	146.0	8,717.7

Source: Coes Sinac

DESCRIPCIÓN	LÍNEA
LÍNEA DE TRANSMISIÓN 500 kV	
LÍNEA DE TRANSMISIÓN 220 kV	
LÍNEA DE TRANSMISIÓN 138 kV	
SUBESTACIÓN	

NATIONAL ELECTRICITY DEMAND - HISTORICAL AND PROJECTED

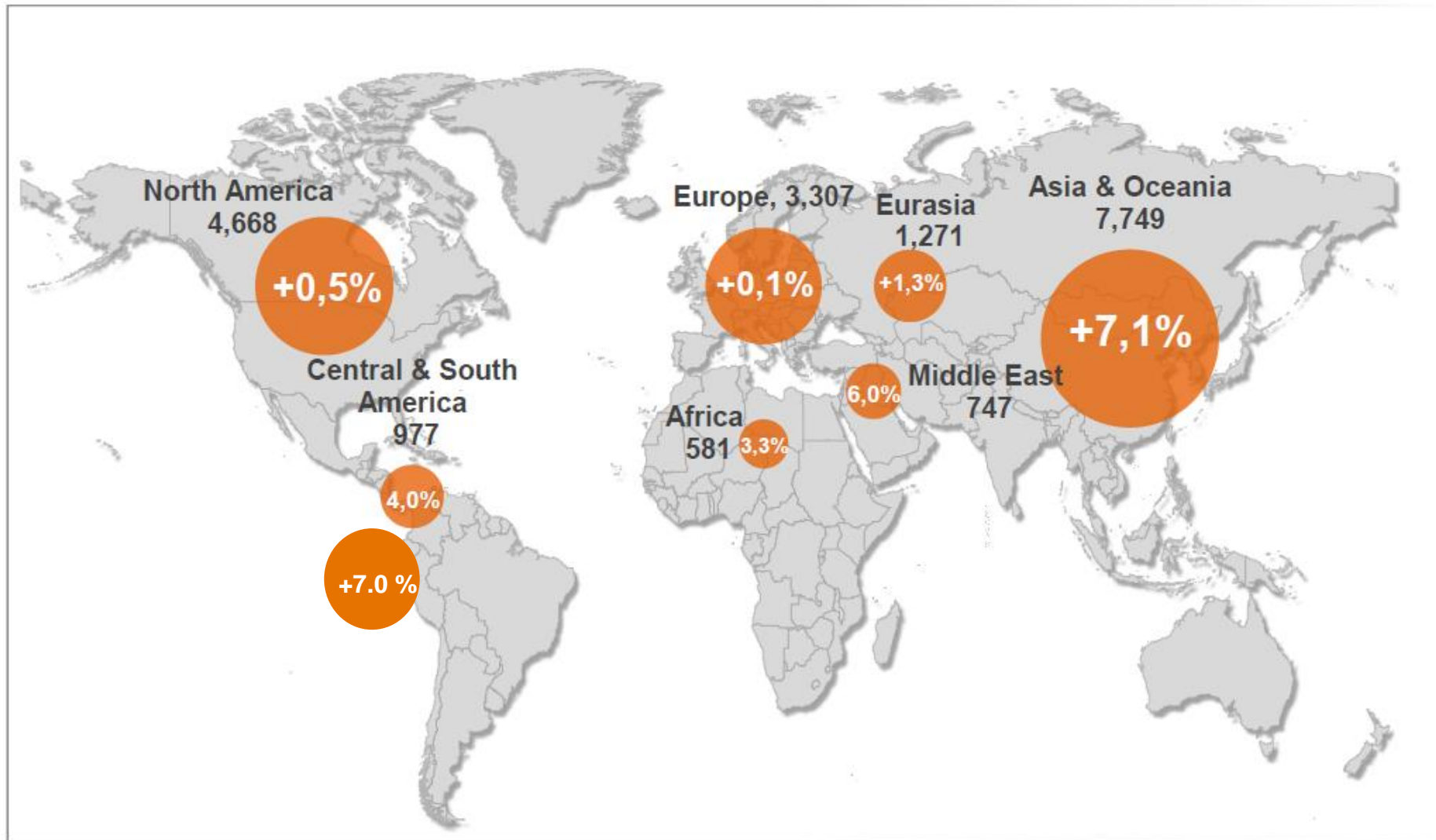
ENERGY PRODUCTION IN PERU (GWh) 2010 - 2014

YEAR	GWh-año	%
2010	32 426.8	8.79%
2011	35 217.4	8.61%
2012	37 321.2	5.97%
2013	39 669.4	6.29%
2014	41 795.9	5.36%
Average 5 years -- >		7.00%

Source: Coes Sinac

YEAR	ENERGY		POWER	
	GWh	%	MW	%
2014	41,796	5.4%	5,737	2.9%
2015	44,005	5.3%	6,105	6.4%
2016	48,494	10.2%	6,813	11.6%
2017	53,973	11.3%	7,488	9.9%
2018	60,450	12.0%	8,169	9.1%
2019	66,374	9.8%	8,888	8.8%
2020	71,950	8.4%	9,635	8.4%
2021	76,842	6.8%	10,280	6.7%
2022	81,453	6.0%	10,876	5.8%
2023	85,851	5.4%	11,442	5.2%
2024	89,972	4.8%	12,003	4.9%
2025	93,751	4.2%	12,519	4.3%
2026	97,595	4.1%	13,057	4.3%
AVERAGE 2015-2026		7.4%		7.1%

ELECTRICITY DEMAND GROWTH WORLD - LAST 5 YEARS



ELECTRIFICATION RATE IN PERU

	Year 2000	Year 2014
National Electrification Coefficient Peru	68%	92%

Source: Minem



Consumption per capita (kWh/capita)			
Country	2000	2014	%
Perú	678.0	1,357.0	100%
Chile	2,481.2	3,667.3	48%

Population (million inhabitants)			
Country	2000	2014	%
Perú	26.0	30.8	18%
Chile	15.4	17.8	15%

Source: INEI, Coes, CNE Chile

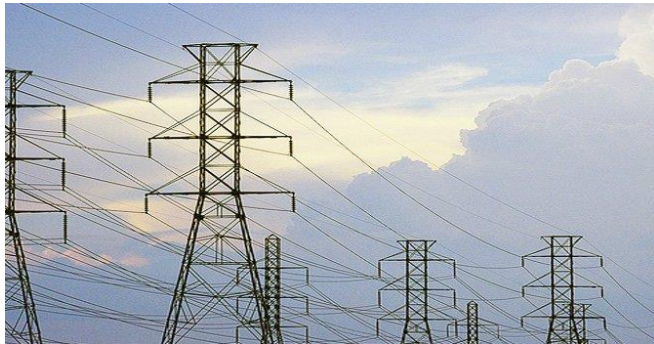
2.- ELECTRICAL SUPPLY TO MINING AND INDUSTRY

- Large Energy Consumers 24 horas. Mining -> **30%** of demand (1,800 MW), Industry -> **15%** of demand (860 MW).
- Main supply - SEIN (National Grid) with Diesel as support groups and for remote areas.
- Mining: Supply Contrats of 5 to 10 years ---> Reserves and market prices -> mine life.
- In its concessions there are available energy resources (water, sun, wind, and geothermal).



ENERGY REQUIREMENTS OF MINING AND INDUSTRY

- **Availability of Energy:** enough energy without congestion or overload, 24 hours a day.



- **Quality and Low Cost:** Electrical parameters within the limits established by NTCSE and reduce energy costs..

- **Reliability:** Supply Guarantee with minimum of interruptions.

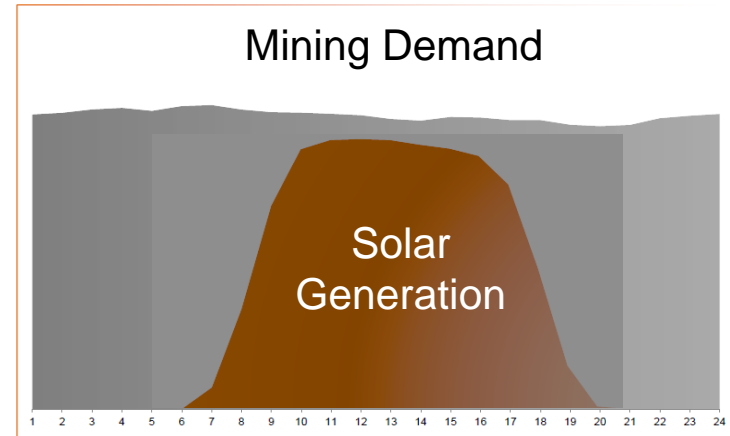


3.- CHALLENGES OF RENEWABLES FOR MINING AND INDUSTRY

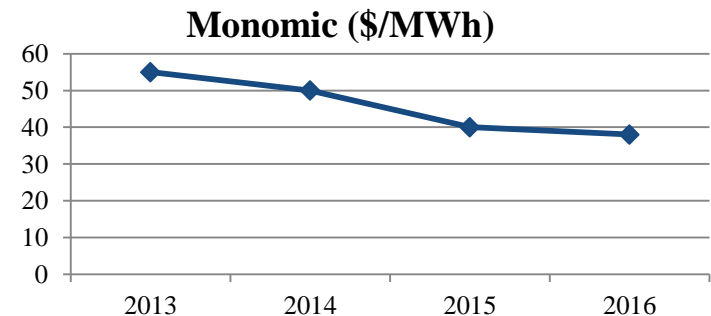
- **Continuity of service:** In hours no sun. Flashing. Energy storage. Fulfillment of supply contracts.



- **New Contracts Down:** monomic Prices less than \$ 40 / MWh for the generator + \$ 25 / MWh for transmission and others for end-user.

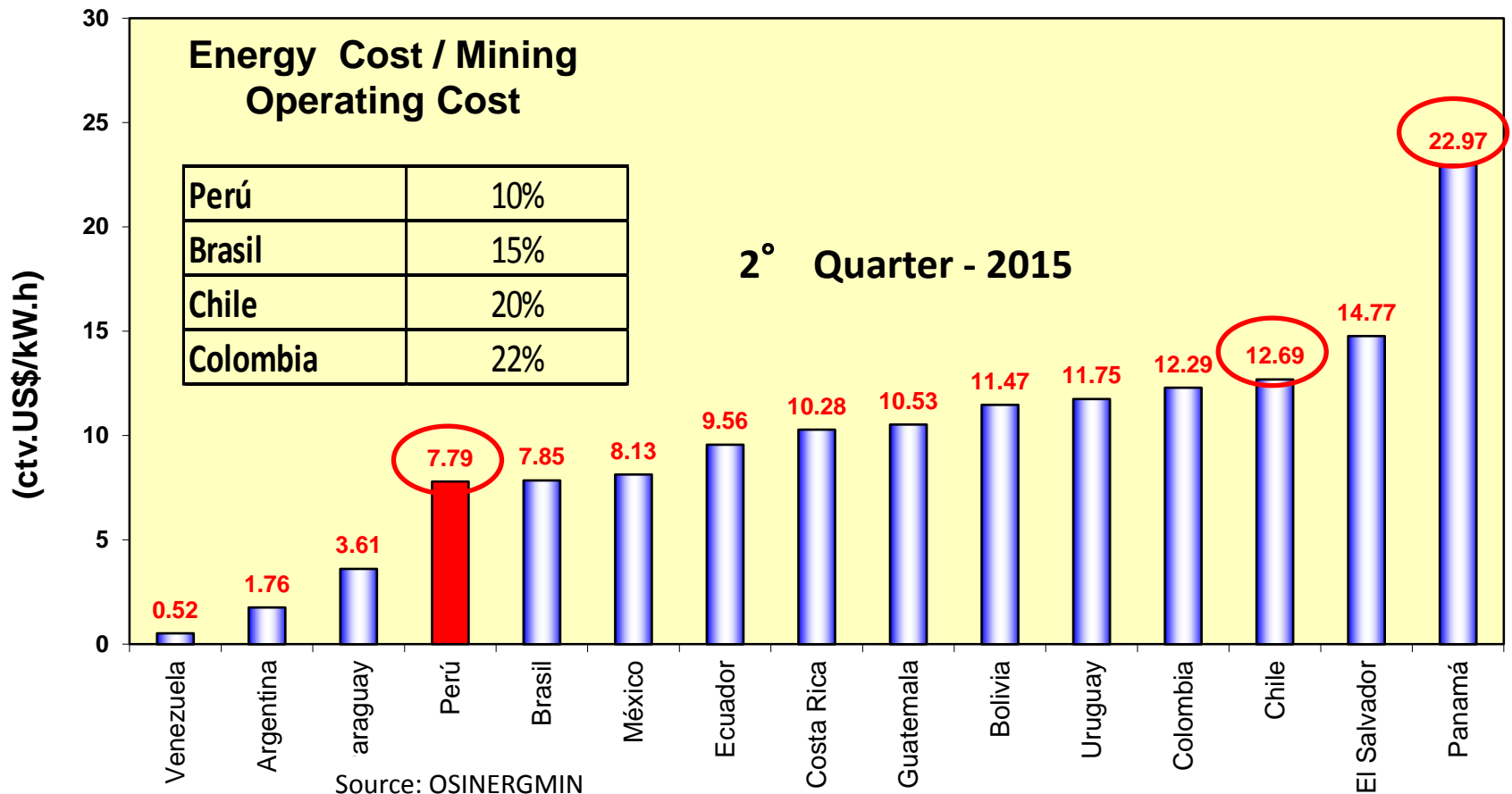


- **Over generation:** Reserve Margin of 40%. Mining projects delayed. Social Issues. Political Decision.



ENERGY TARIFFS - LATIN AMERICAN INDUSTRY

Electricity Tariffs Industrial Sector - Monthly consumption of 500 000 kW.h



CHALLENGES OF RENEWABLES FOR MINING AND INDUSTRY



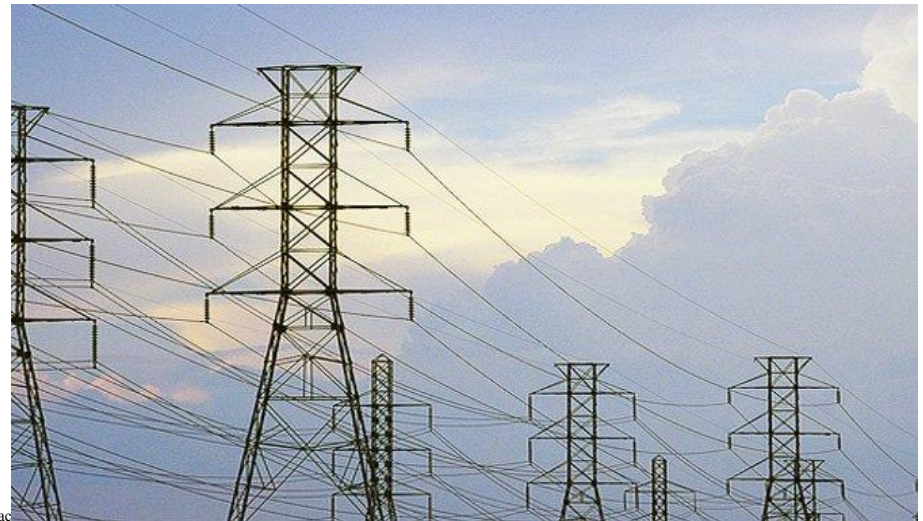
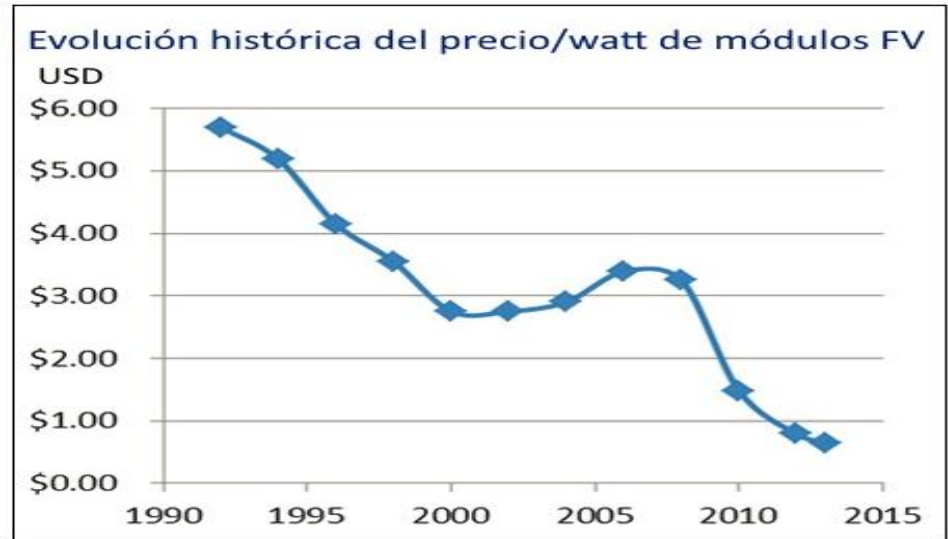
- **Geography:** Irregular terrain and altitud of mining operations. Serfage agreements with communities.

- **Short Renewable Culture:** Last 10 years, with much impulse to the gas thermal generation. Custom for conventional energy.

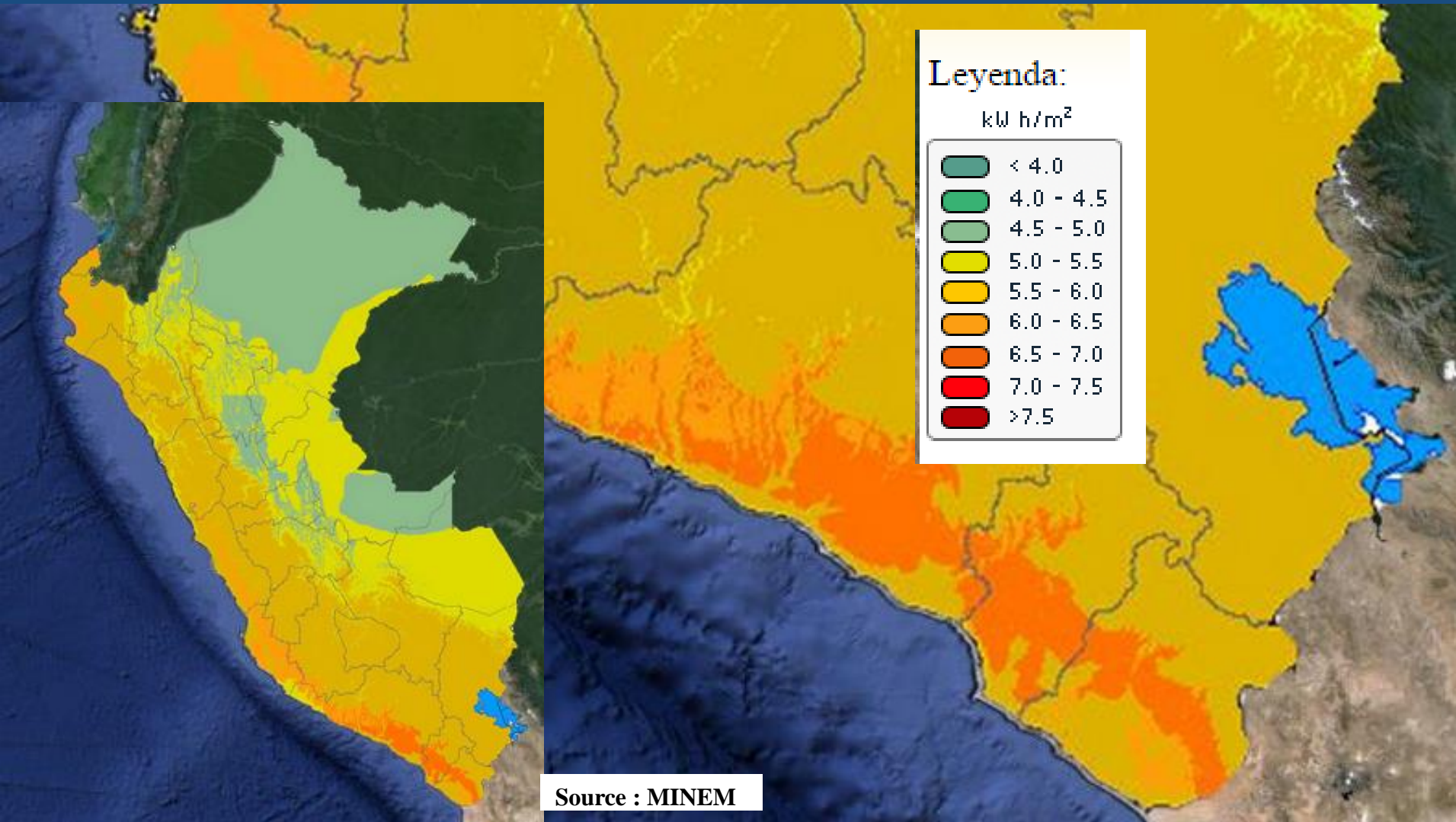


3.- OPPORTUNITIES OF RENEWABLES FOR MINING

- **Cost reduction:** The new solar technologies are lowering in costs per kW-installed. More competitive.
- **Leg. Dec. 1002 (RER):** transmission development plans taking into account the RER and international interconnection.



HIGH SOLAR RADIATION IN PERU

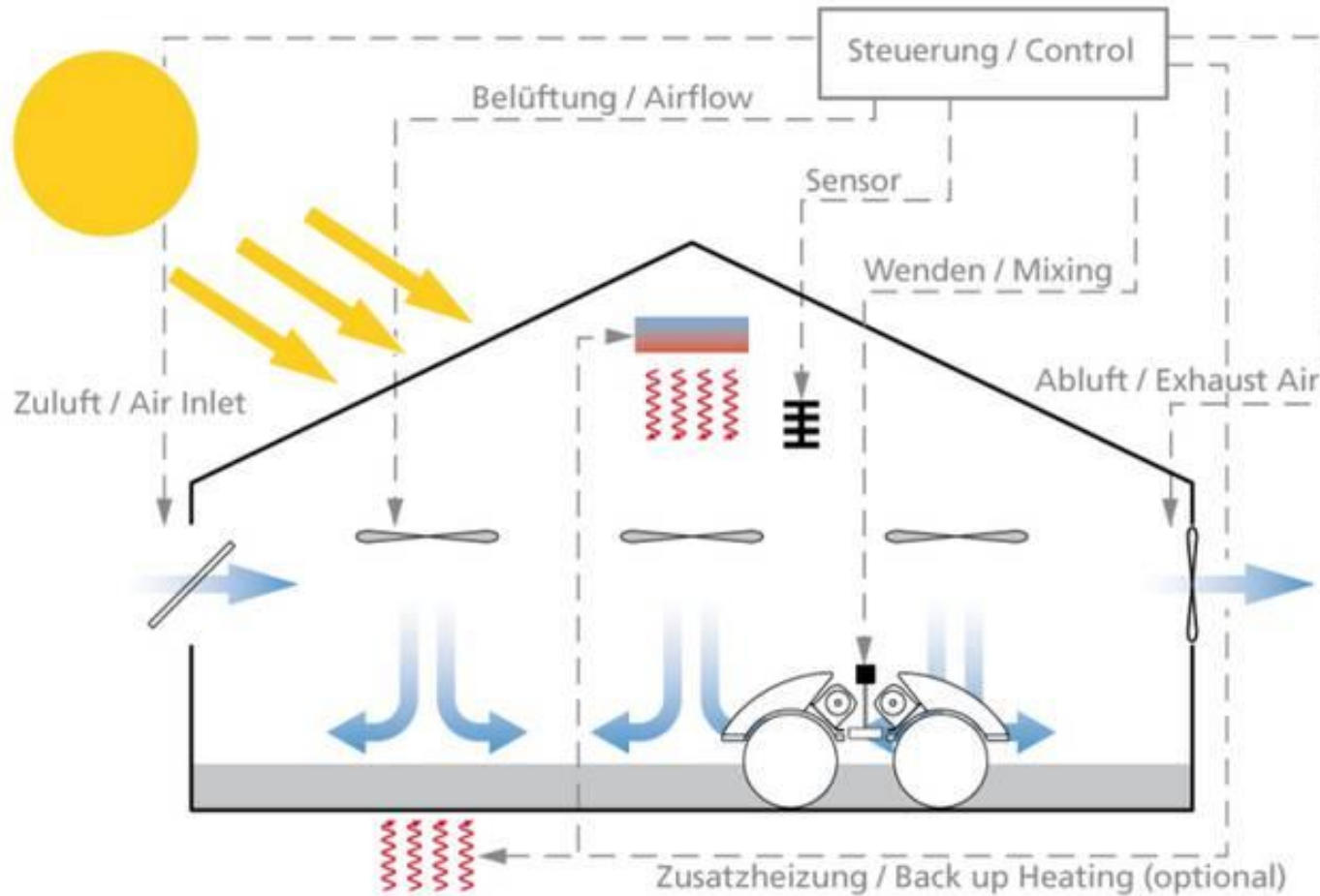


ENERGY EFFICIENCY

Mine of 50 MW Consumption and 5,000 workers. (Rooms, heating, lighting, laundry, cooking, hot water)

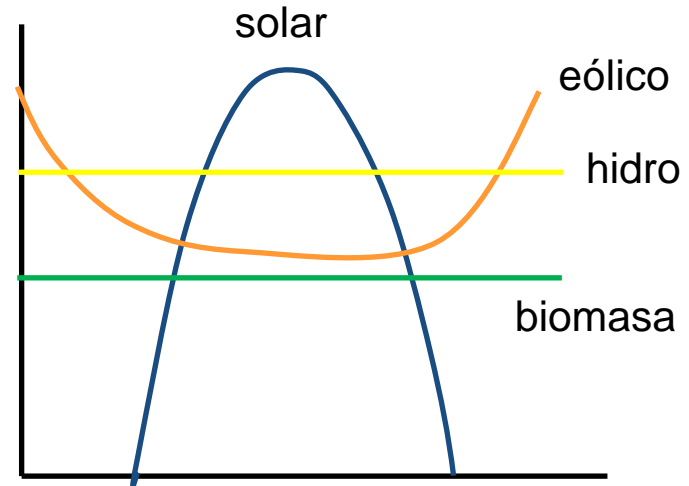


SOLAR DRYING ORE CONCENTRATE



OPPORTUNITIES OF RENEWABLES FOR MINING

- **Hybrid solutions:** Mix of solar, wind, water and biomass to cover the energy demand for mining 24 hours x 7 days.



- **Climate change and carbon footprint:** Peru is vulnerable. 35% reduction of glaciers in last 40 years. Hydros, the most affected. Reduce carbon footprint. Mining requirement.





Artículo 2.- Generación Distribuida.

2.1 Los usuarios del servicio público de electricidad que disponen de equipamiento de generación eléctrica renovable no convencional o de cogeneración, hasta la potencia máxima establecida para cada tecnología, tienen derecho a disponer de ellos para su propio consumo o pueden inyectar sus excedentes al sistema de distribución, sujeto a que no afecte la seguridad operacional del sistema de distribución al cual está conectado.

2.2 La potencia máxima señalada en el numeral anterior, las condiciones técnicas, comerciales, de seguridad, regulatorias y la definición de las tecnologías renovables no convencionales que permitan la generación distribuida, entre otros aspectos necesarios, son establecidos en el reglamento específico sobre generación distribuida que aprueba el Ministerio de Energía y Minas.

DISPOSICIONES COMPLEMENTARIAS FINALES

PRIMERA.- Reglamentación.

En un plazo de ciento veinte días calendario desde la entrada en vigencia del presente Decreto Legislativo, el Ministerio de Energía y Minas emite las disposiciones reglamentarias correspondientes.

SEGUNDA.- Vigencia.

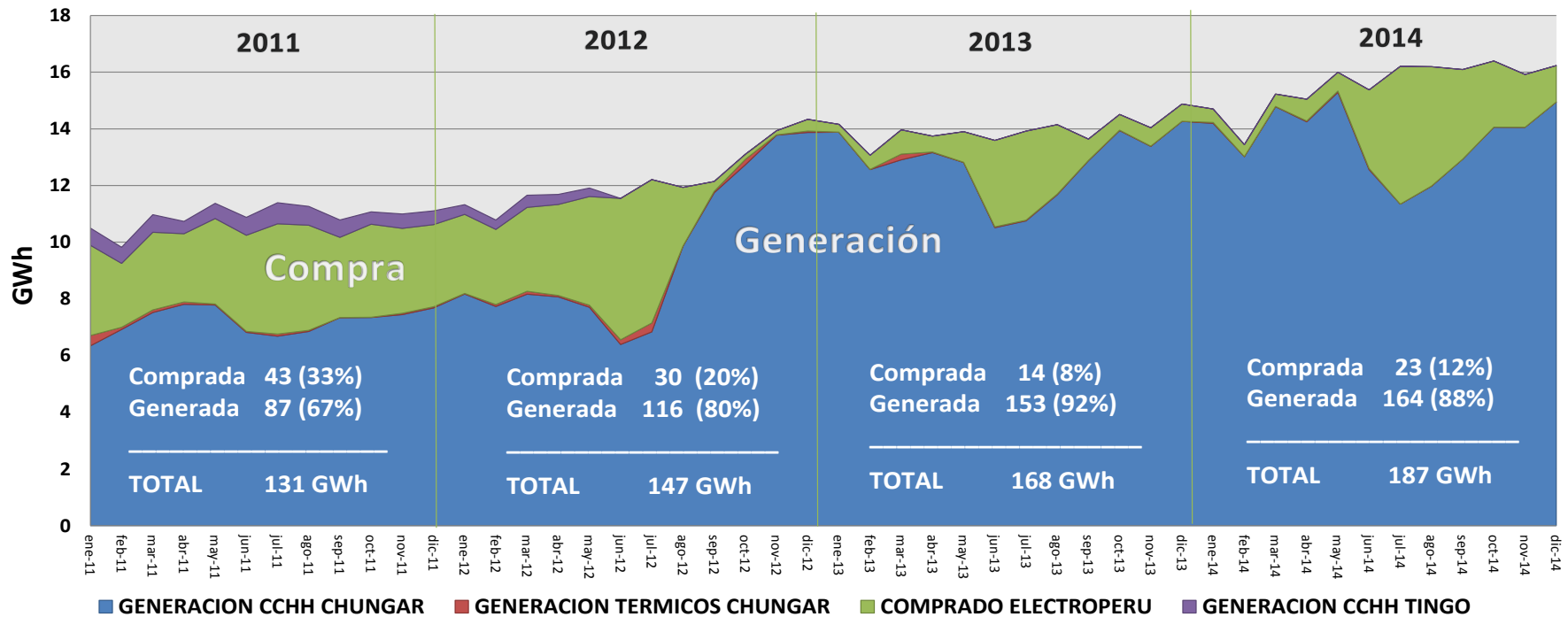
El presente decreto legislativo entra en vigencia al día siguiente de su publicación, con excepción de lo dispuesto en el artículo 2, el mismo que entrará en vigencia a la fecha de publicación del reglamento específico a que se refiere el citado artículo.



EVOLUTION OF ENERGY COSTS – CHUNGAR MINING

Year	2011	2012	2013	2014
Demand (GWh)	131	147	168	187
Generation (%)	68%	80%	92%	89%
Energy Cost (\$/TM)	3.7	3.4	2.6	2.6
Energy Cost / Operating Cost. (%)	6.80%	5.70%	4.50%	4.50%

CHUNGAR - Consumo de Energía (GWh)



4.- ENVIRONMENTAL AND SOCIAL CONTRIBUTION OF RENEWABLE

Problematic of Communities in Peru

- 20% of the population (6 million. Hab.)
Low education and services.
- Activity: Animal husbandry and agriculture.
Lower production planning.
- High rate older adult population. Youth migrate to cities.
- Ancestral distrust outsiders. Principal assets: Land and Water.
- Manipulation by interest groups.
Resistance investment projects.
- Lack of government presence. Lack of infrastructure and legal personality.



ENERGY FOCUS OF AGREEMENTS WITH COMMUNITIES

1. Education

2. Health

3. local employment

4. Basic infrastructure

6. Developing Economic

5. Strengthening institutional

7. Culture Promotion



INFRASTRUCTURE SUPPORT TO COMMUNITIES



Reservoir rehabilitation



Community Center Building



Emboquillado street



School Construction



Construction of bridges



Road Maintenance

ECONOMIC DEVELOPMENT FOR COMMUNITIES



Modulo Livestock



Installing Paddock



Alpacas delivery



Carpentry workshop



Management Biohuerto



Teacher Training

ARCHAEOLOGICAL RESCUE - PROMOTION OF CULTURE



Archaeological complex Marcapiche -
Community SJ Banos. 900 D.C. pre- Inca



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Chungar Mines has calculated its carbon footprint, and it will validate and compensate the carbon credit bonds obtained for Carbon Neutral to be = ZERO GHG emissions.

Carbon Credits Bonds
+ Footprint = Neutral
Carbon

Martes 22 de enero del 2013 **GESTIÓN**

RADAR EMPRESARIAL

GENERACIÓN ENERGÉTICA

Volcan emitirá bonos de carbono para Baños



Certificación permitirá emitir 35 mil bonos de carbono al año.

Volcan Compañía Minera informó que la central hidroeléctrica Baños V -ubicada en Huaral- fue registrada exitosamente para emitir y comercializar a mercados internacionales bonos de carbono bajo el Mecanismo de Desarrollo Limpio (MDL) del Protocolo de Kioto.

Baños V tiene una capacidad de generación energética de 9.2 megavatios (MW).

QUÉ SE DIJO

“Esta certificación cataloga a Baños V como un proyecto que genera energía renovable y reduce emisiones de gases de efecto invernadero”.

José Estela Ramírez
Gerente de Energía

FINAL COMMENTS

- Mining companies have Renewable Energy Resources.
- Mining and industry can optimize their processes with Renewable (It is a world trend).
- There are opportunities for Renewables with distributed power generation for domestic and industrial users in Perú.
- Renewables contribute to the reduction of GHG emissions and the sustainable development of communities.
- Perú should continue investing in developing its mining industry and renewable resources.



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Thank You...

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