PERUVIAN POWER SECTOR MONTHLY REPORT - FEBRUARY 2012

ENERGY CRISIS

Peru currently has a population of over 30 million people. The economy is growing and is attractive to investors; however, the electrification ratio is still quite low; at the end of 2011, the coverage at a national level was 84.8 percent, and in rural areas, this ratio only reaches 63 percent.

Today the country is in an energy crisis caused by the congestion of transmission lines and a lack of improvement of its infrastructure. This situation is deepened with the delay of the construction of three important transmission lines:

- **Machupicchu-Abancay-Cotaruse**—a 220 kV line by the company Colombiana Interconexion Sur (ISA.) This line is important for southern Peru for taking electrical energy that the Machupicchu Hydroelectric Power Plant (second phase by EGEMSA) and Luz del Sur's Santa Teresa Hydroelectric Power Plant will produce. This line is a year late and passes through the jungle of Choquequirao, which was recently declared a protected area by SERNANP. This would change the route of the line not covered by the contract and will lead to a new bid request and will extend the timeline.
- **Chilca-Marcona-Montalvo**—a 500kV line by Abengoa Transmision Sur (ATS.) This line is vital to southern Peru and is currently delayed six months. Its conclusion is uncertain because it has yet to be submitted by the Previous Inquiry Act.
- **Tintaya-Socabaya**—a 220kV line between Arequipa and Cusco.

Due to the delay of these transmission lines, the system continues feeding on cold standby power but at a higher cost. The generation of these plants is based on diesel turbines, which require more expensive fuel, potentially increasing the customer's energy cost three to four percent in 2013.

To solve this adverse situation, limit the supply of electrical energy, stimulate investment, and cover the energy needs of the country, the government will promote the construction of new hydroelectric power plants to meet the demand of our economic growth. In this way, the government issued a Presidential Decree to create a multi-sectoral commission whose job is to facilitate energy investments in the country.

The energy crisis is deepened by the weather. Heavy rains in the interior of the country are affecting the operation of some power plants. In response, the Ministry of Energy and Mines has declared a state of emergency in the SEIN until March 31, 2012.

1. Highlighted Issues

FEBRUARY 2011 HIGHLIGHTS

1. To fulfill the demand for the saturation of the SEIN electric transmission lines and meet the electricity needs in the north and south of the country, the government was forced to import electricity from Ecuador and rent generators, with the cost being transferred to the consumer. If the economy grows at seven percent in 2012, the system will collapse. Paradoxically, the electricity sector will be positive if there is a lower growth in the economy resulting from the slow recovery from the crisis in the United States and Europe.

   The utility rates of electricity in the SEIN have experienced an adjustment since February 4. The increase for residential customers is 3.7 percent, and 4.4 percent for commercial users, and in the isolated system it has not changed. Adjustments for these updates have occurred in the transmission (host toll and demand areas in Lima), generation (generation level price caused by the variation of macroeconomic indicators), and the Social Power Compensation Factor (FOSE.)

Investment projects in the electricity sector:

2. During the second half of the year, a bid submittal award is estimated for fourteen projects in different sectors. The energy sector has the following concessions:

- Transmission Line Machupicchu-Quencoro-Onocora-Tintaya and associated substations in the Cusco region expect to attract US$70 million in investments.
- Transmission Line Moyobamba-Iquitos expects an investment of US$330 million.

3. The Combined Cycle Thermal Power Plant FENIX POWER will begin operations in

2013 with an investment of US$700 million. The plant is currently under construction in Chilca, south of Lima. This thermoelectric plant will work with natural gas and will generate ten percent of the country's energy needs with an installed capacity of 520 MW.

4. The Peruvian company Electropampas will invest US$3.99 million in the construction of the Pampas Verdes hydroelectric project, which includes the construction of four hydroelectric dams. Three dams will be in Ayacucho and one in Ica, with an installed capacity of 2,524 MW that will generate 15,066 GWh of electricity. Its contribution is 25 percent of the country's electricity production. Among the benefits are the creation of 16,000 jobs within five years of construction, water supplied to 218,015 hectares of fallow land in Ica and Arequipa, and the expected generation of US$2 million in agricultural exports.

5. Geotek research firm raised the possibility of using the waters of Lake Titicaca to build five hydroelectric plants in the region of Moquegua. They would take water from the bay of Puno and channel it through a tunnel of 66 km to convert it into the Ichuña ravine in Moquegua at the beginning of the Tambo River. The idea is to harness the water power for the hydroelectric plants and to produce enough energy to supply electricity to southern Peru and sell to other countries. Lake Titicaca has 452 m^3/s of water entering it from tributaries and rain, of which, 415 m^3 are lost to evaporation. This project will not affect the natural ecosystem and will need an investment of 4,121 million Peruvian nuevos soles.

6. On Saturday, February 4, the Jimbe Rural Electric System-Pamaparomas Stage III came into operation in the Moro District in the Ancash Region. This project had an investment of S/.8.8 million and provides electrification to 85 major population centers of poverty in the country, benefitting 10,316 inhabitants.

7. The rivers of the Andes Mountains have significant potential for the construction of hydroelectric plants for the development of renewable energies. In the south of the mountain range, solar energy reaches average levels of over 6 $kWh/m^2/day$, which are among the highest worldwide. These features have encouraged several South Korean companies interested in investing in Peru.

2. Performance of Monthly Demand

2.1 Progression of the Highest Demand

The maximum demand for electricity in February 2012 reached 4899.91 MW, which is 5.0 percent higher than the February 2011 peak. Figure 1 indicates the electricity demand in the SEIN in February from 2007 to 2012.

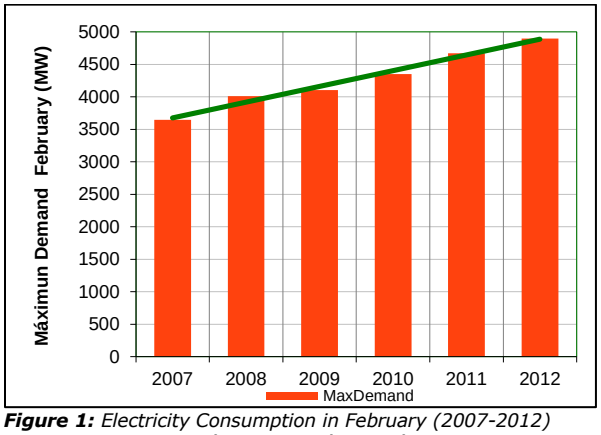

Figure 1: *Electricity Consumption in February (2007-2012)*
Source: *COES (Comité de Operación Económica del Sistema)*
Development: *Mercado Energía*

2.2 Progression of the Rate of Growth

Figure 2 shows the variation of the rate of growth for electricity consumption in February from 2007 to 2012. A decrease of 4.92 percent is observed in the rate of growth of electricity consumption in February 2012 compared to the same period in 2011.

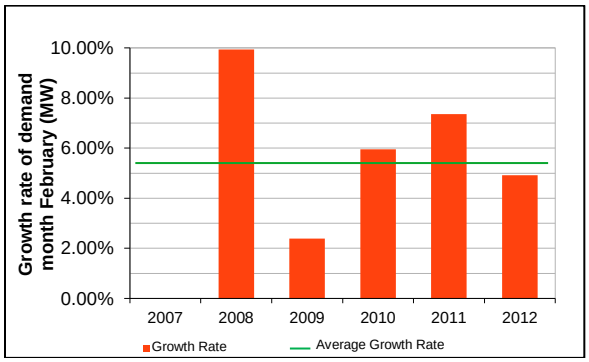

Figure 2: *Rate of Growth at Peak Electricity Demand in February (2007-2012) with Base Year 2007*
Source: *COES*
Development: *Mercado Energía*

3. Performance of the Monthly Offer

3.1 Production of Electricity in the SEIN

The production of electricity in February 2012 reached 2,909.03 GWh, up 7.79 percent from the previous year. Progress in energy production for the month of February is shown in Figures 3 and 4. Figure 3 shows a clear increase in the production of thermal energy despite the heavy rains in January in the country's mountains and forests.

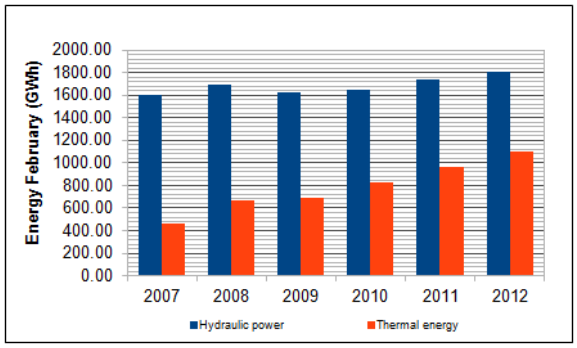

Figure 4: *Progress of Energy Production (GWh) in February (2007- 2012)*
Source: *COES*
Development: *Mercado Energía*

Figure 4 shows a clear downward trend in hydroelectric production from 77.70 percent of total production in February 2007 to only 62.12 percent in February 2012.

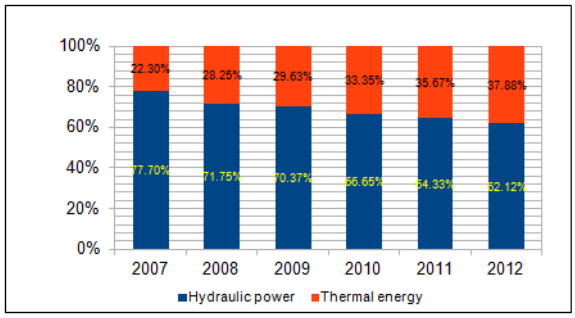

Figure 4: *Share of Thermal and Hydropower in February (2007-2012)*
Source: *COES*
Development: *Mercado Energía*

3.2 Energy Production by Company

3.2.1 COMPANY PARTICIPATION IN THE PRODUCTION OF HYDRAULIC AND THERMAL ENERGY

Tables 1 and 2 show data related to the involvement of various companies in the production of hydraulic and thermal power, respectively.

FEBRUARY 2012		
Company	**Hydropower Generation (GWh)**	**Participation (Percent, %)**
ELECTROPERU	539.06	29.83
EDEGEL	311.99	17.26
EGENOR	204.85	11.34
SN POWER	162.53	8.99
CELEPSA	135.43	7.49
CHINANGO	109.34	6.05
ENERSUR	91.56	5.07
EGASA	77.34	4.28
SANGABAN	72.65	4.02
EGEMSA	57.67	3.19
MINERA CORONA	12.48	0.69
AGUAS Y ENERGIA PERU	7.95	0.44
EGESUR	7.90	0.44
HIDROELECTRICA SANTA CRUZ	7.11	0.39
SINERSA	4.46	0.25
GEPSA	2.43	0.13
MAJA ENERGY	1.82	0.10
HIDROELECTRICA SANTA ROSA	0.58	0.03
TOTAL	**1807.14**	**100.00**

Table 1: *Generation of Electricity with Hydropower Sources in February 2012*
Source: *COES*
Development: *Mercado Energía*

FEBRUARY 2012		
Company	**Thermal Power Generation (GWh)**	**Participation (Percent, %)**
EDEGEL	341.47	31.42
ENERSUR	316.53	29.13
KALLPA GENERACION	254.19	23.39
EGENOR	34.66	3.19
EEPSA	33.50	3.08
TERMOSELVA	31.71	2.92
EGASA	27.68	2.55
SDF ENERGIA	21.24	1.95
EGESUR	9.94	0.91
AIPSA	8.02	0.74
SHOUGESA	4.26	0.39
PETRAMAS	2.57	0.24
ELECTROPERU	0.88	0.08
SAN GABAN	0.09	0.01
EGEMSA	0.00	0.00
SN POWER	0.00	0.00
TOTAL	**1086.74**	**100.00**

Table 2: *Generation of Electricity with Thermal Energy Sources in February 2012*
Source: *COES*
Development: *Mercado Energía*

From the previous tables, it can be concluded that, together, ELECTROPERU, EDEGEL, EGENOR, and SN POWER are responsible for 67.42 percent of hydroelectric power generation. Similarly, KALLPA GENERACION, ENERSUR, and EDEGEL together dispatched 83.64 percent of thermal power generation.

3.2.2 COMPANY PARTICIPATION IN THE PRODUCTION OF HYDRAULIC AND THERMAL ENERGY AT PEAK MONTHLY DEMAND

Tables 3 and 4 show data related to the participation of various companies in the

production of hydraulic and thermal power, respectively, during the peak monthly demand.

FEBRUARY 2012		
Company	**Hydropower Generation (GWh)**	**Participation (Percent, %)**
ELECTROPERU	838.39	30.48
EDEGEL	537.12	19.53
EGENOR	351.91	12.79
SN POWER	246.48	8.96
CELEPSA	218.35	7.94
ENERSUR	131.56	4.78
EGASA	112.74	4.10
SAN GABAN	109.13	3.97
EGEMSA	82.09	2.98
CHINANGO	41.58	1.51
EGESUR	29.62	1.08
MINERA CORONA	18.60	0.68
AGUAS Y ENERGIA PERU	11.77	0.43
HIDROELECTRICA SANTA CRUZ	9.96	0.36
SINERSA	6.73	0.24
MAJA ENERGY	3.32	0.12
HIDROELECTRICA SANTA ROSA	1.23	0.04
GEPSA	0.00	0.00
TOTAL	**2750.56**	**100.00**

Table 3: *Generation of Electricity with Hydropower Sources During Peak Demand in February 2012*
Source: *COES*
Development: *Mercado Energía*

FEBRUARY 2012		
Company	**Thermal Power Generation (GWh)**	**Participation (Percent, %)**
EDEGEL	600.19	27.92
ENERSUR	584.49	27.19
KALLPA GENERACION	550.13	25.0
TERMOSELVA	167.23	7.78
EEPSA	96.23	4.48
EGASA	77.89	3.62
SDF ENERGIA	29.26	1.36
EGESUR	22.35	1.04
AIPSA	9.82	0.46
EGENOR	6.44	0.30
PETRAMAS	4.18	0.19
SHOUGESA	1.13	0.05
EGEMSA	0.00	0.00
SAN GABAN	0.00	0.00
ELECTROPERU	0.00	0.00
SN POWER	0.00	0.00
TOTAL	**2130.43**	**100.00**

Table 4: *Generation of Electricity with Thermal Power Sources During Peak Demand in February 2012.*
Source: *COES*
Development: *Mercado Energía*

3.2.3 CONCENTRATION IN THE POWER GENERATION MARKET FOR THE SEIN

Figures 5 and 6 disclose the market trend of concentration for February from 2007 to 2012. The Herfindahl Hirschman Index (HHI) is used to assess the concentration of electricity supply. HHI values above 1,800 indicate there are economic groups with a high market share in the production of electricity in the SEIN.

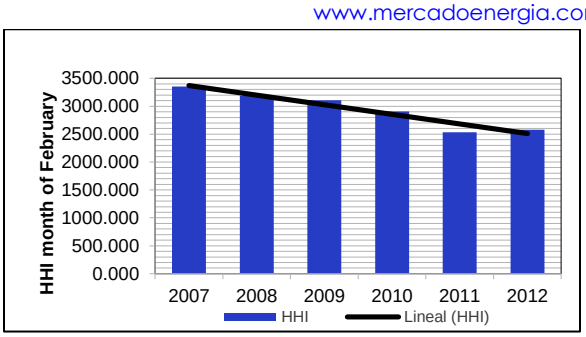

Figure 5: *Evolution of the Hirschman Herfindahl Index for the Hydropower Market in February (2007-2012)*
Source*: COES*
Preparation: *Mercado Energía*

The following business groups were taken into account to produce Figure 5: ESTADO, ENEL, DUKE ENERGY, GDF SUEZ, HIDROELECTRICA SANTA ROSA, HIDROELECTRICA SANTA CRUZ SAC, GEPSA, DIA BRAS EXPLORATION, SN POWER, CELEPSA, SINERSA, AGROINDUSTRIAS MAJA, Y AYEPSA. The decrease of this index in the years 2011 and 2012 is mainly due to the entry of new economic groups such as SN POWER, CELEPSA and AGROINDUSTRIAS MAJA.

The following business groups were taken into account to produce Figure 6: The State, ENEL, DUKE ENERGY, GDF SUEZ, SHOUGANG, KALLPA GENERACION, FIBRAS-SDF, AIPSA, and PETRAMAS. The decrease of this index is mainly due to the entry of FIBRAS SDF, KALLPA GENERACION, and AIPSA.

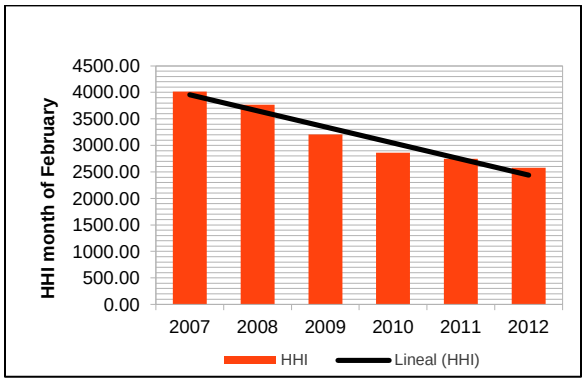

Figure 6*: Evolution of the Hirschman Herfindahl Index for the Thermal Generation Market in February (2007-2012)*
Source: *COES*
Preparation: *Mercado Energía*

The previous graphs show that the HHI in both the hydraulic and thermal generation markets have a decreasing trend caused by the introduction of new plants to the markets.

3.2.4 USE OF FUEL FOR THERMAL GENERATION

The progression of the use of fuels for thermal generation can be seen in Figure 7. As shown in the figure, natural gas is the main fuel for thermal generation in the SEIN. It is used to generate approximately 90 percent of the thermal energy produced.

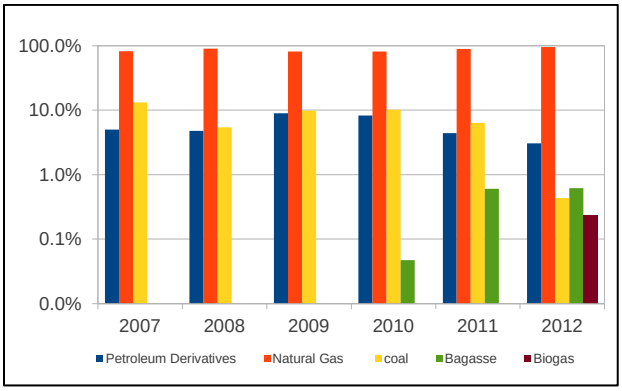

Figure 7: *Use of Fuel for Thermal Generation in February (2007-2012)*
Source: *COES*
Preparation: *Mercado Energía*

3.2.5 RESULTS OF RENEWABLE ENERGY BID SUBMITTALS

Figure 8 shows the increase in energy output of power plants that went into operation as a result of the renewable energy bid submittals (RER.) In February 2012, the power produced by these plants represented 1.48 percent of the total energy dispatched.

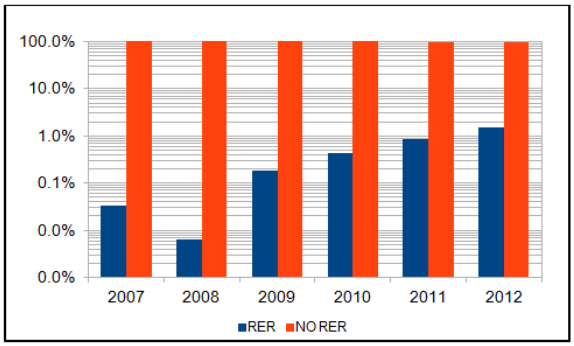

Figure 8: *Energy Produced by Hydroelectric Plants Operated at SEIN Entered through the Bid Submittals February (2007-2012)*
Source: *COES*
Preparation: *Mercado Energía*

4. Marginal Monthly Cost Performance

The marginal cost for February 2012 amounts to S/65.08 per MWh (US$24.10 per MWh), up 10.78 percent compared to February 2011. Figure 9 shows the marginal cost variation for February from 2007 to 2012. The average marginal cost is S/78.73 per MWh (US$29.16 per MWh), with an exchange rate of 2.70 soles per dollar.

According to Emergency Decree No. 049-2008, short-term marginal costs in the SEIN are determined without considering production restrictions, natural gas transportation, or electricity transmissions. Also, marginal costs cannot be greater than S/313.50 per MWh (US$116.11 per MWh) as defined by the Ministry of Energy and Mines Ministerial Resolution No. 607-2008-MEM/DM.

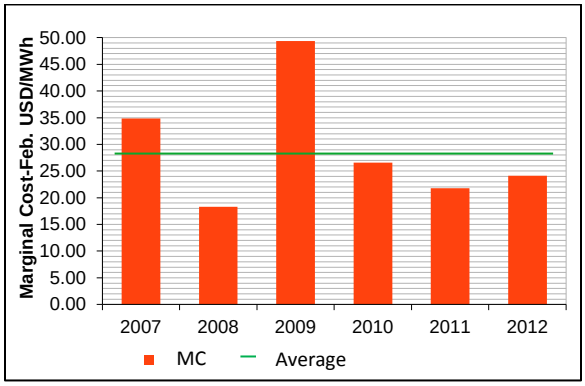

Figure 9: *Marginal Cost Variation for February (2007-2012)*
Source: *COES*
Preparation: *Mercado Energía*

ECONOMY

Evolution of the Price of Oil

During February, WTI oil prices suffered a fall of 0.1 percent, in the first week reaching US$98.40 per barrel. This drop was caused by the unexpected increase in gasoline and distillate inventories in the United States. During the following weeks, constant increases were recorded of 2.4, 5.1, and 0.7 percent per week to reach US$106.6 per barrel. This increase was due to the stoppage of oil exports to Sudan's south by excessive fees charged by Sudan's north, by extremely cold weather in Europe increasing the demand for heating, by geopolitical tensions between Iran and the West, by signs of economic recovery in the United States, and by potential supply disruptions. The weak dollar also boosts oil prices, despite the rise in weekly US inventories.

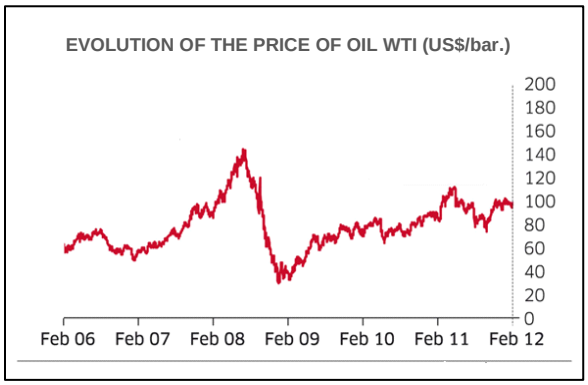

Figure 10: *Oil Prices for February (2006-2012)*
Source: *BCRP*

Country Risk

The country risk measured by the spread of EMBIG Peru fell from 221 to 200 basis points during the month of February. Meanwhile, the spread of debt in the region also fell 53 basis points due to lower global risk aversion, employment data, better than expected manufacturing in the United States, expectations of the agreement for the rescue of Greece, measures of monetary relaxation on China, and measures taken by European leaders to stem the debt crisis in the Europe.

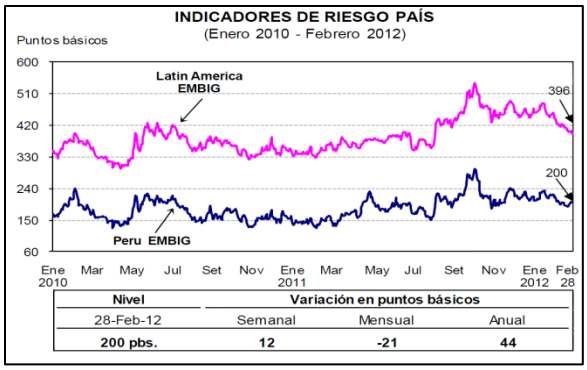

Figure 12: *Indicators of Country Risk (Jan. 2010-Feb. 2012)*
Source: *BCRP*

Exchange Rate

The exchange rate for the month of February has been a negative variation of S/. 2.688 per dollar and S/. 2.678 per dollar at the end of the month. The average interbank exchange rate decreased sales from S/.2.690 to S/.2.678 per dollar, which means a 0.44 percent appreciation of the nuevo sol. During this period, the BCRP intervened in the exchange market, buying US$2.8 million.

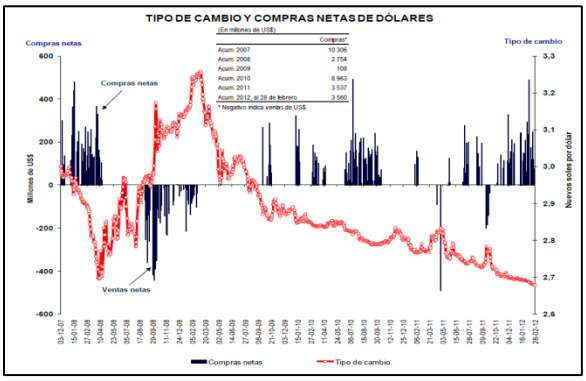

Figure 13: *Exchange Rates (Dec. 2007-Feb. 2012)*
Source: *BCRP*

Interest Rate

The corporate rate in soles remained at 5.33 percent in the first two weeks of February 2012. In the third week, it rose to 5.34 percent, and then decreased to 5.32 percent in the final week of February. The daily average corporate rate in domestic currency in the first week increased 5.32 percent to 5.33 percent, remained the same during the second week, and in the last week, returned to 5.32 percent. The rate for foreign currency at this time rose from 2.90 percent to 2.96 percent.

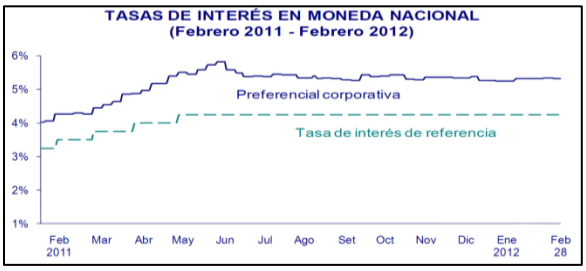

Figure 14: *Interest Rates (Feb. 2011-Feb. 2012)*
Source: *BCRP*

CONTACT INFORMATION

EMAIL: info@mercadoenergia.com
Mercado Energía: USA
USA-California-Silicon Valley:
1701 California St
Mountain View, CA 94041-1710
USA
Telephone: 1-650-265-2619

Mercado Energía: Perú
Lima: Av. Circunvalación 725, 3er Piso
San Ignacio de Monterrico
Surco, Perú

Cusco: Urb. Santa Úrsula M-16
Wanchaq, Perú

Telephone: (+0051) 989289870