ENEL strategy for development of Geothermal and other Renewable energy in Central America

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Typology of Enel RE installations

Hydro plant in Piedmont

Geothermal plant near Pisa

Wind farm in Sicily

Photovoltaic plant south of Salerno
Geothermal in Larderello, Italy
Wind Project, Costa Rica, 24 MW
Tierras Morenas
Hydro Project, Guatemala, 14 MW
Matanzas – San Isidro
Hydro, Guatemala, 47 MW
El Canada Project
Strong commitment of Enel for RE

- 1 billion € to be invested within 2005
- 900 MW of additional capacity

Mix RE generation - target 2005

- hydro: 29%
- others: 9%
- wind: 28%
- geo: 34%
Renewable Market in the World

North America
•-raising public/gov’t interest
•-competitive pricing (€40-50/MWh)
•-tax incentives and Minimum Portfolio Standards

Central America
•Healthy (>4%pa) load growth, short of supply
•-Established liberalized markets
•-No domestic fuel, no fuel logistic
•-High price for new entrants (€60-80), renewables the most competitive
•-higher country risk competitive edge

North Europe
•-Highly subsidized, feed-in tariffs €80-100/MWh
•-Strong gov’t commitment
•-High entry barriers
•-Premium pricing & int’l trading of ERCs

Italy
•-Minimum Portfolio Standard –Bersani decree
•-Attractive green pricing, €103/MWh
•-Upgrade potential
•-Growth limited by permitting lead time

China, India
•-Large capacity additions
•-Lengthy, legally intensive contracts
•-Supplier’s play

South East Asia
•-Weak capacity demand, low oil prices
•-High Country risk

Spain, Greece
•-Feed in incentives and gov’t grants
•-Strong gov’t support
•-Short term capacity shortage

Africa
•-Rural electrification
•-Donor-based projects

Different markets …..different drivers
RE portfolio of Enel worldwide

USA
390 MW
hydro, wind

Canada
40 MW
hydro, biomass, biogas

Guatemala
60 MW - hydro

El Salvador
100 MW - geo partner

Costa Rica
60 MW - hydro, wind

Chile
90 MW - hydro

Italy
15,100 MW
hydro, geo, wind, pv

Spain
1240 MW\(^1\)
hydro, wind, biomass

\(^1\) include plants in partnership
Central America Profile: 7 countries

**Guatemala**
- Population (million people): 12.0
- GDP (USA billion): $22.1
- Generation:
  - Thermal: 57%
  - Hydro: 39%
  - Geothermal: 4%

**El Salvador**
- Population (million people): 6.5
- GDP (USA billion): $14.2
- Generation:
  - Thermal: 47%
  - Hydro: 30%
  - Geothermal: 23%

**Nicaragua**
- Population (million people): 5.3
- GDP (USA billion): $2.6
- Generation:
  - Thermal: 83%
  - Hydro: 9%
  - Geothermal: 8%

**Panama**
- Population (million people): 2.9
- GDP (USA billion): $10.9
- Generation:
  - Thermal: 51%
  - Hydro: 49%

**Costa Rica**
- Population (million people): 4.0
- GDP (USA billion): $16.4
- Generation:
  - Hydro: 82%
  - Geothermal: 13%
  - Wind: 3%
  - Thermal: 2%

**Honduras**
- Population (million people): 6.7
- GDP (USA billion): $6.71
- Generation:
  - Thermal: 52%
  - Hydro: 48%

*Source: CEPAL, Global Insight, ISO’s*
Enel Technology Leadership in geothermal

**Mastering all aspects of technology**
- Hardware, software and cultural-ware
- Unparalleled mining, drilling and process expertise
- Geothermal field farming
- Emission and odor abatement technologies

**Development, O&M excellence**
- *Deep well* drilling
- Upgrade and rehabilitation engineering
- Siting engineering
- Remote operation
Areas of potential international co-operation

• EXPLORATION & ASSESSMENT OF DEEP GEOTHERMAL RESOURCES
  Improvement of geophysical prospecting and deep drilling technology (over 3,000 - 4,000 feet)

• OPTIMIZATION OF PRODUCTION PROCESS
  Chemical treatment of fluids to prevent corrosion and scaling
  Medium-low enthalpy fluid cycle optimization
  Operations with high level of non-condensable gases (>5%)

• ENHANCEMENT OF GEOTHERMAL SYSTEMS
  Stimulation of low production wells
  Heat mining strategies and secondary heat recovery through water injection in mature and depleted fields

• ENVIRONMENTAL COMPATIBILITY
  Gas emission reductions
  Improvement of landscape integration
Enel’s Strategic Position in Latin America

Energia Global International (EGI) now Enel Latin America

Active in Central America since 1991
Acquired by Enel in June 2001

Developed, owns and operates over 200 MW of renewable energy
178 MW of hydro capacity located in Costa Rica, Guatemala, Chile
24 MW wind plant in Costa Rica

Strategic partnership with LaGeo, El Salvador for
development of geothermal plants- 114 MW geo in operation
and 40 MW under development

Participant in early greenhouse gas initiatives, and now selling
emissions reductions from El Canada project in Guatemala
El Salvador: project Enel - Lageo

Enel has a participation in La Geo, as a result of an international bid.

Berlin geo project
- scientific studies to define an integrated model of the geothermal field
- drilling of 12 wells at 2000 - 2500 meters
- vapor duct, aqueducts construction
- implementation of 2 units for total 30-40 MW (electrical)

Experts from Enel Units of Pisa e Larderello have been engaged to develop Berlin project (geologists, engineers, drilling team)
Strategy for geothermal development in Central America

Leverage on **competitive advantage** due to technical experience

- High theoretical geo resources exist
- Exploitation hindered by high cost of development
- Limited in-market technical know-how

**Non technical risks**: competition and political/economic country risk

**Institutional and regulatory risk:**
- Market openness for foreign competition
- Nationalization vs. liberalization
- Development of regulatory framework
- Tariff, priority dispatching
- Continuity of support schemes
Clean Development Mechanism in CA: Overview

- All (except Belize) have ratified Kyoto

- All but Guatemala and Honduras have Designated National Authority (DNA) established – but with different levels of authority, financial support, transparent policies

- Project activity in every country except Honduras, focus on energy

- Each country has Memorandums of Understanding set up with Annex I country and/or multilateral institution

- Generally recognized that the rights to emission reductions reside with project developer, though not generally codified & Honduras may grant a percentage of rights to utility offtaker

Countries at varying degree of CDM development which gives developer varying risk/opportunities
Enel’s CDM Potential in Central America

Enel plans to actively develop renewable energy in Central America.

Pipeline development projects expected to reduce CO2e by an estimated 220,000 tonnes/year beginning in 2005.

Anticipate that future development in geothermal and hydro may result in some 300 MW of new RE power installed resulting in over 1 million tonnes/year CO2e reduction beginning in 2008.

Enel’s presence in Central America also allows it to identify potential emission reductions from third parties.