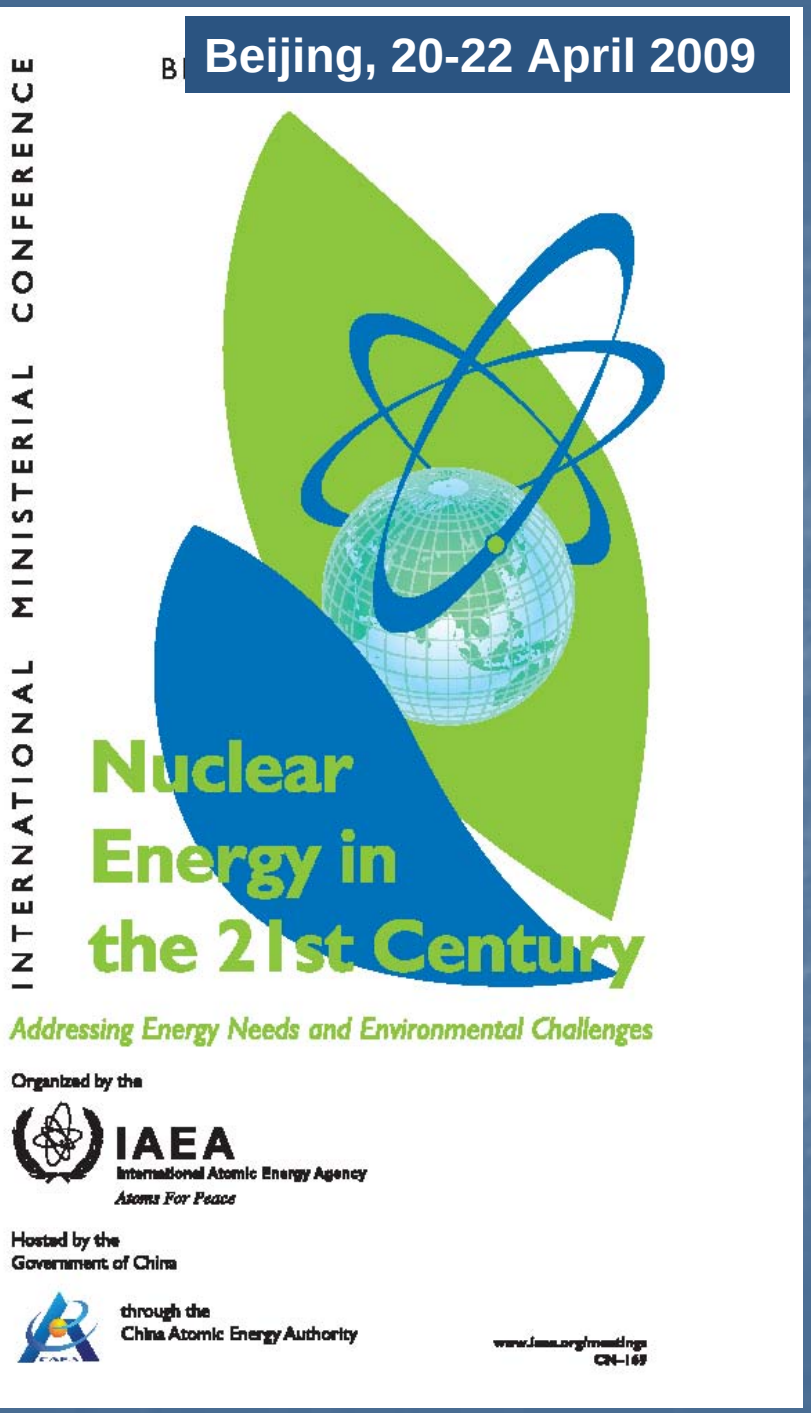

BEIJING 2009
International Ministerial Conference

Strategic and policy concerns when considering the introduction of nuclear energy:

The case of Chile

Jorge Zanelli
[CECES /CCHEN /CNE, Chile]

Strategic and policy concerns when considering the introduction of nuclear energy:

The case of Chile

Jorge Zanelli*

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Why consider a Nuclear Program in Chile?

- Not for strategic/geopolitical reasons
- Not for political/prestige
- Not because of international pressures
- *Just because we need safe, reliable supply of energy*

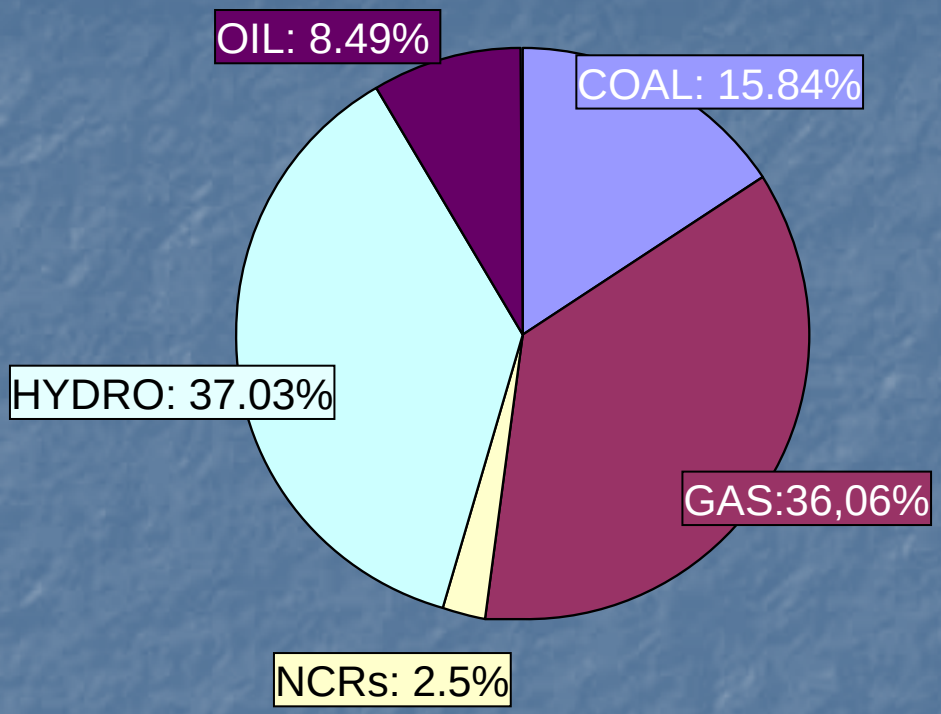
- Chile imports 95% of its coal
  75% of its gas
  98% of its oil

- About 60% of the electricity is generated with imported fuels

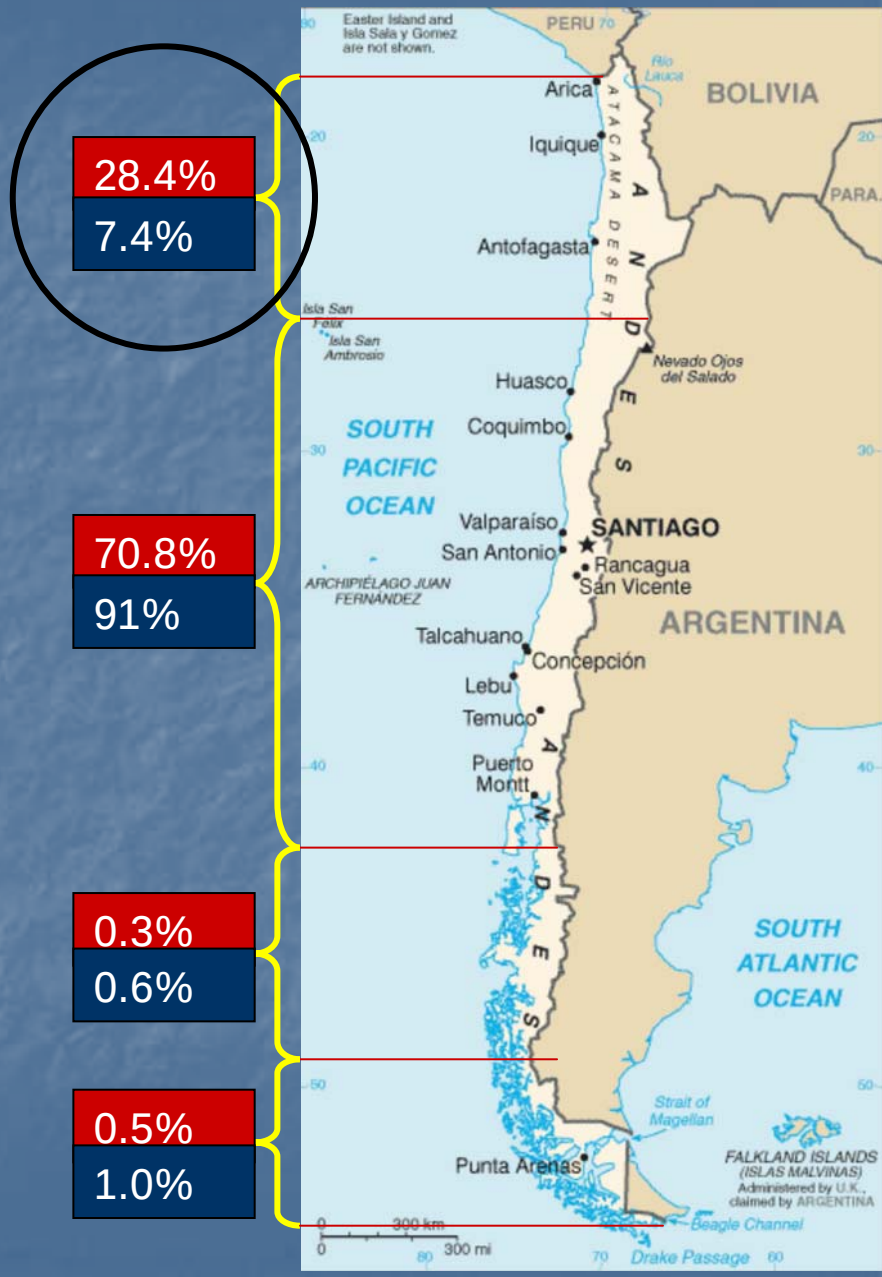
Background

- **Nuclear Development**
  - 1962: Chilean Commission of Nuclear Energy (CCHEN) Regulator, research, producer of radioisotopes for medicine & industry
  - 700 nuclear & 6,000 radiological facilities; 2 research reactors
  - Nearly all the treaties and international agreements have been signed and ratified
- **Electric sector**
  - Installed generation capacity: 12GW
  - Fully deregulated; private generation, transmission & distribution
  - State role: fair play, transparent market, limited strategic planning
  - Technological neutrality: demand driven / price priority supply
- **Total population (est.) :16.6 Million**
- **Per capita GDP : $14,688 (59th in the world)**

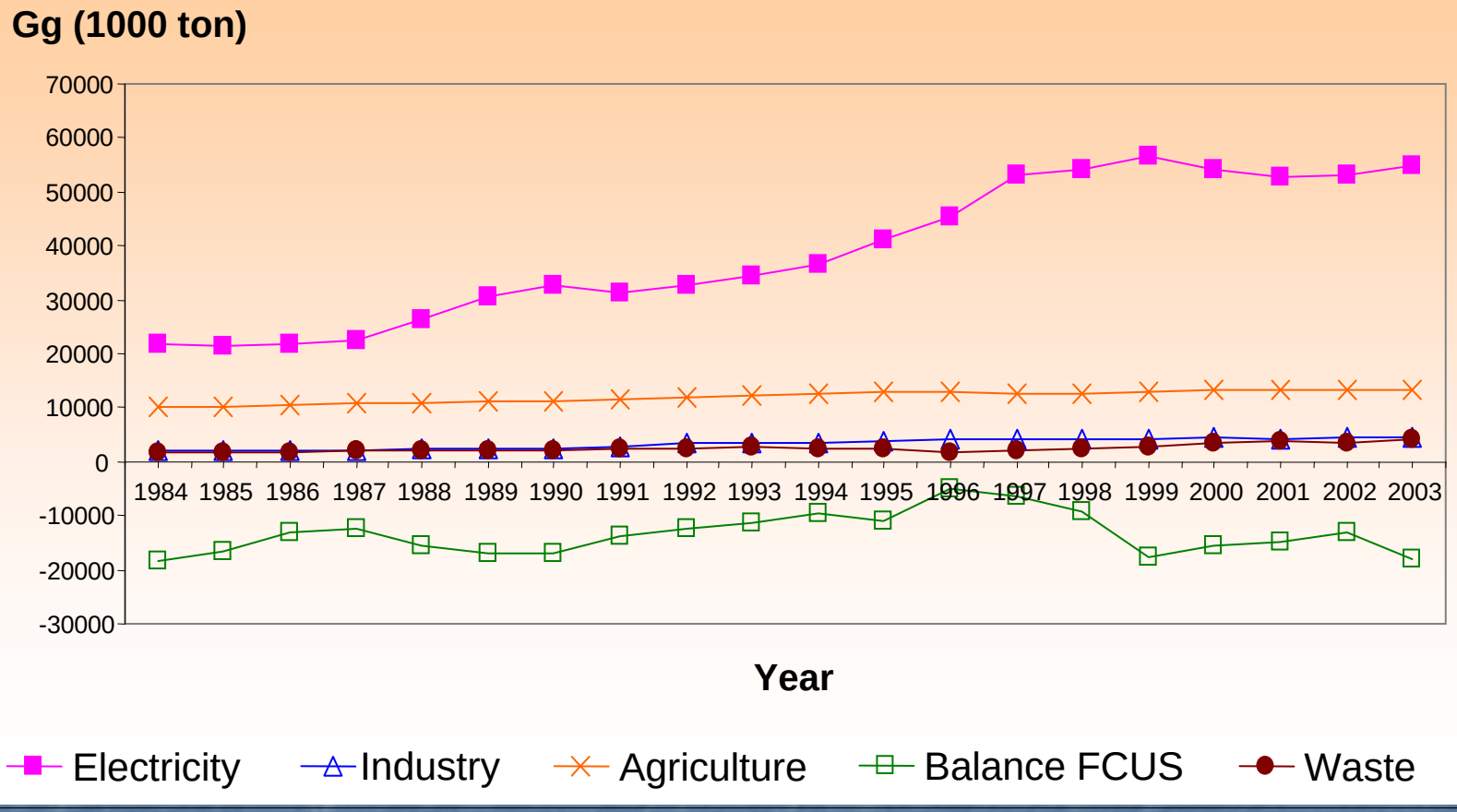
Electric generation (2008)



Distribution



CO_2 Footprint by Economic Sector
1984-2003



- A good part of the energy demand comes from the mining industry
- Most of the growth in energy demand (~ 6%), is explained by economic growth over the past 20 years (~5.4%).

National Context:

Electric demand doubles every 10-12 years

Over 90% fuels are imported: no oil, gas or coal, and only two big rivers left to dam.

1997: Natural Gas agreement with Argentina

2005-06-07: Drastic shortages of supplied gas

→ Dependence, fragility, vulnerability: fundamental strategic weakness

→ Search for long term solutions

↓

Nuclear energy ?

A nuclear power program in Chile?

- Small, split national electric grid (~10GW)
- The most seismic country in the world
- Weak basis in Science & Technology
- Low safety culture
- Insufficient regulatory infrastructure
- Low public confidence in government institutions

Nuclear energy perception (~2006):

Complex, controversial and emotional issue. Fears and hopes, myths and horror stories dominated the public perception…

Need for rational analysis based on facts in order to decide to include or not the nuclear option as part of the energy mix

Long range scope, beyond immediate issues

Multidisciplinary independent, team, capable of analyzing and judging freely

Working Group on Nuclear Energy (2007)

- 10 professionals from natural sciences, mathematics, engineering, political sciences, business, government,
- No preconceived position on the nuclear issue
- No vested interests one way or another
- Each individual representing only him/herself

Mission: to decide whether the nuclear energy should be dismissed as an option. If not, to determine the way by which an informed decision could be made.

WGNE Panel (2007)

Main Conclusions

- Nuclear Energy is a mature technology, safe, reliable, economically competitive and low in carbon emissions.

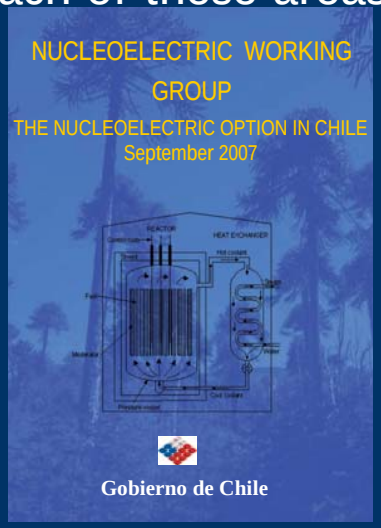
- In principle, there are no reasons to discard the nuclear option for our future energy matrix.

- However, it is a political and strategic decision which would require an active and new role from the State.

- The implementation of a nuclear power program in Chile would require:
  - Public support
  - Economic viability
  - Developing an adequate regulatory framework
  - Taking into account seismic and environmental issues
  - Development of human resources
  - Improving our safety culture

Recommendations

- Before making any decision, further studies in each of these areas are indispensable:
  - Risks, Safety & Security
  - Regulatory Infrastructure
  - Technological options
  - Role of the State
  - Assessment of the electric system
  - Market challenges and opportunities



- These studies should help to:
  - Identify advantages and limitations of each technical option
  - Identify and correct current weaknesses in infrastructure
  - Identify necessary legal, regulatory, operational changes
  - Evaluate the potential costs involved
  - Form a clear picture of the possible future scenarios with and without nuclear energy in our energy mix

Establishment of the Advisory Committee on Nuclear Energy at the Ministry of Energy

Nuclear Advisory Committee (2008)

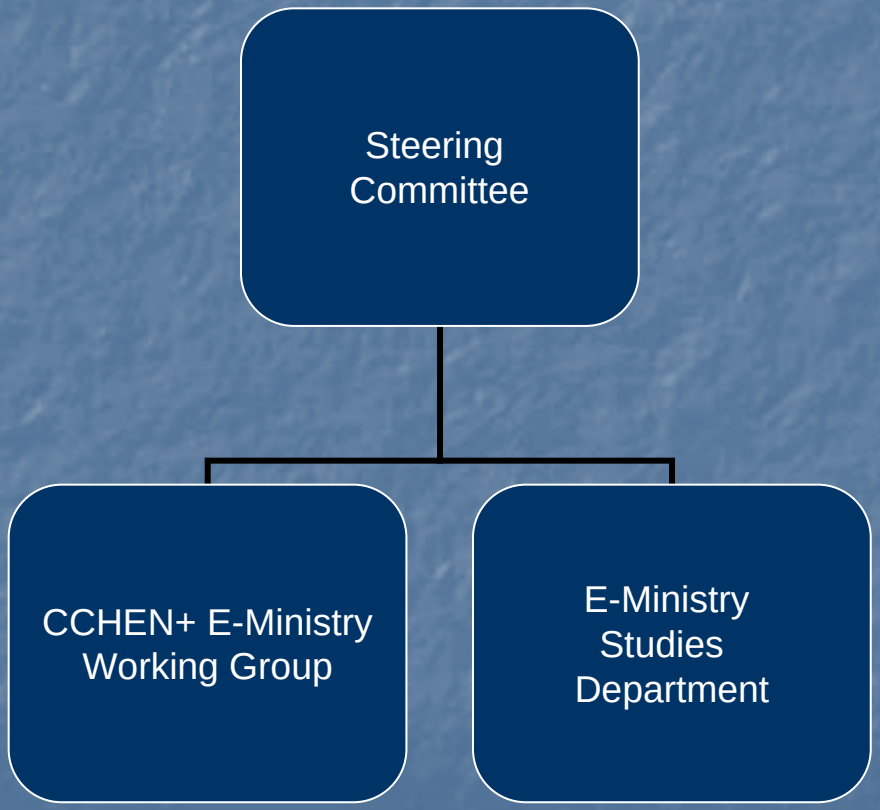
Mandate:

"Advance in every necessary front so that the country may be, in 2-3 years time, in a condition of making a decision on whether to proceed or not in developing a national infrastructure for the production of nuclear energy"

Strategy:

- **Objective:** Advance according to the IAEA guidelines in order to reach the first milestone: *"country ready to take an informed commitment regarding a nuclear energy program".*
- **Means**:
  - Studies to answer the main issues identified by the previous commission.
  - Papers produced by the CCHEN-CNE Working Group.
  - Technical Cooperation Program with the IAEA.
  - Seminars and workshops to get academia, private stakeholders and the general public involved in the process.

Nuclear Advisory Committee



Steering Committee:

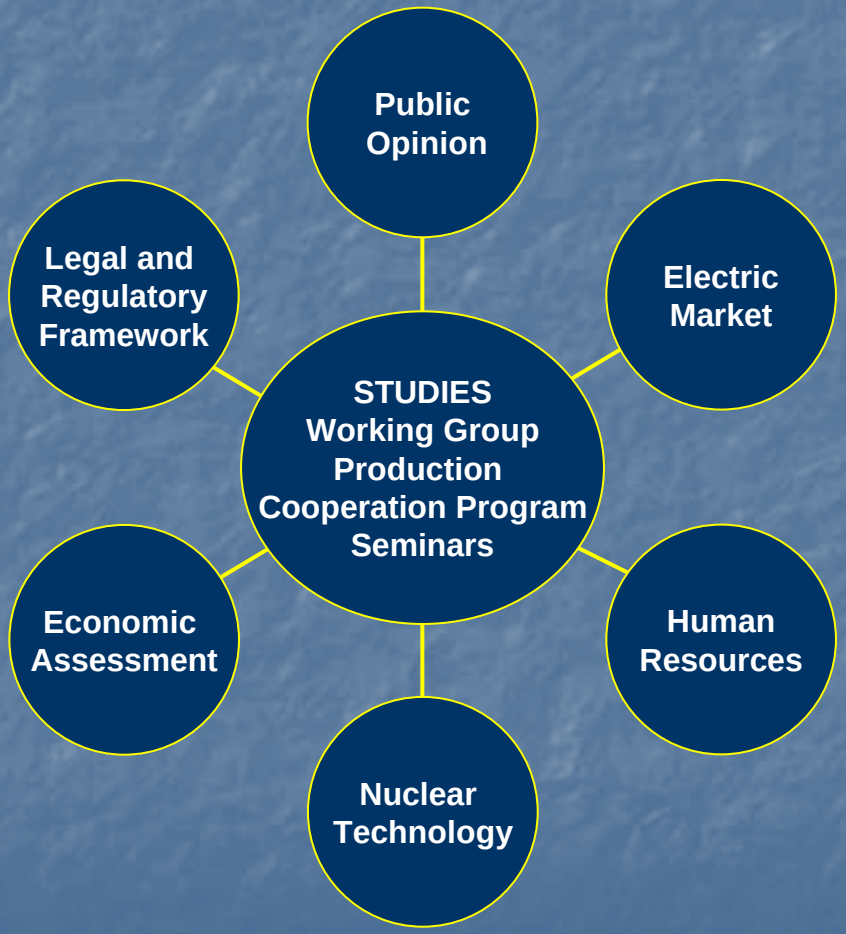
- Independent experts from different fields:
  - Economics
  - Environmental Sciences
  - Physics
- Representatives from key governmental institutions:
  - Min. Energy (chair)
  - Min. Foreign Affairs
  - Min. Defense
  - Min. Environment
  - Chilean Nuclear Energy Commission (CCHEN)

Nuclear Advisory Committee

Goals for the end of this year:

1. To issue a report that will
   - Identify and assess the factors that, under controlled a risk scenario make the nuclear option attractive.
   - Identify all concerns that are necessary to solve before making any decision. This includes the result of the self-assessment exercise recommended by the IAEA Milestones document.
   - Include all the executive summaries of all completed studies and technical papers produced by CCHEN-CNE working groups.
2. Open the discussion to relevant stakeholders through hearings and working sessions.
3. Establish an adequate climate to allow a “reasonable” public discussion of the development of nuclear infrastructure.

Nuclear Advisory Committee: Working areas

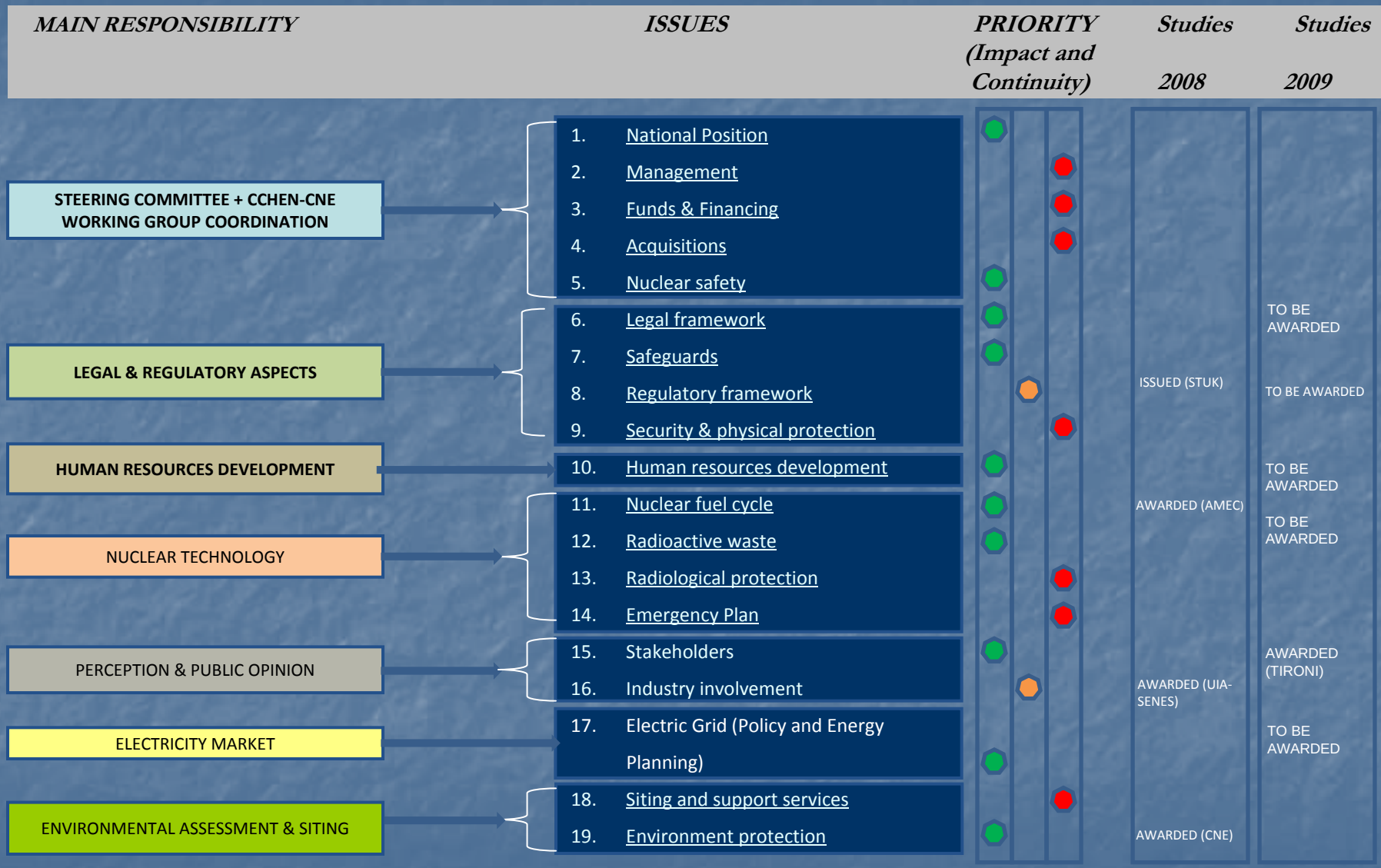



Public Opinion
Polls
Information Programs
Public Hearings
Frontier Issues
Environmental Assessment
Legal and Regulatory Framework
Legislation
Regulatory Body
International Treaties
Environment
Safeguards
Safety & Security
Emergencies
Electric Market
Electric grid issues
Long term energy planning
Market structure
Price Structure
Role of the State
Energy Matrix
STUDIES
Working Group
Production
Cooperation Program
Seminars
Economic Assessment
Infrastructure development costs
Plant Costs
Operation Costs
Fuel cycle costs
Industrial Spillovers
Externalities
Human Resources
Hiring
Development
Maintaining
Replacement
Nuclear Technology
Safety
Fuel cycle
Waste management
Used Fuels management
Siting
Decommissioning

Current Situation

Study	Successful Bidder	Status
Public & Private Role	Adolfo Ibáñez Univ. (Chile)-SENES Consultants (Canada)	Editing of final report
Regulatory Framework	STUK (Finland)	Final report received (waiting for translation)
Nuclear Fuel Cycle	AMEC-CADE (UK)	Final report draft received
Impacts & Risks	Nuclear-Electric Corporation	In process Final report draft expected in April

RESPONSABILITY, IMPACT & INTERMEDIATE EVENT STUDIES



Current Situation

Public Communication Activities

Activity	Objective	Status
Workshop	Present and discuss the results of the Regulatory Framework Study	Done first week of march
Workshops	Present and discuss results of the remaining studies	May through October 2009
Seminar	To address main concerns regarding nuclear energy	Expected by September 2009
IAEA Workshop & Expert Mission	▪ Review the Public Opinion draft report. ▪ Increase communication skills to assist public understanding of nuclear energy	First week of June 2009

We expect to issue our final report by November 2009, before the coming presidential elections of December.

A Personal View

Our Strengths

Global Competitive Index (World Economic Forum)

Chile: 27th among 125; 1st in Latin America

Connectivity Index (World Economic Forum)

Chile: 29th among 125; 1st in Latin America

Economic Freedom (The Wall Street Journal)

Chile: 11th among 150; 1st in Latin America

Our main Challenge

Quality of Education (World Economic Forum)

Chile: 102 out of 125; 13th in Latin America

Distribution of Income (UNDP)

Chile: 114 de 126; 14th in Latin America

Summary

A Nuclear Power Program presents important challenges and opportunities for Chile

A Nuclear Power Program will generate unprecedented tensions in our society

We believe the challenge can be met with great benefit for the country, notably an increase in safe, reliable energy available.

But, equally beneficial for us will be all the changes that will be necessary to make in our society to meet the challenges.

Thank you