Outlook for Security and Reliability in Mexico

Competition and Electricity: Ensuring Security and Reliability

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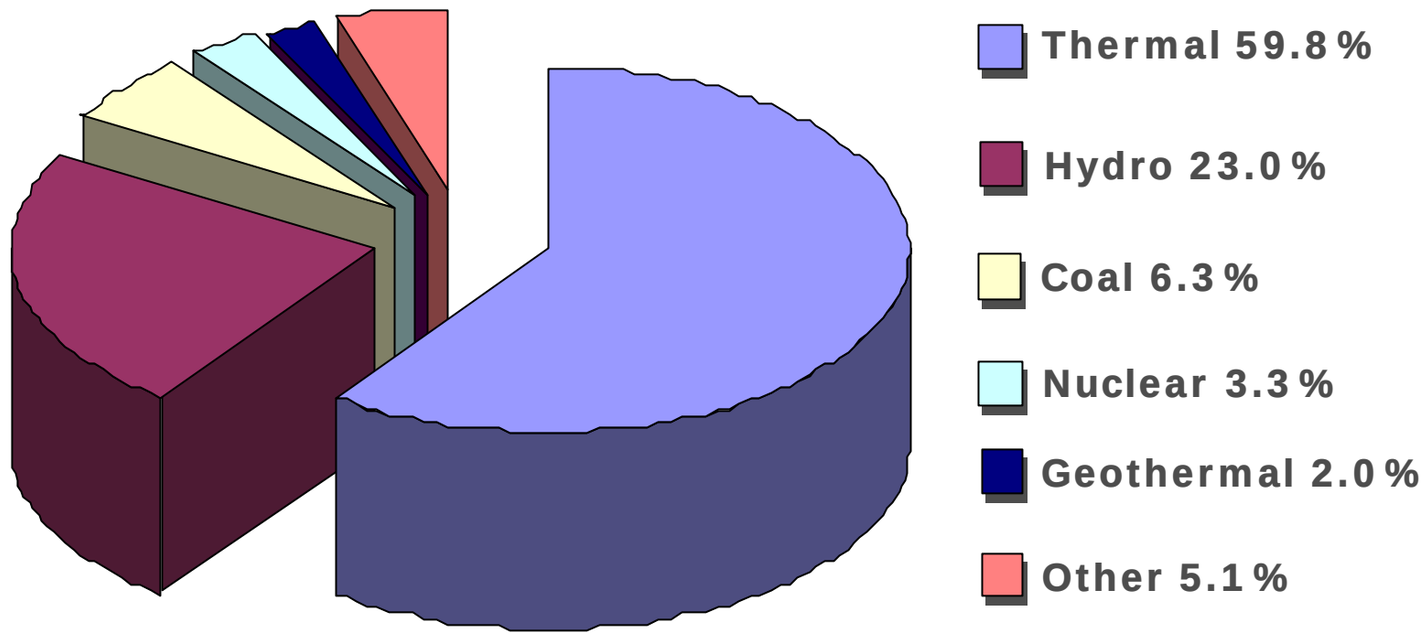
I. Highlights of Mexican Power Industry

Installed Capacity

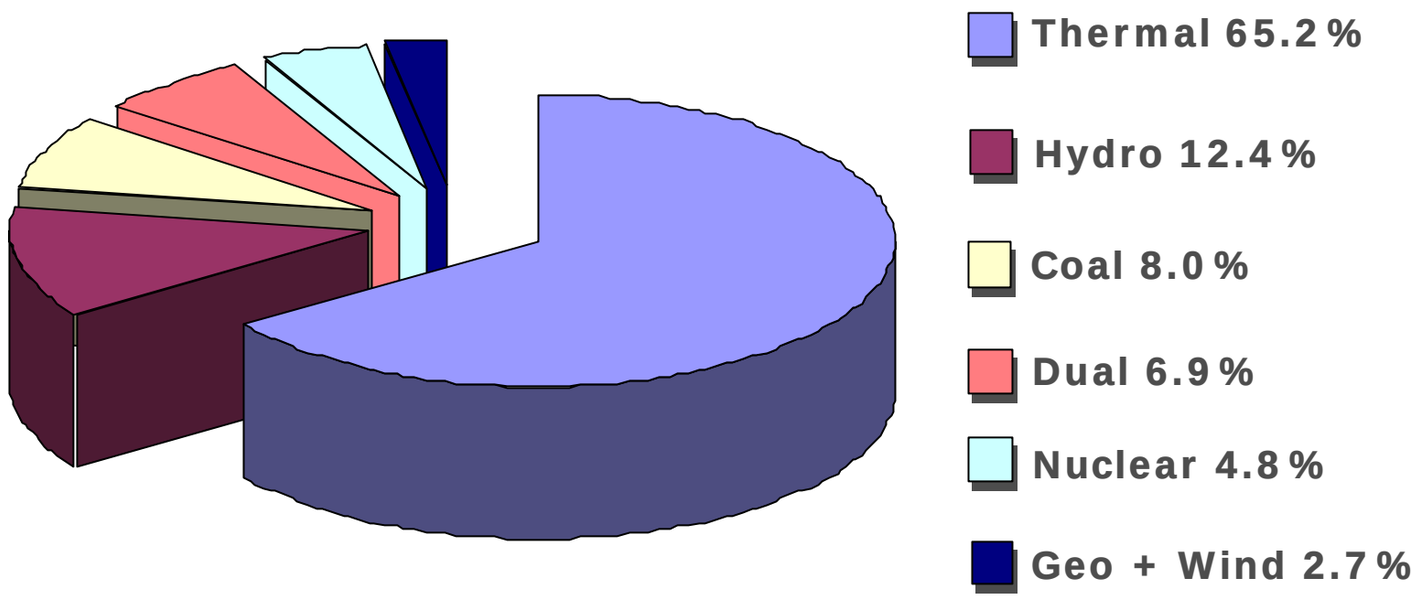
2003 total installed capacity in the Mexican power industry was 44,561 MW



Source: Electricty Prospective 2003-2012; Secretariat of Energy and Comisión Federal de Electricidad

Electricity Generation

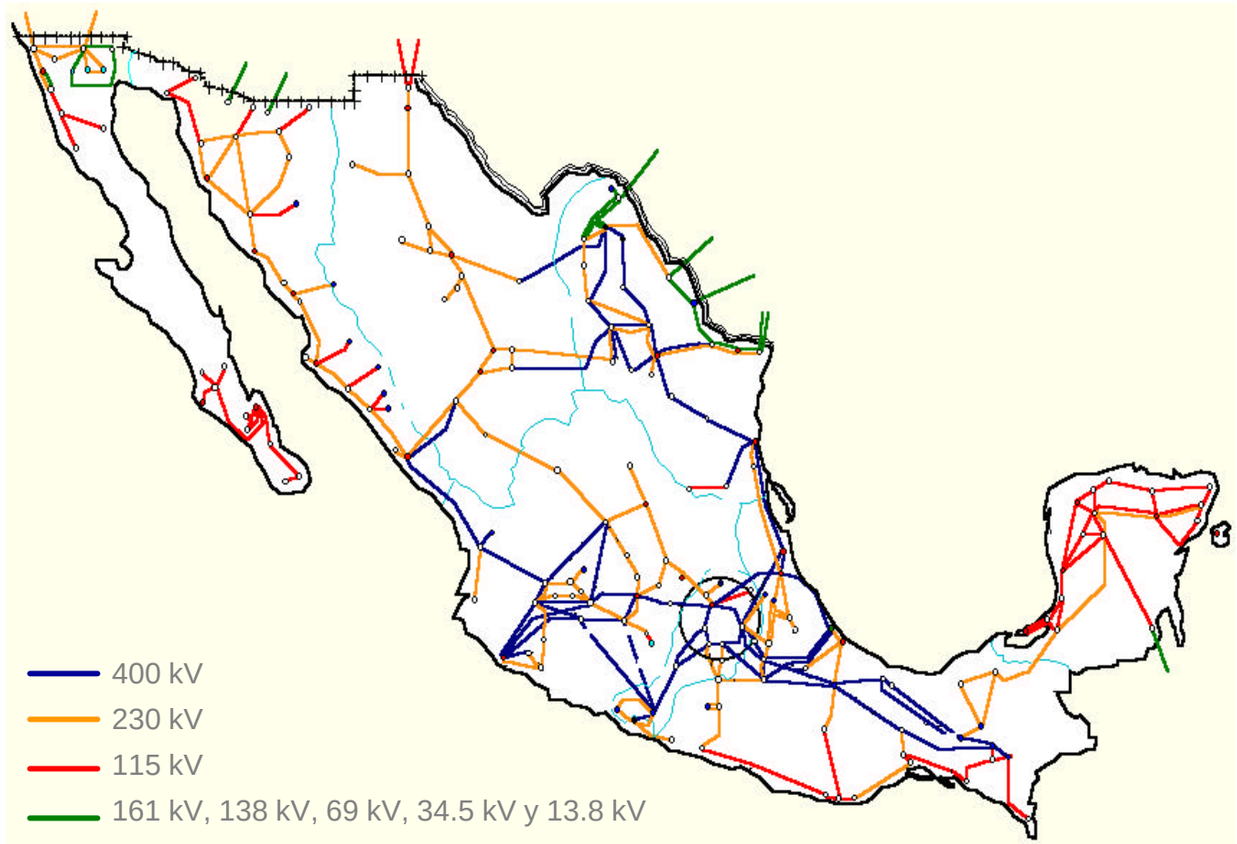
Power generation during 2003 amounted to 201,056 GWh (65% increase during last 10 years)



Source: Electricty Prospective 2003-2012; Secretariat of Energy

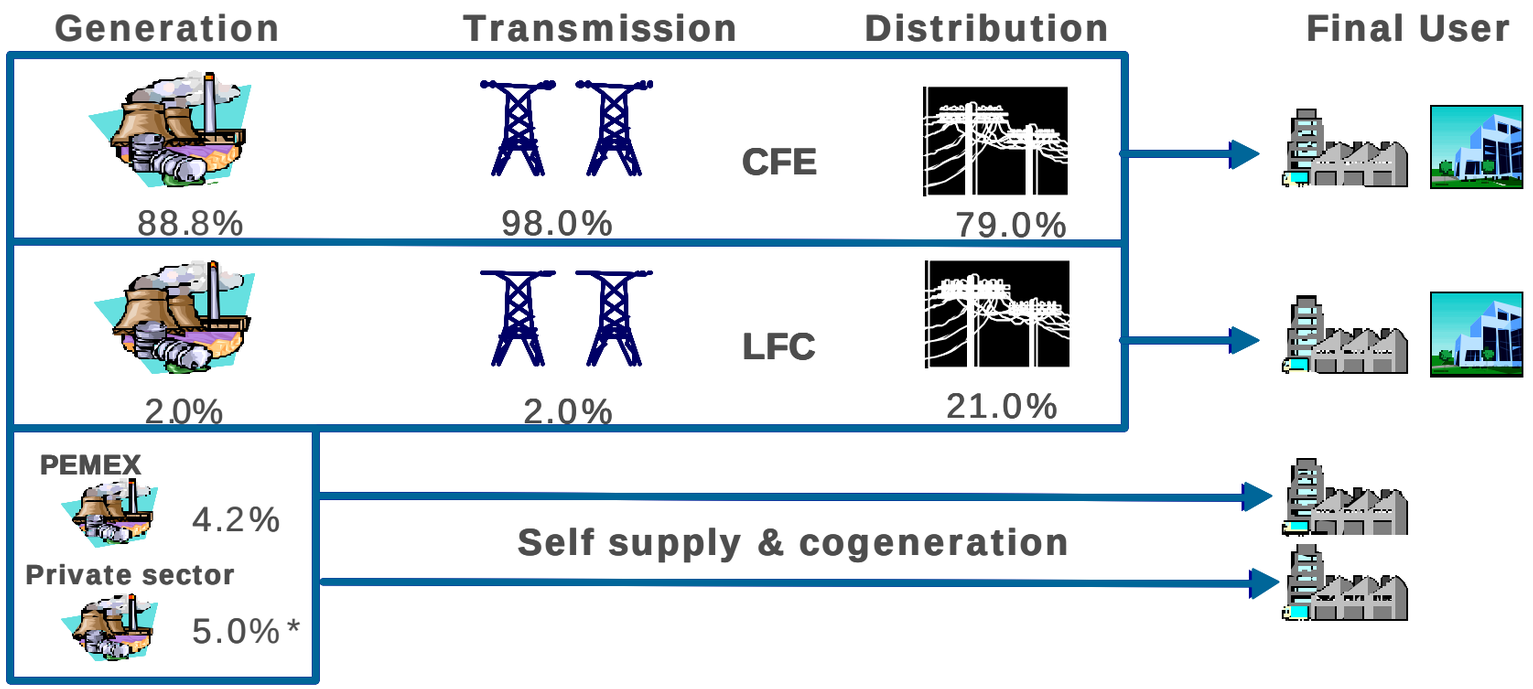
Transmission & Distribution Grid

- **Transmission & Distribution infrastructure consists of 431,205 miles**



Industry Structure

Strong Presence of State-Owned vertically integrated monopolies

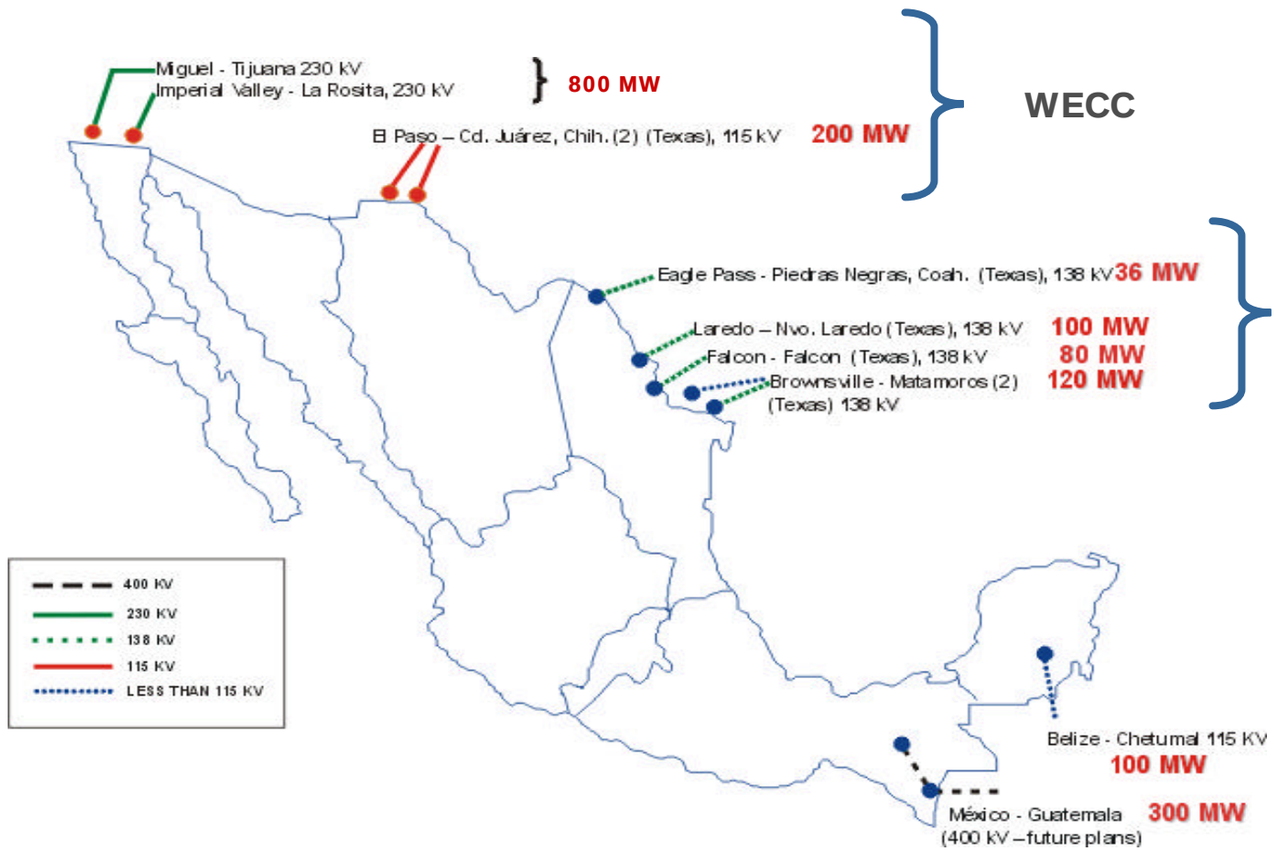


* Excludes IPP's

Interconnection Infrastructure

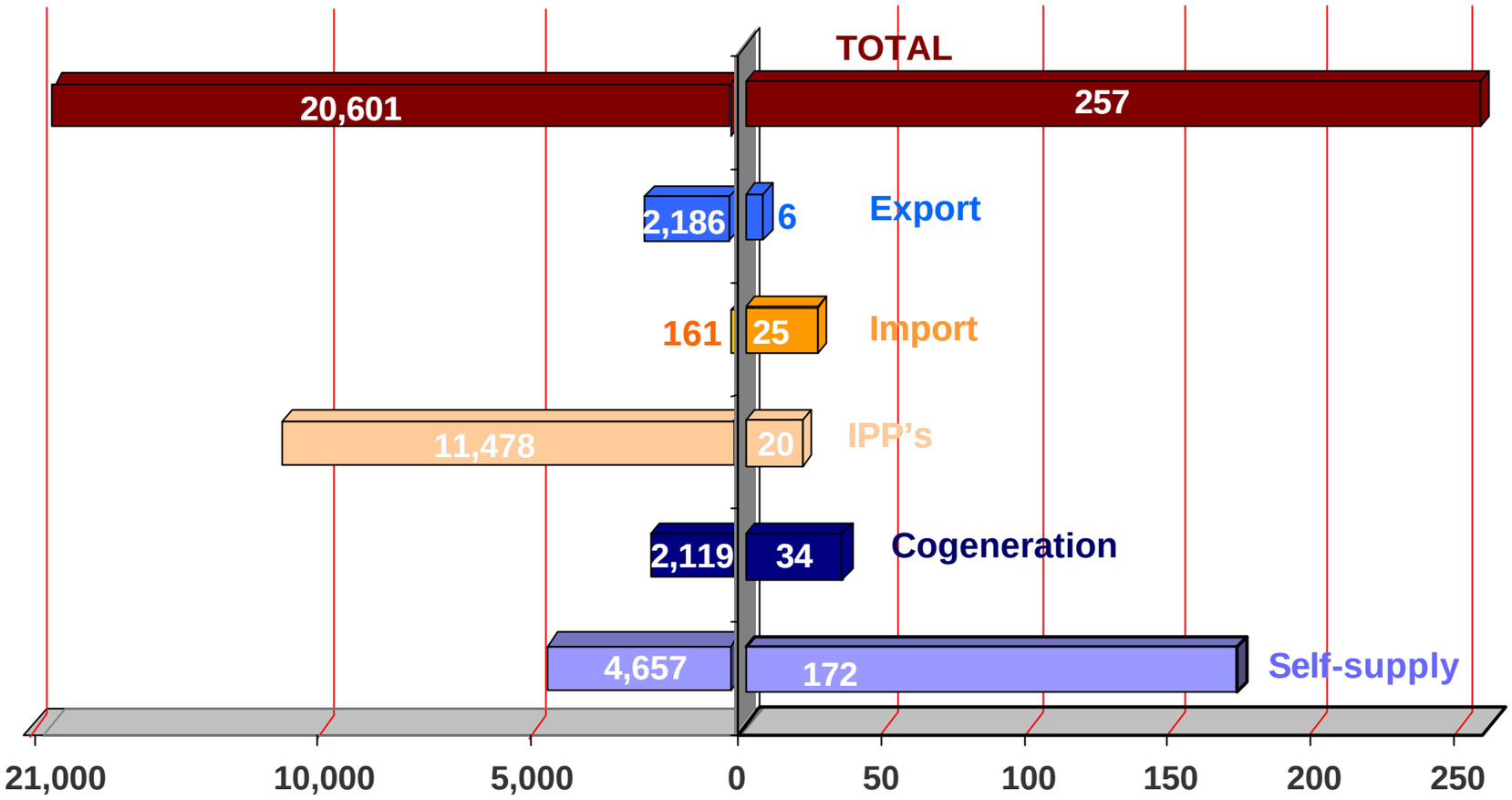
Few and small interconnections between Mexico and US

- Only 12 high voltage operating interconnections



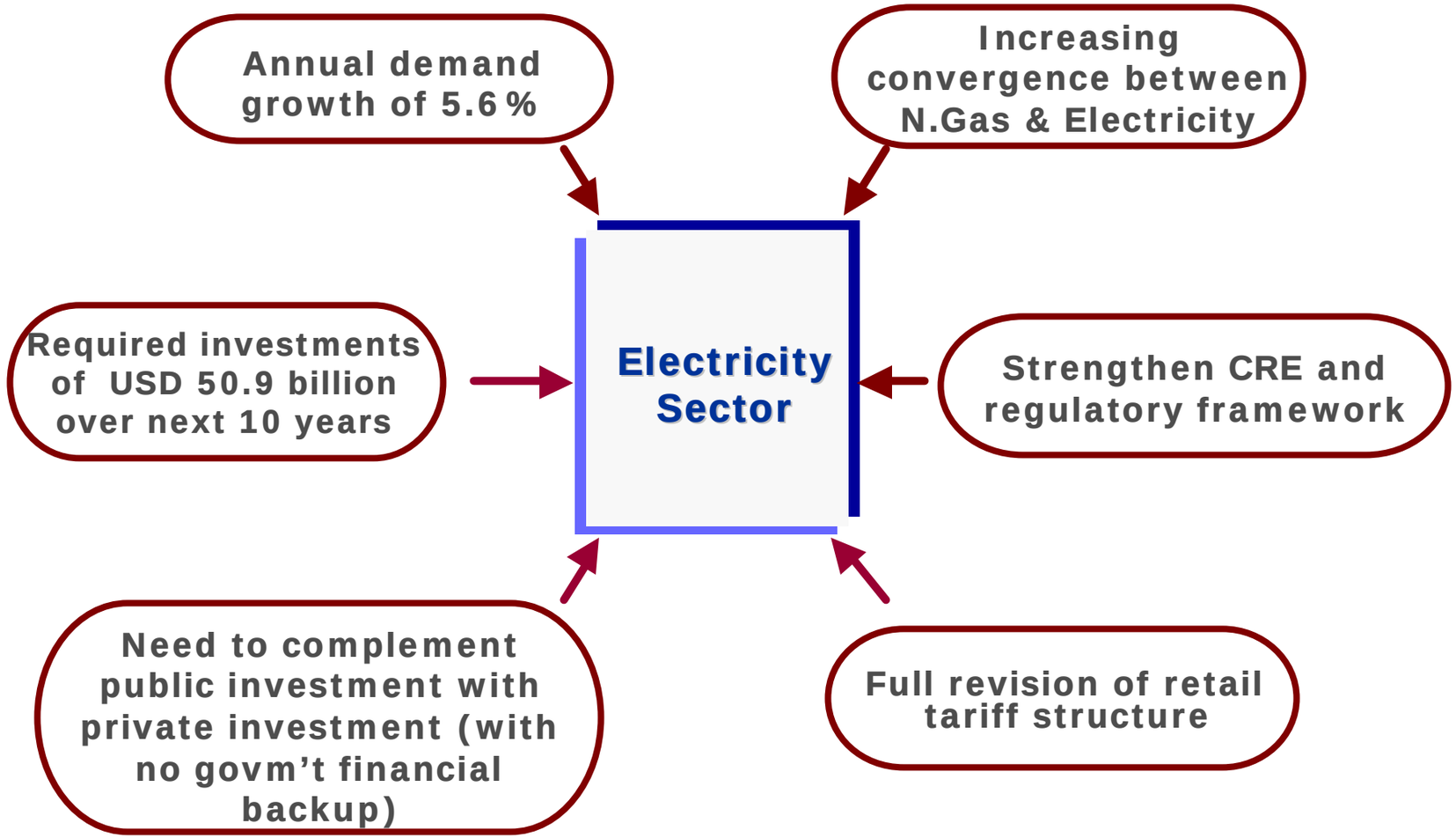
Source: Electricity Prospective, Secretariat of Energy, 2002-2011

Permits granted by CRE (1994-2004)



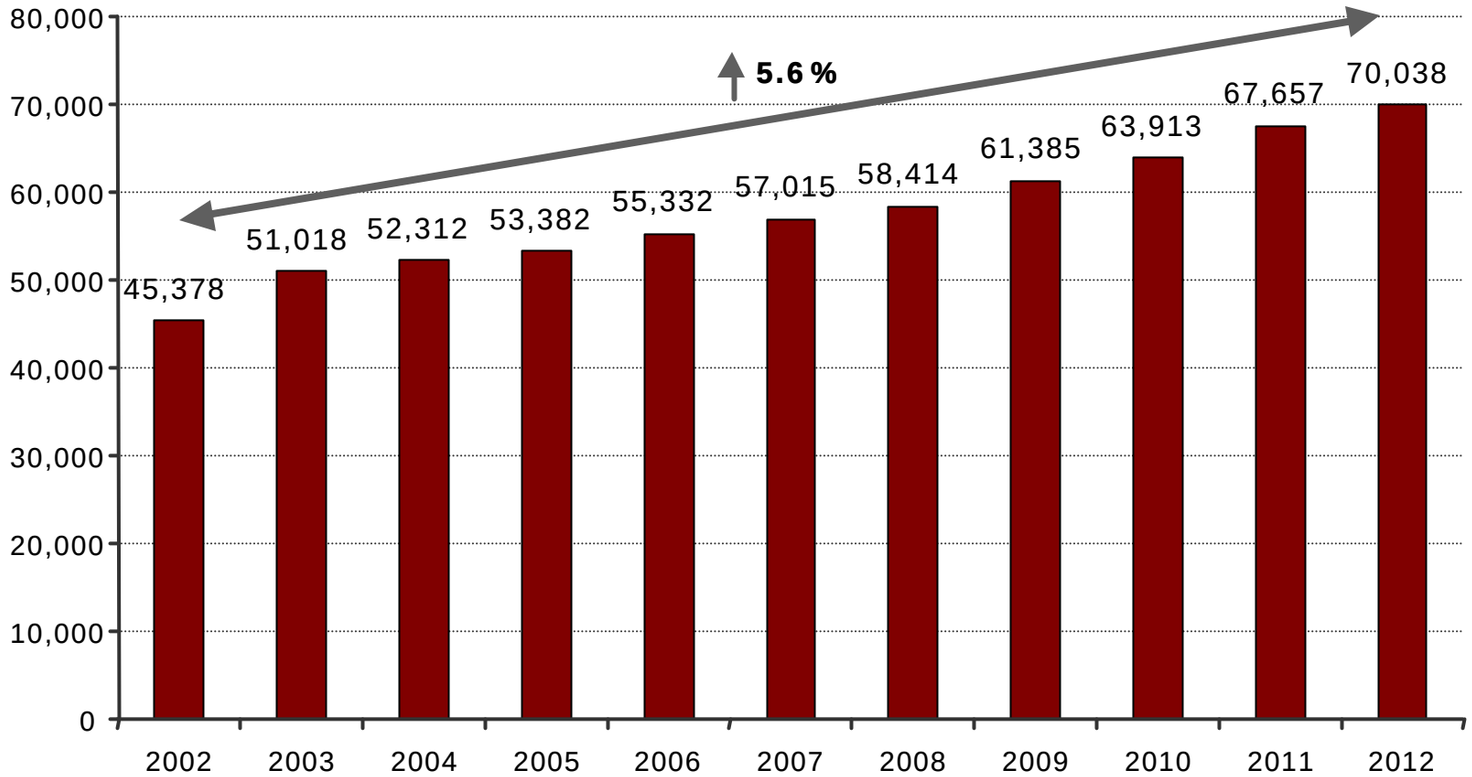
II. Challenges

Electricity Challenges in Mexico



Electricity Demand Growth

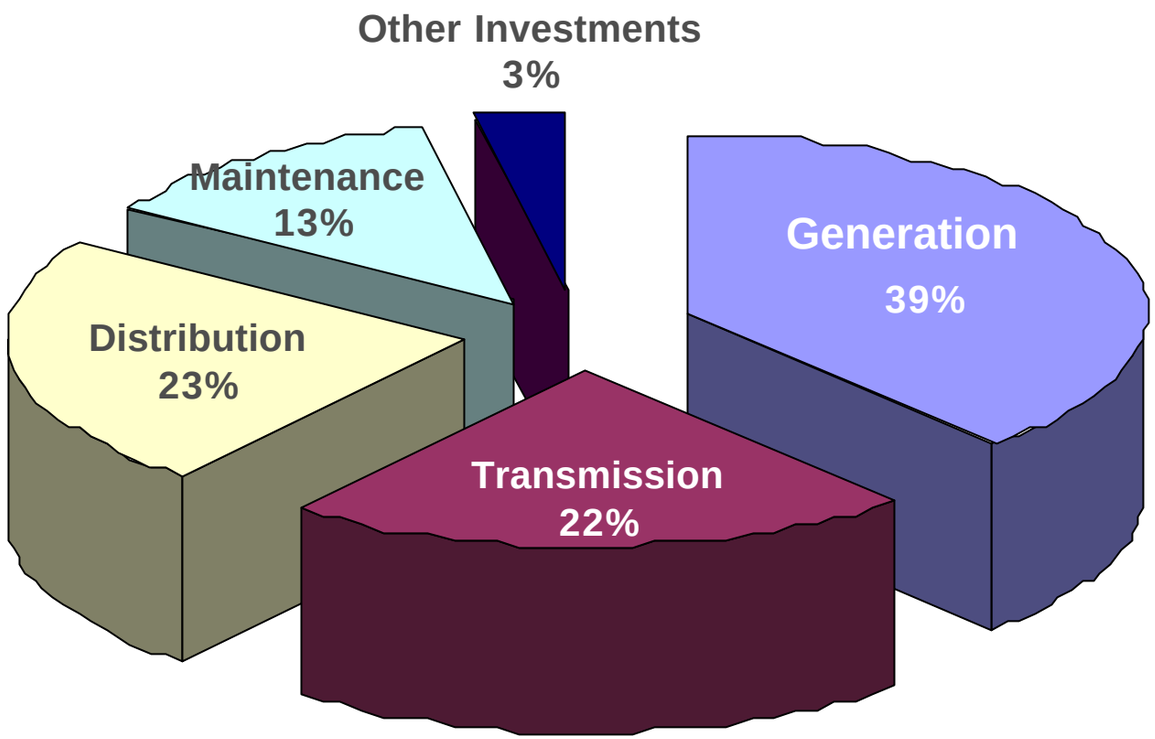
To satisfy growing demand, it will be necessary to install 24,660 MW of additional capacity between 2002 and 2012



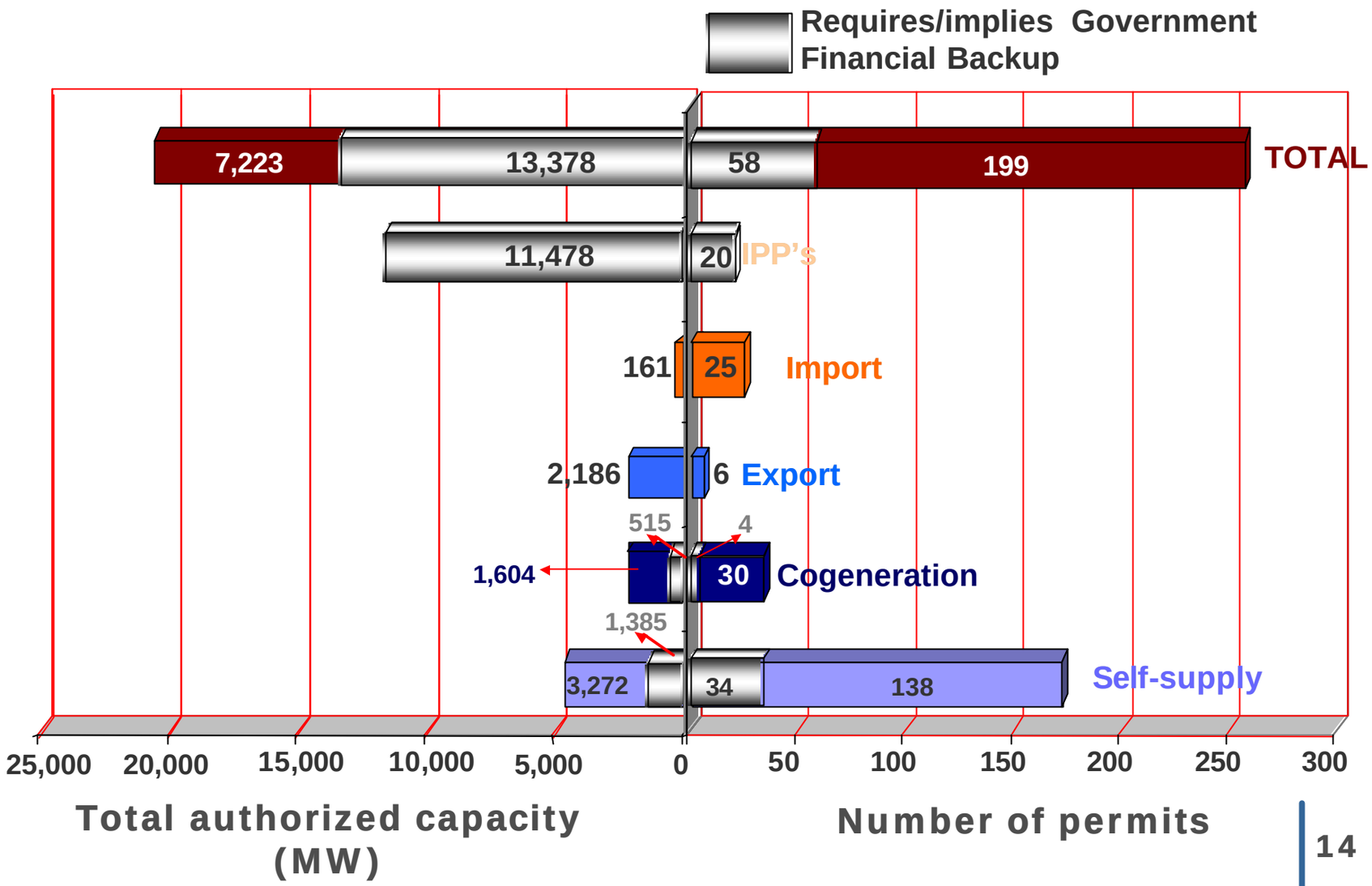
Source: Electricty Prospective 2003-2012; Secretariat of Energy

Investment Requirements

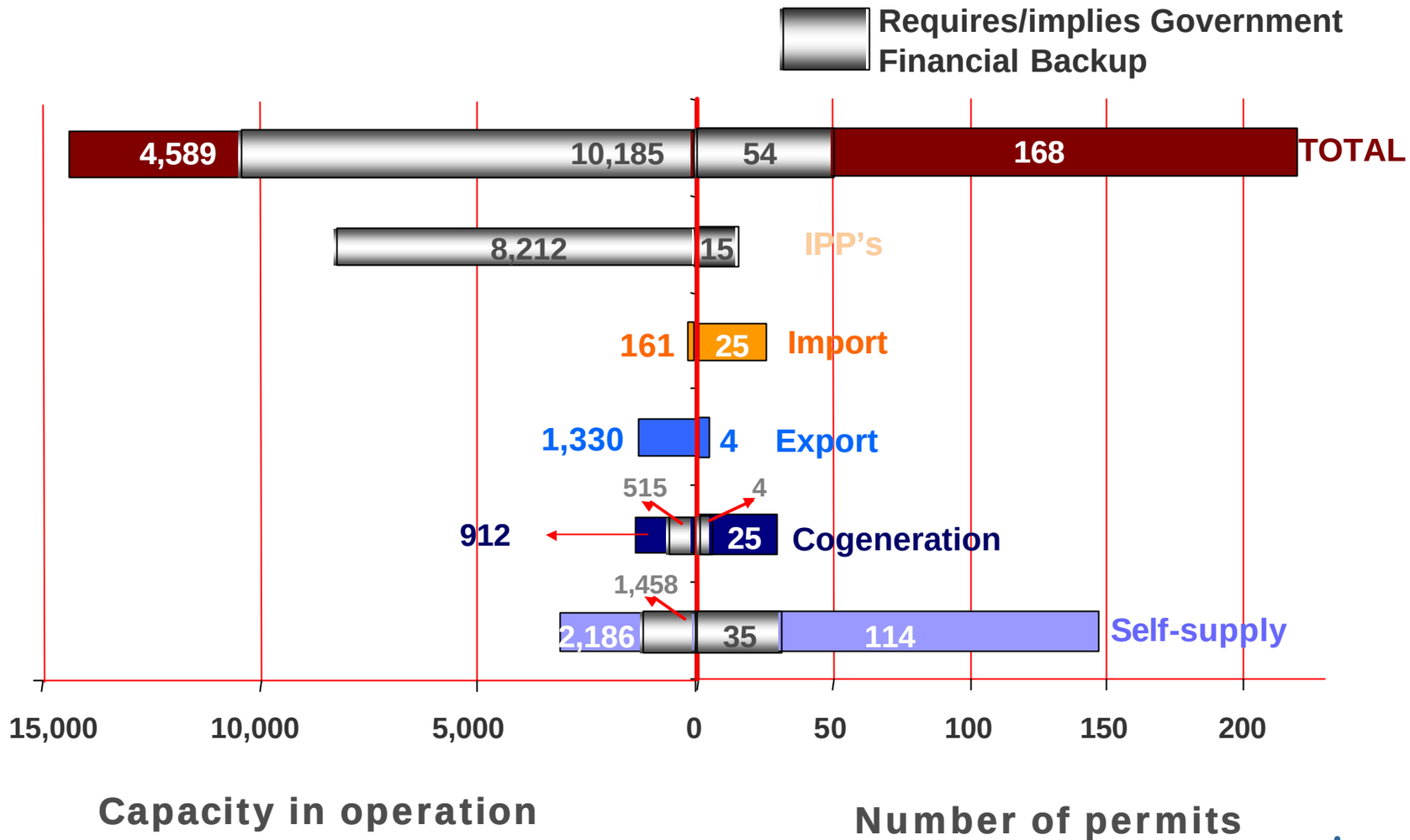
- **Total investment requirements in the electricity sector between 2003 and 2012 are 50.9 billion dollars**



Investments without Government financial backup



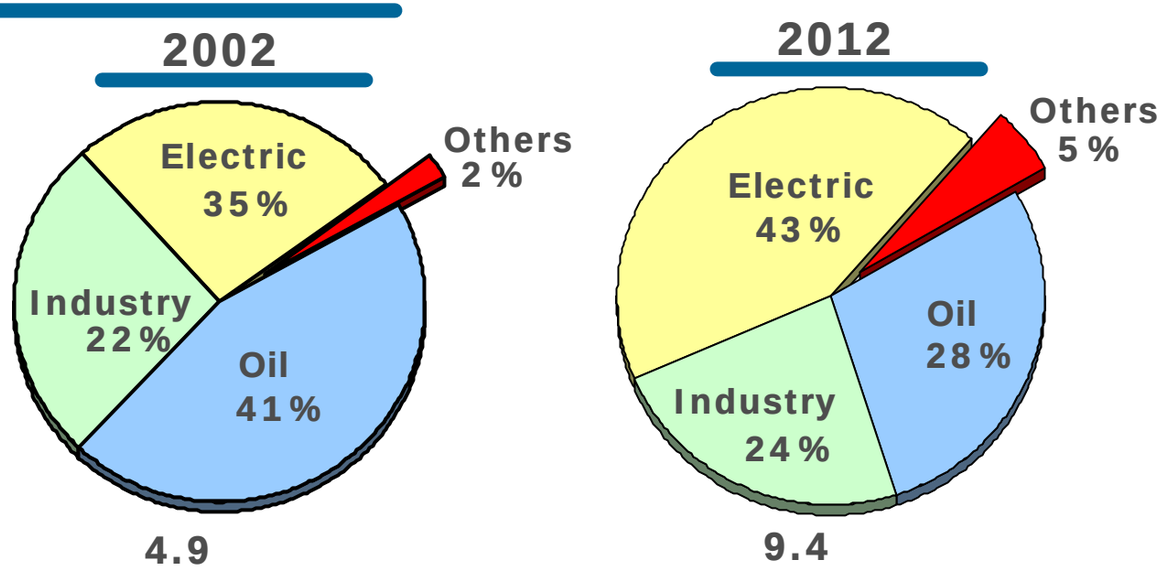
CRE's Permits currently in Operation



Growing convergence of Natural Gas & Electricity

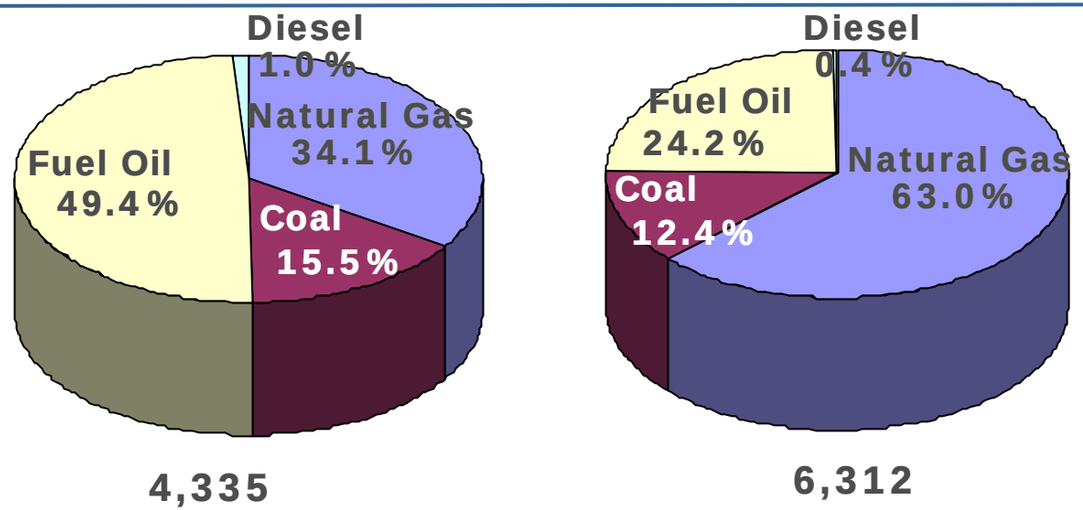
Natural gas demand by sector

(bcfd)

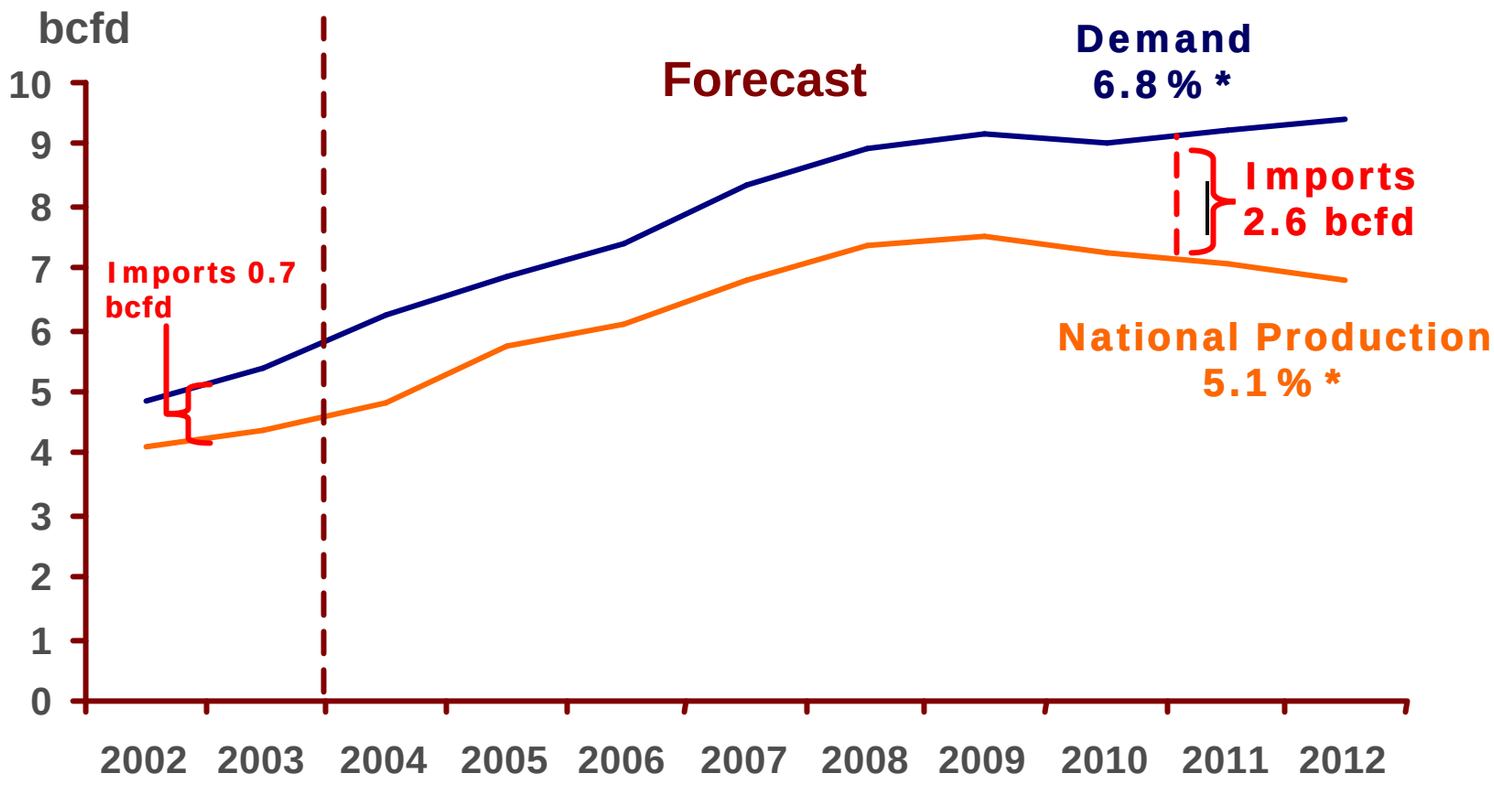


Consumption of fossil fuels used for public service generation

(Terajoules/day)

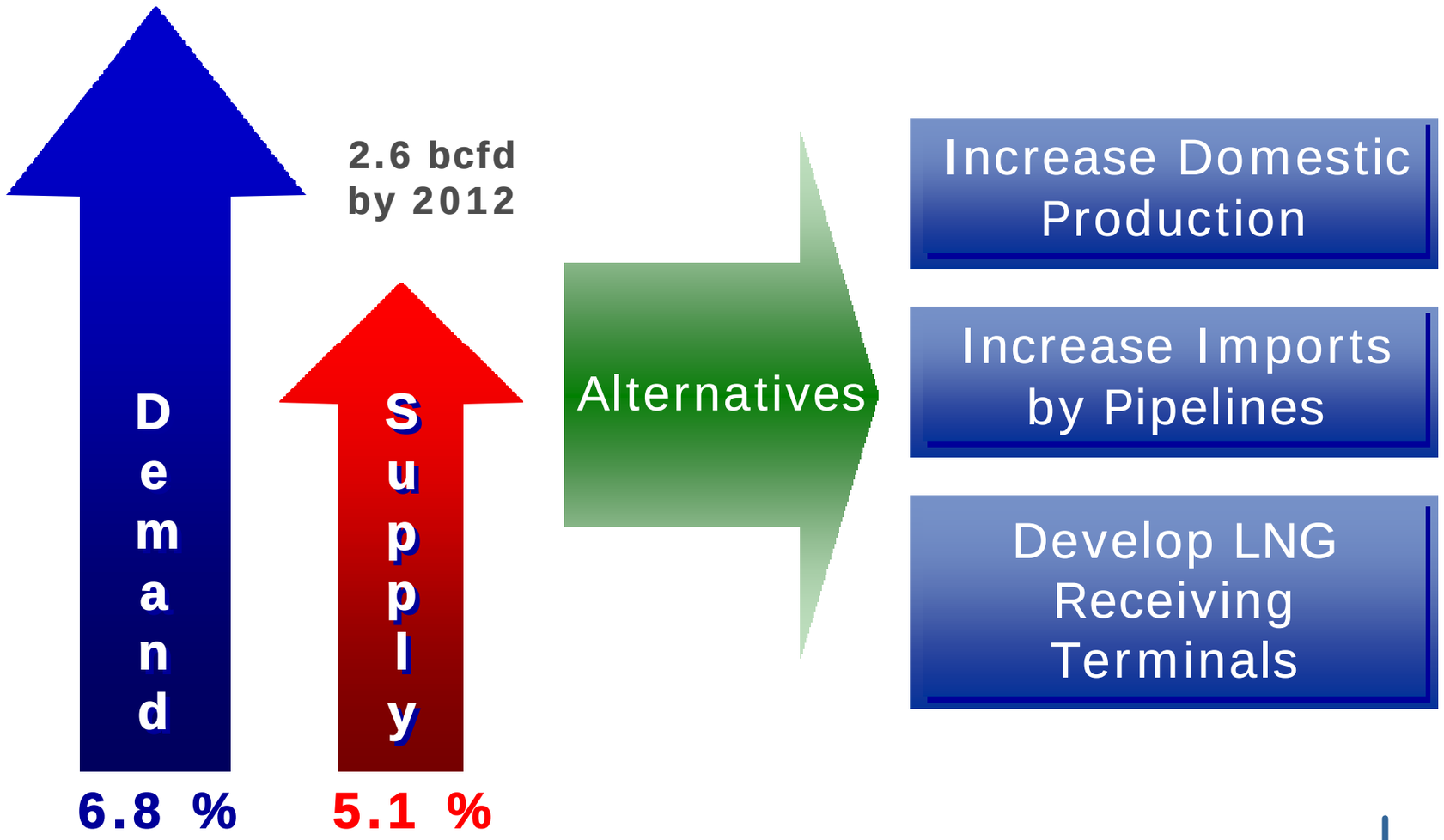


Natural Gas Growing Imports



*10 year expected average annual growth rate

Alternatives to Balance Natural Gas Supply and Demand



III. Issues on Electricity Reliability and Security

System operation

- **Unlike in the US or Canada, in Mexico there is only one system operator**

- **CFE is in charge of the National Power System Operation, through CENACE (Centro Nacional de Control de Energía). The system operation follows four basic principles:**
  - **Security**
  - **Continuity**
  - **Quality**
  - **Economy**

- **As part of the electricity reform proposal, the government aims at strenghtening the CRE, by granting it powers to participate in the design and to approve the reliablity standards proposed by the system operator**

Reliabity standards

- **Currently, CENACE is responsible for designing and implementing reliability standards. These reliability principles are based on NERC standards**

- **Some characteristics of the Mexican reliability standards are:**

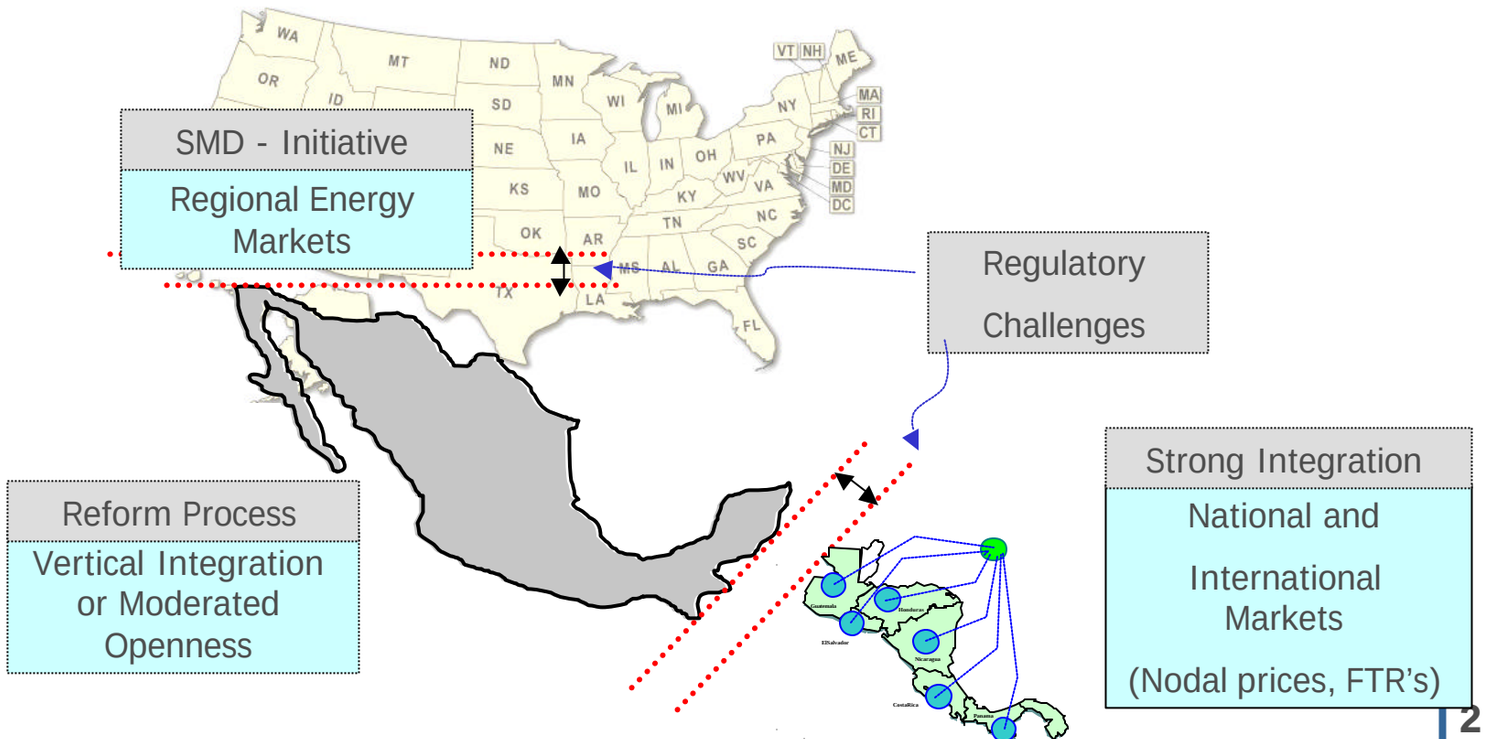
  - **Real Power Operational Reserve (6%)**
  - **Automatic Control Generation**
  - **Transmission Grid Operation Procedures**
  - **Voltage Control and Reactive Power Reserves**
  - **Black Start Reserve**

- **Capacity adequacy requirements. CENACE defines a Long Run Reserve Margin of 27%**

  - **CFE is responsible for assuring this reserve capacity**

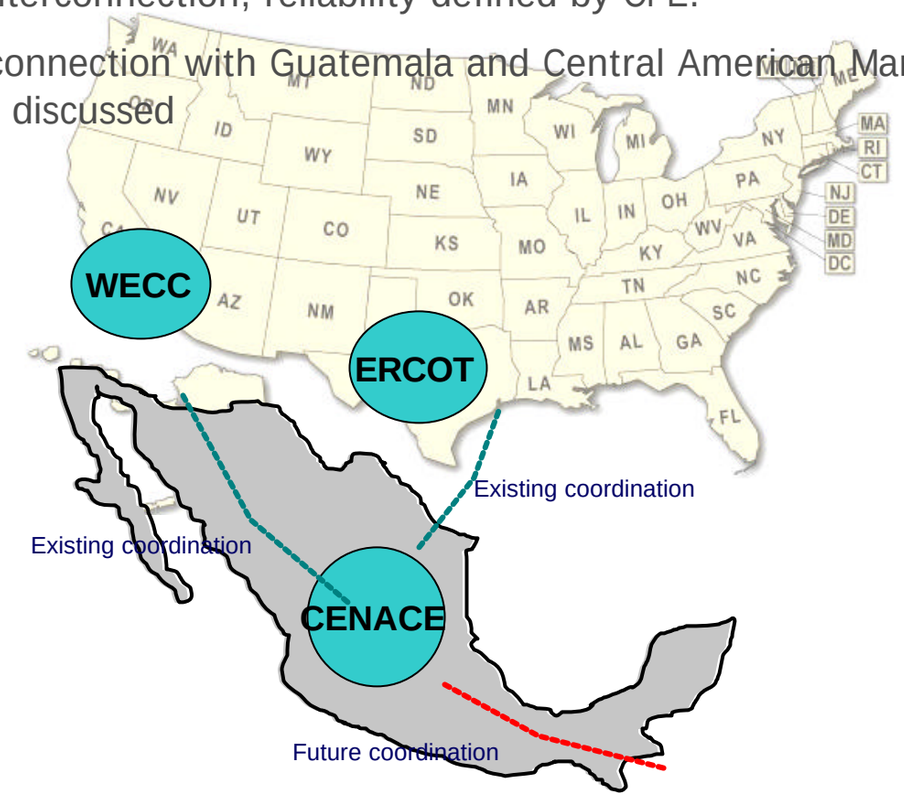
Commercial Cross-border coordination issues

- Consumers are allowed to import electricity for self-consumption. Additionally, generation for exports are permitted under current legislation. Both activities require a permit issued by the CRE
- CFE can also export and import electricity for public service
- Coordination is a challenge due to market and regulatory differences



Reliability cross-border coordination issues

- Baja California is an isolated area fully interconected with WECC for reliability purposes
- The rest of the country is connected with ERCOT through limited reliability coordination
- Current Belize interconnection, reliability defined by CFE.
- For future interconnection with Guatemala and Central American Market, reliability issues are being discussed



Regulatory Perspectives

On March 2001, the North American Energy Working Group (NAEWG) was formed. It includes representatives from Canada, US and Mexico

NAEWG's objectives are:

- Promote communication and cooperation among the three governments on energy maters
- Increase energy trade and interconnections

NAEWG has published several working documents

Additionally, CRE maintains close coordination with Canadian and US Federal regulators

- Among the issues that should be further analyzed are the development, approval and enforcement of common reliability criteria
- Clear and consistent rules are needed in the three countries

www.cre.gob.mx