Lomonosov Moscow State University
Business School

Global Limits of Economic Growth

Lomonosov Moscow State University,
Inter-Departmental Course, 2024-2025, Spring Fall

Course Reader:

Evgeniya Anatolyevna Shvets, PhD.

e.shvec@edu.mgubs.ru

Requirements to Pass the Course

1) At least 50% of sessions are attended (6/12)

2) At least 60% points for the final course test

3) Individual Project (Presentation) is done properly and delivered in time

General Scheme for Resource Limitations Analysis

Scheme for the Individual Project (1-2 students per 1 project)

Resources	Steps of Analysis					
	Step 1	Step 2			Step 3	Step 4
	Role/ Importance	Limitations produced for			Ways used to overcome existing limitations	Suggestions how to improve these ways of coping with limitations
		World economy	National economy	Industries/ Business		
Unique Resource or Problem selected by you *Scale: world or a country or an industry*	...	...	...	...	...	...

Write the Topic of your individual project in a file

- https://disk.yandex.ru/i/0L_3ptbx-s2yBw

Topics for individual projects

Course «Global Limits of Economic Growth», spring 2025

№	Student's Name & Surname	MSU department	E-mail	Topic selected	Comments of the course teacher
	Example: Aurora Dias	*Geografical Department*	*...@geo.msu.ru*	*Water & electricity as limiting factors for the development of mining industries*	*Accepted*
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Pre-Reading and Food-for-Thought Assignment before Sessions 4a,4b (March,20)

Files for pre-reading are available in corresponding folders of the course in Microsoft Teams

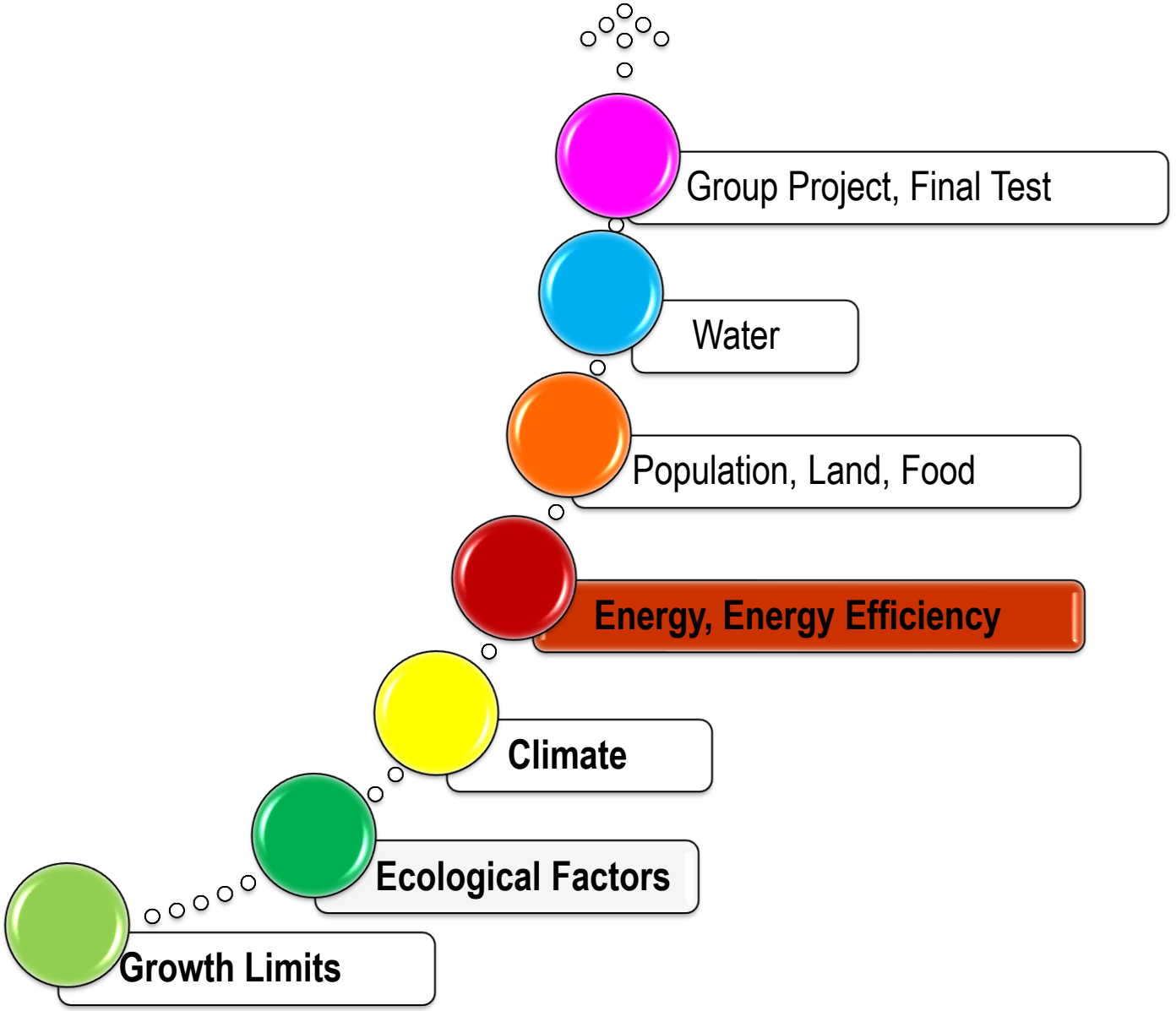
ENERGY EFFICIENCY & ENERGY SAVING PROGRAMS

- Familiarize with websites www.ecolabel.eu and www.energystar.gov.

  Think about:

  1. What are the goals, measures and instruments used in each of these programs?
  2. How the efficiency of these programs can be evaluated?
  3. Should such programs be obligatory or voluntary in your opinion?

Course Route



Session 7

Energy Security
Energy Efficiency & Energy Saving

2025

The Aims of the Session 7

1. To understand the causes of energy security problems and scope of them
2. To understand the origins of energy efficiency programs
3. To be able to calculate basic economic benefits in the field of energy saving
4. To know different types of energy efficiency programs and their instruments

PLAN of the Session 7

1. Energy Politics, Energy Security Problem
   - International Energy Conflicts
   - Role of Multinationals Companies and Governments
   - Types of Energy Crises
2. Origins of Energy Saving
3. Governmental Energy Efficiency Programs

(to be continued during next session)

- Energy Revolution in Cuba
- US Energy Star Program
- EU Ecolabel

Energy Conflicts, Energy Crises, Energy Security

International Energy Conflicts:
Role of *Multinationals Companies* and *National Governments*

Discussion of the abstract from Perkins J. “Confessions of an Economic Hit Man” (Chapter 33, pp.196-202)

Questions for discussion:

1. What was the degree of Venezuelan economy oil dependence?
2. Analyze first government instruments that were used when Chavez came into power? Were they efficient?
3. What were positive and negative social and economic effects of oil dependence for Venezuela at different times?
4. How was the energy security understood by Chavez government and by multinational companies?

Oil in Falklands: Argentina, the UK and Falklands

- The war between Argentina and the UK over the islands was started in 1982 (history goes back to 1833)
- Exploratory wells were drilled off the Falklands in 1998. Results: there might be oil, further exploration was not then seen as profitable.
- Tension increased because:
  - Argentina's output of oil and gas has fallen in 2000-s .
  - Since the war, income per head in the once-poor islands has substantially overhauled that in Argentina: while the Falklands have grown rich on squid, Argentina's long decline has continued.

Source: The Economist

Oil in Arctic: Dispute of 6 Countries *(video)*

- Who are the agents involved?
- What are advantages of ice melting for Greenland?
- What problems can possibly surge if arctic oil reserves prove to be real and huge?

Energy Security Problem

- Threats to energy security (Risk Factors):
  - Increase in energy prices (1973)
  - The political instability of energy producing countries (Iraq, Iran)
  - The manipulation of energy supplies (transit countries)
  - The competition over energy sources (Arctic, Falklands)
  - Attacks on supply infrastructure (Nigeria, Ecuador)
  - Accidents and natural disasters (Brazil, Venezuela, Mexican Gulf)
  - Terrorism and warfare (Middle East)

Energy Security Problem

- National energy security policies: new goals
- Energy crises  Energy security problem

Types of Energy Crises

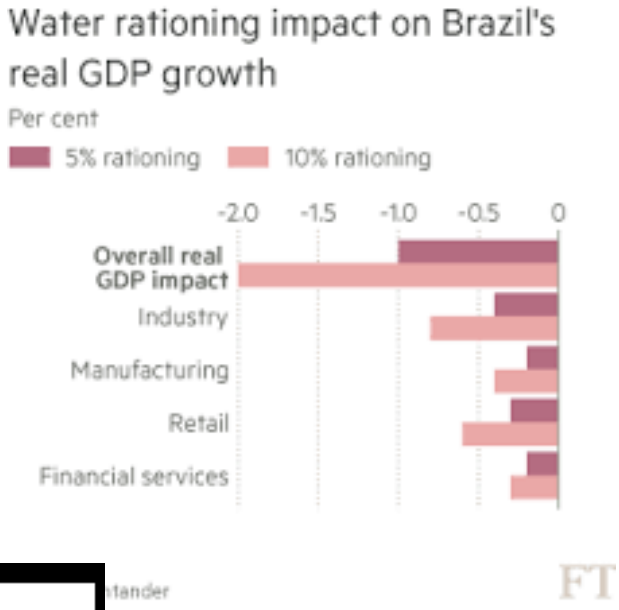
- National level cases:
  - Brazil, 2000-2001
  - Argentina, 2004
  - Chile, 2004
  - Venezuela (2010)
  - Cuba (1990-2005)
  - USA, California, 2000-2001
- Other examples
  - …
  - …
  - …
  - …
  - …
  - …

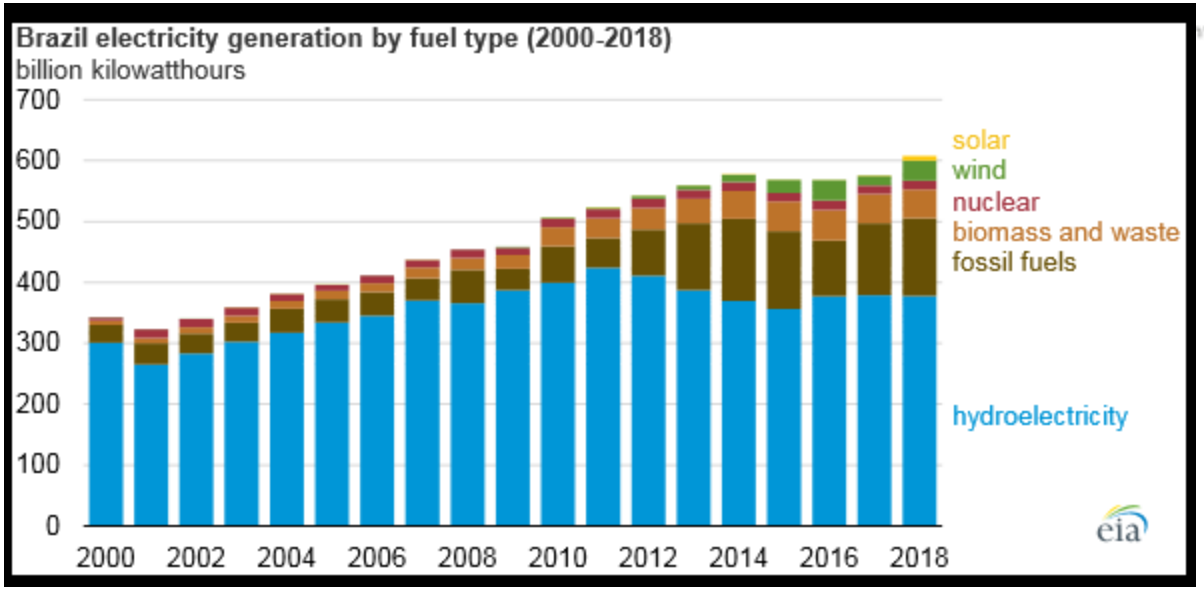
Scheme for Analysis of Energy Crises

Country (year)	Type of energy resource that was missing	The cause of it (natural, tech., etc.)	Caused damage	Measures taken to control it	Lessons learned
Brazil (2001)					
Argentina (2004)					
Chile (2004)					
Venezuela (2010)					
Cuba (1990-2005)					
USA, California (2000-2001)					

Brazil Energy Crisis

- Electricity generation crisis in 2001

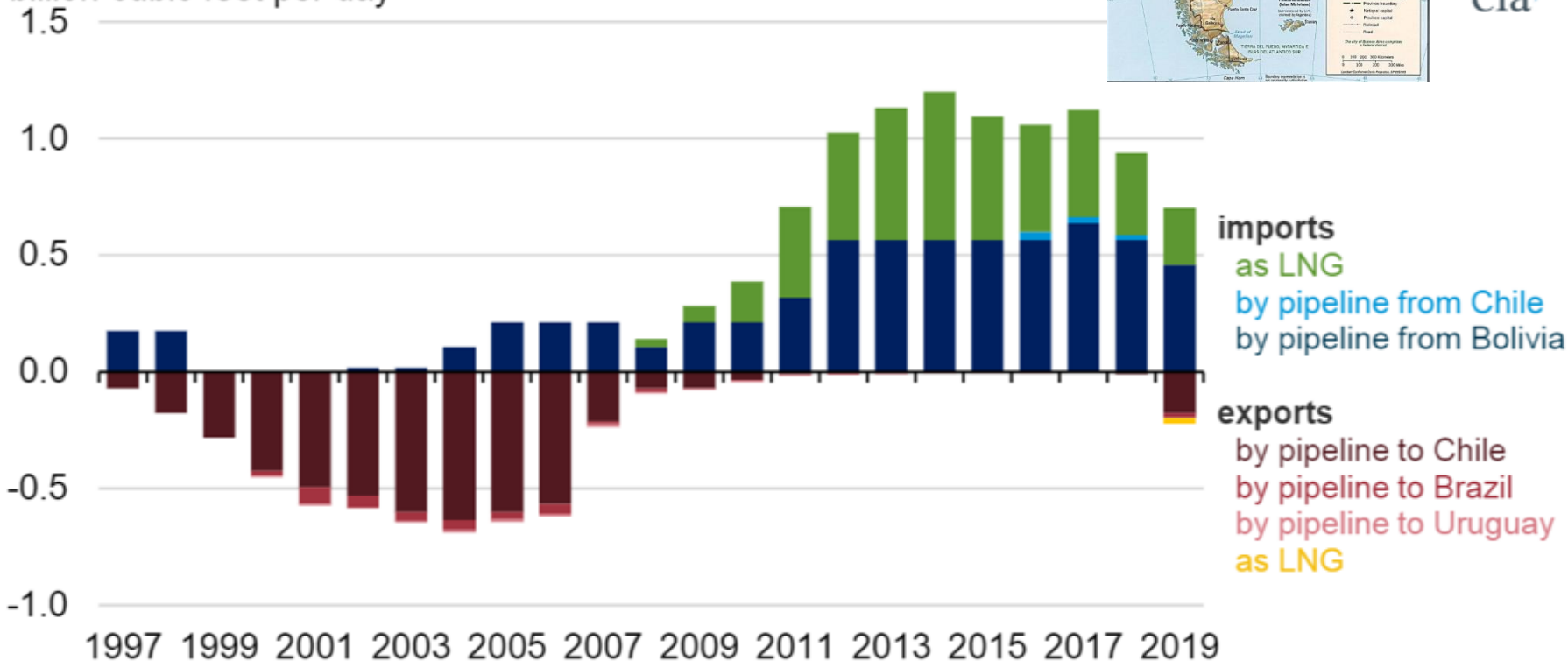




Argentina Energy Crisis

Argentina natural gas trade (1997-2019)

billion cubic feet per day



Source: U.S. Energy Information Administration, based on Secretaría de Gobierno de Energía de Argentina (April 2019)

Chile Energy Crisis

Milestones in the Chilean electricity system

1982 world pioneer in deregulation

1996 Opportunities to investment in natural gas technologies

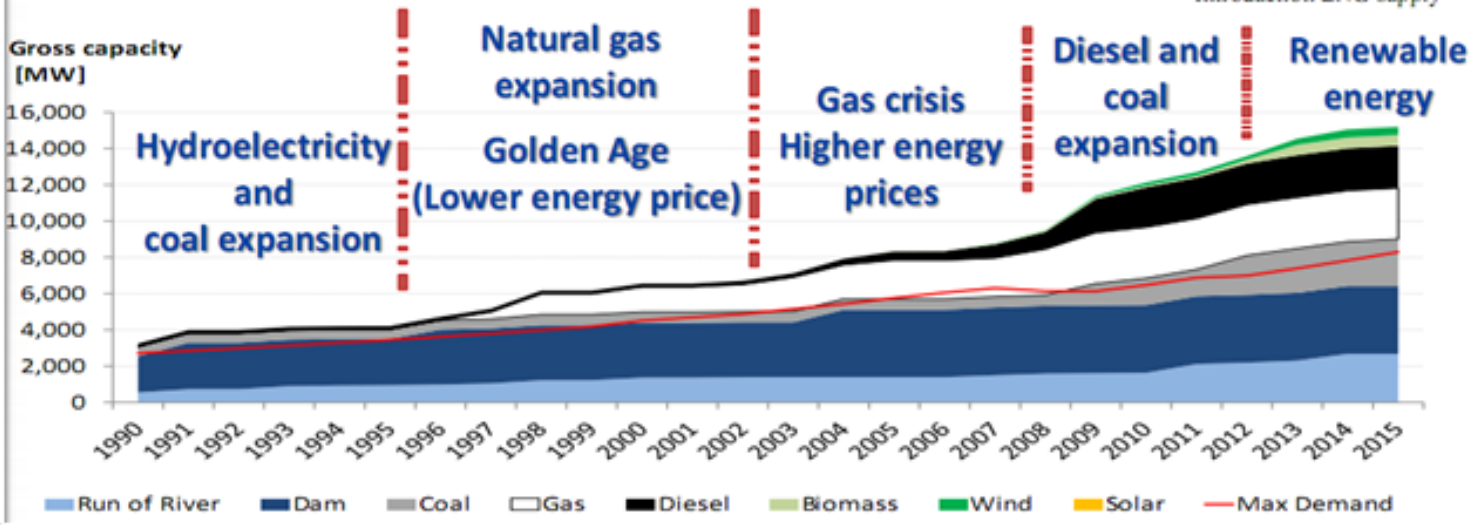
1998 - 1999 Hydro crisis and units failures. Regulation changes

2004 Argentine cutoff gas to Chile. Regulation changes

2009 -2015 Drought scenarios Social rejection

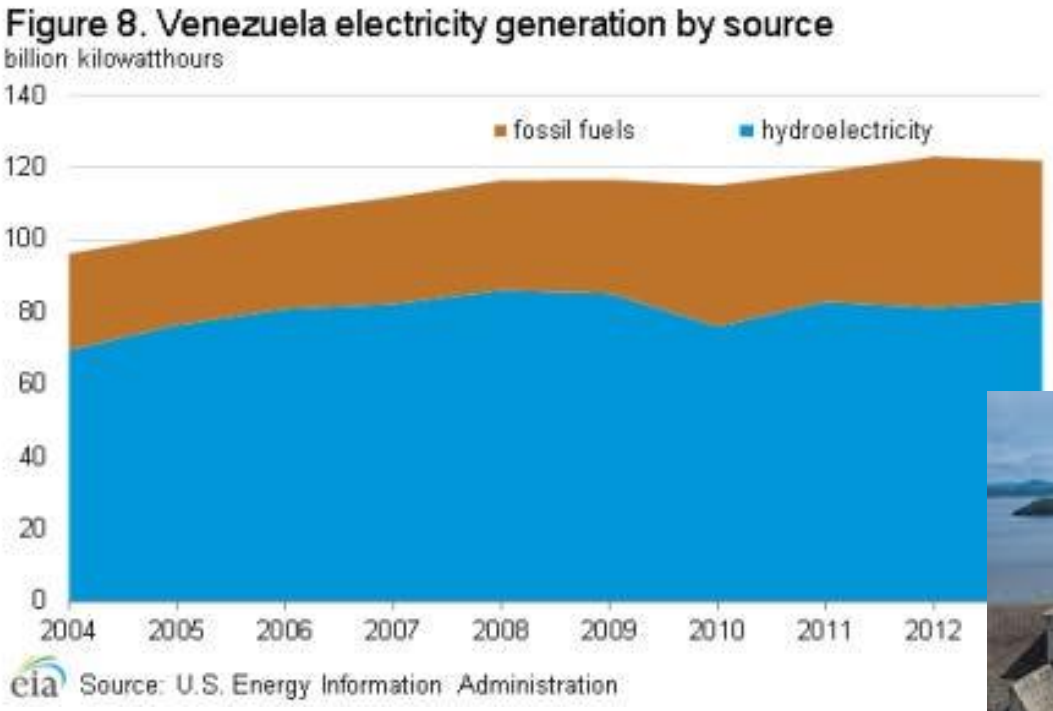
Increased in energy cost

Introduction LNG supply



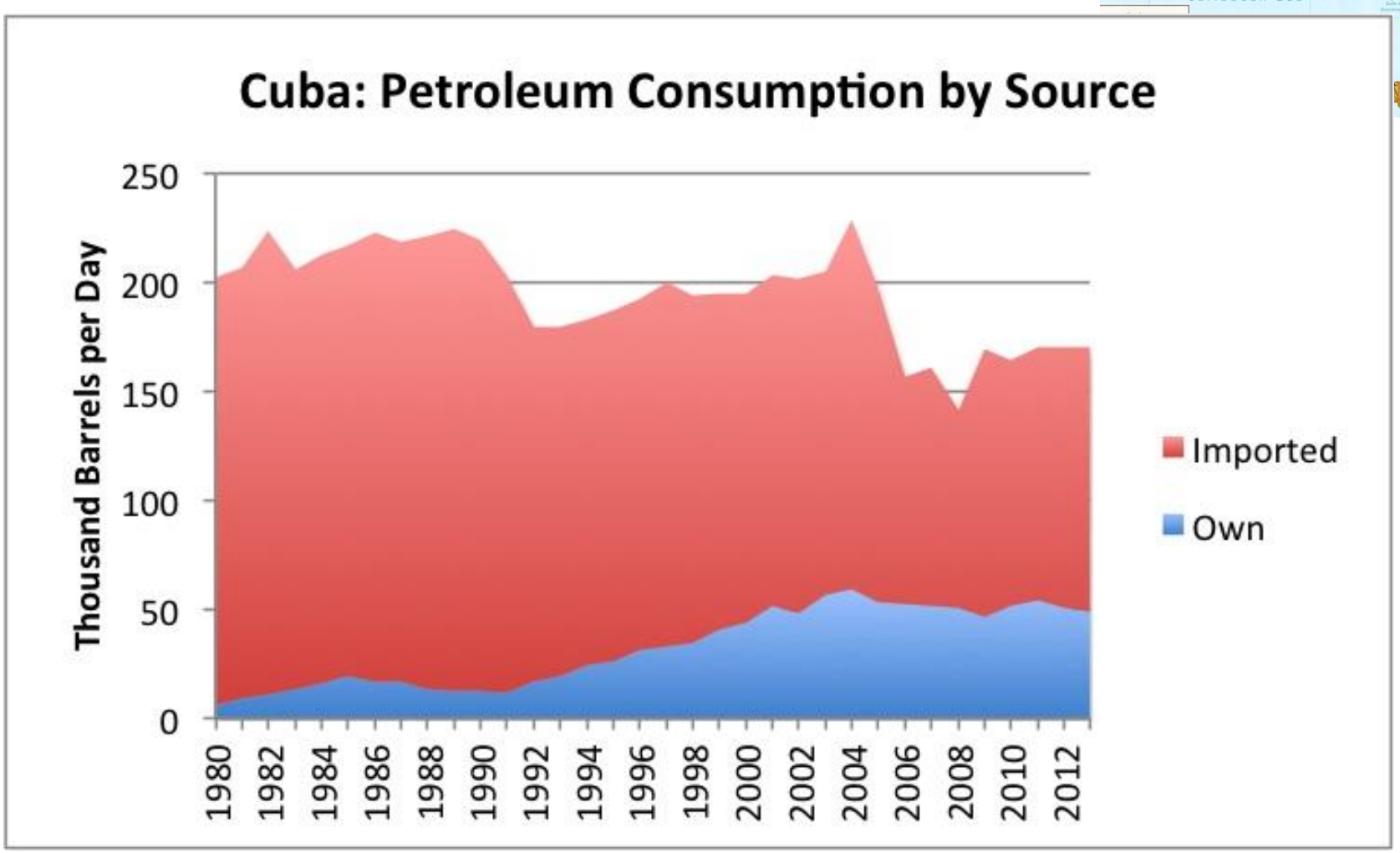
Venezuela Energy Crisis

- Electricity generation crisis in 2010



What is the difference compared to the Brazilian case?

Cuba Energy Crisis



European Energy Crisis (2000-2010)

- Strained relations between Ukraine and Russia concerning Russian natural gas transit through the territory of Ukraine to consumers in Eastern and Western Europe
- Russia
  - Looking for alternative gas pipeline project
- Ukraine
  - Attempts to resolve national scale problem (lack of finance to pay for consumed gas even on preferential terms)
- European countries:
  - Felt their vulnerability due to one energy source and conflict between country-supplier and transit-country, had to rethink their energy policy and pay more attention to energy diversification and alternative gas pipelines
- International agreement to control gas transit with international representatives on key-points of a gas pipeline
- Huge financial losses. Who will pay?

California Electricity Crisis (Western U.S. Energy Crisis)

- 2000-2001 - California had a shortage of electricity
- California's population increased by 13% during the 1990s. The state did not build any new major power plants during that time, only some expansion of production capacity took place.
- By keeping the consumer (retail) price of electricity artificially very low, the local government discouraged citizens from practicing conservation
- 1996 - California began to lose controls on its energy market and took measures to increase competition
- Government price caps
- 2000 - Significant energy price rises
- 2000-2001 – blackouts affected more than 2 mln customers. A state of emergency was declared.
- September 2001 – energy prices normalized
- Deregulation and decentralization processes in electricity sector were stopped
- One of the lessons learned: both types of electricity prices (retail and wholesale) should be controlled

Lessons Learned from Energy Crises

Most Common Crises Causes

1. Dependence on one type of fossil fuels for electricity generation
2. Dependence on one supplier
3. Lack of own engineering technological solutions to use renewable sources
4. Regulation failures when investor (or manager of energy assets) doesn't have to maintain them
5. Lack of investments, energy infrastructure needs modernization
6. Expensiveness of technological devices to use energy of solar, wind and biomass

Most Effective Solutions and Preventions

1. Diversity of energy supply
2. Security of energy supply (multilateral internationally supported agreements)
3. Own investigation and research work needed to be carried on renewable sources of energy
4. Well developed regulation (legislation)
5. Incentives for investors, government should use all instruments to stimulate private investments in this sectors (PPPs, etc.)
6. New electricity use culture, energy saving

Energy Efficiency and Energy Saving

Origins of Energy Saving

1. Do people have to save energy and why?
2. Should energy saving measures be obligatory?
3. What are other ways except obligatory measures to persuade people consume less energy/electric power?
4. Propose when and where energy saving ideas obtained a general recognition?
5. Who should become the leader in introducing energy saving: governments, NGOs, companies, population?

Measures to Achieve Energy Efficiency

- Such measures as
  - *Energy efficient consumer electronics*
  - *Change of lighting-switch incandescent lamps to energy efficient lamps*
  - *Energy efficient appliances*
  - *Energy efficient buildings (heat and temperature saving technologies)*

- … usually are the most popular ones used in different governmental programs. Why?

Calculating Energy Saving

I. Calculating Energy Saving of Energy Efficient Lamps

Table 1

	Incandescent Lamp (60 W)	Equivalent Energy Efficient Lamp (11 W)
Average price (rub.)	30	160
Service time life (hours)	1000	8000
Service time life (months)		
Service time life (years)		
Average daily work hours for 1 lamp (hours)	**6**	
Electricity tariff for 1 kWh (Rub. /kWh)	**4.87**	

One lamp of **60W** consumes **0.06kWh** for 1 hour

Table 2

Expenditures of using this type of lamps	**(A) Incandescent Lamp** (electric lamp power is 60 W)	**(B) Equivalent Energy Efficient Lamp** (electric lamp power 11 W)
[W] → [kWh]	*A 1 kilowatt-hour means that a 1 000 watts of power are flowing for a period of 1 hour.* 1000 W → 1 kWh 60 W → .... kWh	11 W → .... kWh
for 1 month	TOTAL:	TOTAL:
Total [(A) – (B)]		
for 1 year	TOTAL:	TOTAL:
Total [(A) – (B)]		
for 3,5 years		
	TOTAL:	TOTAL:
Total [(A) – (B)]		

II. Choosing electricity tariff

You must choose the tariff for the electricity consumption in a Moscow apartment with electric stove. Still, you do not know at what day time the most part of electricity will be consumed. Decide about the preferable tariff for this case and present your arguments to support it.

Electricity tariffs for Moscow for apartments and houses with electric stoves (from 01/01/2021 till 30/06/2021)	**Price per 1 kWh in Rub.**	**Your calculations, comments**
1. Single-rate accounting with the use of a single-rate tariff	4.87	
2. Two-tariff accounting with the use of a tariff differentiated by day zones		
Night zone T2 (23.00-7.00)	1.63	
Day zone T1 (7.00-23.00)	5.60	
3. Multi-tariff accounting with the use of a tariff differentiated by day zones		
Night zone T2 (23.00-7.00)	1.63	
Half-peak zone T3 (10.00-17.00; 21.00-23.00)	4.87	
Peak zone T1 (7.00-10.00; 17.00-21.00)	5.84	

Governmental Energy Efficiency Programs

- Cases:
  - Cuba: Energy Revolution
  - USA: US Energy Star Program
  - EU: EU Ecolabel

To be continued during next session.