

IREP^{Symposium} 2010



Búzios, Rio de Janeiro
August 1-6, 2010

Bulk Power System Dynamics and Control - VIII
"Controlling Uncertainties in a Dynamic Environment"



Power Engineering Education in Brazil and its Appeal in Fast Growing Energy Market

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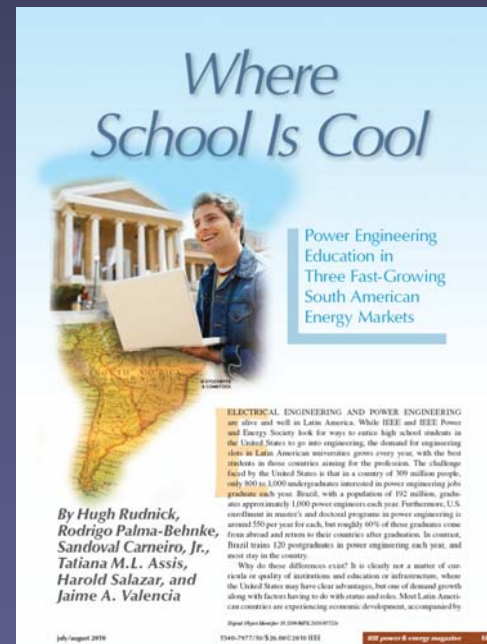
Fluminense Federal University



Federal University of Rio de Janeiro

Introduction

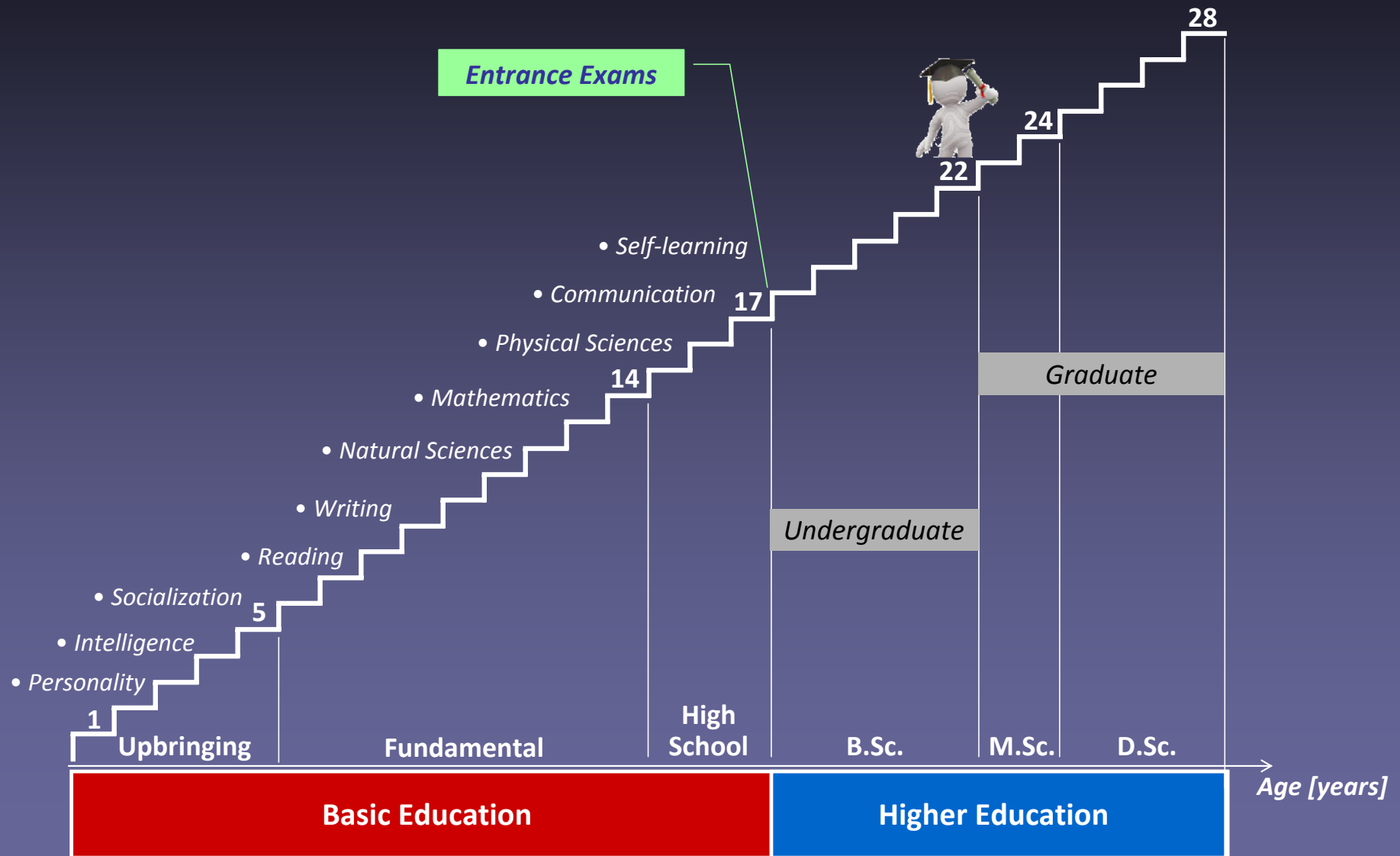
- IEEE Power & Energy Magazine
 - H. Rudnick, R. Palma, S. Carneiro, T.M.L. Assis, H. Salazar and J. Valencia, “Where School is Cool”, pp. 61-74, July/August 2010



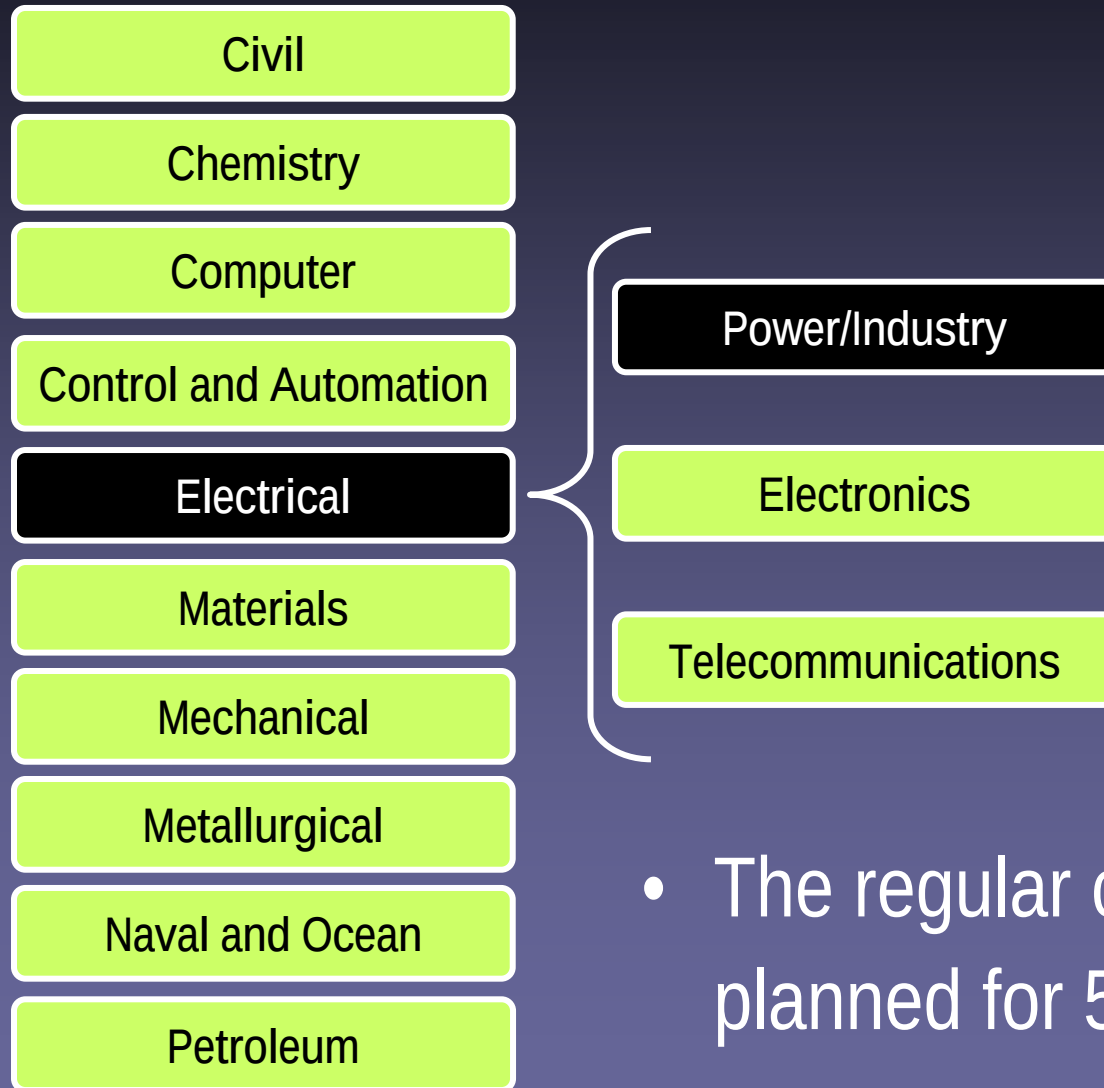
Outline

- Brazilian educational system structure
- Major degrees of engineering
- Typical structure of power engineering course
- Need for power engineers in Brazil
- Some numbers and statistics regarding undergraduate and graduate in Brazil
- Final considerations

Brazilian Education Structure



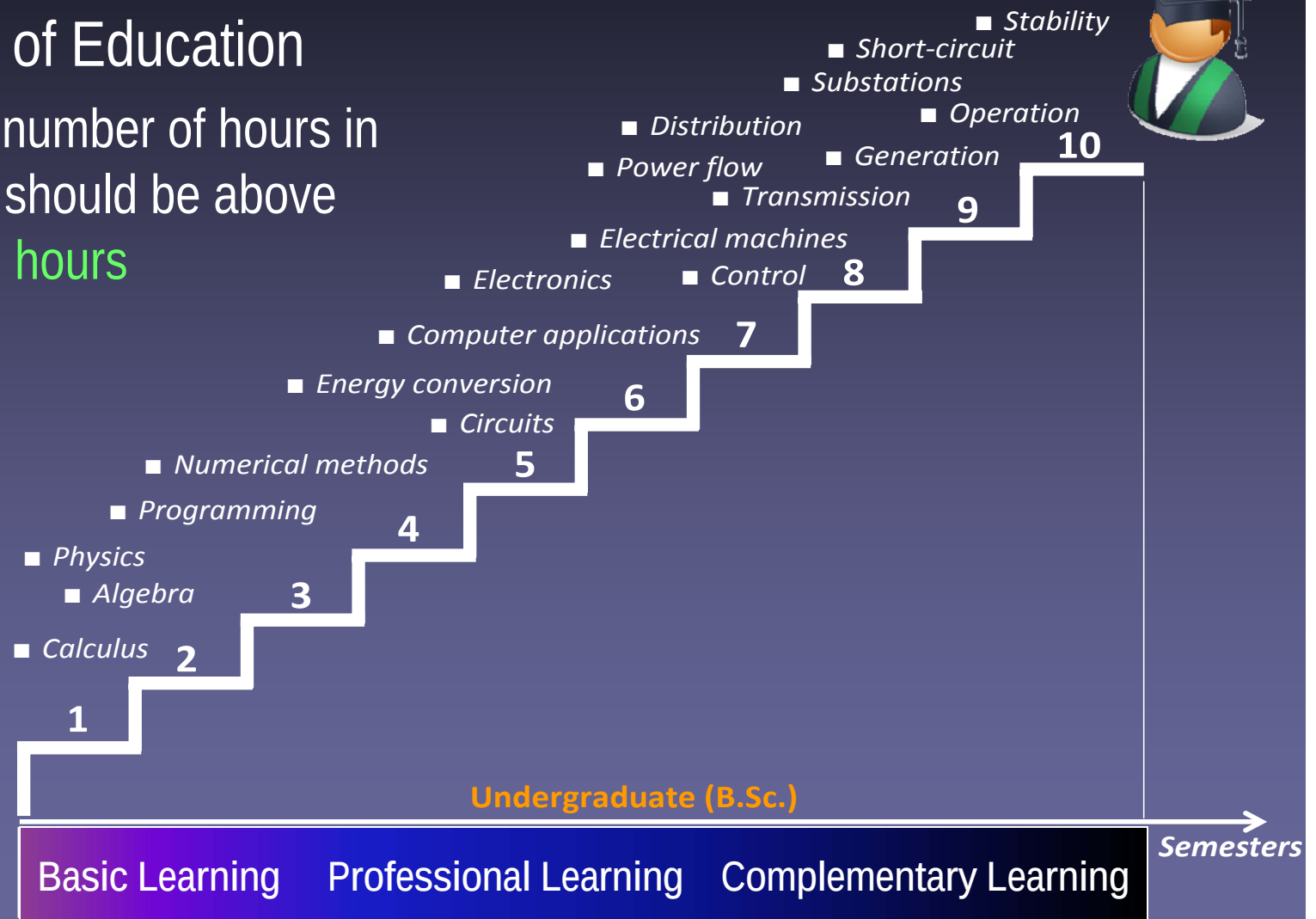
Major Degrees of Engineering



- The regular courses are planned for 5 years →

Typical Structure of a Power Course

- Ministry of Education
 - Total number of hours in class should be above **3,600 hours**



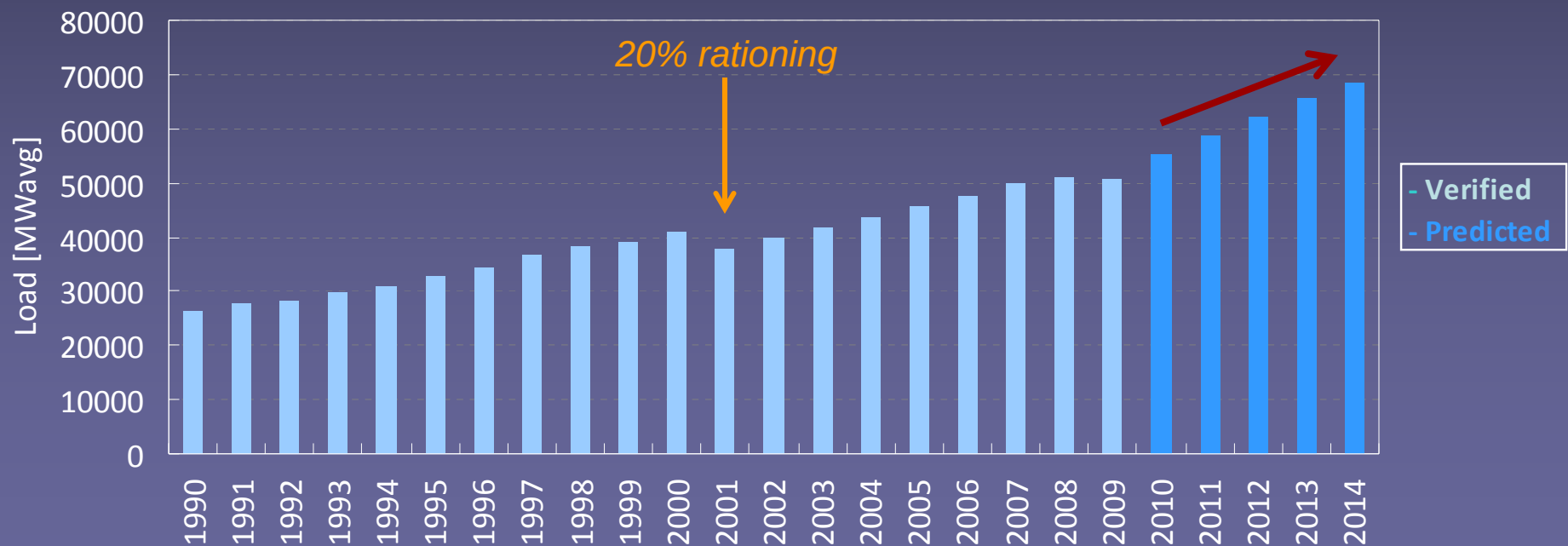
Need for Power Engineers in Brazil

- In the 80s, Brazil was facing economic recession
 - There was little interest in careers related to infrastructure
 - A substantial decrease in the number of engineering graduations was observed
- Today, the scenario is totally different



Present Situation (1)

- In the last years economic activities have resumed a growing tendency
- Brazilian system load [MWavg]



Present Situation (2)

- Currently, Brazil faces a lack of qualified professionals in all engineering fields
 - It is usual to find retired professionals that are invited to resume their jobs or work as consultants
- In the case of power engineering, other factors tend to increase the need for qualified professionals:
 - Electrical sector restructuring process
 - New technologies coming out
 - The need of exploring renewable energy sources with less environmental impact

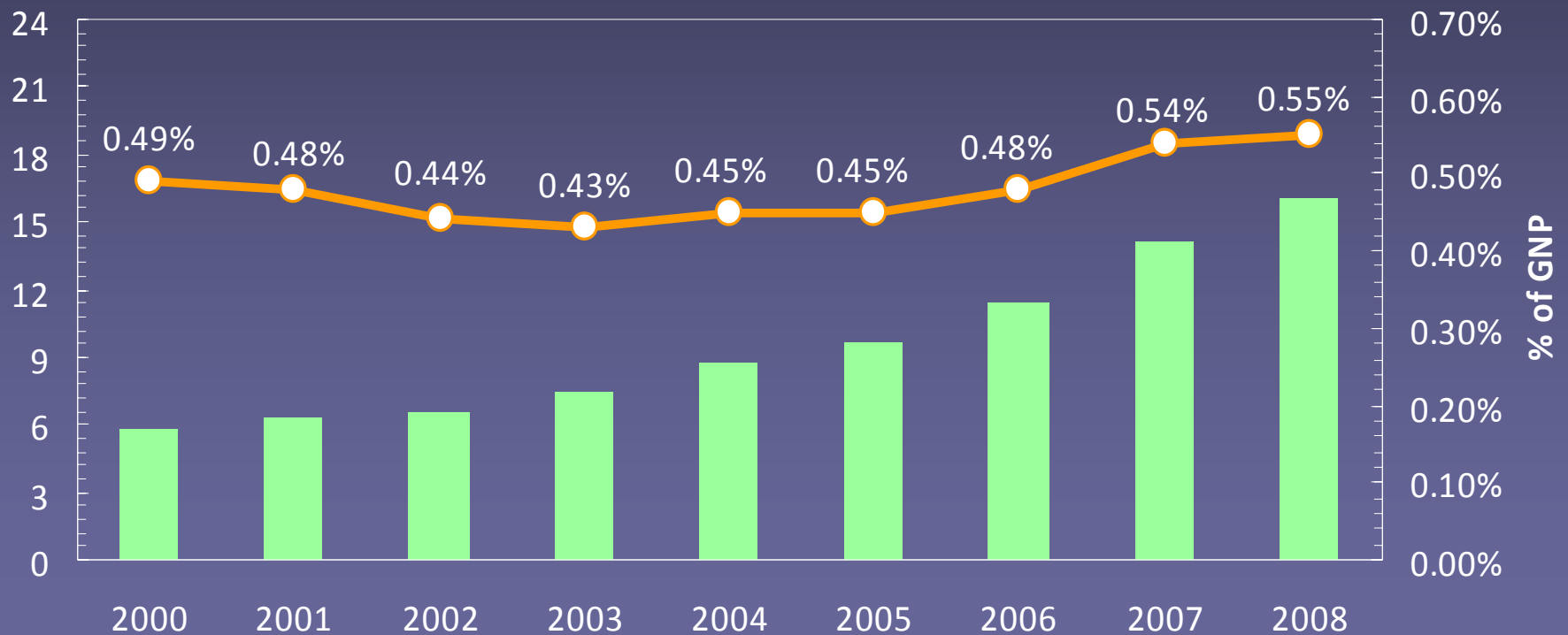


What is being done?

- Some important actions:
 - A task-force was created in 2006 – **iNOVA**
 - Federal government, academy and industry
 - Increase from **30,000** to **100,000** the graduations per year
 - In 2007, the federal government established a program for federal universities restructuring and expansion – **REUNI**
 - Take better advantages of physical infrastructure and human resources available
 - Increasing of federal investment in Scientific, Technological and Innovation projects – **S&T&I**

What is being done?

- S&T&I: Federal investments
 - Billion [R\$]
 - Ratio of investment to the GNP

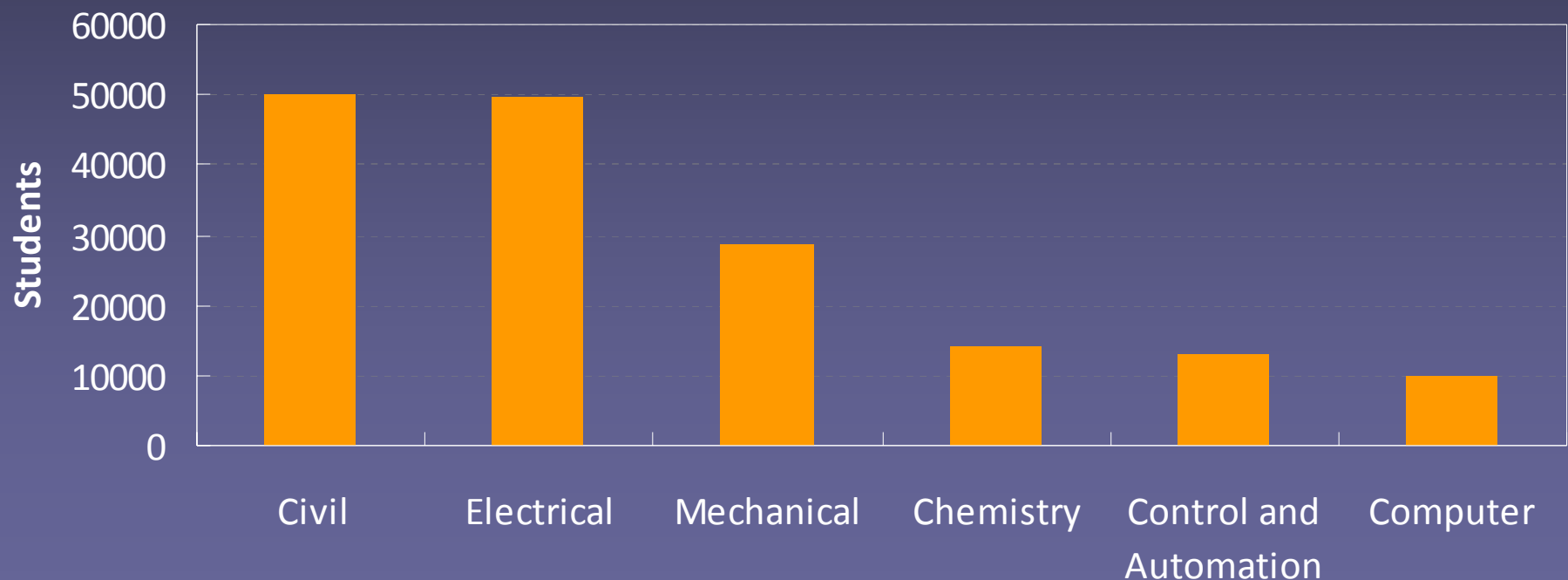


Some Numbers and Statistics

- Number of students (undergraduate level)
- Number of graduations
 - Undergraduate level
 - Specialization (M.Sc. and D.Sc.)
- Institutions

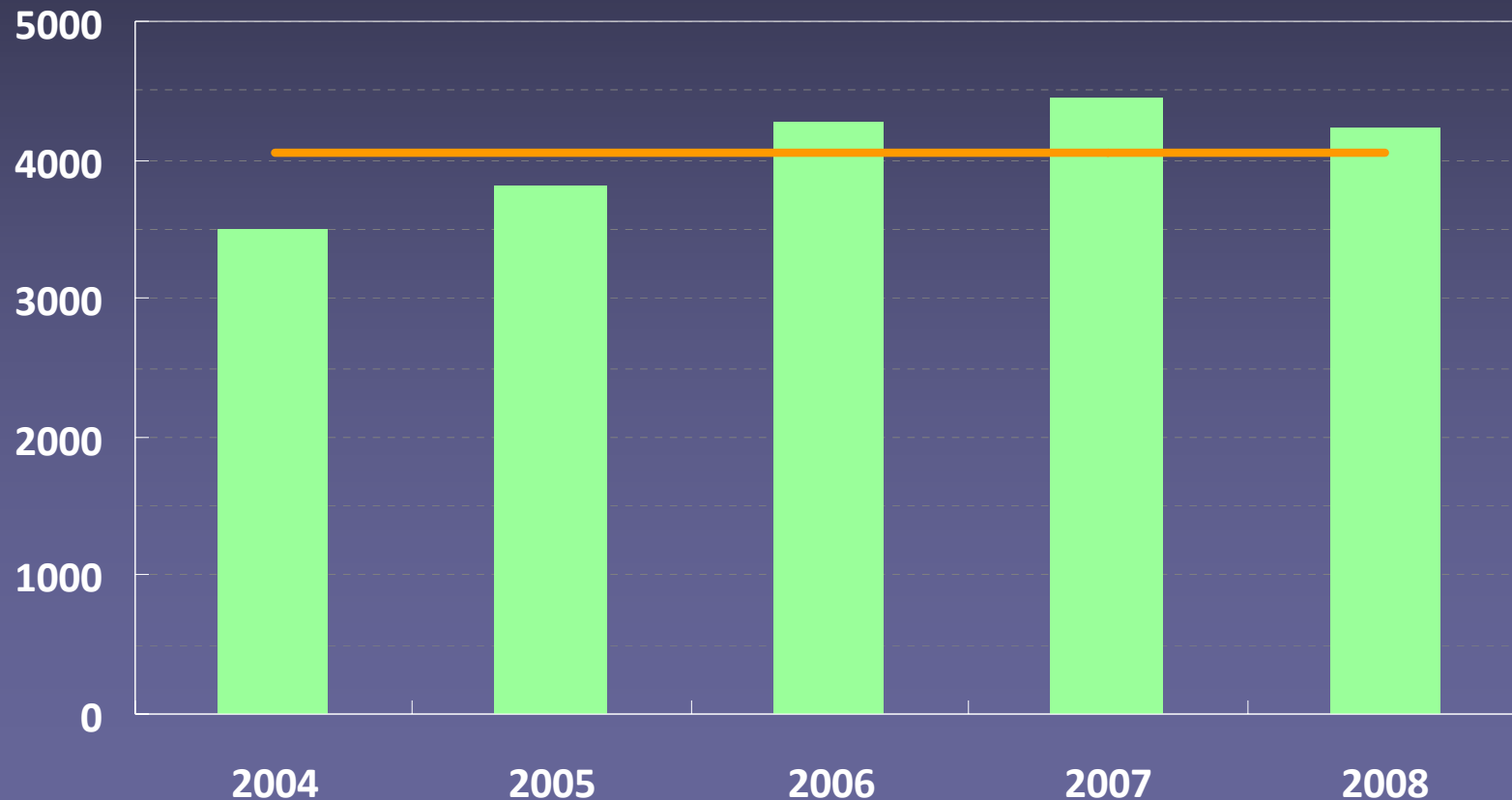
How many students?

- Registered students in different engineering areas (2008)
- Electrical: power, electronics and telecommunications



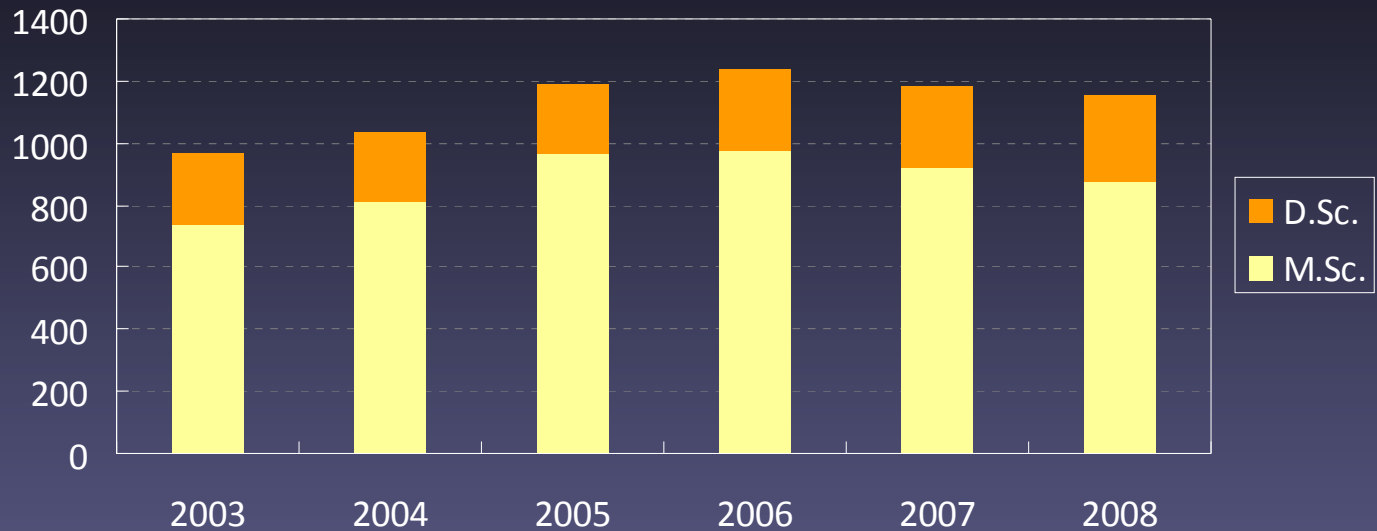
How many graduations?

- Number of degrees awarded in electrical engineering (undergraduate)

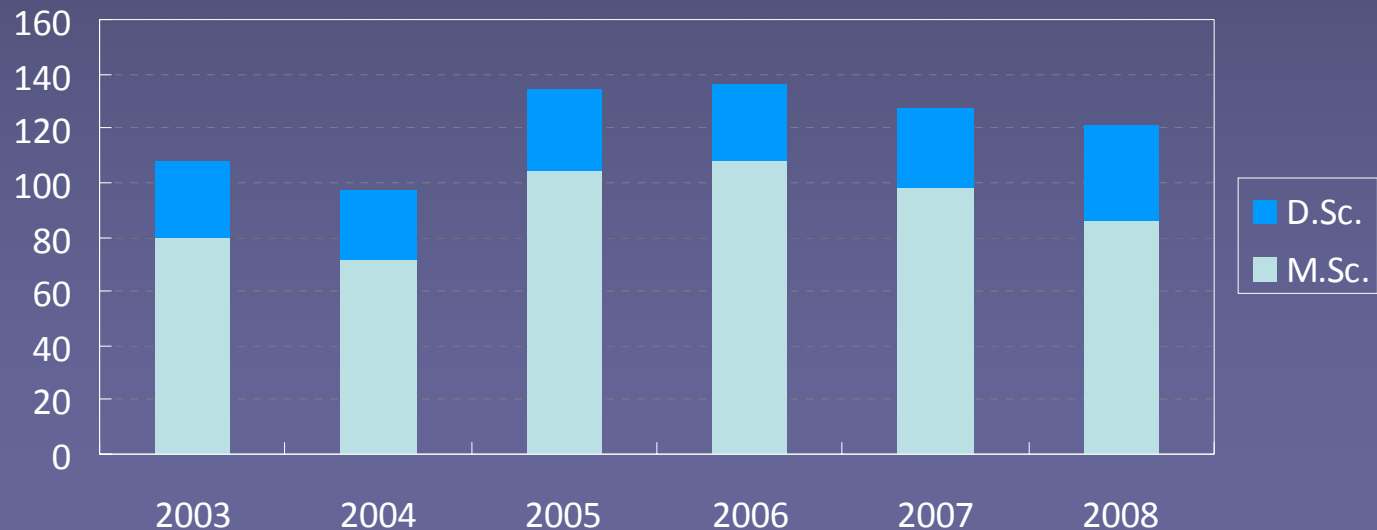


How many specializations?

Electrical Engineering →

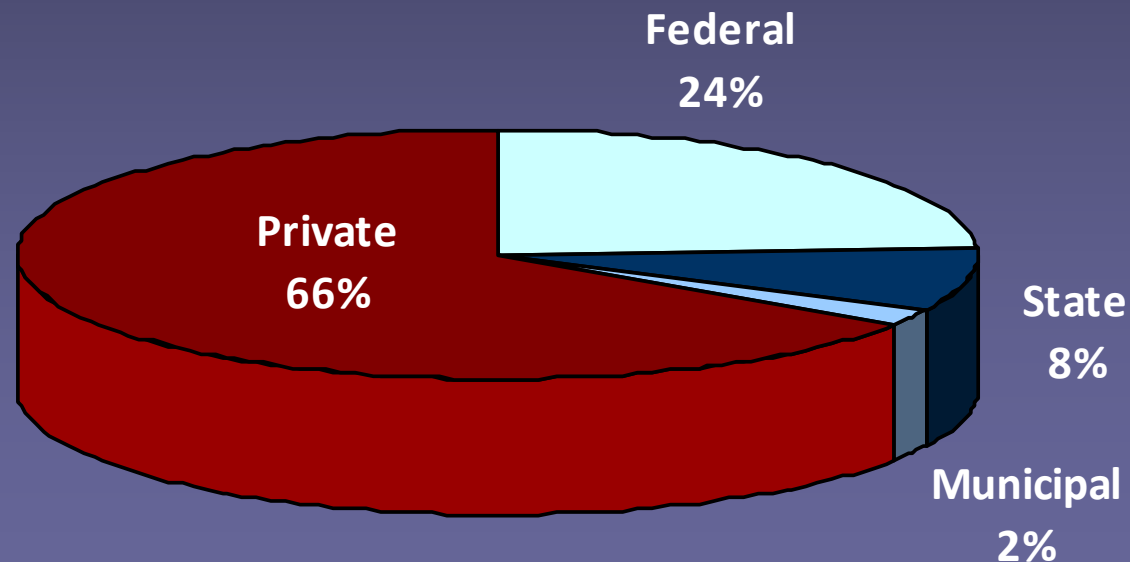


Only Power →



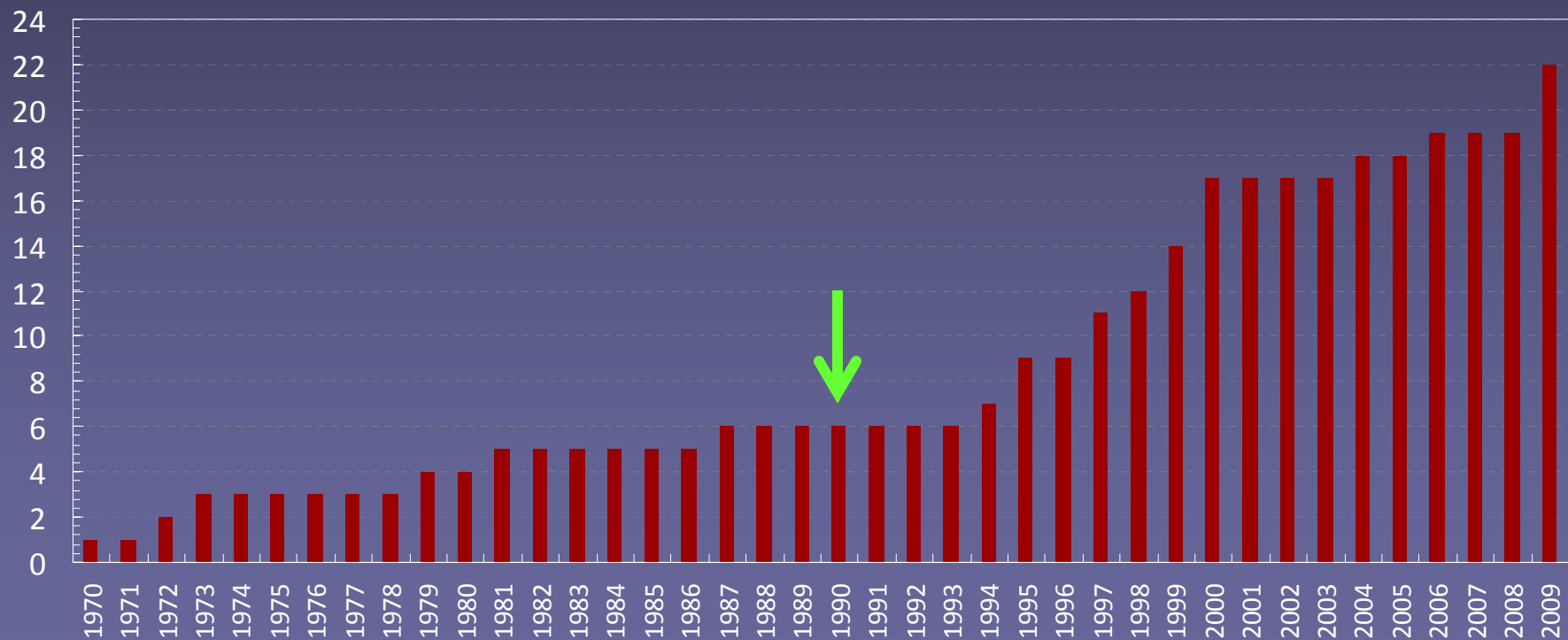
How many institutions?

- 174 higher education institutions offering electrical engineering undergraduates courses (2008)
- Most private do not develop postgraduate and research activities

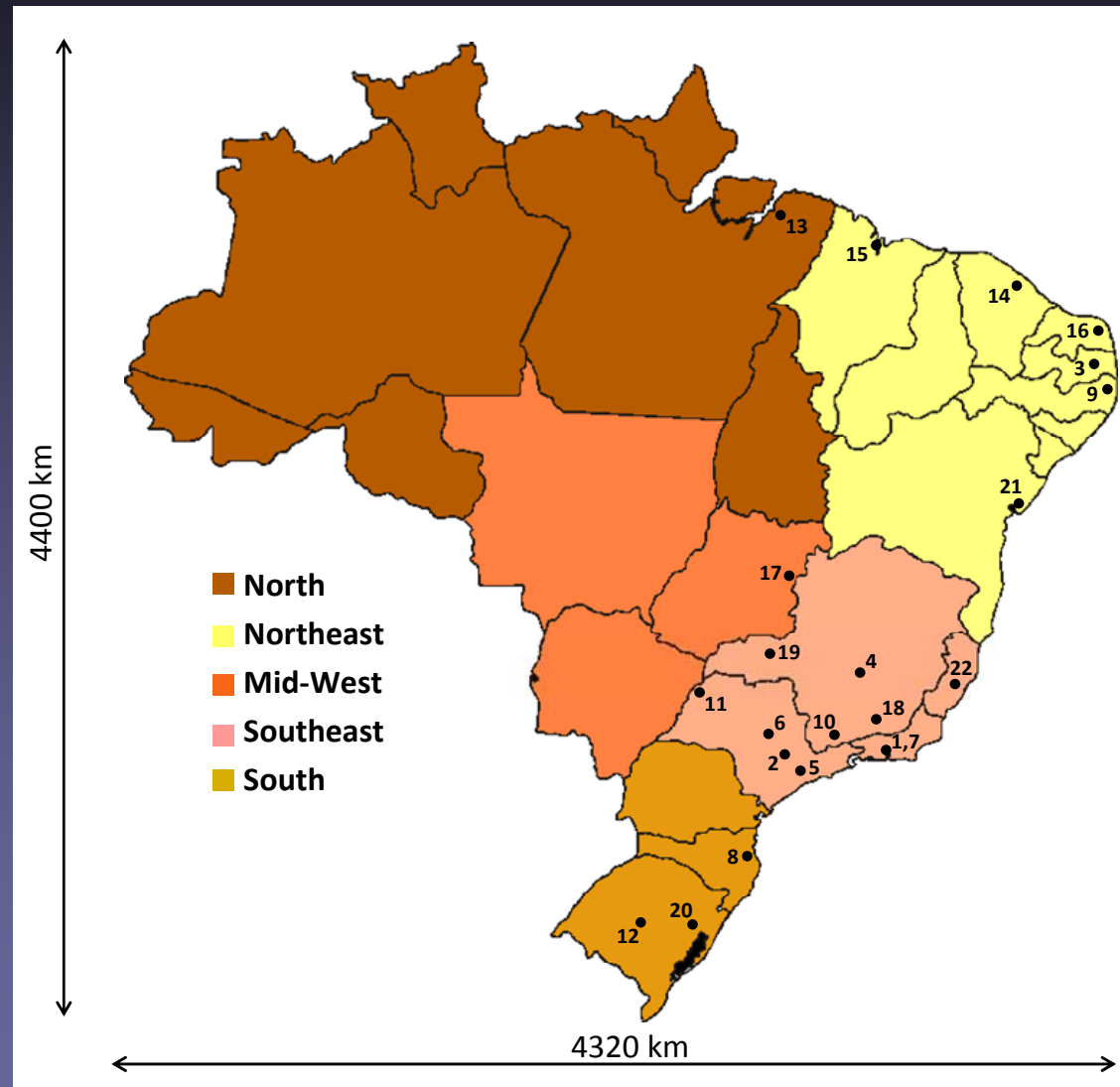


Institutions with Doctorate Programs

- Research areas in power engineering
- Qualified by CAPES
 - Federal Agency for Evaluation and Support of Graduate Education
- In 1990, only 6 institutions offered courses at doctoral level
 - 20 years latter, doctoral programs are available at 22 institutions



Geographical Location



Final Considerations

- Brazil is experiencing economic development, accompanied by rapid growth in basic infrastructure
- Today, there is a lack of qualified professionals
- The present convenience and image of power engineering careers has result a high demand for power engineering courses
- Important actions have been taken by the government, industry and academy

Sources

- Ministry of Science and Technology (MCT) www.mct.gov.br
- Ministry of Education (MEC) www.mec.gov.br
- Federal Agency for Evaluation and Support of Graduate Education (CAPES): www.capes.gov.br
- National System Operator (ONS) www.ons.org.br
- Energetic Reaserch Company (EPE) www.epe.gov.br
- Electric Energy National Agency (ANEEL) www.aneel.gov.br

Thank you!

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