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An Overview of the Spanish Electrical System and its Liberalisation

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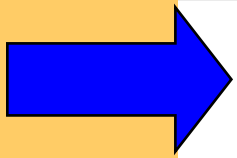
Based on previous presentation from I. Pérez-Arriaga & C. Batlle

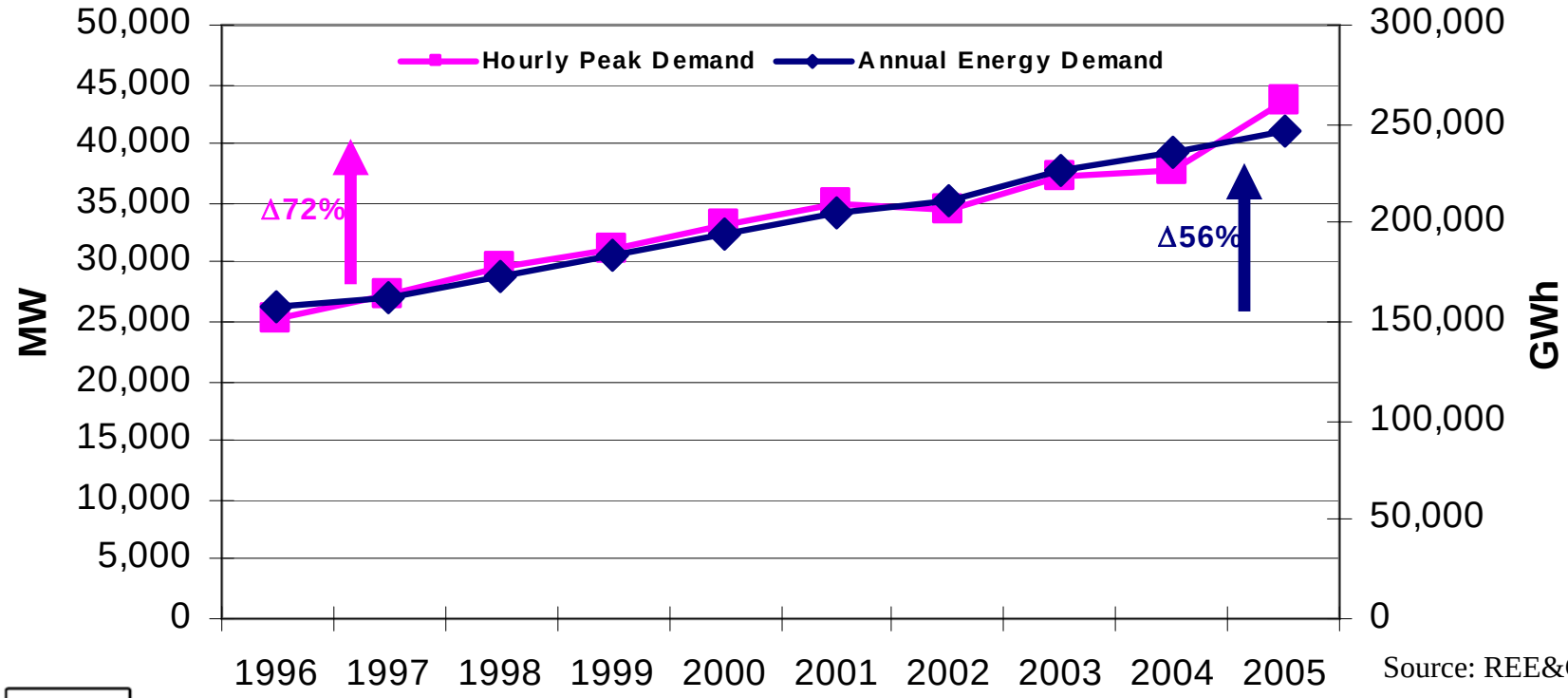
Contents



- Basic data on the Spanish Electrical System
- Regulatory framework
- Successes and flaws

Spanish evolution: last 10 years

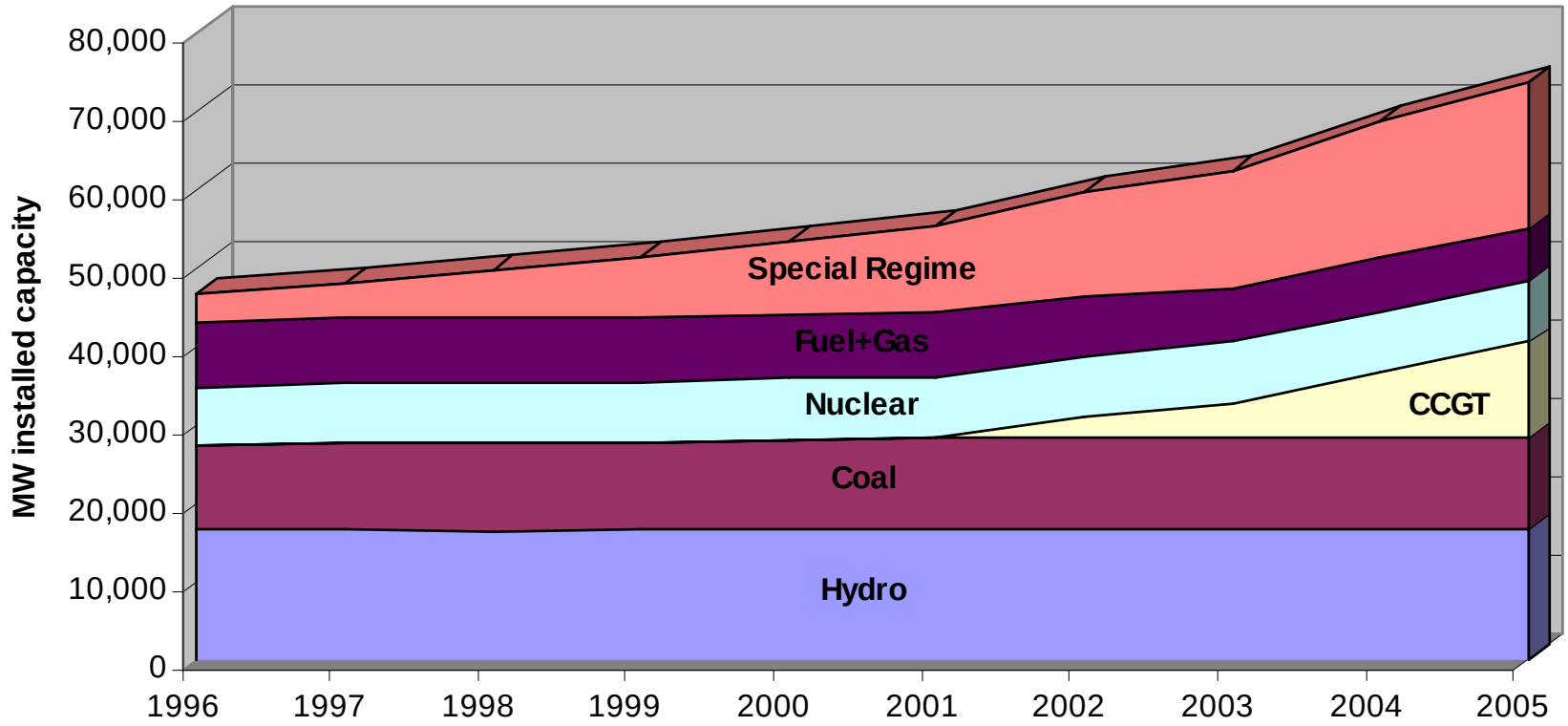
- 10% population growth (mainly immigration)
- 44% GDP growth (average of ~4%/year)
- 56% energy consumption growth (average of ~5%/year)
- 72% hourly peak demand growth (average of ~5.5%/year)



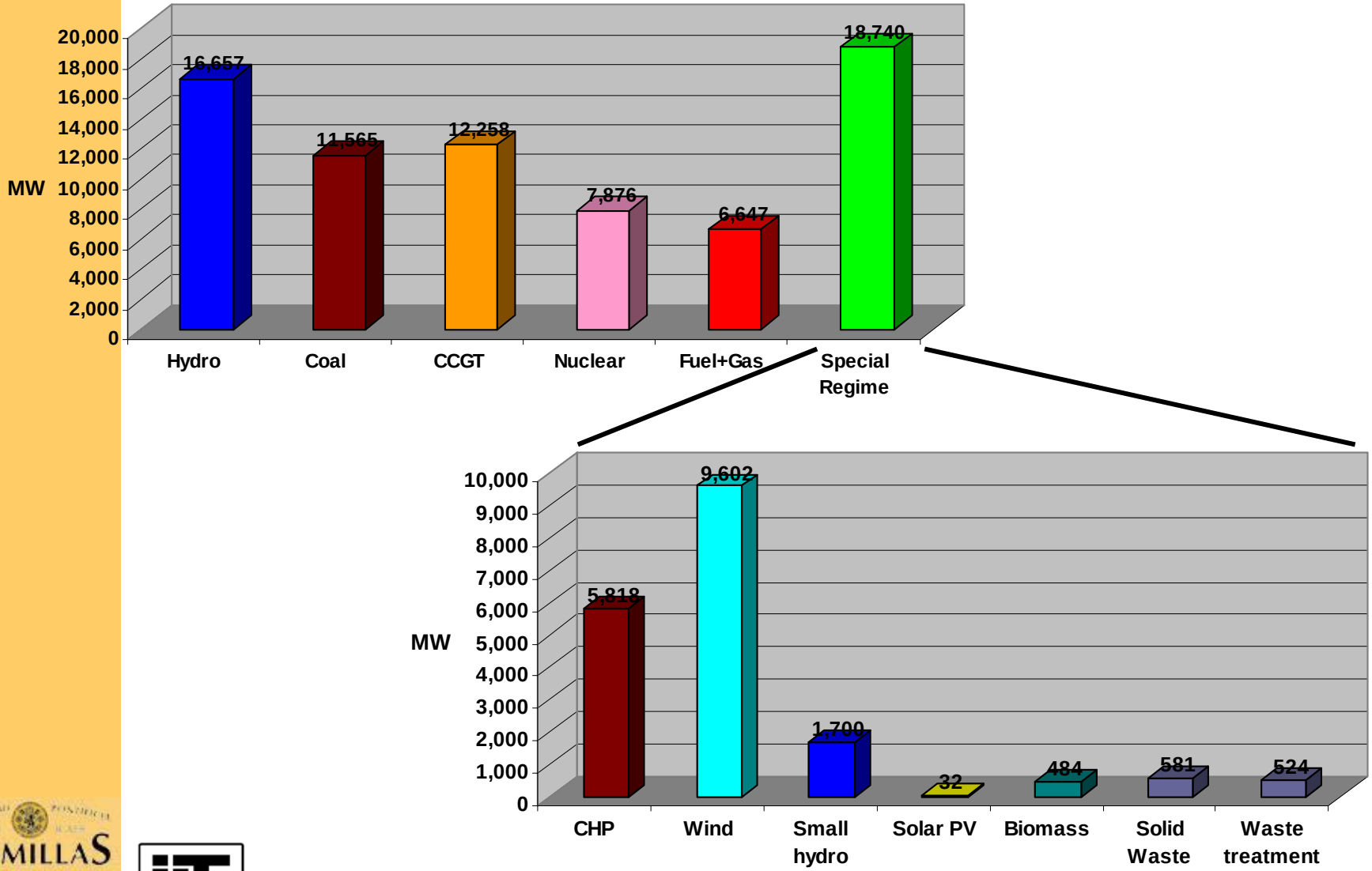
Source: REE&CNE

Evolution of installed capacity

- CCGTs and Wind are almost the only ones being installed:
  - >12 GW of CCGT and >9 GW of wind out of 27 GW growth

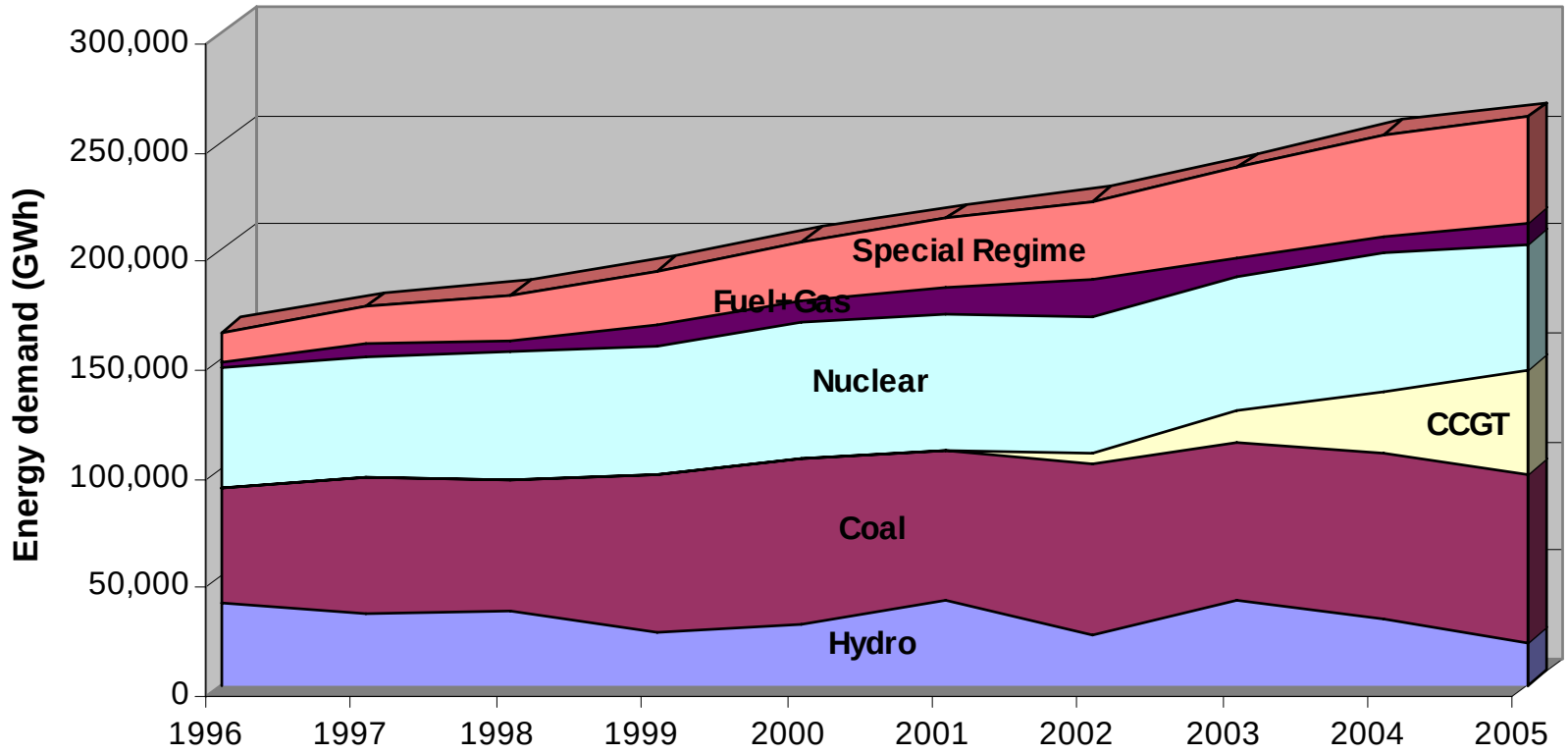


Installed capacity December 2005

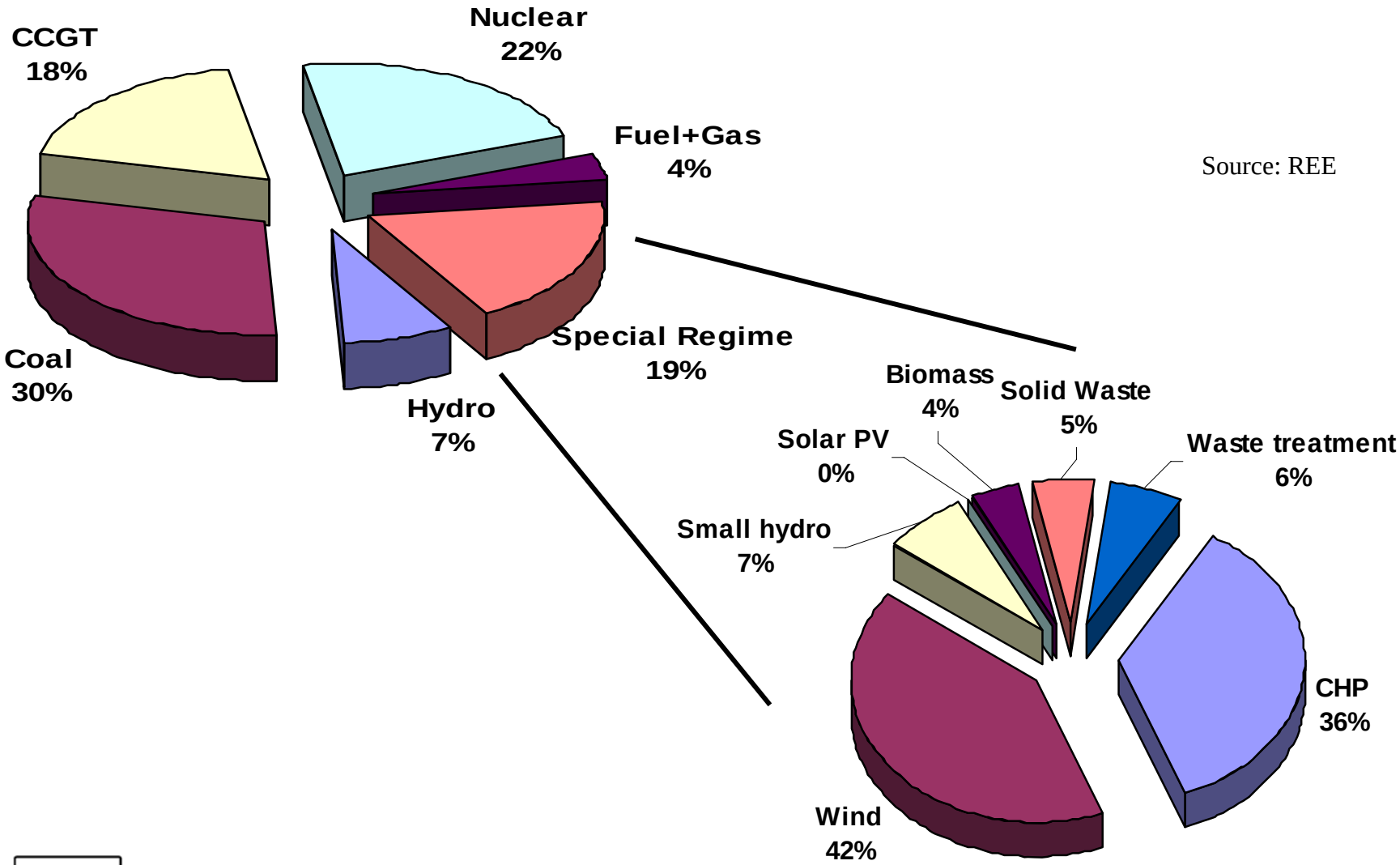


Energy production mix evolution

- Due to demand growth and droughts, coal-fired generation is not really reducing its output



Energy mix today (year 2005)



Source: REE

Contents

- Basic data on the Spanish Electrical System
- Regulatory framework
  - Restructuring process
  - Market design
- Successes and flaws

Restructuring process: initial situation

- Fully private but for the system operator (REE)
  - Smooth transition: traditionally private companies, a few partially owned by public institutions
- Already had an independent SO (since 1984)
- Wealthy electrical utilities
- Good service quality
- Good reserve margin
- Previous regulation tended to micro-regulation

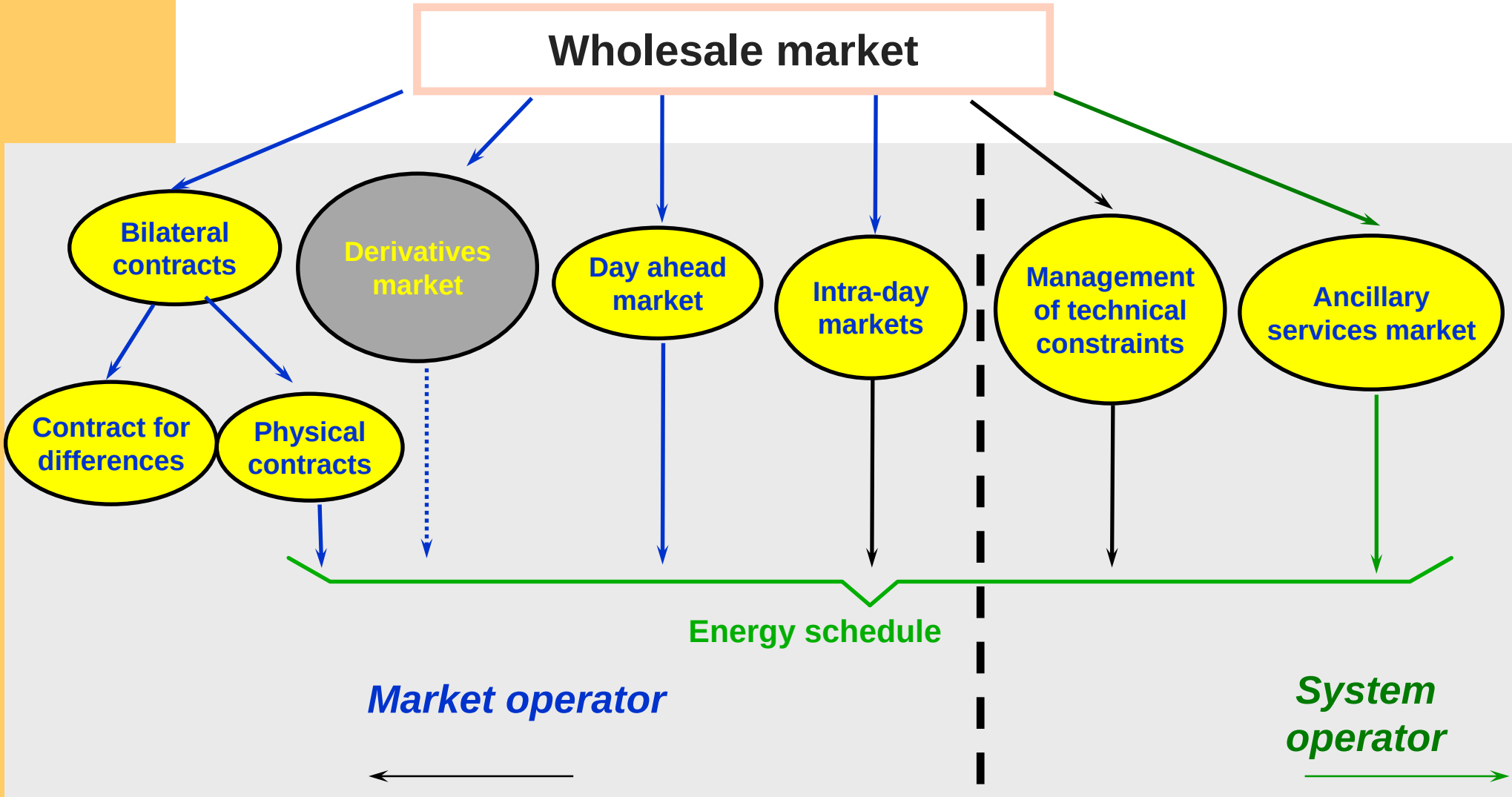
Restructuring process: main decisions

- National champions (will come back to this subject later)
  - Foreseeing a European energy market
- Vertical integration: legal separation between different activities, but no limitation to ownership
- *Red Eléctrica de España* (REE): system operator, transmission network owner and manager
  http://www.ree.es/
- *Operador del Mercado Eléctrico* (OMEL): market operator, newly created
  http://www.omel.es/
- Wholesale market (not mandatory)
- Explicit support to renewable energy sources and CHP (through a *Special Regime*)

Wholesale market design

- Both demand and generation make bids to the market
- Hourly market
- Sequence of different markets until real time is reached
- No derivatives markets
  - In the future there will be a market involving Portugal
- Freedom for international exchanges (within congestion limits)

Wholesale market structure



Wholesale market: ancillary services

- Mandatory services
  - Primary reserve (speed control)
  - Reactive control
- Non-mandatory services
  - Secondary reserve (AGC)
    - Band and energy up to 15 minutes
    - Control areas: each utility has one
  - Tertiary reserve
    - Available in 15 minutes and maintained for 2 hours
    - Marginal price
  - Black-out start
  - Additional reactive support
- Costs fully assigned to agents that deviate from their bid

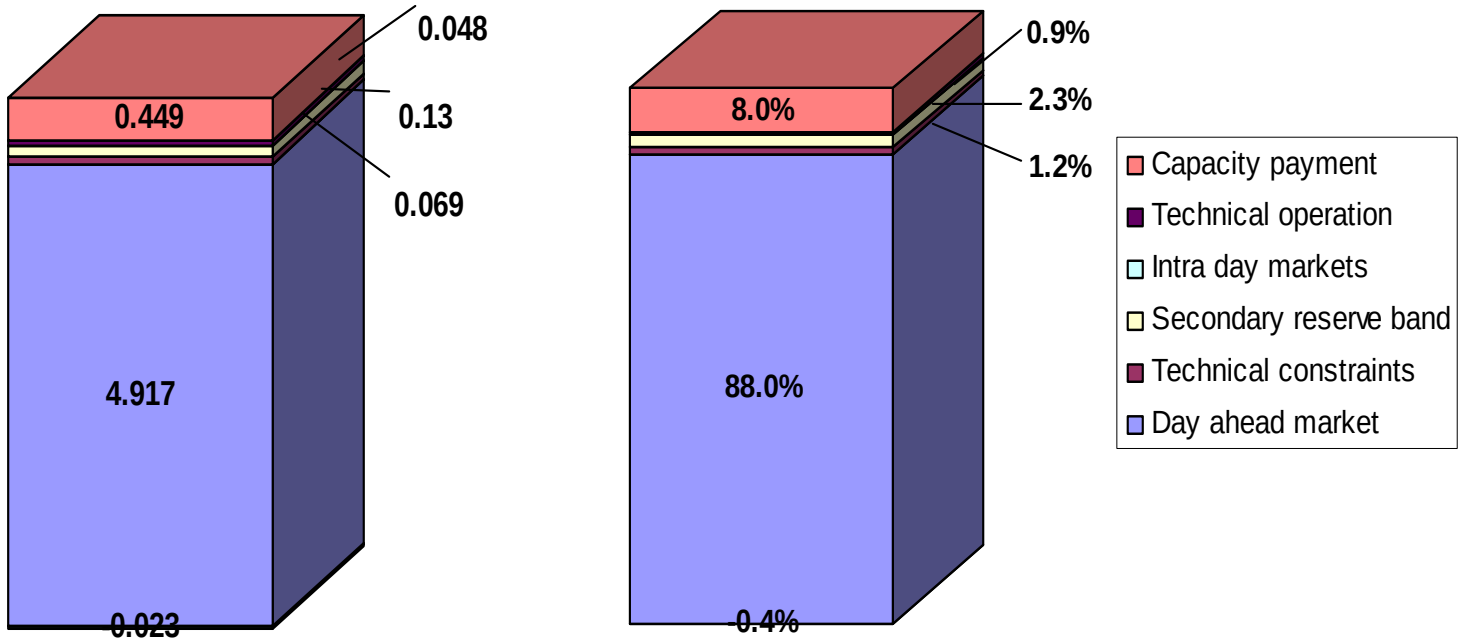
Special Regime

- Feed-in-tariff
  - Distribution companies have to buy their production
  - Under 10 MW
    - No mandatory production forecast
    - Implies costs to distribution companies
  - Over 10 MW
    - Mandatory production forecast
    - Penalisation if deviation bigger than a threshold
- Market access + premium
  - Meant to lead to a better market integration
  - Most wind generators have switched to the market (high prices)

Energy price composition

Last year annual average price (sept04-sept05)

Total: 5.59 c€/kWh = 8.95 c$/kWh



Restructuring: Spanish peculiarities

- Generation
  - Capacity payments
  - Stranded costs
- Regulated tariff
- Gradual gas liberalisation
  - Gas CHP subsidised during 10 years

Capacity payments

- Additional payment on top of market price
  - Meant to encourage new entrants and delay closure of old facilities
- Generators are paid based on
  - Long term reliability (estimated contribution to long term system reliability)
  - Real short term reliability
    - Technical availability, maintenance, hydro reserves management
- Actual payment was very high
  - Has been reduced 2 times
  - It was 25% of market incomes (now 8% partially due to price surges)
  - There is no real incentive for high reliability

Generation stranded costs

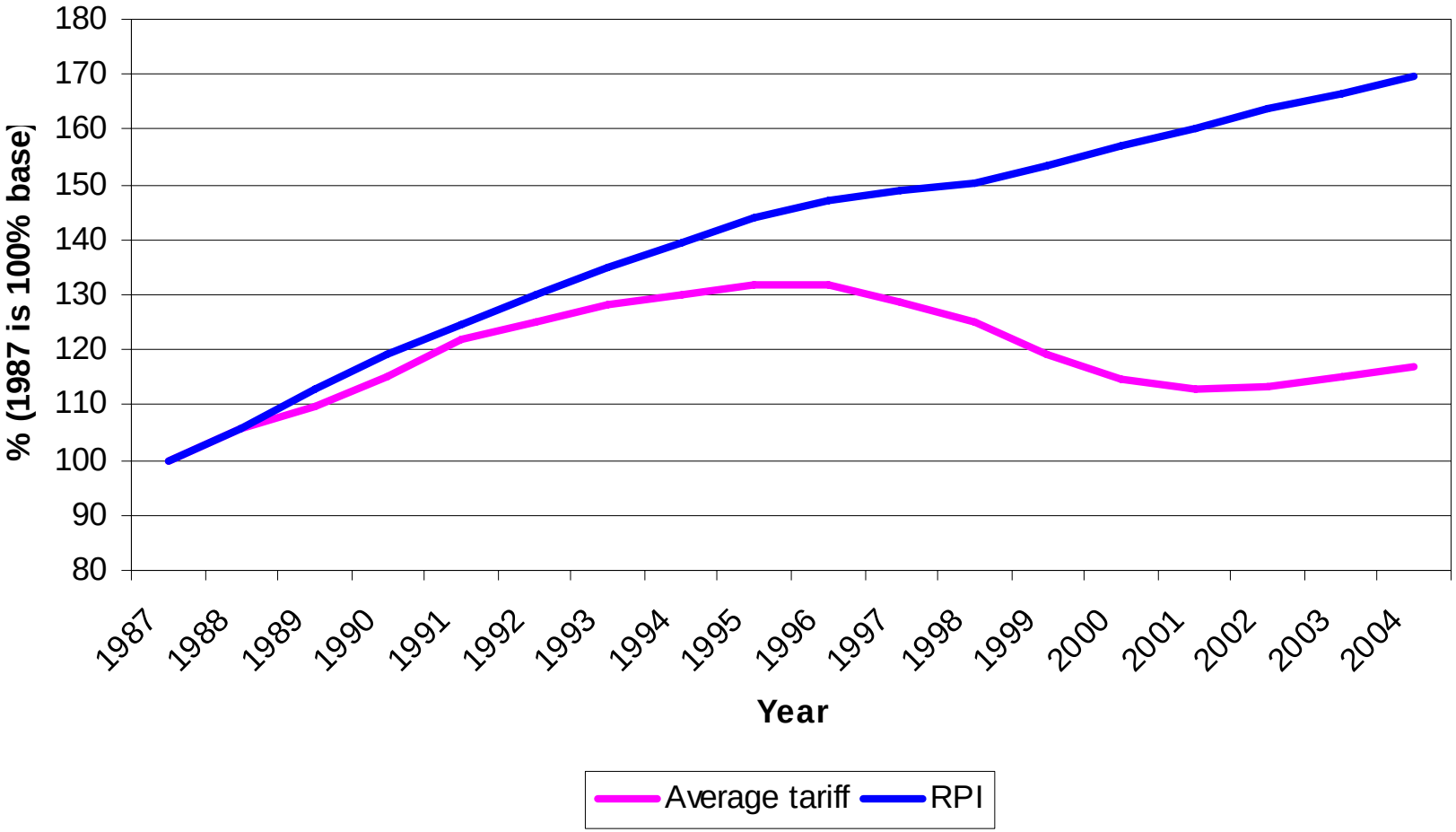
- Paid as the difference between market price and a fixed estimated price used to calculate the regulated tariff (6 c$/kWh)
  - Interference with the market
  - Has stabilised the price in the past few years
- It has been used as a buffer to settle any other cost deviation

- The total amount to be paid has been under discussion since it was decided
  - Final payments were stopped last year
  - This decision, among other factors, has lead to an increase of 72% in the 2005 average market price over 2004

Regulated tariff

- No published methodology to calculate the tariffs
  - Incoherence between access tariffs and full tariffs
- Energy cost included in full tariffs is based on the estimated wholesale market price set at 6 c$/kWh
  - Demand growth has allowed a reduction of regulated tariffs in the last 10 years, despite (increasing) extra costs of Special Regime (1.5 b€/year)
  - Due to energy price growth (last 2 years), there is a tariff deficit
    - Distribution companies are supporting it
    - Generation companies get large profits
      - Most companies are vertically integrated
      - Even though distribution companies are entitled to receive this tariff deficit, the government is reluctant to pay it
        - Specially now that E.ON wants to buy ENDESA

Regulated tariff



Source: CNE

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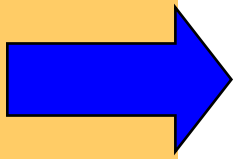
- Regulatory framework
- Successes and flaws



Successes

- Smooth transition
- Market design doesn’t seem to have big flaws
  - No major problem with system security
  - Ancillary services have worked well
    - Normal operation, easy and cheap implementation
    - Security of the system has not been jeopardised
    - Network restrictions management has been criticised (and changed lately)
  - White Book has been published recently
- Transmission regulation
  - Simple and traditional, but without problems
- Wind
  - High penetration of wind energy (10 GW and 8% of total energy)

Flaws (i)

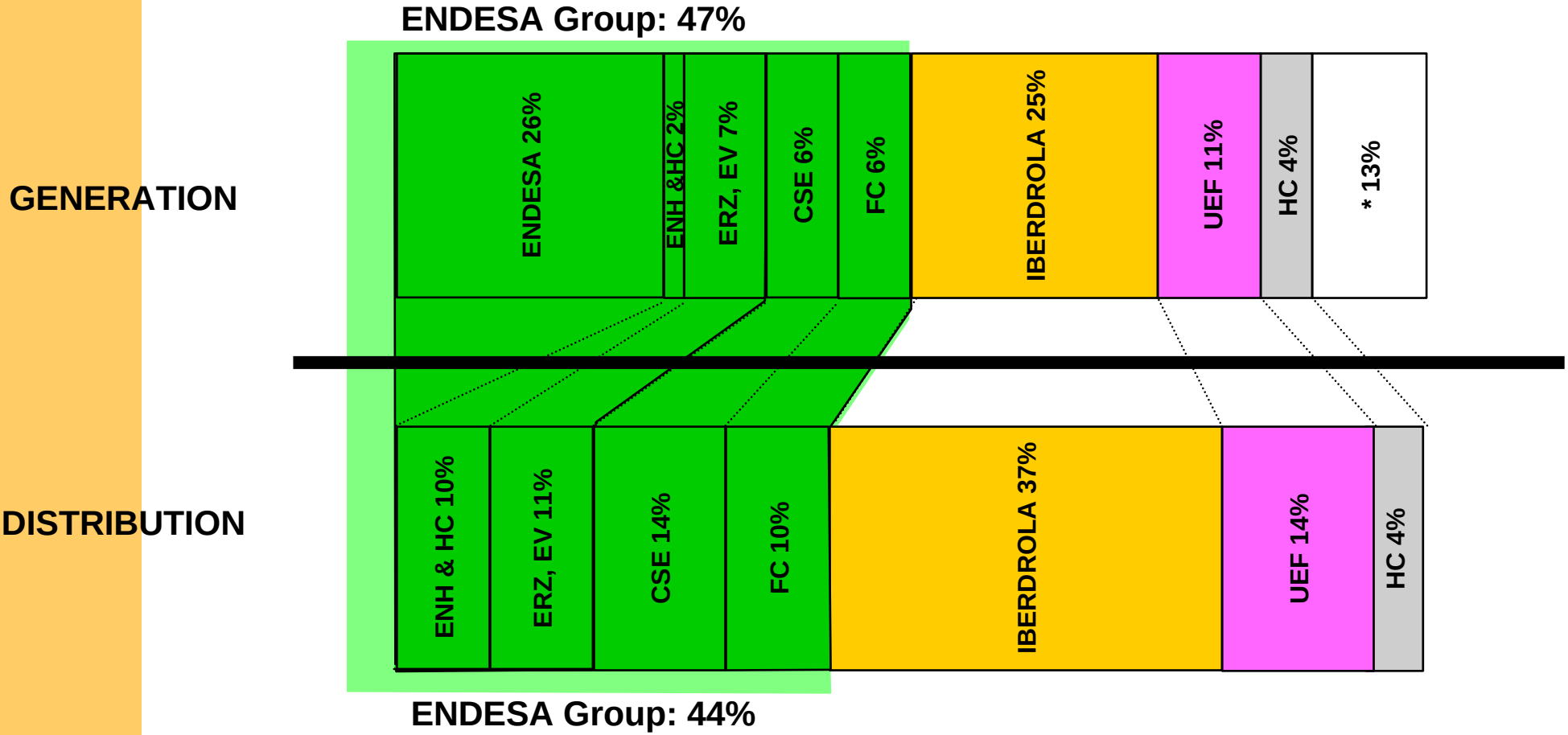
- Horizontal concentration (national champions)
  - Possible price manipulation
  - Market price is not credible
- Stranded costs problem
  - Interference with the market
- Long term capacity reliability
- Lack of a tariff design methodology
- Distribution remuneration
  - Urgent need to develop a viable and quality related regulation

Flaws (ii)

- Need of an effective retail market liberalisation
  - Tariff methodology
  - Credible market price
- Need to increase gas market liberalisation
  - Government is promoting or at least allowing “diagonal” concentration (gas & electricity)
- Environmental sustainability
  - Energy efficiency: complete lack of demand side management
  - CO_2 ETS (45% increase vs. 15%)
  - Higher renewable energy sources penetration
    - Biomass
    - Solar (PV and thermal)

Horizontal concentration

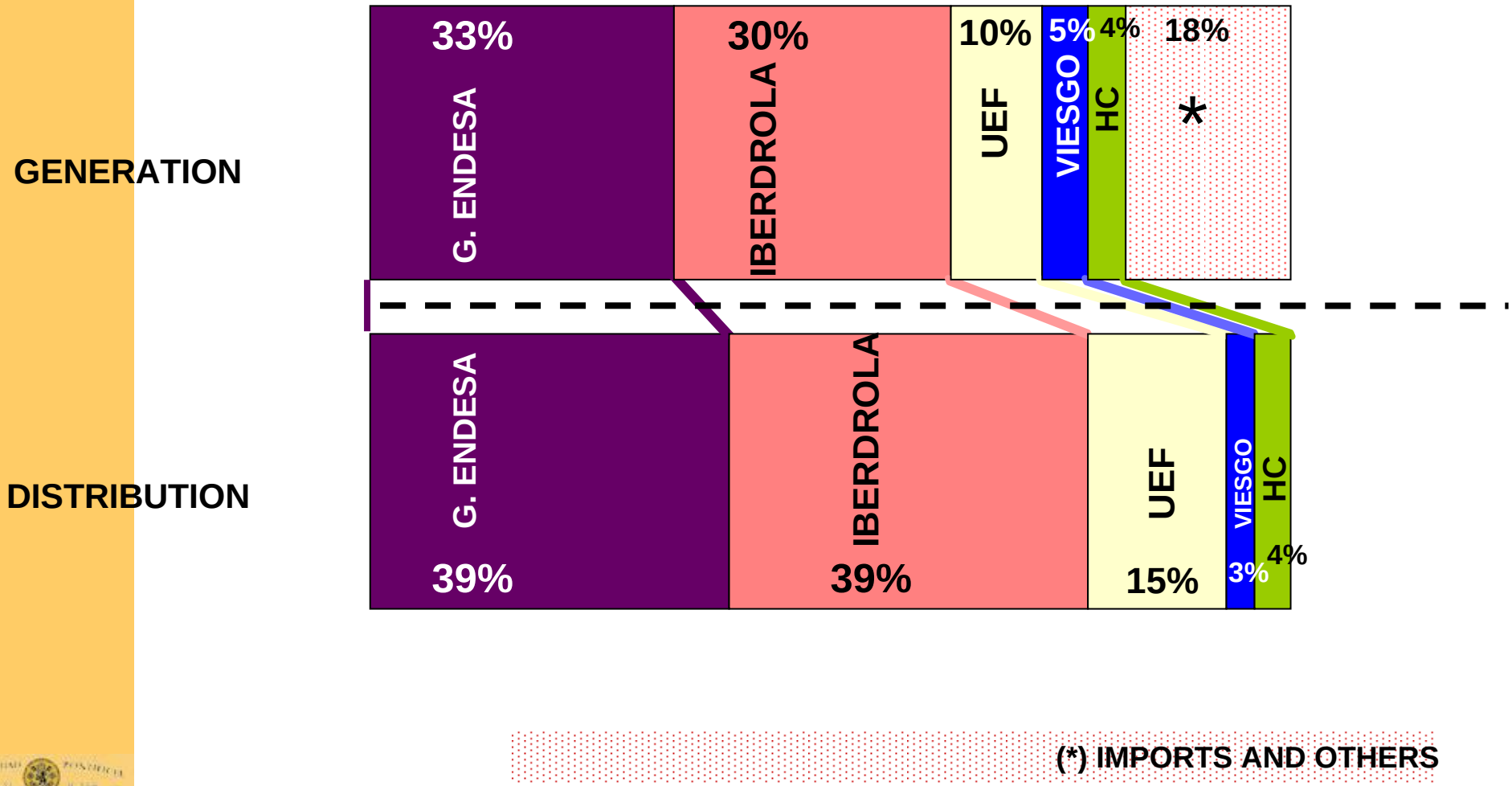
- Initial structure



(*) IMPORTS AND OTHERS

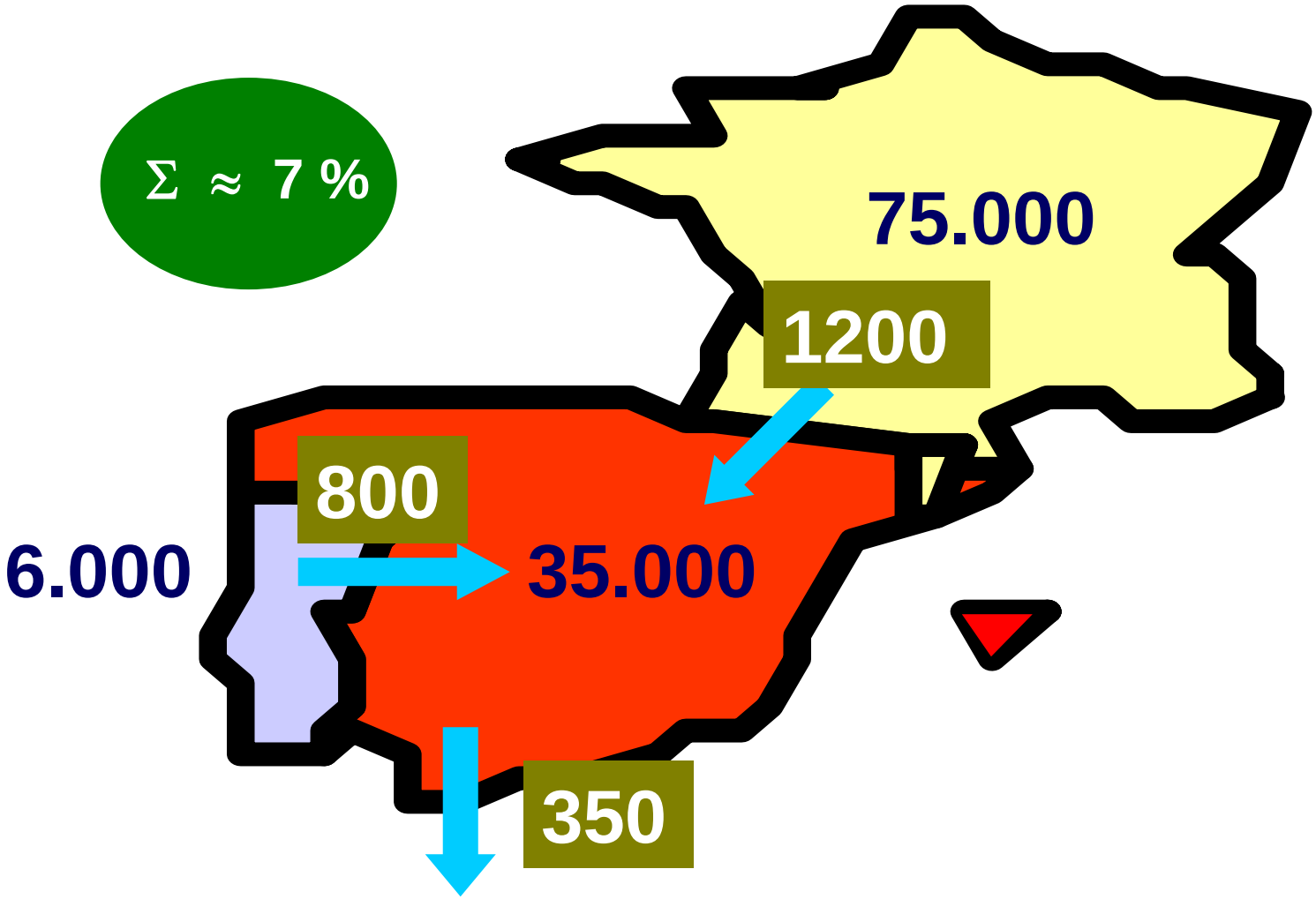
Horizontal concentration

- Last years



(*) IMPORTS AND OTHERS

International exchanges (ii)



National champions

- ENDESA Group was created after liberalisation
  - Merger of all the electric companies with any public ownership

- Today (i)
  - Gas Natural (former Spanish gas monopolist) has made a take-over bid for ENDESA
    - Spanish international strategy (national champion) and regional equilibrium
    - Gas Natural is 1/3 of ENDESA but indirectly under public control

National champions

- Today (ii)
  - E.ON has made a higher takeover bid for ENDESA
    - Spanish government has publicly opposed this offer
    - Published two Royal Decrees to
      - Enhance the Regulatory Commission's powers to judge the transaction
      - Recover costs of given CO2 emission permits and oblige vertical integrated companies to sell to their distribution company "standard price" energy

National champions in Europe

- Germany
  - E.ON was allowed to merge with RHURGAS in order to build a big German company that would be able to compete with EDF
- France
  - Protects EDF in France
  - Is promoting now a merger between GDF (French gas monopolist) and Suez (French services company) to create a new French giant energy company
    - Suez owns Electrabel (Belgium utility)
    - ENEL (Italian utility) was preparing a takeover bid for Suez

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Thank you for your attention

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Contents

- Some additional slides that contain some useful information

Spain today (i)

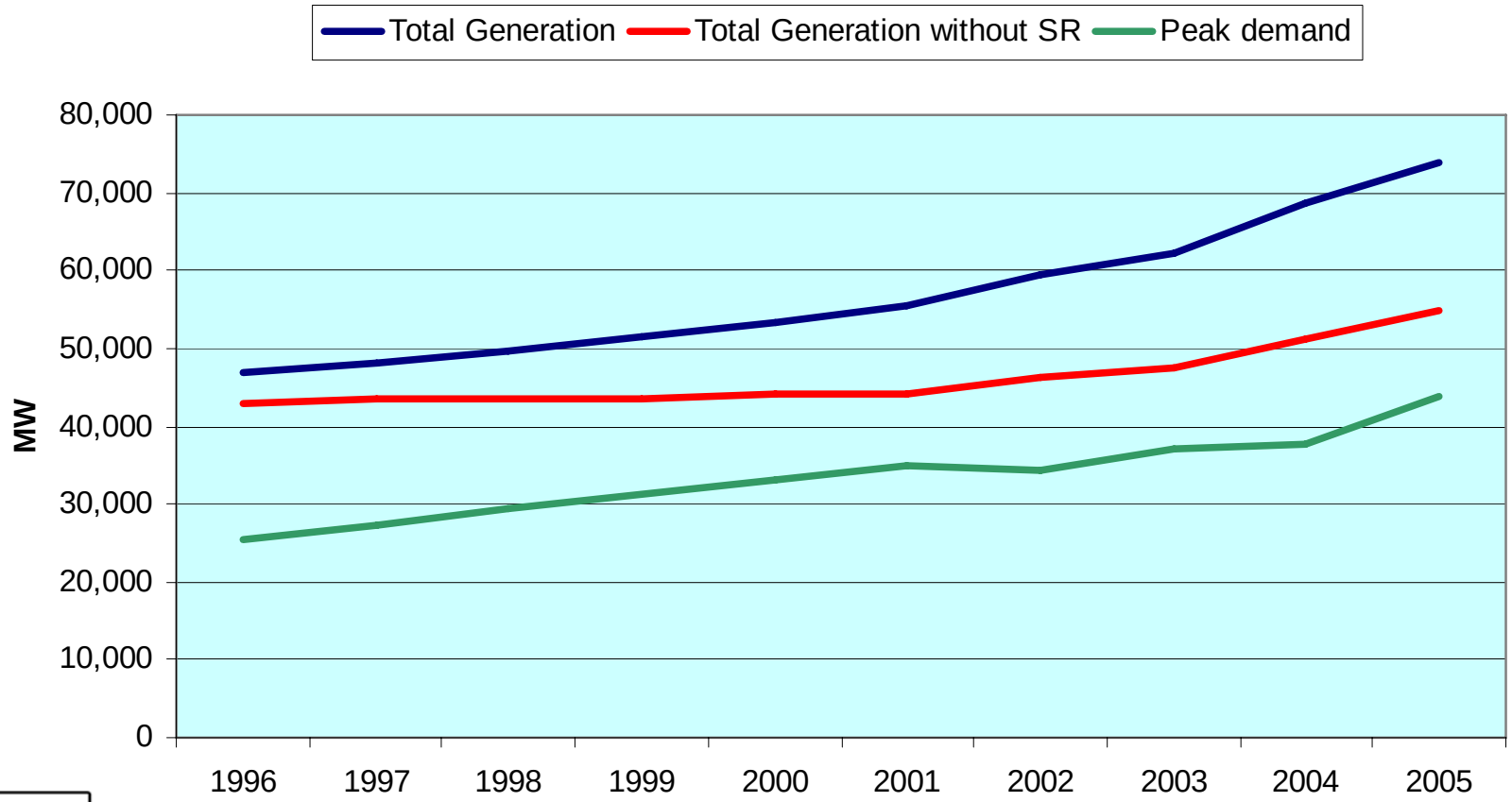
- Situated South West of Europe
  - Total area 505,000 km^2 (NSW ~800,000 km^2)
  - Population: 44 million
- Economic data:
  - GDP: $1,340 b (837 b€)
    $31,155 /capita (19,472 €/capita)
    - Australia: ~$875 b
      ~$43,670 /capita
- Electrical data:
  - Peak demand: ~43,000 MW
  - Energy consumption: 243 TWh (5.6 MWh/year&capita)
    - Australia: 192 TWh (9.6 MWh/year&capita)

Spain today (ii)

- Electrical data:
  - Installed generation capacity: ~73 GW (Dec 2005)
  - Transmission network
    - 400kV: 16,800 km
    - 220&132kV: 16,000 km
  - Customers
    - ~23,000,000 LV customers (~47% energy consumption)
    - ~65,000 HV customers (~53% energy consumption)

Spanish evolution

- Reserve margin reached its minimum in 2001
  - 1.26 without Special Regime (same as in 2005)
  - 1.58 with Special Regime



Spanish future installed capacity

- If all the generation plants that are planned today (at any stage of the administrative process) are built in the next 5 years, there will be around
  - 20 GW of additional wind (~30 GW in total)
  - 16 GW of additional CCGT (~28 GW in total)
  - + rest of Special Regime technologies
    - Biomass
    - Solar thermal
    - Solar Photovoltaic
    - Etc.

Restructuring process: acceptance

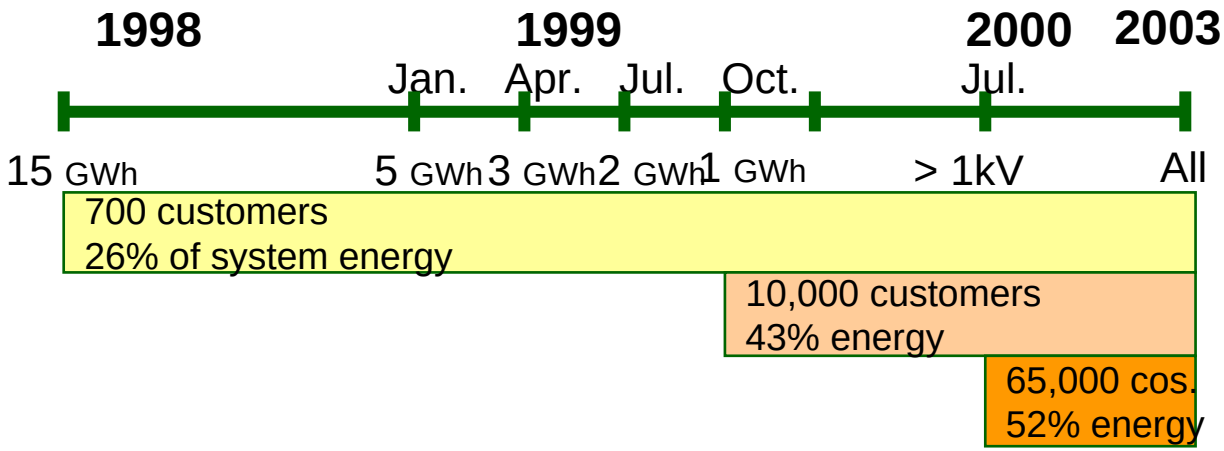
- Shareholders: stranded costs acknowledgement
- Customers: regulated tariff reduction
- Primary energy suppliers:
  - 10 years of subsidies to Spanish coal mines
  - Gradual gas liberalisation
- CHP generators:
  - 10 years of gas subsidies

Wholesale market: characteristics

- Every transaction is considered firm
- Each market has an independent price
- Day ahead market: price-quantity bid for each hour of next day
  - Each hour has its own marginal price
- Intra-day markets: same, but for increments over the day-ahead market transactions
- Congestion management
- Reserves markets
- The SO is able to call for a deviation market if needed

Retail market

- Fully liberalised since 1/1/2003
  - Retail market was liberalised in several steps



- There is still the option to remain at a regulated retail tariff through incumbent distribution companies
- Few customers have switched to a liberalised retailer
- (!) Regulated retail tariff does not reflect actual generation prices, which means that retailers will loose all the customers they gained in the past years

Contents

- Basic data on the Spanish Electrical System
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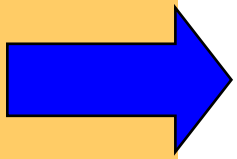
  - Restructuring process
  - Market design
  - Other activities
    - Transmission
    - Distribution
- Successes, flaws and future evolution



Transmission: new investments

- The SO proposes an expansion plan
  - Does not know anymore where the generation facilities will be connected
- The regulator approves the plan and…

  …construction, operation and maintenance is assigned
  - through competitive offers (regulation not yet completely developed)
  - directly in special cases

Transmission: losses

- The SO (REE) calculates loss factors in each node
  - based on marginal losses
  - normalised to match the cost of losses

- Each generator production or demand consumption is adjusted with this factor in the wholesale market
  - A generator connected to an exporting node can only sell less energy than it produces (the loss factor will lower than 1)

Transmission: access

- Free access to the transmission network is guaranteed

- Customers
  - Have to pay for any special equipment
  - Access can be denied in one node if there is not enough capacity
    - Alternative nodes can be offered
- Generators
  - Have to build, operate and maintain all the needed equipment
  - Access is not denied if there is not enough capacity, even if conflicts with other generators arise
  - Network capacity reservation is not allowed

Transmission: congestions

- Spanish internal congestions
  - REE will solve the congestion using the generators bids
    - Any unmatched generator that produces because of technical reasons is paid their original bid price
    - Costs are fully assigned to those responsible for demand

- International congestions
  - *pro rata* between bilateral contracts and market bids
  - First-come-first-served

Distribution

- Global revenue cap
  - Unlinked to ongoing changes in real distribution costs
  - Each company has a fixed % of this amount, independently of changes to their market share
- Quality Regulation
  - Continuity of supply
    - Large individual limits (number and duration of long interruptions)
      - Individual compensation if threshold is reached
    - Large system limits (ASIDI and ASIFI)
      - Mandatory investment plans if threshold is reached
      - Partially financed by access tariffs
  - Commercial quality: some controls
  - Power quality: not yet developed

International exchanges (i)