



CESI RICERCA

*White Certificates: the Italian experiences gained in  
Regulation, Monitoring & Verification and Electricity  
Market contexts*



# Challenges in Energy Efficiency Assessment

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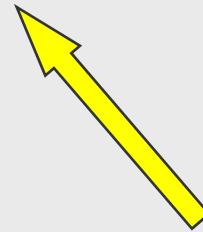
October 22<sup>nd</sup> 2008

# Can energy savings be metered?

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Energy savings can't be **directly** metered

“ ... determined by measuring and/or estimating consumption *before* and *after* implementation of one or more energy efficiency improvement measures, whilst ensuring normalization for external conditions that affect energy consumption”



## ESD article 3d

*(ESD = Directive 2006/32/EC on energy end-use efficiency and energy services)*

# Requisites of the Evaluation Procedures (1)

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- ❑ Take into account only measures driven by the energy efficiency programme and additional to what would have happened otherwise
- ❑ Separate changes in energy demand due to efficiency improvements from all the other possible factors that affect consumption
- ❑ Make sure that estimated savings don't exceed the real ones
- ❑ Be a reasonable trade-off between simplicity and accuracy

# Requisites of the Evaluation Procedures (2)

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- ❑ Comply with prescriptions for products eligibility (“Decreets” art. 6)
- ❑ Facilitate on-site verification, as random controls are foreseen (*i.e.: refer savings to installed equipment, “before” situation is rarely verifiable*)
- ❑ Ready to understand and to use
- ❑ Guarantee the quality of the White Certificates on the market

# General Principles

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- Additionality of savings
- Base line* definition
- Target line* definition

# Additionality principle

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**Certified** Energy Savings are net of those obtained in any case, if the project itself is not implemented, because of the technology and market evolution, including the mandatory compliance to law and regulations

# The *base line*

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Represents the avoided consumption due to the efficiency project, typically it corresponds to:

1. Either in case of a replacement or the installation of new equipment, the baseline is the consumption of the average-on-the-market appliance  
*(the “before” situation irrelevant, early replacement not encouraged)*
2. In case of addition of an energy saving product or component (PV generator, VSD, thermal insulation, ...) to an existing facility, the baseline is the energy consumption without the measure

# The *target line*

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Is the consumption either of the installed appliance or of the original equipment after the improvements:


- It must represent an actual energy improvement with respect to the *base line*
  
- Mandatory compliance to law prescriptions is not eligible
  
- In principle, voluntary compliance to new standards and regulations is accepted



# Equipment eligibility

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## Requirements:

- ❑ Efficiency Class A (or better) for domestic electric appliances
- ❑ Efficiency class = ★★☆☆ rating for boilers  
(*Boiler Efficiency Directive - 92/42/EEC*)
- ❑ Efficiency > 82% for biomass boilers exceeding 300 kW
- ❑  efficiency class for electric motors
- ❑ For other products, appliances or components, the minimum energy performance and the performance certification instructions are to be specified case by case

# Available procedures

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Type of procedures for the quantitative assessment of Energy Savings (AEEG, Decision n. 103/03):

- a) Default method (no on-field measurement) Ex-ante
- b) Analytic method (some on-field measurement) } Ex-post
- c) Metered baseline method }

White Certificates are issued according to the evaluation made by means of an approved procedure

# Default method

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- ❑ Gives ex-ante energy savings per “physical unit of equipment” installed
- ❑ Typically available for “mass” projects where reliable averages can be determined

## Applicable when:

- ❑ phenomena driven by a few “key factors”
- ❑ cause and effect relationship clearly individuated
- ❑ common equipment is installed (domestic appliances, electric motors, boilers, thermal insulation, ... )
- ❑ “on field” energy performances are known for the considered technologies

# Problems with default methods

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- ❑ *Baseline selection*
- ❑ *Analysis of the energy process and algorithm definition*
- ❑ *Set default values for relevant computation parameter*

*Note: compliance with all technical and safety rules is taken for granted on designers' and installers' responsibility.*

# Analytic Method

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- ❑ Is an “open” default method
- ❑ Savings are assessed after on-site metering the relevant parameters
- ❑ Justified for peculiar projects having relatively large unit size (cogeneration, VSD pumping systems, etc.)

# Problems with analytic methods

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- ❑ Engineering model definition
- ❑ Selection of parameters to be metered on field
- ❑ Metering criteria (little intrusive, simple, reliable, not expensive)

# Metered baseline Method

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- ❑ Used when energy savings are the results of measures involving complex interactions among several different variables and equipments
- ❑ Savings are based on the difference between energy consumption measured ‘before’ and ‘after’ the implementation. Measurements may be normalized to other process variables.
- ❑ Recommended for very large projects

# Problems with metered baseline methods

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- ❑ Individuation of the energy flows, and level of service/production to meter
- ❑ Selection of metering criteria (little intrusive, simple, reliable, not expensive)
- ❑ Need for adjustments



# Role of Technical Bodies

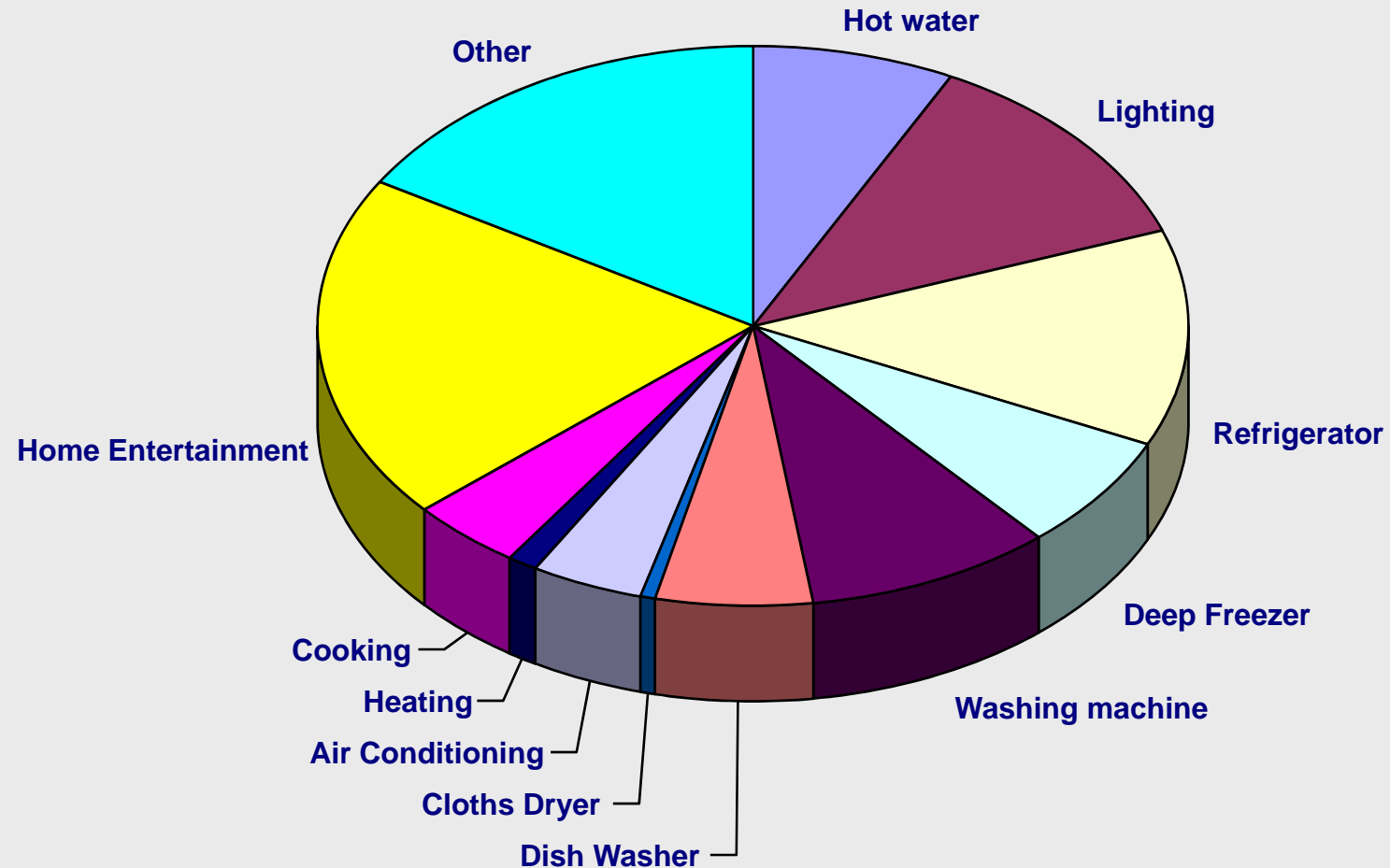
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- ❑ Individuate the general requirements for savings evaluation
- ❑ Analyze end-use demand and technologies
- ❑ Develop evaluation procedures case by case
- ❑ Build and update technology databases
- ❑ Monitor market transformation and revise procedures when needed
- ❑ Be a *Liaison Officer* among regulators, regulated parties, energy users, and equipment manufacturers
- ❑ Verify and certificate savings
- ❑ Independence and expertise are major assets

- Began assisting AEEG in 2001, when the White Certificates mechanism was first conceived:
  - Contributed to individuate and refine the evaluation criteria
  - Developed the initial set of procedures
  
- Since then:
  - Develops and finalizes procedures based both on own and others' proposals
  - Monitors the efficient technology market
  - Meters on site energy performance
  - Regularly interacts with institutions, stakeholders, and industry associations

# Energy Demand Modeling

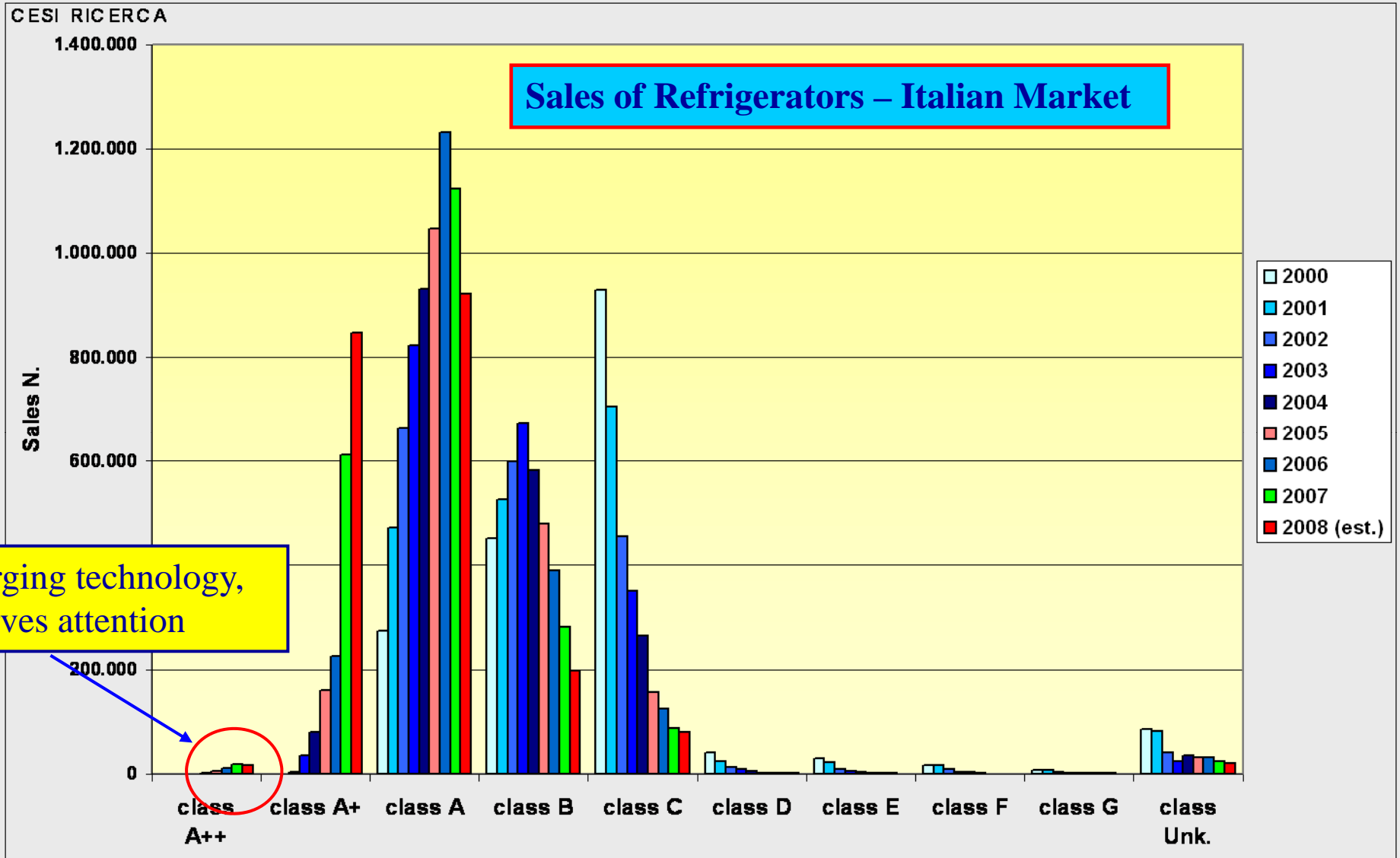
## Residential Sector: Break Down of Electricity Consumption



# Technology Market Analysis (1)

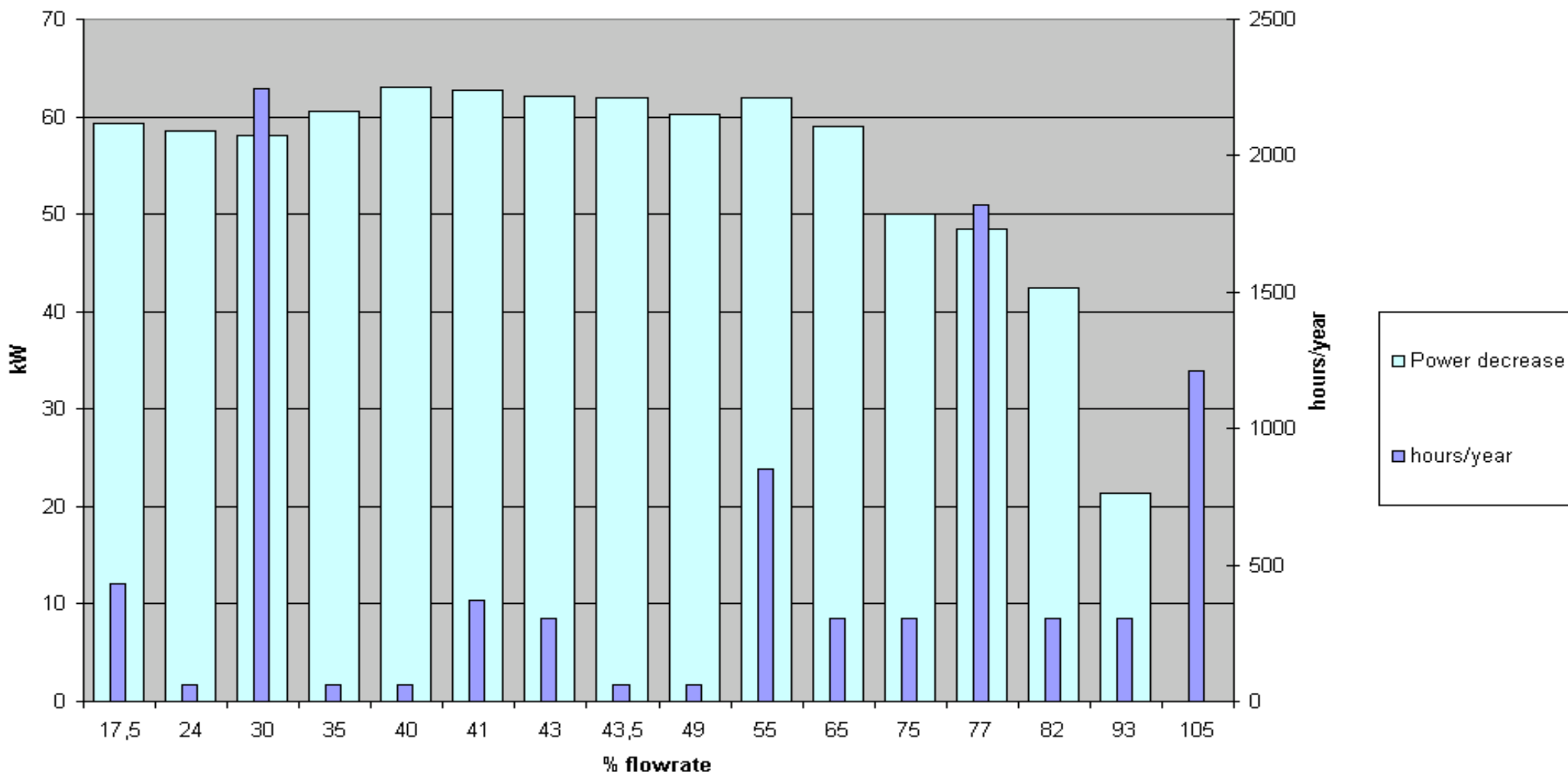


# Technology Market Analysis (2)



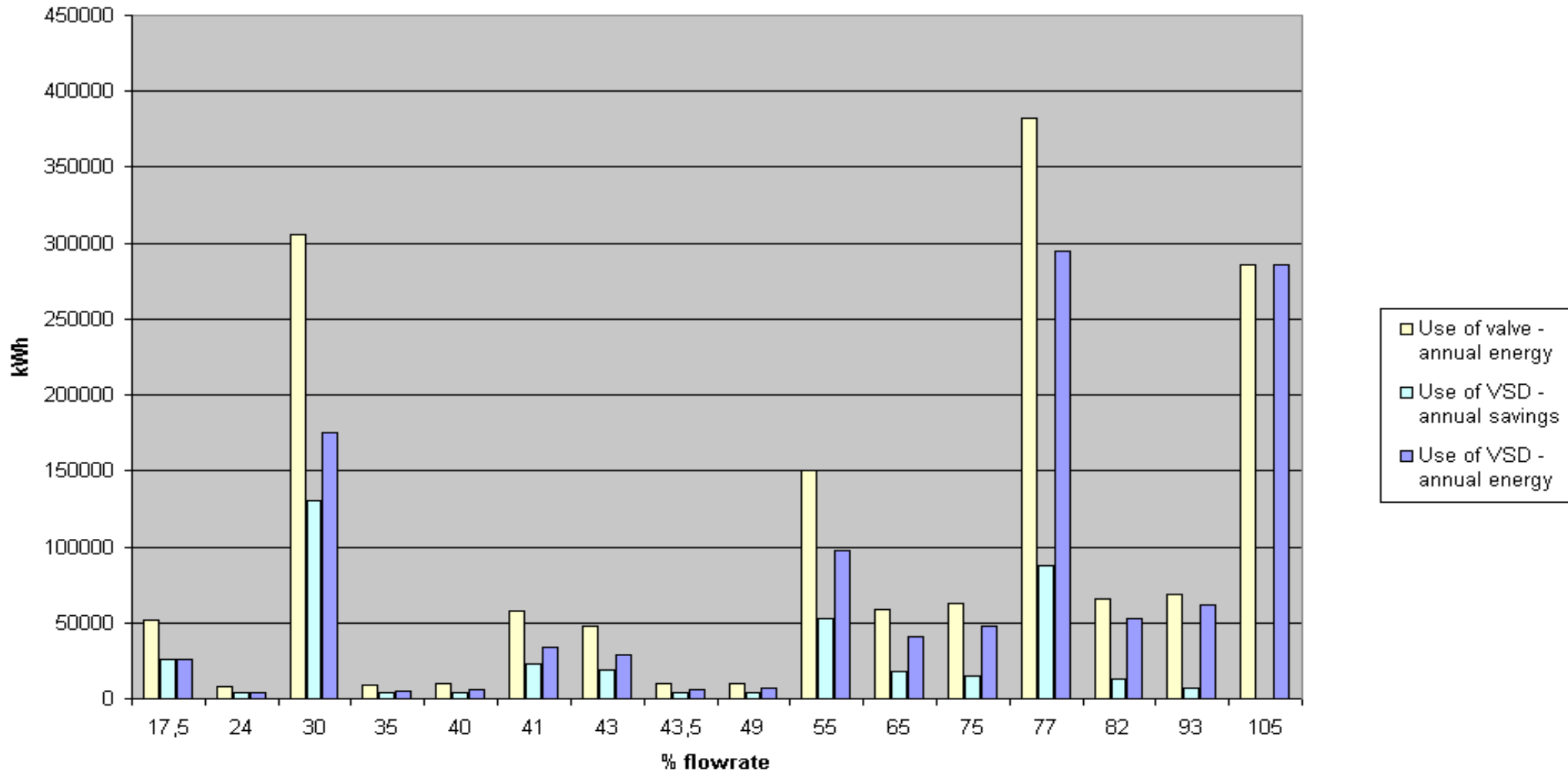
# On site monitoring of water pumping station (1)

## Demand reduction with VSD and related operating hours



# Water pumping station (2)

## Energy Savings with VSD



# Major Interactions





**Grazie**

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