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# **Energy management in Swedish pulp and paper industry - the daily grind that matters**

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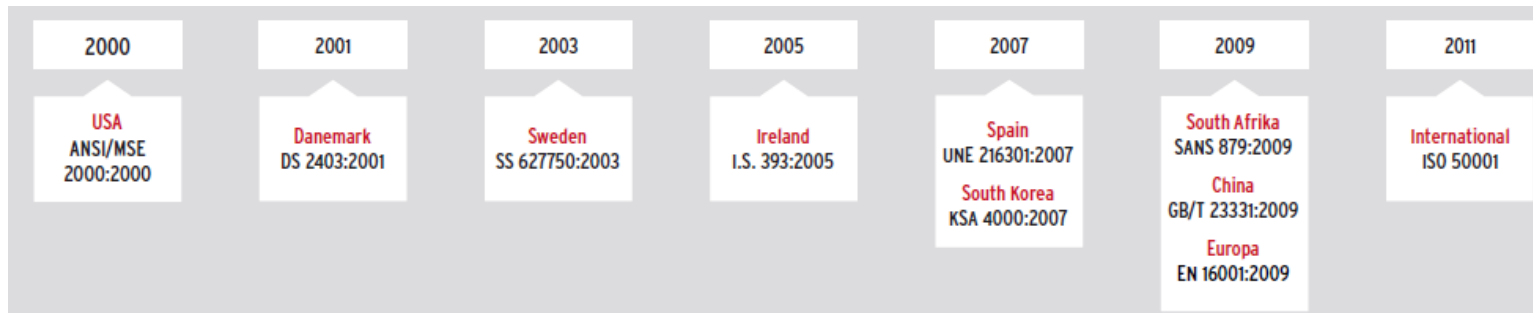
# Outline

- Context
- Research questions
- Previous research
- Empirical study - methodology
- Empirical study - results
- Conclusions
- Topics for discussion



# Context

“Energy management”, by no means new in literature or practice, but the development of standardised Energy Management Systems (EnMS) belongs to a recent development.



Source: Kahlenborn et al 2010

## Said about EnMS in the Energy Efficiency Plan 2011:

EE in **industry** will be tackled through EE requirements for industrial equipment, improved information provision for SMEs and measures to introduce energy audits and **energy management systems**.

EC will encourage MS to provide SMEs with information (for example about legislative requirements, criteria for subsidies to upgrade machinery, **availability of training on energy management** and of energy experts) and develop appropriate incentives

For **large companies** the EC will propose to make regular energy audits mandatory.

It will recommend that MS should develop incentives for companies to introduce an **energy management system (for example as set out in standard EN 16001)** as a systematic framework for the rational use of energy



# Research questions

## Purpose

Increase knowledge about the practical implementation of standardized EnMS in energy-intensive industry.

## Key questions:

- How is a standardized EnMS structured and activated?
- Which are the measurable effects and other discernible outcomes?



# Previous research

*“Exploring energy management in the Swedish pulp and paper industry”*

Thollander and Ottosson (2009), presented at eceee summer study 2009.

## **Criteria for assessment:**

- Priority of energy issues?
- Allocation of energy costs?
- Existence of long-term energy strategy?
- Payoff criteria for energy efficiency measures?

## **Some conclusions:**

- Since 2000 the priority of energy issues has increased significantly within the studied industry,
- One third of the studied mills did not allocate energy costs by means of sub-metering,
- 20 percent of the studied mills lacked a long-term energy strategy,
- Potential to improve energy management in the studied industry.



# Empirical study - methodology

A dual approach,

1) Interviews – qualitative data:

Site visits including interviews with appointed energy management representatives at eight different pulp and paper mills.

2) Data gathering and analysis - quantitative data:

- Reported electricity savings during the course of PFE,
- Absolute electricity consumption,
- Specific electricity consumption



# Empirical results (1)

## ***The Energy Management Coordinator (EnMC),***

All mills have one main EnMC. Takes care of work planning, communication and progress follow up.

Only devote part time for direct work with EnMS. Other tasks can relate to EU-ETS, environmental regulation, other management systems etc.

## ***Commitment of management and staff***

EnMC have appointed contact persons at each major division. Sometimes designated as “mini EnMC”.

At each mills working groups of mixed composition meet regularly to assess lists of proposed EE measures and prepare decision on implementation.

Between 2 and 5.5 percent of entire staff is somehow directly involved in the EnMS activities.



# Empirical results (2)

## ***Energy cost allocation***

Most mills are rather content with their sub-metering systems, and allocate energy costs to cost-centers (i.e. division level).

These are also able to express the specific consumption of different energy carrier (e.g. electricity, steam, bio-fuels, fuel oil, and diesel) down to the division-level (cost centre).

## ***Monitoring and reporting***

Most mills had automatic meter reading to assimilate real-time data (steam and electricity) from the metering devices

Continuous monitoring is used to confirm that specific consumption figures are kept at acceptable levels.

Most mills claim that advancements have been made with regards to measurement and verification of achieved energy savings.

## ***Training***

Has had a low priority in most of the mills.





# Empirical results (3)

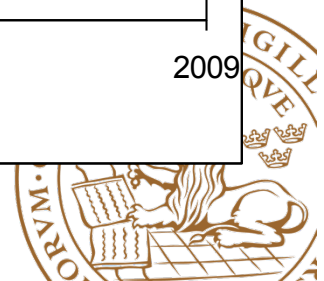
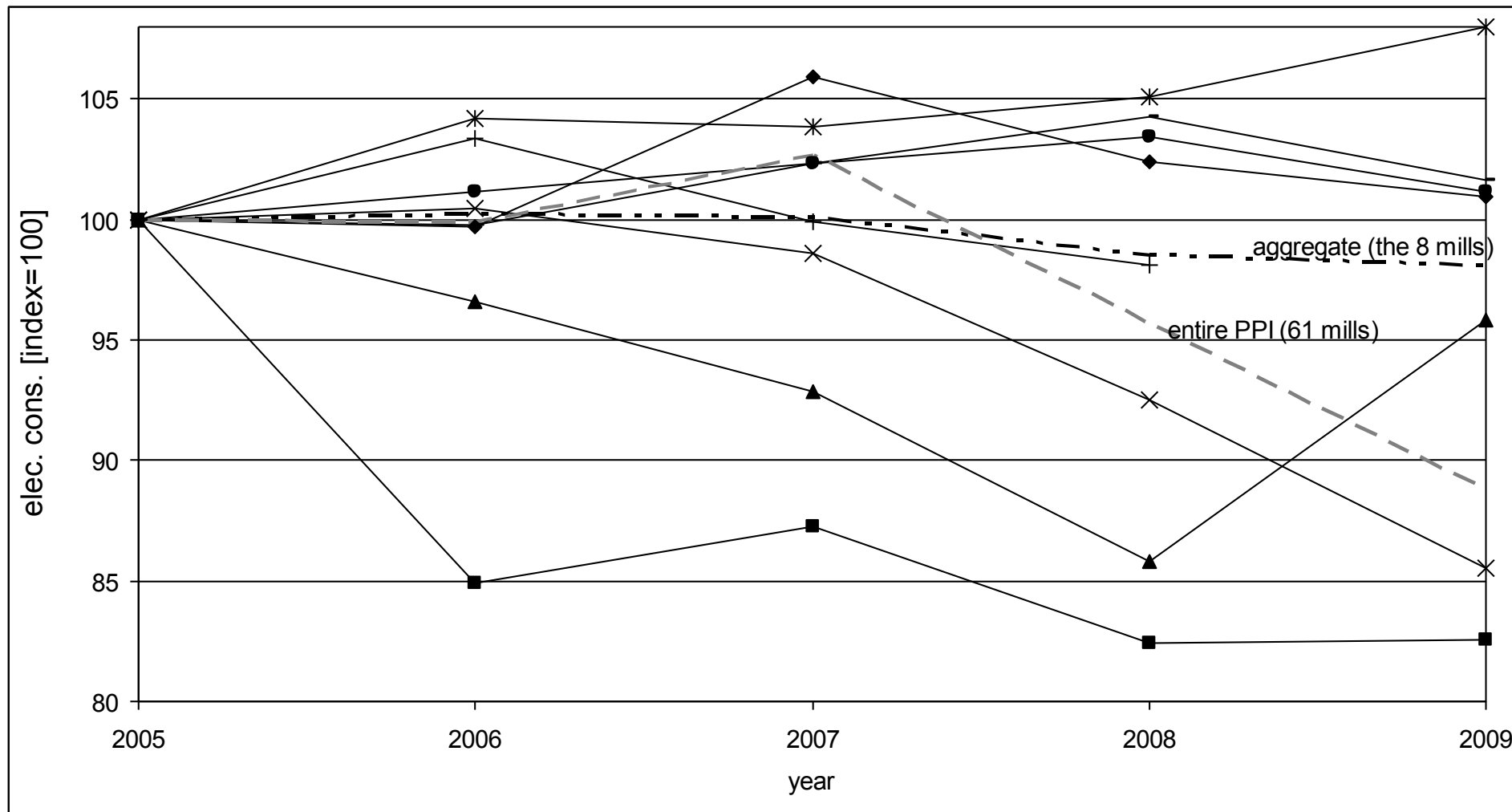
**Table 2. The mill's reported annual electricity savings under PFE. Source: SEA (2011b)**

| Mill | Categories of reported annual electricity savings |                            |                                 | Sum of annual elec. savings |                                   |
|------|---|----------------------------|---------------------------------|-----------------------------|-----------------------------------|
|      | Technical and O&M measures [MWh]                  | Procurement routines [MWh] | Project planning routines [MWh] | [MWh]                       | Relation to 2004 elec. demand [%] |
| ◆    | 6571  | 8                          | 1787                            | 8366                        | 2.9                               |
| ■    | 26016   | 554                        | 270                             | 26840                       | 4.4                               |
| ▲    | 8044  | 63                         | 5                               | 8112                        | 8.6                               |
| ×    | 32384   | 380                        | 390                             | 33154                       | 3.5                               |
| ✱    | 57701   | 794                        | 1509                            | 60004                       | 3.2                               |
| ●    | 1115  | 100                        | 63                              | 1278                        | 1.5                               |
| +    | 26710   | 300                        | 2500                            | 29510                       | 4.0                               |
| –    | 11887   | 199                        | 377                             | 1763                        | 2.7                               |
| Sum  | 170 428   | 2398                       | 6901                            | 179 727                     | 3.5<br>(3.85 in average %)        |



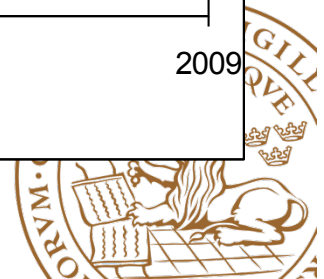
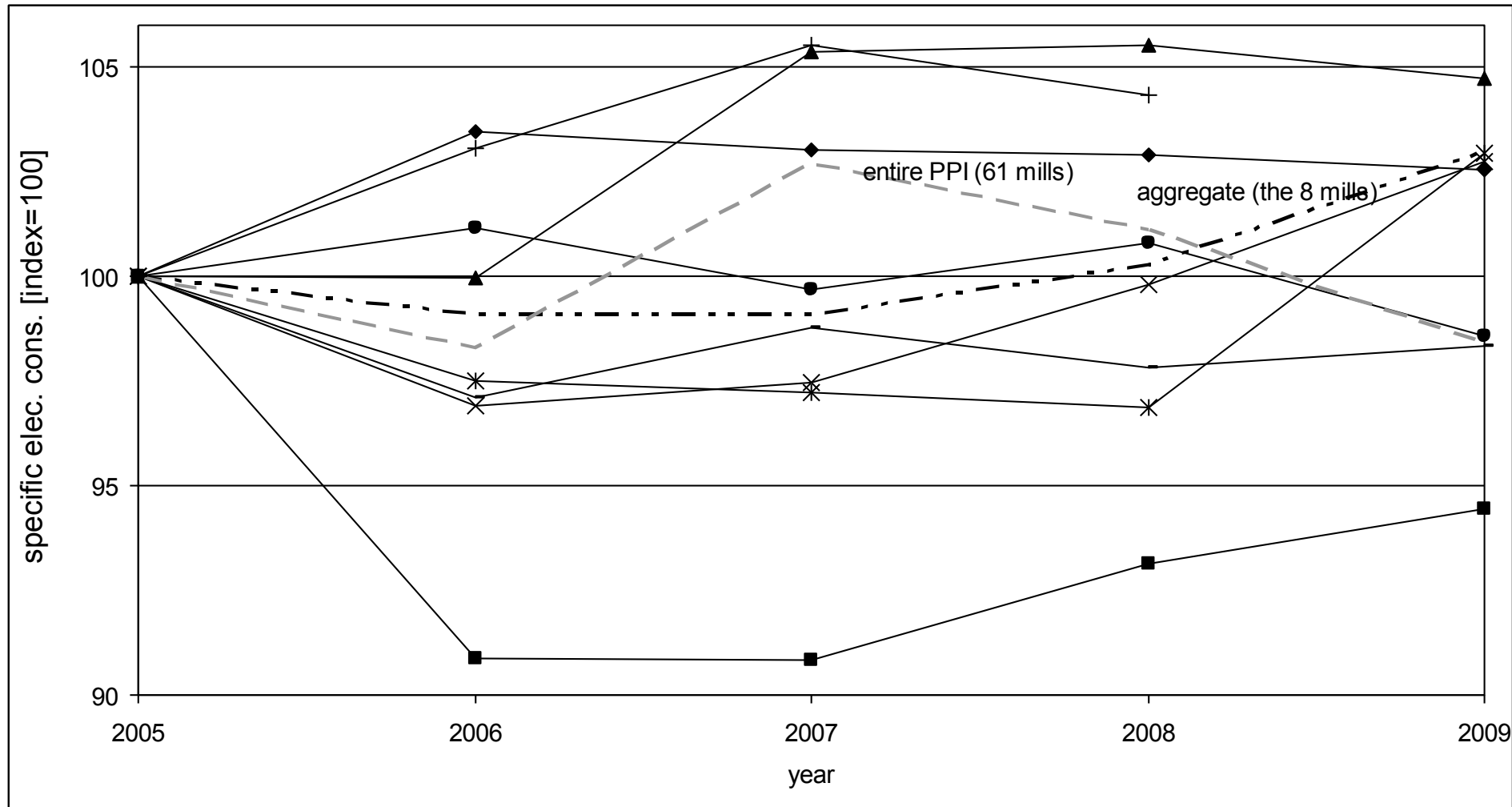
## Empirical results (4)

**Figure 3. Electricity consumption for the eight mills (2005-2009). Source: SFIF (2011)**



## Empirical results (5)

**Figure 4. Specific electricity consumption for the eight mills (2005-2009). Source: SFIF (2011)**



# Conclusions

The EnMS is a very “real thing” in all of the studied mills. It very evidently requires staff in different functions to meet and communicate with a clear focus on energy efficiency improvement.

The organizational structure including allocation of staff resources matters a lot. The EnMC is very dependent on the commitment from colleagues, and mandate from management.

The direct engagement of 3-5 percent of the staff (at least in a pulp and paper industry) appears necessary for an effective EnMS operation.

Standardised EnMS are increasing focus on energy efficiency improvement also in energy-intensive industry. Contrasting belief about persistent energy consciousness within energy-intensive firms.



# Topics for discussion

Is it at all meaningful to evaluate EnMS practices beyond the stamp of approval issued by third party auditors?

What methodologies are found suitable for evaluating companies' EnMS practices?

What are the prospect for EN16001 / ISO 50001 implementation in your countries?

How can the spread of standardized EnMS be facilitated?

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Thank you!

Don't hesitate to contact me at:

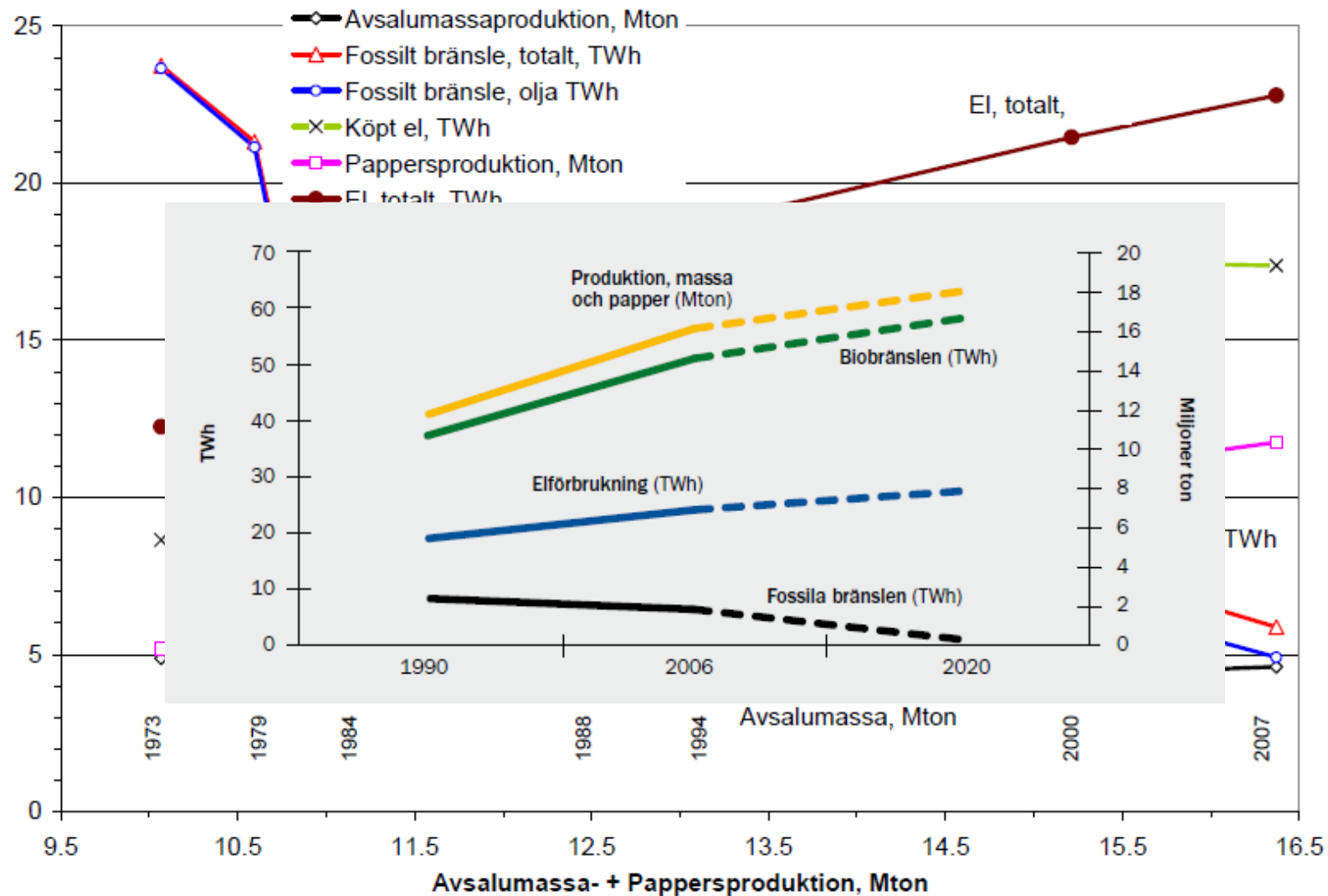
[christian.stenqvist@miljo.tlh.se](mailto:christian.stenqvist@miljo.tlh.se)

See also,

Stenqvist C., Nilsson L. J. (2011). *"Energy efficiency in energy-intensive industries – an evaluation of the Swedish voluntary agreement PFE"*. Accepted for publication in the Energy Efficiency Journal.



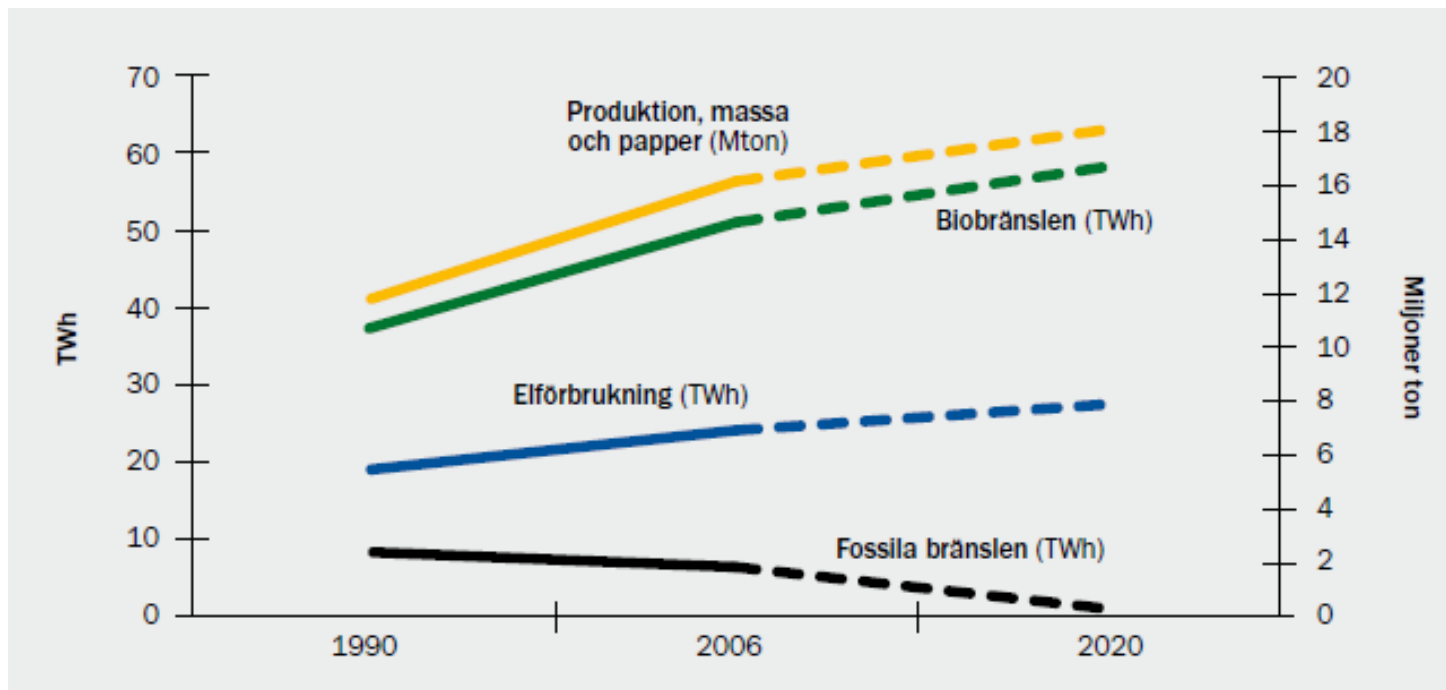
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