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ECOINFLOW

Energy Control by Information Flow

Instrument: Intelligent Energy – Europe (IEE)

Deliverable D.4.1
Constraints defined by stakeholders and external conditions to energy efficiency in SMI

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Content

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The Norwegian Sawmill Industries Association	NO	Treindustrien
InnovaWood	BE	IW
Bundesverband der Säge- und Holzindustrie Deutschland	DE	BSHD
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1 Introduction

1.1 Work Package 4

Work package 4 is designed to demonstrate to important stakeholders of the sawmill industry in a well documented form the effects of energy management systems to ensure a wide range of implementations in the future. On the one hand, effects will be documented for the micro level, disclosing success stories for energy efficiency measures on company level. On the other hand, effects will be documented for macro level, disclosing total national and European saving potentials in the sawmill industry in context with political goals.

In a later stage of the project the results will be reported to the stakeholders to illustrate their engagement in reaching energy saving goals. The results will also be used to formulate a strategic roadmap for improvements of energy efficiency in the European sawmill industry (Figure 1).

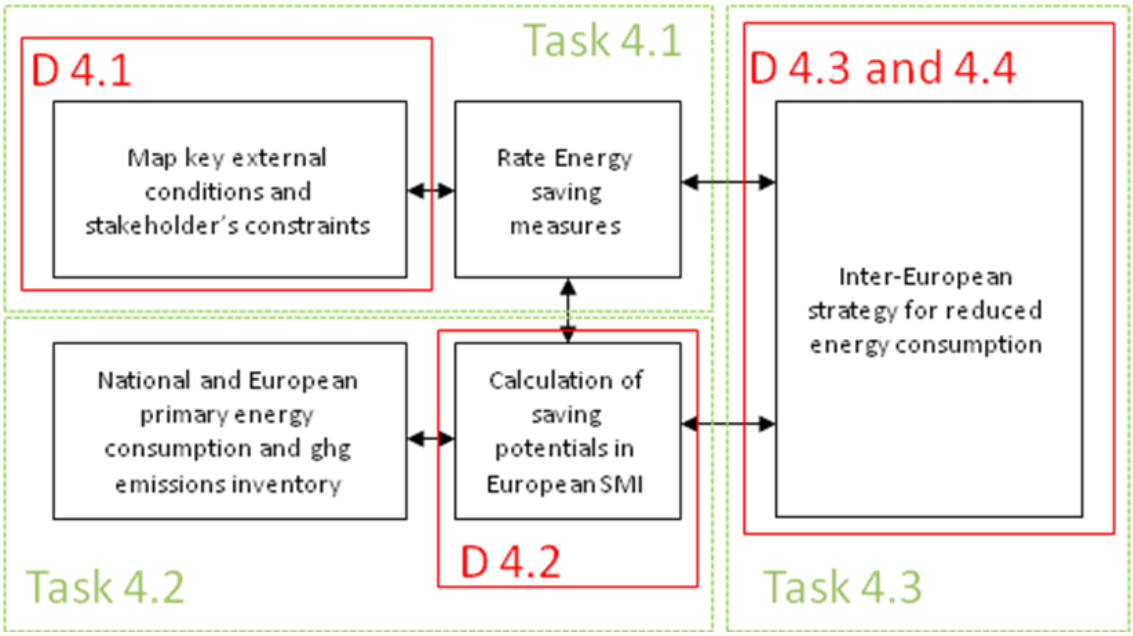

Figure 1: Task 4 overview with content of subtask 4.1 to 4.3 (red) and deliverables 4.1 to 4.3 (green)

Task 4.1 will initially identify international stakeholders and the framework for energy efficiency measures in the European sawmill industry. The task will be accomplished by

- determining a map of key external conditions influencing the implementation of energy efficiency measures in European sawmill industries
- identifying the stakeholders of these external conditions
- describing differences in external conditions influencing the implementation of energy efficiency measures between countries and industry sectors

- weighting the identified external conditions according to life cycle impacts and costs-benefits of energy efficiency measures in close cooperation with the identified stakeholders
- rate energy efficiency measures based on stakeholders weighting

1.2 Deliverable 4.1

This deliverable aims to firstly identify all parameters which need to be considered for an extrapolation of the site specific results from the pilot sawmills to national and European level. Those parameters constitute the essential difference in terms of "the ability to apply energy efficiency measures on site" between the companies analysed, and all other sawmill sites of the European sawmill industry.

Secondly, the deliverable aims to identify the stakeholders on European level. To approach these stakeholders, the relevant external framework has to be analysed in terms of its capability to promote energy measures in SMI. Further on, the stakeholders' constraints have to be identified, to possibly overcome them. The first task identifies the differences, while the second task identifies the stakeholders' responsibility to those differences. Both tasks rely on the same data background.

For a better understanding, the relevant aspects will be subdivided into:

- stakeholder constraints
- key external conditions
- methodological issues

2 Stakeholders' constraints

2.1 General

There are several sawmill specific aspects that might have an influence on the behaviour of the stakeholders within the companies (owner or personal) to implement energy efficiency measures. These aspects need to be described in detail, to firstly know their quantitative impact in terms of being a constraint and secondly to up-scale efficiency potentials to European level. To achieve this, stakeholders within the sawmill industry need to be approached in terms of their view on the relevance of these constraints.

2.2 Development of Questionnaires

Looking at SMI constraints to implement energy efficiency measures, several aspects come into consideration. For the sake of an efficient approach, all possible aspects were collected by the project partners and separated by technology or business based constraints. They were rated by all research project partners regarding their relevance (Table 1 and 2)

Table 1: Business environment related constraints, sorted by relevance

Aspect	Description	Relevance
Production	Total annual production volume of the sawmill	Strong
Age	Age of production site and machines	Strong
Turnover	Total annual turnover	Medium
Shift	Number of workshifts	Medium
Customers	Distance to customers for byproducts	Medium
Employees	Number of employees in sawmills	Medium
Legal form	Legal form of sawmill company	Weak
Membership	Membership in a sawmill association	Weak
Location	Geographical location of sawmill (North, South, East, West)	Weak
Competitors	Nearby competitors of raw material supply (wood fuel)	Weak

Table 2: Technology based constraints, sorted by relevance

Aspect	Description	Relevance
Planing	Technology used for planing	Strong
Fuel type	Type of fuel used to generate heat	Strong
Drying	Technology used for drying	Strong
CHP	Utilization of CHP on site	Medium
Boiler	Yield of Boiler	Medium
Milling	Technology used for milling	Medium
Wood species	Wood species processed in sawmill	Weak
Kind of products	Structural timber, sawn wood for pallets,…	Weak
Debarking	Technology used for debarking	Weak
Log yard	Technology used on log yard (cranes, trucks)	Weak

The listed constraints will be used to set up a questionnaire for the stakeholders. For those aspects that have been considered to have strong relevance, SMI stakeholders will be asked to quantify the impacts. For those aspects with medium relevance, stakeholders will be asked to give a qualitative description of the impact, while all aspects with weak relevance will be listed as potential but marginal impacts only.

3 Key external conditions

3.1 General

Besides the SMI stakeholder very specific constraints to implement energy efficiency measures, the general political and economic framework within a country has an influence on the implementation. Since the regulatory laws, promotions and market instrument on European and national level are expected to act in accordance with the political goals on each level, these goals will be identified first.

Secondly, the framework with influence on sawmills in context with the identification of efficiency potentials and the implementation of the relevant energy efficiency measures will be described.

3.2 Political Goals

While the goals defined on EU level are becoming national goals in different shapes for all EU countries, some special goals may apply for Norway, since it is not a member of the EU.

The fundamental framework, defining energy efficiency goals on European and national level, is set by the Energy Efficiency Directive (2012/27/EU) (further referred to as EnEffDR) which became effective on 25 October 2012 and has to be implemented in national legislation within 18 month. The directive was driven by SEC (2011) 277, where it was estimated that the 20 % energy saving goal, which was approved by the EU members in 2007, would not be met without the assistance of additional measures

The goals defined in EnEffDR focus on absolute measures for consumption of primary energy and final energy. For primary energy consumption, a total of 1.474 Mtoe (61.713 PJ) and for final energy consumption 1.075 Mtoe (45.135 PJ) are defined as maximum in 2020 for the EU.

To ensure the achievement of these goals, energy efficiency obligation schemes are introduced in each country. In terms of final energy consumption reduction, these targets shall be at least equivalent to achieving new savings of 1,5 % (starting in 2014) of the total annual energy sales, which is averaged on basis of annual sales of 2010, 2011 and 2012.

3.3 Framework

The framework leading to direct effects in SMI stakeholder behaviour can be separated into support for an identification of saving potentials and the support for an implementation of measures to exploit those potentials.

The essential tools for the identification of saving potentials are the implementation of energy audits and energy management systems within the SMI as described in Article 8 of EnEffDR. The EU countries affected by the directive are committed to

- "promote the availability [...] of high quality energy audits, which are cost-effective",
- "develop programmes to encourage SMEs [small and medium sized enterprises, which applies for most sawmills (comment by author)] to undergo energy audits",
- "develop programmes to raise awareness [...] about the benefits",
- "encourage training programmes to facilitate sufficient availability of experts".

Besides these schemes, which promote SMEs to voluntarily undergo energy audits, large enterprises (not SME) will be committed to be subject of an independent energy audit or any equivalent scheme (starting in 2015).

The final exploitation of identified energy efficiency potentials via measures fundamentally depends on their cost-effectiveness. The cost effectiveness basically depends on the life cycle costs of the measures, which again is depending on energy prices and procurement costs.

Energy prices are fundamentally influenced by global market prices and taxes, while procurement costs are influenced by the type of measure to be implemented and cost of capital for the investments.

In contrary to global market prices, which cannot be influenced by the national legislative frameworks, taxes, subsidies and incentives are available regulatory tools to promote the subsequent implementation of the recommendations resulting from energy audits. To compare

the possible exploitation of efficiency potentials between European countries, knowledge about energy prices and their taxation within each country needs to be available.

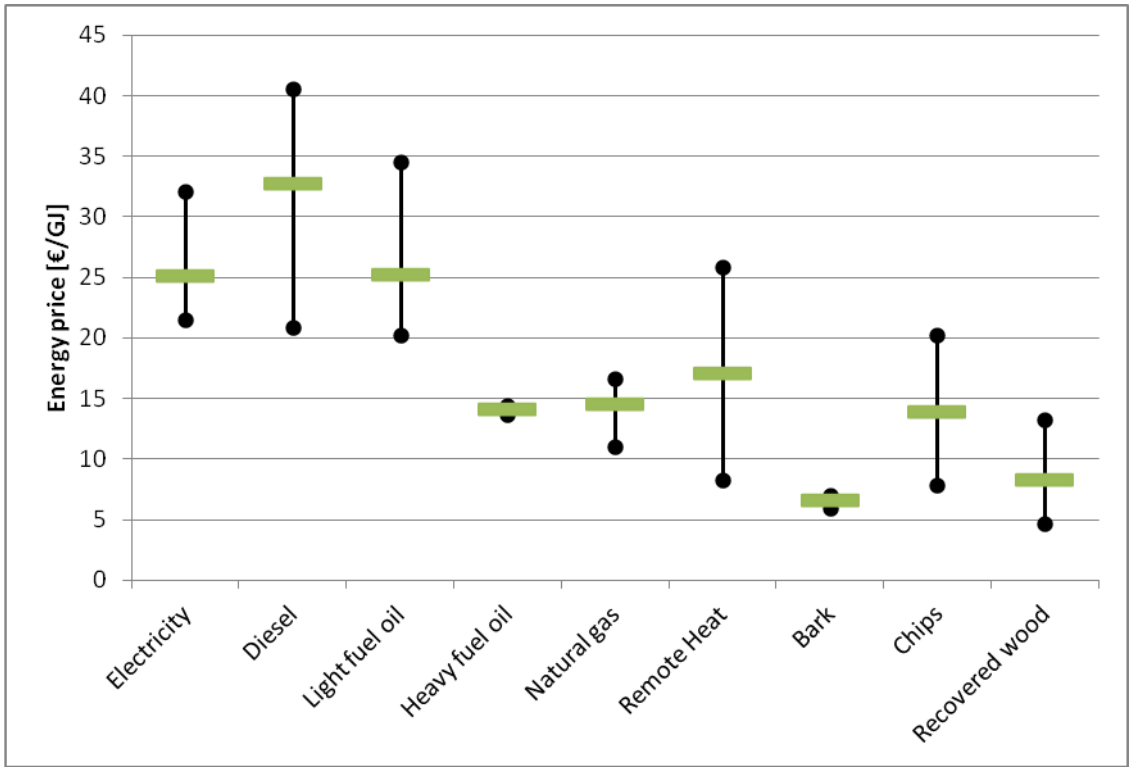

Figure 2: Differences in energy prices for industry in Germany, Sweden, Norway and France (VAT excluded, bars: average price, dots: lowest and highest price) [for references see Annex]

Figure 2 shows the range of final energy prices (VAT excluded) for industrial customers in Germany, Sweden, Norway and France. The differences are especially noticeable for electricity, diesel, light fuel oil, and remote heat. Differences in price for renewable fuels are large for chips and recovered wood. It was not possible to finally separate the specific national taxation costs and the base fuel price for every country. But, if it is assumed that prices for fossil fuels are based on global markets, the differences in prices for fossil fuels are primarily based on different national taxation or other national regulations.

Table 3: Key interest rates of federal banks [for references see Annex]

Capital good	Unit	DE	NO	SE	FR	BE	LV	AU
Key interest rate	[%]	0,75	1,55	1,5	0,75	0,75	2,5	0,75
Interest rates (loans)	[%]	2,94	4,84	3	2,21	2,1	4,26	2,22
Interest rates (deposits)	[%]	0,57	2,39	0,71	0,09	0,24	0,12	0,48

Table 3 shows the main interest rates from federal banks and the average interest rates for loans to industrial companies or deposits. With regard to loans, cost of capital for investment differs strongly throughout Europe. Lowest prices are paid in France, Austria and Belgium, while capital costs are high in Norway and Latvia. Sweden and Germany rank within the middle. The ability of the sawmill companies throughout Europe to invest in energy efficiency measures will also be driven by the national differences in theses interest rates.

Besides energy prices and capital costs, schemes to promote energy efficiency measures are different in each country. Since the complexity of national regulatory schemes is very high, some examples from Germany, Sweden, Norway and France will be described, to give an impression.

3.3.1 Germany

In Germany, companies have to be subject to an energy audit to get a tax refund which had been granted before without statutory requirements. Companies are committed to start with the implementation of these audits no later than 2013 and finish the implementation before 2015. While large (not SME) enterprises are obliged to follow at least ISO 50.001 or any equivalent scheme (e.g. EMAS), small and medium sized enterprises are forced to do energy audits in minimum accordance with EN 16247-1:2012 to get the tax refunds. This can be up to 90 % of the German ecotax (StromStG, EnergieStG).

The tax refunds are also bound to the fulfilment of a contract between the German industry association and the federal government. The contract defines an energy efficiency pathway for the German industry in terms of an industry wide reduction of the energy intensity, measured by total consumption of primary energy divided by total production value.

3.3.2 Sweden

In Sweden, the Swedish Energy Agency is the governmental body that works the most with energy efficiency in Sweden. Industry, universities and research institutes can apply for money from calls within energy efficiency in several areas. Some examples are:

- The national programme with the greatest impact on energy management in energy intensive industry in Sweden is the Programme for Energy Efficiency in Energy Intensive Industries (abbreviated as PFE).
- PFE is a national Swedish programme for promoting energy efficiency in industry. Its primary aim is to reduce electricity consumption in the industry sector, and it was established when the electricity tax for industries was raised in 2004. The programme has been a very important factor for promoting energy efficiency in Swedish industries: 95% of all Swedish companies with a certified EMS have participated in the PFE programme.
- The reward for taking part in the programme is a tax refund, in practice meaning that the companies are relieved from paying electricity tax. The refund is 0.06 cents/kWh, i.e. a fairly small cost reduction, but it nevertheless made the companies act; partly because they got a simple value to base calculations on and partly because—since it was a tax— it was automatically raised to the management level.

The results from the PFE programme so far can be summarised as follows:

- Cost savings of 47 M€/yr caused by the resulting energy savings.
- Cost savings of 17 M€/yr caused by the tax refund.
- Electricity savings of 1.5 TWh (5.2 PJ).
- The average payback period of the energy saving measures has been 1.5 years.

- Energy review cheque (*Energikartläggningscheck*)

Companies that want to perform an energy review of their plant can apply for up to 3,500 € to cover half of the cost for performing the review. The review can be performed by the company itself or an external consultant.

- Industry and research institutes can also apply for specific support for a specific purpose. For example, the project Energy Efficient Sawmill Industry (EESI) is a networking project within the sawmilling industry aiming at reducing the energy use by 20% until the year 2020.

3.3.3 Norway

In Norway there are reduced electricity tax for industry, a state energy fund and green certificates scheme that are important framework factor for energy use in industry.

The taxes on electricity for industry and mining companies are substancially reduced when compared to normal consumers (consumers 1,5 eurocent/kWh, industry 0,05 eurocent/kWh).

The green certificates are economic subsidy for renewable energy production and are paid by end consumers. The scheme is a market shared with Sweden where it was first introduced.

The energy fund is operated by the state enterprise Enova and is the driving force in implementing a transition to more environmentally friendly energy use and production. Enova is also managing the EU "Intelligent Energy Europe" and the IEA program ETDE in Norway. Enova is also operating an industry network for reference measuring and has a tool that industry actors can use for benchmarking with other members.

From January 1st 2010, industries with combustion plants larger than 1 MW have to document emissions of CO, NOx and particles annually or biannually depending on plant size. This is compulsory with regard to maintain emission permit.

3.3.4 France

The European Directive 2012/27/EU on the energy efficiency is going to be transposed in France. The large companies will have to do a mandatory energy audit by independent experts and the other companies will be encouraged to undergo these energy audits.

4 Methodological influences

4.1 General

Stakeholder constraints and the key external conditions are likely to have an influence on the quantity of implemented energy efficiency measures within the SMI. On the basis of quantitative information of the impacts of those influences, the cost effective energy efficiency potentials that have been identified within the analysed sawmills, can be up-scaled to European level. This will disclose the total potential savings and main drivers.

The calculation methodology for the up-scaling procedure has an influence as well.

4.2 Influences on up-scaling calculations

Although economic growth has been slowly decoupling from primary energy consumption during the last years, it still has a certain influence. Therefore, it is assumed that the economic growth in the sawmill industry will have an influence on the total savings potential within the sector. The type of influence depends on the functional unit of comparison. If savings are calculated on basis of specific production units (e.g. kWh/m³) growth will probably lead to a reduction, due to a high degree of capacity utilization. On the other hand, if the functional unit refers to the total amount of primary energy used, growth is assumed to lead to an increase of energy consumption. Although there is no directly visible link to the introduction of energy efficiency measures within the sawmill industry, economic growth or recession will have an

impact on national pathways to achieve EU level goals of maximum total primary energy consumption. This might lead to different legal frameworks which might have an influence on the constraints defined by stakeholders.

Also referring to the functional unit of comparison, the primary energy factors will have an influence on the quantitative assessment of the saved primary energy. Especially in terms of changing the amount of nuclear power, wind, water or photo voltaic within the national electricity grid mixes, primary energy consumption most probably will not be linearly related to final energy consumption.

Another factor, which has strong influence on energy efficiency, refers to the definition of efficiency. If efficiency is measured in terms of energy consumption in relation to monetary indicators (e.g. added value) the efficiency might go down although less energy was consumed. Although efficiency goals are described in absolute figures, any possible discrepancy between absolute results and the relative efficiency measures as used for example in Germany (see chapter framework) need to be clearly described.

5 Conclusion

This deliverable aimed to identify the essential parameters which need to be considered for an extrapolation of the site specific results from the pilot sawmills to national and European level and to identify the essential stakeholders of these parameters.

In context with sawmill stakeholders, their constraints where identified and rated by all project partners in terms of their influence on the behaviour of the stakeholders to implement energy efficiency measures. Their specific quantitative impact can now be determined by questionnaires to sawmill stakeholders, covering these identified influences. The questionnaire will ask these stakeholders to describe influences with strong relevance quantitatively and influences with medium relevance qualitatively.

In context with other stakeholders, the essential political goals and the relevant legislative framework on European level were described. For the framework, aspects which only lead to knowledge of energy efficiency potentials within SMI and aspects which lead to an exploitation of these potentials were described.

For the EU countries, the EnEffDR will mainly solve the problem of identifying the potentials, since high quality energy audits within the companies will be either compulsory or at least promoted heavily. Examples for this are taxation/tax reduction, bound to the implementation or other promoting regulations, as well as research activities like ECOINFLOW. For Norway, a non EU-country, similar regulations are implemented.

The exploitation of identified potentials primarily depends on their cost effectiveness. A rough analysis of country specific prices for energy and capital was conducted, showing large differences between the countries. For calculations on European level, these prices, as well as the share of taxes and subsidies respectively, have to be analysed in more detail. Last but not least, the implications of economic growth, electricity grid mix and the definition of efficiency within the legislative framework were described. Here it can be concluded, that the functional unit used for up-scaling has to be chosen carefully and the sensitivity of the results to this decision has to be discussed.

6 Annex

6.1 References for fuel prices

Germany:

Data on energy price trends - Long-time series February 2013 Base year 2012 (DESTATIS https://www.destatis.de/DE/Publikationen/Thematisch/Preise/Energiepreise/EnergyPriceTrendsPDF_5619002.pdf?__blob=publicationFile)

France:

http://www.statistiques.developpement-durable.gouv.fr/donnees-ligne/r/pegase.html

http://www.developpement-durable.gouv.fr/Prix-de-vente-moyens-des,10724.html,

FCBA data

Sweden:

www.energy.eu

spbi.se/statistic/priser/diesel

spbi.se/statistik/priser/eldningsolja

spbi.se/statistik/skatter/

svenskfjarrvarme.se/statistik--pris/fjarrvarmepriser/

Norway:

Statistics Norway (2013). Table 08205: Energy use, energy costs and energy prices in manufacturing sector, by energy products and industry subclass (SIC2007). 16.1 Sawing and planning of wood

Henning Horn (2013). Expert estimates based on dialogue with industry.

6.2 References for capital prices

Central bank interest rates [EUROSTAT, irt_cb_a] (Official refinancing operation rate – national key interest rate)

Monetary financial institutions interest rates - Loans to non-financial corporations - annual data 2012 [EUROSTAT, irt_rtl_lnfc_a]

Monetary financial institutions interest rates - Deposits - annual data [EUROSTAT, irt_rtl_dep_a]