



Ea Energy Analyses

# **Socioeconomic biomass prices**

**Update of 2013 “Analysis of biomass prices” &  
2014 “Biomassepriser an forbrugssted” reports**

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# 1 Introduction

## 1.1 Background

Long-term CIF prices

Ea Energy Analyses has twice previously provided Energistyrelsen with long-term price forecasts for biomass (wood pellets, wood chips and straw), with the most recent being in 2013 where the methodology was described in a report entitled “Analysis of biomass prices, future Danish prices for straw, wood chips and wood pellets”. These prices were CIF prices, i.e. forecasted prices for biomass delivered to a Danish harbour.

Prices at power plant

In order to convert these CIF biomass prices to prices delivered at central and decentral power plants, in 2014 Ea developed a methodology to take into account the interaction between domestically produced wood chips and straw, and imported wood chips. This methodology was described in “Biomassepriser an forbrugssted”.

Convergence with forward prices

The resulting long-term prices at power plant do not take into account short and medium term price fluctuations. For fossil fuels, long-term IEA price estimates are converged with forward prices that result in convergence prices that attempt to address these short and medium term fluctuations. However, the 2013 modelling did not incorporate a convergence approach with forward prices, as it was not deemed that there were reliable enough forward prices for biomass at that time.

Changing landscape

During the three years since Ea delivered the aforementioned excel model to Energistyrelsen, a great deal has occurred regarding biomass markets. Oil (and natural gas) prices have fallen dramatically, thus reducing both the transport and processing cost of imported wood chips and wood pellets, shipping rates continue to be low, the USD/Euro exchange rate is significantly higher, the eastern US has revealed itself to have an oversupply of wood fibre, and the forward markets for wood pellets appear to be more well-developed. In addition, Ea has over the past three years met with a number of biomass suppliers and purchasers, and based on this experience, is continually refining the methods, data, and modelling approaches, particularly for biomass pricing.

## 1.2 Current work

The current work is based on the methodology outlined in the two above-mentioned reports, and comprises an updated biomass model that incorporates improvements/updates to:

- Methodology – now undertaking a convergence approach, which combines long-term equilibrium prices with short-term forward indicators.
- Data – a new ‘level’ of oil prices, as oil prices affect biomass prices, from the acquisition and production of both the raw biomass and final product, to the various links in the transport chain. In addition, raw biomass prices have also been updated.
- Modelling – In addition to incorporating a new convergence approach, more detailed modelling has been undertaken for the shipping of biomass, and the effects of changes in oil prices and USD/Euro rates shall also be refined.

The current report will thus describe the major additions and alterations to the biomass model, as well as how to use the input/out functions for the convergence approach.

In addition, as Energistyrelsen is interested in an evaluation of which forward prices could be relevant to utilise going forward, a brief description of such forward prices is also included. Meanwhile, a more detail description is provided in a separate background report.

## 2 Convergence approach

During the past three years, biomass markets have continued to mature, and for wood pellets in particular, there are now available forward prices that appear to reflect current market conditions. This allows for the implementation of a convergence approach for biomass, as has also been done for fossil fuels for some time now.

The figure below illustrates how biomass prices based on a bottom up approach are calculated, and are then combined with forward prices to give convergence prices. The bottom up prices are referred to as long-term equilibrium prices, as they assume a market in equilibrium, and therefore do not take into account short term price fluctuations. Lastly, these converged prices are then adjusted to reflect biomass prices at a central or decentral power plant.

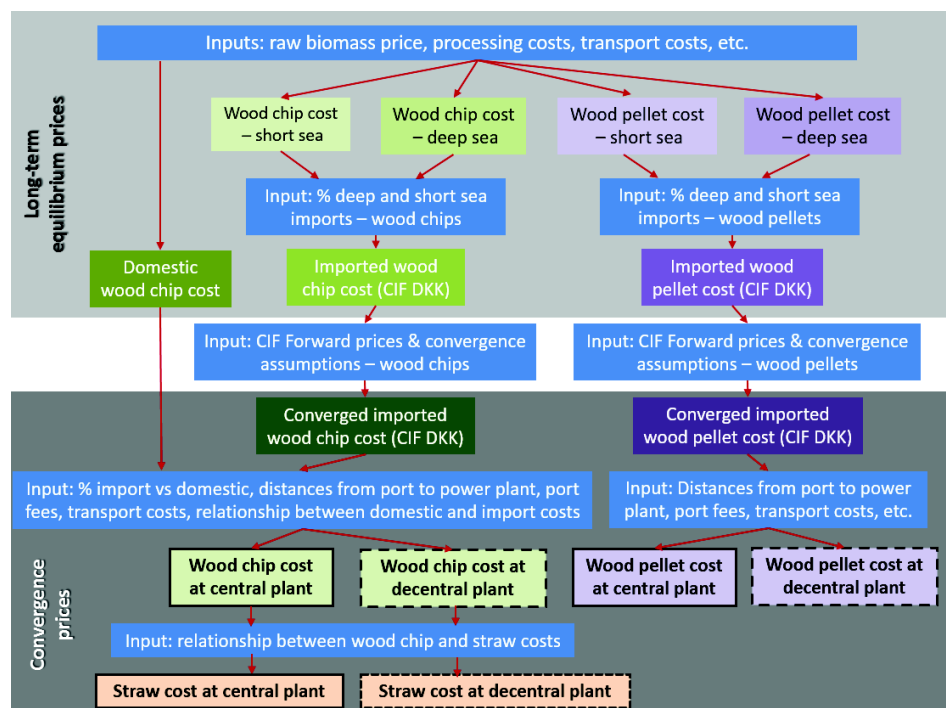


Figure 1: Convergence methodology

### 2.1 Potential forwards

Both Platts (in its Power in Europe publication, published every 2<sup>nd</sup> week) and Arugus Biomass provide spot price indications for wood pellets delivered CIF Europe. In addition, Argus Biomass has a number of additional price indices. These prices are published weekly via its Argus Biomass Markets publication, in which Argus continually adjusts its CIF and FOB categories to reflect new

and/or outdated indices. The table below provides an overview of the current industrial wood pellet indices tracked and published by Argus as of August 2016.

Markets covered	Location	Contracts assessed
European industrial wood pellets CIF <sup>1</sup> ARA	ARA <sup>2</sup>	Spot, 3 quarters ahead, 3 years ahead
European industrial wood pellets FOB <sup>3</sup> Baltic	Riga	Spot, 3 quarters ahead, 3 years ahead
European industrial wood pellets FOB Portugal	Aveiro	Spot, 3 quarters ahead, 3 years ahead
North American industrial wood pellets FOB	Northeast US	Spot, 3 quarters ahead, 3 years ahead
	Southeast US	Spot, 3 quarters ahead, 3 years ahead
	Northwest US	Spot, 3 quarters ahead, 3 years ahead
	Southwest Canada	Spot, 3 quarters ahead, 3 years ahead
Asian industrial wood pellets FOB	Vietnam	Spot
Industrial wood chips CIF	NWE	Spot, 3 quarters ahead, 3 years ahead

Table 1: Overview of Argus Biomass indexes as of August 2016 (Argus 2016a)

Argus considers CIF ARA to be their benchmark price, and this is the price for which they have the largest amount of reported deals. Meanwhile, the majority of Danish wood pellets come from the Baltic area, so the CIF ARA and FOB Baltic indices are of greatest relevance in a Danish context. Precisely which forwards that are recommended to be used by Energistyrelsen for the convergence approach, and the rationale for their selection, is described in a separate background report.

## 2.2 Convergence methodology and excel model user guide

In the “ENS Convergence Inputs” worksheet, various forward prices can be input and utilised, with various adjustable weightings (indicated by orange input cells).

### Ea forward methodology

The Ea methodology involves taking the selected forward price, and converging it with the long-term calculated biomass price. Which year the convergence starts in, and which year the two prices shall converge (i.e. what year will the convergence price be solely based on the long-term equilibrium

<sup>1</sup> CIF: Cost, Insurance and Freight (i.e. includes shipping costs to indicated harbour)

<sup>2</sup> ARA: Amsterdam/Rotterdam/Antwerp

<sup>3</sup> FOB: Free on Board (i.e. loading costs are included, but shipping costs are not)

### 3 Data and modelling updates

#### 3.1 Oil prices

Significantly lower IEA oil prices

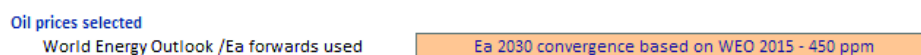
The largest data adjustment was to oil prices, which have fallen significantly since 2013 when the original data was collected. This is relevant because oil prices affect the acquisition, production and transport costs of both raw biomass and the final product. As a result, lower IEA prices have now been input into the model.

Oil inputs as convergence prices

In addition, in order to keep the convergence methodology uniform across fuels, oil prices are now input into the model after first having undergone a convergence with forward prices.

Various oil price options

The user can select from a number of oil prices for use in determining the final biomass prices. This is done in the red tab entitled “Scenario selection & Int. calc.”, where a drop down list is displayed for oil prices (see below).



One of the options is to select “User input”. In this case, the user can input oil prices in the red tab entitled “General Input Data” as indicated by the highlighted line below. The oil prices should be input in terms of 2015 USD/barrel, and are the IEA European prices (i.e. not CIF Denmark).

Oil Prices		2012	2013	2014	2015	2016	2017	2018
IEA crude oil imports (2013 WEO prices)	2012 USD/barrel	101.9	98.14	96.90	95.7	99.1	102.6	106.1
IEA crude oil imports (2013 WEO prices)	2015 DKK/barrel	610	570	556	549	671	687	702
IEA crude oil imports (2015 WEO prices)	2014 USD/barrel							
IEA crude oil imports (2015 WEO prices)	2015 DKK/barrel							
IEA based oil import prices (WEO 2015 + forecasts)	2015 DKK/barrel	628.7	418.83	348.86	278.9	324.2	369.4	414.7
Ea 2030 convergence based on WEO 2015 - 450 ppm	2015 USD/barrel	100.2	70.24	60.25	50.3	41.2	48.2	49.1
Ea 2030 convergence based on WEO 2015 - XXX	2015 USD/barrel	100.2	70.24	60.25	50.3	33.2	45.8	46.6
Ea 2030 convergence based on WEO 2015 - YYY	2015 USD/barrel	100.2	70.24	60.25	50.3	33.2	38.1	40.8
User input	2015 USD/barrel	99.1	69.5	59.6	49.7	32.9	37.7	40.1

Multiple inputs and sensitivities

Lastly, there are now a number of oil input prices that can be selected from (including user input), as well as an oil price sensitives worksheet that provides long-term equilibrium price projections for varying oil prices.

#### 3.2 Raw biomass input prices

Lower raw biomass prices in SE United States

During recent years in the United States, particularly the South-eastern portion, the closing down of numerous pulp and paper mills, along with slower than expected growth in wood pellet demand, has resulted in an oversupply of biomass feedstock. As a result, the raw biomass price of what is considered ‘deep sea’<sup>4</sup> biomass (largely from North America) has fallen relative to that of

<sup>4</sup> Please see “Analysis of biomass prices, future Danish prices for straw, wood chips and wood pellets” for more on deep sea vs short sea costs.



raw biomass in Europe. The updated biomass model now takes this into consideration, and allows for the adjustment of this variable when/if the market situation returns to its previous state.

### **3.3 Shipping**

Based on a number of meetings, interviews and site visits with relevant biomass importers and exporters, Ea has acquired an increased insight into biomass shipping trends. As a result, the shipping calculations now have a deal more detail, and include a number of new ship classes that are currently being utilised to transport wood chips and wood pellets.

## 4 References

Argus. *Argus Biomass Markets - Weekly biomass market news and analysis*.  
London: Argus Media, 2016a.