



Picture credits: left: biomass power plant in Dangjin, South Korea, with kind permission of Sumitomo SHI FW; upper right: biomass power plant in Faridkot, India, with kind permission of Babcock & Wilcox Vølund A/S, lower right: biomass power plant in Polaniec, Poland, by courtesy of Sumitomo SHI FW.

# Biomass to Power

The World Market for Biomass Power Plants 2020/2021

**Extract**

11<sup>th</sup> edition, 2020

ecoprolog GmbH

## **Biomass to Power 2020/2021**

**The standard reference for the global Biomass to Power industry. On more than 1,200 pages the 11<sup>th</sup> edition provides up-to-date information on:**

- more than 4,400 units in almost 4,200 biomass power plants worldwide, including details on age, feedstock, capacities and competition
- more than 1,000 projects, including developer, status, fuel type and commissioning date
- market development forecast 2020-2029, by country, including new constructions, shutdowns and investment volumes based on 770 cost examples
- subsidisation schemes (feed-in tariffs, quota systems and auctions), by country, for the world's most important markets
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Argentina

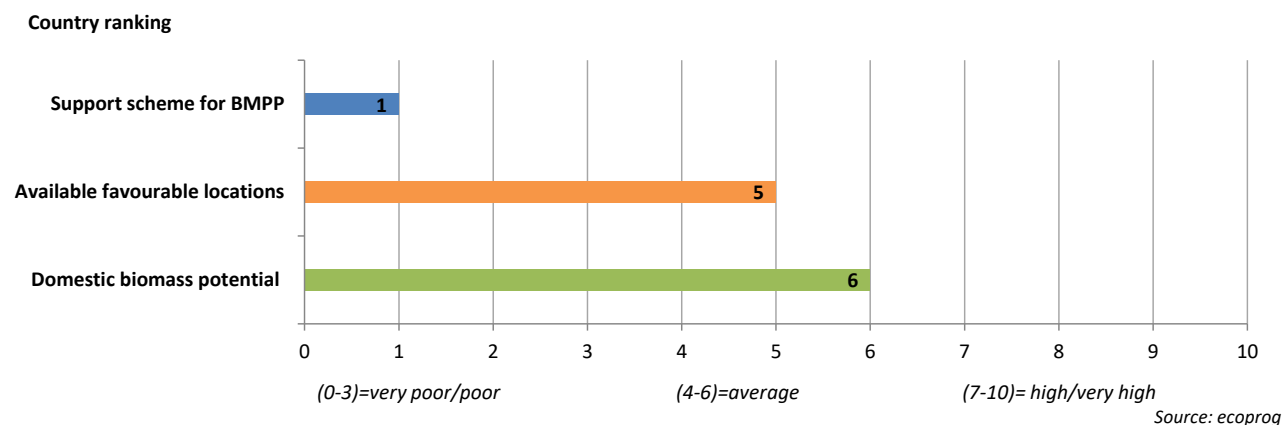
Update: 09-2020

Key figures			
Inhabitants 2020 [UN est. in million]	44.78	Number of BMPPs	30
Goal: biomass generation 2025 (2030) [GWh]	n/a	Installed electrical capacity [MW <sub>el</sub> ]	310
Electricity from biomass 2018 [GWh]	2,095	Share of total electricity generation 2018 [%]	1.44
<i>Forecast 2020-2029</i>		<i>Forecast 2020-2029</i>	
Total invest market [mn EUR]	736	Capacity of new commissionings [MW <sub>el</sub> ]	150

Management summary

The RenovAr auction scheme has led to a considerable project pipeline, with most of the projects starting operations in the next years. However, under the government elected in October 2019, no new auctions were awarded. Due to the weak economic situation, a market forecast is connected with great uncertainty. Because of the country’s existing biomass potential in the forestry and the agricultural sector, we have included a limited number of projects at favourable locations in our forecast after the impact of the auctions phased out.

Figure 295: Ratings for the biomass market in Argentina



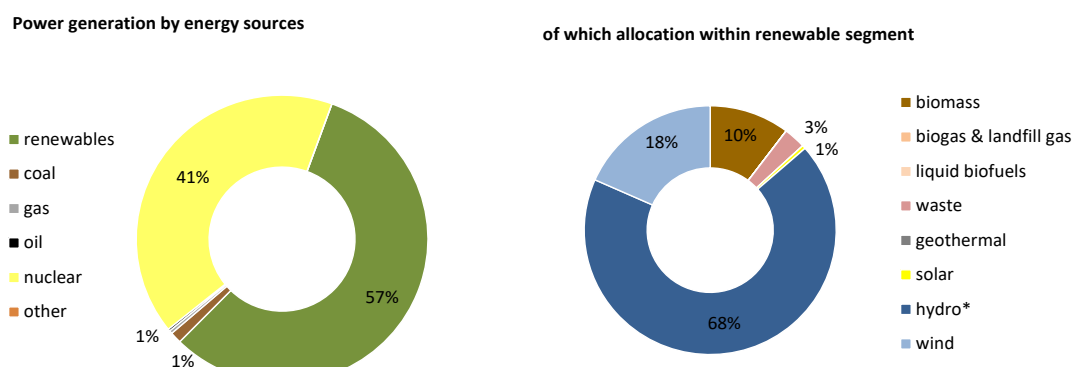
Background, market factors, legal framework

*Electricity generation*

- About 70% of Argentina’s electricity generation comes from using fossil fuels, with natural gas and petroleum being the most important among them.

[...]

Figure 1: Electricity generation in Sweden



*data for 2018, Source: IEA  
\*with pumped storage, tide, wave and ocean*

### Market factors

- Sweden is, after Japan and Finland, the country with the largest forested areas in relation to its size. Sweden's forestry industry has the largest output in Europe.
- In line with the many forests and the geographical location of the country, generating heat from biomass traditionally plays a large role in Sweden. As in all other Scandinavian countries, biomass is an important fuel for the well-developed district heating grid.
- In April 2020, Sweden implemented a tax on waste combustion amounting to 10 EUR/t. In the long term, waste imports should be diminished, which could lead to an additional demand in district heating, e.g. for biomass.

### Support scheme

- BMPPs are subsidised with a renewable energy certificate system with quota regulations. Furthermore, biomass cogeneration plants benefit from an energy and carbon dioxide tax exemption.
- Sweden implemented its certificate system in 2003. Norway joined the Swedish subsidisation system in January 2012, so that both countries may trade the certificates across borders. One important reason for the joint system is the fact that Sweden imports larger amounts of renewable electricity from Norway.
- Electricity suppliers, certain electricity consumers and energy-intensive companies demand certificates because they must prove a specific renewable energy quota of their energy mix. In Sweden, this quota amounts to 26.5% in 2020. Plants that have become operational since September 2009 may qualify for the certificate trading. In the biomass segment, certificates are also issued for electricity generation from peat if this takes place in a CHP plant. Qualified plants are entitled to subsidies for 15 years.

[...]

[...]

- Due to the rapid capacity growth especially of solar power, the REC market price amounted to an average of only 43,854 KRW/REC (32.90 EUR/REC, exchange rate November 2020) between January and October 2020, compared to an average of 63,784 KRW/REC in 2019. The sale of the certificates on the market is a surplus payment on the electricity market price.
- Different biomass fuels are entitled to receive different amounts of RECs per MWh generated. The factors were adjusted downwards e.g. for PKS and wood pellets in 2018. In January 2020, waste wood was excluded from the scheme. Factors for the most important biomass fuels are presented in the table below.

**Figure 99: Certificates for biomass energy**

New plants		
Certificates/MWh	Fuel	EUR/MWh
0.25	Palm kernel shells	8.23
0.5	Wood pellets, woodchips	16.45
1.5	Domestic wood (co-fired)	49.35
2.0	Domestic wood (dedicated biomass plants)	65.81
Existing plants		
1	Palm kernel shells	32.90
1.5	All types of wood pellets, wood chips	49.35
0	Wood pellets, woodchips (co-fired, privately owned)	0.00
0.5	Wood pellets, woodchips (co-fired, publicly owned)	16.45

Source: Personal information of a local market insider, monetary figures based on the trading market price of REC in the period January 2020-October 2020 (43,854 KRW/REC), exchange rate as of November 2020).

- In 2015, South Korea launched its CO<sub>2</sub> certificate trading system. The system is part of the country's goal to reduce its greenhouse gas emissions by 37% below current levels by 2030. The certificates will make the burning of fossil fuels such as coal more expensive and favour renewables, e.g. the incineration of biomass. In October 2020, the certificate market price was around 23,000 KRW/Korean Allowance Units (1 ton of CO<sub>2</sub>) (17.04 EUR/ton of CO<sub>2</sub>).

[...]

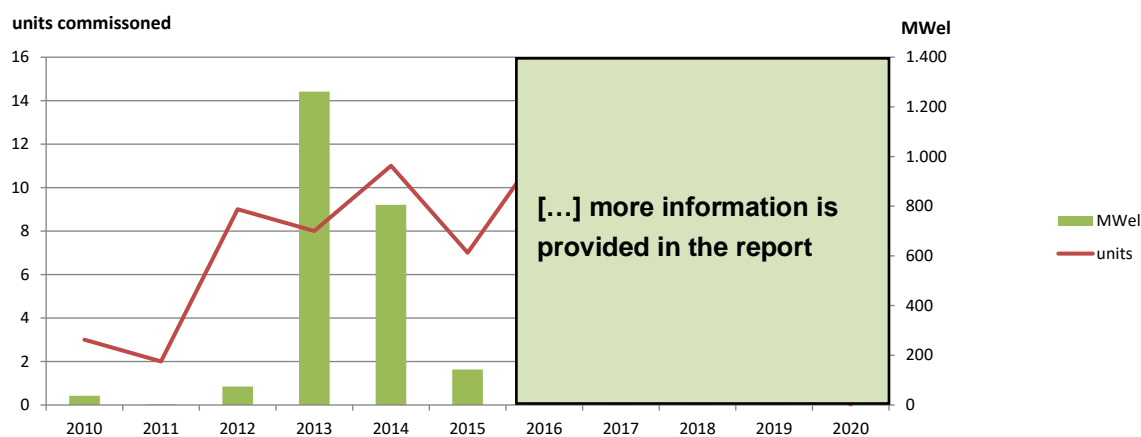


[...]

### Plant asset

- As of October 2020, we know of 105 operational biomass mono-incinerators with an electricity generation capacity of approximately 4,500 MWel.
- In 2018 and 2019, 12 biomass units with a capacity of 1,280 MWel were commissioned, including the fourth converted unit in Selby (645 MWel) and the Lynemouth conversion project (420 MWel) in 2018. In 2020, we have not tracked any commissioning so far.
- The structure of the mono-incineration plants generally reflects the subsidisation policy. Eight facilities with a capacity of about 180 MWel had been developed before the ROCs were introduced in 2002.

**Figure 275: Commissioned biomass power plant units in the UK**



Source: ecoprolog 2020

- As the British incentive schemes do not explicitly subsidise small-scale plants, the facilities in the country are quite large in a European comparison. They have an average size of around 16 MWel (large conversion projects excluded). As waste heat recovery only played a minor role for many years, heat recovery is low in the British plants. Some of them are power plants only.
- The UK has the largest mono-incinerator units in the world. British power and wood pellet producer Drax converted 4 of its 6 units at its formerly coal-fired plant in Selby to biomass. They have a capacity of 645 MWel each and were commissioned between 2013 and 2018. Unit 2, 3 and 4 operate under the ROC system (while unit 4 does not receive any ROCs through grandfathering) and unit 1 was awarded a so-called investment contract in the transition phase of the CfD scheme, which follow the same principles as the CfD scheme. The Lynemouth conversion was awarded such an investment contract as well.

[...]



Market development

*Projects*

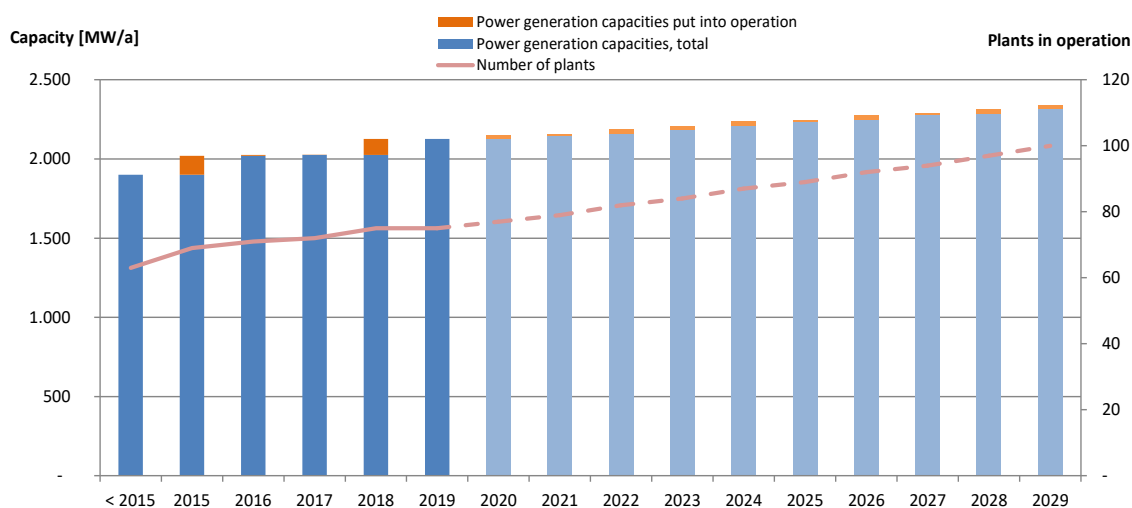
- Canada's project pipeline consists of small, individual projects at industrial locations or of indigenous communities.
- As of October 2020, we know of 12 projects. Four of the projects are of First Nations with smaller capacities. The 6.6 MW<sub>el</sub> Meadow Lake and the Whitesand projects will also supply a sawmill or a pellet plant, respectively.
- Another 4 of the projects are smaller industrial plants at packaging, pulp or pellet facilities.

[...]

*Forecast*

[...]

**Figure 287: Market forecast Canada**



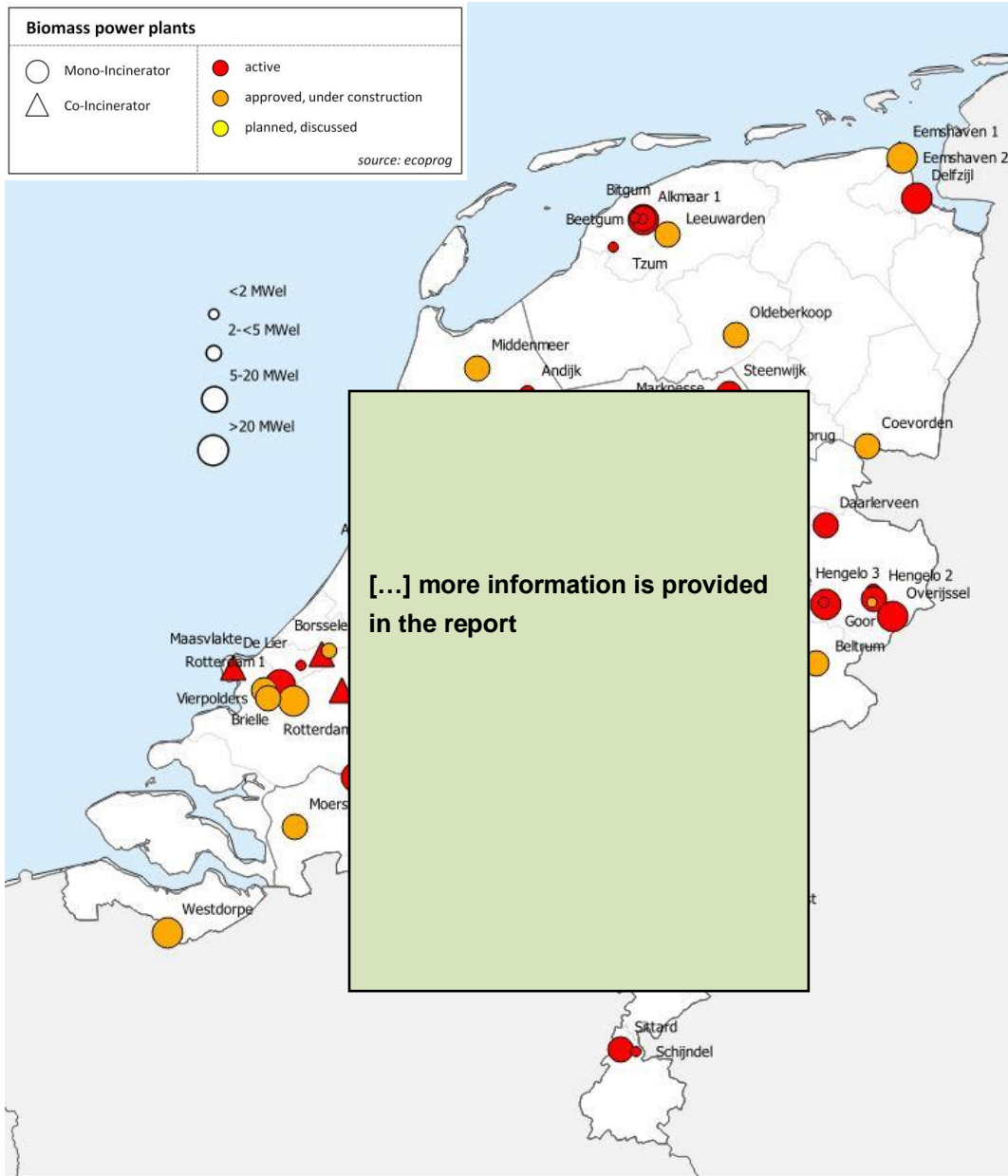
Data estimated up to 2019, from 2020 on: forecast, source: ecoprog

Competition

- Most of the operators in Canada come from the forestry and pulp and paper industries. Among them, Resolute Forest Products (2 plants, 97 MW<sub>el</sub>) and Canfor (1 plant, 118 MW<sub>el</sub>) are the most important companies.
- Public utility Ontario Power Generation with its 200 MW<sub>el</sub> Atikokan plant is an exception. Furthermore, US infrastructure and energy company Atlantic Power Corporation operates 2 plants with a combined capacity of 106 MW<sub>el</sub>.

[...]

Figure 204: Locations of plants and projects in the Netherlands



[...]

Figure 205: Project outlook Netherlands

Plant	Country	Type	Plant unit	Cap. (MWel)	Start	Status
[...]						
Duiven 2	Netherlands	mono-incinerator	1	12,9	2022	approved
Almere	Netherlands	mono-incinerator	1	14,6	n.a.	approved
[...]						

## Plant and project details

[...]

### **Randers, Denmark**

Verdo Energy A/S  
 Agerskølet 7  
 8920 Randers  
 Tel.: +45 89 11 48 11  
 Fax: +45 89 11 48 00  
 energiranders@energiranders.dk

Type: co-incinerator  
 Status: active  
 Start of operation: 2002  
 Capacity [t/a]: 74,000

Remarks: Steam pressure: 111 bar Steam temperature: 525 °C. The plant has been solely fired with coal until 1982. It is capable to treat biomass since 2002/2003. Since 2007/2008, when the plant was reconstructed again, it is capable processing wood chips only.

Unit: 1 (active) co-incinerator  
 Start of operation: 2002  
 Fuel: wood chips  
 Gross heat production [MW]: 180.0  
 Electricity generation capacity [MW]: 52.0  
 Heat production capacity [MW]: 110.0  
 Incineration mode: travelling grate  
 Manufacturer furnace: Aalborg Energie Technik a/s

### **Ringe, Denmark**

Ringe Fjernvarmeselskab A.m.b.a.

Type: heating plant  
 Status: planned  
 Start of operation: 2022  
 Heat production capacity [MW]: 4.8

Remarks: As of September 2020, Danish district heating company Ringe Fjernvarmeselskab A.m.b.a. has signed a contract with Danish energy solutions provider Aktive Energi Anlæg A/S for the full delivery and installation of the plant. The boiler will be supplied by Austrian boiler manufacturer AGRO FORST & ENERGIETECHNIK GmbH. Testing of the boiler is planned for August 2021, and the delivery is expected for October 2021.

Unit: 1 (planned) mono-incinerator  
 Start of operation: 2022  
 Heat production capacity [MW]: 4.8

Unit: 2 (planned) mono-incinerator  
 Start of operation: 2022  
 Fuel: coarse woodchips  
 Gross heat production [MW]: 4.8  
 Manufacturer furnace: Agro Forst & Energietechnik GmbH

### **Rønne, Denmark**

Type: co-incinerator  
 Status: active  
 Start of operation: 2016

Remarks: Steam pressure: 88 bar Steam temperature: 525 °C.

Unit: 1 (active) co-incinerator  
 Start of operation: 2016  
 Fuel: uncontaminated wood, coal, oil  
 Incineration mode: Travelling grate  
 Manufacturer furnace: Aalborg Energie Technik a/s

### **Rudkøbing, Denmark**

Langelands Elforsyning  
 Spødsbjergvej 141  
 5900 Rudkøbing  
 Tel.: +45 62 51 10 55  
 lef@lef.dk

Type: mono-incinerator  
 Status: active  
 Start of operation: 1990  
 Capacity [t/a]: 14.000

Unit: 1 (active) mono-incinerator  
 Start of operation: 1990  
 Fuel: straw, wheat  
 Electricity generation capacity [MW]: 2.6  
 Heat production capacity [MW]: 7.0  
 Incineration mode: vibrating grate  
 Manufacturer furnace: Burmeister & Wain Energy A/S

### **Rudshøgda, Denmark**

Nortura

Type: heating plant  
 Status: active  
 Start of operation: 2017

Remarks: Project announced in 2016. The plant provides 10 GWh of process steam per year that is directly supplied to an adjacent meat production facility. Norwegian renewable energy company Oplandske Bioenergi AS has built the plant. Investments amounted to NOK 21 million.

Unit: 1 (active) heating plant  
 Start of operation: 2017

### **Rugmarken, Denmark**

Billund Varmeværk

Type: heating plant  
 Status: active  
 Start of operation: 2015

Remarks: Expansion planned for 2022.

Unit: 1 (active) heating plant  
 Start of operation: 2015  
 Fuel: Straw  
 Heat production capacity [MW]: 12.0

### **Ryomgård, Denmark**

Type: heating plant

[...]

## Plant and project details

[...]

### Jinzhou 4, China

Type: co-incinerator  
 Status: planned  
 Capacity [t/a]: 320,000

Remarks: On 12 December 2018, Xinsu Huanbao Industrial Group and the local government of Taihe District of Jinzhou City have signed a new Waste- & Biomass-to-Energy bundle project. The WtE project will have a treatment capacity of 500 tpd, entailing a total investment of RMB 290 million, while the BtE project will have a treatment capacity of 1,000 tpd, entailing a total investment of RMB 400 million.

Unit: 1 (planned) co-incinerator

### Jinzhou Panghe, China

National Energy Group Co Ltd

Type: mono-incinerator  
 Status: planned  
 Capacity [t/a]: 450,000

Remarks: As of September 2020, the project has been signed by National Energy Group Co Ltd in the Panghe Economic Development Zone of Heishan County, Liaoning Province. The project is the second phase of the National Energy Heishan BtE project.

Unit: 1 (planned) mono-incinerator  
 Fuel: straw  
 Electricity generation capacity [MW]: 35.0

### Jixian County, China

Type: mono-incinerator  
 Status: planned  
 Capacity [t/a]: 600,000

Remarks: As of September 2020, the project is expected to be operational by the end of 2020. As of September 2019, CEEC Heilongjiang Power Construction Co Ltd has signed as the main contractor. The plant will consist of a 130 tpd circulating fluidised bed furnace and a 30 MW steam turbine generator set. It will have a 130 tpd circulating fluidised bed furnace.

Unit: 1 (planned) mono-incinerator  
 Fuel: straws, rice husks and maize cob  
 Electricity generation capacity [MW]: 30.0  
 Incineration mode: circulating fluidized bed

### Jiyang, China

Type: mono-incinerator  
 Status: active  
 Start of operation: 2010  
 Capacity [t/a]: 1,200,000

Unit: 1 (active) mono-incinerator  
 Start of operation: 2010  
 Electricity generation capacity [MW]: 30.0  
 Manufacturer furnace: Shanghai Lvqiwei Biotechnology Co., Ltd., U.S. company E + CO

### Juancheng, China

China Chant Group

Type: mono-incinerator  
 Status: active  
 Start of operation: 2017

Unit: 1 (active) mono-incinerator  
 Start of operation: 2017  
 Fuel: forest residues  
 Gross heat production [MW]: 30.0

### Juancheng County, China

China Chant Group

Type: co-incinerator  
 Status: under construction

Remarks: Environmental service provider Chant Group has received an approval from the Shandong Development and Reform Commission to develop a biomass plant in Juancheng County of Heze City, Shandong Province. This project should be equipped with one 130 tpd water-cooled vibrating grate biomass boiler.

Unit: 1 (under construction) co-incinerator  
 Fuel: biomass

### Junxian, China

Type: mono-incinerator  
 Status: active  
 Start of operation: 2007

Unit: 1 (active) mono-incinerator  
 Start of operation: 2007  
 Fuel: corn straw, wheat straw  
 Electricity generation capacity [MW]: 30.0  
 Manufacturer furnace: DP Cleantech

### Juxin, China

Type: mono-incinerator  
 Status: active  
 Start of operation: 2018

Remarks: Together with the Nuobao BtE Project in Xunke County, this project can process 300,000 tpy of straw.

Unit: 1 (active) mono-incinerator  
 Start of operation: 2018  
 Fuel: straw

### Juye, China

[...]

## Price and product information

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