



Veolia experiences with using biomass in the heating sector

22 September 2021

Veolia in brief - a merger with Suez in progress

VEOLIA: OUR BUSINESSES

Total revenue
€ 27,2 bn

Municipal | 52%

Industrial & comm | 48%

Water



€ 11,2 bn

out of which € 2,8 bn in water technologies and networks (VWT and SADE)

Waste



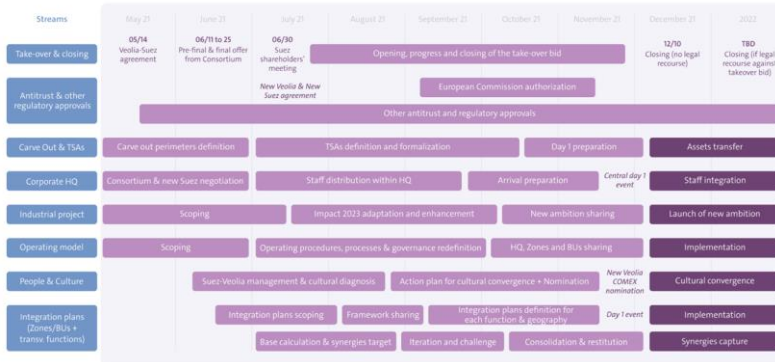
€ 10,0 bn

out of which € 2,5 bn in hazardous waste

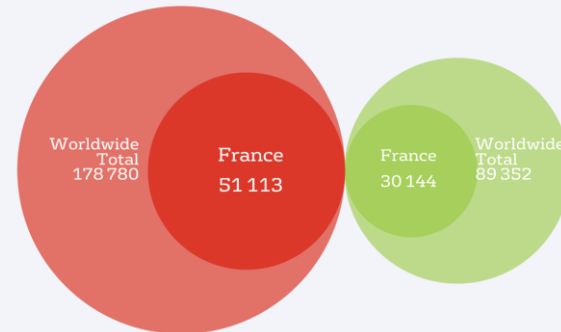
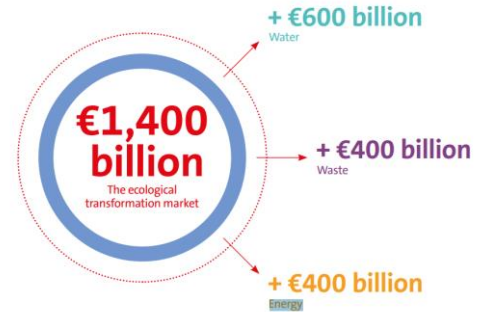
Energy



€ 6,0 bn



COMBINED, THE VEOLIA AND SUEZ GROUPS WILL HAVE A REVENUE OF €37 BILLION



● Veolia ● Suez

Veolia and biomass - our expertise

Biomass supply

- Identify potential biomass sources
- Create a supply chain (if not existing)
- Set-up supply contracts to ensure fuel quality and quantity

Design and construction of the plant

- Define the plant capacity according to the energy requirements
- Select a boiler technology adapted to the fuel type and appropriate FGT system to comply with the regulation related to air emissions
- Select a contractor to manage the construction (for large projects)
- Assess the relevance of CHP and optimize costs by seeking grants

Veolia and biomass - our expertise

Operation & maintenance of the plant

- Deliver heat according to the client's requirements
- Produce and sell electricity where applicable
- Manage fuel and ash
 - *fuel quality should be according to the specification*
 - *ash can be used as fertilizer (presence of Ca, K) depending on the local regulations*
- Ensure optimum performance and availability with appropriate O&M procedures
- Ensure the compliance with the regulation, in particular regarding atmospheric emissions (dust, NOx, CO and SO2 emissions)
- O&M cost of a biomass heating plant (fuel cost excluded) : 10-12 €/MWh

Veolia and biomass - our expertise

Why develop a biomass project ?

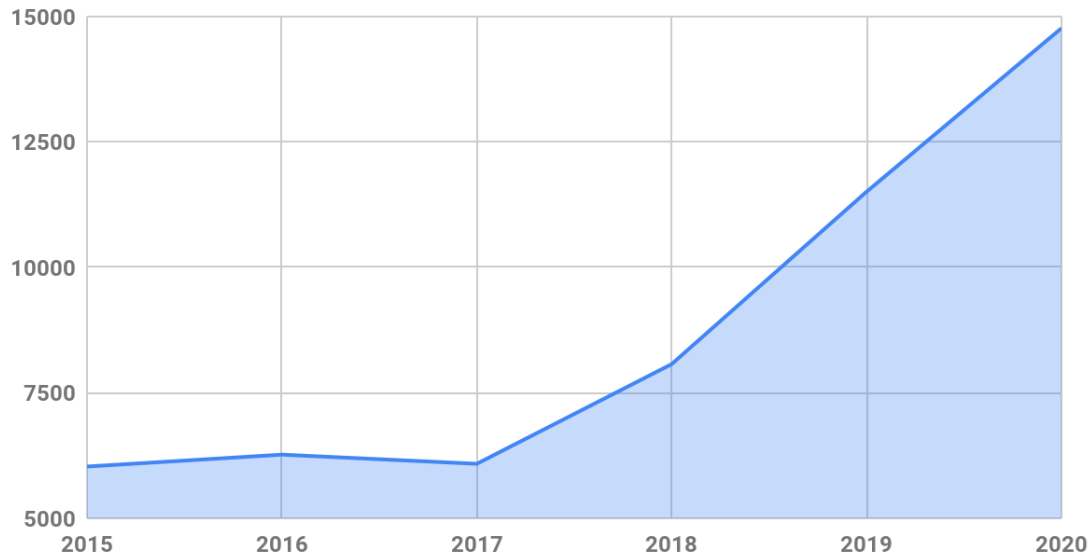
- Use a renewable fuel to produce heat and/or power
- Use a fuel available locally (e.g. wood or agricultural residue) or valorize a by-product from the F&B industry
- Take the advantage of national or local incentives

Challenges associated with a biomass project

- Secure required quality and quantity of biomass
- Biomass plants require higher Capex compared to natural gas plants (Capex of heating plants : 500 to 900 k€/MW for biomass vs 100 k€ for natural gas)
- Most of the time incentives are required (public support) in some form

Biomass consumed by Veolia in 2020

Biomass total consumption (GWh)



- **15 000 GWh corresponds to about 4.5 M tons (3.33 MWh/t)**
- **Top 5 of countries :**
 - **Hungary 27.5%**
 - **USA 21.7%**
 - **China 13.3%**
 - **Poland 8.9%**
 - **Canada 5.7%**
- **Biomass represents nearly 10% of our energy mix**

Our References in biomass use

Hot water boilers

- 65 boilers > 1 MW, total output : 207 MW
- Main countries : Spain, Lithuania, Sweden

Steam boilers for the production of process steam

- 15 boilers, total output : 159 MW

CHP and power plants

- 31 plants, total boiler output : 2 442 MW
- Total power capacity : 822 MWe

Our References in biomass use

Steam boilers for the production of process steam

Plant name	Country	Commissioning year	Type of fuel	Steam flow (t/h)	Steam pressure (bar)	Steam temperature (°C)	Boiler output (MW)	Boiler supplier	Combustion technique
Dairy Crest	England	2011	wood pellets	2 x 8	23	saturated steam	2 x 5,2	Byworth	Grate
Diageo - Roseisle	Scotland	2009	spent grain	11	10	saturated steam	7,1	Weiss A/S	Grate
DEMB - Joure	Netherland	2013	spent coffee ground	15	17	saturated steam	9,8	Vyncke	Grate
Bio energie de Valle/Ede	Netherland	2016	wood shreds	11	16	saturated steam	7,2	Kara	Grate
Danone - Balclutha	New Zealand	2021	wood chips	23	35	saturated steam	14,4	KPA Unicon	BFB
Altia - Koskenkorva	Finland	2014	barley husk, peat, wood	15	15	250	10,3	Vyncke	Grate
Harjavalta	Finland	2016	wood pellets	47	40	saturated steam	30,8	Renewa	Burner
Hankkija - Seinäjoki	Finland	2015	wood chips, oat husk	5	12	saturated steam	3	Järfors	Grate
Findest Protein - Kaustinen	Finland	2015	wood chips, peat	6	15	saturated steam	4	KPA Unicon	Grate
Xylitol plant - Lahti	Finland	2020	oat hulls	12,5	12	saturated steam	8	Enerstena	Grate
Vidal - Molina de Segura	Spain	2015	wood chips	8	12	saturated steam	5,8	Uniconfort	Grate
Vidal - Hellin	Spain	2015	wood chips	8	12	saturated steam	5,8	Uniconfort	Grate
La Alqueria - Valencia	Spain	2015	wood chips	30	13	saturated steam	20	L. Solé	Grate
Trelleborg	Sweden	2012	wood pellets	15	25	saturated steam	9,8	SMV	Burner
Arla Foods - Vimmerby	Sweden	2010	wood chips	20	30	saturated steam	13,1	KMW	Grate

DEMB Joure (Netherlands)

- Client's objectives
 - *Additional steam boiler needed to meet growing production (coffee products)*
 - *Decrease carbon footprint*
 - *Valorize by-product (spent coffee ground)*
- New steam boiler and Flue Gas Treatment system
 - *15t/h of steam at 17 bar (10 MW)*
 - *fuel : 100% spent coffee ground*
 - *very low emissions : NOx < 100 mg/Nm³, dust < 5 mg/Nm³*
- Veolia's scope
 - *Design and construction of the new boiler*
 - *O&M of the new and existing facilities*
 - *supply of utilities (steam, compressed air, process water)*



33 000 tons of spent coffee ground recovered and valorized annually since 2013, savings of between €1 and €2 million, per year on natural gas

More info on: <https://www.veolia.in/about-us/cop21/our-solutions/coffee-grounds-turned-renewable-energy>

Altia Koskenkorva (Finland)

- Altia's production
 - *Ethanol and starch from barley*
 - *25t/h of barley processed giving 2.5 t/h of husk*
- Altia's objectives
 - *Additional boiler needed to meet growing production*
 - *Valorize more barley husk (200 million kg/y)*
- New steam boiler and FGT
 - *15t/h of steam at 18 bar/220°C (10 MW)*
 - *Main fuel : barley husk, back-up fuel : wood chips and peat*
- Veolia's scope
 - *Design and construction of the new boiler*
 - *O&M of the new and existing facilities*
 - *Supply of utilities*



Altia distillery, the leading Nordic distributor of wines and spirits
20 000 tons of barley husk valorized annually

More info on: <https://www.livingcircular.veolia.com/en/industry/100-biomass-steam-power-plant-producing-vodka>

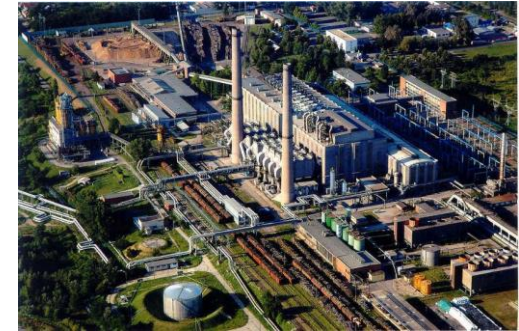
Our References in biomass use

CHP and power plants

Country	Plant	Commissioning	Boiler maker	New boiler / retrofit	Combustion technique	Type of fuel	Boiler output MWth	Steam turbine rate MWe
Hungary	Pannonpower - Pecs Boiler 10	2004	Metso	retrofit	BFB (conversion)	wood chips	133	50
	Boiler 2	2013	DP Clean Tech	new	Water cooled vibrating grate	100% straw - 50% wood chips	101	35
	Szakoly (1)	2009 (2)	Austrian Energy Brno	new	Spreader Stoker	wood chips	61	20
	Ajka	1990/93 (4)	Ganz Danubius	retrofit	Burners + BFB	80% wood chips + 20% agro	4 x 72	3 x 30
Poland	Lodz EC4 - K3	2011	Metso	retrofit	BFB (conversion)	80% wood chips + 20% agro pellets	129	58
	Poznan Karolin - 1K1	2011	Andritz	retrofit	BFB (conversion)	80% wood chips + 20% agro pellets	79	65 (fed by 2 boilers)
Slovakia	Ziar - K6	2013/2014	Isengmont/Agrest	retrofit	Gazifiers + torsional chambers	wood chips	56	12
Czech Republic	Krnov	2009	PBS Brno	new	Spreader Stoker	wood chips + 20% pellets	28	4,985
	Frydek -Mistek	2013	EKOL	new	Spreader Stoker	wood chips	18	5,8
	Marianke Lazne - K7	2013	PBS Brno	new	Spreader Stoker	wood chips + 20% pellets	9,3	1
Lithuania	Marijampole - boiler 7	2007	Bijsk/Axis	retrofit	BFB (conversion)	wood chips	18	2,5
United Kingdom	Chilton (1)	2011	Kablitz	new	Reciprocating grate	recycled wood	48	17,5
Spain	Barcelona	2012	Biochamm	new	Reciprocating grate	wood chips + waste from gardens	8,2	2,35
Netherlands	Cuijk	1999 (3)	Metso	new	BFB	wood chips	80	25
	IPKW	2019	Stork	new	Reciprocating grate	wood chips	13,5	2
Canada	Fort St James (1)	2017	FSE	new	Spreader Stoker	wood chips	103	40
	Merritt (1)	2017	FSE	new	Spreader Stoker	wood chips	103	40
Japan	Tsugaru (1)	2015	Takuma	new	BFB	wood chips	21	6,25
	Hanamaki (1)	2017	Takuma	new	BFB	wood chips	21	6,25
	Daisan (1)	2018	Takuma	new	BFB	wood chips	22	7,05
	Yokosuka (1)	2019	MHPS	new	BFB	wood chips, pruned wood, RDF (5% max)	22	6,95
	Kanda (1)	2021	SHI Foster Wheeler	new	CFB	wood pellets, PKS wood chips	175	75
Germany	Grossaitingen (1)	2002	Bertsch	new	Reciprocating grate	recycled wood	17	5
	Zapfendorf (1)	1998 (2)	Steinmüller	new	Travelling grate	recycled wood	26,8	6
China	Hejian	2020	Jinan Boiler Co	new	CFB	wood, straw and furfural residue	53	10
	Binzhou #1	2008 (5)	Wuxi Boiler Co	new	Grate	recycled wood, bark, corn cob, cotton stalk	57,5	15
	Binzhou #2	2017 (5)	Jinan Boiler Co	new	CFB		118	6 + 15
	Jinan	2017 (5)	Taishan Boiler Co	new	CFB	recycled wood, bark, straw	53	15
	Kedong	2018 (6)	Taiyuan Boiler Co	new	CFB	straw	2 x 57,5	2 x 15
	Yibin	2015 (6)	Jianglian Heavy Industry	new	CFB	recycled wood	2 x 35,5	25
USA	Lumberton (1)	2016 (4)	Foster Wheeler	retrofit	Spreader Stoker	wood chips and poultry litter	2 x 40	25
	Franklin (1)	2019	Foster Wheeler	new	Spreader Stoker	recycled wood	157	65
	Madison (1)	2019	Foster Wheeler	new	Spreader Stoker	recycled wood	157	65

Pannon Power – Pecs (Hungary)

- The largest 100% biomass cogeneration heat network in Europe:
 - *Wood unit (50 MWe): coal fired boiler (133 MW) converted into a bubbling fluidized bed (BFB) boiler n 2004*
 - *Straw unit (35 MWe): new boiler (101 MW) commissioned in 2013*
- Heat supplied to the second biggest DH network in Hungary:
 - *170,000 residents, 31,000 houses and 450 public buildings*
- Locally sourced biomass (from around 20 surrounding farms):
 - *400,000 metric tons of wood and 180,000 metric tons of straw per year*
 - *Biomass consumption : about 2 000 GWh*
- Additional benefits:
 - *Avoided CO2 emissions of 400,000 metric tons of per year, and more than 170 jobs created in the straw supply chain and more than 100 in its timber supply chain*



Pecs is the fifth largest city in Hungary

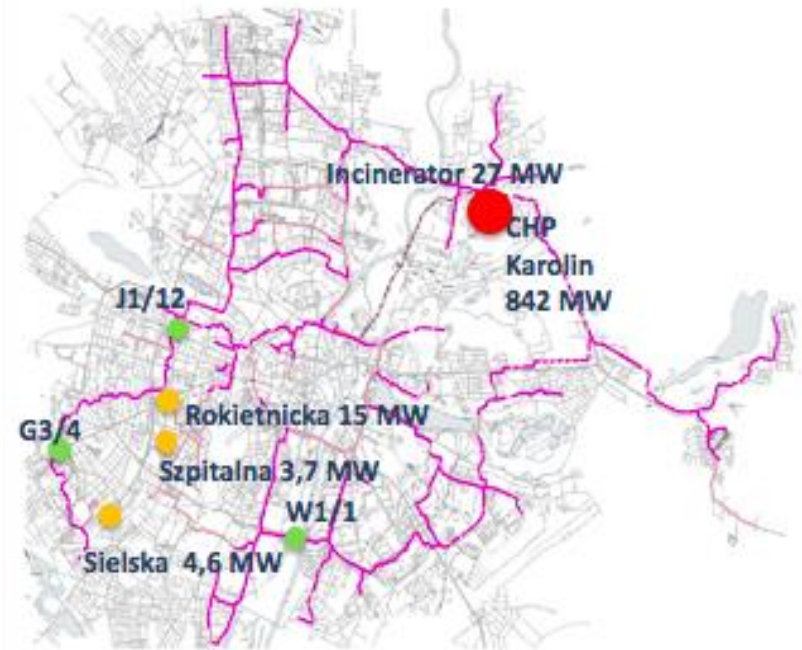
Veolia's role:

- *The owner of the plant*
- *Biomass supply*
- *O&M of the CHP plant*
- *Sale of heat and electricity*
- *Construction of the straw unit*

More info on: <https://www.veolia.com/en/newsroom/thematic-reports/veolia-committed-climate/our-climate-solutions/heating-network-cogeneration-biomass>

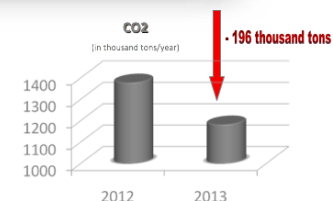
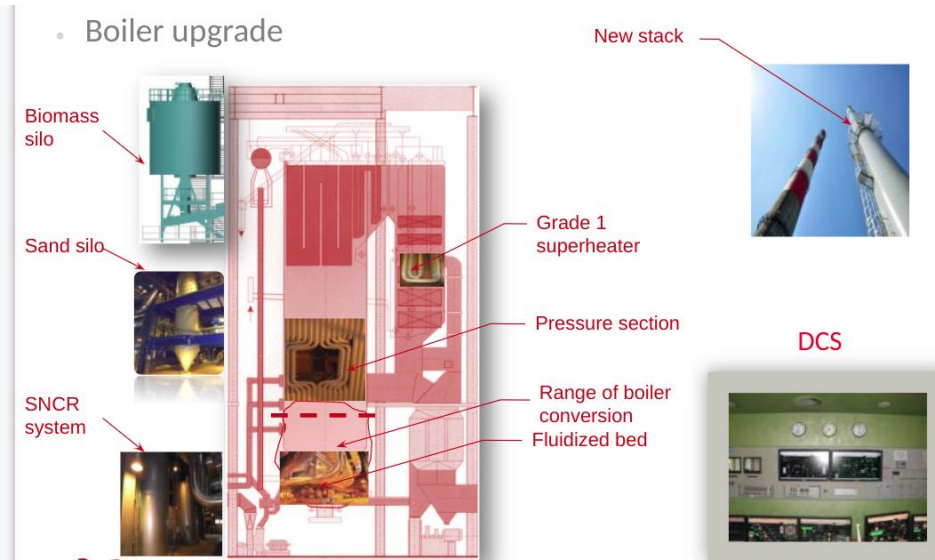
Poznań (Poland)

- Veolia operates the city district heating network since 2002 and heating sources of Poznań since 2004
- The DHNs provide heating and hot water to 200,000 people as well as to various industrial facilities
- In 2020:
 - *60% of heat market of the city*
 - *Network length: 570 km with 5 393 substations*
 - *Heating capacity: 1,139 MW (6 units, incl. CHP)*
 - *Power capacity: 260 MWe*
 - *Heat sales: 6 336 TJ*
 - *Electricity sales: 779 GWh*



Poznań (Poland)

- 2011
 - *Conversion of a coal boiler to a biomass steam boiler (output: 77 MW)*
 - *Important: biomass sourced locally by rail*
- 2020
 - *Biomass ~ 12% fuel mix*
 - *Reduction of CO2 emissions: 140 kt per year*
- In addition
 - *300 TJ of external waste to heat recovery*
 - *12 000 GJ of waste heat generated by industrial customer*
- Difficult national context:
 - *Green certificates do not provide certainty to projects bearers*



Braunschweig (Germany)

- Veolia subsidiary, BS Energy helps the city of Braunschweig (the 2nd largest in Lower Saxony) convert its district to a low carbon one;
- The **Hungerkamp project** replaces the previous heating facility and its 34 coal, gas and oil burners with:
 - *A **CHP plant**, powered with **biogas** (methane) used to produce electricity. Waste heat generated by the electricity production is recovered and stored in accumulators before being released to customers through a four kilometer local heat distribution network;*
 - *A **wood boiler**, to supply additional heat during the coldest days of autumn and winter, which burns locally supplied wood chips;*
 - *A **natural gas boiler** provides peak-load heating capacity and serves as a reserve source of heat when the other two facilities are under maintenance;*
 - *Two **heat storage units** ensure supply and demand balancing with innovative insulation to minimize heat losses.*



Braunschweig (Germany)

Capacity (per year)

- **15 600 MWh** of heating (supplying the equivalent of approximately 1,000 households), 60% produced out of biogas in the CHP unit, **38% from wood chips**, 2% from natural gas; **9 200 MWh of green electricity** (the equivalent of 2,300 households), produced 100% out of biogas

Circularity

- *The exhaust gases generated during combustion processes are purified and filtered before being released into the atmosphere and the **wood ash is used for fertilizer to create a local circular economy loop***

Impacts

- *All resulting in 8000 T of avoided CO2.*

Braunschweig (Germany)

Future developments

- Operated as a system, Hungerkamp may be extended to connect Braunschweig's central distribution network;
- Currently under development, a new and modern biomass combined heat and power plant running on waste wood collected in the region, and a new gas turbine;



- *Currently, BS Energy operates a 180 MW coal boiler, which will be decommissioned in 2023, when the new power plant will be in operation (replacement, not a retrofit)*
- *The new unit will be a circulating fluidized bed boiler combined with a steam turbine that will ensure both electricity and heat production (85 MW);*
- *Wood waste will be collected within a 250 km radius around Braunschweig, with the help of the Veolia Waste Business;*
- *The project will receive a subsidy (for its CHP component)*
- *This will be the end to coal use in the district heating network of the city.*

Université Catholique de Louvain (Belgium)

Context

- *Veolia provides BES services, including M&O of district heating network for over 40 years*

Client needs

- *Supply of green heat (+/- 45 GWh/year, decreasing by 2%/yr), for 20 years (possible + 10) starting in August 2023, below a maximum price*

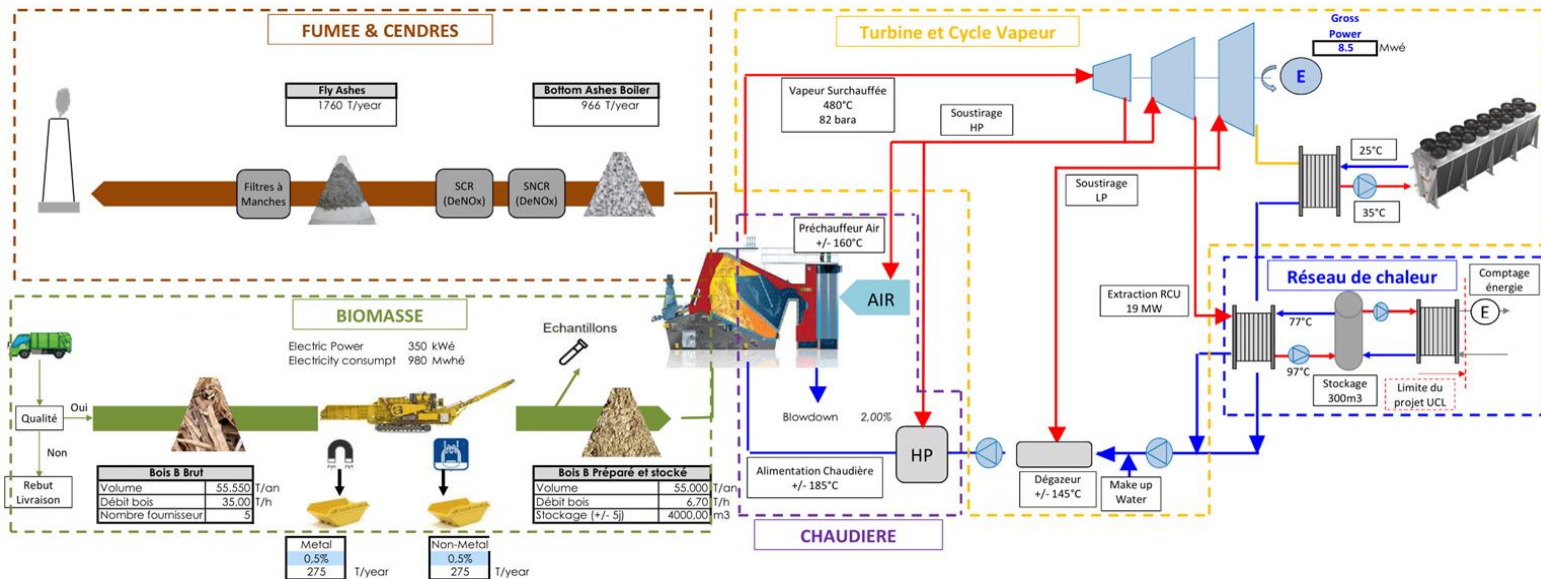
Veolia proposal - DBFOM of biomass plant, consisting of :

- *Wood shredding to shred **B-wood** (will mainly be supplied non shredded, collected at municipal recycling centres);*
- *Fluidised bed boiler with fuel capacity of 55.000 T/yr and boiler of 27 MW - CHP plant with a steam boiler and condensing steam turbine (8 MWe - 54 GWh/yr, with steam extraction for heat supply)*
- *District Heating network: 2 km built (between biomass plant and existing UCL boiler house)*
- *Creation of 'special purpose' subsidiary: 95% shares held by Veolia and 5% by Intercommunale Brabant Wallon (InBW) that brings in the land lot and supplies of 25% of wood*

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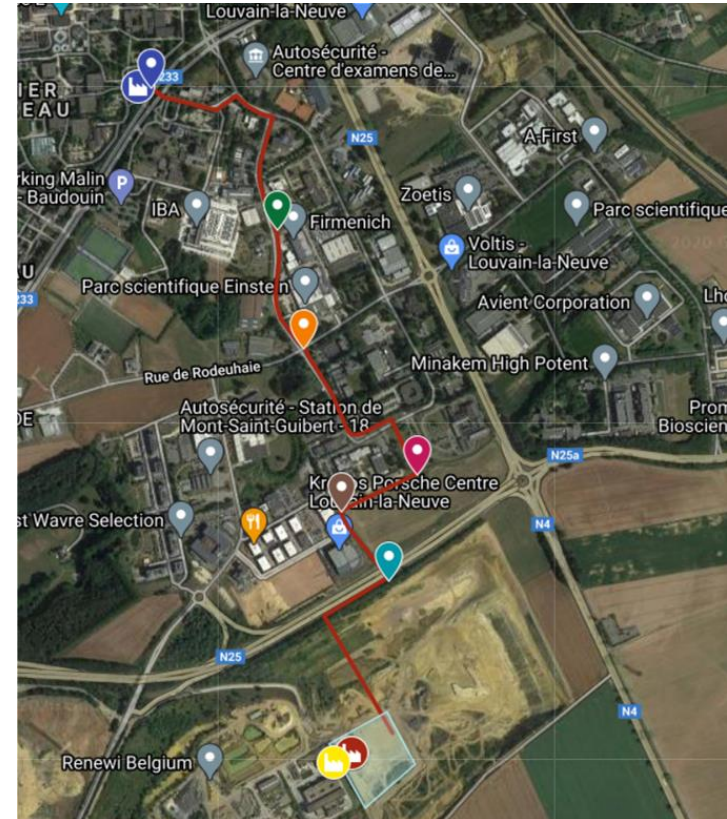
Veolia role: first project of this size (50 MEUR CAPEX) in this zone

- *Project to be developed by Veolia from A to Z: search for land lot, obtain necessary servitudes for the DHN, basic + detailed design, permitting (including legally requested Information Session to the Citizens), secure wood supply contracts*



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The plant will be built in a sandpit next to InBW



Thank you !