

From refinery to a ship

– a story about heat recovery projects within Gothenburg Energy
using prefabricated Energy Transfer Station

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Austin, Texas, February 10th 2016

www.swep.net

From Austin to Gothenburg

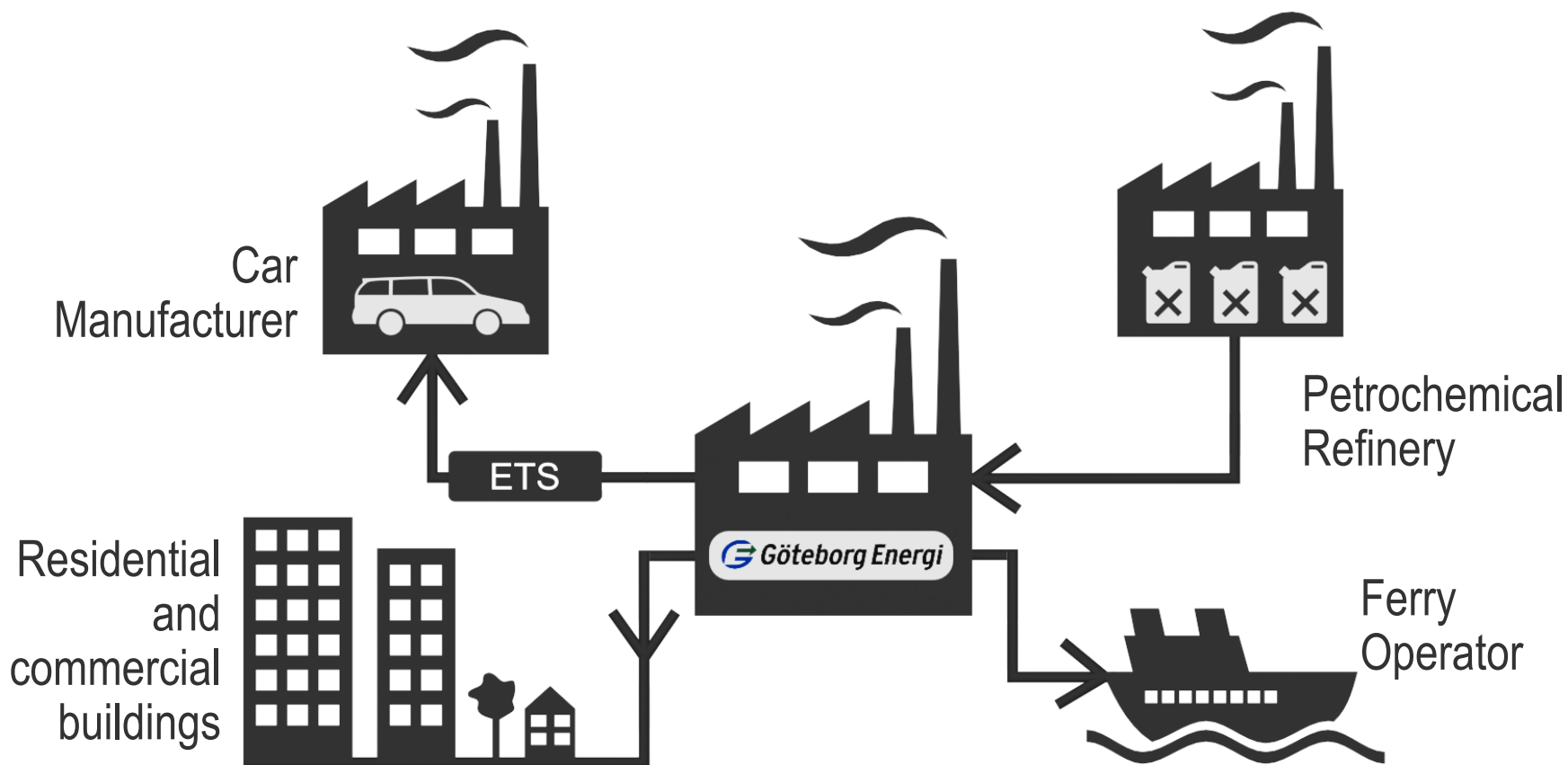


Gothenburg is a port city with a strategic location between Oslo and Copenhagen. It has a population of around 530,000 and is Sweden's second largest city.



City of
Gothenburg

The bigger picture – or it's all connected!



Quick facts

No of employees: 1.080

Turnover 2014: 790 MUSD

Company founded: 1846

District heating

Supply since: 1952

Pipe network: 750 miles

Sold energy 2014: 3177 GWh



No of ETS apartment / commercial buildings:

7.000 units

No of ETS one family buildings / Villa:

12.000 units

No of plants: 3 main CHP

Energy mix:

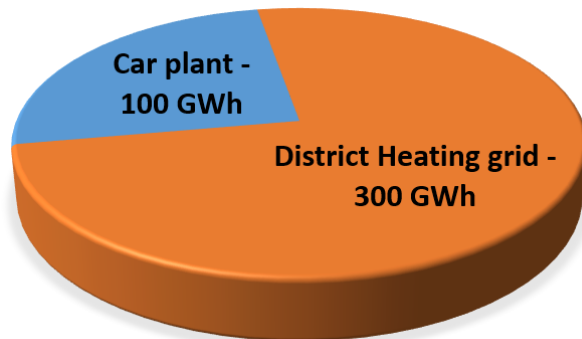
- 74% heat recovery
- 17% renewables
- 9% fossil fuel



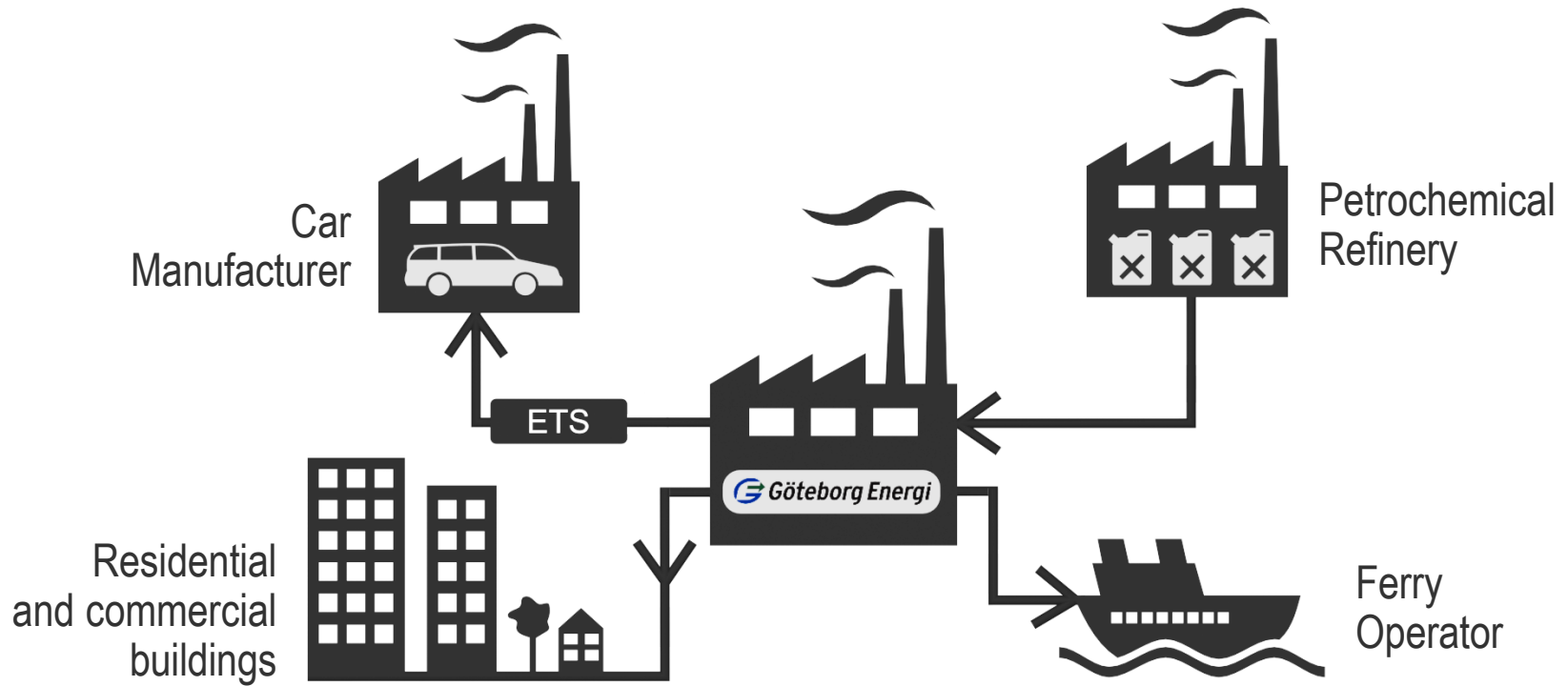
Midsize hydroskimming refinery

Capacity: six million cubic meters of crude oil per year

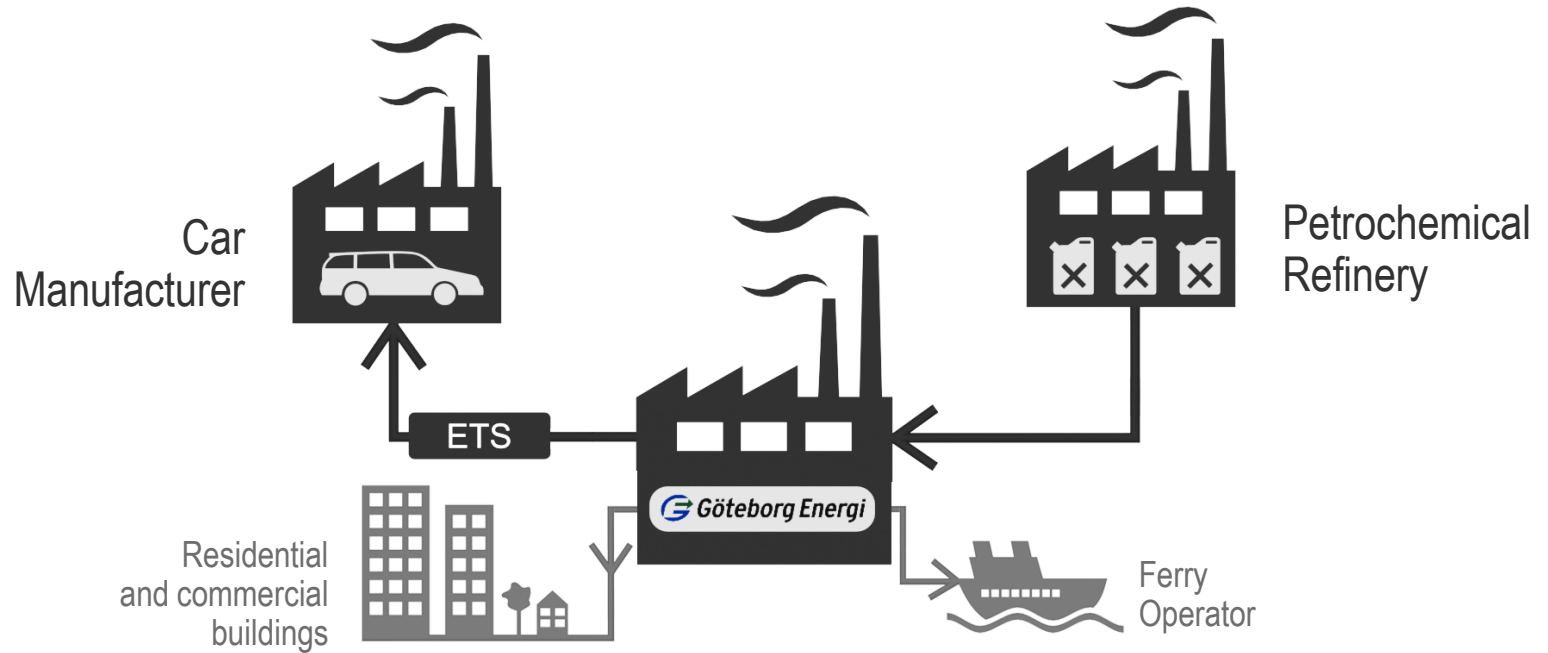
Excess heat from the process - 400 GWh - is delivered to the district heating network.



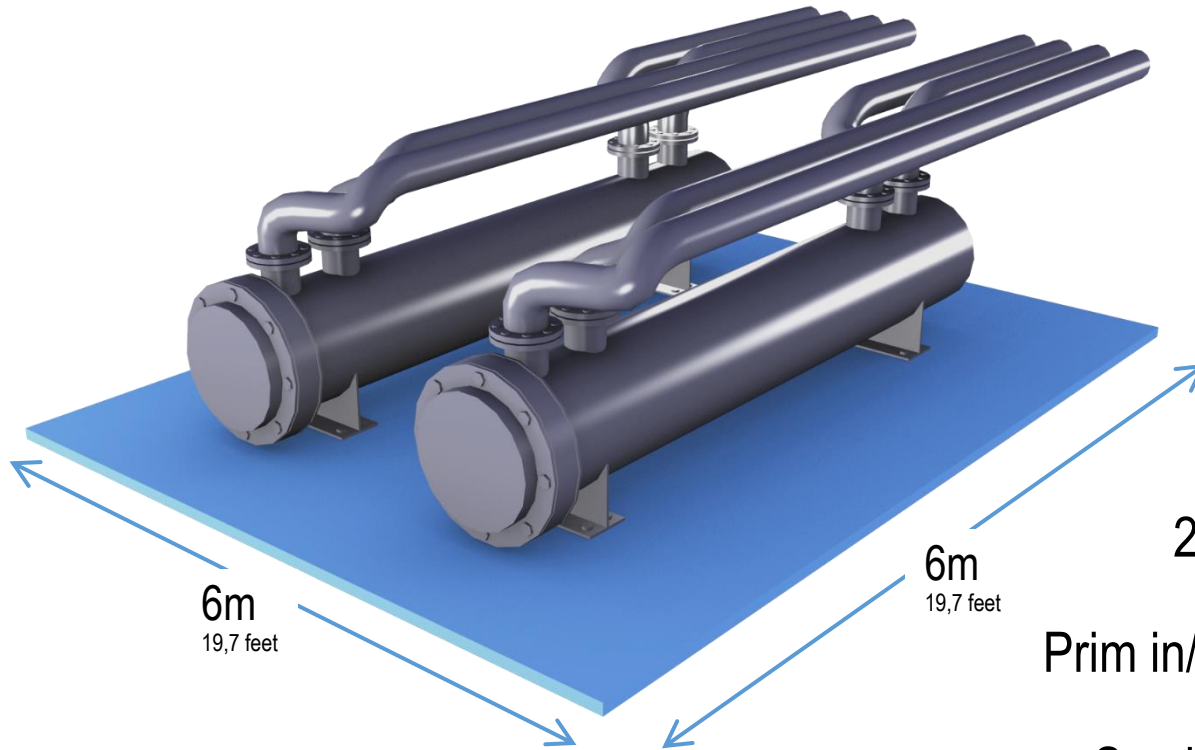
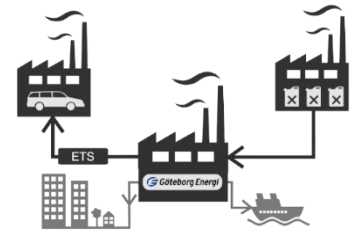
The bigger picture – from energy providers to end user projects



The bigger picture – Heat Recovery Block Station Project



Old technical setup



Some facts

2x 18MW S&T heat exchangers

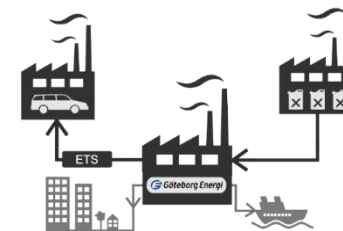
Prim in/out: 118°C (244°F) / 66°C (151°F)

Sec in/out: 42°C (108°F) / 82°C (180°F)

18MW installed for redundancy purpose only

Footprint – 6.0 x 6,0m (19,7x19,7ft.) - 36m² (390sq.ft)

Solution



Some facts

Compact

3x 6MW Brazed Plate Heat Exchangers

Prim in/out: 90°C (194°F) / 46°C (115°F)

Sec in/out: 42°C (108°F) / 82°C (180°F)

Pressure rated 25bar (363psi)

Max working temperature 160°C (320°F)

Footprint – 4.0 x 3,5m (13,0x11,5ft.) - 14m² (150sq.ft)

-What did we achieve?

Less than half of the footprint – from 36m² to 14m² (390sq.ft Vs 150sq.ft)

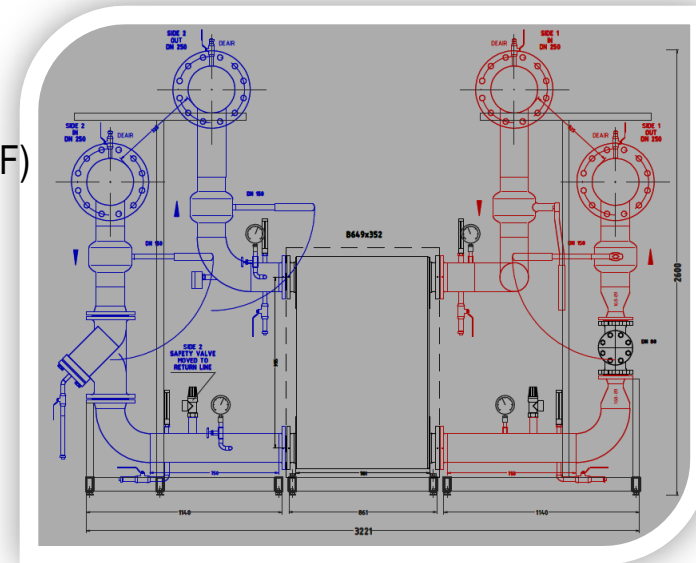
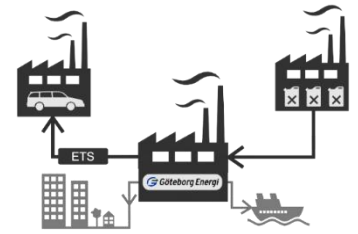
System redundancy within requirements

Return On Investment; <5 months

Lowered the primary return temperature with 20°C (68°F)

No additional heating needed;

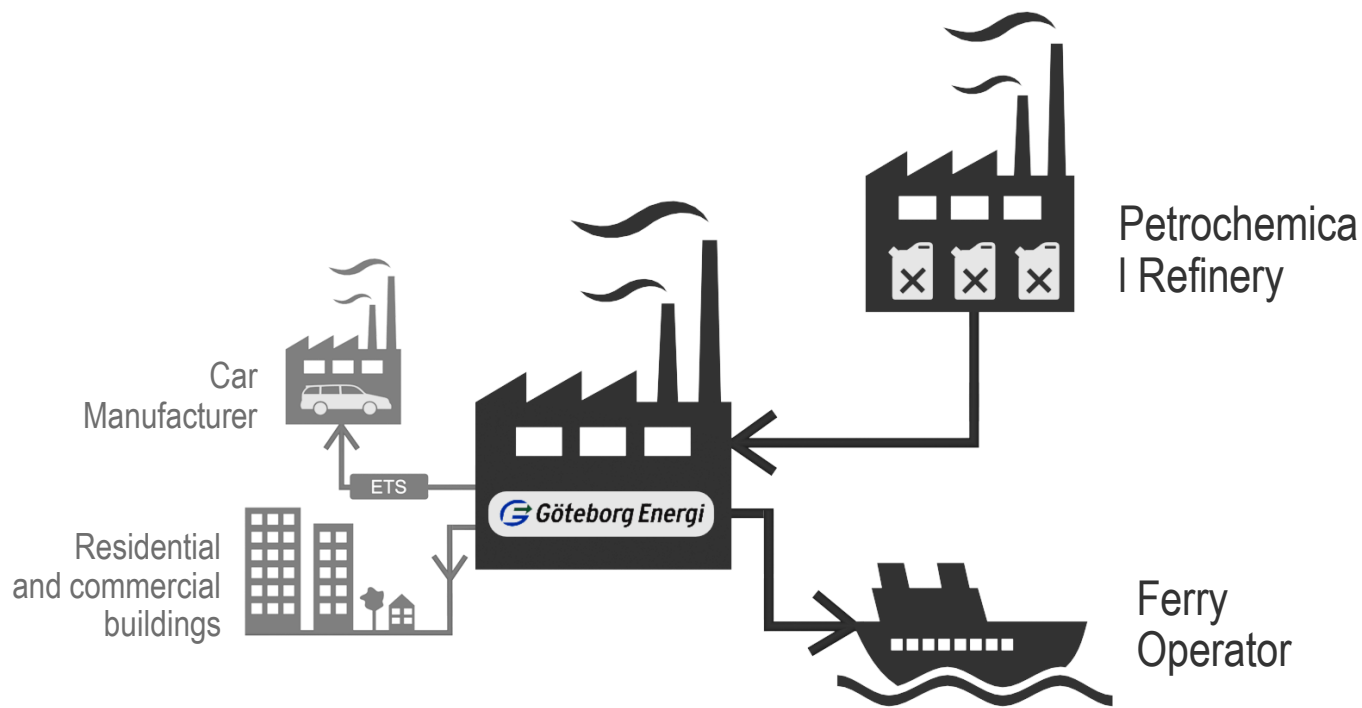
- ✓ No additional fossil fuel burned.
- ✓ Much lower electricity need – less water to pump.



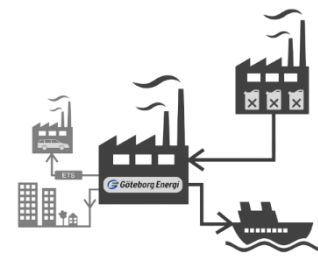
This results in huge reductions on the CO₂ footprint and cost savings!



The bigger picture – Connecting a ship to the grid



Problem / Challenge

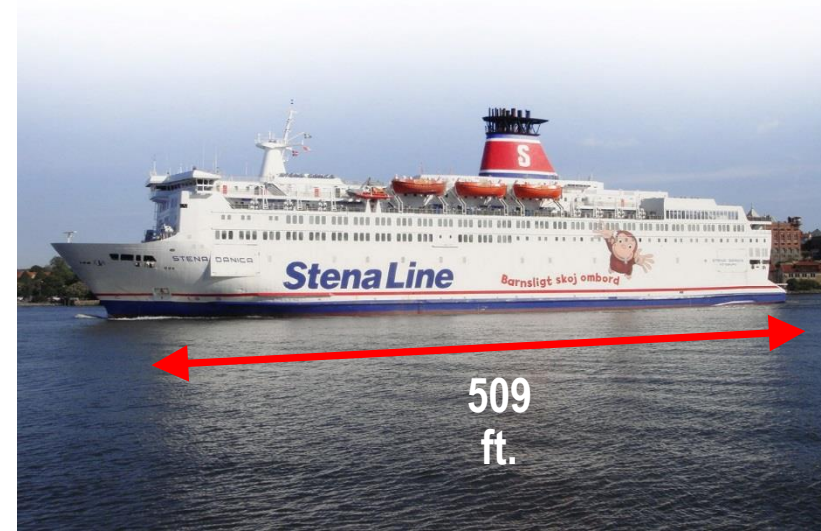


While at quay *Stena Danica* needs to run the diesel generators onboard to keep compartments and vital systems warm.

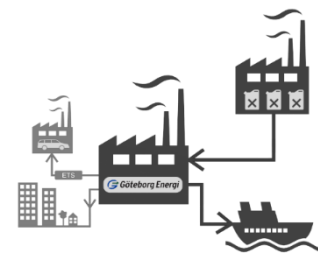
Every night Danica anchors up at the quay in Gothenburg City Centre – emitting particles, Nitrogen oxides (NO_x), carbon monoxide (CO) and more...

STENA DANICA

Length: 154,9 m	Width: 28,5 m
Built: 1983/2005	Passenger Capacity: 2 274
Gross tonnage: 28 727 t	Draught: 6.3 m
Speed: 21 knots	Freight Capacity: 1 640 lane metres
Port of registry: Göteborg	Ship Builder: Chantiers de France, Dunkerque
Flag: Swedish	Engines: 4 x CCM Sulzer
kW Horsepower: 25 612 kW / 34	Height clearance: 4.50 m
Width clearance: 6.0 m	



Solution



At the quay – a 20 ft. containerized ETS – 1.200 kW Capacity

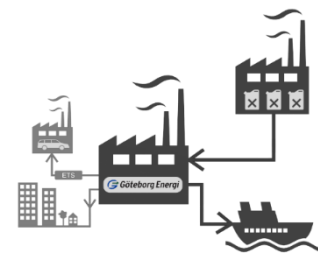
Onboard – 4 BPHEs for space and oil heating

Connection between quay and ship
– Flexible hoses with quick couplings.

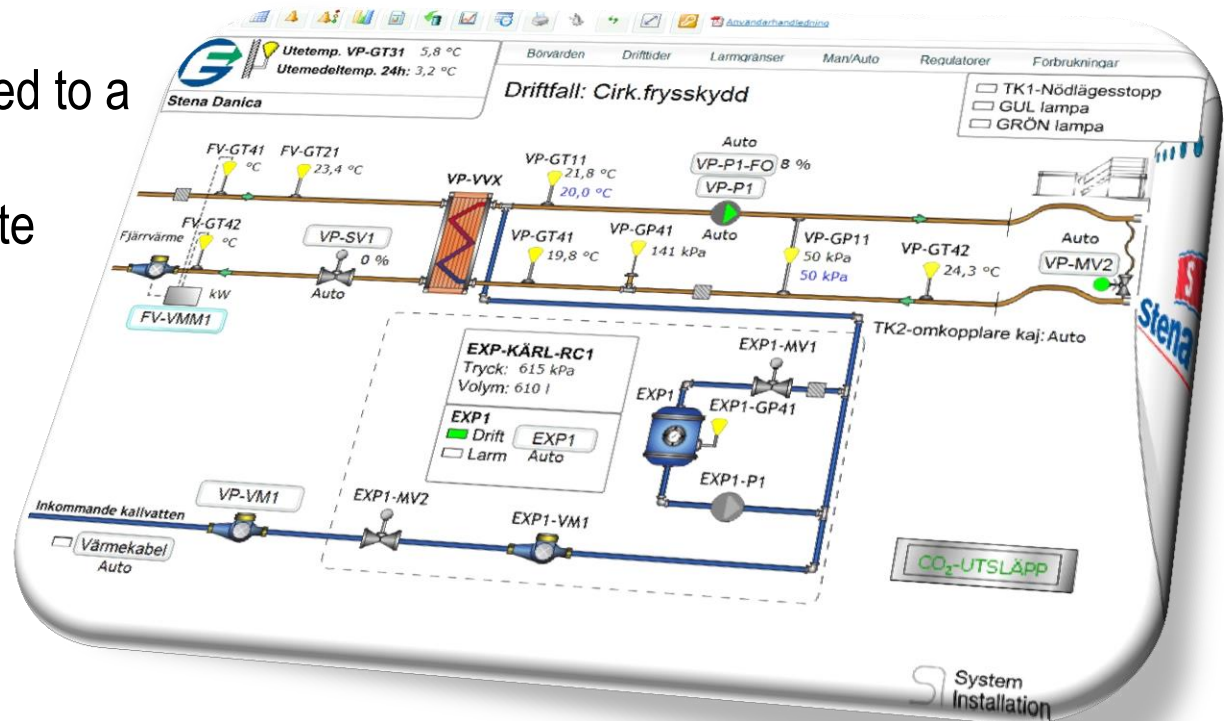
celsius
smart cities



Solution

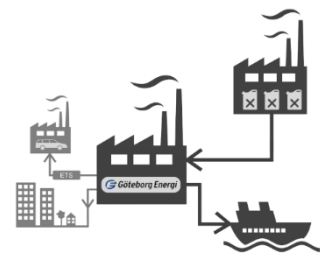


ETS controller is connected to a SCADA* system for remote monitoring and control



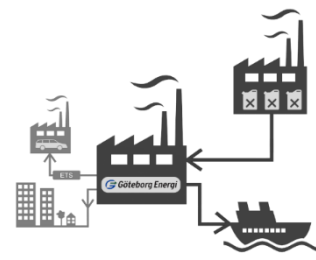
*Supervisory Control And Data Acquisition

What did we achieve?



- Calculated Return On Investment; 3 years
- Meeting coming laws and regulations for ships in Sweden
- Complete engine shutdown while at quay
 - Reduced noise levels in Gothenburg City Centre
 - Calculated to reduce CO₂ emissions with 500 tons annually
 - this value corresponds to the same amount of

What did we achieve?



..emissions from **256 cars** annually!



For more Information

- <https://eu-smartcities.eu/> - Sustainable energy Europe
- <http://celsiuscity.eu/> - Sustainable energy Europe
- <http://www.goteborgenergi.se/> - Utility Company
- <https://www.preem.se/en/in-english/about/refineries/> - Oil Company / Refinery
- <http://www.goteborg.com/en/> - Gothenburg tourist information
- <http://www.svenskfjarrvarme.se/In-English/District-Heating-in-Sweden/> - Swedish District Energy Association
- <http://www.aljazeera.com/programmes/earthrise/2015/04/gothenburg-green-port-150424092208737.html> - Gothenburg's Green Port VIDEO



Thank you for your attention!



Meet us at the **Business Partner Exhibitors** – *Griffin Hall #60A*

Contact;

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