

Regulating Power

Handling negative prices and being active at the regulating market

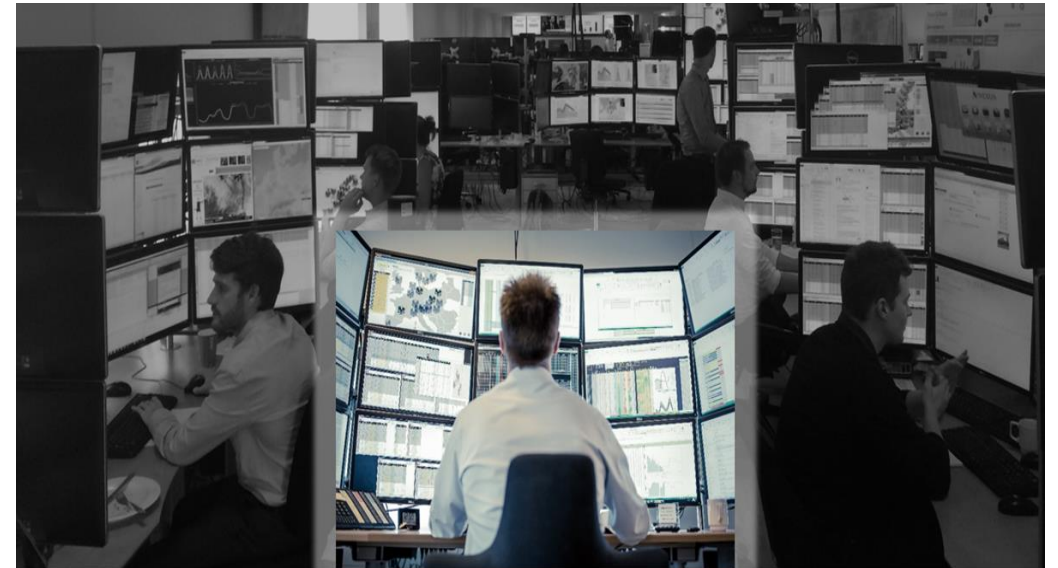
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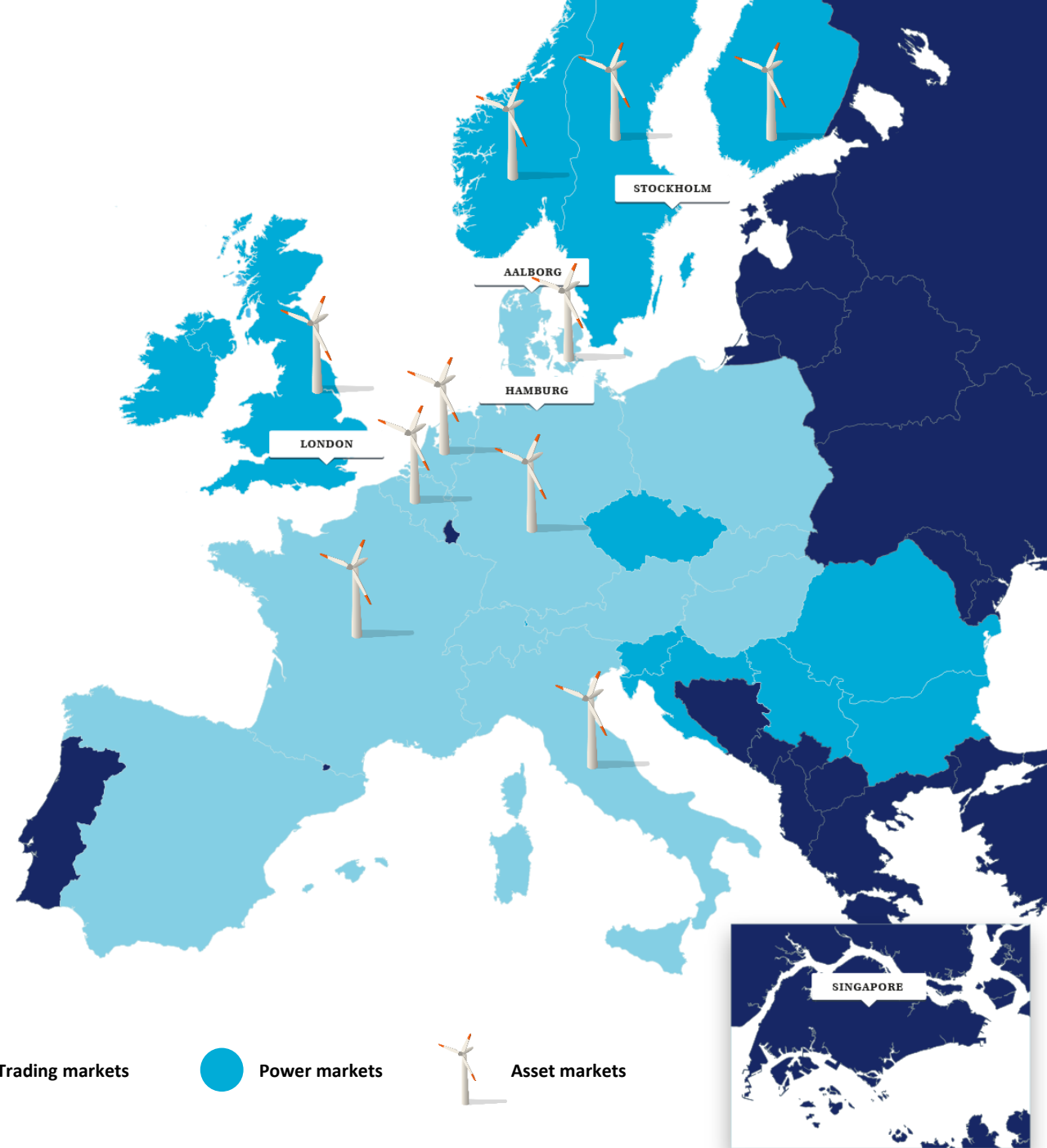
Status

- Competition between energy sources
- Nordic TSO:s ready – mid 2021
- Winner or loser
- No manual - get experience now
- New roles BRP & BSP
- "Discrimination" not allowed



Centrica Energy Trading

- Centrica Energy Trading is a part of Centrica's Energy Marketing & Trading (EM&T) business unit.
- We trade gas, power and LNG and provide route-to-market services for customers with gas, power and LNG assets.
- Centrica EM&T has a diversified portfolio of energy assets under management and our business activities are centered on moving and trading energy to satisfy the changing needs of our customers.
- Around 600 people work in Centrica EM&T in our offices in London, Denmark, Germany, Sweden and Singapore.



Communication in power markets

Distribution

- Change of BRP
- EDI data – metered data



Power Exchanges

- ELSpot Trading
- Intra-Day Trading
- Day-After

EPEXSPOT

nordpool spot

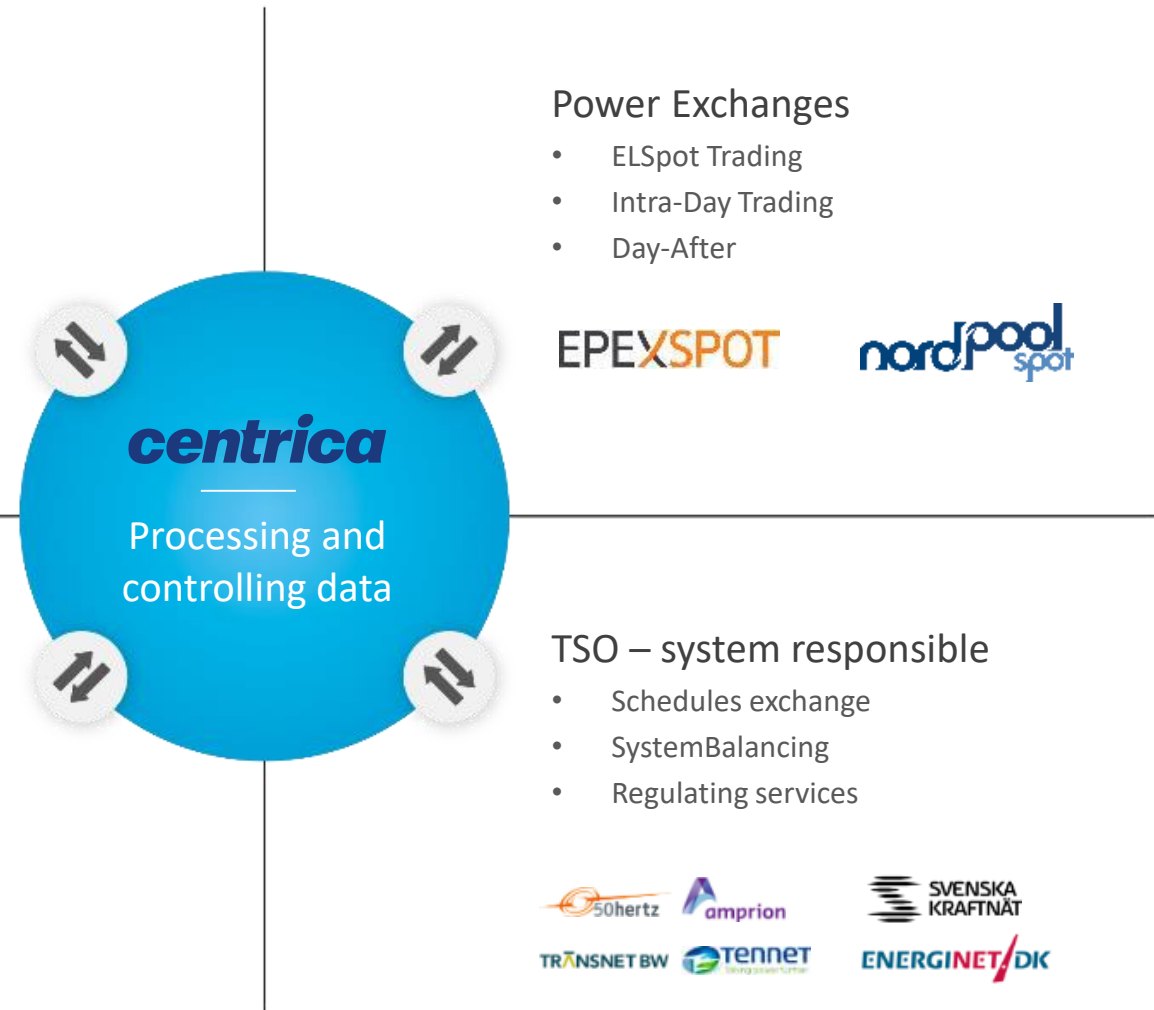
Generators & consumers

- Online-Data
- Regulating services



TSO – system responsible

- Schedules exchange
- SystemBalancing
- Regulating services



Wind turbines must take active part in the market as other types of generation

Must act on market signals in order to:

- Increase earnings

- Handle risks

- Improve the acceptance of wind (TSO and public)

Must participate in all markets available

- Day Ahead

 - Protection against negative spot prices

- Intra day

 - Protection against negative balance prices and possible earnings

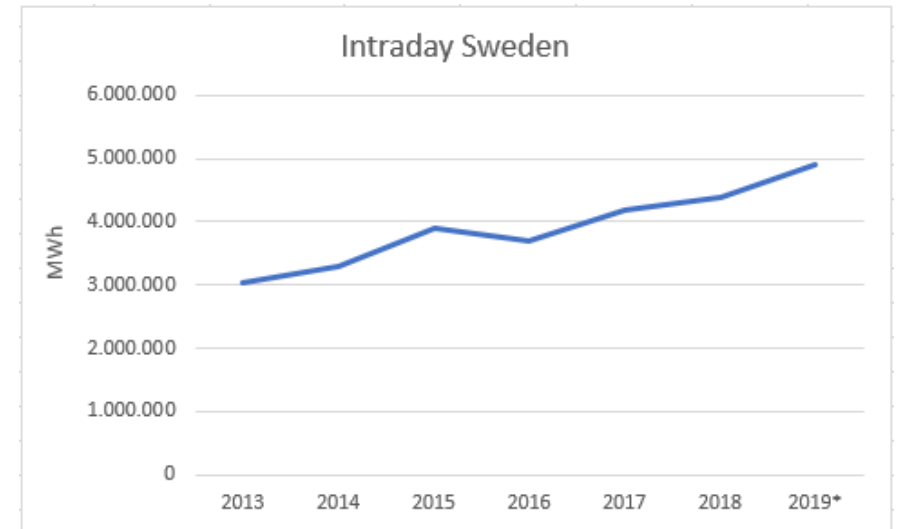
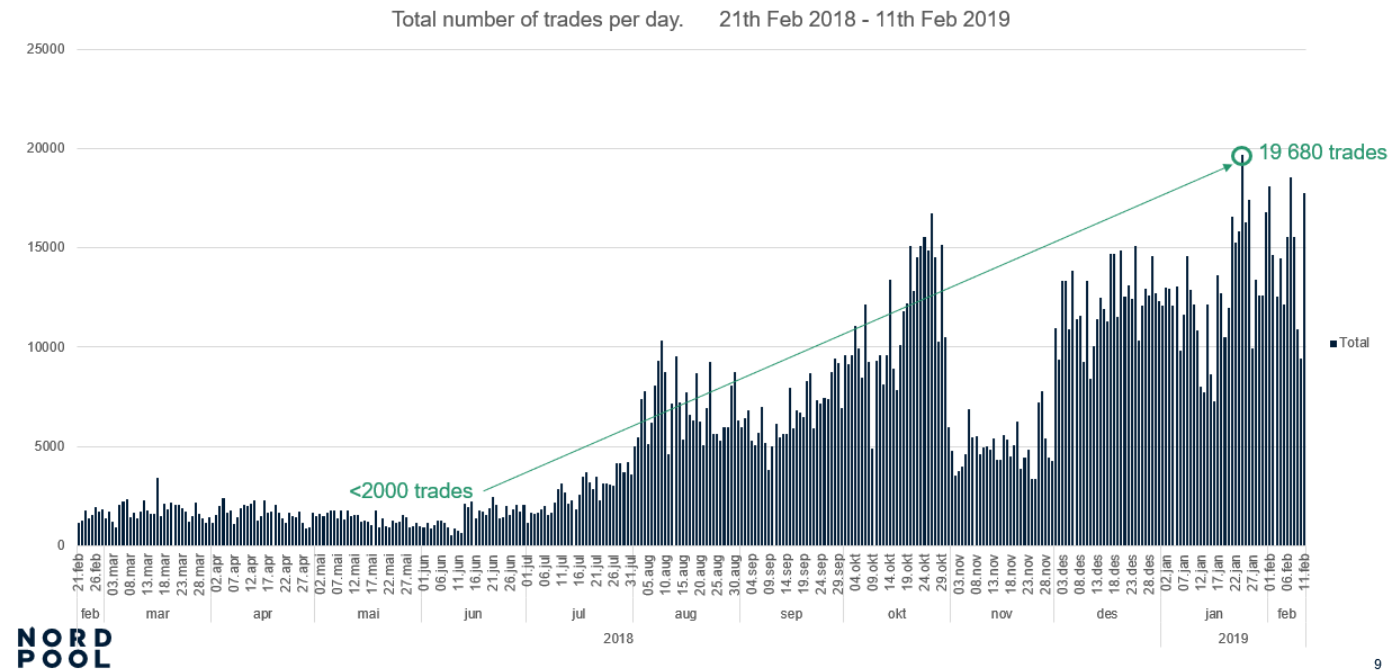
- Regulating power

 - Potential extra earnings

 - It will lower balance costs for wind

Intraday

Trends – Number of trades at Nord Pool per day



Sund & Bælt wind farm – Sprogø – 21 MW



Weather Desk

6 Energy Meteorologists
24/7 environment

3rd party Suppliers
WEPROG (Ensemble)
ConWx (Physical)

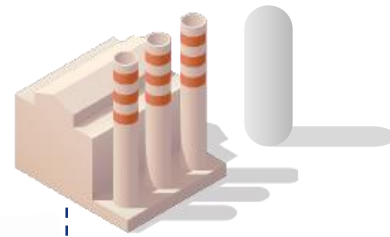
**Neas Energy
Weather Models**

**Wind/PV Power
Forecast**



**Online Data
& Production Data**

Short Term



Trading

Day ahead Market

Intraday Market

Regulating Power Market



Tech Team

4 engineers –
Communication
Exchange of signals



Market for regulating power

1. Primary reserves

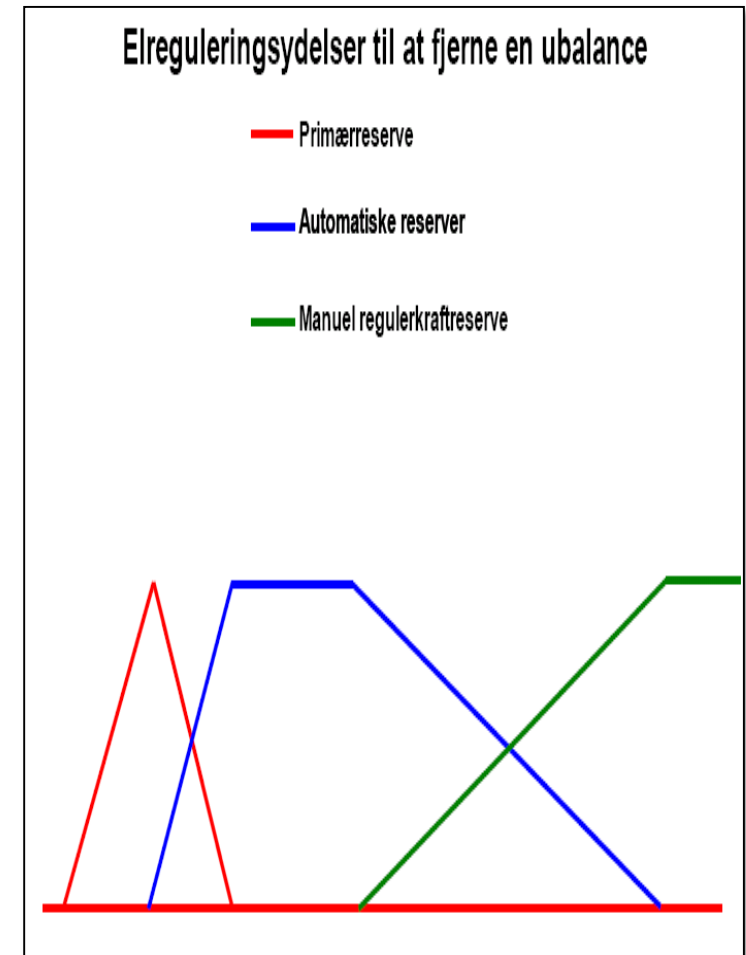
- Response time is 15-30 seconds.

2. Automatic reserves (LFC)

- Response time 30 seconds to 15 minutes.

3. Manual reserves

- 15 min activation
- Hourly auction
- Marginal price market (last price is valid for all)
- Paid per activation
 - Upward regulation price > Spot price
 - Downward regulation price < Spot pris



Bidding in the market for regulating power

Which bids are possible?

Bids on Downward regulation – bids are submitted 1 hour before the hour

Bids on Upward regulation – bids are submitted 1 hour before the hour of operation

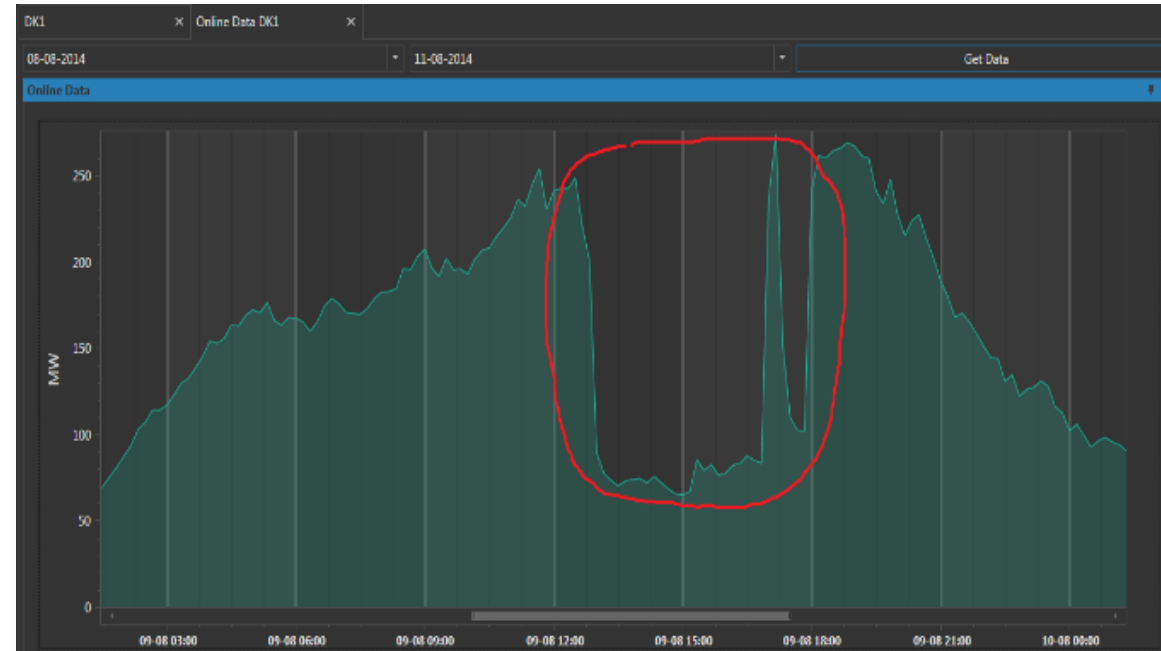
Smallest bid is 10 MW - highest bid is 30 MW

Bonding

Managing Negative balancing Price for regulating power

Case: Downward regulation – 9. August 2014

Regulating prices		
	Up	Down
09-08-2014		
00 - 01	248,34	247,34
01 - 02	213,27	213,27
02 - 03	200,90	200,90
03 - 04	196,95	196,95
04 - 05	188,60	138,07
05 - 06	183,38	124,71
06 - 07	179,65	124,71
07 - 08	194,04	138,07
08 - 09	200,15	151,43
09 - 10	204,25	178,16
10 - 11	207,91	178,16
11 - 12	207,31	178,16
12 - 13	200,68	-90,00
13 - 14	189,05	-90,00
14 - 15	186,06	-541,94
15 - 16	200,75	-90,00
16 - 17	200,82	-90,00
17 - 18	191,88	-90,00
18 - 19	225,42	-50,00
19 - 20	240,26	155,89
20 - 21	246,22	182,70
21 - 22	249,20	193,82



Upward: What you get paid to produce

Downward: What you can by back for

Potential earnings for WTG owners

9th of August 2015 downward regulation

250MW downward regulation to 80 MW

170 MW in a 7 hour period

Spot price	DW Reg price	MW's regulated	Extra earnings Compared to SP	Marginal price of op.	Total earnings
200	-90	170	90	-50	6800
189	-90	170	90	-50	6800
185	-541	170	541	-50	83470
200	-90	170	90	-50	6800
200	-90	170	90	-50	6800
191	-90	170	90	-50	6800
225	-50	170	50	-50	0
			Total earnings 7 hours		117470