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Hydrogen Trains Groningen

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Current Train Network

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Zero emission solutions

- Catenary system;
- Partial catenary system with battery trains;
- Hydrogen (battery) trains.

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Advantages Hydrogen Trains

- About 50% lower investment compared to catenary system and with battery trains still a lot of catenary as well;
- Flexible introduction;
- No catenary failures, blocking views and no maintenance costs for a catenary system as well;
- Less noise (3 up to 6dB compared to diesel trains);
- Easy to cross borders (no loc change is needed);
- Fits perfectly within our total hydrogen strategy.

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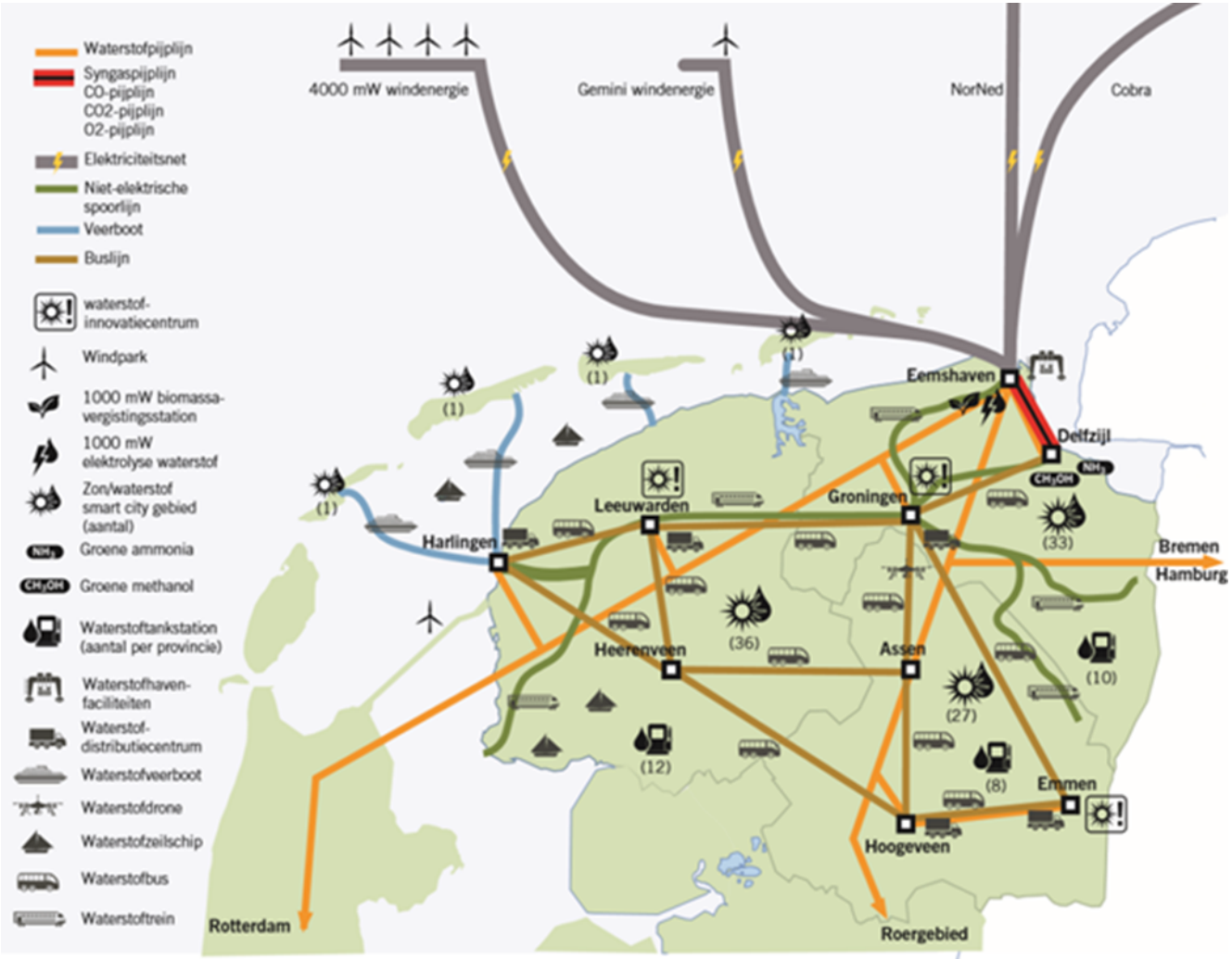
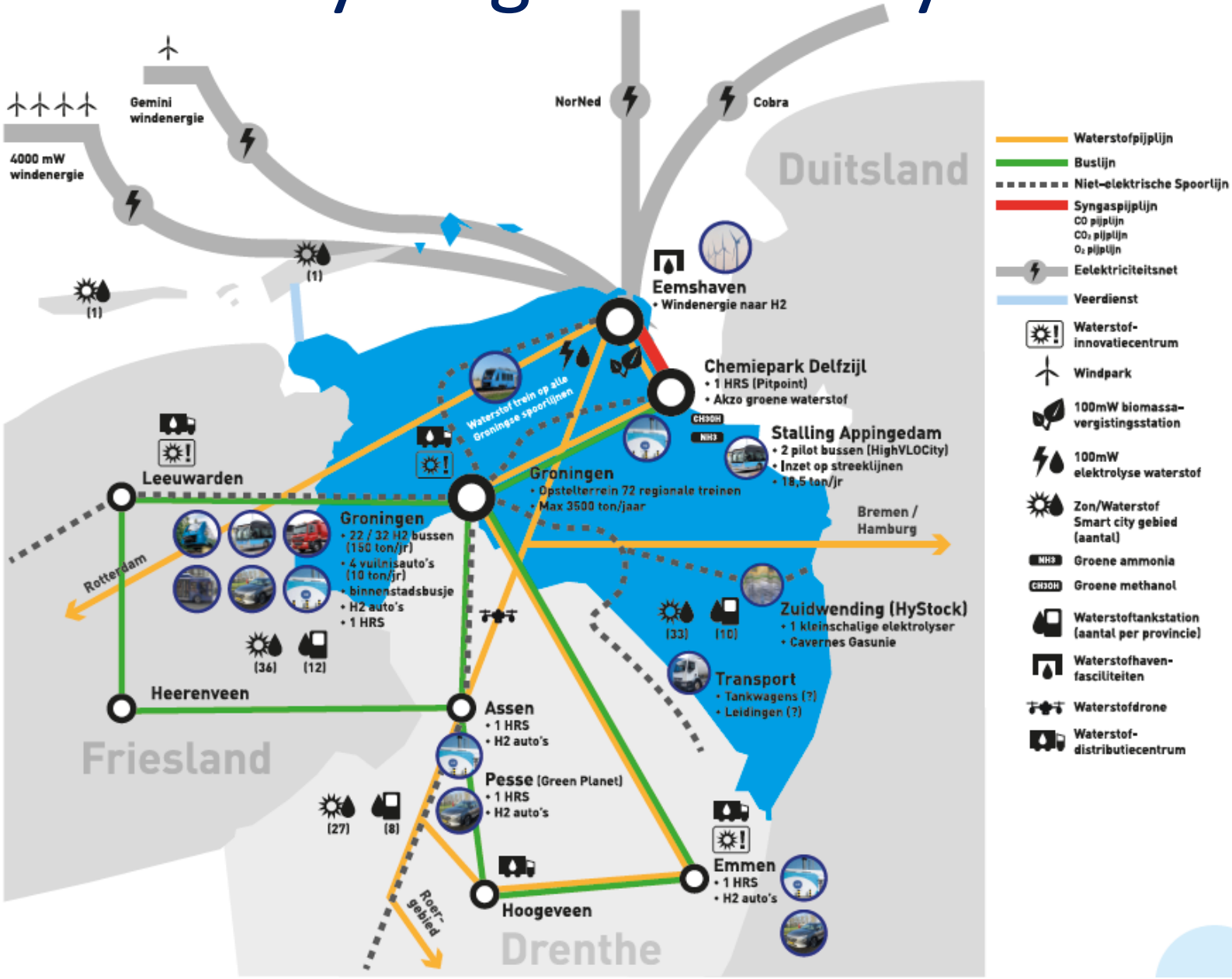
Hydrogen economy



Het waterstofplan in Noord-Nederland.

Hydrogen mobility



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Disadvantages Hydrogen Trains

- It is still a big investment;
- The technique is still developing;
- Maximum speed of 140 km/h (for now);
- Tanking process needs to be fit within the total process;

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Pilot first

Goals:

- Getting the dispensation;
- Testing the train performance on the track for two weeks during the nights;
- Testing the refuelling process (green hydrogen);
- Organise a public and press event.

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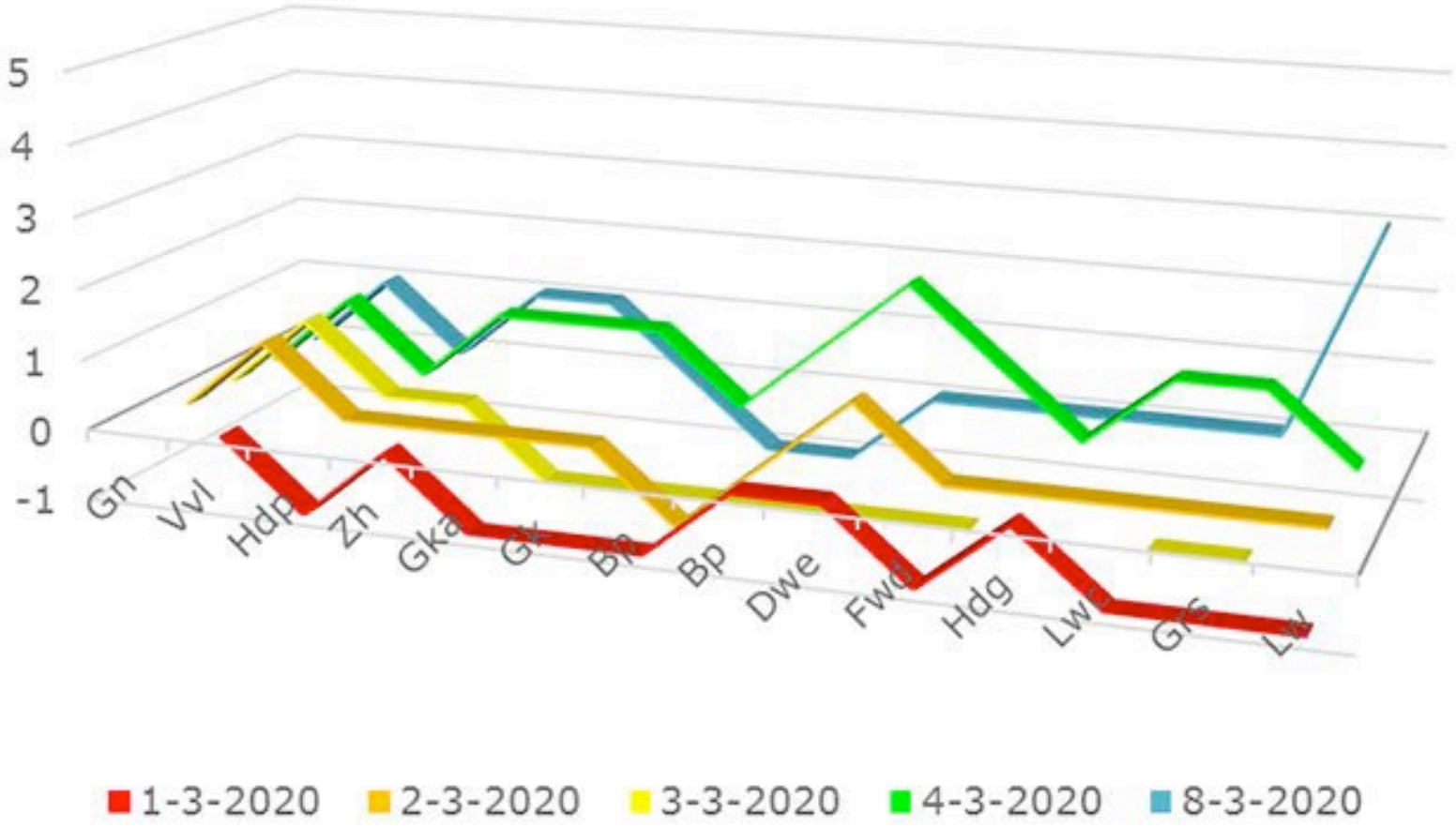
Intercity train Groningen-Leeuwarden



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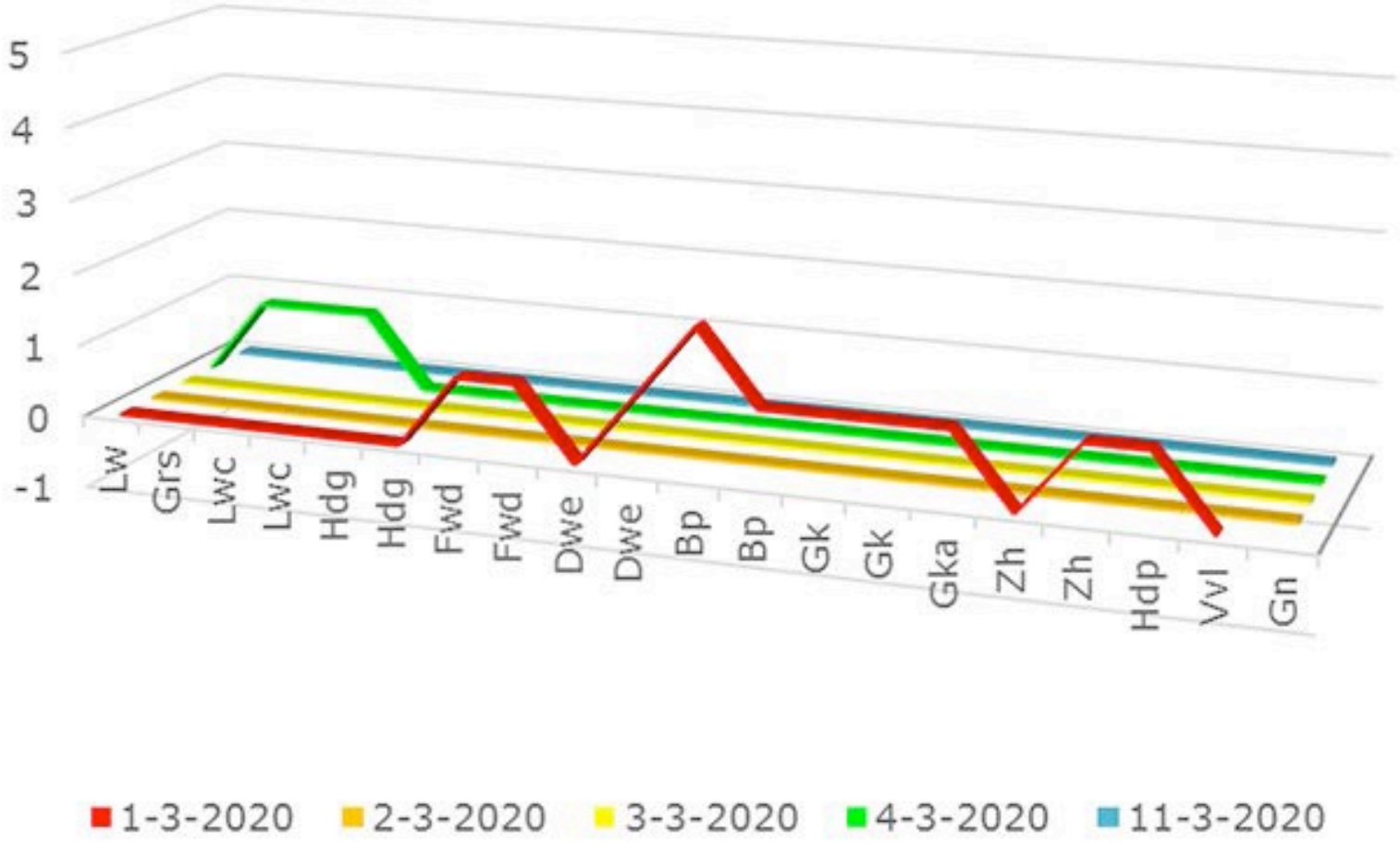
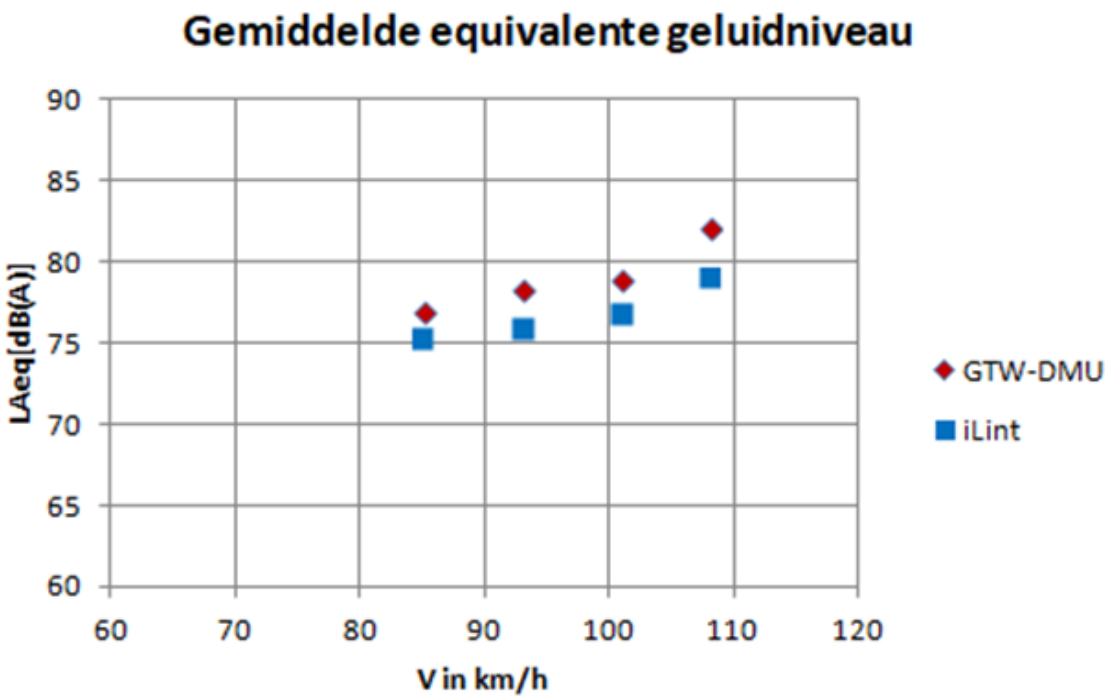
Local train Leeuwarden-Groningen



Noise


Gemiddelde equivalente geluidniveau
LAeq[dB(A)]
90
85
80
75
70
65
60
60
70
80
90
100
110
120
V in km/h
GTW-DMU
iLint

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Refuelling

Date	Train section	Time START	Time READY	Pressure START [Bar]	Pressure READY [Bar]	Temp. START [°C]	Temp. READY [°C]
1 Mar.	A	9:10	9:25	77	200	4	-2
	B	9:30	9:53	59	200	4	6
2 Mar.	A	11:43	12:00	50	200	2	5
	B	11:25	11:41	44	200	2	5
3 Mar.	A	11:13	11:34	53	170	1	4
	B	10:53	11:10	47	170	0	1
4 Mar.	A	9:50	10:24	32	170	4	8
	B	10:25	11:02	19	170	4	16
6 Mar.	A	9:45	10:05	70	170	5	0
	B	10:00	10:40	64	170	6	0
9 Mar.	A	9:40	10:00	42	170	7	5
	B	10:04	10:40	22	170	8	5

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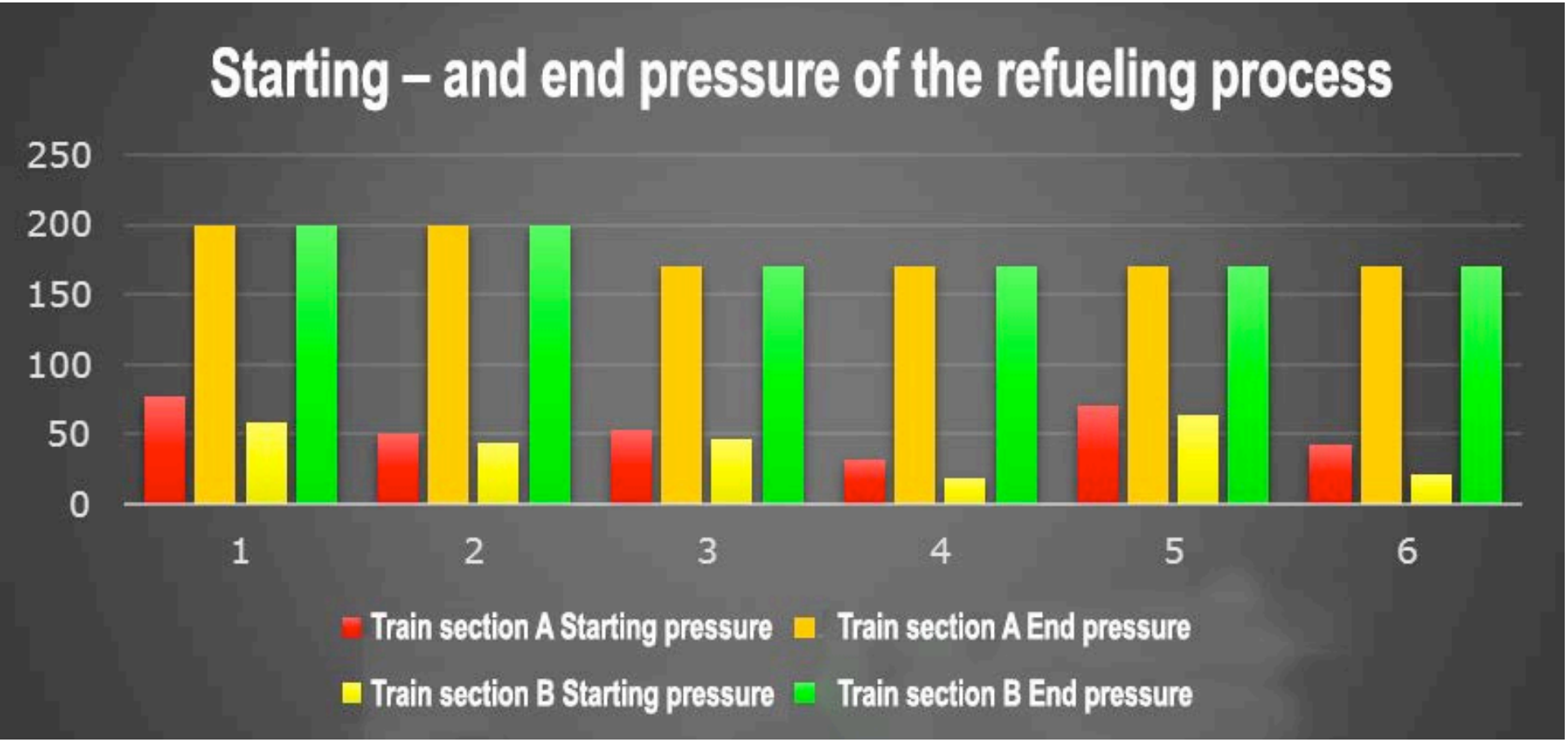

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Next steps

- Pilot very successful;
- Now scale up towards first four new trains needed in 2025 in the real operation and every new train after that;
- If they are successful the tender for a new concession in 2035 can include a demand for all trains to be zero emission with green hydrogen;
- Really interesting if other regions or countries with diesel tracks join us for a bigger market potential and to boost the development.

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Questions?