

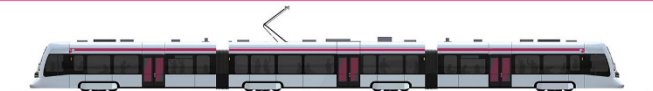
2022

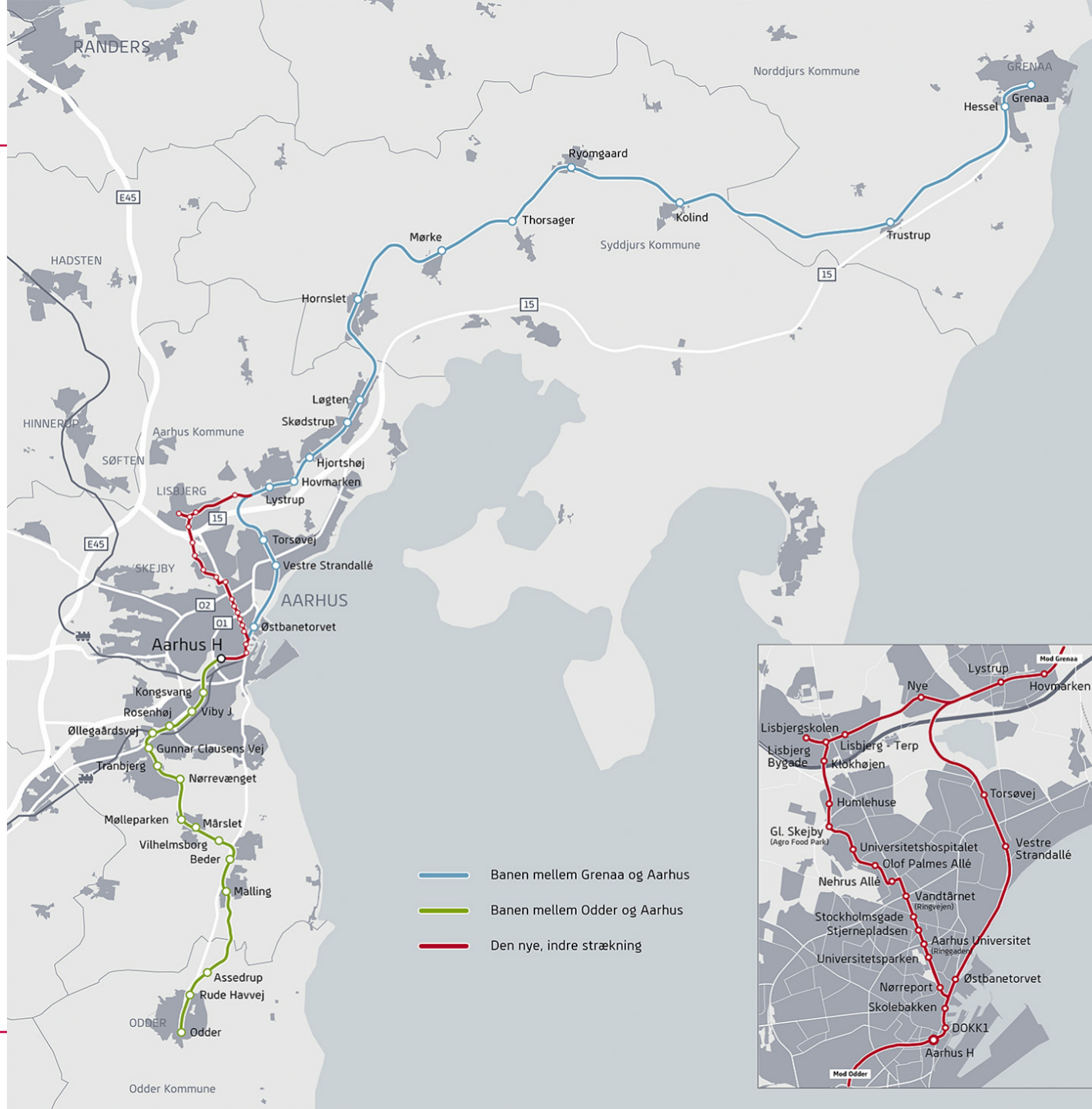


Justin Caton



Velkommen til **Letbanen**





- Banen mellem Grenaa og Aarhus
- Banen mellem Odder og Aarhus
- Den nye, indre strækning



50th ANNIVERSARY EDITION

CLINT EASTWOOD



THE GOOD THE BAD and THE UGLY

co-starring
LEE VAN CLEEF

also starring
ELI WALLACH
in the role of 'TUCCI'

directed by
SERGIO LEONE

GOOD

- Opened "new LRT" with part OLD infrastructure ("TRAM TRAIN")
- Limited delays due to Infrastructure or Trams
- Moved journeys from Car to TRAM
- Encouraging Urban Development along the line



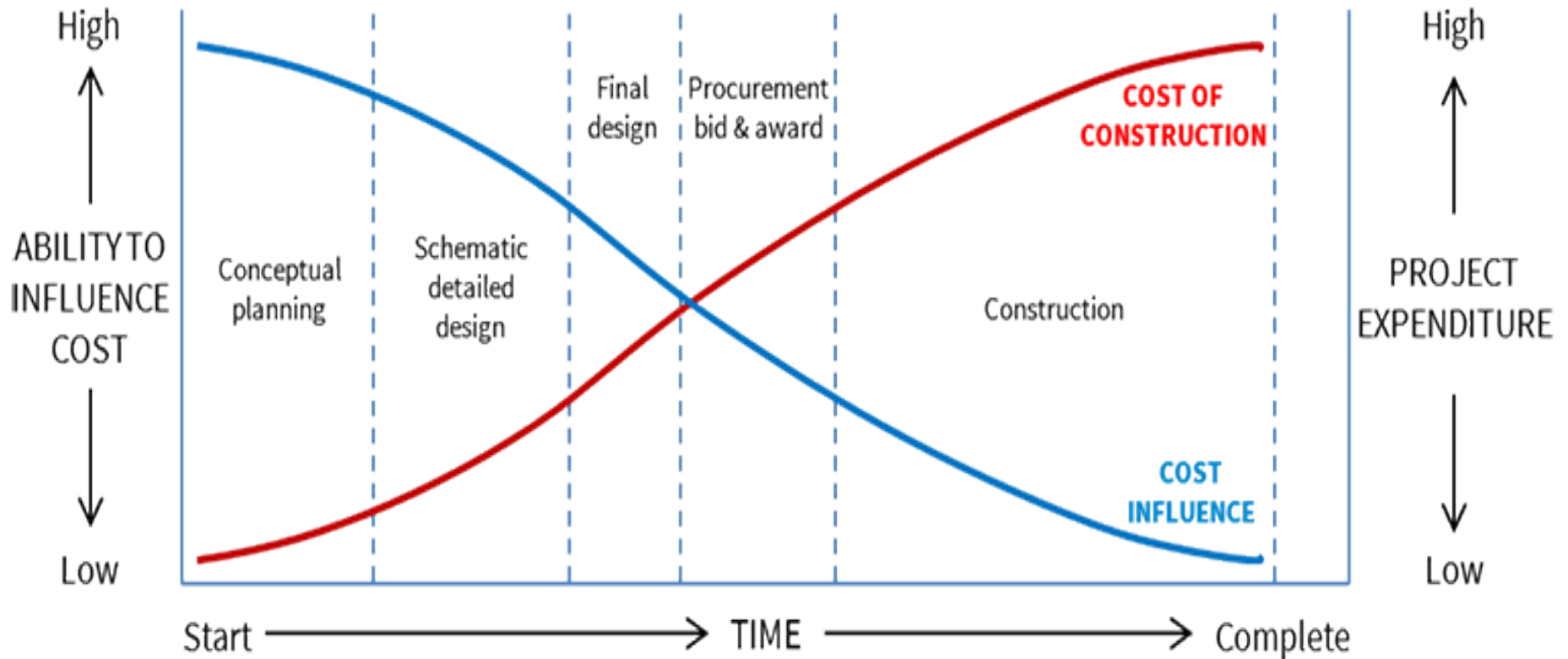
”BAD” - NOT SO GOOD

- Operational Input to Tender and Design
- Adhesion (leafs on the line)
- Winter >> OCS & ICE
- Start Up – peak in ressources



GET IN EARLY

COST INFLUENCE CURVE



ADHESION (LEAFS ON THE LINE)



Issue :-

- 7% slope
- ~ 200 Meter Section with road junctions & Trees

Solution:-

- Weekly (Oct > ~Dec)
- Alleviate (Sand Gel)
- Rail Cleaning
- Grass "trap"



WINTER >> OCS & ICE



TDC 11.26 AM 65 %
jyllands-posten.dk

Jyllands-Posten

KØB

MENU

Helt særlige vejrforhold stopper letbanen

I den forgangne uge har pendlere på især letbanestrækningen til og fra Grenaa haft det særdeles svært.



Letbanen kører generelt med høj pålidelighed, i januar lå den således samlet på 98,5 pct. på pålideligheden og en 97,6 pct. på rettidighed. Foto: Joachim Ladefoged



HISTORY

2018 – Minor Issues

Snow and -20 DegC

2019 – Major Issue : Nov and May

- Ice Breaker Trams
- Self Built Glycerin Machine #1
- Ordered Machine #2

2020 - 1st Frost in **Sept**

- Both Machines running
- Major issue with “Freezing Fog”
 - < 2degC, > 90% H < 3m/s

2021 – Frost January > **May**

- Major Issues ☹️
- Optimized DMI data / warning

2022 – Frost October > April

- 6 Oil applications (Nov > April)
- Oil Saved > 100 Glycerin applications
- Delays 5 Mornings (50% better)



Letbanen arbejder på nye planer mod frost: - Vi er ikke tilfredse nu

AARHUS

Is og frost: Sådan vil letbane undgå aflyste tog



Mest læste

KULTUR
Anmelderne hade film fra Aarhus: N millioner gange o

KULTUR
Kommunen med i Northside: - Der er både de gående o parkering

AARHUS
Politets saks var overarbejde i det især en regel ble gange

AARHUS
Aarhus amok: Tu

Selv om Aarhus Letbane seks dage i den netop overståede vinter måtte aflyse morgengange på grund af is på køreledninger, tror direktør Michael Borre på, at problemet kan reduceres betydeligt næste år. Foto: Henrik Lund

Problemet med aflyste letbanetog på grund af is på køreledninger kender mange andre europæiske letbaner til. Ingen har løst problemet 100 procent effektivt.

TV2 ØSTJYLLAND^o Din kommune Nyhedsudsendelser TV og serier Podcast Tip os

TRAFIK ØSTJYLLAND

Letbanen lover: Højst tre vintermorgener med aflysninger

Den nuværende løsning er den bedste, og letbanen håber at halvere antallet af aflysninger ved at komme is på køreledninger i forkøbet.

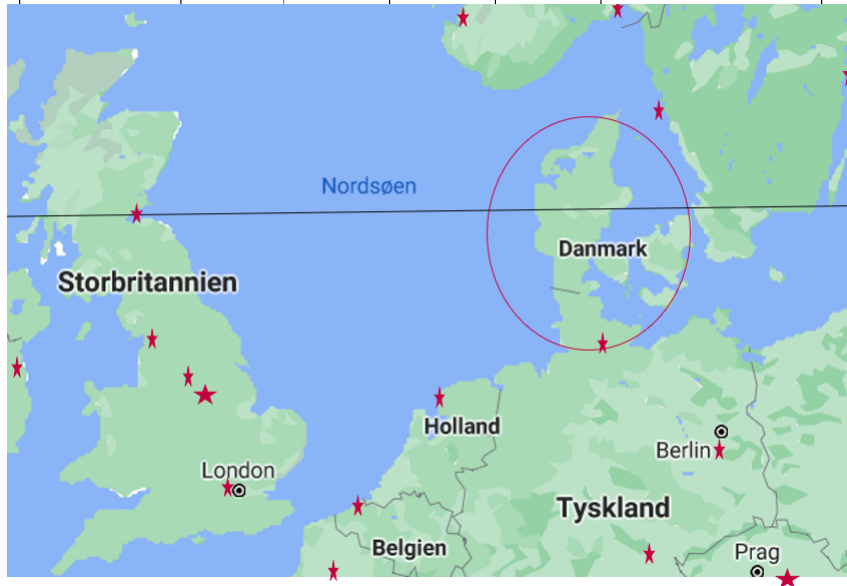
MARKET REASERCH

CITY	TYPE	TRACK	VOLTS	TRAMS	METHOD
ARRHUS	URBAN	DOUBLE	750 VDC	Variobhan	TRAM IS BREAKERS
	SUBURBAN	SINGLE	750 VDC	Tango	GLYCERIN - BRUSHES
					Panto - Plastic
BERGEN	URBAN	DOUBLE	750 VDC	Tango	GLYCERIN - ROLLER
					GLYCOL - POST ICE
					PANTO - Copper
					Panto - Plastic
STOKHOLM	URBAN		750 VDC	Bombardier	Use old trams as brekaers
	SUBURBAN			CAF Urbos A	is Mode ?
EDINBRUGH	URBAN	double	750 VDC	CAF	TRAM IS BREAKERS
SHEFEILD	URBAN	DOUBLE	750 VDC	?	TRAM IS BREAKERS

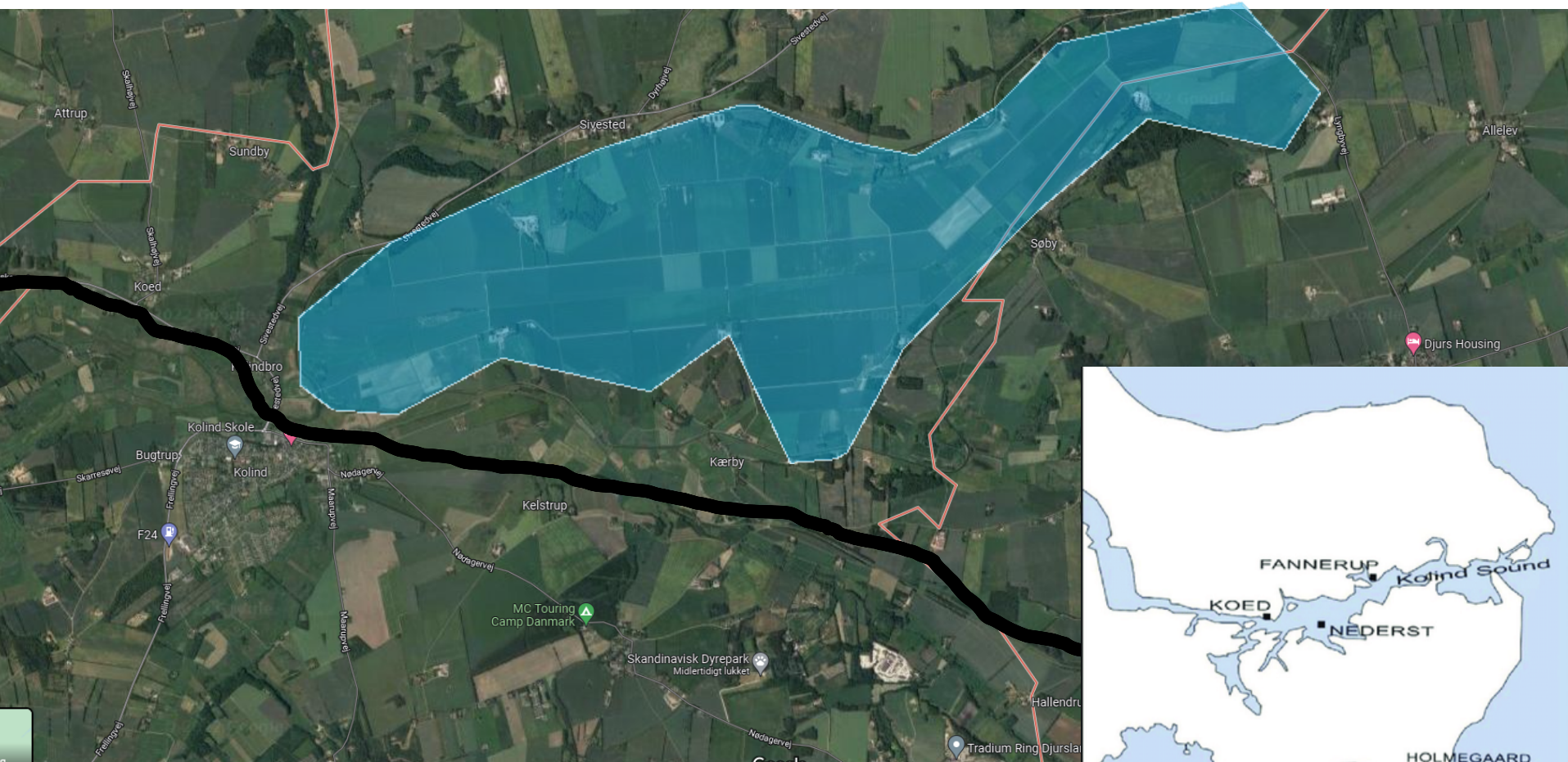
>20 Systems

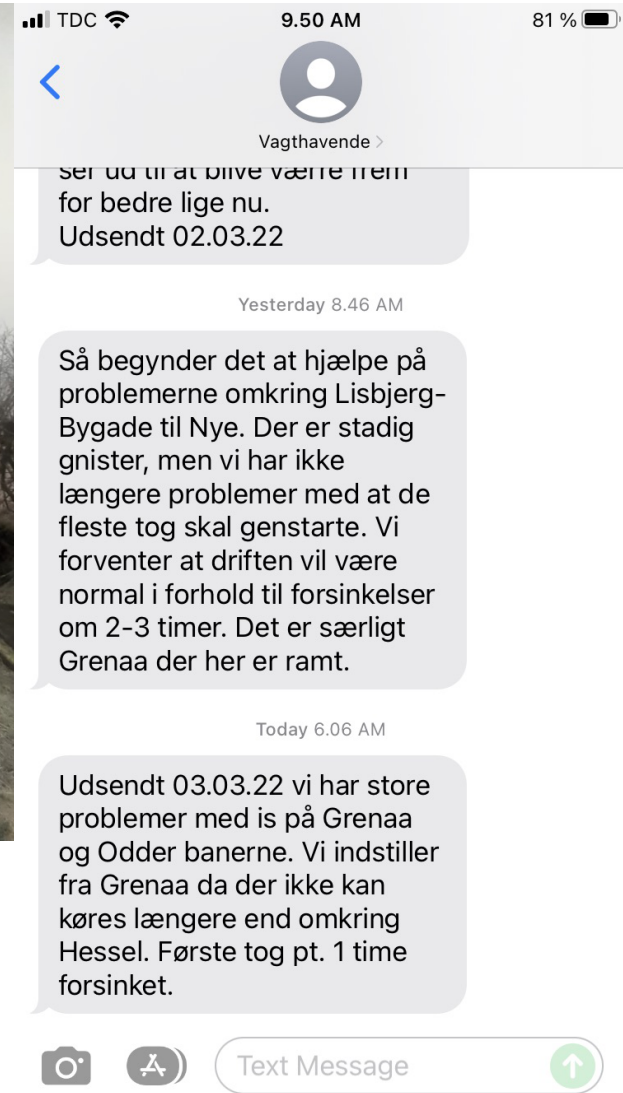
In 10 countries

> 10 solutions



Djursland > DAMP!





WINTER 19> 21 – SEMI PROACTIVE

PRE ICEING - GLYCERIN



2019 (#1)



2020 (#2)

WINTER 21>22 – PROACTIVE



Oil – used in
Holland & France

Applied 6 times
22>23 : 7 times





Vinter Pantograph

4 Tango & 4 Variobhan

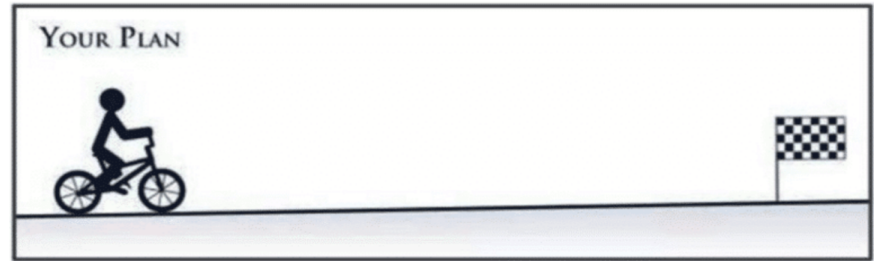
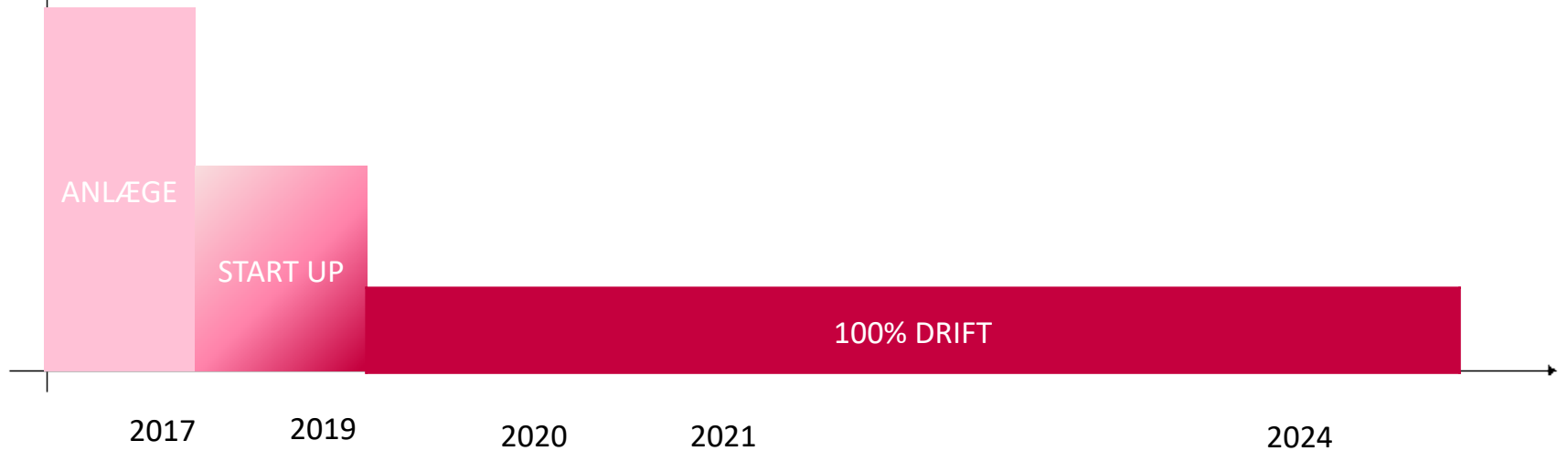
1st In service from Odder and Grenå

November to December only ☹️

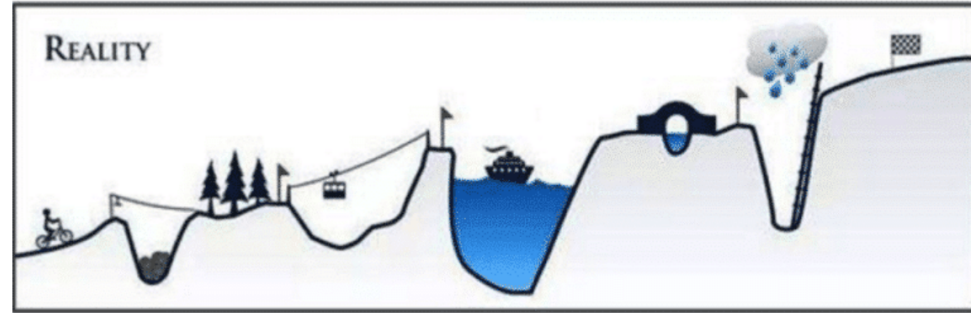


IDEAL START UP PLAN

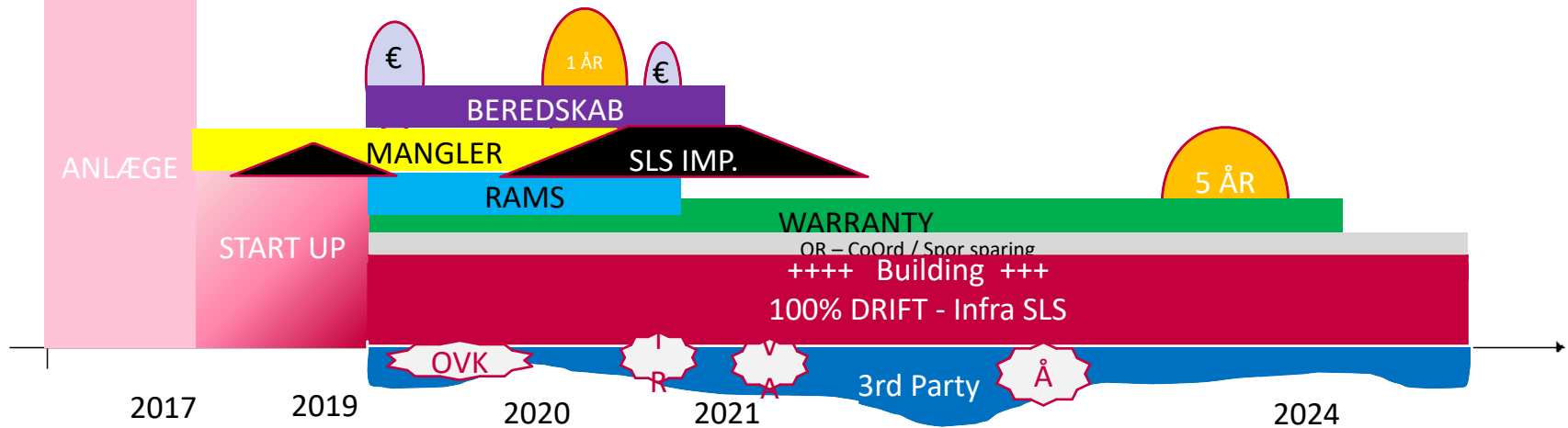
RESSOURCES



RESOURCES (+ BUDGET) : REALITY

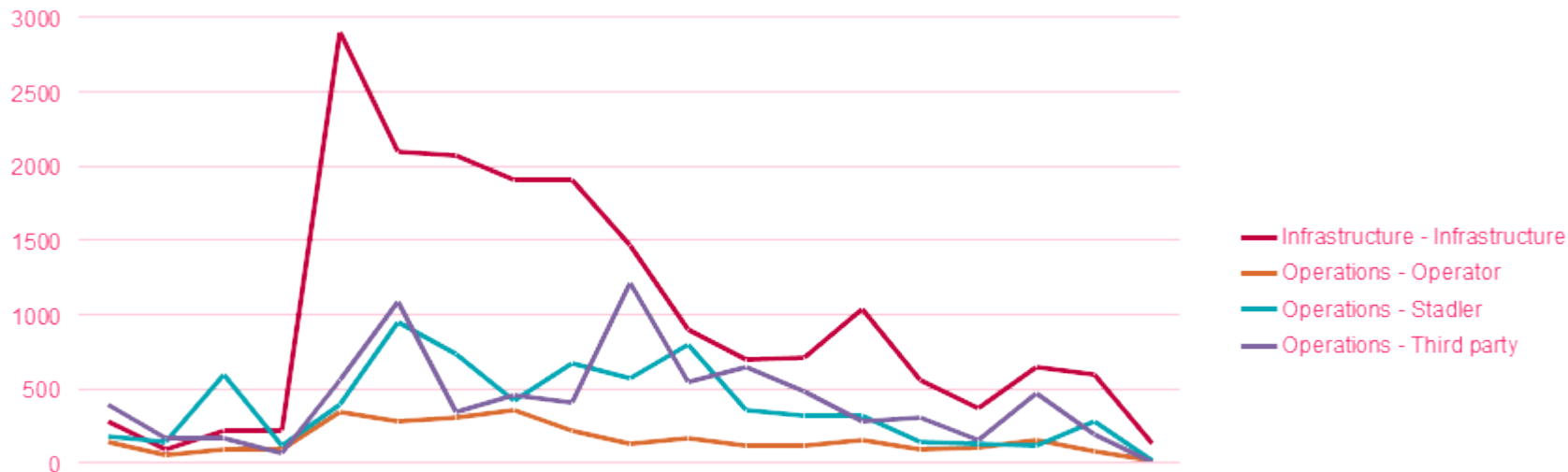


RESSOURCES



START UP – BE PREPARED !

START UP PHASE – Grenåbane opened 1-5-19



Failures	Count of Failures	Sum of Delays and Cancellations
I-Fejl på overkørselsanlæg	9.36%	10.79%
A-Fejl i køreplan (Midttrafik)	7.95%	8.44%
M-Materielle fejl under kørsel	5.86%	7.96%
I-Fejl på spor, som ikke kan befares (skinnebrud, defekt sporskifter olign.)	3.51%	5.36%
I-Fejl på signaler og sikringsanlæg	3.06%	5.23%
F-Passager forhold mange passager	5.52%	5.11%
I-Fejl på kørestrøm	4.24%	4.82%
F-Andet	3.31%	4.69%
M-Vedligehold kan ikke levere nok antal letbanekøretøjer	1.92%	4.51%
I-Fejl på ATS	1.85%	4.22%
M-Fejl på ATP - mobil anlæg	2.88%	3.29%
F-Vejr forhold; Snestorm, orkaner, oversvømmelser, .	1.39%	3.08%
F-Påkørsler på vej mm.	1.36%	2.96%
A-Lyskryds, manglende eller sen detektering	19	4.63%
A-Andet		1.62%

”UGLY” - COULD DO BETTER

- Education of Local Community and 3rd Parties
- Construction Issues
- Interface Management
- Reality

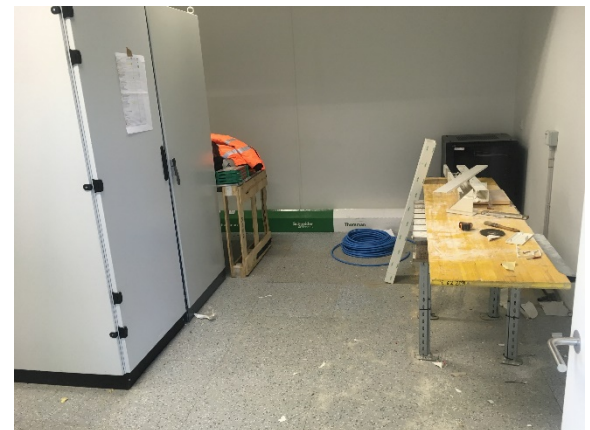


3RD PARTY EDUCATION



CONSTRUCTION

- Need to understand WHY !
- Supervision, Supervision

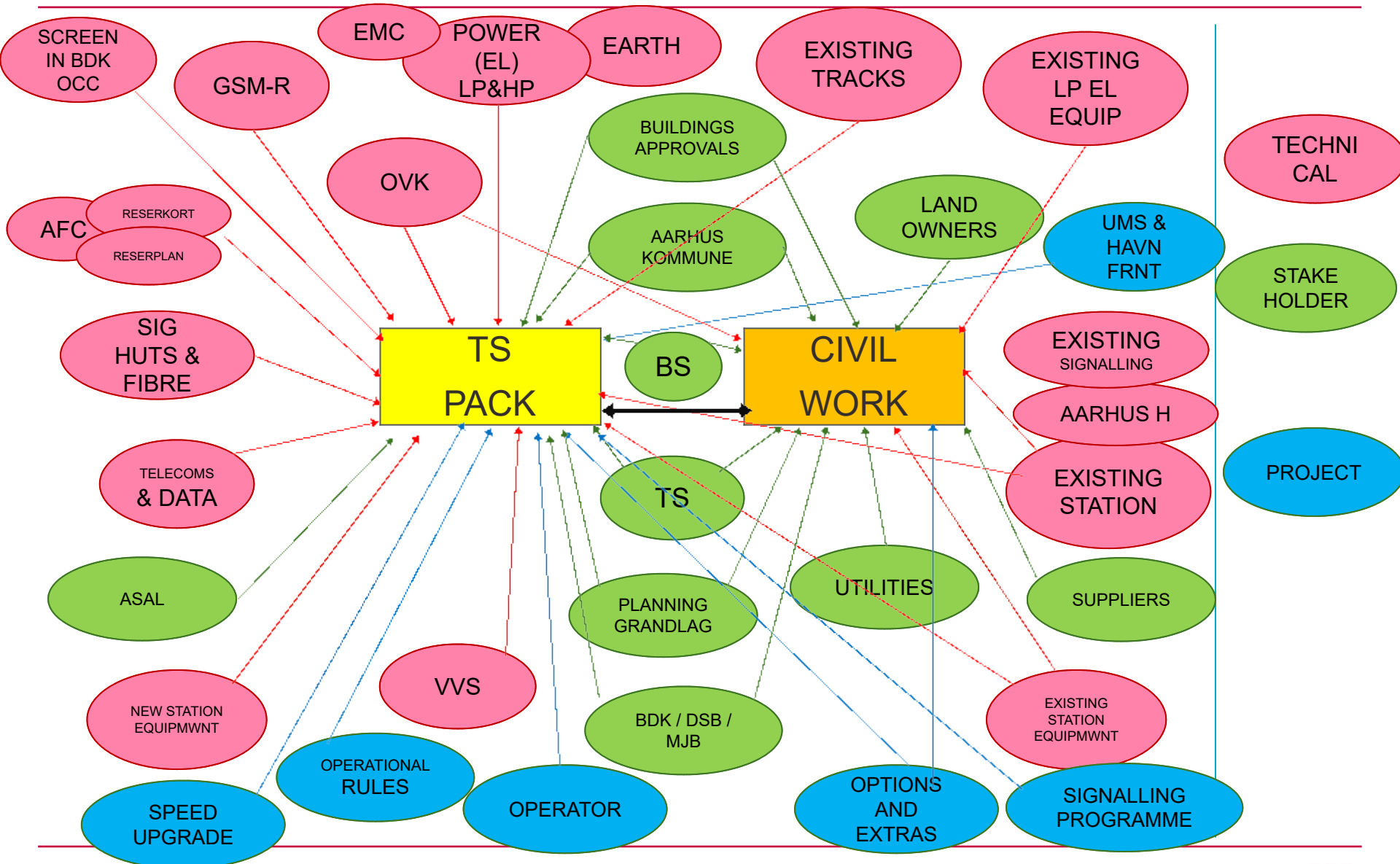


SYSTEMS INTEGRATION

OWNERSHIP



INTERFACE MATRIX – ITS COMPLEX!!!!!!!



INTERFACE MANAGEMENT IS LIKE TEENAGE SEX:

***”Everyone talks about it,
Everyone thinks they know how to do it
Everyone thinks everyone else is doing it
So every one claims they are doing it ?”***

“Happy Days”



Sh!t Happens



QUESTIONS / REFLECTIONS