Key enablers in the transition towards the ZE Construction site

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GMB
uitdaging verbindt

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Nice! A black millwing is easier to see for birds.....

First mobile wind turbine for autonomous power!

Programme today

- Why is the Netherlands leading the way?
- ENI approach and structure
- Key enablers of the ZE transition
  - Disconnect the two transitions
  - Understand your changing cost drivers
  - Clients of this world: change your roles
  - OEMs to the front please


Development requirements for ZE construction equipment & markets

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Nonetheless, there is no better way towards the necessary transition towards a more sustainable sector apparent today.

The Netherlands, 15-07-2024

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ENI today is an ecosystem of ~45 front runners from throughout the whole value chain.

Working to realise the zero-emission construction site by 2026 in the infrastructure market

Focus on heavy duty machines >125kW.

https://www.emissieloosnetwerkinfra.nl/english

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Read it back later:
"ENI development requirements paper"

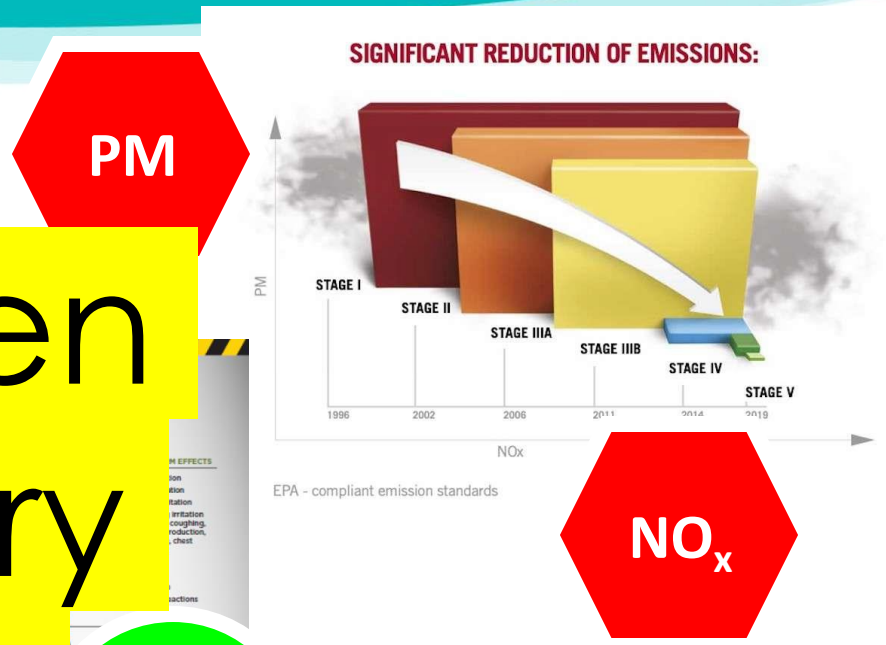
The reasons for the Dutch urgency

- The world is changing very quickly and radically: 'Urgenda' case 2014, Fridays For Future, CO_2 tax, **N 2019 & 202**

- **Zero emissi** Climate + Air Health & Safe The alternative in

The business case and license to operate for diesel machines is getting worse by the day.

This will happen in your country too, just later.

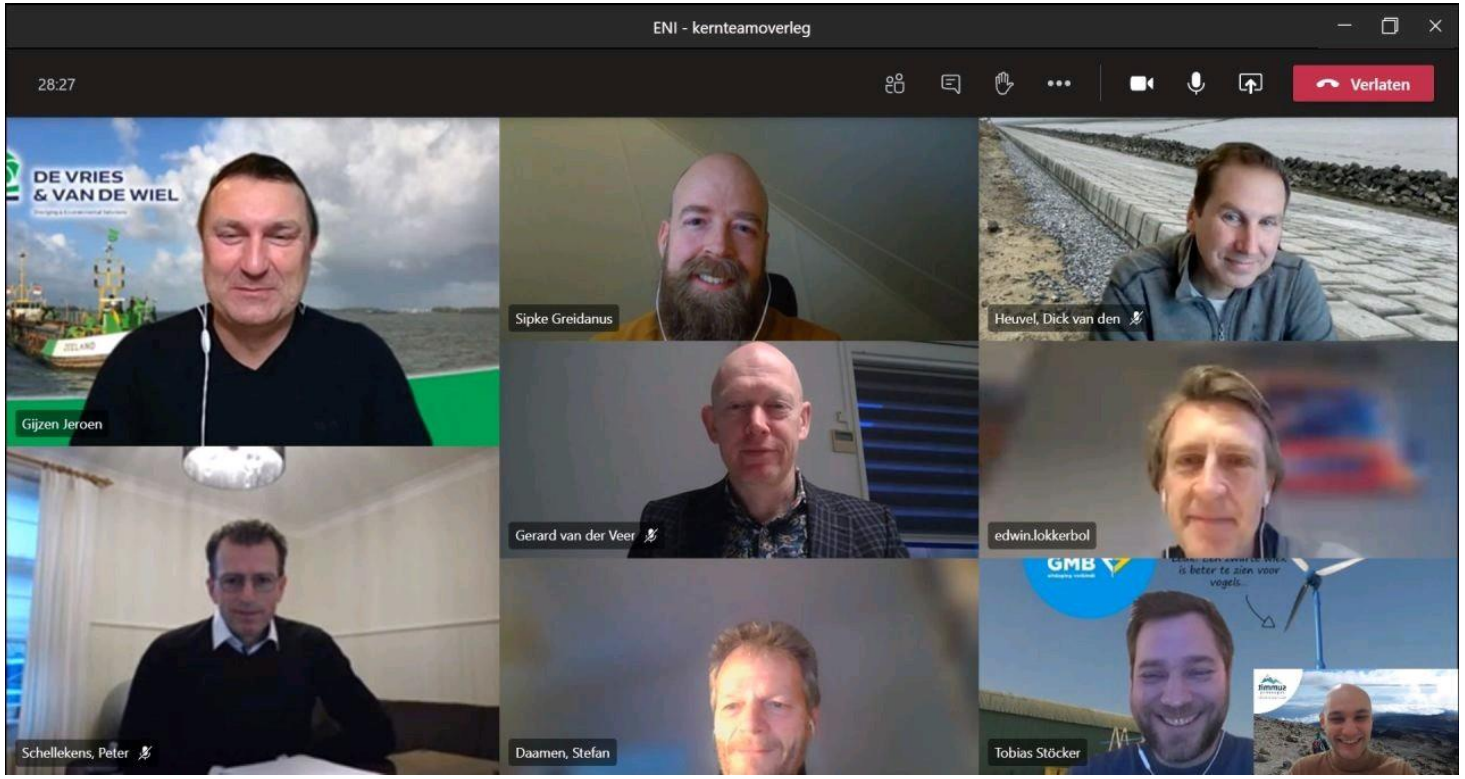


NOISE

ENI: How it started in 2020

- 3 companies
- 1 tender promise
- 9 motivated people
- 6 years to go

- Mandate to make things happen for the sector
- Trust, time and target



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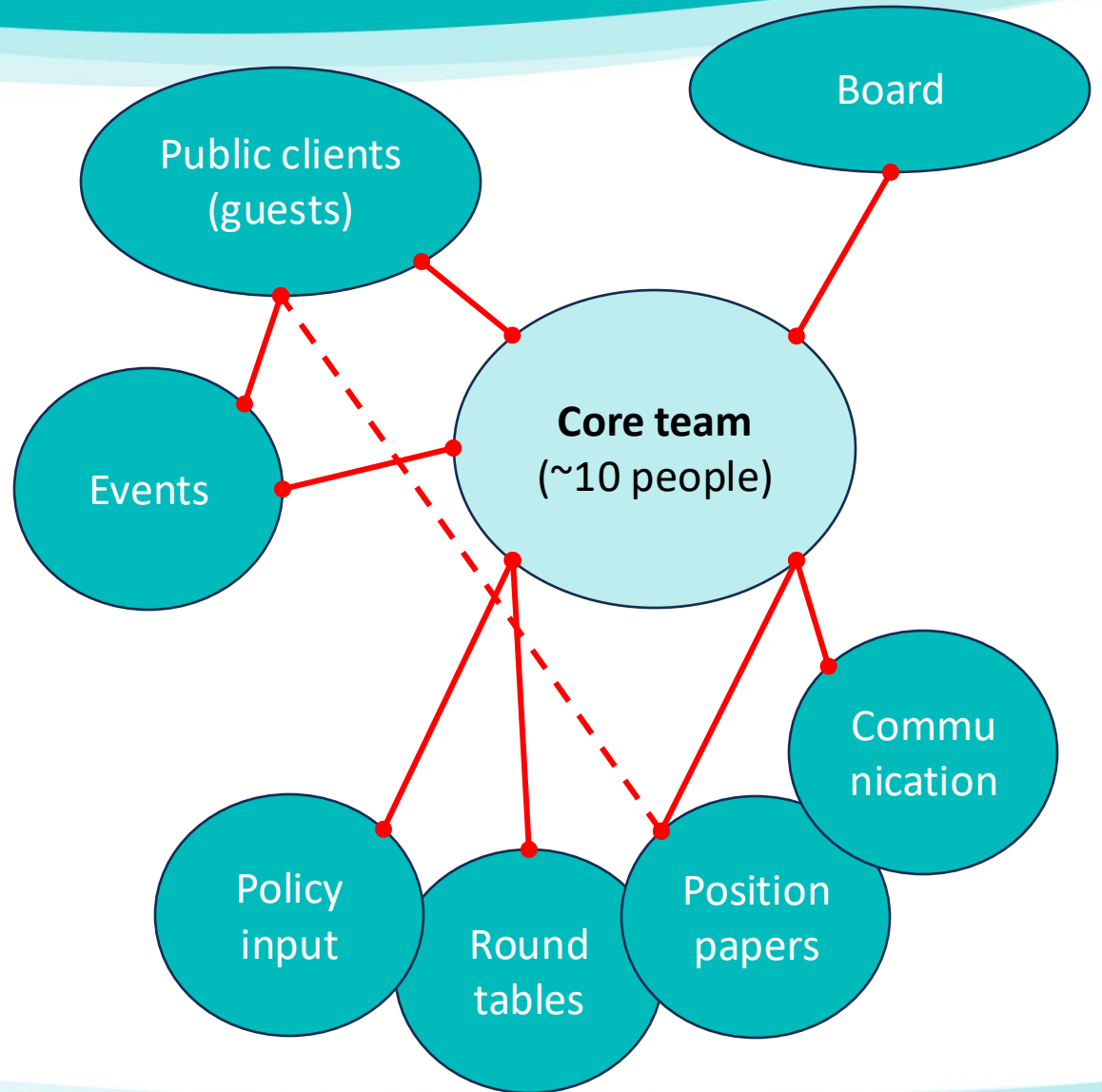
ENI approach & structure

- Independent foundation open to front-runners only
- Financed through membership fee
- Proactive knowledge sharing and investing in ZE are mandatory

- Public clients are guests at some events and equally contribute to relevant output

- Tackling **technical**, **finance**, **contract, safety and energy questions**.



Technology transition is overdue

1 liter of diesel = **9.96 kWh** energy content

1st generation electric machines are designed for an average of **4 kWh per 1 liter** of diesel consumption (= 60% efficiency gain! Combustion is better at heating the outside air than producing work)

Electric machines work great, troublesome only in conjunction with charging.

Estimated quantity of heavier construction machinery in NL = from **50,000 pieces** up to 115,000 / about **420 heavy ZE machines** in operation today

Dutch SEB transition pathways provide for **100% ZE tenders by 2035 (hopefully)**.

Key enabler 1

GMB's electric 30-ton crawler excavator (Hyundai)

1.) Disconnect the technology transition and the energy transition.

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Biogas power generator:
0% fossil CO_2, 70% less NOx,
99,9% less PM

Generators working on local biogas from wastewater treatment

"An electric machine behind a modern diesel generator is still cleaner than a diesel machine. More importantly, I can replace the generator tomorrow, the machine only after 10,000 hours."

Key enabler 2

2.) Understand the change in cost drivers.

Zero emission construction

- Electric machines
- Charging Infra/Energy Logistics
- Method / planning / design / productivity
- Energy transition on- & off-site
- New discipline and rules
- Data and monitoring are ‘must-have’

Key enabler 2

Understanding the changes in cost drivers that are now depending on circumstances on the jobsite:

- **Cost components of a working day:**
  - Machine rate *(one-off decision based on TCO)*
  - **Energy logistics**, literally transporting energy or machines for the sake of charging or refueling (no, not diesel)
  - Costs for charging or refueling infrastructure **equipment** and collection of energy and usage data
  - Possible loss of **productivity per workday** of machine and work crew

Images and data courtesy of Heijmans

Lesson learned Heijmans A1 Highway

stuks	Materieel type	Merk	Batterij capaciteit	T Batterij capaciteit
2	Rupskraan	Liebherr	390	780
2	Verdichtingswals asfalt	HAMM	110	220
4	Verreiker	Manitou	130	520
2	Tandemtrilwals	Bomag	20	40
2	Tandemtrilwals			
2	Verdichtingswals grond/pui			
1	Rupsgraafmachine			
1	Mobiele graafmachine			
1	Mobiele draadkraan			
2	Shovel			
1	Shovel			
1	Shovel	Volvo		
2	Batterij container	Smartgr		
2	Batterij container	Dens El		
1	Aandrijfunit	Fundex		
1	Kernboorwagen	Burtec	31	31
1	Kleefwagen	Volvo	130	130
20	Vrachtwagen	Volvo	540	10.800
6	Torenkraan	Vicario	15	90
Totaal				**18.157**

Think big from the start!

- 15 km of A1 highway reconstruction and expansion
- Now 52 pieces of ZE equipment in use
  - 16 different brands
  - 14 charge points of all sorts
  - Charging ~ 12 MWh / day

Explained: Enablers 1 and 2

A video explaining the technology and energy transition: https://youtu.be/tt3ofXqLm7s

A video explaining the changing cost drivers of construction works: https://youtu.be/GA9Ln8FAM1M

Key enabler 3

3.) (Public) clients: change your role in the market!

Assume different roles and utilize your:

- Buying power
- Policy power
- Connections

Create predictability:

- Clear, binding ZE growth path towards 100%
- Create uniformity & scale with other clients
- Reserve budget (you are internalising environmental and health costs!)
- Play an active role on charging
- Cooperate with your contractors

Key enabler 4

4.) OEM machines need to outperform conversion models

Reliability in operations:

- **Full working days** must be guaranteed to reliably plan and calculate costs. “We cannot always rely on charging during lunch…”
- **Trouble shooting** involves multiple parties, must not become a ‘blame-game’

Compatibility across platforms and time:

- Batteries, machines and charging equipment must function seamlessly in a **multi-brand environment** (“tested against ISO 15118 standards”)
- **Data** must be extractable for third party monitoring software
- **Design:** Future generations of batteries need to fit into current machines
- **Software must not make hardware obsolete**: backwards compatibility is key

Key enabler 4

Future proof machines:

- **A battery is a machine in itself:** separate them from the machine
- **Need to sustainably manage the materials** transition at the same time

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More details can be read in our "ENI development requirements paper"

ENI has developed more tools available on www.emissieloosnetwerkinfra.nl/english

Many tools and insights on our website available for free.

Like our OEM webinar of 2023:

ENI

Let’s talk… and act.