

Leap To Zero conference report

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INTRODUCTION

A growing number of countries is developing policies and measures to meet the Paris climate goals and similar objectives in the field of circular economy, biodiversity and air quality. In every sector, not only governments but also private parties are trying to find their way to contribute to an environmentally rich, clean and healthy earth. The construction sector has a significant impact on climate and nature and is developing measures to reduce its adverse effects. One of the ways to achieve this goal is the transition from fossil driven equipment to emission free machines. Replacing diesel machinery by electric equipment will significantly reduce emissions of greenhouse gases, nitrogen oxides and particulate matter.

Already in Europe several countries are developing policy objectives in this area. The Leap To Zero Conference on 28-29 February 2024 in Utrecht, Netherlands, was the first meeting of committed authorities from six European countries and EU representatives to find common ground, exchange views and positions on the subject and explore the best way forward. The Conference brought together frontrunners like Norway (Oslo) and the Netherlands with parties already on the way (England, Sweden) and partners looking for the best way to make a start with the transition to clean and emission free construction equipment (Belgium, Denmark).

The Conference and the preceding site visit to a big road reconstruction project where electric construction equipment is already deployed appeared to be a valuable exchange of views and an inspiring opportunity. The participants expressed their hopes that the event will appear to be the start of a long term international collaboration and will indeed mark the leap to zero emission construction sites.

PART ONE - SITE VISIT



A1 APELDOORN-TWELLO

The A1 highway is part of the E30 highway, connecting Cork to Omsk. On a local scale this road connects Amsterdam and the Eastern part of the Netherlands to the road to Berlin. The highway has been constructed in the late 1960s-early 1970s. The project consists of a 55 km highway expansion between Apeldoorn and Azelo for a budget of \pm €500 million. The expansion between Twello and Azelo has been realized between 2019 and 2021. The project currently in realisation focuses on the reconstruction of the last 15 kilometres between Apeldoorn and Twello. The budget for this part of the project is €150 million. The project includes the upgrade from 2x2/2x3 lanes to 2x3/2x4 lanes, the construction of a parallel highway between interchange Beekbergen (A1-A50) and exit Voorst and the partial reconstruction of interchange Beekbergen. The contractor who won the tender is Heijmans Infra. Planned completion for April 2025.

The site visit started with introductory talks by Jasper Middelkamp, Technical Manager of the Rijkswaterstaat project team, and Aafke Oude Avenhuis, Sustainability Manager at Heijmans Infra. The group was shown around at several project work sites where some of the over 50 electrical machines could be seen in real life working conditions. Furthermore, explanations were given on the charging solutions developed by the contractor.

JASPER MIDDELKAMP, RIJKSWATERSTAAT

Sustainability in contracts

Rijkswaterstaat uses its role as a client to promote sustainability in projects and encourages a transition towards zero emission, climate neutrality and circular building. For this project, a regular contract has been adapted to the specific scope and requirements of the project.

Contracts can be used to secure a minimum level of sustainability by setting specific requirements. Next to that, the procurement challenged the market by 'rewarding' sustainability in the Environmental Cost Indicator (ECI/MKI) as part of BPKV (Best Price Quality Ratio). The ECI is a monetized way of indicating the impact of a project on the environment. BPKV is a way for the selected companies to distinguish themselves by earning fictional deductions, based on the rating of the offer of those companies. A higher BPKV increases the chance to win the tender.

Tender

The procurement consist of several phases. After the registration phase, the selection phase started. As part of this phase, the registered (five) contractors had to submit a product that focused on reducing greenhouse gas emissions from the (construction) equipment, vehicles and machines to be used on the construction site and in construction logistics. Goal of this submitted product was to stimulate the use of zero emission equipment. Next to this product, a calculation of the ECI of a prescribed case had to be submitted.

To ensure that the submitted products during the selection phase would not contain empty promises, contractors had to promise that they incorporated the selected product in the definitive tender products.



After the selection phase, the procurement continued with the dialogue phase, in which the remaining three contractors were challenged to submit a definitive tender product in which sustainability consisted for 42% of fictive deduction by BPKV. Sustainability was divided in three categories: the total ECI of the project, the amount of asphalt that was recycled and a plan of approach in which the sustainability measures that contribute to the decrease of ECI were explained in detail. Other BPKV subjects were Risk Management and Accesibility and flow.

The contractor that finally earned the contract was Heijmans Infra.



Lessons learned tender phase:

- The availability of zero emission equipment is a limitation (for now). A zero emission building site might be possible by adding additional construction time (in the current situation; this may improve over time).
- At the moment, the Environmental Cost Indicator scores for fully zero emission equipment and for equipment powered by renewable diesel (HVO100/biodiesel) are roughly the same. In other words, the expected environmental advantages of zero emissions are not reflected in the ECI score. This is partly due to the fact that current power generation still relies heavily on fossil fuels. A larger difference between ECI for zero emission equipment and HVO100 equipment will stimulate a transition towards zero emission equipment.
- ECI introduces a focus on reducing material (like concrete and asphalt). To improve the transition to zero emission equipment it has to be specifically mentioned as part of the tender product.
- Contractors are willing to invest in the transition to zero emission equipment, but there is too little certainty about the use of zero emission in other projects. This introduces a risk for the contractors for depreciation of equipment.



Lessons learned realization:

- The production of zero emission equipment is just starting up, which leads to several problems that occur in every transition:
 - Expensive purchase;
 - Teething problems because of new technology;
 - Some equipment is built as a conversion of existing (diesel) machinery;
 - \circ $\;$ Battery capacity per charge is not enough for one working day.
- The biggest challenge is the lack of production of zero emission machinery in factories. Currently there is a limited availability of zero emission equipment worldwide.
- Logistics, planning and work flow have to be adjusted when using zero emission equipment. However, zero emission equipment is able to perform as good as traditional machinery. Further investigations are expected to eliminate much of the difficulties that originate from being a first adapter.

AAFKE OUDE AVENHUIS, HEIJMANS INFRA

Currently, about 50 pieces of electrical construction equipment are used at the construction site, almost half of all the machines. Such numbers allow for good learning experiences with regards to the challenges setting up emission free construction sites.



Learnings demand of electricity

The energy demand of zero emission building site is enormous. A standard Dutch household of four persons uses 10 kWh each day and a car 60 kWh for 300 km. Project A1AT uses 18.157 kWh each day when all zero emission equipment is used, which is equal to energy for more than 1.800 households!

Multiple ways are implemented during the construction to facilitate the charging needs. On top of the power provided by traditional grid operators extra charging sites in the private sector were needed for this demand for energy. In the case of project A1 Apeldoorn-Twello the constructor makes use of the local Attero waste treatment plant. In order to charge the material pieces in time for the next day, fast chargers are needed. The charging of equipment on site affects several aspects like the size of the construction site, security, insurance, safety, grounding and uniformity.



Learnings purchase of ZE equipment

- Converting machines is currently an important way forward, but not desirable for the long term.
- Scale up of production is needed for factory-fabricated equipment

Learnings working with ZE equipment

- Many malfunctions (like cooling)
- Increased weight (less payload and heavier flatbed transport)
- Capacity problems (no 8-hour operation)
- Impact people's behaviour on the project
- Dependability machine (operator / foreman / project)
- Unproductivity (interim charging)
- Keeping attention to the people working with it
- insight into energy consumption
- Battery capacity (15 % upper and lower limit)

Learnings in terms of project impact

- Costs for energy logistics are high (battery container, truck average 4 hours per day transport, morning pickup and afternoon return);
- Additional authorized personnel is needed to work with electrical equipment;
- In order to manage the increased energy demand, an extra employee has been appointed as energy logistics coordinator
- Huge varieties of energy logistics are applied on site.
- The public charging possibilities for trucks appear to be limited
- There are technology bottlenecks like the speed of charging and differences in systems (each with its own software)

PART TWO – EXCHANGING VIEWS



OPENING INTERVIEW ROGER MOL, CHIEF SUSTAINABILITY OFFICER FOR RIJKSWATERTAAT, AND FLEUR DE BRUIJN, PROGRAM MANAGER SUSTAINABLE LOGISTICS, MINISTRY OF INFRASTRUCTURE AND WATER MANAGEMENT)

At the opening of the conference two representatives of the Dutch government appeared on the stage to express the commitment of the Netherlands with the goals of the Conference. The organization was happy to welcome in a 15 minute interview Roger Mol, Chief Sustainability Officer for Rijkswaterstaat, and Fleur De Bruijn, program manager sustainable logistics at the Ministry of Infrastructure and Water Management. Both play a key role in driving the transition programs in the Netherlands, both from a policy level and an executive level. The interview was conducted by Dik de Weger, Rijkswaterstaat program manager for transition pathway for road, dike and railway equipment.

Can each of you briefly explain who you are, the program you are currently leading and why it is important that we work on these issues?

Roger: I am Roger Mol, Chief Sustainability Officer at Rijkswaterstaat, and I am in charge of the program that aims to transform Rijkswaterstaat into a climate neutral, zero emission, clean and circular organization in 2030. It is an important mission. First of all because of our international commitments to reduce the impact of climate change. It is clear that we need to take global action if we want to limit the devastating impact that climate change has on this world. The Netherlands is therefore committed to achieve the goals set in the Paris climate agreement. The construction sector – and Rijkswaterstaat as the largest road authority in the Netherlands in particular - can contribute significantly to this goal.

Another – equally important - reason why this program is so important is the protection of our living environment. The Netherlands is a small country with limited space. Emissions from construction activities have a direct impact on a clean and healthy living environment and on biodiversity. By transitioning towards clean and emission-free construction, we contribute significantly to a healthy living environment and resilient biodiversity and at the same time enable the construction sector to keep building the Netherlands.

Fleur: My name is Fleur de Bruijn, Program manager of Sustainable Logistics at the Ministry of Infrastructure and Water management. This program aims to reduce emissions in the mobility sector that involves the use of vehicles within the logistics sector, like heavy duty vehicles, vans and also, mobile machinery. We are facing <u>ambitious emission reduction targets</u>, for our climate, but also to create cleaner air for the health of our inhabitants. And for the Netherlands, the extra challenge of a nitrogen crisis we are facing. The necessity getting more sustainable this has only grown over the years.

For the construction sector there is still a lot of potential to become more sustainable. In the program of clean and emission free construction equipment we developed a road map towards 2030 and further to make construction equipment¹ more sustainable and phase out fossil fueled machines. In partnership with representatives of the sector, public

¹ The program focuses on: vehicles, machinery and vessels used in the construction sector.



authorities, knowledge institutes we have established a roadmap to achieve a significant reduction of carbon emissions. And some of you might know, a total of 45 parties committed to this roadmap, by signing an agreement on the 30th of October. Working together we will accelerate the uptake of clean and zero-emission construction equipment in the Netherlands, we will challenge ourselves to achieve this transition for our future. To stimulate the transition and help the various stakeholders, we have 1 billion euro available (up to 2030) for the program which is divided over several instruments, like a subsidy scheme, pilots and an innovation program. When I look at the market I see lots of activity. Serious steps are taken by contractors and clients. That is something to be proud of.

We still have a long way to go, but I feel that we have really started and build a good foundation with each other to successfully continue on this transition.

Why is it important for you to be here today? And what are your expectations of today's event?

Roger: This is such an important event because we can't do it alone. Rijkswaterstaat might be a big player in the Netherlands, but we are relatively small in an international context. Only by working together with other organizations like yourselves we can bring the market in transition and make the zero emission construction site a reality. A major challenge that we currently face is the lack of availability of electrical construction equipment. OEM's will need to scale up their production of materials, but they will only develop if the market is large enough. The Netherlands on its own is just too small to drive this development. International cooperation is key. We need each other and have to work on demand aggregation.

Fleur: To add to that: Working together is essential to exchange knowledge and experience. The use of zero emission equipment in construction is relatively new. We are gaining in experience, but a lot of knowledge and experience still need to be developed. Sharing these insights with each other could really accelerate the transition and improve our understanding of existing challenges such as charging infrastructure. I am very pleased to see that other countries also see the potential in this sector. I hope we can really enhance the network around this topic today, and more importantly, in the upcoming months.

Roger: I have high expectations of today's event. First of all, we will learn a lot from each other. We will learn where everyone stands in the transition towards zero emission construction sites and what challenges everyone faces. But more than that, I hope today will kick start a fruitful partnership. By joining forces we will accelerate the transition towards zero equipment construction sites.



NETHERLANDS

DIK DE WEGER, RIJKSWATERSTAAT

Goals and policies

The Netherlands have formulated several policy objectives that drive the transition towards zero emission equipment:



1) Mitigation of climate change
 → reduction of greenhouse gas
 emissions (CO₂(eq))

 2) Conservation of biodiversity
 → reduction of nitrogen emissions (NO_x, NH₃ etc.)

3) Air quality improvement \rightarrow reduction of particulate matter emissions (PM₁₀ etc.)

4) Occupational health → reduction of carcinogenic diesel exhaust emissions at the jobsite

In October of 2023, a large portion of the public and construction sector committed to striving for zero emission by signing the National Agreement Clean and Emission Free Construction Sector. The agreement provides clear steps for phasing out fossil fueled equipment.

The Dutch government has set aside a substantial financial package until 2030 to drive the changes:

- € 370 mln subsidies for purchase or retrofit of clean/ZE equipment
- Additional project funding € 480 mln covering clean/ZE equipment deployment costs, made available through projects of state, regional and local authorities
- Innovation budget: € 50 mln
- Charging infrastructure development: 120 mln

Pilot projects and learnings

The Netherlands is moving from a pilot phase towards full implementation of zero emission equipment by commissioning authorities through their procurement procedures.

Procurement methodology used by Rijkswaterstaat foresees in contract requirements and award criteria, the latter measured as an Environmental Cost Assessment (Milieu Kosten Indicator, MKI) score. Moreover, Rijkswaterstaat also has frontrunner projects that set additional requirements on the use of zero equipment materials.



Challenges in the leap to zero

- Availability of zero emission equipment in the market slows the transition
- Charging infrastructure and the availability on the net is a big challenge currently in the Netherlands



NORWAY

TINA KNUDSEN, NORWEGIAN PUBLIC ROAD ADMINISTRATION

Goals and policies

Norway has multiple policies in place that are aimed at making the transition towards zero emission construction equipment:

- **Carbon pricing** Gradually raising the carbon tax until it reaches NOK 2,000 (EUR 200) by 2030
- Mandate for biofuels quotas in fuels sold to off-road machinery From 1st of January 2023 10 % advanced biofuels. Gradually raising to 28 % in 2030
- **Sustainable public procurements** Climate and environment score 30% in all public procurements from 1st of January 2024
- Enova Accelerate innovation and new technology In 2023 approx. 400 mill. NOK to reduce emissions from construction sites. (273 mill. to zero emission construction machines and 125 mobile charging devices for onsite charging
- Klimasats Support to municipalities all over Norway 2016 Today: 2038 projects (not only construction sites)
- **Projects to reduce emissions from the transport sector** New National Transport Plan (NTP) Q2 2024

The Norwegian Public Roads Administration (NPRA) are moving from a pilot phase to full implementation within the economic framework of the projects - Roadmap Oct 2023. From 2027 NPRA will demand full zero emission sites in all contracts with a gradual escalation from now. Biofuel is not rewarded separately.

Pilot projects and learnings

In Norway there is a need for heavy duty equipment due to the mountainous terrain. Different types of equipment have been used and tested in pilot projects such as electric crushing mills and electric loading of the crushing works, a 52-ton excavator, electric tunnel drilling rig, electric machines for injection and pigging, smaller excavators, emission-free trucks, battery containers, hydrogen container and electric front loaders.

Extensive work has been done with regards to risk assessments on battery electric vehicles (BEV) in tunnels. This was completed as part of the pilot - E39 Rogfast. Conclusion is that there seems to be little, or less risk in BEVs as of conventional machines:



- Lower probability of fire in batteries than in diesel engines
- Slightly, but not very much longer duration on fires from batteries
- Harmful gases both from fossil fuel machines and BEVs



- Need for project-specific risk analyses and mitigation measures to be planned
- Efficiency is still not good enough for the very long and deep tunnels

Challenges in the leap to zero

- High investment costs
- Little experience with workload of heavy ZE machines availability Identified challenges
- In need of series production of heavy ZE NRMM
- Motivation and willingness to change the industry
- Fair competition even for smaller entrepreneurs
- Planning for power at the construction sites less problematic than expected, but needs to be included in early stages of a project.

PHILIP MORTENSEN, MUNICIPALITY OF OSLO

The municipality is in the lead with net zero emission construction. The overall goal for the city is to reduce greenhouse gas emissions 95% by 2030, compared to $2009.^2$

All planned procurement shall be based on the goal of becoming a zero-emission city by 2030. Oslo procures goods, services and works for roughly 3 billion Euro annually, with an investment budget of about 2 billion Euro for 2023. The city uses a combination of minimum requirements and tender award criteria to promote zero-emission construction.



Figure 1: How tender award criteria is used to promote environmental performance in construction projects commissioned by the city of Oslo.

By January 1^{st} 2025 all construction work commissioned by the municipality should be performed with zero emission construction equipment.

Share of work at the municipal construction sites in Oslo in 2023:

- 2% Fossil fuels
- 21 % Sustainable biofuels
- 77 % Zero emission

² The first year with consistent emissions inventory reporting for the municipality of Oslo.



SWEDEN

MAGNUS LINDGREN, TRAFIKVERKET

Trafikverket is responsible for long-term transport system planning for roads, railways, shipping and aviation and responsible for construction, operation and maintenance of State roads and railway.

Goals and policies

There is a National goal to create 70% reduction in carbon emissions in the domestic transport sector in 2030. This includes Non-road Mobile Machinery (NRMM) 2030.'In 2045 a net zero must be reached.

The Transport Administration follows the following roadmap to achieve this goal:

- 2020: 15 percent reduction (compared to 2015)
- 2025: 30 percent reduction (compared to 2015)
- 2030: 60 percent reduction (compared to 2015)
 - Renewable fuels in all vehicles and construction equipment
- 2035: 80 percent reduction (compared to 2015)

Fuel accounts for 56% of greenhouse gas emissions in the Swedish Transport Administration's measurements for basic road contracts.

Pilot projects and learnings

There is limited experience with single equipment in Sweden and no experience with whole sites that become zero emission. A lot of equipment is owned by Swedish SME constructors in contrast to for example the Netherland

A few learning from projects:

• Setting up good contract requirement to achieve zero emission goals is a challenge. You get what you inspect, not what you expect. Keep it simple and preferably digital reporting and data collection

Challenges in the leap to zero

- Business model
- Procurement strategy
- (Electric) Energy supply (especially the on-site energy logistics)

DENMARK



DITTE DAHL MATHIASEN, THE DANISH Road DIRECTORATE

Goals and policies

The Climate Act sets a target to reduce Denmark's emissions by 70 percent in 2030 compared to 1990 and climate neutrality by 2050. The aim for climate neutrality is afterwards advanced to 2045. The 2023 climate program describes 2 methods for the industrial sector: A new green broad-spectrum tax reform and support/subsidies for private institutions energy effective initiatives. There are no targets related specific to zero emission construction sites



Incentives to transition is thus foremost given through taxation on diesel Private institutions (contractors) can also attain subsidies to conversion or replacement of high emissive fueled machines to less or zero emissive. The size of the subsidy is calculated from the CO2 reduction and is also dependent on the size of the company.

The Road Directorate has to work within the economic frame given in the government's 2035 infrastructure plan. Expenses for ZE-NRMM are not included in the budget for projects, which makes driving a transition towards zero emission equipment a challenge.

Within the last year the Danish National Centre for Public-Private Sector Innovation has facilitated a collaboration between public buyers to create demand on ZE-NRMM towards the machine industry. 14 public buyers (municipalities and regions) signed a statement of intent to request for ZE-NRMM in forthcoming projects. In this collaboration CO-PI contribute with:

- A total cost of ownership calculation
- A shadow price calculation of carbon reflecting the social cost of a total transition to ZE-NRMM if we were to make a complete transition in the years 2028-2037
- Knowledge sharing between public buyers

Pilot projects and learnings

Experience with zero emission equipment is limited. In 2023 The Danish road directorate had its first two pilot projects, where small electric machinery was part of the tender.



<u>Pilot project –Parking ground:</u> Contractors would receive a deduction in the tender price if they used ZE-NRMM in the project. The project only delivered a minimal use of ZE-NRMM and the contractor who won the contract did not offer to use ZE NRMM at all. Availability of machinery for the project was a bottleneck.

<u>Pilot project –Renovating a sidewalk</u>: It was a requirement in the contract that the contractor could only use ZE-NRMM. The client has a new role in the project, in terms of accessing electricity in the project. The project is ongoing, and we are starting to get feedback and data from the project. The machinery in the project is all > 5 ton, and consist of a digger, a few loaders and a custom-made tile-suction lifting machine.

The Danish Road Directorate expects large scale electric machinery to be available in Denmark, but primarily as renting. The Danish Road Directorate's short-term goals and plans:

- Set up a strategy for implementing large ZE-NRMM on our projects as they become available. Possible Project specific requirements related to the given electric availability at the given site.
- Making standardized tender models and competition parameters for using ZE-NRMM
- Using pilot projects to drive the transition and learn what's possible.

Challenges in the leap to zero

- <u>Electricity infrastructure</u>: accurate dimensioning of the electricity need within the individual projects and establishing the needed effect and outlet in time is an issue.
- <u>Availability of machinery</u> that is not too expensive. Only small equipment is OEM, larger equipment is only available as retrofit, and no company that we know of enables retrofitting in Denmark.
- <u>Financing</u>
 - Everyone waits for someone to take the initiative to drive the transition.
 The contractors, the clints, politicians, the machine industry



NORDICS

Helle Redder Momsen, Nordic Sustainable Construction

Nordic Sustainable Construction is a program under the Nordic Council of Ministers, which contributes to the Nordic Vision 2030 of becoming a sustainable and integrated region by 2030 in respect to sustainable construction and housing. In September 2023, the Nordic Ministers of Housing and Construction gathered in Iceland and recommitted their commitment to the cause. Specifically on construction they acknowledge the need to reduce the emissions and waste from the construction process, and work towards emission free construction sites. A specific work package under the Nordic Sustainable Construction programme is working to contribute to this aim. The Icelandic Ministry of Infrastructure is responsible for the work package.

The work package focusing on Emission Free Construction sites acts as a knowledge accelerator and publish useful materials to enable standardisation and share learnings. They published:

- *Report Knowledge Gaps and Research Needs.* The report advocates for researchbacked decisions among stakeholders, highlighting the industry's need for extensive research, testing, and pilot projects to drive change.
- Case examples of emission free construction sites³
- Calculator that estimates Cost-effectiveness of Electric-powered Machinery. Tailored for construction machinery. It shows cost of ownership per year, payback time and total saved carbon emissions
- *Newsletters* to promote a Network of Cooperation. On average every other month

Coming up:

- Guidelines plan, procure and evaluate June 2024
- Report on standards, rules and regulations that can be hindering late 2024

Get more details and sign up to the newsletter on their website: Emission-free Construction Sites | Nordic Sustainable Construction.

³ <u>Video: Nordic construction sites aiming to reduce waste and emissions | Nordic Sustainable Construction</u>

FLANDERS, BELGIUM



BART VAN HERBRUGGEN, FLEMISH DEPARTMENT OF MOBILITY AND PUBLIC WORKS

Goals and policies

Belgium has a fragmented political landscape with multiple government bodies (federal, Flanders, Wallonia, Brussels) which have different policies and policy goals. The Department of Mobility and Public Works is responsible for the major transport infrastructure in Flanders (except most rail infrastructure).



The Department of Mobility and Public Works has set goals on decarbonization of its infrastructure works in its internal climate plan These involve the emissions from construction of new infrastructure as well as from maintenance of infrastructure. Next to greenhouse gas mitigation objectives Flanders (Belgium) has, as the Netherlands, NOx reduction objectives.

Centralised policy on emission free construction equipment is still under development:

- There is a subsidy on purchase of, amongst others, electric (mobile) construction equipment heavier than 5 tonnes [SME's: 25% other: 20% (% on extra cost compared to conventional equipment)], electric trucks and truck charging equipment.
- There have been first time experiences with electric equipment on a small scale.
- Larger Pilot projects are being prepared.
- The pilot projects should lead to guidelines for infrastructure project leaders, which can be a step towards binding public tender guidelines.
- Contacts with road building sector / contractors are being started up.

Pilot projects and learnings

Two pilot projects of note:

- The use of Electric dredging equipment Marina of Blankenberge.
- The use of a Sennebogen 653 E Telehandler on the Ringroad of Antwerp

Challenges in the leap to zero

Bottlenecks:

• Convincing all partners that this is necessary and possible



- Ensuring contractors that first movers will benefit
- Concerns about on-site charging infrastructure

Recommendations:

- Site visits for project leaders and contractors
- Raising awareness on climate impact of infrastructure works (and urgency to take action)



ENGLAND

PATRICIA SILVA, NATIONAL HIGHWAYS

National Highways is responsible for planning, designing, building, operating, and maintaining England's motorways and major A roads, known as the Strategic Road Network (SRN), which is the most heavily used part of the national road network, carrying a third of all traffic and two-thirds of all freight. National Highways is about connecting the country and ensuring our network meets customers' needs.

Goals and policies

Departmental goals:

- Corporate emissions net zero in 2030
- Maintenance and construction emissions net zero in 2040
- Road user emission net zero in 2050

National Highways recently published its ambitious Connecting the Country vision that aspires to put roads at the heart of Britain's net zero future. National Highways ambition set out across three horizons, 2030, 2040, 2050 ensures our roads are not just fit for purpose both now and in years to come but achieve high standards for safety making them amongst the safest in the world. National Highways is an arm's length body (ALB) of the Department for Transport. Other ALBs included Transport for London, High Speed 2 and Network Rail. Each of these organisations has been developing plans and timelines for reducing emissions associated with construction programmes. With that in mind, they identified collaborative programmes that address their common challenges. Aim/strategy is to bring together a community of stakeholders (clients, contractors, technology providers, governing bodies, etc.) to agree and drive forwards a vision for diesel-free construction and maintenance sites within the transport network.

According to their framework of action, five priorities are formulated to shape alignment and collaboration:

- Publish Roadmaps
- Identify collaboration efficiencies
- Establish clear intent across supply chain
- Assign accountability
- Standardize format to collect and communicate data

Pilot projects and learnings

High value National Highways pilot project is Lower Thames Crossing (LTC).

LTC will be the greenest road ever built and a pathfinder for low carbon construction. We aim to support the UK reach net zero by 2050:

- Construct Lower Thames Crossing for the lowest practicable carbon
- Develop a local supply chain and use low carbon energy
- Adopt innovation and best practice, and scale up use of low carbon materials and modern methods of construction



- Using hydrogen to replace 20 million liters of diesel (Launched purchase of over six million kilograms of low carbon hydrogen).
- Leave a legacy that enables future projects to achieve carbon neutral construction

Learnings:

- Different types of machinery were used. Positive results.
- Power infrastructure is a challenge. Draining of batteries is an issue. Also, there is an issue with standards. For example, different sets of power cubes available.
- What data to be used to steer on?

Challenges in the leap to zero

- Lack of Industry Standardisation around processes, metrics and definitions
- Clear and transparent Communication mechanisms internally, with partner public sector and wider stakeholders
- The future state of construction sites looks to hold many different Technologies and fuel types, all of which will enable the industry to achieve Net Zero by 2050.
- Critical is that the partners, including central government, move together to achieve tangible change as efficiently as possible, while supporting the complex eco-system within the industry and de-risking adoption for smaller organisations.

MATTHEW BADGER, THE ENVIRONMENT AGENCY

The Environment Agency is responsible the strategic overview of the management of all sources of flooding and coastal erosion, and has operational responsibility for managing the risk of flooding from main rivers, reservoirs, estuaries and the sea.

Goals and policies

The organization has the goal to become a net zero organization by 2050, with 45% carbon reduction by 2030. Construction work and pumping is currently at 64% of their Carbon output, which make measures to reduce carbon a priority.

Pilot projects and learnings

As a lot of the work is done in remote areas, and flood risk management schemes are typically shorter in duration than road construction schemes, establishing connection to the electricity grid is a challenge.

- A lot is done with alternative fuels: hybrid plant, hybrid plant with HVO
- There is experience with electric plants: plug in crawler crange (Bridgwater) and electric dozer (York)
- Gaining experience with non-diesel on-site electricity generation e.g. solar (Canvey) and hydrogen (River Ouse). These work well with batteries.
- Also a lot of experience with electric hand tools: East Anglia

For the coming years the Environments Agency's strategy is to:



- Match project types to good zero emission solutions
- Keep building case studies negativity to overcome
- Be realistic about what is achievable (cost, CO₂, time)



Challenges in the leap to zero

- Planning availability of equipment & infrastructure
- *Unintended consequences* There is a lot you can't plan for.
- *Technology development* which technology/ solution becomes feasible at which time.



EUROPE

FRANC MOUWEN, THE EUROPEAN INNOVATION COUNCIL

EIC stages the entrepreneurial journey as pathfinder and transition accelerator with increasing readiness levels. The goal is to bridge the gap between scientific excellence and market adoption.

In 2024 EIC allocates $\sim \in 1$ bn to Open and Challenge calls by its Pathfinder, Transition, Accelerator programs. Projects in the construction sector seem a good contender for particularly EIC Challenges as the sector is the second sector of the EU terms of GDP and contributed to 8% of all global CO2 emissions. Especially innovation projects that target challenges around on site electricity infrastructure capacity and consumption seem contenders.

DANKO ALEKSIC, EUROCITIES

Eurocities is a network of over 200 mayor European cities working together to ensure a good quality of life for all our citizens

In 2023 a collaboration between public buyers with strong purchasing power was launched to promote the wider use of strategic PP for innovative and sustainable solutions to their procurement challenges, Big Buyer Working Together (BBWT). The initiative is funded by the EU through EISMEA and managed by Eurocities, ICLEI and BME.

BBWT has defined and established 10 CoPs embedded on the Public Buyers Community Platform. One of the COPs is led by the City of Oslo and is aimed at Zero Emission Construction Sites.



Challenges for procuring emission-free works:

• Limited availability of certain large electric NRMM, or limited awareness of it

- Predictable demand
- Optimization of energy
- use and logistics on-sitePower supply & charging
- infrastructureCapacity building of construction workforceOptimized on-site data collection

Part Three – World Café



POLICY DEVELOPMENT

Discussion summary by table host Fleur Malschaert

Policy on more sustainable construction equipment is necessary to create more certainty for the sector for a longer term. International policy could further enhance this, showing a clear shared goal and creating an enabling framework. and can/should include a combination of clear shared targets that show the pace of transition, subsidy/other support, knowledge and technical development. It is important to keep the sector involved in this process. Developing the European market for more sustainable construction equipment, is not only beneficial for climate and clean air, it is also interesting in terms of industrial policy.

However, as the process of changing international policy is long and can dependent on politics and data & practice-supported arguments, (international) collaborations on other aspects should be explored at the same time. Public procurement is an important stimulating force for sustainability, and enabling the transition from bottom-up. An international shared baseline in using public procurement could bring wider certainty for the sector,



and client groups could be connected. Other points of attention are: remove obstructive legislation, tax depreciation and the taxonomy for sustainable activities, the current high investment risks.

EQUIPMENT AVAILABILITY

Discussion summary by table host Marc Bollen

In essence can the availability of equipment be characterised as a 'chicken and egg' situation. Contractors are waiting for investment perspective from public authorities,

OEM's are waiting for sufficient order flow to start series manufacture.

In a transition this means that demand aggregation is key to get out of the doldrums. Important to make this a success is involving all the stakeholders (f.e. grid- and energy network companies). Bearing in mind that EU supported innovation may stimulate the energy efficiency of the equipment, especially related to the hydraulics. A strong and innovative industry back





bone require bold steps with clear and adequate requirements and with focus on the "day after tomorrow". In short an appeal do we do the right things, and do we do them right!

POWER SUPPLY

Discussion summary by table host Marc de Rooij

More and more, power supply becomes an issue in the participating countries. In most countries, the power grids are very similar; a high capacity near power stations and a decreasing capacity towards the end of the grid. However, this situation is different in Norway (many hydropower stations around the country, and an existing high use of

electricity, also for heating) and Belgium (densely populated country, with little variation in the grid capacity). Grids have difficulties with peaks that don't fit the capacity present because of increasing demand (domestic use, EV's, and construction equipment) as well as supply (growing amount of solar and wind power). Many countries are therefore reinforcing their grids. The availability of power is less of a



problem than thought on beforehand. So, adapt your charging to the grid capacity (charging logistics become important). Grid reinforcement is the number one top priority; unfortunately, this will take a while. In the meantime, optimizing charging logistics is a good strategy, and mobile charging facilities are required to provide the increasing demand on the short term.

This poses new challenges to contractors, who now must manage their energy demand (something they never had to). How much power is needed when? And how to provide that?

Energy efficiency then also becomes more important (for instance, hydraulic components of construction machines appear to be very inefficient).



WRAP-UP, CONCLUSIONS AND WAY FORWARD

DIK DE WEGER, RIJKSWATERSTAAT

The Leap to Zero-conference has brought together a group of ambitious authorities that are committed to speed up the transition to zero emission construction sites. Basically, all participants endorse the common goal of emission free construction within a few decades. As to the tempo of the transition and the scope of measures there is considerable variation in the participating countries (e.g. fossil free versus full scale zero emission).

For the short term, the shared ambition is to raise awareness on the subject in the other European countries and to define a number of specific co-operation products to be realized on a relatively small time scale (1-2 years).

The participants agreed on the following actions:

- Enlarge the Leap To Zero-network by establishing contacts with relevant parties that are able and willing to contribute to the Network and its ambitions;
- Creating a small but effective team in order to support the planning, organization and internal communication (contributions on a voluntary basis);
- Organize 1-2 meetings per year during the next 2-4 years, preferably at least one live meeting per year;
- Stimulate exchange of information by making available reports, presentations, footage etc. of relevant developments, projects and investigations, preferably through a digital environment with good accessibility;
- Publish a set of practical examples (best practices) of the use and deployment of emission free construction equipment in real life construction projects from each of the participating countries, as a showcase of the European potential for emission free construction equipment. This will typically include not only different types of equipment but also charging facilities and infrastructure.

It was agreed to organize a follow-up meeting in the second half of 2024. At this event we hope to add other (European) countries to the list of participants; furthermore, equipment manufacturers, suppliers and end users (building companies) will be invited.

It is our sincere hope that the conference will spark a fruitful collaboration to truly make the Leap To Zero!

