Viewers' questions and ENI answers

ENI OEM webinar 20-09-2023

Date: 25-09-2023

Introduction

ENI (Emissionfree Network Infrastructure) is a foundation with 40+ members from the whole value chain of zero-emission heavy duty machinery. About half of our members are construction companies in the infrastructure sector, the other half consists of a.o. equipment dealers, conversion companies, rental agencies, battery and genset producers as well as ELAAD, representing grid operators.

We cooperate pre-competitively to speed up the development and availability of >20 tons Zero-emission (ZE) off-highway machinery and power production units. So far, we estimate a few hundred units to be used in the Netherlands, covering earth movement, foundation, asphalt and transportation.

We cooperate with a wider range of stakeholder like the government, grid operators, public procurement organisations and industry associations. The Netherlands have a higher urgency to go ZE than other countries and we therefore see a substantial head start in such developments for Dutch organisations.

Therefore, we organised this webinar to make the case for an acceleration of development activities from OEM parties. There is an urgent and growing market demand, buying power and technical knowledge that will drive the development and deployment of ZE machines in the coming years like nowhere else in the world.

Read here the questions asked during the webinar and our answers to them.

Q & A - General

Question	ENI Answer
is there a recording available of this webinar?	**Yes,** you can find it at our website: www.emissieloosnetwerkinfra.nl/english The ENI OEM webinar - the Dutch case of ZE construction works (RECORDING) (emissieloosnetwerkinfra.nl)
Market potential is an important driver for OEMs to invest in new technology. What can ENI do to promote ZE abroad?	Firstly, ENI has network partners who can accelerate the pilot phase of ZE machines to be developed, leading to an market ready model that has already been tested in the field and with regard to our standards (data, safety, connectivity etc). Secondly, we are more than happy to come to OEM parties and potential (public) clients abroad to share our expertise, experience and lessons learned. Please get in touch. We furthermore cooperate with Dutch government bodies that are also bringing this call to the stage. Rijkswaterstaat (Road authority) is planning to host a live meeting next year with relevant parties. Get in touch with us if you would like to learn more about that meeting.
SEB already sets an ambitious target for the implementation of ZE construction equipment, especially for the larger category of equipment. Whilst understanding the challenges contractors are facing, the acceleration foreseen by ENI may only cause (more) frustration among market parties when these turn out to be unrealistic. Why doesn't ENI stick to the SEB convenant?	SEB (Schoon en Emissieloos Bouwen = Clean and Zero Emission constructions) ENI has been involved with the definition of SEB and it has been in the making for years. In the meantime, the legislative landscape has changed. NGO's are sewing governments and projects based on NOx emissions and are often succeeding. Nature permits that are necessary to build in the vicinity of Nature2000 reserves are often not issued without substantial substitutions of diesel machines with zero-emission models. SEB is thus a baseline for the sector as a whole, but projects in N2000 relevant areas are not helped by it.
Safety is of utmost importance to OEMs, having a legal and social responsibility to provide construction machinery which is safe to operate and maintain. Implementing new technology requires not only development of the product but also training of operators, sales people, technicians etc. This requires a massive effort and therefore does take time. ENI should recognize that OEM solutions do take (much) more time than project-based conversions.	Contractors as much as OEM's have safety on the very top of their agenda. ENI has put some of its first efforts into guidelines on safe conversion of machines and safety of charging infrastructure. The conversion sector in the Netherlands is professionalising rapidly, partly already taking positions as OEM suppliers. We see also a lot of engagement of some OEM parties with their respective dealers on those conversions. There are nonetheless also conversions taking place that have potential for achieving higher standards. We have also learned from one particular OEM that the required development time for OEM-delivered ZE models can be as short as 12-18 months. As our

	situation often dictates "build with ZE machines, or don't build at all", construction companies will make it work with or without OEM delivered machines. Some OEM's also have moved their real-life testing downstream and test on live client construction projects. It not only serves to create safe equipment, but also increases safe use, safe transport and safe charging. ENI members are mostly open to such cooperation.
To put things in perspective, the majority of OEMs are investigating and developing ZE solutions. However, uncertainties regarding suitability and availability of energy sources and their infrastructure as well as the limited market size in The Netherlands do not help OEMs to determine which solutions to invest in. A clear roadmap would help OEMs.	Understandably, OEM's await more security with regard to their development efforts. ENI cannot speak for the rest of the world. But we can speak from our experience and expect things to be quite comparable in other countries. As said in our animation, electric power trains / machines are the unchallenged direction of development at this moment in time. Their power source however will be diverse. If grid connections cannot be arranged, energy logistics come into play. For transportation purposes, we see applications for exchangeable batteries and local power generation from H2 (fuel cell), biogas and other renewable energy sources. We also see transportation batteries being used, but are concerned with the additional strain that will put on resources availability (Because you have to charge two batteries for using one load in a machine, you will degrade two batteries instead of one with each cycle.). They also sometimes require more time and costs than other energy carriers.
What are the biggest challenges in the near future for ZE machines?	Aligning the way clients tender for ZE emission works with the scarcity of ZE machines in the market is tricky. On top op that, we need to find a way to enable projects that need ZE equipment for permit reasons first and before projects where one might still work with NOx filters or biodiesel in Stage IV/V machines. Another challenge in the midterm is the net capacity to make energy logistics more efficient. Lastly worthwhile to mention here: The connectivity and operational reliability with different brands and types of charging equipment in use will be of great concern to users in the coming period.
How do we get OEM's to speed up production of zero emission equipment?	We hope to have made clear that Dutch construction companies are already investing in ZE machines. The OEM that comes first has a higher chance to claim market share. Luckily we see several OEMs already pushing their models into the Dutch market. We welcome more of them to do the same.

Technology

Question	Answer
For larger equipment 56kW, TNO recognized in the EMPK pilot project that NOx and PM emissions are very low due to the use of aftertreatment systems, provided idling is avoided and the engine is at working temperature.	Yes, aftertreatment generates lower emissions than with regular diesel machines. However, NOx deposition allowed under nature permits are often still lower than could be achieved with aftertreatment. Secondly, investing in upgrading diesel equipment becomes more risky as more and more well-functioning ZE equipment becomes available. As numbers of ZE machines rise, clients will increase their requirements of them as well.
From an environmental and sustainability point of view what would be the best solution? Batteries, hydrogen, e-fuels, something else?	We see a clear winner in power train technology: electric. The internal combustion engine always emits NOx and remains very inefficient compared with electric equipment (which proves to be 60% or more efficient in converting energy into labour). If hydrogen or e-fuels are used for electricity generation and they do that without emissions, they can all be part of the solution. Batteries play a pivotal role in the electrification as an energy carrier. We see them as the better alternative compared to fossil fuels. However, much sustainability issues still remain to be solved with batteries: resource scarcity, conflict minerals, recycling etc.
Exchangeable batteries are a safety concern. It sounds easy but it is not. I don't hear anybody about costs, what will be the investment, not only on equipment and batteries but also on the whole infra structure.	Costs vary greatly depending on the local situation and way of working. Immobile machines (e.g. crawlers) that are used off-highway often benefit from exchangeable batteries. They have to adhere to more stringent safety requirements than fixed batteries, but are already successfully deployed in various models. Stationary and mobile machines can more easily be hooked up to a charger. The situations are very divers and with each situation comes another budget. ENI members and other parties that are deploying ZE equipment have gained knowledge of the required costs and yes, they are often higher than anticipated. Yet the transition towards ZE construction is not one of economic origin, it is a necessity that we try to fulfil as economically as possible.
The problem is that there is no standard. Finally it will be determined by what the OEM's can supply, which OEM is providing the best solution.	ENI has published several documents concerning standardisation: English | Emissieloos Netwerk Infra Furthermore, we urge OEMs and suppliers of (charging) equipment to have their models tested by

	ELAAD before delivery. Interoperability is a necessity in the construction sector where parties work together in constantly changing alliances. Using each other's infrastructure on a construction site is paramount to control costs and complexity as well as increase safety for operators and users. OEMs are urgently asked to agree on standard protocols beforehand. We must prevent the history of other sectors like mobile phone chargers, where it took decades before standards were forced upon the industry. Also the automotive sector can be used as an example to leapfrog hiccups like diversified technologies and protocols and arrive at standards earlier.
When talking about hydrogen you need to differentiate the combustion engine technology from fuel cell technology. There is a big difference between these two technologies. I have not heard anything about HVO100 in combination with a normal combustion engine as a possible solution.	ENI sees no future for the ICE (Internal Combustion Engine) in our applications. Full electric power trains already dominate the developments, even in the heaviest categories. HVO100 is a shortcut to reduce CO_2 emissions, but does little to cut NOx and PM emissions. So it only supplies half an answer. Furthermore, the local capacity for feedstock of HVO has been used up, so HVO production already needs to be fed with imported raw materials. This has led to the increase of the CO_2 conversion factor for HVO already, diminishing its emission reduction effect. Further scale-up will only worsen this situation.
How does modularity and circularity fit in to the problem? This in the sense that the technology moves so fast that battery's that are being made now will be obsolete in about 5 or 10 years and that the life expectancy of machines is still negligible.	This is an argument to develop models that can be retrofitted with different types of batteries. Systems with exchangeable batteries might have an advantage here. This is an excellent question we would herewith like to put through to OEMs. Please plan ahead and incorporate flexibility into your systems.
We are looking at different zero emission technologies, mostly focusing on zero CO2. One technology is hydrogen internal combustion engines. This would have a zero CO2 emission, but would still emit NOx. Does that mean that this type of technology will not be interesting in the Netherlands?	Correct, as said earlier, we see little future of ICE technology, H_2 or otherwise. It simply is not zero emission, it only prevents local CO_2 emissions. Firstly, the inevitable NOx emissions still occur. Secondly, the energy loss in H_2 production means that ICE machines need even more units of energy for the same work. Given the scarcity of truly green hydrogen, this will result also in a higher CO_2 intensity per workhour than with a diesel machine. PM and NOx emissions are a mostly local concern whereas CO_2 emissions are global. That means that CO_2 emissions in the production chain matter as much as local emissions. The energy source is the relevant differentiation. ENI advocates renewable sources instead of fossil (net-zero) sources.

Power grid and charging

Question	Answer
Will the grid providers (DSO's) be able to keep up with the increasing energy demand?	They are already running behind given the high net congestion in the Netherlands. The investments in the grid for upcoming years are however unprecedented and we hope the situation will become better eventually. Furthermore, there are several ways to address the grid congestion challenge. Amongst them are flexible contracts on existing grid connections, smart charging and buffering combined with smaller connections.
With the high energy demand of larger construction equipment, OEMs would welcome more clarity on the preferred energy sources. Ad-hoc/on-site solutions do not provide this and create ambiguity about the way forward. How to solve this?	For OEMs we have a clear message: supply electric machinery. Our situations are divers and even with autonomous, local power generation we can operate electric machinery. There is a wide array of possibilities to deliver energy to a machine and they all can work with electric equipment. Standardization is key, please take note of the guidelines ENI published earlier: SCEB advice and make sure your equipment is tested by ELAAD.
What certainty can Elaad provide regarding energy availability?	None, ELAAD is concerned with charging infrastructure and standardization so OEM equipment can be safely and reliably charged wherever it is connecting to the grid.
(What is the opinion of Elaad on:) It is important that the OEM supplies the charging equipment. It should come from one safe source.	ENI can only recommend that all charging equipment is tested and safe to be used with a divers range of equipment. It then does not matter if it is OEM supplied or manufactured by the current players in the charging market (which are already active in the mobility sector) . Technical lock-ins of a single brand are a concern for construction companies because we structurally work with divers brands and multiple companies on the same spot. Lock-ins create costs and add complexity we cannot afford in this transition.
Do you expect wide adoption of DC fast charging? Can equipment manufacturers and refitters deliver it, or will we be stuck with 22kW AC?	Yes, DC charging will become the standard. Local DC grids might follow. Read our SCEB document for more on DC charging. AC 22kW charging is not enough to charge e.g. a truck with 400 kWh overnight.
Do you think battery swapping can be a solution to sites where there is no grid connectivity?	Yes, please refer to our answers above.