

# NFPA Pace of Technology Adoption Survey – Construction Machinery

The following are results of a survey developed with the NFPA Work Group on the Pace of Technology Adoption. The purpose of the survey was to provide a broad understanding of which construction machines, by type and size, are likely to adopt electrification technology, and for which application...powertrain, propulsion, and actuation for work function. And the ultimate goal is to help move past the hype, and for fluid power manufacturers to align their technology development initiatives with indications of technology adoption in end machines expected for 2030.

The survey was conducted between March and July of 2025, and was sent to NFPA members, members of the International Fluid Power Society, and past attendees of the IFPE trade show. NFPA members were asked to forward the survey to their OEM customers.

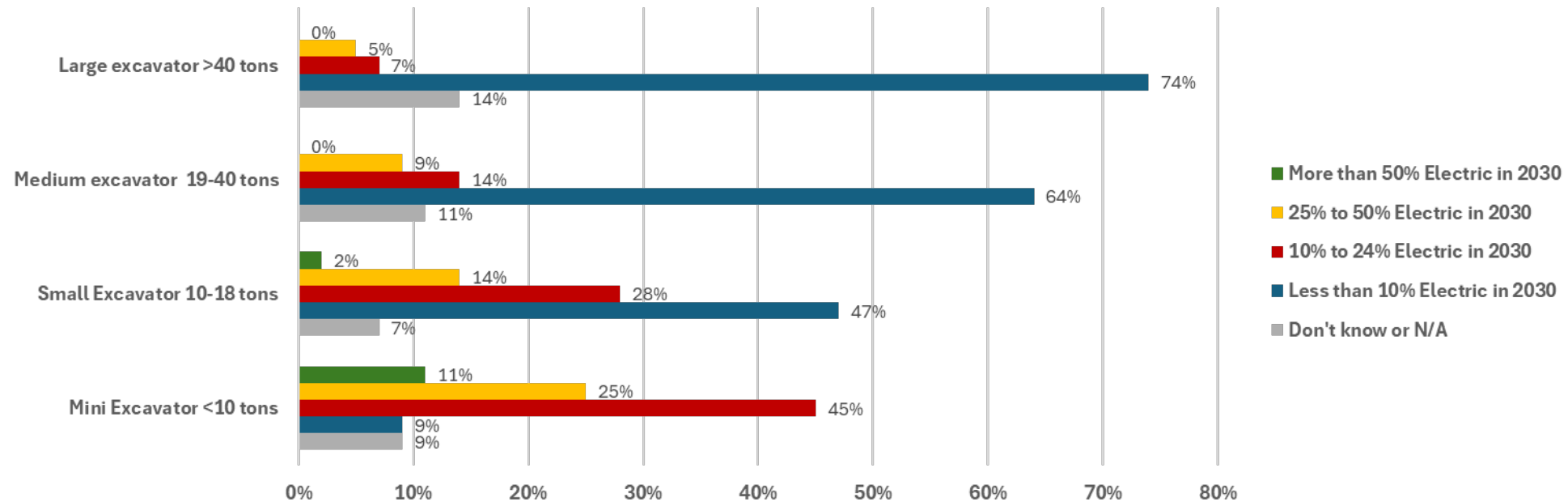
These summary results are from 72 respondents. With a few exceptions, respondents were NFPA member manufacturers and distributors of fluid power products.



# Adoption of Electric Powertrain Types in 2030



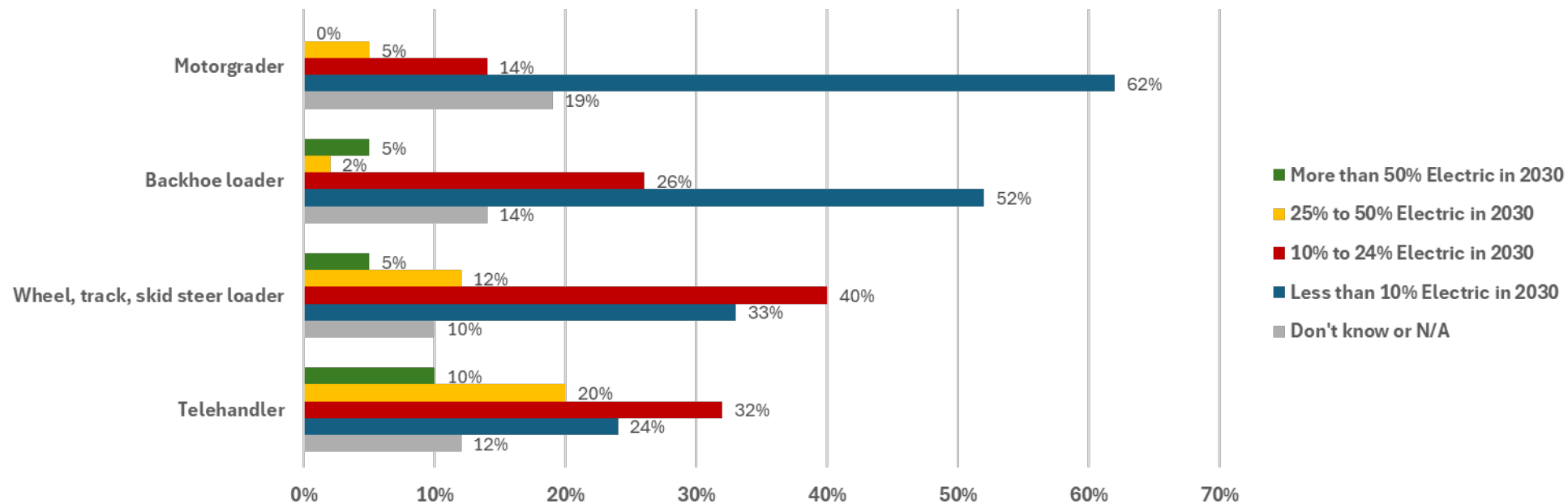
For each machine type, to what extent do you expect electric **powertrains** will be used in 2030?



# Adoption of Electric Powertrain Types in 2030



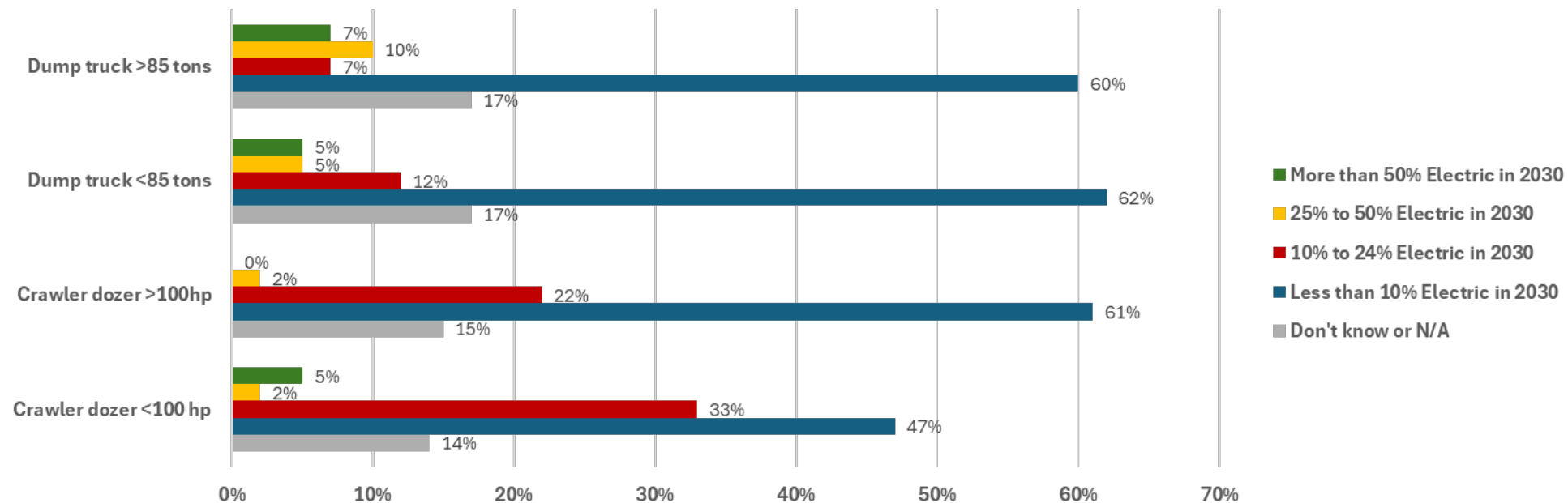
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# Adoption of Electric Powertrain Types in 2030



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# Adoption of Electric Powertrain Types in 2030



## Comments concerning electric powertrain adoption:

The larger the machine, the less likely this will happen. most cannot justify the cost to get the amount of kWh needed for their duty cycles.

Issues regarding cost, infrastructure, and safety will continue to slow adaptation of electrification in machines with greater than 20kw of axis motion.

I've heard less than 20t excavators could see electric powertrain, but larger than that the batteries are prohibitively large.

Almost every customer slowed down with their electrification plans

Cost is a huge issue especially combined with inflation. Electrification costs only make sense for very large fleets and/or fortune 500 companies.

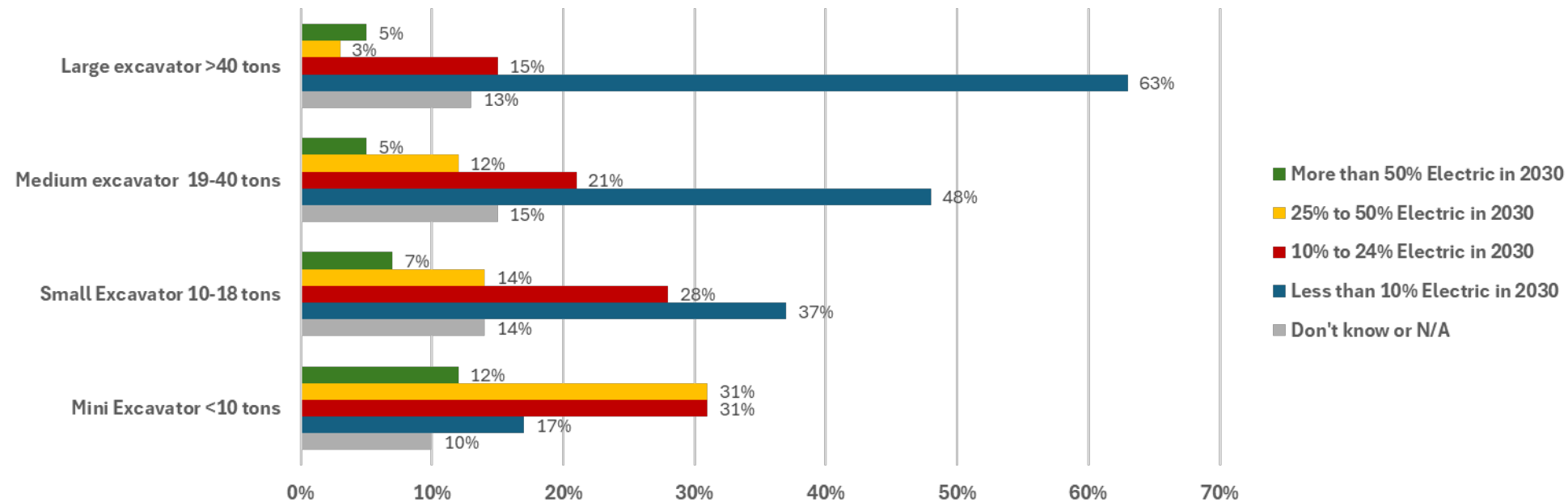
Low power, small machines may grow but I expect that the majority of units that are not used inside buildings will continue to rely on traditional power sources (ICE) as the expense of battery electric versions keep their price competitiveness and commercial viability minimal.

Anything in the mining field or with high duty cycle will be hybrid. This is most applicable to the last section of machines above.

# Adoption of Electric Actuation for Propulsion in 2030



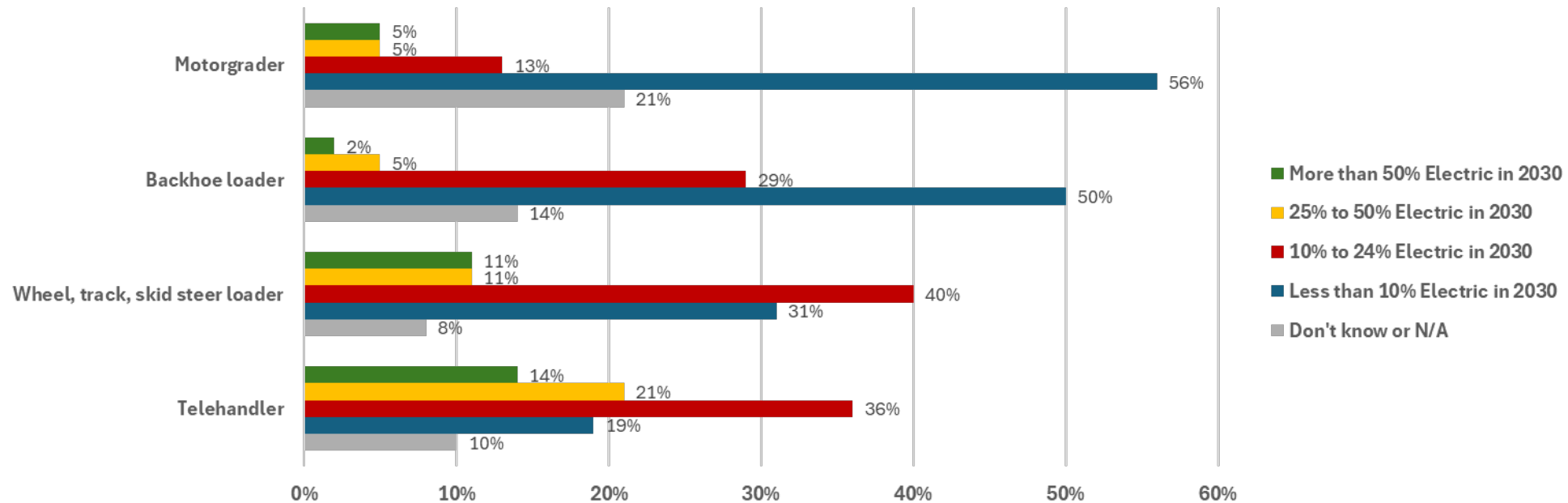
For each machine type, how much of the actuation for propulsion do you expect will be electric in 2030?



# Adoption of Electric Actuation for Propulsion in 2030



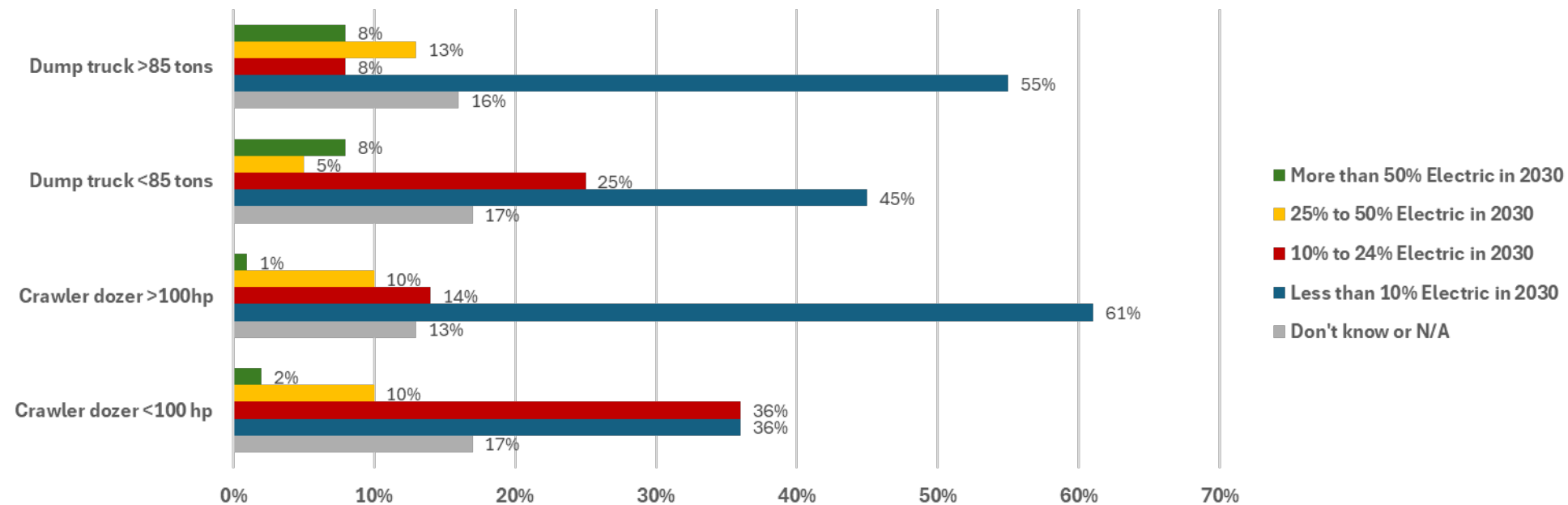
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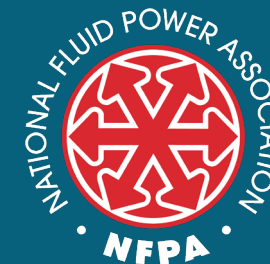
Comments concerning electric actuation for propulsion:

Certain applications (indoors / urban) might move there before others - and there are some good efficiencies to be gained here - but regulations need to be there to push the machine cost here

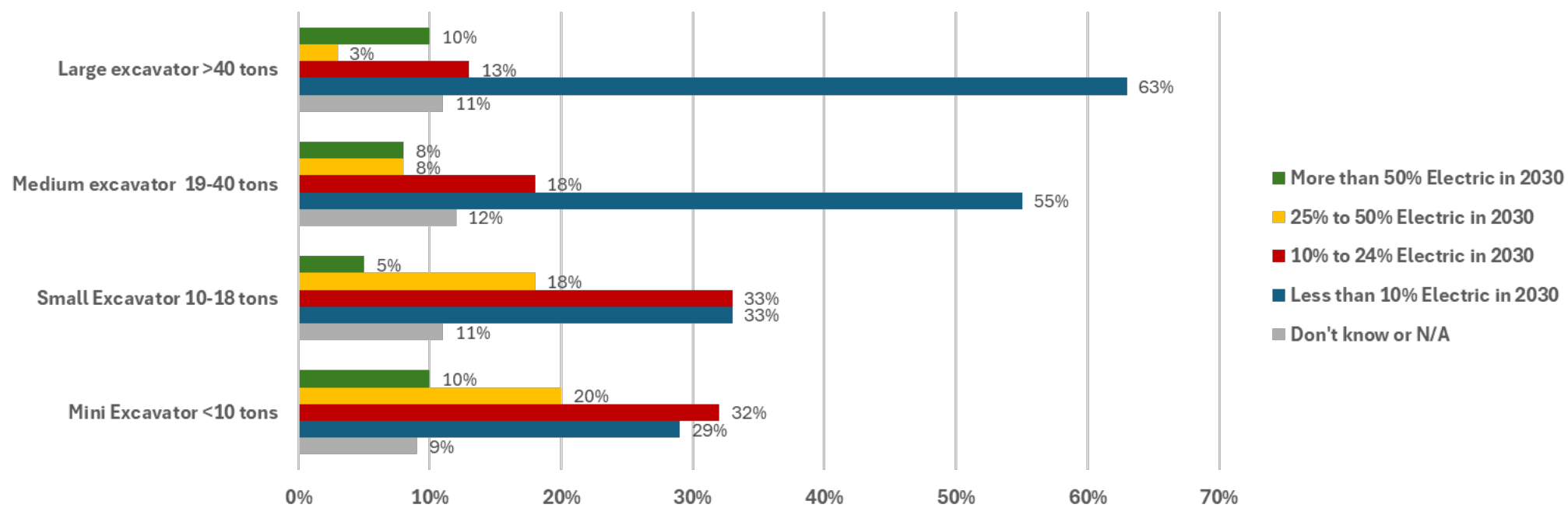
Not sure if the technology can yet replace hydraulics

Mirrors my assumptions about the industry, hybrid drive units may increase this slightly which is reflected in my responses.

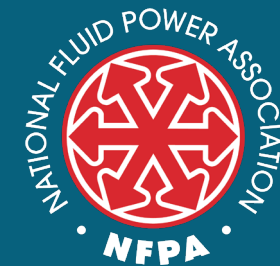
# Adoption of Electric Actuation for Work Functions in 2030



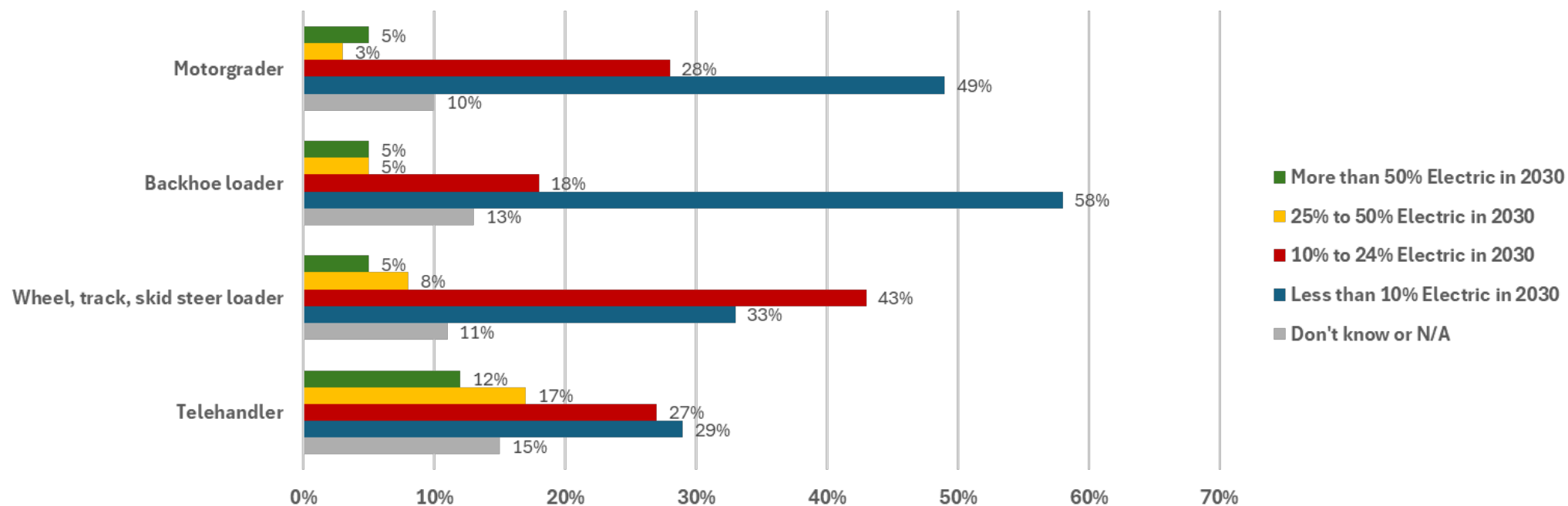
For each machine type, how much of the actuation for work functions do you expect will be electric in 2030?



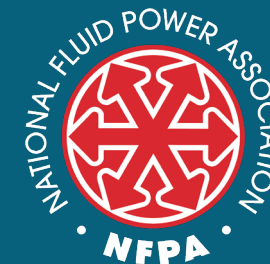
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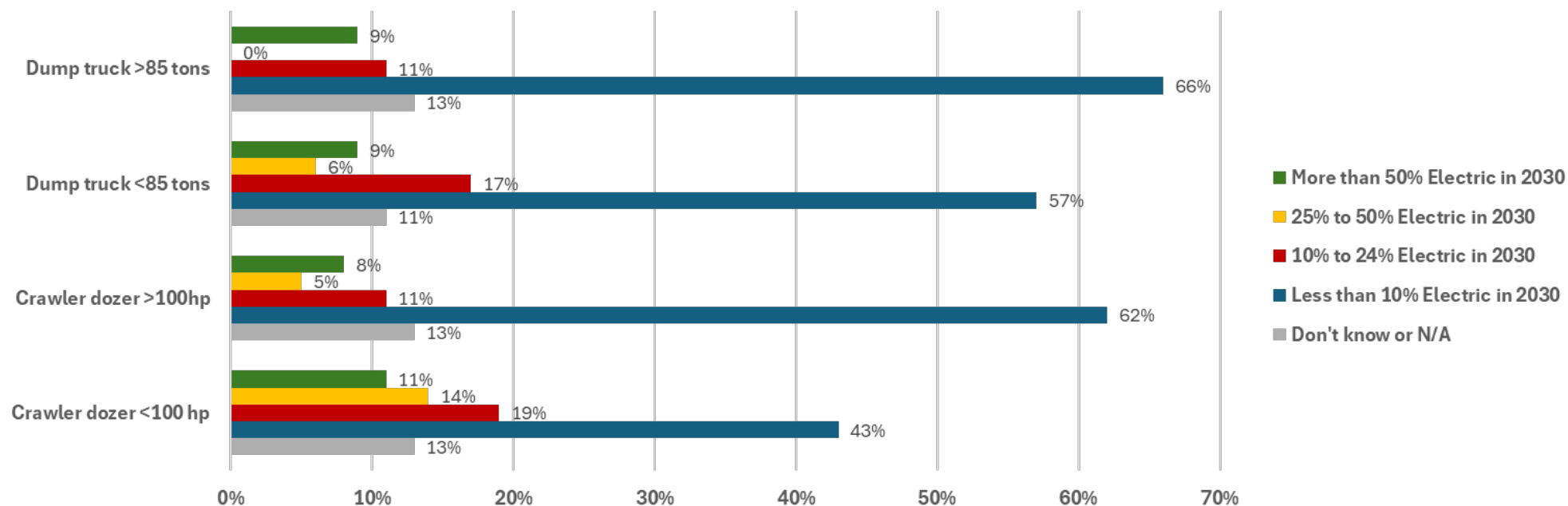
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# Adoption of Electric Actuation for Work Functions in 2030



## Comments concerning electric actuation for work functions:

Auxiliary work functions are the only ones which might... but the technology for fully electric actuation just is not there for widespread adoption - in particular when focused on shock load resistance

We still aren't there in terms of cost for linear actuators. Large scale hydraulics are difficult to replace efficiently with electric due to large power requirements.

Depends on capacity and infrastructure for electrical actuators, i.e available electrical delivery power.

You need the hydraulic power for the heavier weights. I don't think we are there with electric power yet.

Hydraulic cylinders will still be the main choice for actuation due to cost and flexibility. Even with the adoption of BEV, moving to electric actuation only gains 40% efficiency at 4X of the cost. Hydraulics for most vehicles, other than excavators, is less than 30% of the overall duty cycle. This puts it at a major disadvantage vs traditional hydraulics.

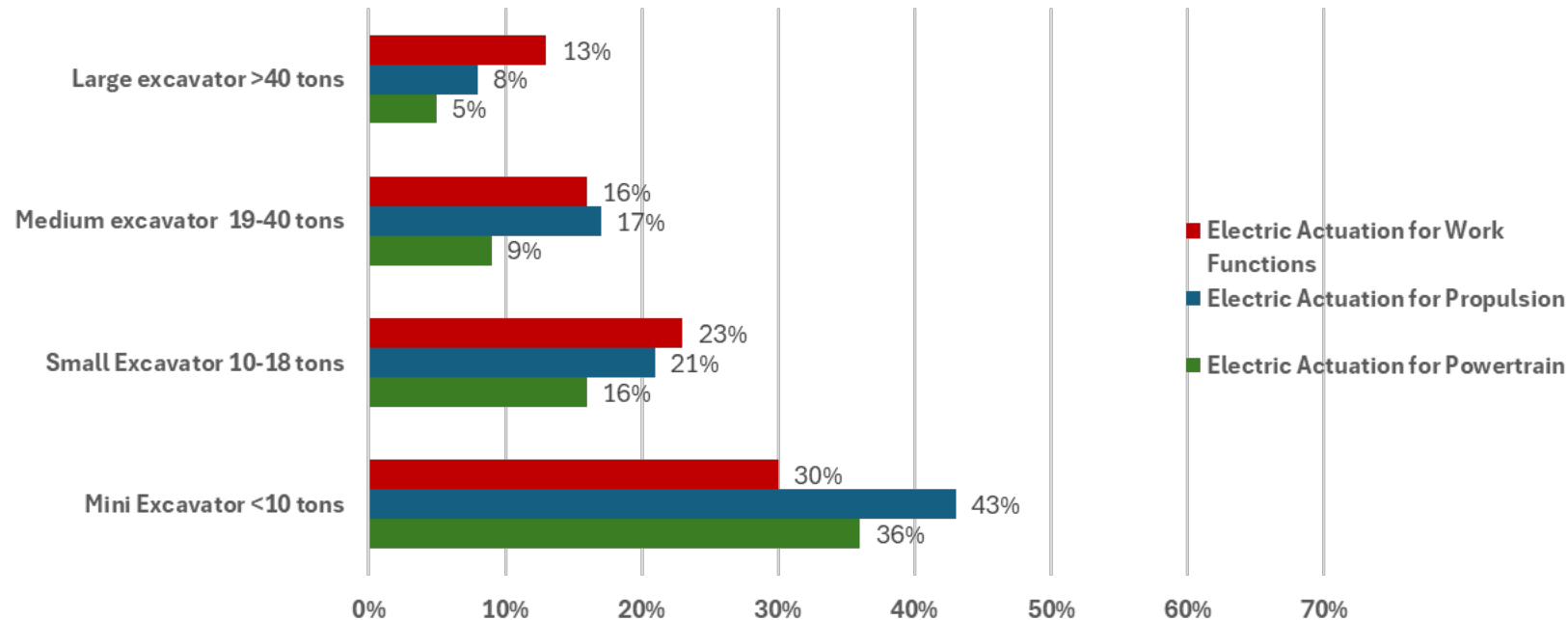
Units with electrified hydraulic systems will increase in popularity and are the largest driver of work related actuation. PTO units may also increase some offerings.

Electric linear actuators currently have too many limitations including stroke length, speed, power, availability and cost. That is our reasoning for putting this so low in this section. We feel that these will most likely remain electric over hydraulic.

# Summary: Electrified Powertrain, Propulsion, Actuation > 25%



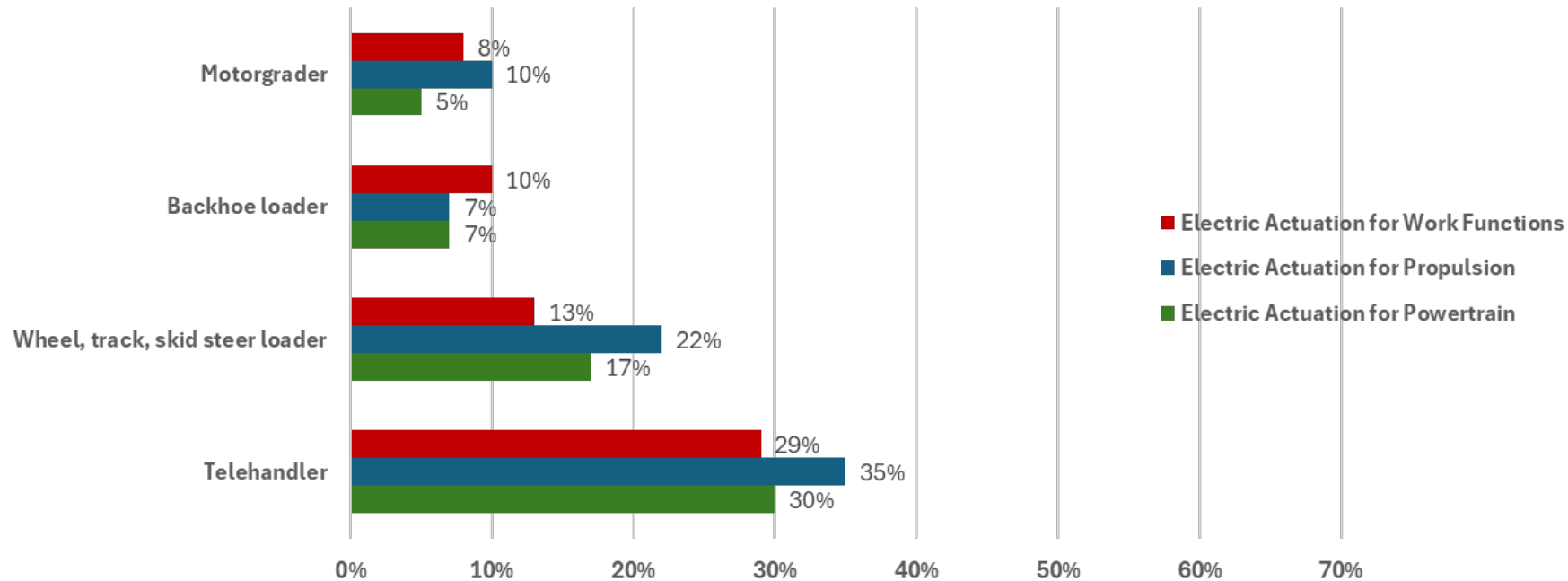
For each machine type, percent of respondents expecting electrification greater than 25% by 2030.



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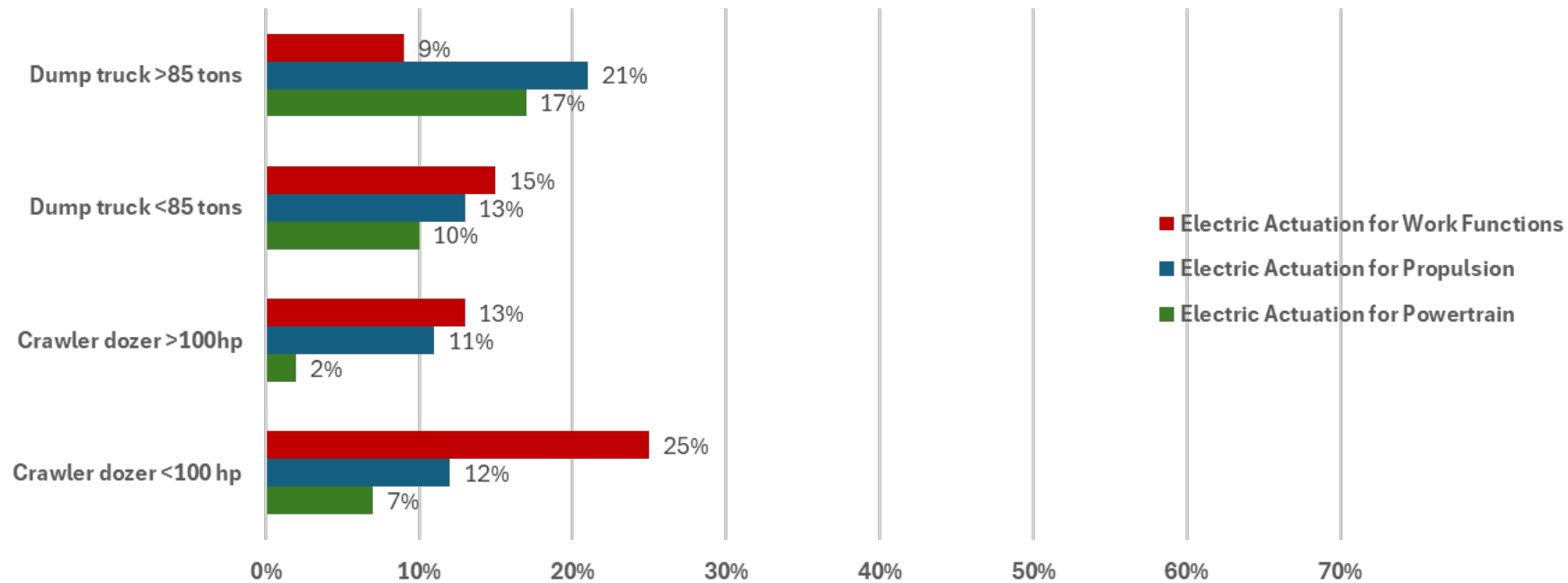
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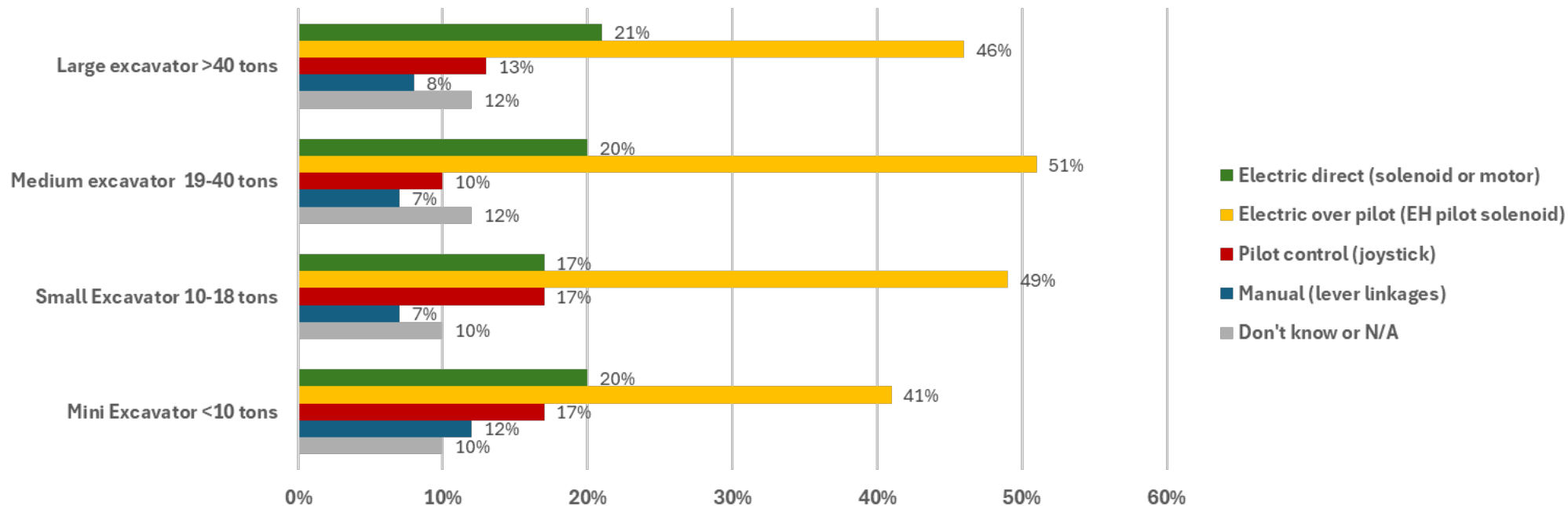




# Method of Hydraulic Control Actuation in 2030



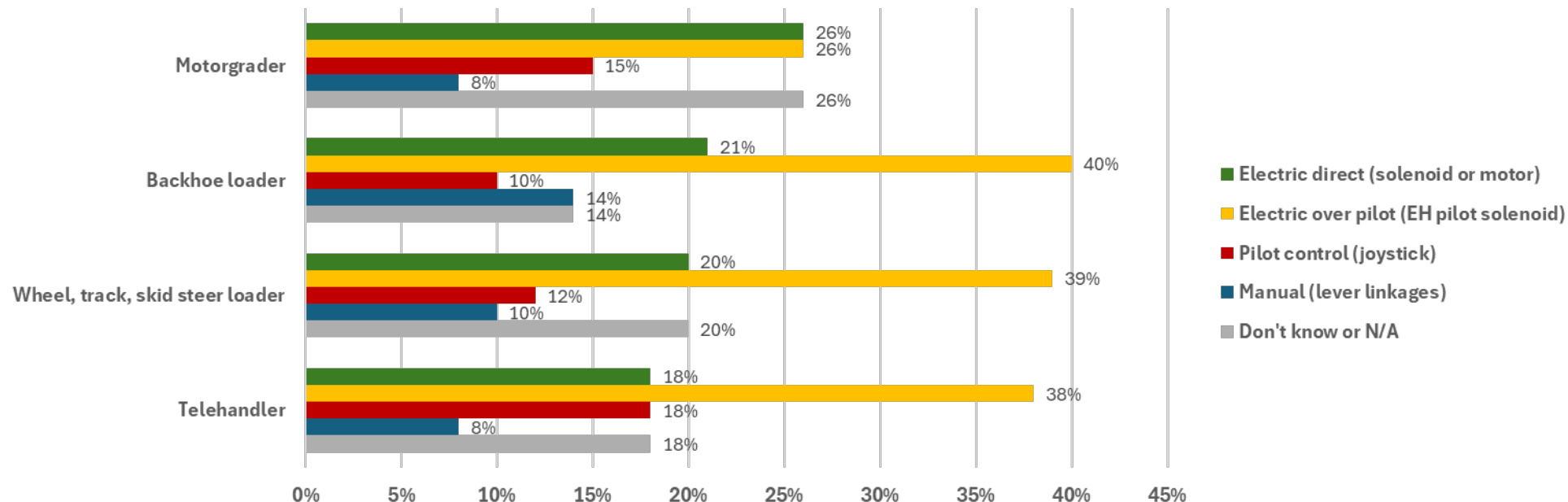
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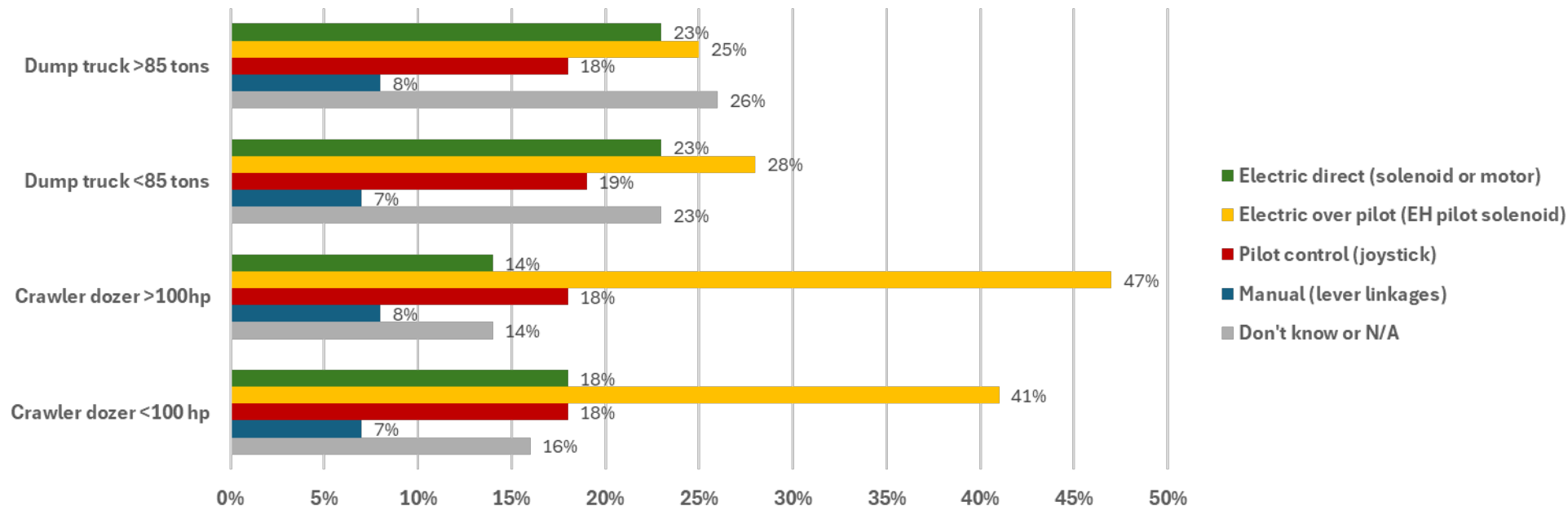
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# Method of Hydraulic Control Actuation



Comments concerning method of hydraulic control actuation:

I see EH+ becoming more and more popular and needed for further machine functions, but I still think most OEMs will employee some sort of budget machine + tech machine approach to keep the cost sensitive markets happy

Minis are difficult, as top-OEMs will likely go EH on all models, but other cheaper makes/models could still be using Pilot, I don't know the volume mix for that, but I anticipate EH Solenoids to be very prevalent. Very unlikely to see many manual actuation valves for excavators.

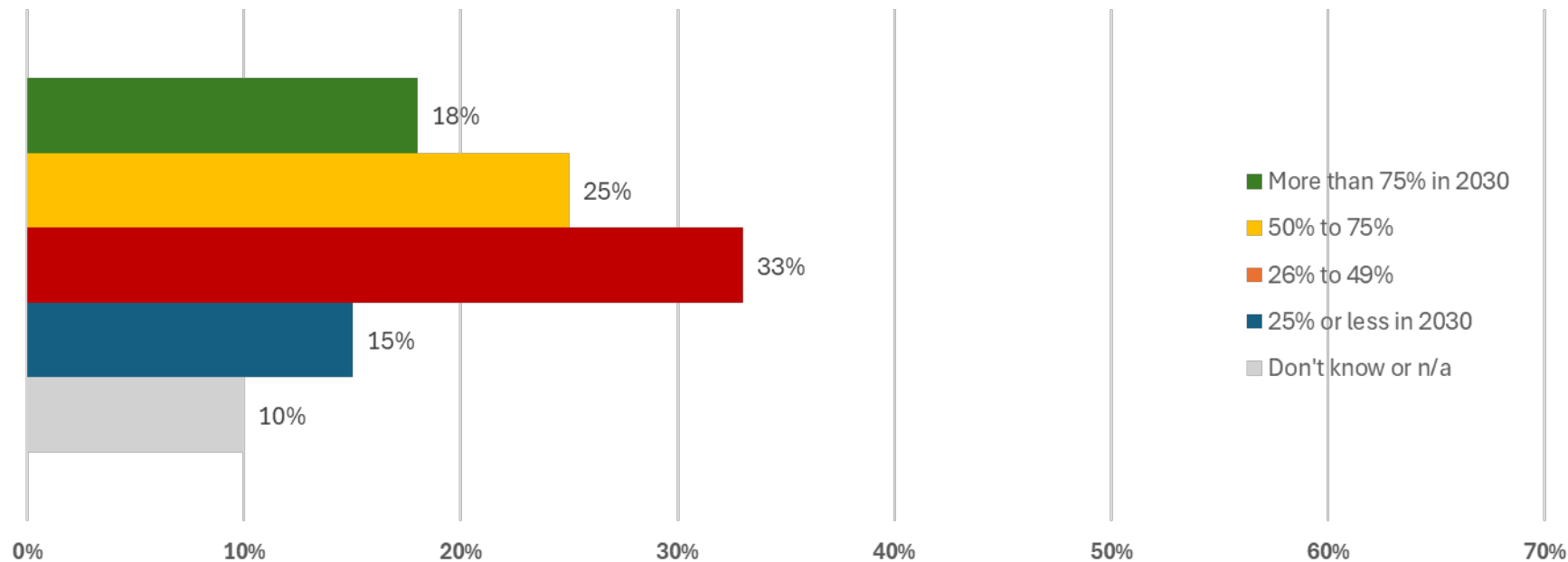
Even more integration with hydraulic controllers, including on smaller machines. Canus and other.

Every product has or is progressing to EH control. Moving to direct solenoid or motor control is being experimented with things like electro-hydraulic actuators, but there is a high cost to such systems compared to a PCLS with a main control valve.

# Connection to the Cloud



For the machine types in the previous questions, to what extent do you expect they will be **connected to the cloud in 2030?**



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The larger machine OEMs have had a solution for a while, but the smaller fleets will keep the average percentage down, in my opinion

Haven't seen or heard about this, I could see a benefit for some usage statistics to be uploaded, I guess I would say 10% or less.

Customers struggle to see the value in this.

Most of these machines will have the capability but cost will keep usage of telematics low.

Need to have a solid ecosystem to make it worth while.

New units may all be cloud compatible, while small units and some older units in service will not receive upgrades for this especially among small contractors and smaller fleets.

# NFPA Pace of Technology Adoption

Thank you to those who responded to this survey.

Questions about this survey, or suggestions for future survey topics...  
contact Pete Alles at 414-778-3350 or [palles@nfpa.com](mailto:palles@nfpa.com)

Contents of this report are intended for use by NFPA members and survey respondents only.

