



# **NFPA Roadmap Committee**

**Meeting Report on Customer Drivers**

**January 12, 2023**

# NFPA Technology Roadmap

The NFPA Technology Roadmap describes an industry-wide consensus regarding the pre-competitive research and development needs associated with improving the design, manufacture, and function of fluid power components and systems.

The research and development agenda it describes is focused on advancements that will help the fluid power industry meet the future needs of its customers, expand into new markets, and attract the best and brightest students to the field.

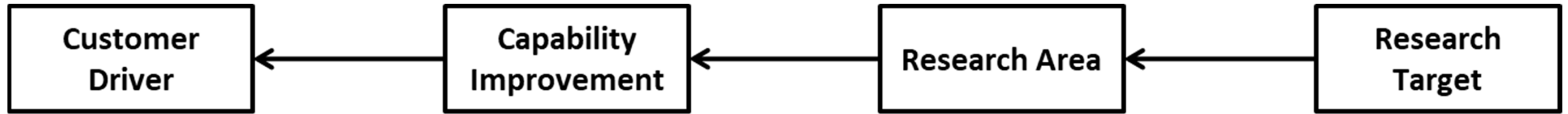
It is used by the NFPA and its academic partners to guide their research efforts, by NFPA members and other industry players to inform decisions about research partnerships and product development, and by academic, government, and other organizations that wish to pursue research and development projects of importance to the fluid power industry.

It is updated every two years under the guidance and leadership of the NFPA Roadmap Committee.



# Roadmap Elements

The NFPA Technology Roadmap is comprised of the following four elements, each linked to the one preceding in an interdependent chain.



**Customer Drivers** are the business or technology objectives of fluid power customers. They help them serve the needs of their own customers, and are not necessarily connected to their use of fluid power.

**Capability Improvements** describe the ways in which fluid power systems must improve if they are to meet or better meet the customer needs described by the Customer Drivers.

**Research Areas** are the broad areas of pre-competitive investigation that could assist in bringing about the Capability Improvements.

**Research Targets** are the objectives that quantify or otherwise describe successful strategies for pursuing the Research Areas.



# 2023 Roadmap Process and Timeline

The NFPA Roadmap Committee is following this process and timeline for the 2023 update to the NFPA Technology Roadmap. This is the report from its meeting on January 12, 2023 to discuss, define and prioritize customer drivers.

## Phase 1 – Customer Drivers

- |        |   |
|--------|---|
| Dec 1  | Present Roadmap Process and Timeline at NFPA/FPIC Regional Conference<br>Launch of survey on customer drivers |
| Dec 22 | Deadline to respond to survey on customer drivers   |
| Jan 12 | Virtual committee meeting to discuss, define and prioritize customer drivers                                  |

## Phase 2 – Capability Improvements

- |        |  |
|--------|--|
| Jan 26 | Meeting report sent with prioritized customer drivers and setting the stage for fluid power alignment and capability improvements<br>Launch of survey on fluid power alignment and capability improvements |
| Feb 16 | Deadline to respond to survey on fluid power alignment and capability improvements   |
| Mar 2  | Virtual committee meeting to discuss, define and prioritize capability improvements  |

## Phase 3 – Research Areas and Targets

- |         |  |
|---------|--|
| Mar 16  | Meeting report sent with prioritized capability improvements and setting the stage for research areas and targets, including process for defining working groups for each capability improvement<br>Launch of survey on research areas and targets |
| Apr 6   | Deadline to respond to survey on research areas and targets  |
| Apr/May | Virtual working group meetings to discuss and prioritize research areas and targets for each capability improvement  |
| Jun 1   | Virtual committee meeting to review and harmonize research areas and targets for each capability improvement   |

## Phase 4 – Final Roadmap Document

- |        |  |
|--------|--|
| Jun    | Draft Roadmap document written                     |
| Jun 29 | Draft Roadmap document sent for review and comment |
| Jul 20 | Deadline to return comments on draft Roadmap       |
| Aug 16 | Final Roadmap document presented at NFPA IEOC      |

# Meeting Participants

## Committee Chair

- Bradlee Dittmer, NORGREN

## Committee Vice Chair

- Steven Meislahn, Sun Hydraulics

## Committee Members

- Brian Rhode, Afton Chemical Corporation
- Blake Cawley, AMETEK APT
- Benjamin Moses, Association for Manufacturing Technology
- Cory Geers, BDI
- Jon Frey, Bosch Rexroth Corporation
- Christian Eitel, Bucher Hydraulics
- Mike Gust, CCEFP
- Dominic Catanzarite, Daman Products
- Mike Betz, Danfoss
- Adam Livesay, Elevat
- Jonathan Gamble, Enfield Technologies
- Mitchell Wiese, Faster Couplings
- Brent Rogers, Festo Corporation
- Matt Loeffler, FORCE America
- Todd Pinkelman, Gates
- Russ Schneidewind, Hydraforce
- Scott Nagro, Hydraforce

- Mark Bokorney, Hydra-Power Systems
- Narendra Gupta, Hyster-Yale Group
- Joe Jackan, JARP Industries
- Tom Vander Meulen, Kawasaki Precision Machinery
- Donald St. Clair, Master Pneumatic-Detroit, Inc.
- Douglas Lacina, Milwaukee Cylinder
- Paul Michael, Milwaukee School of Engineering
- Dave Geiger, Moog
- Andy Nackovic, National Tube Supply
- Howard Zhang, Parker Hannifin
- Ron Hibbler, Proportion-Air
- Kevin Brown, QP Hydraulics
- Jay Dalal, ROSS Controls
- Allan Scales, RSA, Inc.
- Zeke Metzler, Texcel
- Furat Al-Saleem, Trelleborg Sealing Solutions
- John McLaughlin, Trelleborg Sealing Solutions
- Michael Cook, Trelleborg Sealing Solutions
- Nancy Getz, Trelleborg Sealing Solutions

## NFPA Staff

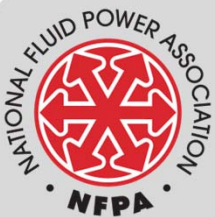
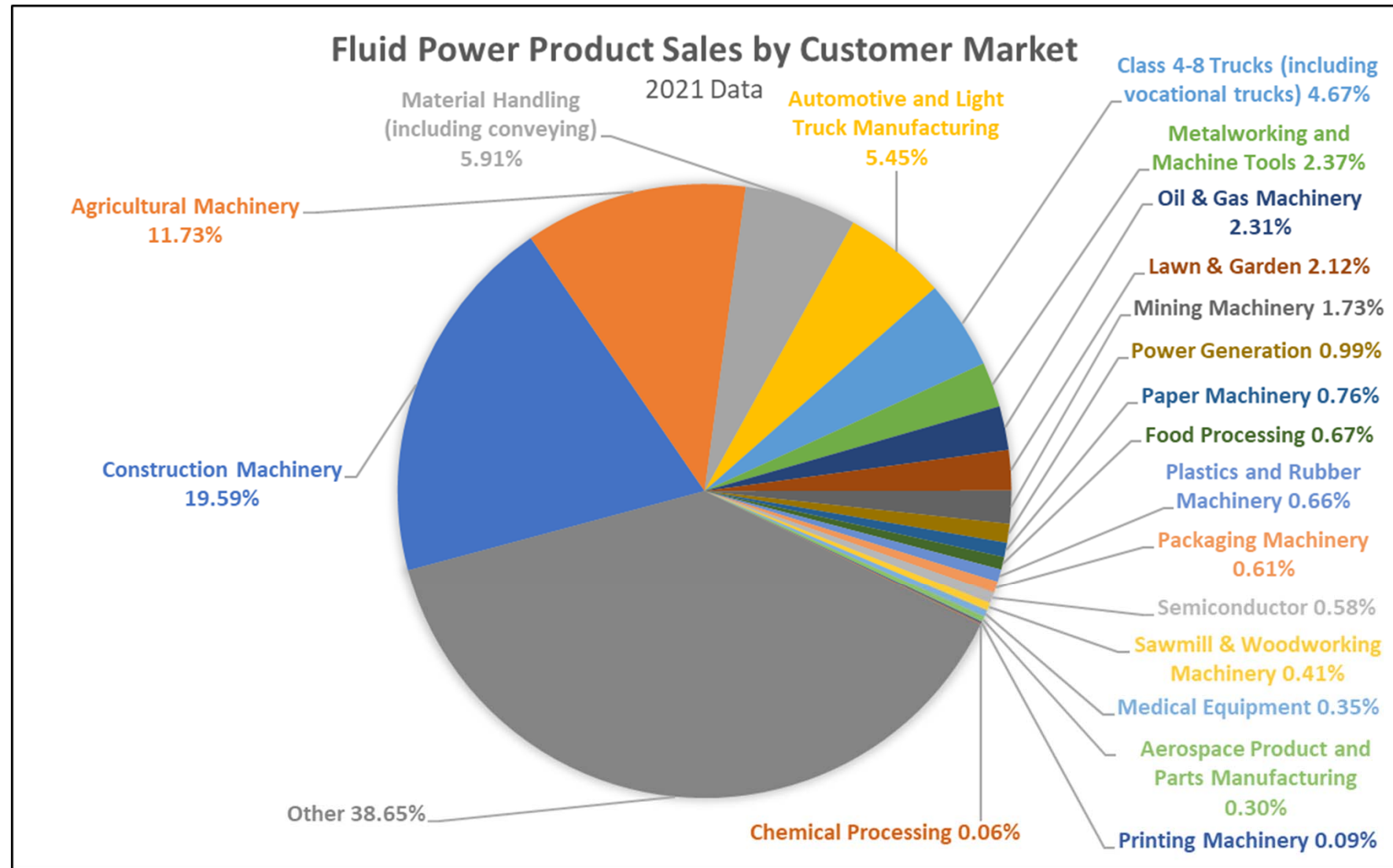
- Pete Alles
- Eric Lanke



# Fluid Power Customer Markets

The Committee first reviewed the 20 largest fluid power customer markets.

Fluid power technology is used in hundreds of applications in dozens of specific customer markets. Generally speaking, all of fluid power's customer markets can be grouped into two general areas: those that are served by hydraulics and those that are served by pneumatics. According to NFPA's latest data, the 20 largest customer markets represent nearly 62% of all hydraulic and pneumatic product sales.



# Customer Drivers

The Committee next reviewed the Customer Drivers that were defined as part of the 2021 NFPA Technology Roadmap.

Customer Drivers are the business or technology objectives of fluid power customers. Generally speaking, fluid power customers are the companies that build machines that incorporate fluid power components and systems. We sometimes refer to these customers as “machine builders.” The Customer Drivers help these machine builders serve the needs of their own customers (the companies or people that purchase and use the machines).

In the 2021 NFPA Technology Roadmap, the following seven Customer Drivers were identified as those of highest importance to the majority of fluid power customer markets:

## Customer Drivers

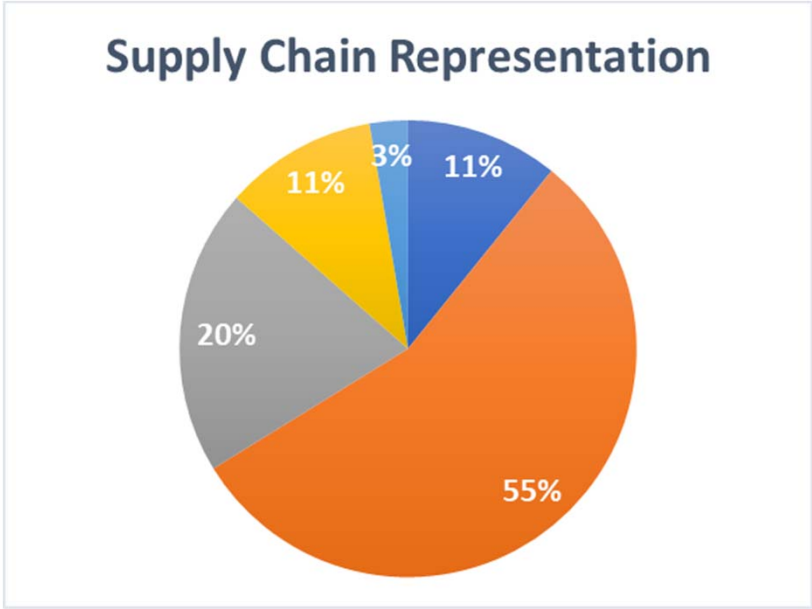
Fluid power’s machine builders want to provide their customers with machines that offer:

1. **Increased availability and up-time**
2. **Increased productivity and performance**, including through efforts to provide autonomous functions and operations, and to use of integrated data and intelligence
3. **On-time delivery of the machine**, including through efforts to decrease lead time in getting the machine
4. **Lower capital and operating costs**
5. **Compliance with environmental and safety regulations and machine directives**
6. **Easier and more predictable maintenance**, including through efforts to use integrated data and intelligence
7. **Increased energy efficiency**, including through efforts to reduce weight and increase power density

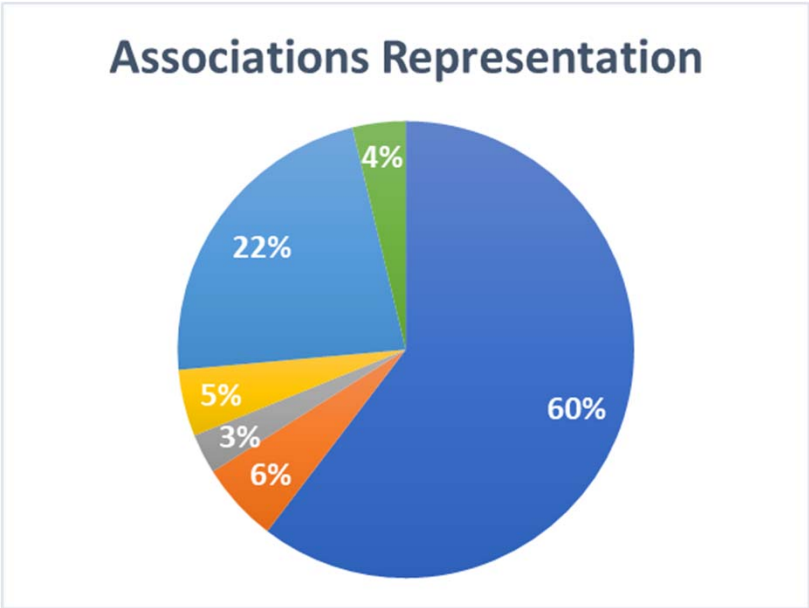


# Survey on Drivers in Fluid Power Customer Markets

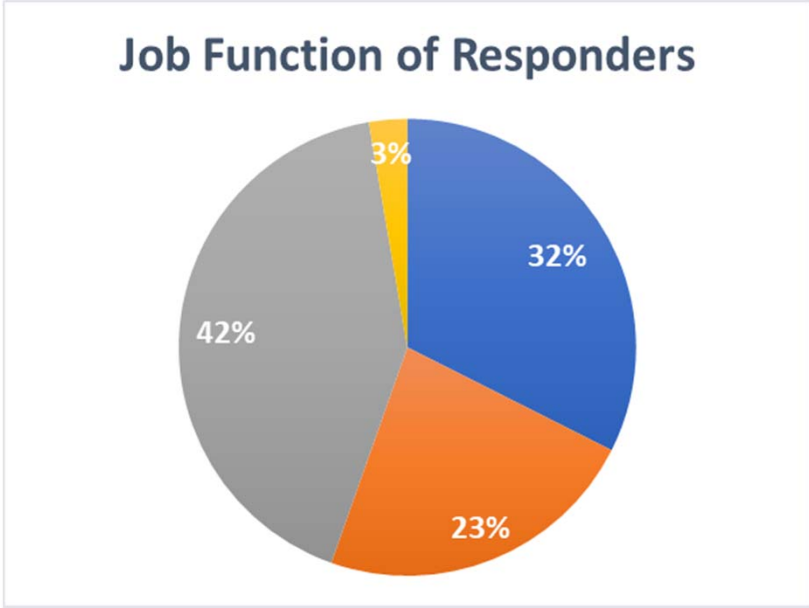
The Committee next reviewed the results of a December 2022 survey conducted by NFPA to determine the importance of these Customer Drivers in the 20 largest fluid power customer markets, and to determine if any new drivers had emerged in these markets since the time of the 2021 NFPA Technology Roadmap. The survey received responses from 74 individuals across the fluid power supply chain, including a large percentage from the NFPA Roadmap Committee.



	SUPPLIER to the fluid power industry
	MANUFACTURER of fluid power components
	Fluid power DISTRIBUTOR or system integrator
	MACHINE BUILDER that uses fluid power technology
	USER of machines that use fluid power technology



	National Fluid Power Association
	Association for High Technology Distribution
	Power Transmission Distributors Association
	Packaging Machinery Manufacturers Institute
	Association of Equipment Manufacturers
	Association for Manufacturing Technology



	Executive Management
	Sales or Marketing
	Engineering
	Human Resources





# Importance of Existing Customer Drivers

Respondents were asked to rank the importance of each Customer Driver in each of the customer markets with which they were familiar. Some variations in importance emerged for particular markets. In the aggregate, all the drivers were ranked as at least somewhat important, with “Increased availability and up-time” ranked highest and “Increased energy efficiency” ranked lowest.

		CUSTOMER DRIVERS								
CUSTOMER MARKETS	N	Increased availability and up-time	Increased productivity and performance	On-time delivery of the machine	Lower capital and operating costs	Compliance with environmental and safety regulations and machine directives	Easier and more predictable maintenance	Increased energy efficiency		
Aerospace Product and Parts Manufacturing	13	4.000	3.769	4.000	3.615	4.231	3.692	3.615	5	Extremely important
Agricultural Machinery	50	4.520	4.240	4.040	3.940	3.800	3.760	3.860	4	Very important
Automotive and Light Truck Manufacturing	11	4.455	4.364	3.909	4.091	4.000	3.636	3.727	3	Somewhat important
Chemical Processing Machinery	2	4.500	4.000	3.000	4.500	3.500	4.000	3.500	2	Not so important
Class 4-8 Trucks (including vocational trucks)	8	4.375	4.000	3.625	3.750	3.500	3.750	3.500	1	Not at all important
Construction Machinery	37	4.622	4.459	3.730	4.108	3.892	3.892	3.892		
Food Processing Equipment	12	4.583	4.083	4.083	4.000	4.417	4.000	3.333		5.000 - 4.500
Lawn and Garden Equipment	13	3.923	3.923	3.769	4.000	3.692	3.462	3.462		4.499 - 4.000
Material Handling (including conveying) Equipment	26	4.577	4.385	3.808	4.192	3.731	3.692	3.923		3.999 - 3.500
Medical Equipment	8	4.250	4.500	3.375	3.250	4.625	3.750	3.000		3.499 - 3.000
Metalworking Machinery and Machine Tools	15	4.467	4.400	4.000	4.133	3.267	3.867	3.667		2.999 - 2.500
Mining Machinery	19	4.632	4.368	3.684	3.789	4.158	4.263	3.789		2.499 - 2.000
Oil and Gas Machinery	10	4.600	4.400	3.700	4.100	4.200	3.900	3.500		
Packaging Machinery	10	4.600	4.600	4.000	3.900	3.500	4.100	3.400		
Paper Machinery	6	4.833	5.000	3.833	4.500	3.667	4.167	4.167		
Plastics and Rubber Machinery	4	4.250	4.750	3.250	3.750	3.250	4.000	3.000		
Power Generation Equipment	2	5.000	5.000	4.000	4.500	5.000	4.500	4.000		
Printing Machinery	3	4.333	4.333	4.000	4.000	4.000	3.667	3.667		
Sawmill and Woodworking Machinery	7	4.571	4.571	3.857	4.286	3.429	3.857	3.714		
Semiconductor Machinery	6	4.667	4.333	4.167	3.500	3.500	4.167	3.333		
<b>All Responses</b>	<b>262</b>	<b>4.492</b>	<b>4.324</b>	<b>3.851</b>	<b>3.981</b>	<b>3.855</b>	<b>3.851</b>	<b>3.698</b>		



# Most Important Customer Driver

Respondents were also asked to identify the most important Customer Driver in each of the customer markets with which they were familiar. Some variations emerged for particular markets, but in the aggregate, the overwhelming choice was for “Increased productivity and performance” and “Increased availability and up-time.”

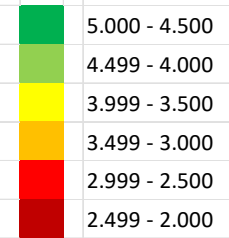
		CUSTOMER DRIVERS								
CUSTOMER MARKETS	N	Increased availability and up-time	Increased productivity and performance	On-time delivery of the machine	Lower capital and operating costs	Compliance with environmental and safety regulations and machine directives	Easier and more predictable maintenance	Increased energy efficiency		
Aerospace Product and Parts Manufacturing	12	17%	25%	17%	8%	33%	0%	0%		Highest ranked
Agricultural Machinery	49	33%	35%	12%	6%	6%	0%	8%		Second highest ranked
Automotive and Light Truck Manufacturing	11	9%	27%	9%	18%	18%	9%	9%		
Chemical Processing Machinery	2	50%	0%	0%	0%	0%	0%	50%		
Class 4-8 Trucks (including vocational trucks)	8	38%	0%	13%	13%	25%	13%	0%		
Construction Machinery	37	22%	46%	5%	8%	8%	3%	8%		
Food Processing Equipment	12	17%	33%	8%	0%	33%	0%	8%		
Lawn and Garden Equipment	13	23%	0%	0%	54%	15%	8%	0%		
Material Handling (including conveying) Equipment	26	42%	19%	12%	19%	0%	0%	8%		
Medical Equipment	7	29%	29%	0%	0%	43%	0%	0%		
Metalworking Machinery and Machine Tools	15	20%	53%	7%	13%	7%	0%	0%		
Mining Machinery	19	37%	16%	0%	16%	11%	21%	0%		
Oil and Gas Machinery	10	70%	10%	0%	10%	10%	0%	0%		
Packaging Machinery	10	10%	60%	10%	10%	0%	10%	0%		
Paper Machinery	6	33%	50%	0%	0%	17%	0%	0%		
Plastics and Rubber Machinery	4	50%	50%	0%	0%	0%	0%	0%		
Power Generation Equipment	2	50%	0%	0%	0%	50%	0%	0%		
Printing Machinery	2	0%	50%	50%	0%	0%	0%	0%		
Sawmill and Woodworking Machinery	7	14%	57%	0%	14%	0%	14%	0%		
Semiconductor Machinery	6	50%	33%	0%	0%	0%	0%	17%		
<b>All Responses</b>	<b>258</b>	<b>29%</b>	<b>31%</b>	<b>7%</b>	<b>12%</b>	<b>11%</b>	<b>4%</b>	<b>5%</b>		



# Customer Drivers – Hydraulic vs. Pneumatic Markets

When comparing responses for the top 5 hydraulic markets to the top 5 pneumatic markets, not much variation emerges – either from each other or from the aggregate of all responses. For both, the two most important drivers are “Increased availability and up-time” and “Increased productivity and performance.” The biggest variations are “Increased energy efficiency,” which scored on average 0.329 higher for hydraulic markets than for pneumatic markets, and “Easier and more predictable maintenance,” which scored on average 0.153 higher for pneumatic markets than for hydraulic markets.

CUSTOMER MARKETS	N	CUSTOMER DRIVERS								
		Increased availability and up-time	Increased productivity and performance	On-time delivery of the machine	Lower capital and operating costs	Compliance with environmental and safety regulations and machine directives	Easier and more predictable maintenance	Increased energy efficiency		
Construction Machinery	37	4.622	4.459	3.730	4.108	3.892	3.892	3.892	5	Extremely important
Agricultural Machinery	50	4.520	4.240	4.040	3.940	3.800	3.760	3.860	4	Very important
Material Handling (including conveying) Equipment	26	4.577	4.385	3.808	4.192	3.731	3.692	3.923	3	Somewhat important
Class 4-8 Trucks (including vocational trucks)	8	4.375	4.000	3.625	3.750	3.500	3.750	3.500	2	Not so important
Automotive and Light Truck Manufacturing	11	4.455	4.364	3.909	4.091	4.000	3.636	3.727	1	Not at all important
<b>TOP 5 HYDRAULIC MARKETS</b>	<b>132</b>	<b>4.545</b>	<b>4.326</b>	<b>3.871</b>	<b>4.038</b>	<b>3.811</b>	<b>3.773</b>	<b>3.848</b>		
Automotive and Light Truck Manufacturing	11	4.455	4.364	3.909	4.091	4.000	3.636	3.727		
Food Processing Equipment	12	4.583	4.083	4.083	4.000	4.417	4.000	3.333		
Packaging Machinery	10	4.600	4.600	4.000	3.900	3.500	4.100	3.400		
Semiconductor Machinery	6	4.667	4.333	4.167	3.500	3.500	4.167	3.333		
Metalworking Machinery and Machine Tools	15	4.467	4.400	4.000	4.133	3.267	3.867	3.667		
<b>TOP 5 PNEUMATIC MARKETS</b>	<b>54</b>	<b>4.537</b>	<b>4.352</b>	<b>4.019</b>	<b>3.981</b>	<b>3.741</b>	<b>3.926</b>	<b>3.519</b>		
<b>All Responses</b>	<b>262</b>	<b>4.492</b>	<b>4.324</b>	<b>3.851</b>	<b>3.981</b>	<b>3.855</b>	<b>3.851</b>	<b>3.698</b>		



# Suggestions for New Customer Drivers

In addition to ranking the importance of the existing Customer Drivers, respondents were asked to suggest any additional Drivers that they would have ranked as “Extremely Important” or “Very Important” for the customer markets with which they were familiar. Here’s a summary of the responses collected, sorted by market, with the percent of the fluid power market that each represents.

## Construction Machinery (19.59%)

- Integration with site management systems
- Ease of serviceability
- Compact size of machinery
- Repair parts availability

## Agricultural Machinery (11.73%)

- Communicating status of machine
- Ease of serviceability
- Compact size of machinery
- Replacement parts availability
- Required simple system and environment friendly fluids
- Quality
- Autonomous capabilities

## Material Handling (including conveying) Equipment (5.91%)

- Ease of serviceability
- Compact size of machinery
- Noise level is critical for larger high-speed distribution/manufacturing sites
- Replacement parts availability
- Cloud based condition monitoring

## Automotive and Light Truck Manufacturing (5.45%)

- Communicating status of machine
- Conflict or strategic material usage
- Autonomous operation

## Class 4-8 Trucks (including vocational trucks) (4.67%)

- Conflict or strategic material usage

## Paper Machinery (0.76%)

- Noise levels

## Food Processing Machinery (0.67%)

- Cloud based condition monitoring

## Packaging Machinery (0.61%)

- Noise levels
- Cloud based condition monitoring

## Semiconductor Machinery (0.58%)

- Communicating status of machine
- Ease of serviceability

## Sawmill and Woodworking Machinery (0.41%)

- Ease of serviceability
- Robotic automation

## Medical Equipment (0.35%)

- Communicating status of machine

## Aerospace Product and Parts Manufacturing (0.30%)

- Communicating status of machine

## Printing Machinery (0.09%)

- Communicating status of machine



# Electrification Trend

Many customer markets are experiencing an electrification trend, that is, an increase in the use of electric power sources that serve as the prime mover in either the propulsion circuit, work circuit, or both. When asked if this was a trend in the markets they were familiar with, a high amount of consensus clustered around many of the largest markets for fluid power.

More than 90% of respondents agreed that such a trend was occurring in:

- Automotive and Light Truck Manufacturing
- Chemical Processing Machinery
- Food Processing Equipment
- Lawn and Garden Equipment
- Material Handling (including conveying) Equipment

More than 80% agreed for:

- Class 4-8 Trucks (including vocational trucks)
- Construction Machinery

<b>CUSTOMER MARKETS</b>	<b>N</b>	<b>Is there an electrification trend in this market?</b>		Yes
Aerospace Product and Parts Manufacturing	12	75%	Green	91-100%
Agricultural Machinery	49	71%	Light Green	81-90%
Automotive and Light Truck Manufacturing	11	91%	Yellow	71-80%
Chemical Processing Machinery	2	100%	Orange	61-70%
Class 4-8 Trucks (including vocational trucks)	8	88%	Red	51-60%
Construction Machinery	37	89%	Dark Red	0-50%
Food Processing Equipment	12	100%		
Lawn and Garden Equipment	13	100%		
Material Handling (including conveying) Equipment	26	92%		
Medical Equipment	8	50%		
Metalworking Machinery and Machine Tools	15	40%		
Mining Machinery	18	78%		
Oil and Gas Machinery	9	56%		
Packaging Machinery	10	70%		
Paper Machinery	6	67%		
Plastics and Rubber Machinery	4	75%		
Power Generation Equipment	2	50%		
Printing Machinery	3	67%		
Sawmill and Woodworking Machinery	7	71%		
Semiconductor Machinery	6	67%		
<b>All Responses</b>	<b>258</b>	<b>78%</b>		



# Electrification Trend

When asked to estimate the percent of machines electrified in each market in 2022 and in 2030, a wide variety of responses were received, which were then averaged.

One way to examine this data is to focus on those markets with a low current percent of electrified machines AND a high predicted increase in electrified machines by 2030. Noteworthy markets here include:

- Agricultural Machinery
- Automotive and Light Truck Manufacturing
- Chemical Processing Machinery
- Class 4-8 Trucks (including vocational trucks)
- Construction Machinery
- Lawn and Garden Equipment
- Oil and Gas Machinery

CUSTOMER MARKETS	N	Estimated percent of electrified machines in 2022	Estimated percent of electrified machines in 2030	Increase 2030 vs. 2022	% electrified
Aerospace Product and Parts Manufacturing	2	53%	55%	3	81-100
Agricultural Machinery	24	8%	32%	24	61-80
Automotive and Light Truck Manufacturing	8	10%	45%	35	41-60
Chemical Processing Machinery	1	20%	60%	40	21-40
Class 4-8 Trucks (including vocational trucks)	6	6%	26%	20	1-20
Construction Machinery	28	4%	23%	19	0
Food Processing Equipment	8	58%	79%	21	
Lawn and Garden Equipment	11	10%	37%	27	Increase % points
Material Handling (including conveying) Equipment	20	34%	53%	18	31-40
Medical Equipment	2	98%	98%	0	21-30
Metalworking Machinery and Machine Tools	4	75%	85%	10	11-20
Mining Machinery	14	21%	39%	18	1-10
Oil and Gas Machinery	4	18%	36%	19	0
Packaging Machinery	4	65%	84%	19	
Paper Machinery	4	70%	81%	11	
Plastics and Rubber Machinery	2	45%	53%	8	
Power Generation Equipment	1	90%	95%	5	
Printing Machinery	2	63%	73%	10	
Sawmill and Woodworking Machinery	5	53%	75%	22	
Semiconductor Machinery	2	55%	88%	33	
<b>All Responses</b>	<b>152</b>	<b>26%</b>	<b>46%</b>	<b>20</b>	



# Discussion of Prioritized Customer Drivers for 2023

In discussing which Customer Drivers to prioritize for the 2023 Roadmap, the Committee considered the items shown at right.

It was first decided to make a distinction between Customer Drivers (the top level machine performance objectives) and Customer Strategies (machine-level objectives and technologies that help achieve one or more of the performance objectives).

With that distinction in mind, the Committee proceeded to discuss each item in turn, and determined which items would be positioned as Customer Drivers, which items would be positioned as Customer Strategies, how each should be listed and defined, and how each Customer Strategy was connected to which Customer Drivers.

The outcomes of that discussion is show on the next page.

## Ranked Order of 2021 Customer Drivers

- 4.492 Increased availability and up-time
- 4.324 Increased productivity and performance, including through efforts to provide autonomous functions and operations, and to use of integrated data and intelligence
- 3.981 Lower capital and operating costs
- 3.855 Compliance with environmental and safety regulations and machine directives
- 3.851 On-time delivery of the machine, including through efforts to decrease lead time in getting the machine
- 3.851 Easier and more predictable maintenance, including through efforts to use integrated data and intelligence
- 3.698 Increased energy efficiency, including through efforts to reduce weight and increase power density

## Suggestions for New Customer Drivers

- Autonomous operation and capabilities (robotic or otherwise)
- Cloud based condition monitoring
- Communicating status of machine
- Compact size of machinery
- Conflict or strategic material usage
- Ease of serviceability
- Environment friendly fluids
- Integration with site management systems
- Noise levels
- Quality
- Repair/replacement parts availability
- Simple systems

## Electrification Trend

- Increase in the use of electric power sources that serve as the prime mover in either the propulsion circuit, work circuit, or both



# 2023 Prioritized Customer Drivers and Strategies

## CUSTOMER DRIVERS

Top Level Machine  
Performance Objectives

**Increased availability and up-time**  
Generally defined as the robustness of the machine, its ability to work continuously.

**Increased productivity and performance**  
Generally defined as the efficiency of the machine, its ability to do more work in less time.

**Lower total cost of ownership**  
Includes capital and/or operating costs.

**Compliance with regulations**  
Such as those pertaining to environmental, safety, or other concerns.

## CUSTOMER STRATEGIES

Machine-Level Objectives and Technologies That Help Achieve Performance Objectives

**Autonomy**  
Either semi- or fully-autonomous functions and/or operations.

**Compactness**  
Increasing power density and/or reducing weight and/or size.

**Connectivity**  
Expanding the use of data, such as intelligence for cloud-based condition monitoring, integration with site management systems, and/or communicating machine status for other value-added purposes.

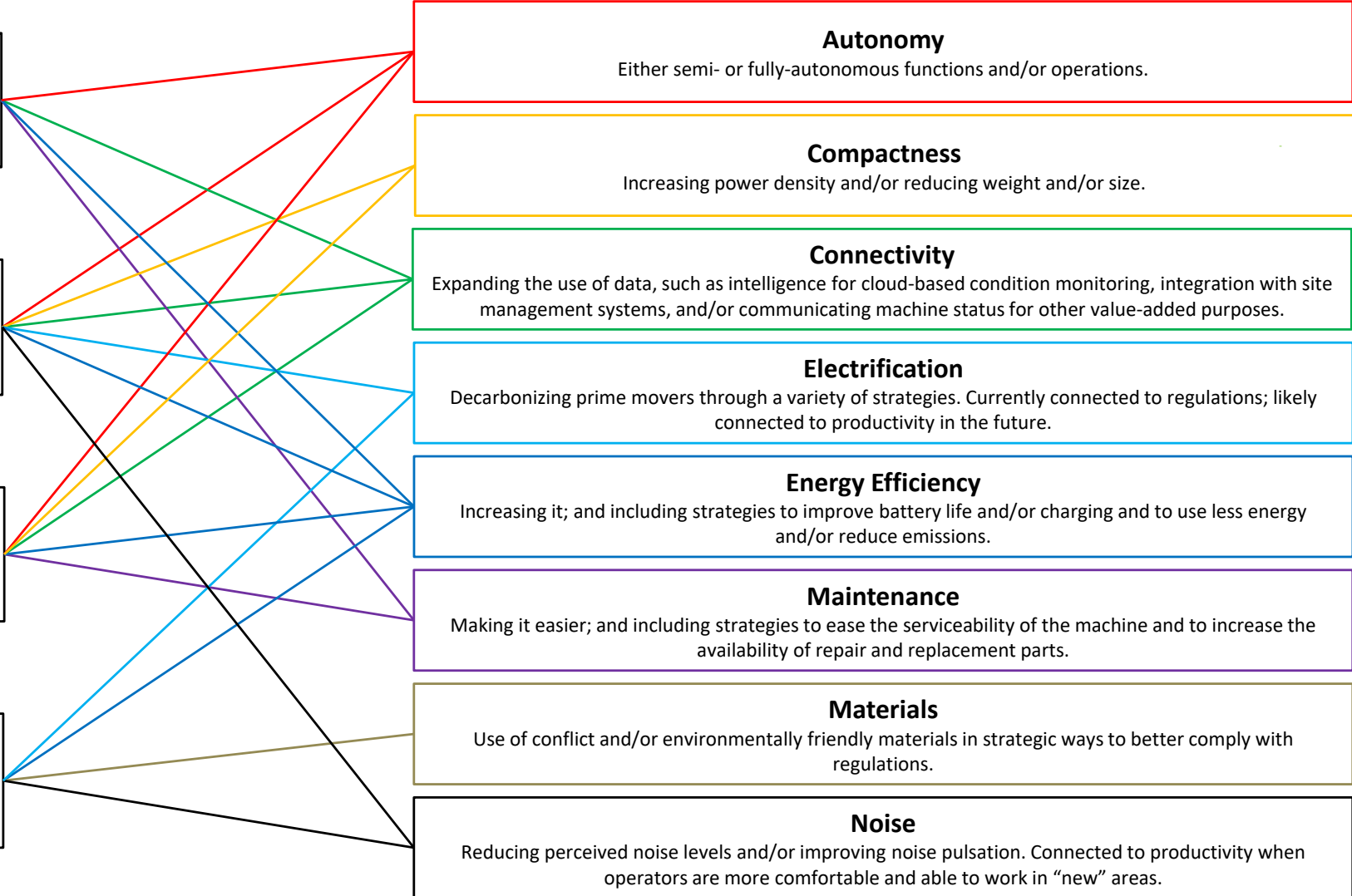
**Electrification**  
Decarbonizing prime movers through a variety of strategies. Currently connected to regulations; likely connected to productivity in the future.

**Energy Efficiency**  
Increasing it; and including strategies to improve battery life and/or charging and to use less energy and/or reduce emissions.

**Maintenance**  
Making it easier; and including strategies to ease the serviceability of the machine and to increase the availability of repair and replacement parts.

**Materials**  
Use of conflict and/or environmentally friendly materials in strategic ways to better comply with regulations.

**Noise**  
Reducing perceived noise levels and/or improving noise pulsation. Connected to productivity when operators are more comfortable and able to work in "new" areas.





# Wrap-Up and Next Steps

The Committee meeting closed with a review of the next steps on the process and timeline for the 2023 update to the NFPA Technology Roadmap, including the survey on fluid power alignment with the Customer Drivers and Strategies, and potential capability improvements for fluid power.

## Phase 1 – Customer Drivers

- Dec 1 Present Roadmap Process and Timeline at NFPA/FPIC Regional Conference  
Launch of survey on customer drivers
- Dec 22 Deadline to respond to survey on customer drivers
- Jan 12 Virtual committee meeting to discuss, define and prioritize customer drivers

## Phase 2 – Capability Improvements

- Jan 26 Meeting report sent with prioritized customer drivers and setting the stage for fluid power alignment and capability improvements  
Launch of survey on fluid power alignment and capability improvements
- Feb 16 Deadline to respond to survey on fluid power alignment and capability improvements
- Mar 2 Virtual committee meeting to discuss, define and prioritize capability improvements

## Phase 3 – Research Areas and Targets

- Mar 16 Meeting report sent with prioritized capability improvements and setting the stage for research areas and targets, including process for defining working groups for each capability improvement  
Launch of survey on research areas and targets
- Apr 6 Deadline to respond to survey on research areas and targets
- Apr/May Virtual working group meetings to discuss and prioritize research areas and targets for each capability improvement
- Jun 1 Virtual committee meeting to review and harmonize research areas and targets for each capability improvement

## Phase 4 – Final Roadmap Document

- Jun Draft Roadmap document written
- Jun 29 Draft Roadmap document sent for review and comment
- Jul 20 Deadline to return comments on draft Roadmap
- Aug 16 Final Roadmap document presented at NFPA IEOC