

2021 Strategic Directions: Megatrends Report

Rail Electrification Council
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Brian Sifton
Sustainability Program Manager

Paul Stith
Director, Global Transportation Initiatives

Black & Veatch



About Black & Veatch

120

Offices



AND



8,500+

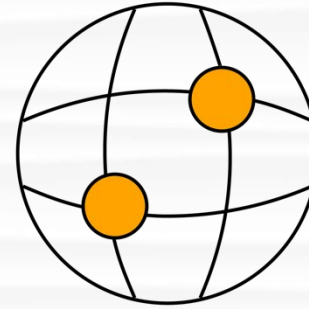
Professionals

\$3.0B

Revenue in 2020

Founded

1915



Projects on

6 Continents

0.18

Recordable
Incident Rate

&

0.04

Lost Time
Incident Rate

7,000

Active Projects
Worldwide

Learn more at bv.com

Black & Veatch: Innovating for Over 100 Years

Our work in Transportation Decarbonization

Renewable Energy



Battery Energy Storage



Hydrogen Refueling



High-Powered Charging

- Strategy, planning, design, engineering, permitting through construction of **EV charging and H2 fueling at scale**
- Communications, renewables, energy storage integration and resilient microgrids
- Clients: Public & Private Fleets, Utilities, Vehicle OEMs, Charging Networks, Developers
- **Focus on safety, speed, and quality**

1200+

EV Charging Sites
Deployed

120+
MW

Transit & Fleet
Charging
Engaged

150+
MWh

Behind-the-
Meter Battery
Installations

25,000
MW

Solar Capacity
Installed

First of a Kind Projects and National Programs

Supporting clients in all phases – from planning through deployment

- Regional & Nationwide charging networks
- Medium/Heavy Duty Truck OEMs and Logistics Clients, multiple sites and technologies with integrated resilience
- Transit: Depot, on-route charging, NYC, DC, Rochester, Reno, LA DOT and several others
- Utility programs for AC and DC Charging Infrastructure with over 10,000 charging stations under contract



Image source: Washington DC DOT



Photo Sim: Daimler Trucks North America

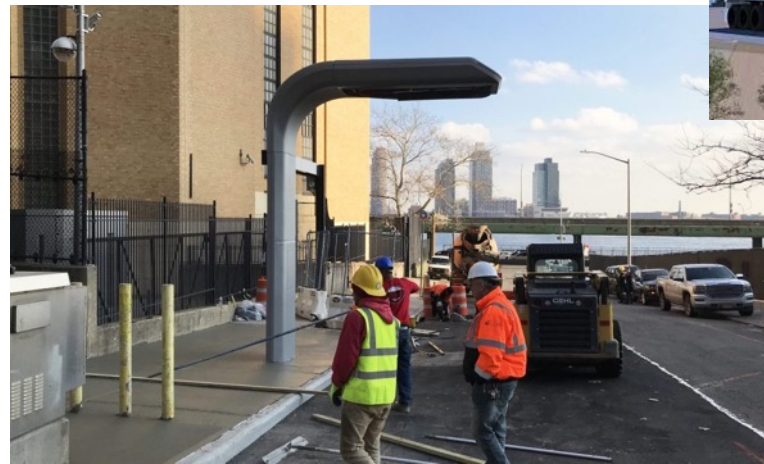


Image source: Black & Veatch
New York Metropolitan Transit Authority

Black & Veatch works with clients such as Daimler Trucks North America (above), Proterra and New Flyer and supporting Washington DC DOT (above left) and New York City Transit Authority (left)

Electrification Ecosystem

Technologies & Stakeholders

Successful Fleet Operations

Commercial Fleets	Transit Agencies
Public Fleets	Off-Road Applications
Airports	Marine



Key Themes From the 2021 Megatrends Report

1. Stakeholders Driving Sustainability in the C-Suite
2. Next-Level Reliability Through Resilience
3. Turning Data into Action
4. Hydrogen





1

Stakeholders Driving Sustainability in the C-Suite

Does Your Organization Have Either Carbon Reduction, Greenhouse Gas Emissions Reduction Or Renewables Goals?

(Select all that apply)

53.3%
Yes

**Separate from any
regulatory mandate**

40.5%
Yes

State
regulatory
mandate

15.2%
Yes

Local
regulatory
mandate

15.2%
No

Source: Black & Veatch.

85% of respondents said they have some drivers

To What Extent Do You Agree Or Disagree With the Following Statement: We Are Pushing Our Capital Towards Clean Energy

(% by population served)

	Strongly Agree	Somewhat Agree	Neither Agree Nor Disagree	Disagree
Less than 500,000	29.2%	33.0	28.3	9.4
500,000 to 1,999,999	37.0%	35.4	22.0	5.5
2,000,000 or more	42.0%	37.6	14.8	2.4

Source: Black & Veatch.

What Has Been the Primary Relationship Driving the Establishment of Your Organization's Sustainability Goals?

(Select one)

30%

**C-Suite or
management's
expectation**

29%

Investors'
expectations

16%

B2B customer
expectations

10%

Consumer
expectations

9%

Regulatory
or policy
requirements

5%

Employee
expectations

Source: Black & Veatch.

How Do You Typically Fund Energy and Sustainability Projects?

(Select all that apply)

60%
**Combination of
CapEx and OpEx**

48%
Power Purchase
Agreements
(PPAs)

32%
CapEx

22%
OpEx

14%
Energy / green
bonds

11%
Don't know

10%
Procurement
savings used to
fund projects

9%
Asset leasing

7%
Energy
performance
contracting

5%
Energy-as-a-Service
models (e.g.
outsourcing control
of your energy
portfolio)

1%
None of
the above

Source: Black & Veatch.



2

Next-Level Reliability Through Resilience

What Are the Major Challenges Your Team Is Facing With Your Current Electric Distribution System?

(Select up to three choices)

72.5%

**Improving
reliability**

49.5%

Asset
management

48.6%

Improving
resilience

37.2%

Integrating
distributed
energy
resources
(DERs)

34.4%

Physical
security and
cybersecurity

24.8%

Common
distribution
automation
plan

Source: Black & Veatch.

What Are the Risks That Your Organization Must Manage?

(Select up to three choices)

60.2%
Regulatory

37.1%
Customer
expectations

34.0%
Environmental
compliance

33.2%
Technological
change

29.0%
Nature (storms,
climate change, etc.)

23.9%
Political

21.2%
Market
competition

20.8%
Labor

13.5%
Shareholder

Source: Black & Veatch.

Is Regulatory Uncertainty at the Federal Or State Level Having An Impact On Your Utility?

(Select all that apply)

Regulatory uncertainty impacts our ability to ...

40.2%

**Recover
infrastructure
investments to
modernize the grid**

39.2%

Recover operating
costs and provide
satisfactory earnings

26.8%

Accurately predict
electricity prices

24.7%

Recover large
one-time costs
(e.g., storm
restoration) in a
timely fashion

16.7%

No, regulatory
uncertainty
does not have
an impact

Source: Black & Veatch.



3

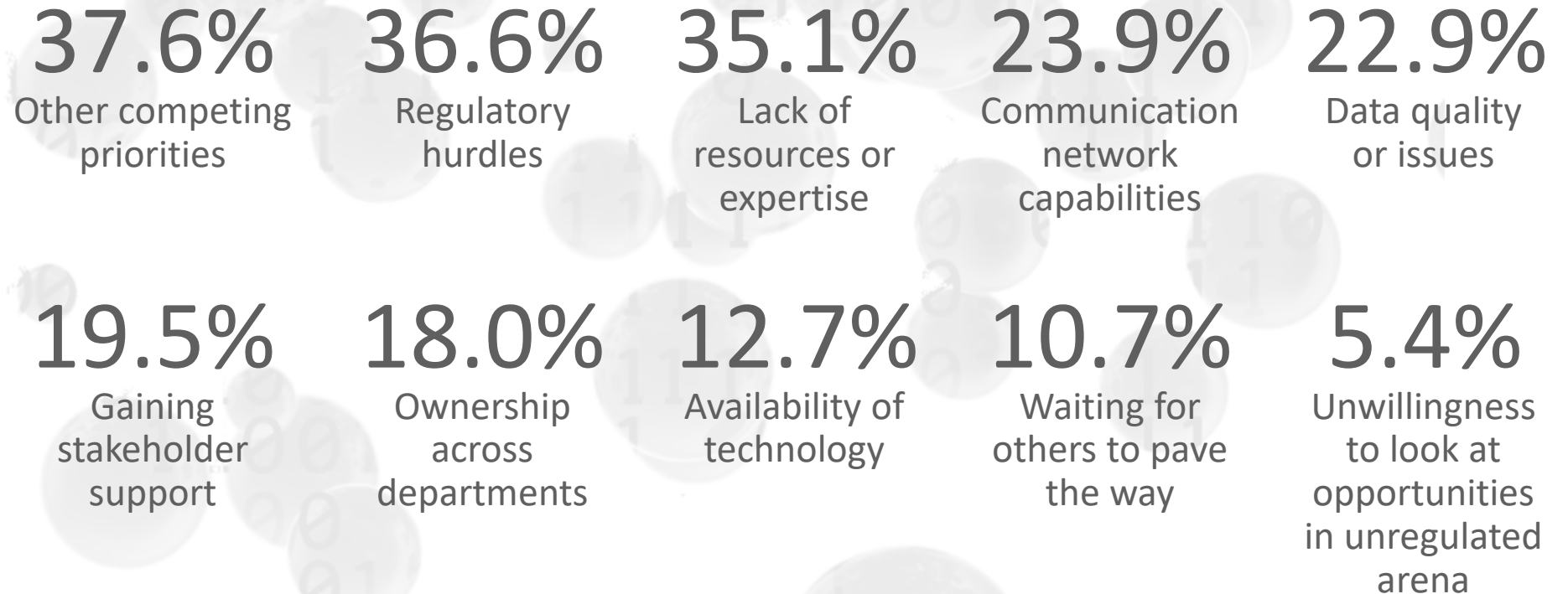
Turning Data Into Action

What Are the Barriers Your Utility Is Facing to Enable Smart Distribution Infrastructure?

(Select up to three choices)

54.1%

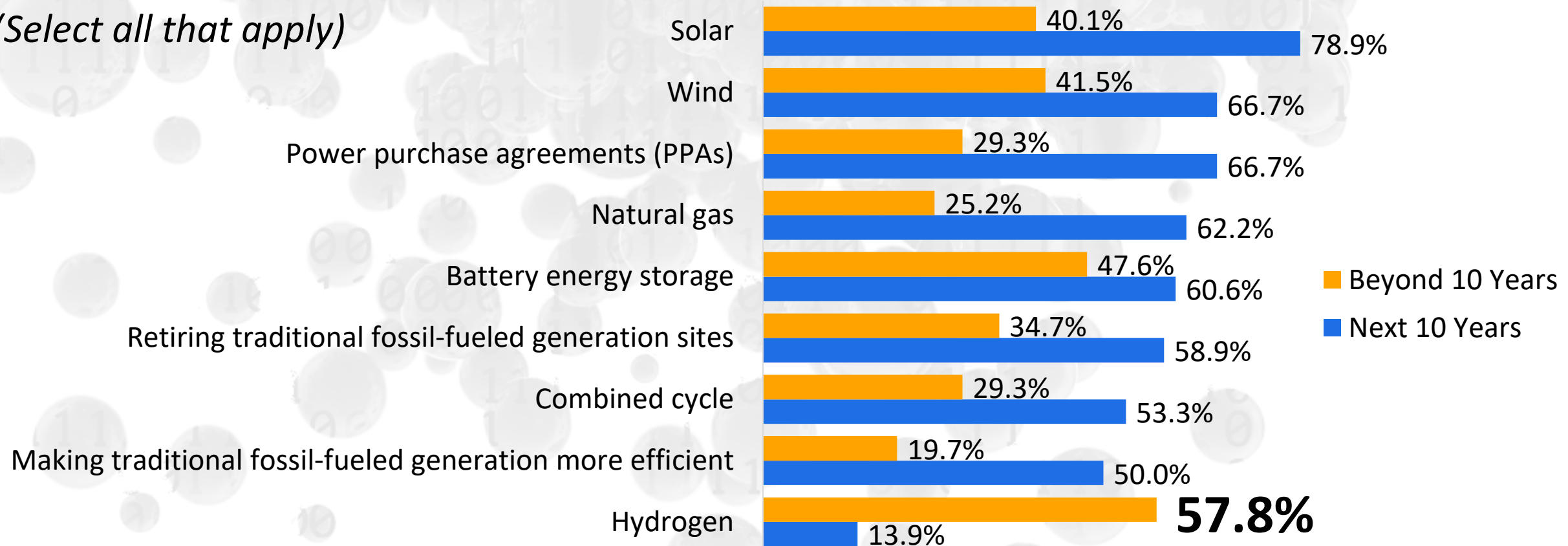
Budget constraints



Source: Black & Veatch.

Which of the Following Techniques Do You Expect Will Be Included Specifically to Help Meet Your Carbon Emissions Reduction and/or Clean Energy Goals?

(Select all that apply)





4

Hydrogen the Fourth Megatrend

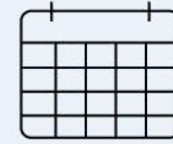
2020 Snapshot – Hydrogen Is On the Rise



US\$500 billion:
committed to
decarbonization (up 9%)
[Bloomberg New Energy Finance]



15 countries:
launched major
hydrogen plans and
policies



35 GW: new projects
announced by major
industry players until
2030



US\$14 billion:
projected market
capital size of FCEV
by 2026
[Global Market Insights]



60%: potential fall in cost of
low-carbon and/or renewable
hydrogen production this
decade due to declining costs of
renewables, scaling up of
electrolyzer manufacturing, and
development of lower-cost
carbon storage facilities
[Hydrogen Council]



US\$1 trillion:
cumulative total of
green debt capital
market between 2015
and 2020, raising
record US\$269.5
billion in 2020
[Climate Bonds Initiative]



70%: share of the
largest U.S. electric
and gas utilities with
net-zero emissions
or equivalent targets
as of end of 2020
[S&P Global Market Intelligence]



Some Industry Experts Say Hydrogen Could Be a Part of the Generation Mix Within a Few Years ...

- New power generation technologies harnessing green hydrogen produced through renewable power and more advanced battery storage show growing promise in the quest for decarbonization
- Nearly 25% of respondents say they would consider hydrogen as a source of peak generation

What services would you consider hydrogen for?
(Select all that apply)

43.0%

Fuel cell storage

24.1%

Transportation
fuel

24.1%

Peak
generation

18.9%

Backup power /
component of
microgrid

15.3%

To make a plant
“greener”

9.2%

Baseload
generation

29.7%

None of the above

... We're Here to Tell You It Already Is

Black & Veatch is working on hydrogen-fueling stations:

- **First Element** – first state-wide hydrogen fueling infrastructure network in California (2016)
- **Ammonia** will be a critical piece in the hydrogen value chain as a storage, transportation and zero carbon fuel source

Black & Veatch is working on developing three hydrogen-capable generation facilities:

- **The Long Ridge Energy Terminal** – 485-MW combined-cycle natural gas project in Ohio
- **The Intermountain Power Agency** – 840-MW combined-cycle gas facility in Utah
- **Confidential Client** – 720-MW combined cycle unit in the Southeastern U.S.



Building a World of Difference.®

Brian Sifton

Sustainability Program Manager

Black & Veatch

P +1 913-458-6362

E SiftonBW@[bv.com](mailto:SiftonBW@bv.com)

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