

The next meeting of the Article 36 Task Force will be at **5:30 pm on February 10, 2022**

The meeting will occur **by Zoom** at:

<https://us02web.zoom.us/j/81323463581>

877 853 5257 US Toll-free Meeting ID: 813 2346 3581

In the event of **connection issues**, contact Aaron Lamperti at aaron.lamperti@gmail.com or 802-526-2463

Committee materials available for viewing at:

https://drive.google.com/drive/folders/19jhlhaVpcRAQr_VvRBrN7F4-4YUXa89t

Article 36: In March 2019, the Town of Norwich advised all Town Officials to “take immediate and sustained efforts to gradually and continually reduce the Town’s direct use of fossil fuels, beginning at a rate of no less than 5% per year starting in the 2019-20 fiscal year and continuing until they are eliminated entirely.” This task force will begin the development of an aggressive and comprehensive work plan to achieve the elimination of direct fossil fuel use by the Town of Norwich.

Dramatis Personae:

Jack Cushman, Chair

Aaron Lamperti, Vice chair

Ernie Ciccotelli

Eva Rosenbloom

Rob Gere

Agenda:

1. Approval of minutes and this agenda
2. Select moderator and secretary for the meeting
3. Lamperti will introduce working draft (attached)
4. Discussion including any proposed revisions (members and public)
5. Consider approving draft for February 23rd SB meeting (deadline of Feb 17 at 3 pm)
6. Do we need another meeting?
7. Adjourn

Report of the Town of Norwich Article 36 Task Force

February 7, 2022



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Executive Summary

- Countless authoritative sources have urged that global civilization must reach net zero carbon emissions no later than mid-century to avoid the worst consequences of climate change
- We must move quickly where there are ready solutions
- Two main kinds of consumption – buildings and mobile – both must be addressed
- Ready solutions include Tracy Hall, the largest single point of fossil fuel consumption
- Other ready solutions include gasoline vehicles such as police cruisers which should be replaced with EVs
- The Selectboard should form a Green Procurement Team (GPT) to evaluate all town spending and report on the Town carbon footprint
- We must avoid “locking in” fossil fuels in all new investments
- We must aggressively seek federal and state assistance where available and devote ARPA funds to climate priorities
- We should be willing to borrow for long term health AND climate benefits so as not to leave behind a “carbon debt”
- We have many opportunities to act. Norwich should be a leader in our region and our state
- Future actions must go beyond direct municipal use of fossil fuels, to include planning, zoning, land management, solarization and electrification, and other “economy wide” measures
- Adaptation and resilience as well as novel approaches beyond the scope of Article 36 need to be addressed

Text of Article 36

Approved at the 2019 Town Meeting by a vote of 792 to 189.

Shall the voters of Norwich direct all Town officials to take immediate and sustained efforts to gradually and continually reduce the Town's direct use of fossil fuels, beginning at a rate of no less than 5% per year starting in the 2019-20 fiscal year and continuing until they are eliminated entirely, and shall the Town Manager be charged with monitoring such efforts and reporting on them each year in the annual Town Report, and no capital expenditures shall be made that contradict or undermine this direction, absent a majority vote of the Selectboard?

Introduction

It has become increasingly clear and urgent that humanity must respond to the threat of climate change at all levels as quickly as possible.

- The Intergovernmental Panel on Climate Change recently reaffirmed that “stabilizing the climate will require strong, rapid, and sustained reductions in greenhouse gas emissions.”
- The International Energy Agency calls for “nothing less than a complete transformation of how we produce, transport and consume energy.”
- The head of the World Meteorological Organization said: “The world needs to fast-track commitments to slash greenhouse gas emissions.”
- Vermont's latest statutory goal, contained in the Global Warming Solutions Act of 2020, would cut economy-wide emissions 40 percent below 1990 levels by 2030 and 80 percent below by 2050.
- The latest Vermont progress report of the Energy Action Network finds that “reaching our GWSA requirements for 2025, 2030, and 2050 will require far more progress in the transportation and thermal energy sectors, in particular. “This report expands our understanding of our fossil fuel consumption and the resulting emissions and recommends policies, programs and projects for enactment by the Selectboard. Much more work lies ahead and all town officials, managers, and committees need to be fully engaged.”
- The Norwich Selectboard adopted the following resolution on October 9, 2019:

WHEREAS, global climate is changing at an unprecedented rate due to human activities, driving the sixth great mass extinction of species since the origin of life on the planet and threatening human communities worldwide;

WHEREAS, residents of the town of Norwich have voted to make climate change a defining focus of town planning and to eliminate fossil fuel use in municipal operations by 2028;

WHEREAS, the town of Norwich, the New England region, and the world have suffered significant losses due to increasingly frequent extreme weather events and that action is required to promote greater resiliency in the face of future events,

WHEREAS, the term "Just Transition" is a framework for a fair shift to an economy that is sustainable, equitable, and just for all its members;
NOW BE IT THEREFORE RESOLVED, the town of Norwich declares that a climate emergency threatens our town, region, state, nation, civilization, humanity, and the natural world;
BE IT FURTHER RESOLVED, the town of Norwich commits to working towards a Just Transition to a sustainable and resilient climate, society, and economy.

This emergency calls us all to act. For the Town, we expect much of this work to focus on how best to phase in future clean technologies, with due consideration to orderly and affordable financing. Town planning and management processes need to be reviewed and updated across the board to meaningfully incorporate carbon reduction goals.

History

The voters of Norwich overwhelmingly advised the town three years ago to move steadily and rapidly to eliminate the direct municipal use of fossil fuels. This is an easily articulated goal that will contribute substantially to more comprehensive climate action.

Scientific and economic evidence has made it increasingly clear that all of us must replace fossil fuels with energy that emits no greenhouse gases, and that we have only two to three decades to avoid the most severe consequences of climate change.

In 2019 the Norwich Energy Committee began the process of evaluating all municipal fossil fuel use and identified the Heating, Ventilation And Cooling (HVAC) systems of Tracy Hall as the appropriate first target for remediation. The Town Manager put out a Request For Qualifications (RFQ) seeking a performance contractor to undertake a thorough evaluation of the building and to make recommendations for reduction or elimination of fossil fuel use. Energy Efficiency Investments (EEI) of Merrimack NH was the firm selected and they performed an energy audit which ultimately resulted in a proposal to replace the end of life oil boilers with a ground source heat pump system. They also found that Tracy Hall has an inadequate ventilation system which will need to be upgraded whenever any change is made to the grandfathered heating system currently in use.

A warrant article seeking permission to borrow up to the not-to-exceed estimate of the project cost was passed at town meeting in 2020 and subsequently reconsidered in the face of the looming COVID pandemic.

In 2021 the Selectboard created the Article 36 Task Force. Its mandate: to resume progress by making recommendations toward an aggressive plan to meet the increasingly urgent goals of the article.

Fossil fuel baseline

Overwhelmingly, the Town uses fossil fuels in three areas: vehicles such as equipment, patrol cars, and light duty trucks that burn gasoline, apparatus such as fire engines and public works heavy trucks that burn diesel, and space heating of buildings using #2 fuel oil or propane. To achieve the Article 36 goals, fossil fuel use must eventually be eliminated in all three sectors.

Green house gas emission accounting is a complex field. The Norwich Energy Committee has produced a full inventory of scopes 1 and 2 emissions for the municipality (See appendix A for a summary). However, this report follows the language of Article 36 and only refers to direct fossil fuel consumption in Town buildings and vehicles.

We suggest that the town use the fossil fuel consumption from the 2018-2019 fiscal year (FY19) as a baseline for measuring progress toward the article 36 goal (see table 1). We chose that year both because it was the year in which the article passed (spring of 2019) and because it was the latest year unaffected by the COVID pandemic.

FY2019: Fossil Fuel Sources by Fuel		Fuel	Gallons	GHGe MT	%	TON %	
Stationary Combustion	Tracy Hall	Fuel oil	4,738	48.5	47.2%	14.7%	
	Fire Apparatus Bay	Fuel oil	1,665	17.1	16.6%	5.2%	
		Town Garage	Propane	6,256	35.5	34.5%	10.7%
		Transfer Station	Propane	316	1.8	1.7%	0.5%
		Sub total	12,975	102.8	100.0%	31.1%	
Mobile Combustion	Police Department	Gasoline	2,450	21.8	9.5%	6.6%	
	Fire Department	Diesel	626	6.4	2.8%	1.9%	
		Gas	452	4.0	1.8%	1.2%	
	Public Works	Diesel	17,303	176.1	77.2%	53.2%	
		Gas	2,248	20.0	8.8%	6.0%	
		Sub total	23,079	228.3	100.0%	68.9%	
		Total	36,054	331.1		100.0%	

Table 1. Fossil fuel use by source for FY19. Units of gallons and metric tonnes of carbon dioxide per year (MT/yr).

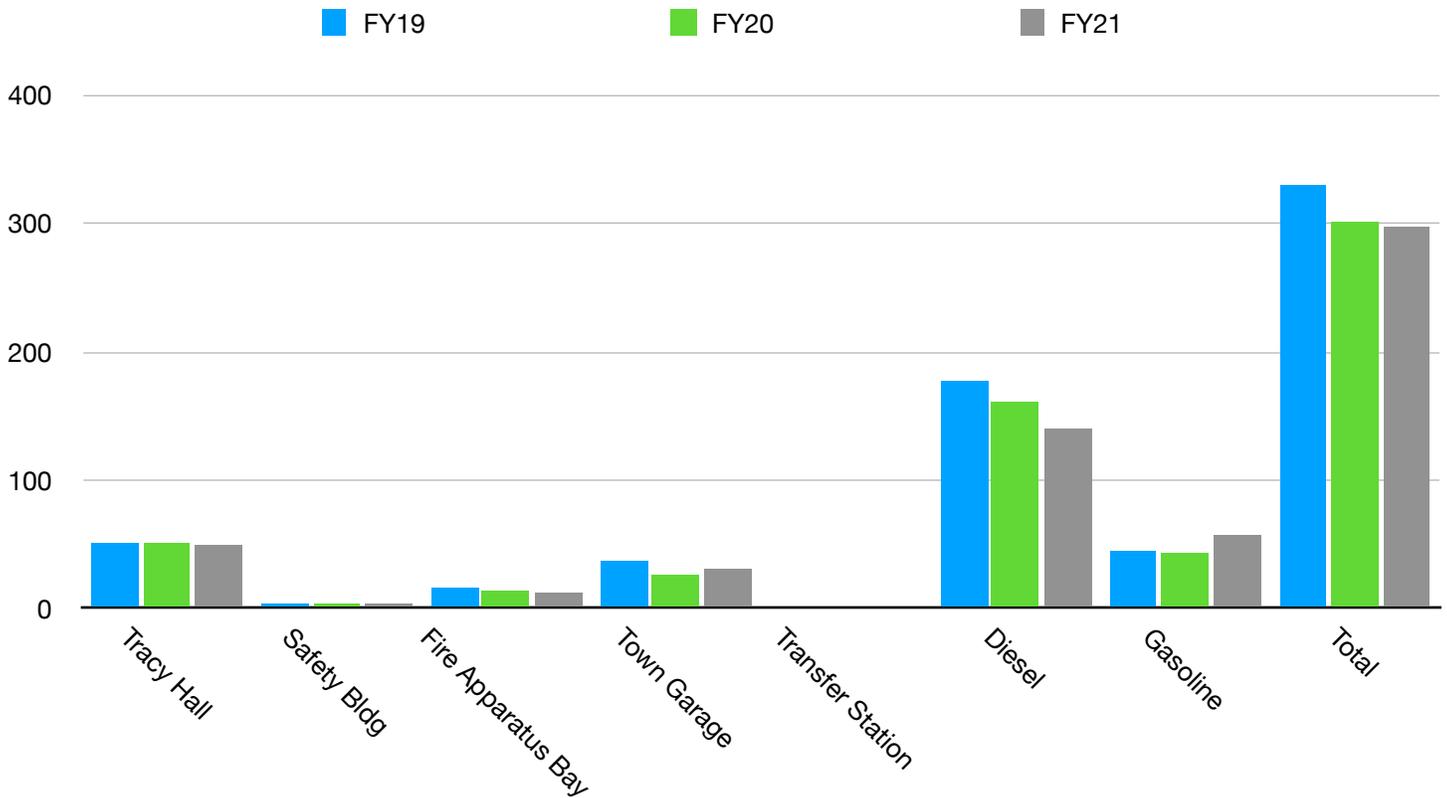


Chart 1. Fossil fuel use by source from baseline of FY19. Units of metric tonnes of carbon dioxide per year (MT/yr).

There have been two full years since FY19; FY20 and FY21. Town fossil fuel use is shown for all three years in Chart 1. Total fossil fuel use decreased from FY19 about 9 percent in FY20 and another 1% in FY 21 for a total reduction of 10% from the baseline. This is consistent with the goal of 5% a year in Article 36.

However, it is clear that most of the reduction is in diesel fuel use, which means DPW and Fire vehicles and equipment. Both of these years were heavily impacted by COVID. About 90% of diesel is used by the DPW, but without detailed data on use, it’s hard to know if consumption is down for reasons related to efficiency or to effects of COVID such as staffing disruptions or perhaps to reduced plowing miles due to warming winters. It’s too early to tell if this reduction is permanent or if use will rebound once we are released from COVID restrictions.

Available technology

As the climate crisis has progressed and action at all levels has failed to grapple adequately with the problem, it has become increasingly clear that we must transition all activities away from combustion to alternative technologies. Simply put, we have to stop burning things for heat and transportation.

Some non-combustion technologies are ready and technologically proven today. Others are on the cusp. Still others may take time to arrive but most are likely to be available in ten to twenty years. We should act soonest

on those solutions that are already available. Proven and widely used technologies and practices for phasing out fossil fuels are currently more readily available for building and space heating than for most kinds of vehicles and equipment -- although electric or other zero-emission technologies for the latter are arriving rapidly.

Fortunately, there are options to replace or reduce most stationary combustion and increasingly options for mobile combustion as well. These include, but are not limited to:

- Heat pumps for heating and cooling buildings
- Weatherization and other efficiency measures
- Behavior changes
- Battery backup
- Hybrid vehicles
- Fully electric vehicles
- Electric groundskeeping equipment

Recommended actions for 2022

The task force compiled and reviewed a list of potential actions to take to meet the goals of the article. We selected a set of these which we are recommending for immediate implementation. Together they will bring the town up to date on the 5% a year goal and set the stage for continued success through the remaining 17 year period. They follow, grouped into the categories of policy, data collection and infrastructure.

Policy

- Establish and empower a Green Procurement Team (GPT). See appendix C for a draft policy to that end. The GPT will establish green procurement policies, review all town purchases, and produce an annual report on progress toward the Town's climate goals
- Engage the GPT or another body to review all Town practices and procedures and recommend changes or new policies to align all town practices with the goals of article 36. This should include, but is not limited to:
 1. The Selectboard, Town Manager, staff, and all committees, commissions and boards – must center their work around climate action. To do so, the town should produce “climate impact statements” offering a hard look at likely results and a real examination of low-emission alternatives for every major decision the town makes, including capital planning, purchases of heating, transportation, and public works equipment, and including also decisions relating to growth, development, and public services

2. The town must avoid new purchases of equipment, vehicles, and infrastructure that lock in the use of fossil fuels. Whenever an alternative exists, or will soon exist, such as police and DPW vehicles, the zero-carbon alternative is to be preferred, even if that means higher initial cost or a delay in procurement. Where the delay is too long to maintain operations, refurbishment of existing equipment is to be preferred over replacement until a non fossil alternative become available
3. The town should focus intensively on and should unfailingly apply for federal and state financial assistance, along with other grants, especially for long-lived capital investments that reduce or eliminate our use of fossil fuels, and should devote the bulk of COVID recovery (ARPA) financing to climate-related projects
4. Cost/benefit and lifecycle analysis should be applied to all purchase decisions and should always consider co-benefits (such as public health impacts and access to efficient, well-ventilated buildings) that are beyond the simple calculations such as reduced fuel costs
5. Existing replacement cycles of equipment should be reconsidered when fossil free alternatives become available, especially when switching from fossil fuel will reduce costs
6. The Town should adopt and enforce policies to make operational (ie behavior) changes, such as cutting idling time, changing mowing schedules, and regulating building temperatures

Data collection

- Ideally, the Town should contract to install Telematics (ie automated data collection) to track driver behavior, milage and fuel use for all vehicles in the Town fleets. At a minimum, the Town should install fuel usage monitoring per vehicle or expand the fuel key system so there is a separate key for each vehicle and fuel and milage data for each vehicle should be compiled on at least a monthly basis

Infrastructure

- The Tracy Hall HVAC system remains the single largest point of fossil fuel use in the Municipality and should be taken to zero immediately with proven technology. ARPA funds can and should be used to substantially offset the cost of this project. We strongly recommend that the existing oil boilers, which are end of life, must not be replaced as this will either lock the Town into fossil fuel use beyond 2040 or necessitate replacement of the new system before the end of its expected life
- Install heat pumps to meet some or all of heating load at the DPW
- Revisit the recent decision to replace police cruisers with hybrid models and invest in EV cruisers instead for one or both of the replacements. See appendix D for an evaluation of the relative costs and benefits of EV cruisers

Recommended actions for the future

Beyond this initial set of actions, we have laid out a rough timeline for the elimination of the remaining fossil fuels in Town operations in appendix B. This table was created by combining the list of Town buildings, fleet inventories from the DPW, NFD, and NPD, and fuel use data.

Note that there is no data that we could find to determine how many miles or hours each piece of DPW equipment is used. So for the DPW fleet, fuel use was divided evenly among the pieces of equipment for each fuel type. Thus, for example, each piece of diesel equipment is listed as producing 3.1% of the TON emissions because there are 17 pieces of diesel equipment that together generate 53.2% of the Town's emissions ($53.2/17 = 3.1$). Once the Town has implemented a system of data collection for the DPW fleet, these numbers will become much more meaningful and will be able to guide a rational and effective replacement schedule.

We suggest that the new Green Procurement Team be assigned the task of monitoring the Town's progress toward the goals of Article 36, updating the GHG inventory and timeline, and reporting on progress annually. The regional energy coordinator should be a member of the GPT and play a substantial role in working through these complex issues.

Financing

We recommend that the Town consider creative financing methods such as performance contracts for major steps to cut fossil fuel use. In this kind of arrangement, the energy cost savings from a capital investment can be shared between the contractor and the customer.

However, it is appropriate to borrow money for major capital expenditures that would make long term reductions to our carbon footprint. Typically these projects will offer important co-benefits such as healthy ventilation or reduced pollution and can also be partially offset by federal or state matching funds. These benefits must be considered when evaluating the upfront costs of projects.

The Task Force notes that the Vermont Legislature is considering H.518, to create the Municipal Fuel Switching Grant Program, and urges the Selectboard to engage with legislators to make sure that any such bill addresses the needs of Norwich going forward, and to encourage the enactment of such legislation.

Conclusion

Norwich continues to run up a "carbon debt" -- the equivalent in pollution terms of falling behind what we owe financially. If you take out a loan and don't meet the promised payments, the debt piles up for future payment. Similarly, if we commit as a nation, state or town to cutting our fossil fuel pollution, and don't deliver, we leave the costly payback to our children who will suffer the effects of our neglect.

Appendix A - GHG Inventory

GHG Inventory Summary: Norwich												
Facility	Emission		Scope	Totals MT CO2e								
				FY18	%	FY19	%	FY20	%	FY21	%	
Norwich Operational Control			Town Totals	1,2	337.43		333.29		303.68		299.15	
			1	335.19		330.95		301.46		296.90		
			2	2.24		2.34		2.22		2.26		
Tracy Hall			Totals	1,2	55.01		54.15		53.88		50.54	
	Relevant Categories											
Direct	Stationary Combustion	Heating & generator	1	50.27	15%	48.45	15%	48.32	16%	47.50	16%	
	Fugitive Sources	Refrigerants	1	2.24	1%	2.24	1%	2.24	1%	2.24	1%	
Indirect	Purchased Electricity	Electricity Town Hall	2	2.50	1%	3.46	1%	3.33	1%	0.81	0%	
Safety Center			Totals	1,2	50.10		48.32		42.09		44.68	
	Relevant Categories											
Direct	Stationary Combustion	Heating & generator	1	15.93	5%	17.03	5%	13.38	4%	12.51	4%	
	Mobile Combustions	FD vehicles*	1	10.60	3%	10.28	3%	9.52	3%	9.27	3%	
		PD vehicles (4)*	1	21.43	6%	20.77	6%	19.25	6%	18.73	6%	
	Fugitive Sources	Refrigerants	1	3.33	1%	3.33	1%	3.33	1%	3.33	1%	
Indirect	Purchased Electricity	Electricity FD /PD	2	-1.19		-3.09		-3.39		0.85	0%	
Dept of Public Works			Totals	1,2	232.32		230.82		207.71		203.94	
	Relevant Categories											
Direct	Stationary Combustion	Heating & generator	1	31.29	9%	36.72	11%	27.21	9%	30.57	10%	
		Transfer station	1	3.74	1%	1.85	1%	1.87	1%	1.18	0%	
	Mobile Combustions	DPW vehicles*	1	196.36	58%	190.28	57%	176.35	58%	171.59	57%	
Indirect	Purchased Electricity	DPW	2	0.74	0%	1.98	1%	2.14	1%	0.39	0%	
		Transfer station	2	0.19	0%	-0.01	0%	0.14	0%	0.21	0%	

*Dept Usage is based on percentage of FY19 actual key data

GHG By Category: Norwich											
Facility	Emission		Scope	Totals MT CO2e							
				FY18	%	FY19	%	FY20	%	FY21	%
All	Stationary Combustion	Building heating	1	101.23	30%	104.05	31%	90.78	30%	91.75	31%
All	Mobile Combustion	Police /FD/ DPW vehicles	1	228.39	68%	221.33	66%	205.12	68%	199.58	67%
All	Fugitive Sources	All Refrigerants	1	5.56	2%	5.56	2%	5.56	2%	5.56	2%
All	Purchased Electricity	Market Based calculations	2	2.24	1%	2.34	1%	2.22	1%	2.26	1%

Appendix B - Action time line (2020-2040)

Town of Norwich Article 36 action timeline

Source	Dept	Fuel Key	Year	Make	Model	Fuel	TON GHGe	Replace with	Rplc Year	2020	2021	2022
COMPRESSOR	DPW	A1*	1987	INGERSOLL	REND125	DIESEL	3.1%	EV/retire	2030			
BACKHOE	DPW	A1*	2017	CATERPILLAR	430F2	DIESEL	3.1%	EV/retire	2036			
LOADER	DPW	A1*	2017	JOHN DEERE	624K	DIESEL	3.1%	EV/retire	2036			
GRADER 1	DPW	A1*	2012	JOHN DEERE	672G	DIESEL	3.1%	EV/retire	2031			
GRADER 2	DPW	A1*	2004	CATERPILLAR	143H	DIESEL	3.1%	EV/retire	2023			
TRACTOR 1	DPW	A1*	2007	HOLDER	C4.75	DIESEL	3.1%	EV/retire	2026			
TRACTOR 2	DPW	A1*	2009	JOHN DEERE	6415 4WD	DIESEL	3.1%	EV/retire	2028			
TRACTOR 3	DPW	A1*	1998	JOHN DEERE	5410	DIESEL	3.1%	EV/retire	2030			
TRACTOR 4	DPW	A1*	1986	JOHN DEERE	2350	DIESEL	3.1%	EV/retire	2030			
TRUCK 1	DPW	A1*	2021	FORD	F550	DIESEL	3.1%	EV/retire	2040			
TRUCK 10	DPW	A1*	2019	FREIGHTLINER	108SD	DIESEL	3.1%	EV/retire	2038			
TRUCK 12	DPW	A1*	2001	FORD	F-550	DIESEL	3.1%	EV/retire	2030			
TRUCK 2	DPW	A1*	2017	FORD	F550	DIESEL	3.1%	EV/retire	2036			
TRUCK 4	DPW	A1*	2010	FREIGHTLINER	M2 106 V	DIESEL	3.1%	EV/retire	2029			
TRUCK 5	DPW	A1*	2015	FRIEGHTLINER	DUMP	DIESEL	3.1%	EV/retire	2034			
TRUCK 8	DPW	A1*	2012	FREIGHTLINER	M2 106 V	DIESEL	3.1%	EV/retire	2031			
CHIPPER	DPW	A1*	1994	BANDIT	2398	DIESEL	3.1%	EV/retire	2030			
SKI DOO	DPW	D6*	1982			GAS	0.3%	EV/retire	2030			
TRUCK 13	DPW	D6*	1989	FORD	F-350	GAS	0.3%	EV/retire	2030			
TRUCK 3	DPW	D6*	1981	FORD	FORD L900	GAS	0.3%	EV/retire	2030			
TRUCK 6	DPW	D6*	2021	CHEVY	1500 PU	GAS	0.3%	EV/retire	2040			
TRUCK 7	DPW	D6*	2021	CHEVY	2500 PU	GAS	0.3%	EV/retire	2040			
TRUCK 11	DPW											
TRUCK 9	DPW											
Engine 1	FD	B3	2005			DIESEL	1.0%	EV?	2030			
Engine 2	FD	B2	2000			DIESEL	0.3%	Ordered	2022			0.3%
Tanker 1	FD	B4	2002			DIESEL	0.3%	EV?	2028			
Ladder 1	FD	B1	1991			DIESEL	0.4%	EV?	2026			
Utility 1	FD	D10	2019			GAS	0.2%	EV	2029			
Car 1	FD	D9	2013			GAS	1.0%	EV	2024			
EQ1	PD	D1	2013	Ford	Sedan	GAS	1.6%	EV	2022			1.6%
EQ2	PD	D2	2016	Ford	SUV	GAS	1.7%	EV	2024			
EQ3	PD	D3	2020	Ford	Hybrid SUV	GAS	0.9%	EV	2028			
EQ4	PD	D4	2013	Ford	Sedan	GAS	2.1%	EV	2023			
Tracy Hall	TON		1994		Boiler	Oil	14.7%	HP	2022			14.7%
Tracy Hall	TON					Propane		Battery				
Apparatus bay	TON				Boiler	Oil	5.2%	HP	2023			
Safety Genset	TON					Propane		Battery				
DPW HVAC	TON				Radiant tube	Propane	10.7%	HP	2025			
DPW Genset	TON	D6*				DIESEL	0.3%	Battery	2022			0.3%
Transfer station	TON					Propane	0.5%	HP	2027			
Buildings and	DPW	D8				GAS	3.3%	Electric	2027			
Water District	WD	D5				GAS	0.8%	EV	2027			
							Year		0.0%	0.0%	16.9%	
							Total	99.7%	Running	0.0%	0.0%	16.9%

* Note that because we are lacking any usage data, fuel pumped under keys A1 and D6 are divided equally among those vehicles.

Town of Norwich article 36 action timeline

Source	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
COMPRESSOR								3.1%										
BACKHOE														3.1%				
LOADER														3.1%				
GRADER 1									3.1%									
GRADER 2	3.1%																	
TRACTOR 1				3.1%														
TRACTOR 2						3.1%												
TRACTOR 3								3.1%										
TRACTOR 4								3.1%										
TRUCK 1																		3.1%
TRUCK 10																3.1%		
TRUCK 12								3.1%										
TRUCK 2														3.1%				
TRUCK 4							3.1%											
TRUCK 5												3.1%						
TRUCK 8									3.1%									
CHIPPER								3.1%										
SKI DOO								0.3%										
TRUCK 13								0.3%										
TRUCK 3								0.3%										
TRUCK 6																		0.3%
TRUCK 7																		0.3%
TRUCK 11																		
TRUCK 9																		
Engine 1								1.0%										
Engine 2																		0.3%
Tanker 1						0.3%												
Ladder 1				0.4%														
Utility 1							0.2%											
Car 1		1.0%																
EQ1																		
EQ2		1.7%																
EQ3						0.9%												
EQ4	2.1%																	
Tracy Hall HVAC																		
Tracy Hall Genset																		
Apparatus bay	5.2%																	
Safety Genset																		
DPW HVAC			10.7%															
DPW Genset																		
Transfer station					0.5%													
Buildings and					3.3%													
Water District					0.8%													
Year	10.4%	2.7%	10.7%	3.5%	4.7%	4.3%	3.3%	17.5%	6.3%	0.0%	0.0%	3.1%	0.0%	9.4%	0.0%	3.1%	0.0%	4.0%
Running	27.1%	29.7%	40.4%	43.9%	48.6%	52.9%	56.2%	73.7%	80.0%	80.0%	80.0%	83.1%	83.1%	92.5%	92.5%	95.7%	95.7%	99.7%

* Note that because we are lacking any usage data, fuel pumped under keys A1 and D6 are divided equally among those vehicles.

Appendix C - Draft Green Procurement Policy

Overview

The purpose of this policy is to commit the Town of _____ to a high level of fiscal, social, and environmental responsibility in the procurement of energy-related capital improvements, and to define the process for procuring these products. The Town of _____ will prioritize improvements, systems, vehicles and equipment, and other energy-related products that are energy-efficient and powered by, or are capable of being powered by, renewable energy sources, and will eliminate, wherever feasible, the use of fossil fuel.

Background

The voters of Norwich overwhelmingly advised the town in 2019 to move steadily and rapidly to eliminate the direct municipal use of fossil fuels. Achieving this goal will mean steadily replacing infrastructure that uses fossil fuel with clean alternatives. Each purchase of goods and services, therefore, must be carefully considered in the context of this goal.

This Policy provides a framework to utilize when making purchasing decisions, helping to ensure that the purchases the Town makes are in line with the objective of Article 36. The Policy also outlines procedures that ensure the Town: utilizes the resources and incentives of the State's energy efficiency utility and the Town's electric utility, selects products that best meet the Town's operational needs, and reduces ongoing operational costs.

This Policy establishes a Green Procurement Team. The Green Procurement Team shall include the Town Manager, the Finance Manager, a member of the Energy Committee, and the Intermunicipal Regional Energy Coordinator (IREC) (if applicable). The function of this Team shall be to review proposals from Department Heads for large capital improvements for consistency with this Policy, and to monitor, review, and, if necessary, develop new procedures and practices related to this Policy. The Green Procurement Team will report progress and findings to the Selectboard at least annually and as appropriate, including any proposed alterations to the Policy.

Nothing in this policy shall be construed as requiring a department, vendor or contractor to procure goods or services that do not perform adequately for their intended use or are not available at a reasonable price or in a reasonable period of time. Decisions regarding adequacy or suitability for use shall be at the discretion of the Selectboard.

Definitions

“Alternative Fuel Vehicle (AFV)” is defined as an all-electric, Plug-in Hybrid Electric (PHEV), hybrid-electric, or biodiesel vehicle.

“Building Modifications” are defined as additions, alterations, renovations, and repairs to existing buildings.

“Emergency Repair/Replacement” is defined as a repair/replacement for which immediate action is needed to avoid harm to Town property or personnel, and/or would substantially impact the Town’s ability to provide adequate services. The Town Manager shall have full discretion to determine what constitutes an *Emergency Repair/Replacement*, and whether, in light of the emergency situation, the procedures defined in this Policy should apply as defined or in an amended form.

“Green Procurement Team” is the group responsible for reviewing budget requests for consistency with this Policy, and for monitoring the implementation of this Policy, reviewing it and making suggestions for additions or amendments to the Policy to better meet the Policy’s objectives. The Green Procurement Team consists of the Town Manager, Finance Director, Energy Committee representative, and IREC (if applicable).

“Large Capital Improvements” include vehicles, equipment, and machinery (VE&M); heating, ventilation, and air conditioning (HVAC) replacements, and; building modifications and new construction.

“Requestor” is the Department Head or other individual making a purchase request under this Policy.

“Small Capital Improvements” is defined as appliances and electronics, lighting, cooking equipment, and pumps, motors, and drives.

“Vehicles, equipment, and machinery (VE&M)” VE&M is defined as all light-, medium-, and heavy-duty vehicles and equipment (e.g., loaders, graders, excavators), small machinery, including but not limited to mini-excavators, ATVs, snow blowers, and lawn mowers, and small equipment, including but not limited to chainsaws and leaf blowers.

Policies

Vehicles, Equipment, and Machinery (VE&M)

It is the policy of the Town to utilize VE&M that will achieve the largest reduction in greenhouse gas (GHG) emissions possible, while meeting the operational needs of the Town and without putting an undue financial burden on the Town. VE&M were responsible for 67% of the Town’s emissions in FY 21. VE&M also contribute significantly to other air pollutants that are harmful to human health and the environment. Lowering emissions and costs from VE&M should be achieved by optimizing the fleet size, reducing vehicle miles traveled (VMT), reducing idle time, transitioning to AFVs, and increasing fuel economy.

Space Heating and Water Heating Replacements

It is the policy of the Town not to install new fossil fuel-based heating systems. Water heaters can last for a decade or more, and heating systems can continue to operate for several decades. Thus, decisions made today will either avoid, or lock in, fossil fuel use for many years to come. The significance of these decisions necessitates careful planning, potentially over multiple years. Replacement heating systems in particular should be evaluated in the context of current and future plans for the building. For example, in general buildings should be weatherized prior to replacing the heating system to avoid installing an oversized heating system. Evaluation of whether the existing heat distribution system (i.e., forced-air, steam, etc.) best meets the needs of the building is also necessary before selecting a replacement.

Ventilation

It is the policy of the Town to utilize effective and energy-efficient ventilation systems in municipal buildings wherever economically feasible. Installing new ventilation systems should be considered during building renovations or modifications, and replacing existing ventilation systems should be considered when the systems are not adequately protecting the health and safety of building occupants and/or the building, or when the existing system fails. Controls are an important piece of an effective, efficient ventilation system.

Air Conditioning

It is the policy of the Town to limit the use of air conditioning systems, and to utilize heat pump systems that can simultaneously replace or offset fossil-fuel use for heating wherever possible. Like a replacement heating system, new air conditioning systems can last for decades and should be evaluated in the context of existing and future plans for the building.

Building Modifications and New Construction

It is the policy of the Town to utilize best practices for efficiency during Building Modifications; to build all new construction to net-zero energy standards, and; not to install new fossil-fuel-based systems in new construction or Building Modifications. Modifications to existing buildings or the construction of new municipal buildings are opportunities to significantly lower the Town's energy use and greenhouse gas emissions for generations. Additionally, proper construction techniques lower or eliminate ongoing energy costs and can significantly extend the lifespan of buildings.

Small Capital Improvements

It is the policy of the Town that Small Capital Improvements are efficient and do not use fossil fuel. Small Capital Improvements should be ENERGY STAR certified and/or qualify for incentives through Efficiency Vermont, where possible.

Procedures

1. Large Capital Improvements (Capital Improvement Request Form Required)

Large Capital Improvements include:

- Vehicles, equipment and machinery (VE&M)
- HVAC replacements (heating/domestic hot water, ventilation, air conditioning)
- Building modifications and new construction

For Large Capital Improvements, Requestors must follow the respective procedure described at Attachment A (VE&M), Attachment B (HVAC), and Attachment C (building modifications and new construction). The procedures shall apply during the budget process (i.e., prior to formal adoption of the budget by the Selectboard and voters). With the exception of building modifications and new construction, Requestors must complete a [Capital Improvement Request Form](#) for review by the Green Procurement Team. The Town Manager may waive the requirements detailed at Attachments A, B, and C for Emergency Repairs and Emergency Replacements only.

2. Review by the Green Procurement Team

The Green Procurement Team will review the applicable Capital Improvement Request Form once submitted by Requestor and respond within three (3) weeks. The review will assess whether the Requestor followed the applicable procedures, whether the request meets the standards and guidelines described in this policy, and other factors as appropriate. The Town Manager will consider the Green Procurement Team’s assessment when developing a final budget proposal for the Selectboard, and shall include a written description of the Green Procurement Team’s assessment, approved by the Committee, as part of the final budget proposal.”.

3. Small Capital Improvements

For Small Capital Improvements, review by the Green Procurement Team is not necessary. Town Manager shall ensure that all requirements detailed at Attachment D are met during the procurement process.

Contacts/Responsible Official

Questions related to the daily operational interpretation of this policy should be directed to:

[Insert responsible official

Effective Date

Approved by:

_____ Responsible Official

_____ Title of the Responsible Official

_____ Date

Attachment A - Vehicles, Equipment, and Machinery (VE&M) Procedures

1. VE&M need justified

In order to ensure that the Town does not invest in unnecessary or underused VE&M, the VE&M Request Form asks for details on the operational purpose and type of VE&M requested, as well as whether it is a new or replacement VE&M.

2. VE&M sized for purpose

The JTEC should assess whether the requested VE&M could be smaller (e.g., a sedan instead of an SUV).

3. Fuel type guidelines

The default fuel-type for all VE&M replacements shall be electric. The following fuel types are ranked in order of preference:

- All-electric
- Plug-in Hybrid Electric (PHEV)
- Hybrid-electric
- Biodiesel
- Gasoline/Diesel

Requestors must search for their desired vehicle type using the U.S. Department of Energy (DOE) AFV search engine, available [here](#). When searching the DOE AFV database, requestors shall check electric, PHEV, and hybrid-electric only. The DOE database on AFVs is continuously updated and provides a comprehensive list of AFVs currently available in the U.S. market. If a suitable AFV is found, the form asks for the specific make and model. **If no AFV is found, an explanation must be given before the Requestor can proceed to requesting a gasoline or diesel vehicle.**

For equipment and machinery not listed on the DOE AFV search engine (e.g., lawn mowers, leaf blowers, etc.), Requestors must search for electric options using a web-based search, contacting the IREC (or Two Rivers-Ottawaquechee Regional Commission), or contacting the [Vermont Clean Cities Coalition](#) and documenting the search/contact. If an electric option is not selected, justification is required.

4. Determine incentives

Determine available incentives through Efficiency Vermont, Green Mountain Power, and other funding sources.

5. VE&M compared for fuel economy (vehicles only)

If no AFV is found, only vehicles with high fuel economies will be considered. The requestor must search for their desired vehicle type [here](#) and fill in the form with the highest fuel economy currently available on the market. If the requested vehicle does not have the highest fuel economy currently available on the market, the requestor must also provide the fuel economy of the requested vehicle, and provide justification for the request.

6. Complete [VE&M Request Form](#).

Attachment B – HVAC Procedures

Space Heating and Water Heating Replacements

1. Fuel type guidelines

The following fuel types are ranked in order of preference:

- Heat pump (ductless, ground-source or geothermal, air-to-water, centrally-ducted, commercial water-source) or solar (hot water systems). For air-source heat pumps, only cold-climate heat pumps listed on the [Northeast Energy Efficiency Partnership's \(NEEP\) cold climate ASHP product list](#) shall be acceptable.
- Biomass
- Fossil fuel (*Fossil fuel is never acceptable for water heater replacements*)

2. Contact Efficiency Vermont

The Town's Efficiency Vermont representative will provide technical assistance to determine the best fuel-type, distribution (heating systems only), equipment sizing, and system efficiency.

3. Determine incentives

Determine available incentives through Efficiency Vermont, Green Mountain Power, and other funding sources.

4. Complete [Space Heating/Water Heating Replacement Form](#).

Ventilation

1. Contact Efficiency Vermont

Contact Town's Efficiency Vermont representative for technical assistance to assess the need for ventilation, the appropriate type of ventilation system, and the proper controls for the system.

2. New ventilation system guidelines

If requesting the installation of a new ventilation system, only the following ventilation systems shall be considered, ranked in order of preference:

- Energy recovery
- Heat recovery

3. Replacement ventilation system guidelines

If requesting the replacement of a failed existing ventilation system, energy and then heat recovery systems should be considered unless technically or economically infeasible. Justification must be provided for a simple replacement of a balanced or exhaust-only system.

4. Complete [Ventilation System Replacement Form](#).

Air Conditioning

1. Needs Assessment

Assess whether and where air conditioning is needed.

2. Use heat pump systems

Heat pump systems should always be the first systems considered, with the goal of completely (preferable) or partially meeting the building's heating load in addition to providing cooling. For air-source heat pumps, only products listed on the [Northeast Energy Efficiency Partnership's \(NEEP\) cold climate ASHP product list](#) shall be acceptable. If there are documented plans to replace the building's heating system in the future, and cooling is needed immediately, a room air conditioning unit (e.g., window air conditioning unit) may be considered. The unit must be ENERGY STAR certified.

3. Contact Efficiency Vermont

Contact Town's Efficiency Vermont representative for technical assistance to assess the appropriate type of air conditioning system.

4. Complete [Air Conditioning System Replacement Form](#).

Attachment C – Building Modifications and New Construction Procedures

1. Contact Efficiency Vermont

All applicable projects (major renovations and new construction) shall enroll in [Efficiency Vermont's Commercial New Construction Program](#) or equivalent. For modifications that do not qualify for Efficiency Vermont's Commercial New Construction Program, Requestors shall involve either an Efficiency Vermont representative or a Building Performance Institute (BPI) Certified contractor or consultant.

2. Net-zero new construction

All new construction shall achieve net-zero energy on an annual basis, as defined by one of the following standards:

- **Preferred:** Achieve a net-zero certification from Efficiency Vermont through its Commercial New Construction Program (includes incentives for successfully completion)
- Achieve a [HERS Index](#) Score of ≤ 0
- Achieve [PHIUS+ Certification](#)

3. No fossil fuels

The Town shall not use fossil-fuel based systems in new construction or modifications, where the modification includes the need for replacing space or water heating systems, ovens, cookstoves, or any other appliance or system that traditionally requires combustion, under any circumstances.

4. Green Procurement Team Review

Provide documentation of enrollment in Efficiency Vermont's Commercial New Construction Program or equivalent and/or building plans/designs to Green Procurement Team for review and comment.

Attachment D – Small Capital Improvements Procedures

Appliances and Electronics

Appliances include refrigerators, washing machines, clothes dryers, dishwashers, and dehumidifiers. Electronics include computers, monitors, and televisions. Requestors shall utilize the following process for purchases of appliances and electronics.

- Clothes dryers, dehumidifiers, and refrigerators
 - Dryers shall use electricity – no gas-fired dryers shall be permitted.
 - Dryer must be on Efficiency Vermont’s Qualified Products List or ENERGY STAR certified. For up-to-date listings, see the [Rebates section on Efficiency Vermont’s website](#).
 - Secure all eligible rebates through Efficiency Vermont.
- Computers, dishwashers, monitors, televisions, and washing machines
 - Must be on the [ENERGY STAR Most Efficient list](#).
 - Secure all eligible rebates through Efficiency Vermont.

Lighting

Includes indoor and outdoor lighting. Requestors shall utilize the following process.

- For larger projects, complete a lighting power density analysis.
- All replacements shall be LED, and the lowest wattage LED replacement that achieves the desired lumens shall be utilized.
- All replacements shall be on [Efficiency Vermont’s Qualified Lighting Products List](#), if applicable, or ENERGY STAR certified if not applicable.
- For larger projects, consider contacting Efficiency Vermont for [consulting services or custom incentives](#).
- Consider installing motion sensors and/or daylight controls.

Cooking Equipment

Includes refrigerators, dishwashers, cookstoves, ovens, steam cookers, hot food holding cabinets, fryers, griddles, and hood fans. Requestors shall utilize the following process.

- All cooking equipment shall be electric.
- Contact Efficiency Vermont for consultation on appropriate equipment and design.
- Secure all eligible rebates through Efficiency Vermont.

Pumps, Motors, and Drives

- [Contact Efficiency Vermont](#) for free consultation on energy efficient replacements and energy-saving controls.

Capital Improvement Request Forms

VE&M Request Form

DEPARTMENT NAME *

REQUESTOR NAME *

REQUESTOR TITLE *

REQUESTOR EMAIL *

OPERATIONAL PURPOSE FOR VE&M REQUESTED*

REQUESTED VEHICLE TYPE* VEHICLE EQUIPMENT MACHINERY

REQUESTED VE&M STATUS* NEW ADDITION TO FLEET REPLACEMENT OF RETIRED VEHICLE

TYPE OF VE&M NEEDED (E.G., SEDAN, DUMP TRUCK, SNOW BLOWER, ETC.)*

PLEASE SPECIFY*

ESTIMATED USAGE* (HOURS PER WEEK)

ESTIMATED NUMBER OF REGULAR USERS*

CAN THIS VE&M BE SHARED BETWEEN DEPARTMENTS* YES NO

IF NO, WHY NOT?

CAN THIS VE&M BE RENTED WHEN NEEDED* YES NO

IF NO, WHY NOT?

Search for your desired vehicle type at <https://www.afdc.energy.gov/vehicles/search/> and select: Electric, Plug-In Hybrid Electric, Hybrid Electric, and biodiesel.

IS THERE AN ALTERNATIVE FUEL VEHICLE (AFV) THAT FITS YOUR NEEDS?*

YES NO

IF YES, MAKE AND MODEL

IF NO, PLEASE EXPLAIN HERE

FOR GASOLINE/DIESEL VE&M REQUESTS ONLY

MAKE AND MODEL*

DETERMINE THE VEHICLE'S FUEL ECONOMY (VEHICLES ONLY)

Search for your desired vehicle type at <https://www.fueleconomy.gov/feg/powerSearch.jsp>.

WHAT IS THE HIGHEST FUEL ECONOMY AVAILABLE FOR YOUR VEHICLE TYPE?*

WHAT IS THE FUEL ECONOMY FOR YOUR REQUESTED VEHICLE?*

Space Heating/Water Heating System Request Form

Please complete this form and attach any relevant information, such as price quotes, conversations with Efficiency Vermont or licensed contractors, drawings, etc.

DEPARTMENT NAME *

REQUESTOR NAME *

REQUESTOR TITLE *

REQUESTOR EMAIL *

REQUESTED HEATING SYSTEM TYPE* SPACE HEATER WATER HEATER

BUILDING/FACILITY WHERE REPLACEMENT IS NEEDED AND REASONS FOR REPLACEMENT*

SPACE HEATING SYSTEM REPLACEMENTS

EXISTING HEATING SYSTEM DISTRIBUTION TYPE* HOT AIR HOT WATER RADIANT
STEAM
OTHER (PLEASE SPECIFY)

EXISTING HEATING SYSTEM FUEL TYPE* PROPANE HEATING OIL ELECTRICITY
(HEAT PUMP) ELECTRICITY (RESISTANCE) BIOMASS
DIESEL
OTHER (PLEASE SPECIFY)

DATE OF CONTACT(S) WITH EFFICIENCY VERMONT?*

NAME OF EFFICIENCY VERMONT REPRESENTATIVE*

PROPOSED HEATING SYSTEM REPLACEMENT DISTRIBUTION TYPE*

HOT AIR HOT WATER RADIANT STEAM
OTHER (PLEASE SPECIFY)

PROPOSED HEATING SYSTEM REPLACEMENT FUEL TYPE*

ELECTRICITY (HEAT PUMP) BIOMASS ELECTRICITY (RESISTANCE) PROPANE
 HEATING OIL DIESEL
OTHER (PLEASE SPECIFY)

IF PROPOSING A SYSTEM OTHER THAN AN ELECTRIC HEAT PUMP, PLEASE PROVIDE A JUSTIFICATION

WATER HEATING REPLACEMENT

EXISTING WATER HEATER TYPE* STORAGE TANKLESS COIL INDIRECT ON-DEMAND
 HEAT PUMP SOLAR
OTHER (PLEASE SPECIFY)

EXISTING WATER HEATER FUEL TYPE* PROPANE HEATING OIL ELECTRICITY (HEAT PUMP)
 ELECTRICITY (RESISTANCE) SOLAR
OTHER (PLEASE SPECIFY)

DATE OF CONTACT(S) WITH EFFICIENCY VERMONT?*

NAME OF EFFICIENCY VERMONT REPRESENTATIVE*

PROPOSED WATER HEATER REPLACEMENT TYPE*

HEAT PUMP SOLAR STORAGE ON-DEMAND
OTHER (PLEASE SPECIFY)

PROPOSED WATER HEATER FUEL TYPE* SOLAR ELECTRICITY (HEAT PUMP)
 ELECTRICITY (RESISTANCE)
 OTHER (PLEASE SPECIFY)

IF PROPOSING ELECTRIC RESISTANCE, PLEASE PROVIDE A JUSTIFICATION

DRAFT

Ventilation System Request Form

Please complete this form and attach any relevant information, such as price quotes, conversations with Efficiency Vermont or licensed contractors, drawings, etc.

EXISTING VENTILATION SYSETM TYPE* EXHUAST BALANCED HEAT RECOVERY
 ENERGY RECOVERY NONE
 OTHER (PLEASE SPECIFY

DATE OF CONTACT(S) WITH EFFICIENCY VERMONT?*

NAME OF EFFICIENCY VERMONT REPRESENTATIVE*

PROPOSED VENTILATION SYSTEM REPLACEMENT TYPE*
 HEAT RECOVERY ENERGY RECOVERY BALANCED EXHUAST

IF PROPOSING BALANCED OR EXHUAST, PLEASE PROVIDE A JUSTIFICATION

Air Conditioning System Request Form

Please complete this form and attach any relevant information, such as price quotes, conversations with Efficiency Vermont or licensed contractors, drawings, etc.

EXISTING AIR CONDITIONING SYSETM TYPE* ROOM UNIT CENTRAL HEAT PUMP
 MINI SPLIT NONE
 OTHER (PLEASE SPECIFY

DATE OF CONTACT(S) WITH EFFICIENCY VERMONT?*

NAME OF EFFICIENCY VERMONT REPRESENTATIVE*

FOR BUILDINGS WHERE FOSSIL FUEL IS USED FOR HEATING, WILL THE PROPOSED AIR CONDITIONING SYSTEM ALSO OFFSET OR REPLACE FOSSIL FUEL USE ASSOCIATED WITH HEATING?*

YES NO

IF NO, PLEASE JUSTIFY

PROPOSED AIR CONDITIONING SYSTEM TYPE HEAT PUMP MINI SPLIT
 CENTRAL ENERGY STAR RATED ROOM UNIT
 OTHER (PLEASE SPECIFY

Appendix D - Report on costs and benefits of EV police cruisers

Executive Summary

Article 36, passed by Norwich residents in 2019, advised Town Officials to reduce the Town's direct fossil fuel use by no less than 5% per year until they are completely eliminated. Reducing fossil fuel use from mobile combustion (i.e., the vehicle fleet), the town's largest source of fossil fuel use/emissions, is critical to achieving the objective of Article 36, but is challenging because of the nature of the town's fleet.

Most of the town's vehicles are medium- to heavy-duty, for which hybrid and all-electric alternatives are not readily available. In contrast, the Norwich Police Department (NPD), which contributes approximately 10% of the town's greenhouse gas (GHG) emissions from mobile sources, uses light-duty vehicles for its operations and is therefore in a unique position to reduce fossil fuel use from mobile combustion.

Electric vehicles (EVs) are widely available for light-duty vehicles such as sedans and SUVs, and there is a robust [network of public charging infrastructure in Vermont](#) to support EVs. EVs perform well against their internal combustion engine (ICE) counterparts, with generally superior acceleration and comparable top speed. The range of EVs has improved dramatically in recent years, with many models capable of driving over 300 miles on a full battery. EVs are roughly three times more efficient than ICE vehicles and have far fewer moving parts, meaning they are cheaper to power and maintain.

While the class of vehicle that the Police Department utilizes (i.e., light-duty) is suitable for electrification, there are practical challenges to using electric vehicles (EVs) for police operations. Some challenges, such as installing charging infrastructure at the NPD or ensuring the vehicle has enough range before each shift, should be easily surmounted. Other issues may be harder to overcome. Perhaps most notable among the challenges is the fact that there are not currently any purpose-built, all-electric vehicles on the market. This means that some modifications that come standard with purpose-built law enforcement vehicles do not come standard in any EV model, and would have to either be sacrificed or modified post-production to meet law enforcement needs. Depending on the model of the EV, the modifications may be difficult or even impossible.

Other law enforcement agencies across the country have begun using electric vehicles in law enforcement. There are at least two such agencies in Vermont, the Town of Richmond and the Windham County Sheriff's Department, that have recently purchased a Tesla vehicle for their fleets. Norwich can learn from the experience of these agencies as it prepares to use EVs in the NPD.

Ultimately, the town will need to transition to EVs for its police department. While each police department is unique, EVs have proven effective in other police departments around the country.

Gerald Fredrickson, Chair ~ Peter G. Gregory, AICP, Executive Director
128 King Farm Rd. Woodstock, VT 05091 ~ 802-457-3188 ~ trorc.org

1. Background

Article 36, passed by Norwich residents in 2019, advised Town Officials to reduce the Town's direct fossil fuel use by no less than 5% per year until they are completely eliminated. In fiscal year 2019, approximately two-thirds of the town's direct greenhouse gas (GHG) emissions, which for the purpose of this report will serve as a proxy for fossil fuel use, come from mobile combustion (i.e., the vehicle fleet). Reducing fossil fuel use from mobile combustion, the town's largest source of emissions/fossil fuel use, is critical to achieving the objective of Article 36, but is challenging because of the nature of the town's fleet.

The bulk (73%) of the town's emissions from mobile combustion are produced by the Department of Public Works (DPW), and most of DPW's emissions come from medium- to heavy-duty vehicles and machinery for which hybrid and all-electric alternatives are not readily available. The Fire Department, responsible for 8% of emissions from mobile combustion, also primarily employs heavy-duty vehicles for its operations. In contrast, the Norwich Police Department (NPD), which contributes approximately 10% of the town's emissions from mobile sources, uses light-duty vehicles for its operations and is therefore in a unique position to curb fossil fuel use from mobile combustion.

Other police departments around the country are adopting electric vehicles in their fleets, and some Vermont police departments, such as the Town of Richmond and the Windham County Sheriff's Department, are piloting EVs (see Attachment A for a list of law enforcement agencies that are either using EVs or have purchased EVs). While converting to EVs will come with challenges and require flexibility as staff learn to use EVs for their operations, the shift to EVs for public safety is inevitable, and is a viable option today. This report intends to identify those challenges and if/how they can be overcome, as well as recognize the benefits of moving to EVs for the police fleet.

This report compares the 2021 Ford Interceptor Utility, which is a hybrid vehicle that the NPD has proposed to replace its 2013 Ford Sedan Interceptors, to the Tesla Model Y and the Tesla Model 3 Long Range models. While other EVs, [including the Ford Mustang Mach-E](#), could serve as police cruisers, this report focuses on the Tesla vehicles because they have been used most by other law enforcement agencies around the world. Both Cruiser 1 and Cruiser 4 are scheduled to be replaced next year, but the report concentrates on Cruiser 4 because it uses significantly more gasoline than Cruiser 1, and may be a better match based on the function of the vehicle and modification needs.

The cost, fuel consumption, and emissions numbers in this report were developed using the best available data and should not be taken as exact, but rather as order of magnitude estimates.

2. Meeting the Objective of Article 36

The NPD is currently requesting to replace Cruiser 4, a Ford Interceptor Sedan, with a hybrid Ford Interceptor Utility. This replacement would increase fuel efficiency and reduce the amount of time the engine runs when the vehicle is at idle. These improvements would result in an estimated 35% reduction in fossil fuel use and GHG emissions. However, the Interceptor Utility would still use approximately 500 gallons of gasoline each year, and would only achieve about a 0.75% reduction in the town's annual fossil fuel use. Moving to either of the Tesla models would eliminate fossil fuel use for Cruiser 4, achieving a 2.11% reduction in the town's total fossil fuel use. Either Tesla model would also reduce GHG emissions from the vehicle by about 90%.

3. Performance

The Model Y and Model 3 can accelerate faster than and match or exceed the speed of the Interceptor Utility. The Model Y has less storage capacity than the Interceptor, but still provides significant capacity at 76 cubic feet, far more than 20.1 ft³ of the current Ford Sedan Interceptors. The Model 3 has far less storage capacity than the Interceptor or Model Y, which may be an issue for the NPD, but still has more storage than the Ford Sedan Interceptors with 22.9 ft³.

Ground clearance is a concern for the NPD. The Interceptor provides the greatest ground clearance at 7.6". The Model Y provides 6.6" of ground clearance, and the Model 3 offers 5.5". However, it is possible to install lift kits for both the [Model Y](#) and the [Model 3](#), achieving ground clearance equivalent to or greater than the Interceptor. Without the lift kits, both Tesla vehicles provide more clearance than the existing Sedan Interceptors, which have 5.1" of clearance.

See Table 1 for a comparison of the 3 vehicles.

Table 1 – Performance and Specification Comparison

Vehicle	2021 Ford Interceptor Utility	Tesla Model Y Long Range	Tesla Model 3
Range (mi)	N/A	318	334
MPG	24	125	134
0-60 mph	5.5	4.7 sec	4.2 sec
Top Speed (mpg)	136	135	145
Estimated Delivery	Unknown	March 2022	March 2022
AWD	Y	Y	Y
Storage Capacity (ft ³)	87.8*	76	22.9
Ground Clearance (in)	7.6	6.6	5.5
Head Room (in)	40.7	41	40.3
Leg Room (in)	40.9	41.8	42.7
Hip Room (in)	59.1	53.8	53.4
Shoulder Room (in)	61.8	56.4	56.3

*Based on [2022 Ford Explorer](#)

4. Charging

An electric vehicle can be charged with different charging types (level 1, level 2, and DC fast) that offer different charging speeds. Level 1 chargers utilize a standard 120 V outlet, and would not be suitable for the NPD given their slow charging speeds. DC fast chargers can charge a vehicle almost as quickly as refueling a gasoline vehicle. Installation costs, however, would likely make installing a DC fast charger at the NPD infeasible without significant grant funding. A level 2 charger is practical for the NPD from both a cost and operational perspective.

Given the range of both Tesla models and the fact that the NPD is not a 24-hour department, the vehicle could easily be charged overnight and should be able to provide more than enough range to complete multiple shifts without charging. If the vehicle ever needed to be charged quickly, either because it was accidentally left unplugged overnight or because a shift required driving unusually far, there is a Tesla

Supercharger in West Lebanon, just over 10 minutes from the NPD. Additionally, if the cruiser ever needed to travel long distances (e.g., to Burlington or Boston), [Tesla offers a network of Superchargers](#) that make charging on road trips fast and convenient.

The Richmond Police Department took advantage of a \$750 rebate on the purchase and installation of a level II charger when they purchased their Tesla. They paid \$800 for the charger, and \$1,400 for an electrician to install the charger, bringing the cost to just \$1,450. It is likely that this or a similar rebate program will be available through GMP for the foreseeable future.

5. Police Modifications

Police cruisers typically need post-manufacture modifications for things like prisoner partitions or light bars. These modifications would have to be made to both the Interceptor Utility and the Tesla vehicles, so the cost to modify the vehicles is likely comparable. Many of the modifications that come standard with the Interceptor Utility, are designed to improve the performance of the vehicle, and the Tesla vehicles, though not designed specifically for law-enforcement, appear to perform at the same level as the Interceptor Utility. There may be, however, some modifications that come standard with the Interceptor Utility, like heavy-duty seats, that do not come with the Tesla vehicles. Such modifications, if desired, would increase the cost of modifying the Tesla vehicles.

Furthermore, because the Tesla vehicles are not designed specifically for law-enforcement, there are some unique challenges to modifying them for that use. Tesla vehicles have been modified with some success by other police departments across the country, including the [Windham County Sheriff's Department](#) and the [Richmond Police Department](#). One of the main challenges to modifying both Tesla models is their glass roofs, which make installing a light bar impossible. The light bar issue can be overcome with the installation of interior lights, but may cause visibility concerns. In addition, the Model 3 is too small to install a prisoner partition and is challenging to get in and out of because of how low it sits to the ground, according to the Richmond Police Chief. These issues are unique to the Model 3, as the City of Menlo Park, CA Police Department was able to install a prisoner partition in the Model Y and the Model Y sits higher off the ground. One positive feature of the Tesla vehicles is that the standard computer and center display can serve as a mobile data terminal, according to the Windham County Sheriff's Department.

6. Cost

EVs are typically more expensive upfront than internal combustion engine vehicles, but have lower operating costs. This is true of the Tesla models when compared to the Interceptor Utility. The Model 3 is closer in price to the Interceptor Utility, at around \$6,000 more expensive.¹ The Model Y costs over \$14,000 more upfront than the Interceptor Utility. While the upfront cost of the Tesla vehicles is greater than the Interceptor Utility, the estimated total cost of ownership (TCO) of both the Model Y and the Model 3 is less than the Utility Interceptor, by about \$10,000 and \$25,000 respectively. See Attachment B for more details. These savings come from three sources: lower fuel costs, lower maintenance costs, and a lower rate of depreciation.

¹If a rear-wheel drive vehicle is acceptable to the NPD, the Model 3 offers a rear-wheel drive option that costs approximately the same as the Interceptor Utility. The rear-wheel drive option comes with less range (267 miles).

Depreciation is the most significant factor in the TCO estimates. The Interceptor Utility is assumed to depreciate at a standard rate of 20% in year one and 15% per year thereafter, while the Tesla vehicles are assumed to depreciate much less, at only 3.3% per year. This historically low depreciation rate is due in part to the low maintenance requirements and longer lifecycle of EVs, and also to a very strong used market for Tesla vehicles in particular. If that market were to suddenly change and the Tesla vehicles depreciated at the same rate as the Interceptor Utility, the TCO of the Model Y would be approximately \$25,000 more than the Interceptor Utility. The Model 3 TCO would be about \$6,500 more than the Interceptor Utility.

Another factor to consider (and not factored into the TCO calculations above) is the warranties of vehicles. [The Interceptor Utility](#) has a 5 year/60,000 mile warranty on the Drivetrain, and a 5 year/100,000 mile warranty on the diesel engine. The warranty for the [Tesla vehicles](#) is 8 years/120,000 miles. The warranty for the Tesla vehicles could allow the town to extend the lifecycle of the police vehicles, which could provide substantial additional savings.

7. Availability

As of the writing of this report, Tesla's website indicates that both models are available for delivery by March 2022. The Richmond Police Department received their Tesla Model 3 in August 2021, slightly earlier than their anticipated delivery date. Completing the modifications will take time. It took approximately 3.5 months from the time the Richmond Police Department ordered their modification parts to the time they were installed.

8. Conclusion

To achieve the objective of Article 36, Norwich will need to eliminate fossil fuel use throughout its vehicle fleet, generally through the use of all-electric vehicles. While all-electric technology is not available today for the medium- to heavy-duty vehicles in the town's fleet, there are proven EV options for light-duty vehicles like sedans and SUVs. The Norwich Police Department utilizes four light-duty vehicles, two of which are up for replacement next year. Given the urgency to meet the goal of Article 36 and the feasibility of using EVs in law enforcement, the next time a cruiser is up for replacement, it should be replaced with an EV.

As with the adoption of any new technology, there are challenges to using an EV in the NPD. The most notable relate to modifying a civilian vehicle to meet law enforcement needs, and the upfront cost associated with the EV. Depending on the NPD's needs, some modifications may be difficult or impossible to make given the constraints of the Tesla models, such as installing a light bar on either model or a prisoner partition in the Model 3. However, other police departments have successfully modified both the Tesla Model 3 and Tesla Model Y to meet their needs.

The upfront cost of both the Model 3 and Model Y is higher than the Interceptor Utility. The 5-year total cost of ownership, however, is lower for both Tesla models assuming a low rate of depreciation for the Tesla vehicles. Even if the Tesla vehicles depreciated at the same rate as the Utility Interceptor, the TCO is only 5% higher for the Model 3 and 20% higher for the Model Y, before considering the longer lifecycle of the Tesla vehicles.

The Town will need to be prepared for a learning curve as staff adapt to the new technology. Both law enforcement agencies in Vermont that have purchased a Tesla vehicle are approaching their purchases

as a pilot – an opportunity to learn how to utilize a new, fossil fuel-free technology with a single vehicle, without completely converting their fleets. This approach may work for Norwich as it strives to make progress toward the goal of Article 36.

Attachment A: List of Law Enforcement Agencies Using or have Purchased Electric Vehicles

Agencies in Vermont

Jurisdiction	Number of EVs in Fleet	Vehicle Make/Model	Purpose
Town of Richmond	1	Tesla Model 3	Administrative
Windham County Sheriff's Department	1	Tesla Model S	Administrative, but currently piloting as patrol

Agencies in U.S.

Jurisdiction	Number of EVs in Fleet or Ordered	Vehicle Make/Model	Purpose
Bargersville, IN	5	Tesla Model 3	Patrol
Boulder County Sheriff's Office	1	Tesla Model Y	Patrol
Denver, CO	1	Tesla Model S	Administrative
City of Fremont, CA	2	Tesla Model S/Model Y	Patrol
Los Angeles, CA	100	BMW i3	Administrative
City of Menlo Park	3	Tesla Model Y	Patrol
New York City, NY	434	Tesla Model 3/ Mustang Mach-E	Many purposes, including patrol

International Agencies

Jurisdiction	Number of EVs in Fleet or Ordered	Vehicle Make/Model	Purpose
Basel, Switzerland	7	Tesla Model X	Patrol
Luxembourg	2	Tesla Model S	Patrol
Ontario, CA	1	Tesla Model X	Patrol

Attachment B – Interceptor Utility Vs. Tesla Vehicles Total Cost of Ownership Estimates

	2021 Ford Interceptor Utility	Tesla Model Y Long Range	Tesla Model 3 Long Range
Purchase Price ^a	\$68,316	\$82,490 ^b	\$74,490 ^b
Annual Fuel Cost EQ4	\$1,477 ^c	\$392 ^d	\$365 ^d
Annual Maintenance Costs	\$572 ^e	\$282	\$282
Annual Depreciation ^f	\$7,957	\$2,571	\$2,321
Annual Insurance Costs ^g	\$1,228	\$2,878	\$1,712
Charging Infrastructure	N/A	\$1,450 ^h	\$1,450 ^h
Total Cost of Ownership over 5 Years	\$124,486	\$114,558	\$99,340

^a Price includes police modifications, estimated at \$25,000.

^b Includes utility incentive

^c Usage calculated from Article 36 Task Force Appendix C&D by converting GHG emissions to gallons of gasoline. Gas prices based on 2021 average \$/gallon in Vermont.

^d Using the gallons of gasoline estimate and subtracting the gallons assumed to have been consumed at idle, converted to vehicle miles travelled based on EPA estimated MPG, then calculated kWh needed to travel this distance. Based on Dec 2021 Green Mountain Power cost of \$0.18969/kWh. Running the auxiliary police systems at idle is [assumed to have no impact on range](#). Does not include utility customer charges if a new electricity meter is needed.

^e Based on estimate from the [12/08/2021 Selectboard packet](#).

^f Assumes [standard depreciation](#) for the Ford Interceptor at 20% in first, year, 15% per year thereafter, and a modest [depreciation rate of 3.3%](#) per year for the Tesla Model Y. Some reports find that [Tesla vehicles hold their value](#).

^g National average cost to insure a Ford Explorer and Tesla Model Y. Actual costs likely higher for police vehicles. Assumes that the incremental cost to insure a police vehicle is the same for a Ford and a Tesla.

^h Based on installation in Richmond, VT. Assumes only a Level 2 charger is needed.