University of Maryland sustainability council

Meeting Summary
November 7, 2019

Council Members Present:

Carlo Colella, Vice President for Administration and Finance (Chair)
John Zacker, Interim Vice President for Student Affairs
Maureen Kotlas, Executive Director, Department of Environmental Safety, Sustainability & Risk
Scott Lupin, Assoc. Dir., Environmental Safety, Sustainability & Risk, and Director, Office of Sustainability
MaryAnn Ibeziako, Director, Engineering and Energy, Facilities Management
Bryan Quinn, Director of Technical Operation, Department of Electrical & Computer Engineering
David Cooper, Assistant Director of Operations, Division of IT
Joe Sullivan, Professor and Associate Dean, College of Agriculture and Natural Resources
Eric Wachsman, Professor, Materials Science and Engineering and Director, Energy Research Center
Jana VanderGoot, Assistant Professor, Architecture
Candela Cerpa, Undergraduate Student Representative

Meeting start time: 10:00am

Meeting Highlights

Welcome and Introductions

Carlo Colella welcomed the Council members and called the meeting to order.

Carbon Neutral Fleet Work Group

Mark Stewart presented a Carbon Neutral Fleet Work Group Report [Appendix A-B].

UMD's Fleet:

- Part of the University's Scope 1 (direct) emissions
- Consumes 700,000 gallons of gasoline and diesel annually
    - Equates to approximately 7,000 tons of GHG emissions
    - Fuel consumption, especially diesel, has steadily increased over the past 10 years.

Recommendations, Discussion, and Committee Verdicts:

1. Collect and Analyze Data to Find Efficiencies in Fleet Operations. **Approved by Council**
    a. Devices were installed in 57 fleet vehicles that capture idling times, vehicle use, trip length, and so on. After 12 months of data collection, AMP and MTS will present their findings to the Council.
    b. The Council has requested that this research inform baseline fleet efficiency knowledge in future fleet considerations.

2. Use Total Cost of Ownership for New Vehicle Purchases: **Approved by Council with amendment**

    a. **Friendly Amendment:** Include infrastructure in Total Cost of Ownership Calculator
    b. The Council approves of using Total Cost of Ownership (TCO), but Council members expressed interest in the TCO calculator including factors such as:
        i. Cost of ZEV infrastructure
        ii. Cost for 100% renewable electricity to power ZEVs
        iii. Benefits of ZEVs participating in Demand-Response programs
        iv. Embodied energy and lifecycle emissions
3. Exceed the Zero Emission Vehicle (ZEV) State Fleet Goal: **Approved by Council**
    a. The Council approves the following goal: At least 50% of UMD's light-duty fleet purchases should be ZEV by 2025.
4. Set Aside Limited Funding for Purchasing ZEVs and ZEV Infrastructure: **Tabled until Dec. Meeting**
    a. The Council recommends that the Office of Sustainability create a funding proposal to pay for infrastructure, offsets, or other recommendations. This funding proposal would include the costs for a ZEV infrastructure study.
5. Fund ZEV Infrastructure Plan: **Approved by Council**
    a. Strongly endorsed by all members of the Council and should be concurrent to any commuting ZEV infrastructure considerations.
6. Prioritize Diesel Vehicles for Replacement and Anti-Idling Measures: **Approved by Council**
    a. The Council supports the recommendation but said that diesel vehicles will likely be replaced as needed.
    b. There was stronger support for the part of this recommendation focused on providing annual air quality training for drivers of UMD's diesel vehicles.
7. Offset GHG Emissions Associated with Fleet Fuel Consumption: **Tabled until Dec. Meeting**
    a. The Council would like to better understand potentially available funds and costs before specifically allocating funds towards offsets.

SustainableUMD Progress Report: Follow-Up on Ratings

Sally DeLeon provided an overview of the 2019 Progress Report and opened discussion on key-takeaways. [Appendix C]

- Reframing UMD's Goals in Sustainable Development Goals Context
    - It is recommended that the Sustainability Council once again explore the definition and categorical approach to sustainability at UMD.
    - This exercise would include identifying and working with other campus groups that address SDG issues, redefining the categories of the Progress Report, and addressing academic and research sustainability keywords.
- Campus thermal load presents carbon neutrality challenges
    - UMD performs lower on the building EUI credit on AASHE STARS as compared to its affiliates. It is recommended that the Council consider a plan to address building EUIs.
    - By the end of the year, building EUI will be available on the TerpFootprints Dashboard. FM Engineering and Energy has begun discussions with the State regarding natural gas procurement to include a renewable gas strategy.
- Education for sustainability strategies outside of the Office of Sustainability
    - In 2012, this Council launched the Education for Sustainability Work Group. In 2014, the work group concluded and presented to this Council and the Provost's Office. It was concluded in 2014 that the Office of Sustainability should continue to lead sustainable education efforts.
    - Currently, we are now behind our peers in Education for Sustainability progress. It is encouraged that the Council consider prioritizing education in sustainability.
- Divestment

- Work with USM and College Park Foundation to encouraged sustainable investment and divestment opportunities.

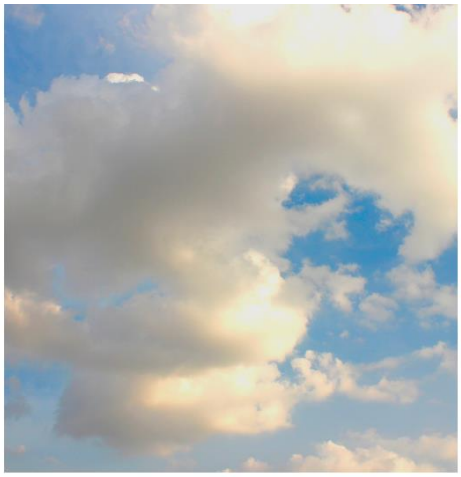
Adjourn 12:00

Appendix of Meeting Handouts and Attachments:

Appendix A: Carbon Neutral Fleet Work Group – Final Report for Sustainability Council

Appendix B: Carbon Neutral Fleet Work Group – Presentation to Sustainability Council

Appendix C: SustainableUMD Progress Report – November Update



UNIVERSITY SUSTAINABILITY COUNCIL

CARBON NEUTRAL FLEET REPORT

OCT 2019

sustainableumd

Definitions

List of Acronyms

AMP – Administrative Modernization Program

BEV – Battery electric vehicle

GHG – Greenhouse gas

ICEV – Internal combustion engine vehicle

MTCO2e – Metric tons of carbon dioxide equivalent

MTS – Motor Transportation Services

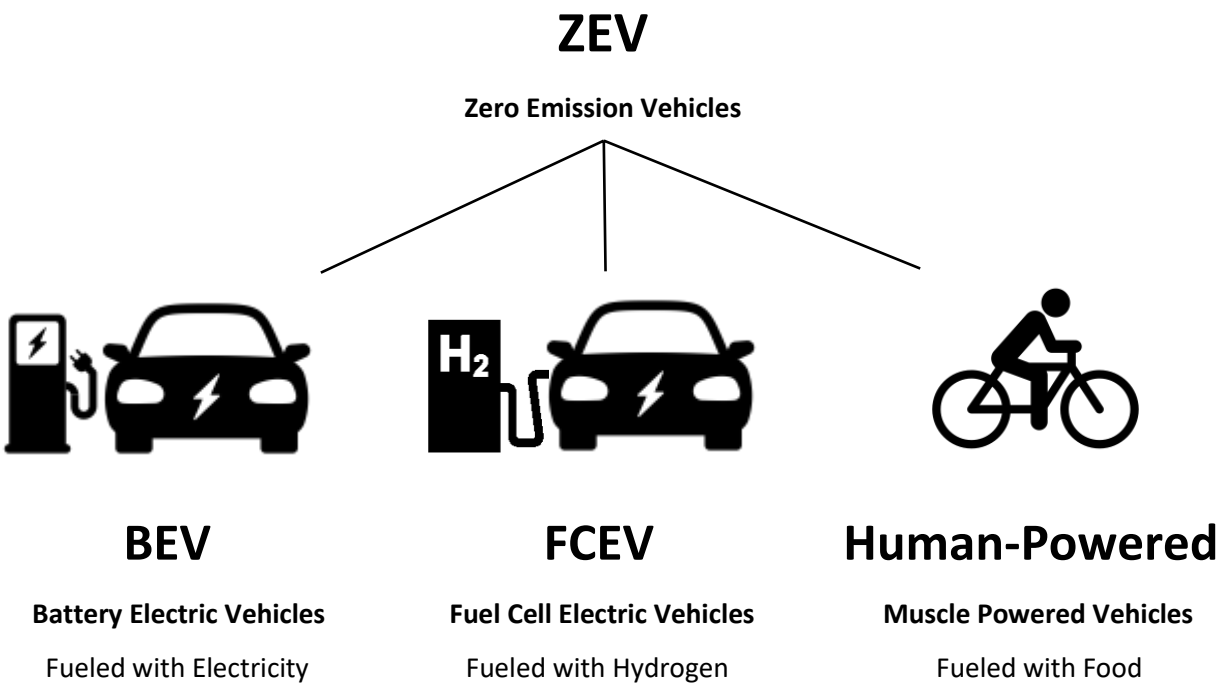
SGA – Student Government Association

TCO – Total cost of ownership

UMD – University of Maryland

ZEV – Zero emissions vehicle

Types of Zero Emission Vehicles



Background

UMD is making progress toward its goal of carbon neutrality. Between 2005 and 2017, UMD reduced its greenhouse gas emissions (GHG) by 49%, nearly meeting its 2020 goal (50% reduction) three years ahead of schedule. The university's remaining GHG emissions primarily come from just three sources: on-campus heat and power generation, commuter vehicles, and the UMD fleet.

Building on UMD's progress, the UMD Student Government Association (SGA) called on the university in the fall of 2018 (see Appendix A) to accelerate climate action and requested specific changes including:

1) Using revenue from the University Sustainability Fund to purchase verified carbon offsets to neutralize 100% of undergraduate student commuting emissions. This request received unanimous support from the SGA Legislature and was approved by the University Sustainability Council in spring 2019. UMD began offsetting undergraduate commuting emissions in summer 2019.
2) Creating a work group to recommend options for achieving carbon neutral commuting for faculty, staff, and graduate students by 2025.
3) Creating a work group to recommend options for achieving carbon neutrality for UMD fleet operations by 2025.
4) Moving UMD's carbon neutrality target from 2050 to 2025 to align with recommendations from the climate science community and commitments made by several other large universities.

Following SGA's request, the Sustainability Council launched a Carbon Neutral Fleet Work Group to develop strategies for achieving carbon neutrality across fleet operations by 2025. As of 2017, UMD's fleet emissions equaled 7,034 metric tons of carbon dioxide equivalent (MTCO2e), or around 4% of UMD's net GHG emissions.

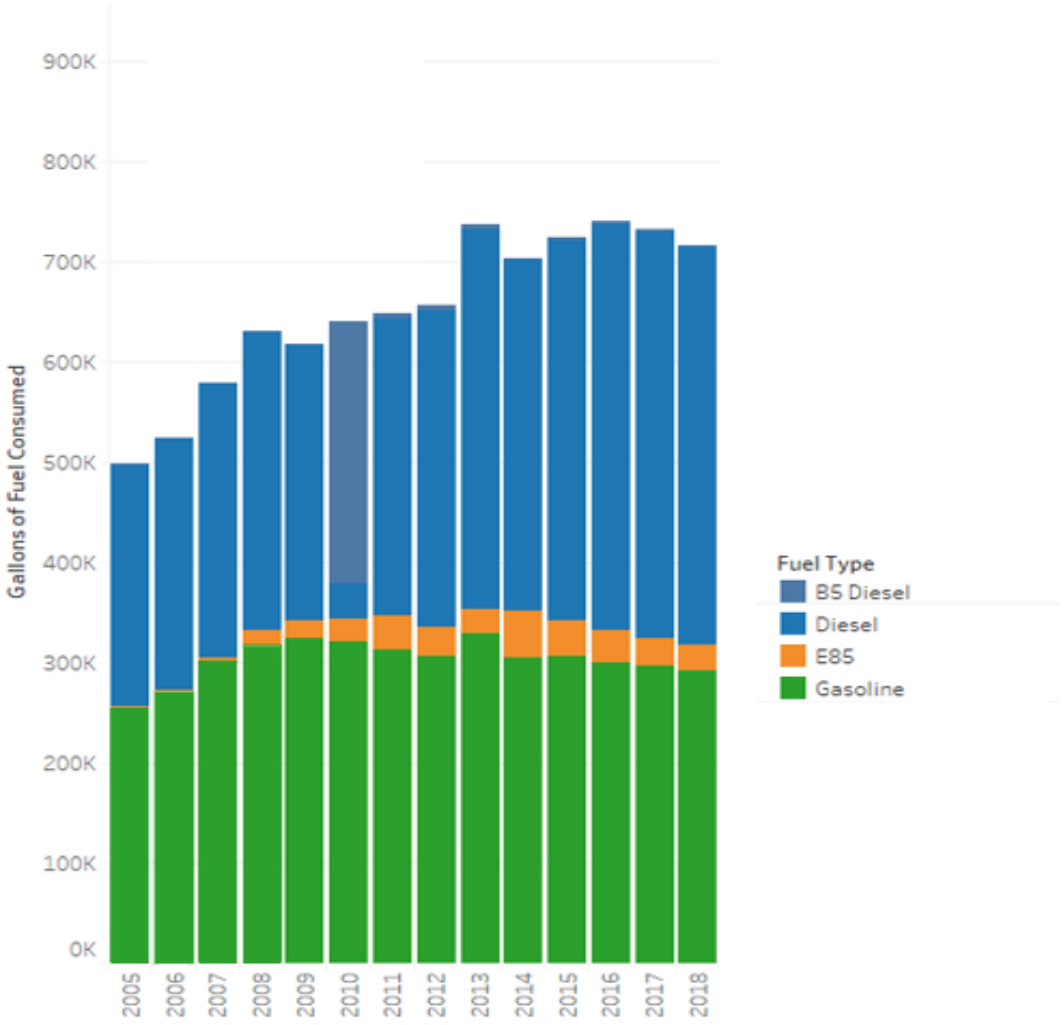
Work Group Members

Sally DeLeon, Senior Project Manager, Office of Sustainability
Ira Levy, Executive Director, Administrative Modernization Program
Scott Lupin, Director, Office of Sustainability
Anna McLaughlin, Assistant Director for Sustainability, Transportation Services
Joe Mullineaux, Senior Associate Director, Dining Services
Leigh Remz, Manager, Motor Transportation Services
Ken Riebert, Executive Director, FM Facilities Business Operations
Armand Scala, Senior Associate Director, Transpiration Services/Shuttle-UM
Gary Seibel, Research Engineer, Environmental Science and Technology
Mark Stewart, Manager, Office of Sustainability

Fleet Fuel Consumption

The Office of Sustainability calculates the university's fleet emissions based on annual fuel consumption. UMD's fleet – including cars, Shuttle-UM buses, pickup trucks, golf carts, box trucks, mini-vans, forklifts, etc. – collectively consumes around 700,000 gallons of fuel annually. Approximately 60% of fuel consumed by the fleet is diesel and 40% is gasoline. Small quantities of E85 (85% ethanol mixed with gasoline) and propane are also used by fleet vehicles.

Gallons of Fuel Consumed by the UMD Fleet



Not included in the above chart is the fuel consumption of UMD's small fleet of zero-emission vehicles (ZEVs), which includes roughly one dozen plug-in battery electric vehicles (BEVs) and an unknown number of bicycles. As of this writing, UMD's fleet does not include any fuel cell electric vehicles (FCEVs).

Strategies for Reducing Fleet Emissions

A review of climate action plans from other universities uncovered a common set of strategies for reducing GHG emissions from fleets:

- Require that a percentage of new vehicle purchases are zero-emission vehicles (ZEV).
- Replace old vehicles with newer, more fuel-efficient vehicles when ZEV are not available/viable.
- Right-size fleets.
- Reduce vehicle miles traveled.
- Reduce engine idling.
- Switch to fuels with lower GHG emissions.
- Purchase carbon credits to offset fleet emissions.

The Carbon Neutral Fleet Work Group considered the above strategies in its deliberations. Most of the strategies are reflected in the Work Group's recommendations.

RECOMMENDATIONS

The Carbon Neutral Fleet Work group recommends to the University Sustainability Council that UMD implement the following initiatives to reduce and neutralize GHG emissions associated with fleet operations.

Recommendation #1: Collect and Analyze Data to Find Efficiencies in Fleet Operations

Rationale: Motor Transportation Services (MTS) and the Administrative Modernization Program (AMP) recently initiated a Fleet Modernization Program with a goal of right-sizing parts of the UMD fleet. The program recently contracted with Enterprise to replace 100 older Motor Pool vehicles with new models. The program also intends to collect data on fleet vehicle usage to find opportunities to improve efficiencies and services across fleet operations.

Recommendation: The Fleet Modernization Program should prioritize emissions reduction by evaluating how potential changes to the makeup and/or utilization of UMD's fleet could increase average miles per gallon (MPG), reduce fuel consumption, and/or reduce GHG emissions for the fleet. Once the program has collected and analyzed 12 months of data on UMD's fleet operations, then MTS and AMP should make a report to the Sustainability Council explaining how UMD can/will reduce emissions by implementing program improvements. Improvements may include purchasing strategies, efficiencies in fleet utilization, and procedural changes all resulting in decreased emissions across the fleet.

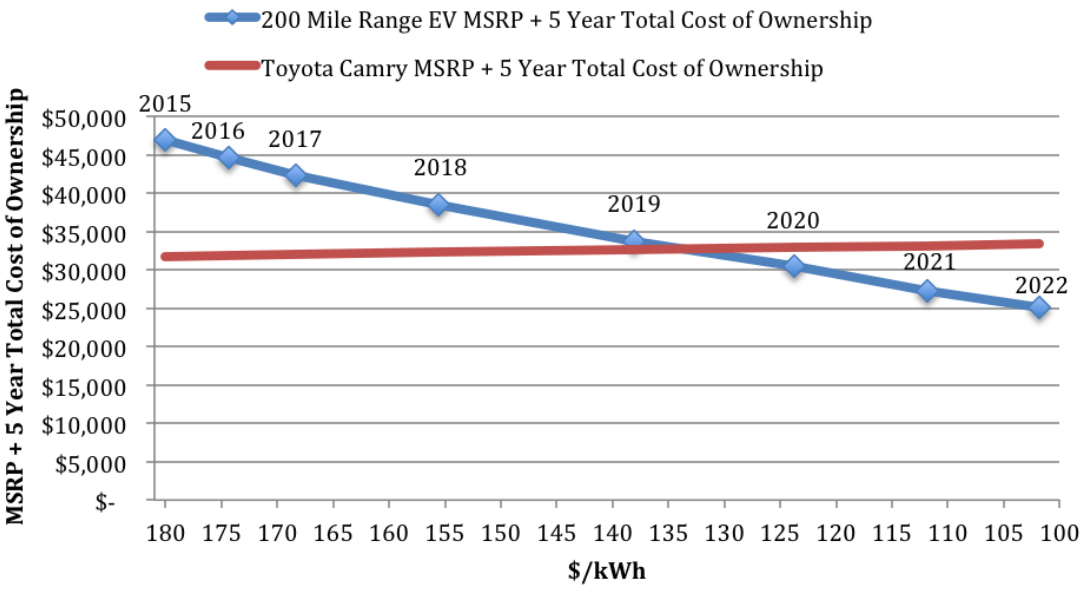
Recommendation #2: Use Total Cost of Ownership for New Vehicle Purchases

Rationale: Currently, battery electric vehicles (BEVs) and comparable internal combustion engine vehicles (ICEVs) have similar 5-year total costs of ownership (based on typical usage without incentives). BEVs are expected to reach purchase price parity with ICEVs around 2025, so a new BEV in 2025 could

provide instant financial savings for its owner based on lower fuel and maintenance costs. The following charts illustrate these trends.

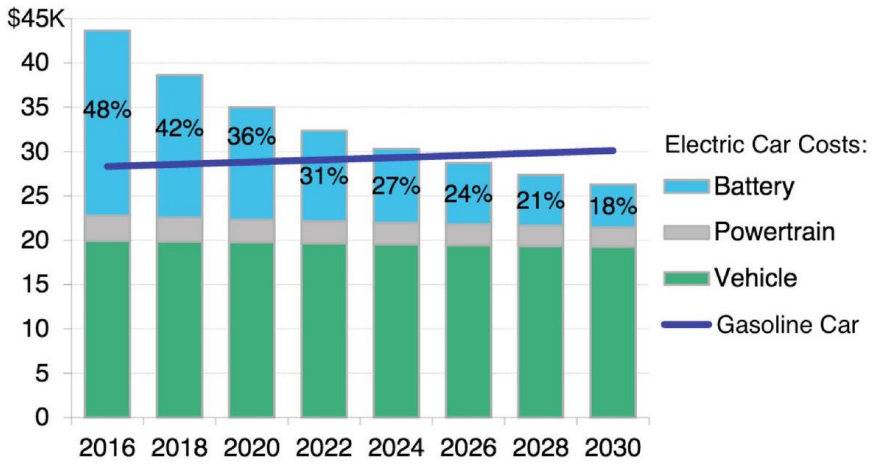
5-Year Total Cost of Ownership, 200-Mile Range BEV vs Toyota Camry

Source: ARK Investment Management



Average Initial Purchase Price, BEV vs Gasoline Car

Source: Bloomberg New Energy Finance



These analyses are encouraging for the proliferation of BEVs, however, they are based on typical usage of privately-owned vehicles and might not align with fleet usage.

Recommendation: UMD should adopt a total cost of ownership (TCO) approach for new vehicle purchases. TCO typically includes purchase price, depreciation, interest on financing, taxes and fees, insurance premiums, fuel, maintenance, repairs, and any tax credits or other incentives. Procurement & Strategic Sourcing and other campus units involved with vehicle purchasing would need to integrate TCO into current vehicle purchasing practices.

For each new vehicle purchase, it is recommended that UMD compare the TCO of at least two vehicles that are suitable for the intended use. One of those vehicles should be a Zero-Emissions Vehicle (ZEV), if one exists for the intended use. UMD should purchase the vehicle with the lower 10-year TCO unless the purchaser can justify why the more expensive vehicle is necessary. With approval by the Vice President for Administration & Finance or designee, UMD could forego the TCO approach to take advantage of benefits that are not quantifiable in a TCO calculation.

Note: The State has a mandate to increase the number of ZEVs in its fleet. Maryland Department of Budget and Management requires that the purchaser of any non-ZEV provide written justification directly addressing the reason(s) for the purchaser's decision to not purchase an ZEV (see Appendix B).

Recommendation #3: Exceed the Zero Emission Vehicle (ZEV) State Fleet Goal

Rationale: By Executive Order 01.01.2015.02 (see Appendix C), effective January 2015, Maryland State agencies must increase the number of ZEV acquisitions in light-duty fleets to at least 25% of annual fleet purchases by 2025. To the extent practicable, ZEV acquisitions should increase by 3% each year from fiscal year (FY) 2016 through FY 2020, so that by FY 2020 at least 15% of annual light-duty fleet purchases are ZEVs. The State must annually report ZEV purchases to the Governor, the Maryland Energy Administration, and the Maryland Department of the Environment. The Executive Order encourages "the University System of Maryland and county and local governments to join in purchasing ZEVs under the State contract."

Recommendation: UMD should establish a goal of exceeding the ZEV State Fleet Goal by making at least 50% of UMD's light-duty fleet purchases ZEV by 2025.

Recommendation #4: Set Aside Limited Funding for Purchasing ZEVs and ZEV Infrastructure

Rationale: Currently, ZEVs have higher purchase prices than comparable ICEVs (excluding incentives). Investment in ZEV infrastructure will be necessary for the campus to transition to ZEVs and take advantage of lower operating costs. Offering some fixed pool of funding for purchasing ZEVs or installing ZEV infrastructure could encourage early adoption of these technologies by campus units.

Recommendation: UMD should set aside at least $200,000 in one-time funding to:

1. Buy down the purchase price on a new ZEV so that its 10-year total cost of ownership (TCO) is equal to or lower than a comparable ICEV; and
2. Cover costs for installing EV charging stations and other ZEV infrastructure.

Example from University of Florida: “The Office of the Chief Operating Officer will pay for the cost difference of purchasing an approved departmental electric vehicle in place of a gas-powered vehicle over the next three years (beginning Feb. 1, 2018), or until the designated $100,000 budget is depleted.”

Recommendation #5: Fund a ZEV Infrastructure Plan

Rationale: UMD lacks information concerning how to best expand its ZEV infrastructure. Specifically, UMD requires outside consulting expertise to assess its options given the current power infrastructure, charging stations and available technologies.

Recommendation: UMD should commission a ZEV Infrastructure Plan. The plan should address several critical questions including, but not limited to: how UMD should prepare for the ZEV technologies that will most likely exist over the next 20 years; the ability of UMD’s current electrical infrastructure to accommodate additional charging stations; where additional charging stations should be located; how ZEVs integrate with smart-grid technologies including vehicle-to-grid charging for demand response programs; the estimated cost for the recommended improvements; and possible funding sources including State and Federal grant programs. The estimated cost for this study is $50,000.

Recommendation #6: Prioritize Diesel Vehicles for Replacement and Anti-Idling Measures

Rationale: According to the Maryland Department of the Environment, “Diesel exhaust is a complex mixture of gases and fine particles. The primary pollutants emitted from diesel engines include particulate matter (PM), carbon monoxide (CO), nitrogen oxides (NOx), hydrocarbons (HC), volatile organic compounds (VOCs), and other chemicals that are classified as ‘hazardous air pollutants’ under the Clean Air Act. Health studies show that exposure to diesel exhaust primarily affects the respiratory system and worsens asthma, allergies, bronchitis, and lung function. There is some evidence that diesel exhaust exposure can increase the risk of heart problems, premature death, and lung cancer.” (Source: mde.maryland.gov/programs/Air/MobileSources/Pages/DieselHealthandEnvironmentalEffects.aspx)

Recommendation: UMD should prioritize the replacement of diesel vehicles with ZEV or low emissions alternatives to reduce GHG emissions and improve local air quality. Facilities Management, Transportation Services, and other departments that operate diesel vehicles should:

1. Identify diesel vehicles that could be replaced with ZEV or low emissions alternatives; and
2. Develop a plan for providing annual training for drivers of diesel fleet vehicles to educate them about health impacts associated with diesel emissions and the State’s anti-idling law.

Recommendation #7: Offset GHG Emissions Associated with Fleet Fuel Consumption

Rationale: UMD has a carbon neutrality goal and has purchased verified carbon credits. The costs for credits have been incurred by various UMD units and the University Sustainability Fund. Specifically, UMD has or will purchase verified carbon credits to offset greenhouse gas emissions associated with:

- Air travel (Carbon Neutral Air Travel Initiative),
- Energy consumption from new buildings (Carbon Neutral New Development Initiative), and
- Undergraduate student commuting emissions (Carbon Neutral Undergraduate Student Commuters Initiative).

Recommendation: UMD should purchase verified carbon credits annually for fleet GHG emissions that are not mitigated through the recommended strategies previously described. The budgetary cost estimate to implement this approach in 2020 is $28,000. It is further recommended that UMD either implement a 4-cent carbon surcharge per gallon of gasoline/diesel or centrally fund the purchase.

Note: $4 per carbon credit roughly equals 4-cents per gallon of gasoline or diesel fuel.

FINANCIAL SUMMARY

Recommendation/Strategy	Financial Impact
1. Collect and Analyze Data to Find Efficiencies in Fleet Operations	• Funding already committed to AMP/MTS for the Fleet Modernization Program
2. Use Total Cost of Ownership for New Vehicle Purchases	• No funding required to use Total Cost of Ownership in purchasing decisions • **Savings within 0-10 years** of each new vehicle purchase
3. Exceed the Zero Emission Vehicle (ZEV) State Fleet Goal	• No additional cost (already paid for by #2 and #4)
4. Set Aside Limited Funding for Purchasing ZEVs and ZEV Infrastructure	• **One-time cost of $200,000** supported by VPAF, Facilities funds, internal and/or external grants, and/or internal loan repaid through fossil fuel surcharge • Note: a 10 cent surcharge per gallon of gasoline and diesel would generate approximately $70,000/year; thus 3-year repayment on $200,000 internal loan
5. Fund a ZEV Infrastructure Plan	• **One-time cost of $50,000** (estimated) supported by VPAF, Facilities funds, and/or State grants
6. Prioritize Diesel Vehicles for Replacement and Anti-Idling Measures	• No additional cost for vehicle replacement (already paid for by #2 and #4) • Marginal cost for driver education/training
7. Offset GHG Emissions Associated with Fleet Fuel Consumption	• **Annual cost of $28,000** (estimated for 2020) • Implement a 4-cent surcharge per gallon of gasoline/diesel or centrally fund

Appendix A: Letter from SGA Requesting Carbon Neutrality by 2025

November 5, 2018

Dear President Loh and the University Sustainability Council,

We, as representatives of the Student Government Association (SGA), urge you to move the carbon neutrality deadline in the Climate Action Plan from 2050 to 2025.

The University of Maryland has established itself as a leader in sustainability. UMD was listed as one of the Top 25 Best Green Colleges in the United States for our commitments to waste reduction, renewable energy, investments in sustainable solutions, and much more. Our renowned faculty and dedicated student body consistently make impressive strides in climate action and decarbonization. With the October 23rd release of the 2018 SustainableUMD Magazine, the Office of Sustainability announced that UMD reduced its emissions 49 percent between 2005 and 2017, essentially meeting the University's 2020 goal three years ahead of schedule. These are significant accomplishments, but we must now take the next step: we must commit to reaching carbon neutrality by 2025 to address the ever-growing threat of climate change.

We are proud of this University's accomplishments, but we now face a new, more urgent call to action. The recent United Nations Intergovernmental Panel on Climate Change's "Special Report on Global Warming of 1.5°C" found that to avoid the catastrophic consequences of climate change, net human-caused emissions of carbon dioxide (CO2) must be reduced globally by 45 percent by 2030. If this is not achieved, future generations of students will face the threat of catastrophic weather events, rising sea levels, disease, and crop failure, resulting in geopolitical challenges unlike anything we have ever experienced.

If the University of Maryland intends to continue being a leader on climate action, then it must achieve carbon neutrality by 2025, the carbon neutrality deadline set by at least 20 other leading research universities in the United States. The University of California System, Oregon State University, Loyola University Chicago, Duke University, and the Universities of Florida, Vermont, and Montana have all committed to carbon neutrality by 2025 or earlier. American University achieved carbon neutrality earlier this year. As one of the nation's premier research institutions, the University of Maryland should make the same decisive climate commitment.

Three main sources of emissions stand in the way of UMD achieving its carbon neutrality goal:

1) Commuter vehicles
2) UMD fleet vehicles
3) The combined heat and power plant

The SGA already took a significant step toward helping the University meet its goal. On October 31, 2018, the SGA Legislature voted unanimously in support of purchasing verified carbon offsets to eliminate the climate impact of undergraduate commuter vehicles. This action will help the University reduce emissions by around 11,000 metric tons of CO_2 equivalent and get seven percent closer to carbon neutrality. This is the first time since the establishment of the Sustainability Fund in 2010 that the SGA has voted to use the student body's own Sustainability Fee money to directly decrease greenhouse gas emissions and make a positive climate impact. We are excited about the opportunity for students to directly invest in climate solutions and contribute to the University's climate goals, and we hope the administration can reciprocate by accelerating the implementation of its own carbon neutral strategies.

November 5, 2018

The SGA urges you to support our plan of offsetting undergraduate commuting emissions while the University and commuter students continue transitioning toward cleaner commuting choices. We believe that the campus community can find an agreeable way to offset graduate student, faculty, and staff commuting emissions by 2025. We are also confident that the University can make progress toward decarbonizing its fleet and using more electric vehicles over the next six years.

The University's major challenge is implementing a new district energy system that can operate with net zero carbon emissions by 2025. Fortunately, the University is already planning for the replacement of the existing combined heat and power plant, so the time is now to find a carbon-neutral district energy solution. We are encouraged by a proposal to capture emissions from our combined heat and power plant and convert them to profitable algae products as this offers an innovative and revenue-generating solution for the University to tackle its most difficult emissions problem.

We thank you for your support of numerous sustainability projects in the past. We hope that the student body can count on your full support for a 2025 carbon neutrality deadline, and for continued action towards a low-carbon future.

Best,

Jonathan Allen
Student Body President

Amelia Avis
Director of Sustainability

cc:
Carlo Colella, Vice President, Division of Administration and Finance
Scott Lupin, Director, Office of Sustainability

Appendix B: Letter to Fleet Managers and Coordinators about Electric Vehicles

MARYLAND
DEPARTMENT OF
BUDGET & MANAGEMENT

LARRY HOGAN
Governor
BOYD K. RUTHERFORD
Lieutenant Governor

DAVID R. BRINKLEY
Secretary
MARC L. NICOLE
Deputy Secretary

June 25, 2019

Greetings Fleet Managers and Fleet Coordinators,

I wanted to provide an update with regard to electric based vehicles and their inclusion in the overall State fleet. When I refer to electric based vehicles, I'm including electric, plug-in hybrid and hybrid vehicles. In instances where the initiative or discussion does not involve all three, I will clearly delineate that. If you are uncertain as to the differences, feel free to contact me and I will clarify.

Currently, there are three separate initiatives to increase the number of electric based vehicles in the State's fleet. First, in 2019 the State Legislature mandated through budget appropriation that select agencies will spend $2.25 million on the purchase of fully electric or plug-in hybrid vehicles in FY-20, with affected agency budgets being adjusted accordingly. My office, along with the Office of Budget Analysts (OBA) at DBM, have developed a list of vehicles that will be replaced under this budget appropriation. Based on cost assumptions, we expect to purchase approximately 65 of these vehicles, though we will know more precisely once the vehicle contracts are set early this Fall. Affected fleet managers will be contacted and we will discuss whether a fully electric or a plug-in hybrid vehicle is best suited for your agency's needs. Once all requests are confirmed, DBM will place the vehicle order(s) for this initiative. ***Your agencies will not need to place these orders.*** Unless re-addressed in next year's legislative session, this is a one year adjustment and the only agencies exempt are MSP, DNR and DGS.

Second, the State has been mandated to increase the number of electric based vehicles in our eligible fleet by incremental percentages over the next decade. In furtherance, FY-20's State Vehicle Contracts will have availability of every non-luxury model electric based vehicle type currently on the market, to include police pursuit rated vehicles. This will be the widest range of availability of electric based vehicles to date. As such, I encourage you to consider electric based vehicles for your agency when selecting new vehicles for purchase in FY-20. ***While DBM does not have the authority to deny non-electric based vehicle purchases under this mandate, we will be requiring that comments directly addressing the reason(s) for your decision to not purchase electric be provided in the Notepad section of WebFleetmaster. Purchase orders that do not provide commentary in Notepad will not be authorized.***

Lastly, my office is working as part of the Electric Vehicle Infrastructure Council (EVIC) to determine workable numbers of electric based vehicle purchases to meet the mandated electric based vehicle increases, as well as and maybe more importantly, how to move forward with charging station infrastructure. Much of the funding for infrastructure comes from the civil settlement with Volkswagen with regard to the diesel engine lawsuit. Plenty of information

regarding the settlement is on the internet if you are interested in the details. Expect to see significantly more charging stations over the next couple of years. Also, this settlement requires the replacement of approximately ten diesel engine vehicles with electric based vehicles, though that will not occur in FY-20.

I expect that you have heard some or all of this from other sources; however, I wanted to make certain you heard it from DBM. As always, I appreciate your cooperation and am available for any questions.

Joseph C. Consoli
Administrator
State Fleet and Travel Services
Department of Budget and Management

Appendix C: Executive Order 01.01.2015.02 - State Fleet Goals for Zero-Emission Vehicles

A. State Leadership. The purpose of this Executive Order is to ensure that State agencies exercise leadership in the purchase and use of Zero-Emission Vehicles (ZEVs).

B. Zero-Emission Vehicles Defined. For the purpose of this Executive Order, ZEVs shall mean plug-in hybrid electric vehicles, plug-in battery electric vehicles, hydrogen fuel cell vehicles and other low- and zero-emitting vehicles that meet California's low emissions standards, as may, from time to time, be amended and incorporated by reference into Maryland regulations.

C. Zero-Emission Vehicle State Fleet Goal.

(1) 2025 Goal. Consistent with operational requirements, and the provisions and requirements of this Executive Order, State agencies shall increase the number of ZEVs in their fleets through the normal course of fleet replacement so that at least 25 percent of annual fleet purchases of light duty vehicles will be ZEVs by 2025.

(2) Milestones. To the greatest extent practicable, and consistent with operational requirements and the provisions and requirements of this Executive Order, State agencies shall increase the percentage of ZEVs in their fleets through the normal course of fleet replacement by three percent each year from FY 2016 through FY 2020 so that at least 15 percent of annual fleet purchases of light duty vehicles will be ZEVs by FY 2020.

D. Approval of Vehicle Specifications. The Department of Budget and Management shall, in consultation with the Maryland Energy Administration, the Department of the Environment, and the Department of Transportation, approve and annually update for State agencies, vehicle specifications in order to provide reasonable and practical options for the purchase of ZEVs.

E. Vehicle Procurement and Fueling Infrastructure. The Department of General Services and the Department of Transportation shall procure approved ZEVs, electric vehicle charging equipment, and other necessary fueling infrastructure for ZEVs for State agency fleets.

F. Reporting. The Department of Budget and Management and Department of Transportation shall annually submit a report to the Governor, Maryland Energy Administration, and the Department of the Environment summarizing the number and types of ZEVs purchased in the reporting fiscal year, the total number of ZEVs in the State vehicle fleet, the agencies to which the ZEVs have been assigned and the progress toward achieving the milestones and goals set forth in this Executive Order.

G. Implementation of Executive Order. The Department of Budget and Management shall, in consultation with the Maryland Energy Administration, the Department of the Environment, the Department of Transportation, and the Department of General Services, be responsible for coordinating the requirements of this Executive Order and for informing and encouraging the University System of Maryland and county and local governments to join in purchasing ZEVs under the State contract.

Effective date: January 20, 2015

Carbon Neutral Fleet Work Group

Report to the University Sustainability Council

UNIVERSITY OF MARYLAND

Carbon Neutral Fleet Work Group Objectives

The Carbon Neutral Fleet Work Group should develop recommendations for the University Sustainability Council that meet the following objectives:

1. Develop strategies for achieving carbon neutrality for fleet operations by 2025.
2. Estimate costs for achieving carbon neutral fleet operations by 2025.
3. Recommend funding sources for each cost.
4. Allow for carbon offsetting to be part of the strategy for achieving carbon neutral fleet operations.

Carbon Neutral Fleet Work Group Members

Sally DeLeon, Senior Project Manager, Office of Sustainability

Ira Levy, Executive Director, Administrative Modernization Program

Scott Lupin, Director, Office of Sustainability

Anna McLaughlin, Assistant Director for Sustainability, Transportation Services

Joe Mullineaux, Senior Associate Director, Dining Services

Leigh Remz, Manager, Motor Transportation Services

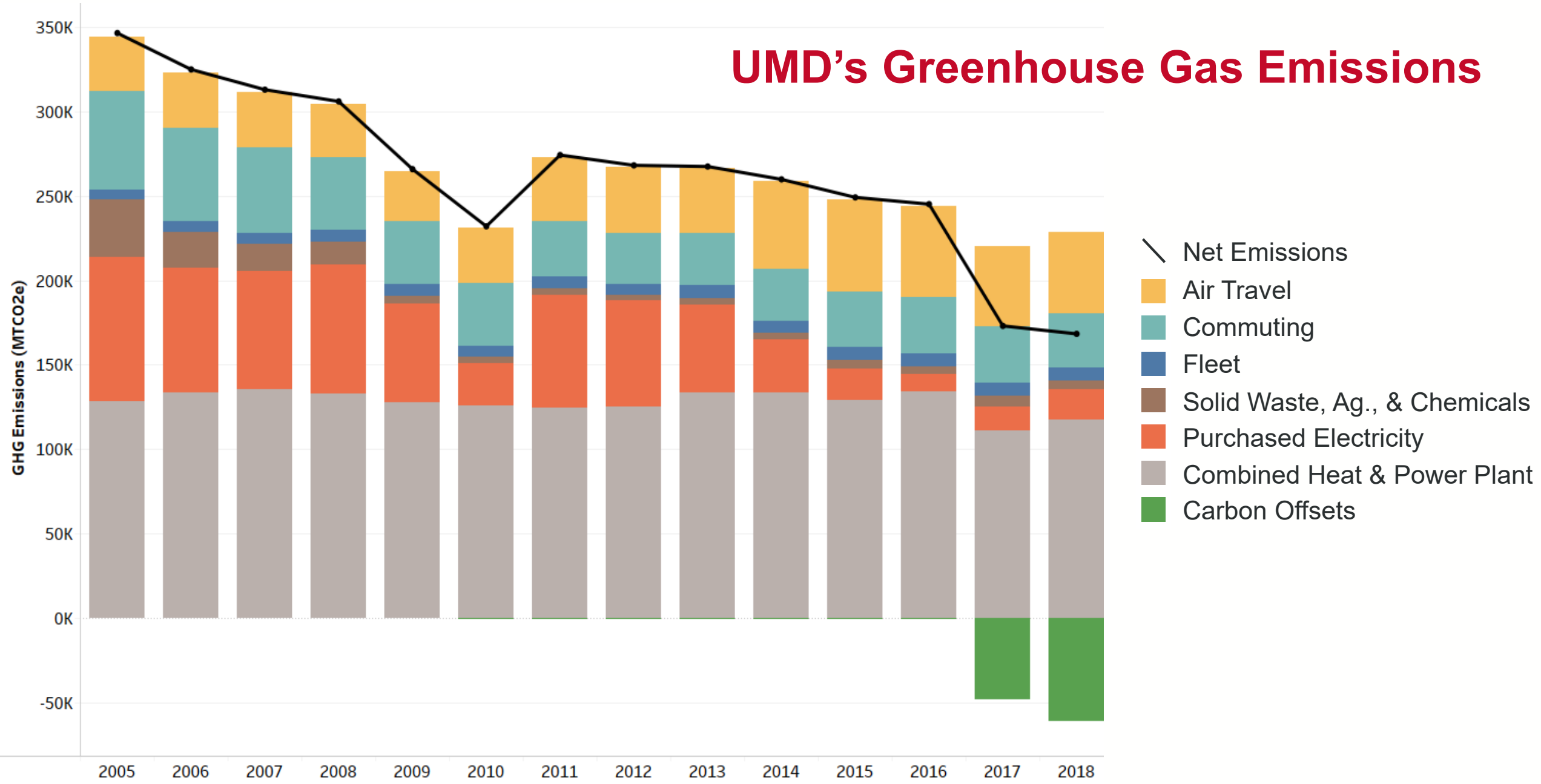
Ken Riebert, Executive Director, FM Facilities Business Operations

Armand Scala, Senior Associate Director, Transpiration Services/Shuttle-UM

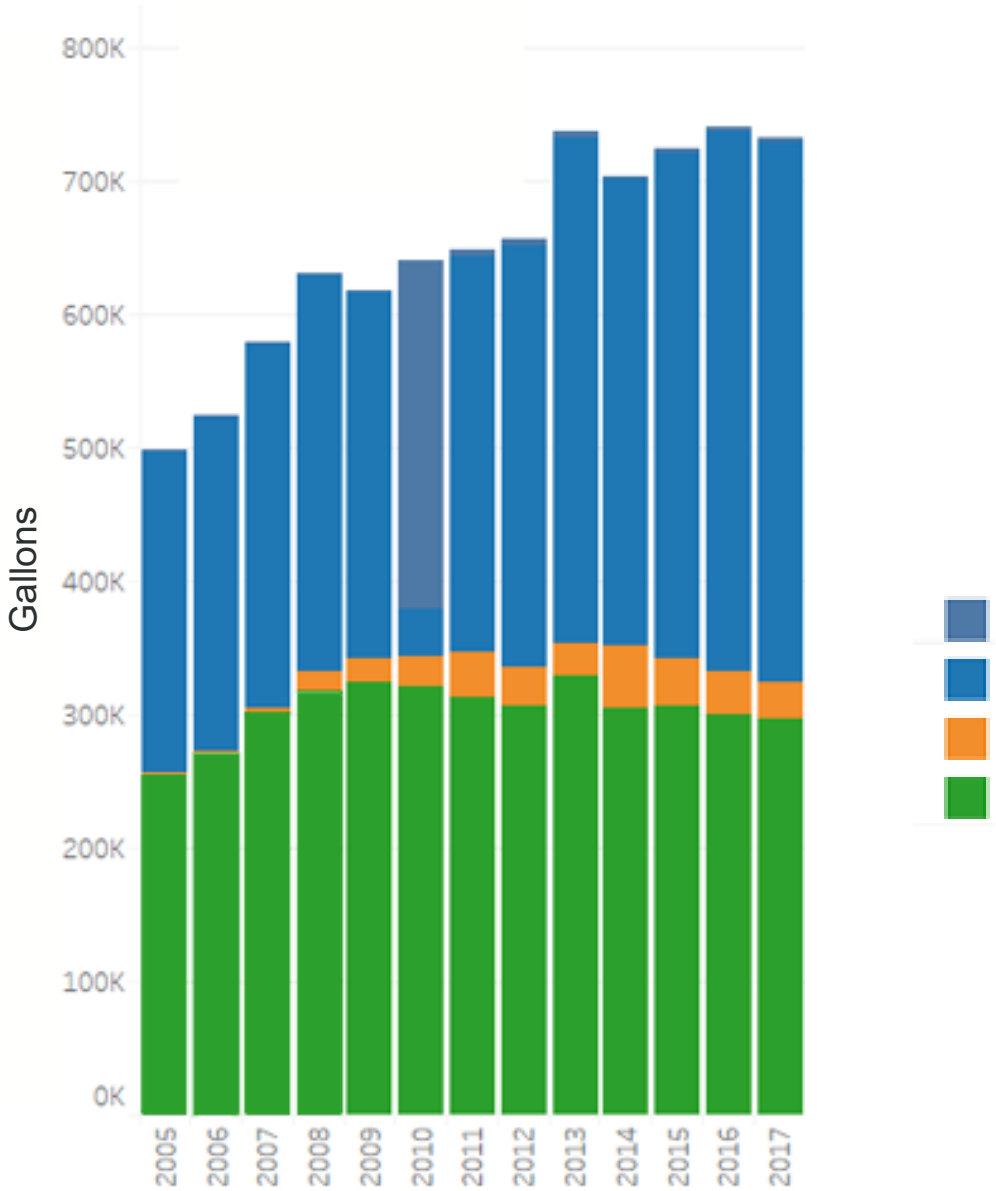
Gary Seibel, Research Engineer, Environmental Science and Technology

Mark Stewart, Manager, Office of Sustainability

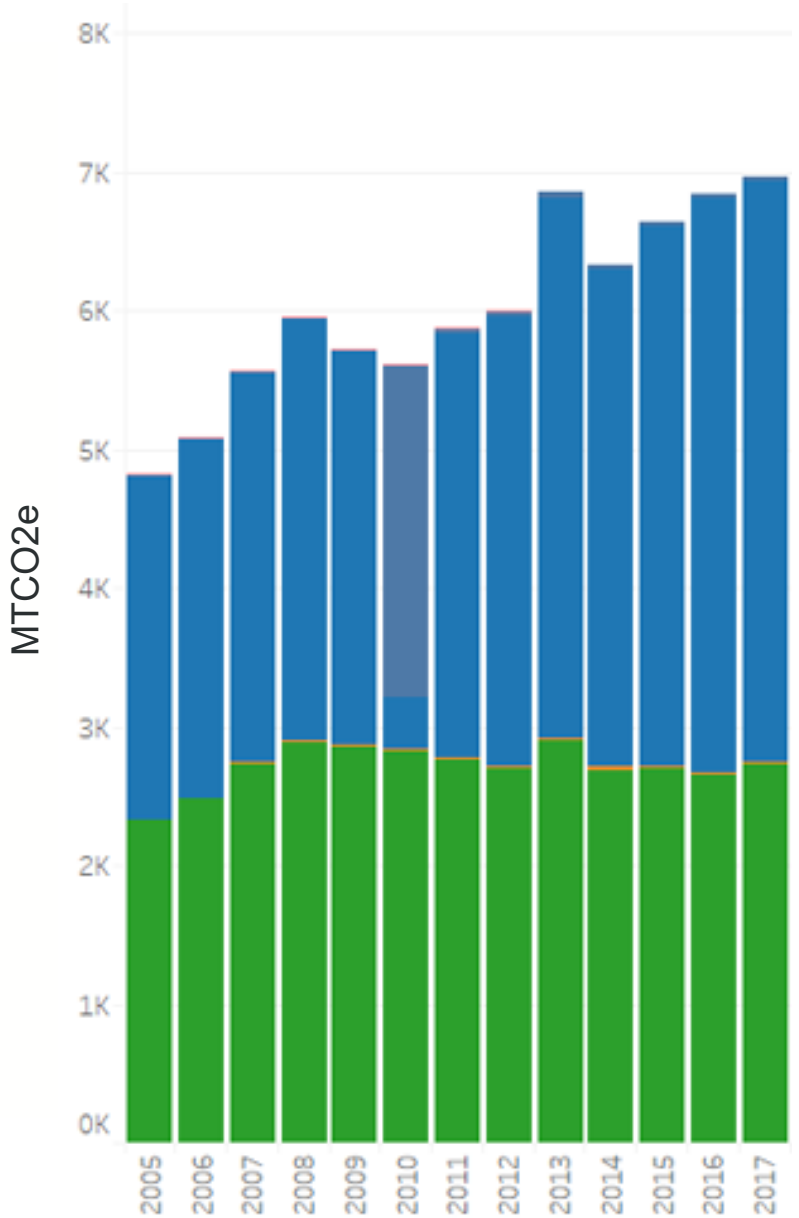
UMD's Greenhouse Gas Emissions

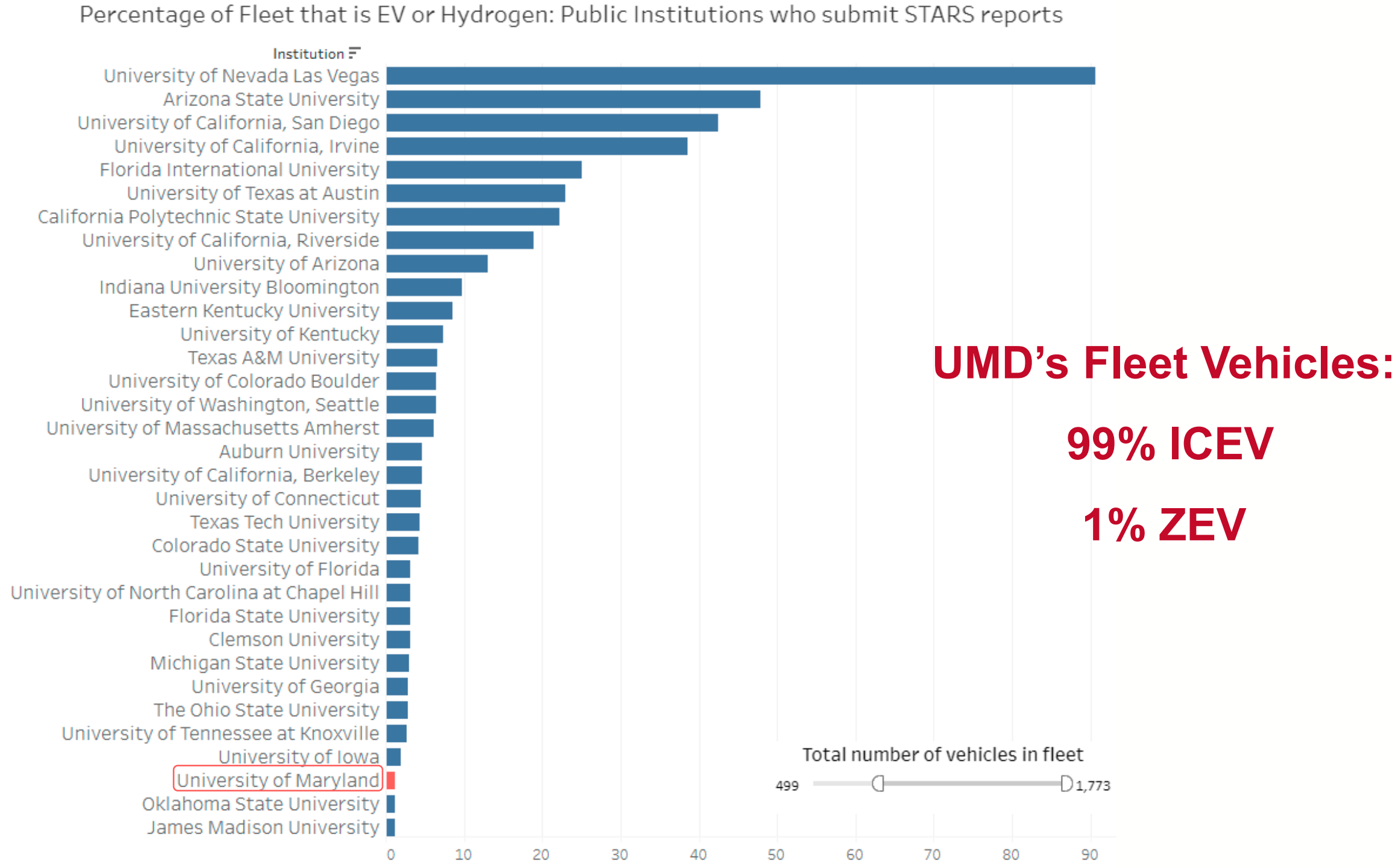


Fleet Fuel Consumption



Fleet GHG Emissions





UMD's Fleet Vehicles:

99% ICEV

1% ZEV

Types of Zero Emission Vehicles

ZEV

Zero Emission Vehicles

BEV

Battery Electric Vehicles

Fueled with Electricity

FCEV

Fuel Cell Electric Vehicles

Fueled with Hydrogen

Human-Powered

Muscle Powered Vehicles

Fueled with Food

Strategies for Reducing Fleet Emissions

- Require that a percentage of new vehicle purchases are zero emission vehicles (ZEV).
- Replace old vehicles with newer, more fuel-efficient vehicles when ZEV are not available.
- Right-size fleets.
- Reduce vehicle miles traveled.
- Reduce engine idling.
- Switch to fuels with lower GHG emissions.
- Purchase carbon offsets to neutralize fleet emissions.

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- Purchase carbon offsets to neutralize fleet emissions.

Emission neutralization activities

Emission reduction activities

Recommendations

UNIVERSITY OF MARYLAND

Recommendation #1:
Collect and Analyze Data to Find Efficiencies in Fleet Operations

Rationale: Motor Transportation Services (MTS) and the Administrative Modernization Program (AMP) recently initiated a Fleet Modernization Program with a goal of right-sizing parts of the UMD fleet. The program recently contracted with Enterprise to replace 100 older Motor Pool vehicles with new models. The program also intends to collect data on fleet vehicle usage to find opportunities to improve efficiencies and services across fleet operations.

Recommendation: The Fleet Modernization Program should prioritize emissions reduction by evaluating how potential changes to the makeup and/or utilization of UMD's fleet could increase average miles per gallon (MPG), reduce fuel consumption, and/or reduce GHG emissions for the fleet. Once the program has collected and analyzed 12 months of data on UMD's fleet operations, then MTS and AMP should make a report to the Sustainability Council explaining how UMD can/will reduce emissions by implementing program improvements. Improvements may include purchasing strategies, efficiencies in fleet utilization, and procedural changes all resulting in decreased emissions across the fleet.

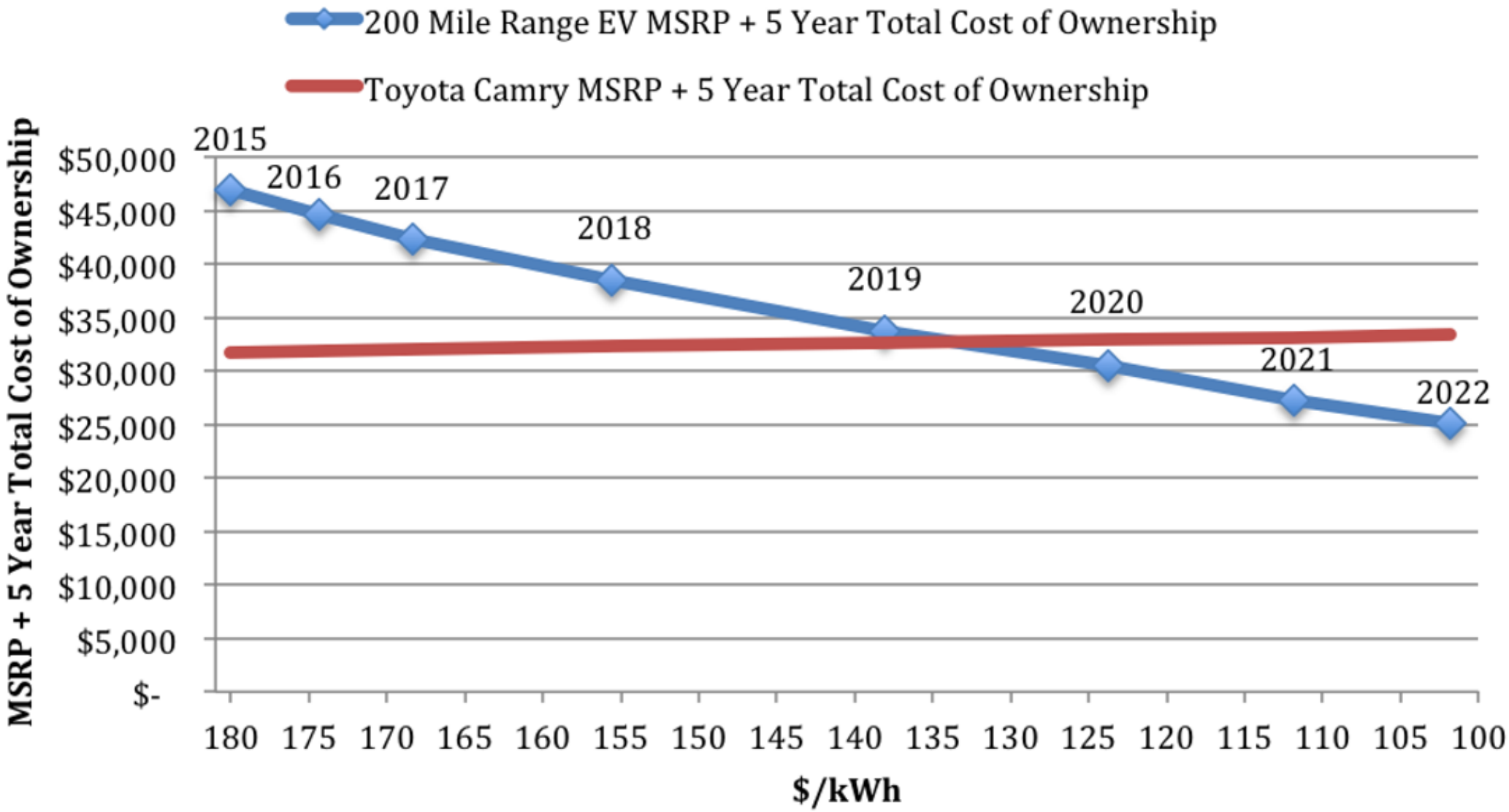
Recommendation #2:
Use Total Cost of Ownership for New Vehicle Purchases

Rationale: Currently, battery electric vehicles (BEVs) and comparable internal combustion engine vehicles (ICEVs) have similar 5-year total costs of ownership (based on typical usage without incentives). BEVs are expected to reach purchase price parity with ICEVs around 2025, so a new BEV in 2025 could provide instant financial savings for its owner based on lower fuel and maintenance costs.

The following charts illustrate these trends.

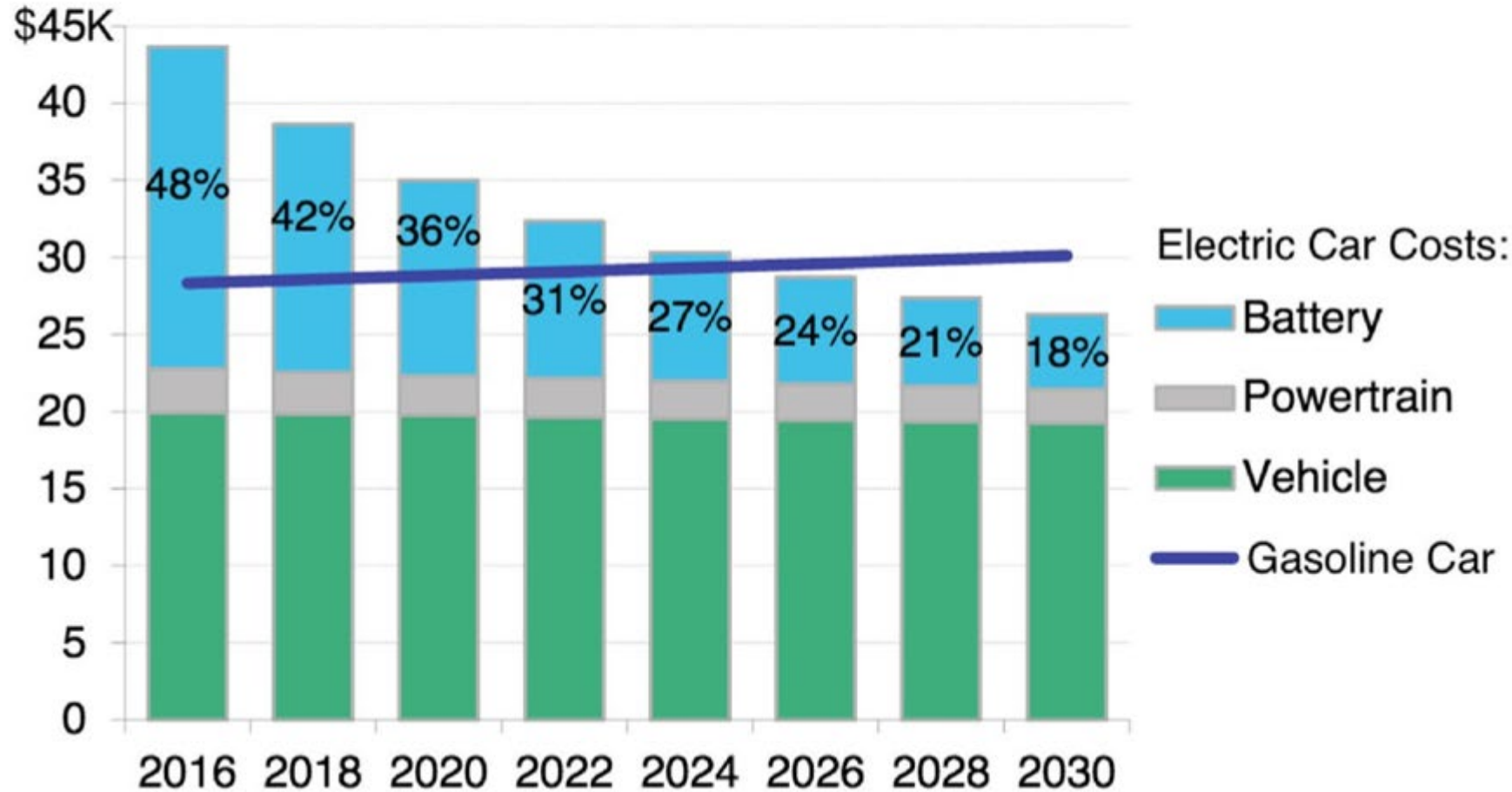
5-Year Total Cost of Ownership, 200-Mile Range BEV vs Toyota Camry

Source: ARK Investment Management



Average Initial Purchase Price, BEV vs Gasoline Car

Source: Bloomberg New Energy Finance



Recommendation #2:
Use Total Cost of Ownership for New Vehicle Purchases

Recommendation: UMD should adopt a total cost of ownership (TCO) approach for new vehicle purchases. TCO typically includes purchase price, depreciation, interest on financing, taxes and fees, insurance premiums, fuel, maintenance, repairs, and any tax credits or other incentives. Procurement & Strategic Sourcing and other campus units involved with vehicle purchasing would need to integrate TCO into current vehicle purchasing practices.

For each new vehicle purchase, it is recommended that UMD compare the TCO of at least two vehicles that are suitable for the intended use. One of those vehicles should be a Zero-Emissions Vehicle (ZEV), if one exists for the intended use. UMD should purchase the vehicle with the lower 10-year TCO unless the purchaser can justify why the more expensive vehicle is necessary. With approval by the Vice President for Administration & Finance or designee, UMD could forego the TCO approach to take advantage of benefits that are not quantifiable in a TCO calculation.

Note: The State has a mandate to increase the number of ZEVs in its fleet. Maryland Department of Budget and Management requires that the purchaser of any non-ZEV provide written justification directly addressing the reason(s) for the purchaser's decision to not purchase an ZEV. (See Appendix B)

Recommendation #3:
Exceed the Zero Emission Vehicle (ZEV) State Fleet Goal

Rationale: By Executive Order 01.01.2015.02 (see Appendix C), effective January 2015, Maryland State agencies must increase the number of ZEV acquisitions in light-duty fleets to at least 25% of annual fleet purchases by 2025. To the extent practicable, ZEV acquisitions should increase by 3% each year from fiscal year (FY) 2016 through FY 2020, so that by FY 2020 at least 15% of annual light-duty fleet purchases are ZEVs. The State must annually report ZEV purchases to the Governor, the Maryland Energy Administration, and the Maryland Department of the Environment. The Executive Order encourages "the University System of Maryland and county and local governments to join in purchasing ZEVs under the State contract."

Recommendation: UMD should establish a goal of exceeding the ZEV State Fleet Goal by making at least 50% of UMD's light-duty fleet purchases ZEV by 2025.

Recommendation #4:
Set Aside Limited Funding for Purchasing ZEVs and ZEV Infrastructure

Rationale: Currently, ZEVs have higher purchase prices than comparable ICEVs (excluding incentives). Investment in ZEV infrastructure will be necessary for the campus to transition to ZEVs and take advantage of lower operating costs. Offering some fixed pool of funding for purchasing ZEVs or installing ZEV infrastructure could encourage early adoption of these technologies by campus units.

Recommendation: UMD should set aside at least $200,000 in one-time funding to:

1. Buy down the purchase price on a new ZEV so that its 10-year total cost of ownership (TCO) is equal to or lower than a comparable ICEV; and

2. Cover costs for installing EV charging stations and other ZEV infrastructure.

Example from University of Florida: "The Office of the Chief Operating Officer will pay for the cost difference of purchasing an approved departmental electric vehicle in place of a gas-powered vehicle over the next three years (beginning Feb. 1, 2018), or until the designated $100,000 budget is depleted."

Local Context for Early Adoption of ZEV Fleets

Bus Fleets

- Montgomery County and Prince George's County are currently purchasing BEV transit buses.
- Maryland Aviation Administration currently replacing 10 of its 49 buses with BEV buses.
- Maryland Transportation Authority set a goal of upgrading half of the state's transit buses to battery electric or hydrogen models by 2030.
- Case studies show a 6-10 year ROI on BEV transit buses based on data from 2015-2017.

Light-Duty Vehicle Fleets

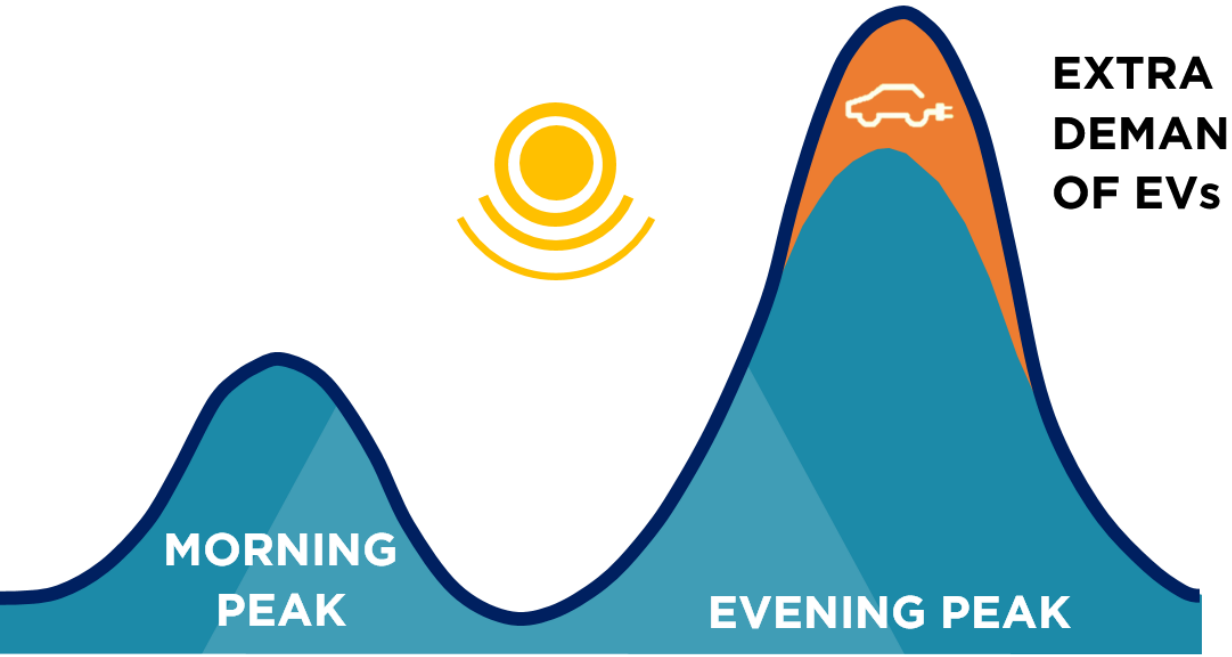
- Montgomery County's fleet (roughly the same size as UMD's fleet) is already 20% electric.
- All cities/towns near UMD seem to already operate light-duty ZEVs in their fleets.
- Hyattsville purchased its first ZEV police car in 2018.

Recommendation #5:
Fund a ZEV Infrastructure Plan

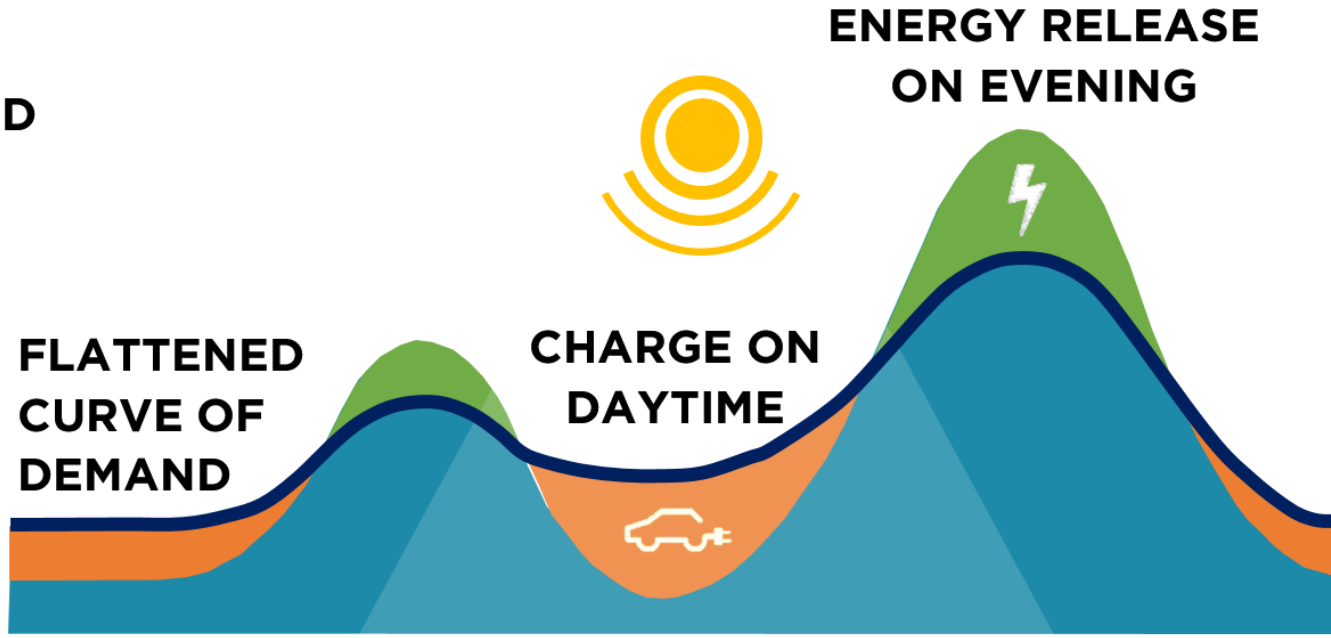
Rationale: UMD lacks information concerning how to best expand its ZEV infrastructure. Specifically, UMD requires outside consulting expertise to assess its options given the current power infrastructure, charging stations and available technologies.

Recommendation: UMD should commission a ZEV Infrastructure Plan. The plan should address several critical questions including, but not limited to: how UMD should prepare for the ZEV technologies that will most likely exist over the next 20 years; the ability of UMD's current electrical infrastructure to accommodate additional charging stations; where additional charging stations should be located; how ZEVs integrate with smart-grid technologies including vehicle-to-grid charging for demand response programs; the estimated cost for the recommended improvements; and possible funding sources including State and Federal grant programs. The estimated cost for this study is $50,000.

Vehicle-to-Grid (V2G) Could Factor into UMD's Demand Response Program



WITHOUT V2G



WITH V2G

Recommendation #6:
Prioritize Diesel Vehicles for Replacement and Anti-Idling Measures

Rationale: According to the Maryland Department of the Environment, “Diesel exhaust is a complex mixture of gases and fine particles. The primary pollutants emitted from diesel engines include particulate matter (PM), carbon monoxide (CO), nitrogen oxides (NOx), hydrocarbons (HC), volatile organic compounds (VOCs), and other chemicals that are classified as ‘hazardous air pollutants’ under the Clean Air Act. Health studies show that exposure to diesel exhaust primarily affects the respiratory system and worsens asthma, allergies, bronchitis, and lung function. There is some evidence that diesel exhaust exposure can increase the risk of heart problems, premature death, and lung cancer.”

Recommendation: UMD should prioritize the replacement of diesel vehicles with ZEV or low emissions alternatives to reduce GHG emissions and improve local air quality. Facilities Management, Transportation Services, and other departments that operate diesel vehicles should:

1. Identify diesel vehicles that could be replaced with ZEV or low emissions alternatives; and

2. Develop a plan for providing annual training for drivers of diesel fleet vehicles to educate them about health impacts associated with diesel emissions and the State’s anti-idling law.

Recommendation #7:
Offset GHG Emissions Associated with Fleet Fuel Consumption

Rationale: UMD is actively supporting verified carbon offset projects that reduce global GHG emissions. UMD's financial contribution to those projects allows it to take credit for a portion of those projects' GHG reduction benefits. The costs for carbon credits have been incurred by various UMD units. Specifically, UMD has or will purchase verified carbon credits to offset GHG emissions associated with:

- Air travel (Carbon Neutral Air Travel Initiative)
- Energy consumption from new buildings (Carbon Neutral New Development Initiative)
- Undergraduate student commuting emissions (Carbon Neutral Undergraduate Student Commuters Initiative).

Recommendation: UMD should purchase verified carbon credits annually for fleet GHG emissions that are not mitigated through the recommended strategies previously described. The budgetary cost estimate to implement this approach in 2020 is $28,000. It is further recommended that UMD either implement a 4-cent carbon surcharge per gallon of gasoline/diesel or centrally fund the purchase.

Note: $4 per carbon credit roughly equals 4-cents per gallon of gasoline or diesel fuel.

Financials

1. **Collect and Analyze Data to Find Efficiencies in Fleet Operations**	➢ Funding already committed to AMP/MTS for the Fleet Modernization Program
2. **Use Total Cost of Ownership for New Vehicle Purchases**	➢ No funding required to use Total Cost of Ownership in procurement ➢ Generates **savings within 0-10 years** of each new vehicle purchase
3. **Exceed the Zero Emission Vehicle (ZEV) State Fleet Goal**	➢ No additional cost (already paid for by #2 and #4)
4. **Set Aside Limited Funding for Purchasing ZEVs and ZEV Infrastructure**	➢ **One-time cost of $200,000** supported by VPAF, Facilities funds, internal and/or external grants, and/or internal loan repaid through fossil fuel surcharge ➢ Note: a 10-cent surcharge per gallon of gasoline and diesel would generate approximately $70,000/year; thus 3-year repayment on $200,000 internal loan
5. **Fund a ZEV Infrastructure Plan**	➢ **One-time cost of $50,000** (estimated) supported by VPAF, Facilities funds, and/or State grants
6. **Prioritize Diesel Vehicles for Replacement and Anti-Idling Measures**	➢ No additional cost for vehicle replacement (already paid for by #2 and #4) ➢ Marginal cost for driver education/training
7. **Offset GHG Emissions Associated with Fleet Fuel Consumption**	➢ **Annual cost of $28,000** (estimated for 2020) ➢ Implement a 4-cent surcharge per gallon of gasoline/diesel or centrally fund

SustainableUMD Progress Report

Council Discussion and Next Steps

Goals for Progress in Six Key Areas

Sustainability Council Endorsed

Fall 2014 (five years ago)

- Carbon Neutrality
- Education for Sustainability
- Local and Global Impact
- Smart Growth
- Sustainable Water Use
- Waste Minimization

SUSTAINABLE DEVELOPMENT GOALS

Local and Global Impact

SUSTAINABLE DEVELOPMENT GOALS

Four UN Promoted Goals that are not included in UMD's Sustainability Goals

Only mentioned in Local and Global Partnerships

UMD earned a **Gold** STARS Rating

- Public Report and Rating valid for three years
- Submitted for Publication in February 2019
- Review by Association for Advancement of Sustainability in Higher Education (AASHE) completed in May 2019

Other Public Reports from STARS Data

Princeton Review's Green College Honor Roll

- UMD was included with 25 other schools

Sierra Magazine's Ranking of America's "Cool Schools"

- UMD was Ranked 38th out of 282 Schools

AASHE Sustainable Campus Index

- UMD was not in the top ten schools for any of the featured categories or credits in 2019

stars.aashe.org

Key Discussion Points

- Reframe UMD's Goals in SDG Context?
  - Water and Waste Goals may need to be updated anyway
- Campus thermal load presents carbon neutrality challenge
- Education for Sustainability Strategies from Outside OS

Key Discussion Points

Path to STARS Platinum

ACADEMICS

- Sustainability Learning Outcomes at Institutional Level
- Collaborative (but Repeatable) Process for Inventorying Courses
- Academic Coordinator for Curriculum
- Sustainability Literacy Assessment

OPERATIONS

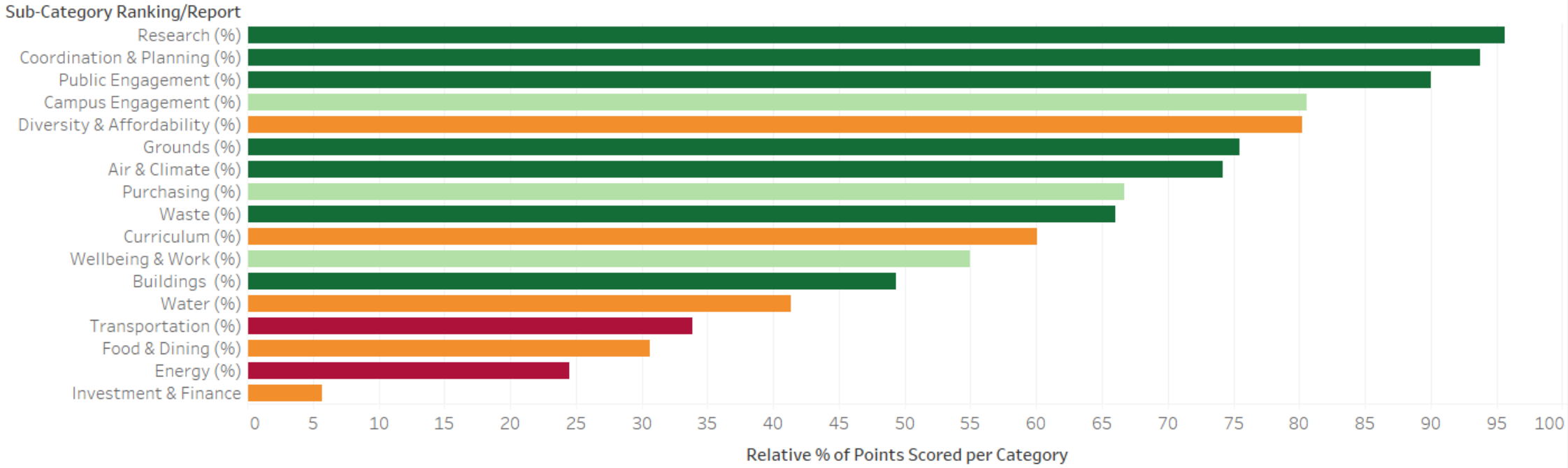
- Opportunities for Biogas/Renewable Natural Gas
- Continued focus on EUI Improvement (Site and Source)
- Revolving Loan Fund for Energy & Water Conservation

PLANNING AND ADMINISTRATION

- USM Sustainable Investment & Finance Discussion

University of Maryland, College Park: Gold; Feb. 2019 (2.1)

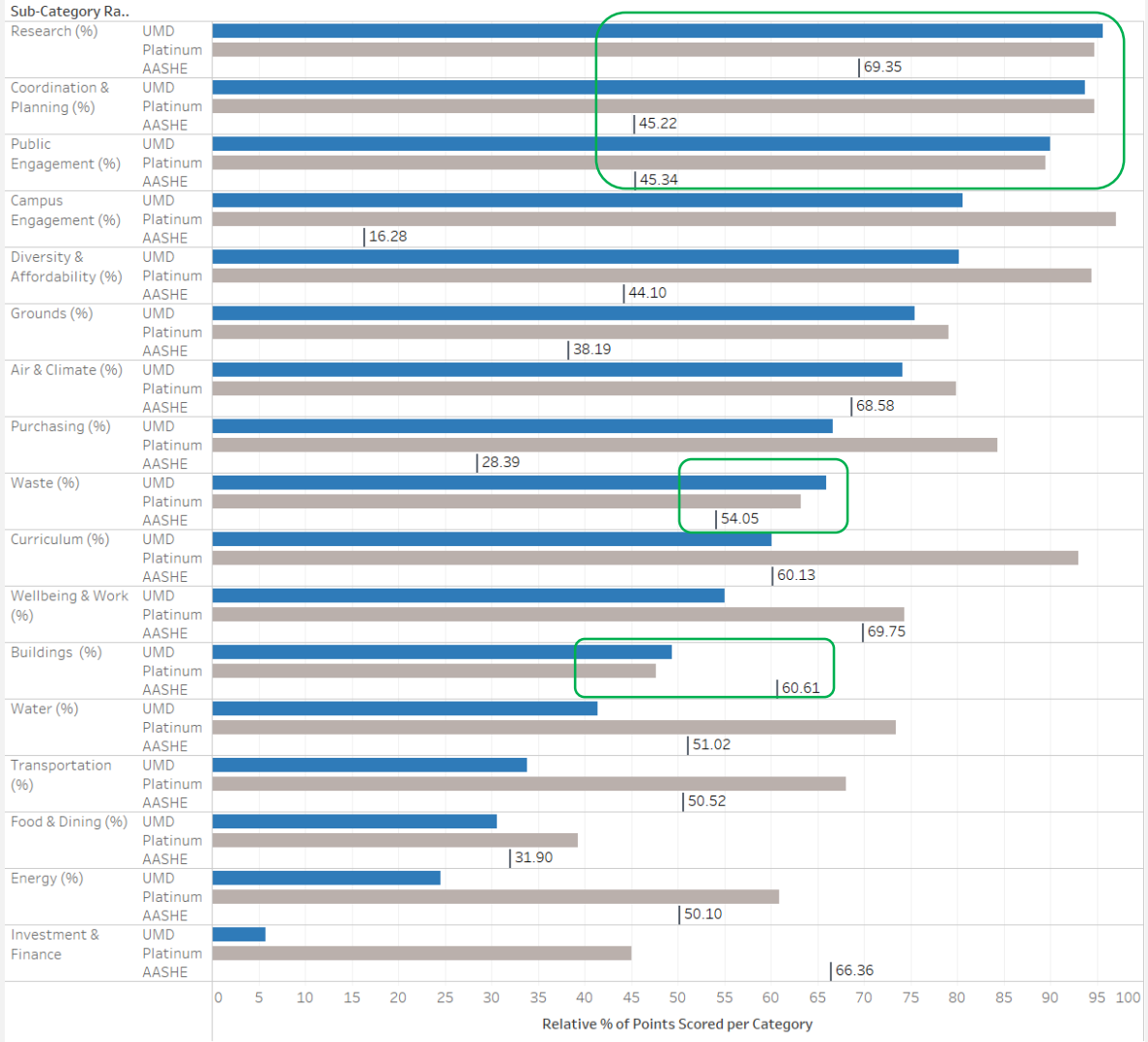
AASHE Stars Report Relative % of Points Awarded per Category



Sum of University of Maryland, College Park Gold: Feb 2019 (2.1) for each Sub-Category Ranking/Report. Color shows details about Sub-Category Ranking/Report. The view is filtered on Sub-Category Ranking/Report, which excludes Overall Score (%).

In February 2019, **University of Maryland, College Park**, submitted its second AASHE Stars Report and was certified **Gold**. The above graph illustrates the relative percent of points scored per category (ex., Research, Investment & Finance).
Color coordinated by quartile ranking, dark green indicages top quartile (top score), light green indicates third quartile (below top score but above median), orange indicates second quartile (below the median), and red indicates the lowest quartile. The quartiles are established by the average relative percent of points scored by all participating AASHE Stars institutions.

Comparing **University of Maryland, College Park,** Relative % Score per Category to the **Platinum-Ranked AASHE Institutions** and **AASHE Star** Averages Relative % Score per Category



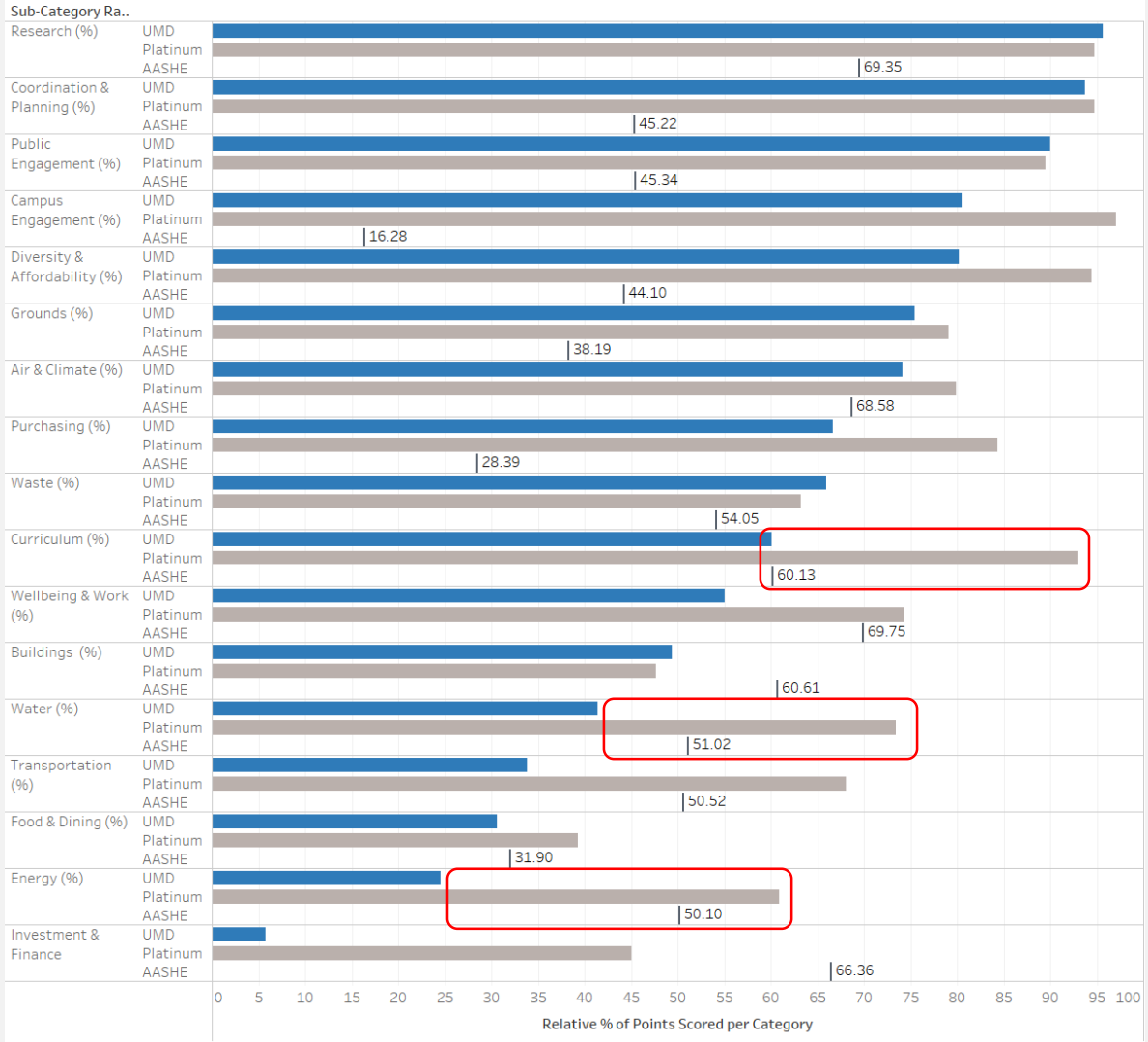
The University of Maryland, College Park, frequently uses the AASHE Stars Report and respective rankings in sustainability benchmarking. AASHE offers five rankings: Participant, Bronze, Silver, Gold, and Platinum. Only six universities have scored Platinum on the AASHE Stars Report: UC Irvine, Colby College, Stanford University, Colorado State University, Thompson Rivers University, and the University of New Hampshire.

The above graph compares UMD's relative percent of points scored per category to the *average* relative percent of points scored per category of all AASHE Platinum-ranked institutions. The average (or aggregate) was calculated using AASHE's Benchmarking Tool, available on their website. Both UMD and the average Platinum Institution scores are compared to the average AASHE score (calculated from the relative percent of points scored by all participating AASHE institutions).

Color coordinated, UMD is represented by blue, Platinum by gray and AASHE by the thin gray bar. The numeric value on the graph indicates the average AASHE relative percent of points scored per category.

Measure Names
- UMD
- Platinum
- AASHE

Comparing **University of Maryland, College Park,** Relative % Score per Category to the **Platinum-Ranked AASHE Institutions** and **AASHE Star** Averages Relative % Score per Category



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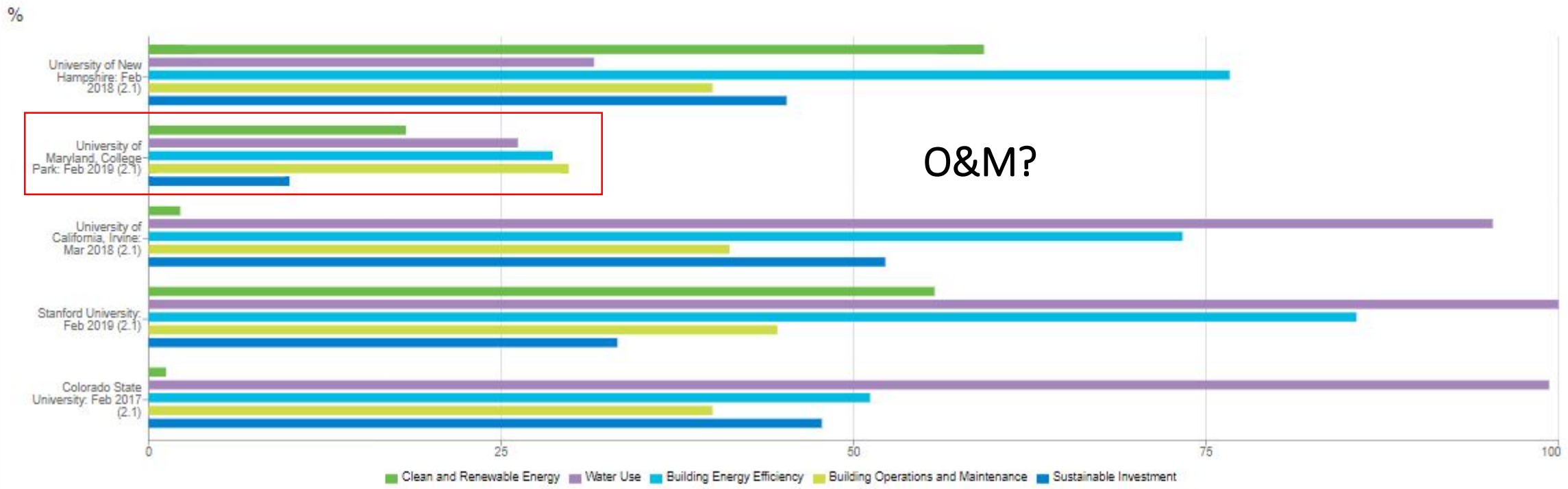


O&M?

Report	Clean and Renewa... (%)	Water Use (%)	Building Energy ... (%)	Building Operati... (%)	Sustainable Inve... (%)
University of New Hampshire Platinum: Feb 2018 (2.1)	59.25	31.6	76.67	40	45.25
University of Maryland, College Park Gold: Feb 2019 (2.1)	18.25	26.2	28.67	29.8	10
University of California, Irvine Platinum: Mar 2018 (2.1)	2.25	95.33	73.33	41.2	52.25
Stanford University Platinum: Feb 2019 (2.1)	55.75	100	85.67	44.6	33.25
Colorado State University Platinum: Feb 2017 (2.1)	1.25	99.33	51.17	40	47.75

- LEED Certification for Existing Buildings Operations & Maintenance
  - UC Irvine
- Home-grown LEED Equivalency Rating System for Existing Buildings
  - Stanford
- Clearer Documentation of Indoor Air Quality Management Plan
  - UNH

Sustainability in the Academic Curriculum

UMD used CY 2016 data for Academic Courses and FY 2017 data for Learning Outcomes

Courses with Sustainability Focus/Component

- Full points awarded for 20% of courses (or more) and 90% of departments (or more)
  - Partial Points are relative to percentage of courses and departments that offer sustainability courses
  - UMD received 63% of available points
  - 90% of departments offer sustainability courses
  - 7.17% or all courses identified as sustainability courses
    - Keyword search of registrar course titles and descriptions followed by manual assessment (Office of Sustainability)
    - Sustainability-studies minor approved courses
    - Partnership for Action Learning courses
    - Courses submitted by Sustainable Teaching Fellows

Sustainability Learning Outcomes for Grads

- Full points awarded when 100% of students graduate from programs that have adopted at least one sustainability learning outcome
  - 14.59% of UMD students graduated from programs with clear sustainability learning outcomes

Sustainability learning outcomes are

statements that outline the specific sustainability knowledge and skills that a student is expected to have gained and demonstrated by the successful completion of a unit, course, or program.

Learning outcomes do not necessarily have to use the term “sustainability” to count as long as they collectively address sustainability as an **integrated concept having social, economic, and environmental dimensions.**

Sustainability learning outcomes

may be specified at:

- Institution level (e.g. covering all students)
- Division level (e.g. covering one or more schools or colleges within the institution)
- Program level
- Course level (if successful completion of the course is required to complete a degree program)

Sustainability learning outcomes

(UMD examples)

Agricultural and Resource Economics:
Knowledge of policies and institutional arrangements relevant to agricultural, environmental, and resource economics

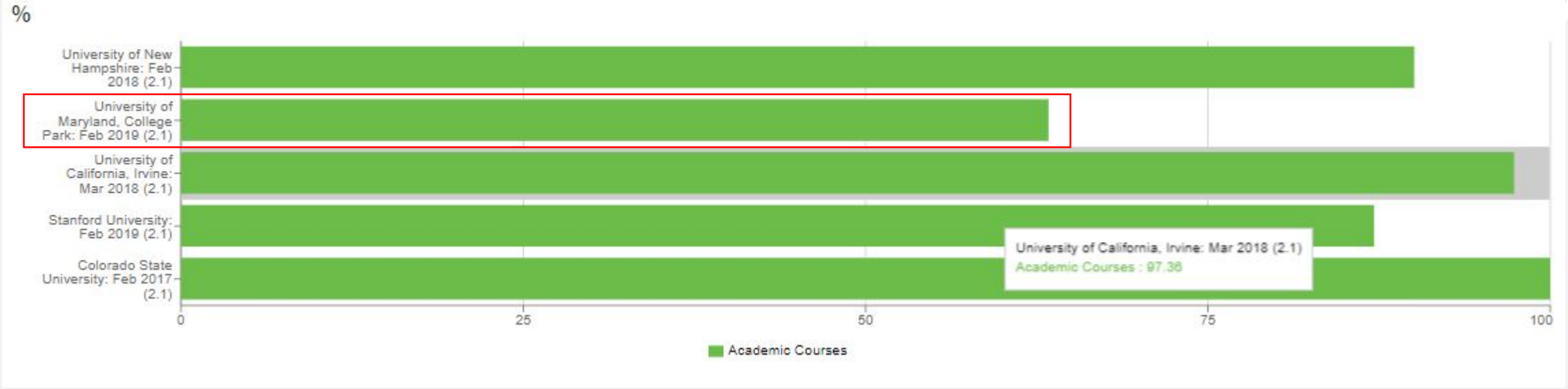
Aerospace Engineering:
Understanding of the impact of engineering solutions in a global, societal, environmental, and economic context

Bioengineering:
An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainabililty.

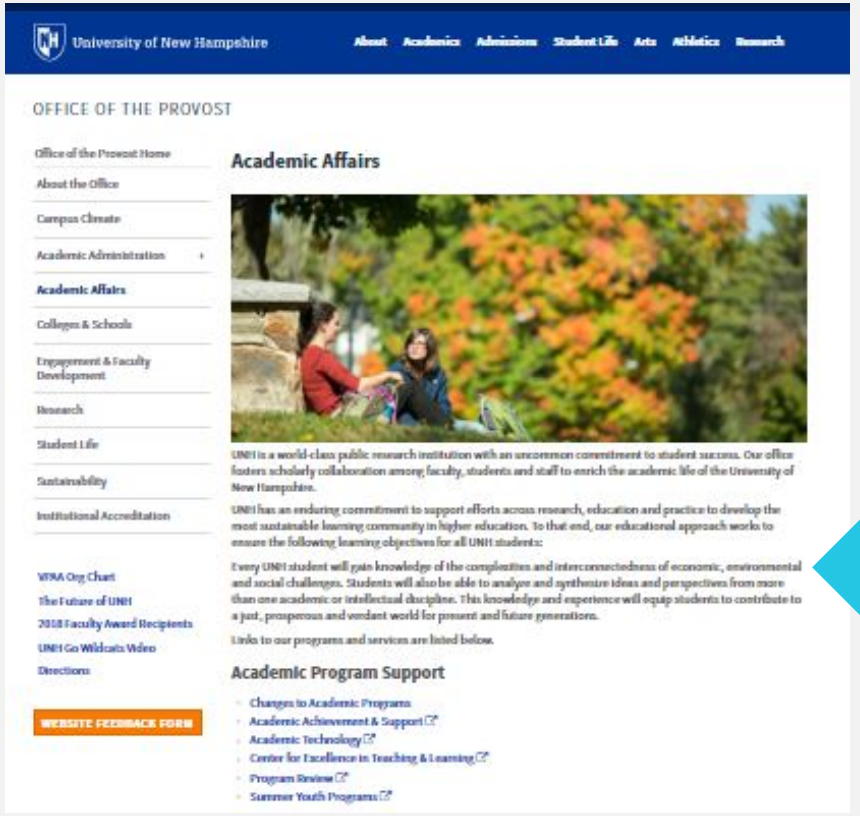
Family Science:
Students will demonstrate the principles of cultural competence that shape the experiences and disparities of vulnerable families and populations.

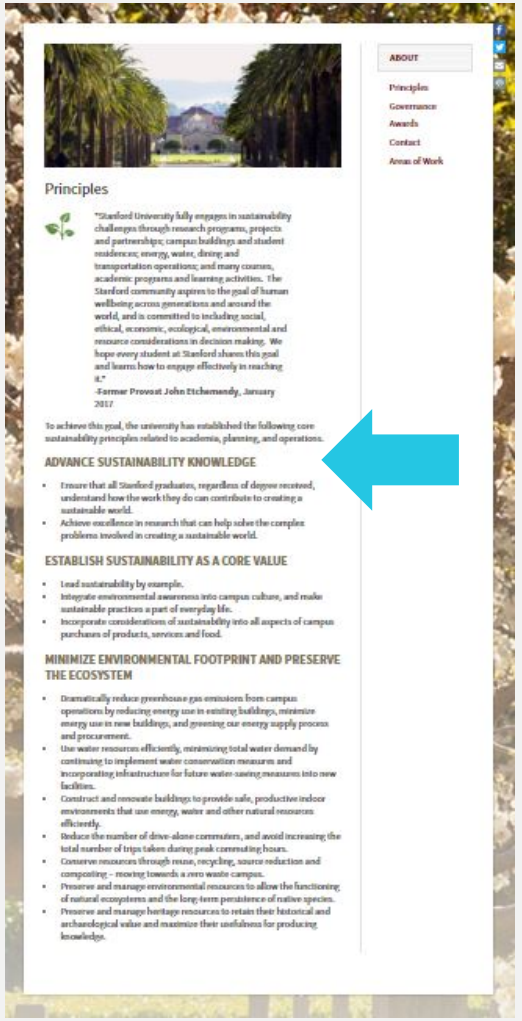
Sustainability in the Curriculum

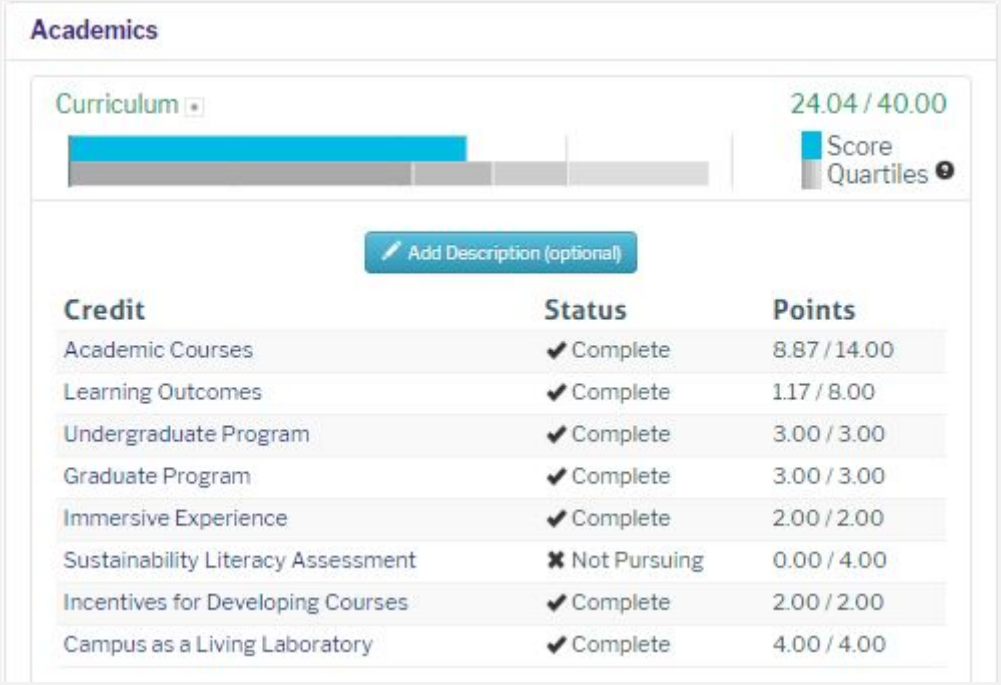
Platinum Rated Doctorate Research Institutions Schools and UMD



Overarching Learning Outcomes (examples)







Academics

Curriculum 24.04 / 40.00

Score
Quartiles

Add Description (optional)

Credit	Status	Points
Academic Courses	✔ Complete	8.87 / 14.00
Learning Outcomes	✔ Complete	1.17 / 8.00
Undergraduate Program	✔ Complete	3.00 / 3.00
Graduate Program	✔ Complete	3.00 / 3.00
Immersive Experience	✔ Complete	2.00 / 2.00
Sustainability Literacy Assessment	✖ Not Pursuing	0.00 / 4.00
Incentives for Developing Courses	✔ Complete	2.00 / 2.00
Campus as a Living Laboratory	✔ Complete	4.00 / 4.00

Institution conducts an assessment of the sustainability literacy of its students. The sustainability literacy assessment focuses on knowledge of sustainability topics and challenges

Maximum of 4 points available for this credit by administering a pre- and post-assessment to the entire student body or, at minimum, to the institution's predominant student body (e.g. all undergraduate students), directly or by representative sample.

Key Recommendations

- Revolving Loan Fund for Energy and Water Conservation Measures
- Explore All Viable Options for Biogas and RNG
- Establish Sustainability Learning Outcomes as part of Gen Ed
- Appoint Academic Coordinator for Sustainability in the Curriculum
- Engage new O&M Director early and explore opportunities
- Perhaps Host USM Sustainable Investment & Finance Discussion

- **Other thoughts and ideas?**
- **Discussion and questions**