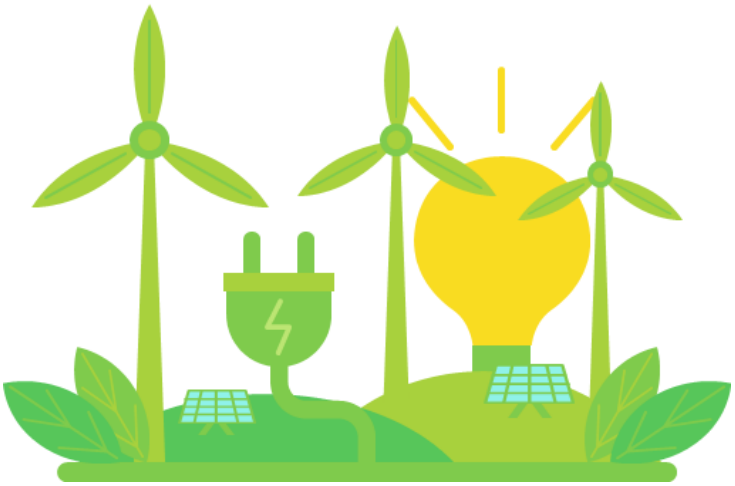
CLEAN ENERGY 2030

FINAL REPORT



February 7, 2022

Miami-Dade County Public Schools
Clean Energy Taskforce

MIAMI-DADE COUNTY PUBLIC SCHOOLS
giving our students the world

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Background

Miami-Dade County Public Schools (M-DCPS) is the fourth largest school district in the nation, comprised of 392 schools and a student body of 334,000 students. In April 2021, the M-DCPS School Board unanimously voted to adopt Resolution No. 21-010[1]: a resolution to get the District to 100% clean energy by 2030. The Clean Energy 2030 Task Force was assembled to produce a report with recommendations and policy changes to the Board to achieve the goal of 100% clean energy. While ambitious, this goal aligns perfectly with M-DCPS' vision to "build healthy students and a better future for all," given the urgent need for a rapid transition to a clean energy economy locally and globally.

In M-DCPS, buildings and operations account for 87% of total greenhouse gas emissions, transportation accounts for 8%, and solid waste another 5%. Energy is also the second highest cost to the School District after personnel costs. M-DCPS spends $65 million on electricity, $35 million on water, logs 13 million diesel bus miles and 16.5 million white fleet (maintenance, nutrition, and police vehicles) miles, and serves 35 million meals every year.

Moreover, FPL just received approval to increase its rates by more than 20% over the next four years. Without investments in energy efficiency and renewables, electricity alone could cost the district an additional $12-$13 million annually. While the capital costs of energy efficiency, renewables, and fleet electrification can be significant, much of them can be offset by the operational savings of reduced electricity, fuel, and maintenance costs of up to $100 million a year by 2030. Additionally, investment cost benefit analyses need to take into account the harder to quantify benefits of healthier buildings and vehicles and exciting real-world project-based learning opportunities for classes in science, technology, engineering, and math.

[1] http://pdfs.dadeschools.net/Bdarch/2021/Bd042121/agenda/H3rev.pdf

What M-DCPS has done to date

The M-DCPS Office of Design and Sustainability has taken commendable steps towards sustainability-minded design standards, criteria, and green initiatives that seek to address energy management systems and usage. Through our capital construction program, numerous initiatives have taken shape including replacing fluorescent lights with LED lighting and installing high efficiency HVAC systems and occupancy sensors throughout all new construction. Additionally, all new buildings are equipped with solar-ready roofs and increased building insulation. The District has also completed a greenhouse gas (GHG) inventory that established a baseline of the District's GHG emissions.

The Department of Food and Nutrition has implemented food service initiatives as part of their greening operations, including replacing the Styrofoam tray with a compostable item, removing the plastic straw from the utensil packet, expansion of school gardens and Food Forests, and increased plant-based menu options.

Definitions of and Steps towards 100% Clean Energy

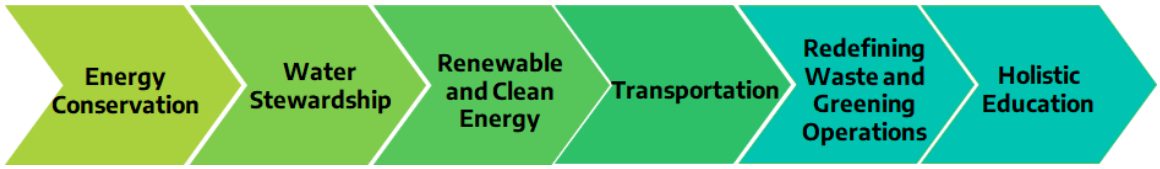
For M-DCPS to achieve 100% clean energy, any and all energy consumed by the buildings, vehicles, and operations must come from a clean energy source. Clean energy sources include nuclear, solar, wind, and geothermal energy.

Considering that FPL is projected to achieve 37% clean energy by 2030, M-DCPS would have to either convince FPL to convert 100% of its fuel sources to clean energy by 2030 or generate 100% of its energy needs (from renewable energy installed and generated by the District) to achieve 100% clean energy. Neither option is a viable path given FPL's investments in natural gas, the current technologies, the high cost of battery storage, and the high maintenance costs of essentially managing its own utility.

While the end goal is to power M-DCPS' buildings and vehicles by 100% clean energy, we recognize that our interim or transitional goal is to achieve net zero clean energy. Net zero energy would mean that M-DCPS would be connected to the FPL grid, generating enough on-site renewable power over the course of a year to equal the amount of energy it consumes from the grid that is fossil fuel generated. While still quite ambitious, net zero could be achieved by 2030 through a combination of energy efficiency, on-site renewable energy generation, and working with our utility provider in converting the overall grid to clean energy.

Taskforce Process and Approach to Recommendations

The taskforce adopted 6 pillars from the 17 goals of sustainable development from the UN Sustainable Development Goals (2015)[2]:



The taskforce divided these pillars into four subcommittees:

1. Energy Conservation and Water Stewardship
2. Renewable and Clean Energy
3. Transportation, Redefining Waste, and Greening Operations
4. Sustainability and Holistic Education

Monthly meetings were established for the task force as well as each subcommittee to create and discuss policy recommendations, each including a summary, implementation costs, implementation savings/benefits, resources for funding, estimated carbon reduction, and a schedule to complete. The recommendations were developed to move M-DCPS towards its clean energy goal in the most fiscally responsible manner while maximizing educational opportunities and other benefits to environmental and human health and resilience. The good news is that many of these recommendations will result in operational savings or are cost neutral.

Implementation and Accountability

It is paramount that M-DCPS follow and implement the recommendations within this report. Achieving the stated recommendations will require active cooperation and involvement from multiple departments throughout M-DCPS (e.g., Grants, Transportation, Maintenance, Facilities, Information Technology, Food and Nutrition, and Academics) and key external partners (e.g,, Miami-Dade County, Florida Power and Light). By working together, M-DCPS and Miami-Dade County can expand the impact of their actions and increase leverage with service providers, such as utilities and consulting and engineering firms, and with product procurement.

To coordinate and accelerate these efforts and ensure accountability, our first and foremost recommendation is to create a dedicated Sustainability Department—led by a cabinet level Chief Sustainability Officer—to implement, monitor, and report on the progress, challenges, and next steps of the policy recommendations.

A list of all recommendations detailed in this report is provided below:

[2] https://sdgs.un.org/goals

IMPLEMENTATION AND ACCOUNTABILITY

1. IMPLEMENTATION AND ACCOUNTABILITY

ENERGY CONSERVATION AND WATER STEWARDSHIP

2. GENERAL/BEHAVIORAL CHANGES

3. EXISTING BUILDINGS

4. NEW CONSTRUCTION

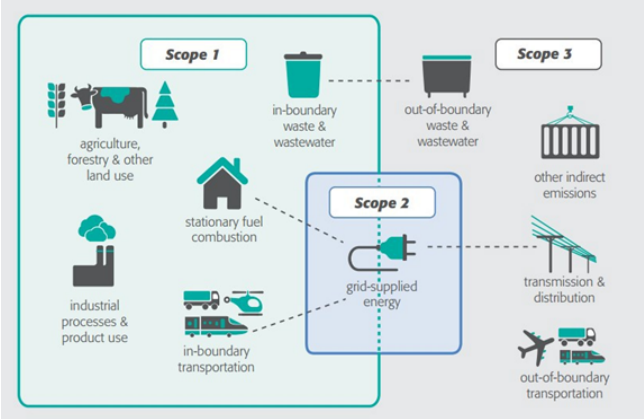
RENEWABLE AND CLEAN ENERGY

5. RENEWABLE AND CLEAN ENERGY

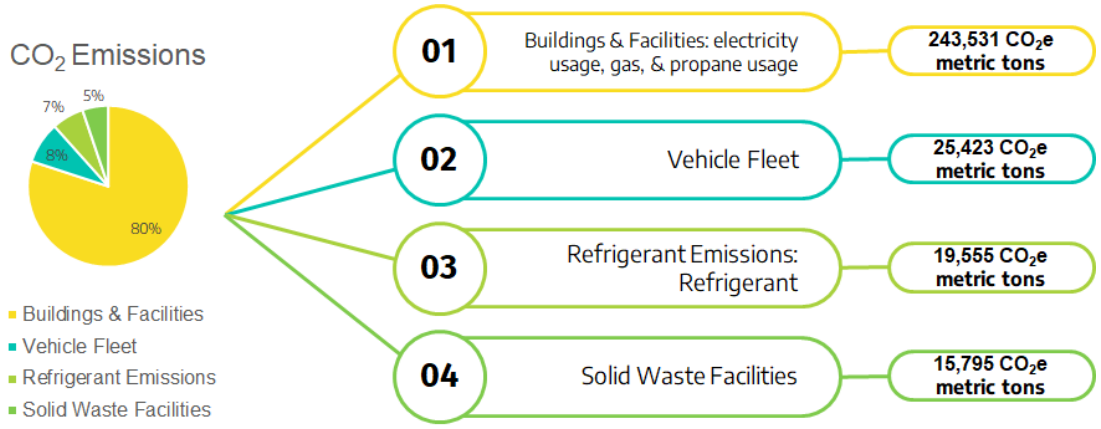
M-DCPS GHG INVENTORY AND SUSTAINABILITY PLAN

The M-DCPS Greenhouse Gas (GHG) Inventory is a quantitative assessment of greenhouse gas emissions emitted in the process of operating M-DCPS, including direct and indirect sources of emissions. The greenhouse gas emissions inventory, conducted in partnership with University of Miami, is a necessary step for M-DCPS's sustainability plan, implementation, and progress reporting for emission reductions in the coming years.

According to the US EPA calculator:
"1 metric ton of CO_2 is equivalent to driving 2,451 miles in an average passenger vehicle or burning 1,094 pounds of coal. It would take 25.9 tree seedlings 10 years of growth to sequester 1 metric ton of CO_2 equivalent (CO_2e) from the atmosphere."

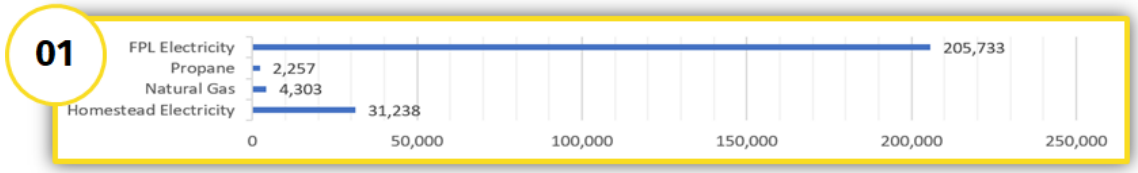


The M-DCPS GHG Inventory was conducted using the International Council for Local Environmental Initiatives (ICLEI) ClearPath tool. Data was added for 392 schools and ancillary facilities for the year 2018–19. In total, the estimated 2018-19 GHG emissions from these sources was 304,304 CO_2e metric tons. Four categories were explored using ICLEI ClearPath, and a general carbon emissions for each area was determined:

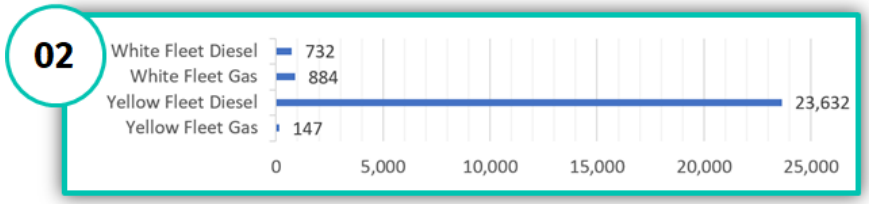


The M-DCPS GHG Inventory also provided a breakdown analysis for each of the four areas mentioned above. For example, the total KWh consumption for buildings and facilities for the 392 public schools is 677,735,352 KWh.

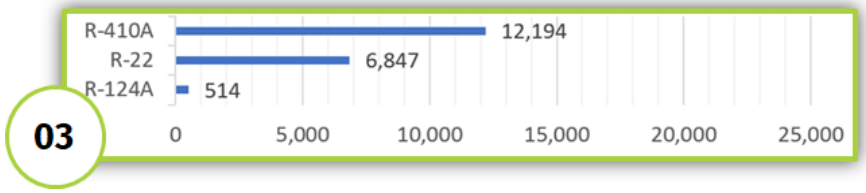
Buildings & Facilities Breakdown



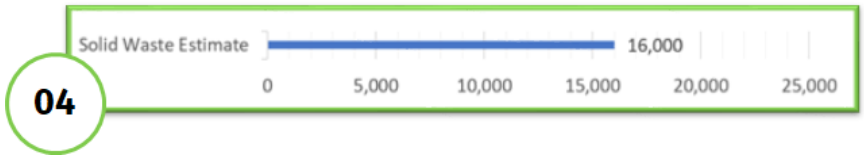
Vehicle Fleet Breakdown



Refrigerant Emissions Breakdown



Waste Breakdown (average school)



Of these categories, our electricity consumption from Florida Power and Light (FPL), yellow fleet diesel, refrigerant emissions, and generated waste are areas we should focus our efforts.

DEFINITIONS OF AND PATH TO 100% CLEAN ENERGY

Clean energy is any energy source that does not produce carbon emissions (e.g., solar, wind, nuclear, geothermal). There are two key concepts that are fundamental to understanding the actions needed to achieve the intent of the Resolution. In the clean energy conversation, two philosophies exist, and while they share some similarities, there are considerable differences in what it takes to achieve them.

Net Zero Building: a building is able to generate enough clean energy over the course of a year to equal the amount of energy it consumes.

A Net Zero building is achieved through a combination of energy efficiency (e.g., lighting retrofits) and renewable energy generation (e.g., photovoltaics). On any given day, week, or month, the building may consume more energy than it produces, but on an annual basis, the consumption of the building and production from the clean energy source is equal. A key point to understand is that a Net Zero building will still pull a portion of its power from the utility grid (e.g., at night when the sun is not shining) and will therefore still be responsible for the associated carbon emissions.

100% Clean Energy Building: any and all energy consumed by the building comes from a clean, renewable source.

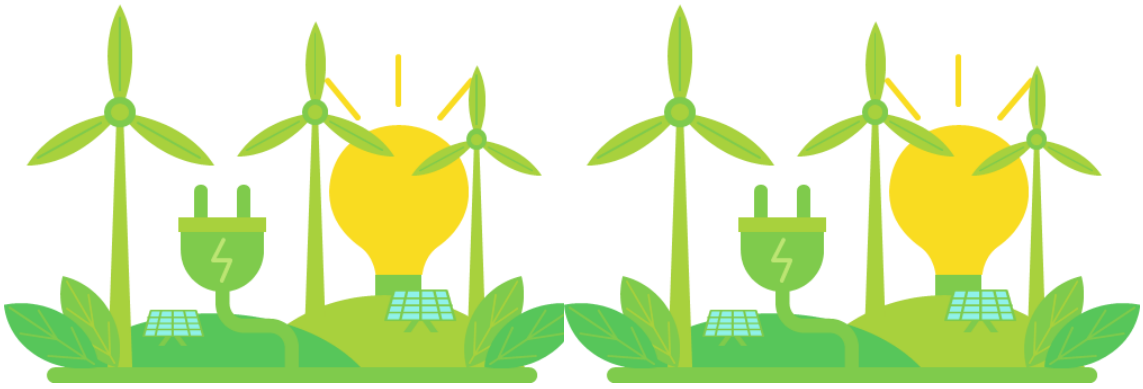
One hundred percent clean energy is achieved when the amount of clean energy brought into, or generated by, schools within a district equals or exceeds 100% of the annual energy consumed within that school or district. Our campaign defines clean energy as all onsite energy use, including both electricity and fuel used for heating, cooling, and cooking. Moving to 100% clean energy in M-DCPS buildings would reduce carbon emissions by 80%.

Under FPL's current site plan, we can expect the percentage of electricity from the grid that is sourced from clean energy (i.e., nuclear, solar and wind) to grow from 27% currently to 37% by 2030. Therefore, if M-DCPS is to get to 100% clean energy by 2030, it will have to either convince FPL to convert 100% of its fuel sources to clean energy or M-DCPS will need to generate 100% of its energy needs (from renewable energy installed and generated by the School District). Using some broad assumptions regarding costing trends for solar and battery storage technologies and energy conservation targets for the District, we can derive very rough estimates for achieving 100% clean energy.

If the district reduces the electricity usage from the 2018-19 baseline by 25%, the annual usage will be roughly 547,000,000 kWh (note: this value does not attempt to quantify the effects of electrification of the bus fleet). Assuming the electricity is generated exclusively through solar photovoltaics, and a current average cost for solar PV at $2/W, the cost to generate that amount of energy through photovoltaics would be roughly $500 million.

While the end goal is to power M-DCPS' buildings and vehicles by 100% clean energy, we recognize that an interim, or transitional goal is to achieve net zero clean energy. Net zero energy would mean that M-DCPS would be connected to the FPL grid, generate enough on-site renewable power over the course of a year to equal the amount of energy it consumes from the grid that is fossil fuel generated. At this time, the net zero goal will not include fuel used by buses, refrigerants, or waste. These emissions sources will be addressed in a second phase to achieve 100% clean energy. Net zero clean energy as defined in this paragraph will be achieved by 2030.

While still quite ambitious, net zero could be achieved through a combination of energy efficiency, on-site renewable energy generation and working with our utility provider in converting the overall grid to clean energy. Furthermore, we recommend that M-DCPS add state and federal advocacy for renewable portfolios. Policy recommendations could include a Board resolution endorsing a national carbon pricing rebate and a state solar for schools bill that allows for schools to enter into third party power purchase agreements (PPAs). Several local municipalities like Key Biscayne, South Miami and the City of Miami have already passed resolutions in support of carbon pricing rebates.



IMPLEMENTATION AND ACCOUNTABILITY

1. IMPLEMENTATION AND ACCOUNTABILITY

1.1 Create a dedicated Sustainability Department to implement recommendations.

Clean energy and sustainability touches a broad range of activities in an organization or system, and is therefore dependent on buy-in from all areas. Each department has a different part to play and a different way to contribute to success. Some departments may be responsible for a disproportionate percentage of the carbon emissions, but curbing those emissions is a concern for the entire organization. A system where each department is working independently of others without communication or feedback cannot be as efficient as possible, and that is the situation the District is currently facing. Operating in a silo limits a department's ability to coordinate and plan for large changes across different functional areas, but working together as a system will always be more than the sum of its collective parts and perform better accordingly. The District will need to rebrand the current facilities employee "sustainability" titles to better reflect their core duties which does not include the scope and breadth of this dedicated position.

An overarching, consolidated, and coordinated effort is needed to ensure that the goals, strategies, and actions established by the task force and implemented by the Board are considered and prioritized by all departments and all levels.

An organizational change is needed to ensure accountability by establishing a Sustainability Department (including a cabinet level Chief Sustainability Officer department head) that is tasked with working along with the appropriate departments to implement, monitor, and report on the challenges, failures, and successes of the policy recommendations. The Chief Sustainability Officer will need support of at least three additional staff (1) to provide programmatic and capacity building support, (2) to conduct and manage data collection, and (2) to assist with coordination of initiatives.

The Chief Sustainability Officer will work with the leadership team to integrate performance measures into the District strategic plan and annual capital and operating budget process, pursue grant and financing opportunities, and provide department leads and liaisons with technical assistance. The Department could also foster a tri-county exchange with Broward and Palm Beach to share best practices and attend yearly Green Schools conferences to learn best practices to attain clean energy goals.

- Implementation Costs: $500,000+ dependent on department size
- Implementation Savings/Benefits: millions of dollars in cost avoidance; improved air quality in and around schools and enhanced educational programming for students
- Resources for Funding: annual budget
- Estimated Carbon Reduction: 304,000 CO_2e metric tons
- Schedule to Complete: by end of 2022

1.2 Update the Greenhouse Gas Inventory every two years.

The primary cause of global warming and climate change is human generated greenhouse gas emissions. While transitioning to 100% clean energy or even net zero energy would significantly reduce the greenhouse gas (GHG) emissions of the School District, there are other sources of human caused GHG emissions, such as solid waste, that are not captured. Additionally, the tracking of greenhouse gas emissions can be an educational tool and a way of aligning the School District's goal within Miami-Dade County's goal of reducing communitywide GHG emissions by 50% by 2030 and becoming carbon neutral by 2050. Therefore, we recommend updating the M-DCPS GHG inventory every two years in coordination with Miami-Dade County to align methodologies and GHG inventory schedules starting with the 2021 calendar year inventory. M-DCPS should also collaborate with Miami-Dade County to implement the County's Climate Action Strategy (CAS) particularly by supporting closing the emissions gap as identified by CAS[3].

Miami Dade County Office of Resilience has offered to assist the school district with updating its inventory every two years. While there is no direct carbon reduction benefit of producing an inventory, this deliverable is critical to meeting the emissions goals outlined in the plan; "you can't manage what you don't measure."

- Implementation Costs: $0 some staff time to gather data
- Implementation Savings/Benefits: Ability to track progress on carbon mitigation
- Resources for Funding: N/A
- Estimated Carbon Reduction: N/A
- Schedule to Complete: by end of 2023

[3] https://www.miamidade.gov/green/library/climate-action-strategy-final-draft.pdf

ENERGY CONSERVATION AND WATER STEWARDSHIP

The majority of energy that powers our schools comes from fossil fuels: petroleum and natural gas. When we use less energy we burn fewer fossil fuels, leading to lower emissions of CO_2 which is the primary contributor to climate change. Clean, renewable energy (solar, wind, etc.) produces no greenhouse gas emissions from fossil fuels, which is key to fighting climate change.

Water and energy systems are interdependent (water-energy nexus) and are affected by weather and the environment. More than 13% of the nation's electricity consumption, nearly 521 billion kilowatt hours (kWh), is associated with water-related energy use. Energy used to move, treat, distribute, and use water produces nearly 290 million metric tons of carbon dioxide annually—the equivalent of 5% of the nation's overall emissions[4]. Global water consumption is estimated to be 4,200 km^3 per year. By 2030, the global water demand is estimated to be 6,900 km^3, exceeding sustainable supply by 40%[5]. Investments in energy efficiency also results in local job creation: 60% percent of funds spent on energy efficiency goes to labor, and local suppliers provide half of all energy efficiency equipment available to schools[6].

Everyone deserves a healthy learning environment, and healthy and resilient buildings have the power to positively impact the quality of education and our planet. In order to improve the quality of our buildings and reduce our energy consumption, we need to set clear goals for building improvement and reduced energy consumption. To date, M-DCPS has installed cooling tower meters to avoid being charged sewer costs. In addition, M-DCPS is implementing programs to detect and plug leaks where there seems to be excessive water consumption (e.g., Robert Morgan). Energy CAP is the tool M-DCPS uses to streamline and consolidate receipt and payment of utility bills and can be used to track utility usage. The M-DCPS current strategic plan is to realize a 15% reduction in energy consumption by 2026 compared to the 2018–19 baseline. We propose a 30% energy consumption reduction goal for existing buildings by 2030 over the 2018-19 baseline year with reevaluation after 5 years.

Our specific recommendations for energy conservation and water stewardship are subdivided into the following three sections:

- General/Behavioral Changes
- Existing Buildings
- New Construction

[4] https://www.hrwc.org/wp-content/uploads/Carbon-Footprint-brochure_single-pages.pdf

[5] https://www.unido.org/our-focus/safeguarding-environment/resource-efficient-and-low-carbon-industrial-production/industry-and-adaptation/water-stewardship

[6] https://www.sierraclub.org/sites/www.sierraclub.org/files/SC%20-%20Clean%20energy%20investments%203-pager.pdf

2. GENERAL/BEHAVIORAL CHANGES

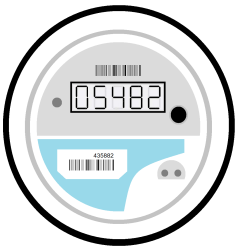
Encouraging the whole school community—students, teachers, and staff members—to adopt conservation habits can amount to significant savings. Turning off lights in unoccupied rooms, closing doors and windows when the AC system is on, and raising temperature on AC settings can add up to big savings. These activities also enhance social cohesion and provide hands-on learning opportunities. Research has found that behavioral energy efficiency campaigns are successful and with the increase of plug loads, the potential for energy savings through behavioral campaigns have increased to up to 20%[7]. It is recommended that the School Board adopt the following policies/procedures that reduce energy use through behavioral changes and daily practices.

2.1 Provide schools with water and energy consumption statistics.

2.1.1 - Energy Performance

Provide monthly site-level energy and water consumption data to school officials with comparison to consumption in the baseline year of 2018-19. Include tips for reducing consumption. Once each school understands their facility's energy consumption, they can better control energy costs.

2.1.2 - Smart Meters



Install building level Smart meters to provide schools with daily energy information (including a notification system for when consumption is over thresholds). This data should be used to track performance pre- and post-intervention to have a better understanding of costs and benefits.

2.1.3 - Digital Dashboards

Create and install a digital dashboard of building performance data at each school site. These digital dashboards can be displayed on monitors in entry/high visibility areas to show daily electricity usage. In addition, the dashboards should be embedded into dadeschools.net to make them as accessible as possible for transparency. Dashboards can be developed for different stakeholders (e.g., principals, staff, teachers, students, public) and integrated with student education programs (e.g., Miami Heat Challenge).

[7] https://www.aceee.org/sites/default/files/publications/researchreports/b1501.pdf

- Implementation Costs:
  - Energy CAP = $80,000 annually (already existing, recurring M-DCPS expense)
  - Physical centralized dashboards at each school = $5K-$15K per smart TV
  - Cost for installing smart meters = to be determined
- Implementation Savings/Benefits:
  - Financial savings: The Alliance to Save Energy helped 15 pilot schools realize an average of $7,700 annual savings from behavior and minor operational changes
  - Additional benefits: involving the whole school community in conservation efforts enhances social cohesion and provides hands-on learning opportunities.
    - Less processing time, improved efficiency, less errors, and the potential for finding energy and water inefficiency/waste
    - Allows the opportunity to analyze consumption in a single source
- Resources for Funding: Could be paid for out of the utility budget
  - Could request smart meters to be installed by FPL
- Estimated Carbon Reduction: dependent on data recovered from smart meters
- Schedule to Complete:
  - March 2022: dashboards for electrical usage will be available
  - By 2024: all metered accounts (water, gas, electric) incorporated into Energy CAP
  - By 2030: complete installation of smart meters and digital dashboards
    - This school should be done incrementally (about 40 schools per year)

2.2 Codify incentive and educational programs and create and implement associated marketing campaigns.

2.2.1 - Incentive Programs

Reimplement and codify energy savings incentive programs for schools to reduce their energy consumption by 5% or more over the 2018–19 baseline. Schools will receive a portion of the savings realized (e.g., $0.75 of every dollar saved in energy) that is not otherwise attributable to efficiency retrofits.

2.2.2 - Marketing Campaign

Create and implement a marketing campaign about the incentive programs to encourage student participation (e.g., Miami Heat's "How Low Can You Go" competition[8]; $2,500 award for school that reduces their energy consumption the most). In addition, M-DCPS should create a digital directory with accountable points of contact to assist with these campaigns, noting the responsible individual per school or District who can help with energy, water, and waste reduction measures.

[8] https://www.howlowcanyougochallenge.com/

2.2.3 - Educational Programs

Work with Dream in Green to expand its educational program offerings around energy and water efficiency and conservation that will work for at least one grade level within each of the elementary, middle and senior high schools. Dream in Green estimates that its energy and water conservation activities at schools have resulted in approximately $3.5 million in savings over the last 15 years. If this program were expanded and the incentive programs in place, this could increase. All grades can benefit from learning about the energy-water connection and how manufacturing and food production (especially animal products), is water and energy intensive.

- Implementation Costs: $50,000-$65,000 for curriculum development and training
- Implementation Savings/Benefits: Financial savings on utility costs could be substantial; Hands-on learning opportunities and improved social cohesion
- Resources for Funding: utility account, federal and foundation grants
- Estimated Carbon Reduction: approximately 12,000 CO_2e metric tons
- Schedule to Complete: by end of 2022-23

2.3 Create and implement a policy for keeping doors and windows closed.

M-DCPS should create and implement a policy to keep doors and windows closed. This policy should address COVID concerns and communicate how the HVAC systems filter air. There will need to be a dedicated point person (e.g., Sustainability Department) who can help schools troubleshoot policy implementation.

- Implementation Costs: $0
- Implementation Savings/Benefits: to be monitored
- Resources for Funding: N/A
- Estimated Carbon Reduction: to be monitored
- Schedule to Complete: start immediately

2.4 Create and implement a policy for turning lights off in unoccupied rooms.

- Implementation Costs: $0
- Implementation Savings/Benefits: to be monitored
- Resources for Funding: N/A
- Estimated Carbon Reduction: to be monitored
- Schedule to Complete: start immediately

3. EXISTING BUILDINGS

It is recommended that the School Board adopt the following policies/procedures that reduce energy use through existing building upgrades and retrofits.

3.1 Implement Energy Management Systems (EMS) or Building Automation Systems (BAS) in all buildings for lights, chillers, HVAC, air handler units, etc.

By controlling temperature, lighting, and more, Energy Management Systems (EMSs) or Building Automation Systems (BASs) can improve energy efficiency and occupants' comfort. M-DCPS should incorporate estimated increases in utility costs into lifecycle payback analyses and include a carbon tax/incentive payback calculation to consider environmental externalities (to attach a value to carbon emissions). When BASs are installed, staff will need to receive training on how to keep proper settings.

- Implementation Costs: 1.25% of the building's construction cost
- Implementation Savings/Benefits: 45% annual savings on electricity for the school
- Resources for Funding: ESSER funds
- Estimated Carbon Reduction: 100,000 CO_2e metric tons annually
- Schedule to Complete: by 2030

3.2 Use Energy CAP software to create a scorecard, identifying buildings/assets with the most cost-effective opportunities to reduce consumption.

M-DCPS should work with FPL to get building-level consumption data for improved benchmarking and install metering on all distribution panels to reconcile FPL bills with actual energy consumption. The Department of Energy has a building energy asset scorecard[9] with green, yellow, and red categories to identify buildings with the most opportunity for savings.

- Implementation Costs: $0 additional costs
- Implementation Savings/Benefits: able to monitor savings in real-time
- Resources for Funding: N/A
- Estimated Carbon Reduction: dependent on energy reduction based on scorecard
- Schedule to Complete: within 2 years

[9] https://www.energy.gov/eere/buildings/building-energy-asset-score

3.3 Double staff capacity to conduct in-house building audits of identified high consumption buildings and retro-commissioning re-tuning of existing buildings.

3.3.1 - Conduct in-house building audits of high consumption buildings

An audit—an inspection, survey, and analysis of energy and water flows, for energy and water conservation in a building—is an important step toward understanding a facility's water and energy use and what can be done to reduce consumption. M-DCPS should create a temporary Electrician/ACR Mechanic corps to help retrofit and install/maintain HVAC systems. Per the lead electrician, doubling the electrician corps would allow full retrofits at a rate of 20% of schools per year. Reducing heat loads with LED retrofits can help preserve the life of the HVAC system.

- Implementation Costs: $9.5 Million to double the staff
- Implementation Savings/Benefits: 3%–5% of annual maintenance costs; electricity savings to be determined by project and based on prevailing rate structures
- Resources for Funding: ESSER Funds
- Estimated Carbon Reduction: N/A
- Schedule to Complete: Increase staff by 20% per year for 5 years

3.3.2 - Establish and implement a commissioning and retro-commissioning policy.

Re-tuning/retro-commissioning improves a building's operations and maintenance procedures to enhance overall performance without major capital investments. In re-tuning, existing building systems such as heating, ventilation and HVAC, electrical, plumbing, and lighting systems, and building envelope are evaluated and optimized through energy modeling to ensure that they are performing properly according to the Building Operations Plan. Re-tuning makes sure that equipment manuals are on site and building operators are properly trained on how to use the systems. Re-tuning can resolve problems that occurred during design or construction, or correct issues that have developed during the building's life, such as fans that run backwards or lighting that never turns off. Retro-commissioning outcomes would be a list of items found to not be working in accordance with Building Operations Plan, repairs/upgrades, and retesting results.

Palm Beach County School District had engineers on staff conduct in-house commissioning for 4-5 years. The District should train in-house staff to function as commissioning agents.

- Implementation Costs: $90,000 per project
- Implementation Savings/Benefits: $360,000+ per project
- Resources for Funding: Create a revolving Green Fund to fund ongoing retrofits
- Estimated Carbon Reduction: to be monitored
- Schedule to Complete: start immediately

3.4 Accelerate LED light bulb conversion to achieve 100% by 2030.

Lighting accounts for 15% of global electricity use. LEDs require less energy and create less waste heat than other bulbs. A study should be done to determine if any reduction in lighting can be achieved, after switching to LED light bulbs.

3.4.1 - Conversions Completed by M-DCPS

M-DCPS to date has made considerable progress converting to LED light bulbs. M-DCPS has already introduced LED light bulbs in 22 school parking lots. Lighting in 23 gymnasiums (approximately 33% of high schools) has been reduced from 400 watts to 161 watts, as well as all transportation center parking lots and garages. Throughout M-DCPS, the following conversions have been completed: (a) over 100,000 fluorescent tubes (40, 32, and 28 watts) have been replaced with 14 and 12 watts LED tubes; (b) 5,000 fluorescent fixtures (140, 110, and 72 watts) have been replaced with 30-50 watt LED flat panels; (c) 20,000 wall pack lights have been reduced from 250-175-150-70 watts to 75-60-45-17 watts; and (d) 15,000 canopy lights have been reduced from 150 and 100 watts to 27 watts.

3.4.2 - Potential LED Conversion Savings

Below are sample calculations for potential savings, assuming schools either have Fluorescent T8 lamps (using 32 w per lamp) or LEDs (using 17 w/lamp). M-DCPS used 729,296,672 kWh in the 2018-19 baseline year, with approximately 116,687,468 kWh used for lighting (assuming lighting makes up 16% of the electricity usage for a K-12 school; US Energy Administration data). Assuming 90% of M-DCPS electricity usage comes from T8 lamps, that results in 105,018,721 kWh used by Fluorescent lamps. At a usage rate of 9 hours a day, M-DCPS would have about 364,648,000 T8 lamps. Replacing those lamps with LEDs (using 17 watts) would save M-DCPS 49,227,525 kWh and $4,676,615 (assuming 9.5¢/kWh). That's about 6% of the total Energy used.

- Implementation Costs:
  - Retrofit fixture with LED TUBES: $30-$40 depending on how many tubes
  - Replace fixture with 2X2 Flat LED panel: $65, (can decrease depending on how many.
  - Replace fixture with 2x4 Flat LED panel: $75 Cost can go down depending on how many.
- Implementation Savings/Benefits: approximately $5,000,000
- Resources for Funding: FPL incentive program
- Estimated Carbon Reduction: 14,612 CO_2e metric tons (represents 6% of total tons mentioned in pie chart above)
- Schedule to Complete: 33% every 3 years until completion

3.5 Explore methods and evaluate costs/benefits for creating a fund for self financing the retrofits as well as using Guaranteed Energy Performance Contracts (GEPC).

3.5.1 - Guaranteed Energy Performance Contracts (GEPC)

Self-financing saves on interest and limits debt. However, self-financing has the limitation of not being able to start the work until you have the funds to complete the project. Thirty-four schools have already been identified as candidates for GEPC (see Appendix II). GEPC can create up to 40% utility savings (energy and water) which can fully fund the capital improvements. The project could be around $5M in capital improvements fully funded revenue neutral to the District.

GEPC offers upfront financing so M-DCPS can get improvements done without expending money. GEPC opens up the door to access additional federal funding from the COVID relief packages (ESSER, etc.) which will infuse millions more in additional funding that is available until 2024. This would fund full air handling unit, variable air volume system, heat pump, and chiller replacements which could add another $3-5M in capital improvements fully funded revenue neutral to the District. If an ESCO group does the GEPC project, they can include an interactive curriculum, teaching students the concepts of energy efficiency and sustainability using their own school building as an educational tool.

- Implementation Costs: full cost of improvements
- Implementation Savings/Benefits: interest charged through GEPC contracts (6%-7% of cost of improvements)
- Resources for Funding: ESSER Funds
- Estimated Carbon Reduction: same as GEPC
- Schedule to Complete: by 2030

4. NEW CONSTRUCTION

Below are the current M-DCPS Design Standards for all new building construction:

- LED Lighting
- Motion sensors for lighting
- Maximize use of natural light
- Use of eyebrows and vertical fins to shade windows
- Energy efficient window and storefront systems
- High efficiency HVAC equipment
- Centralized Energy Management Systems
- Programmable thermostats at stand-alone HVAC units
- MERV 13 HVAC filters
- Bi-polar ionization allowing the reduction of outside air

- Utilize commissioning agent for selective projects
- Energy Use Intensity requirement of 25 or lower (energy use per sq ft per year)
- Building Airtightness shall not exceed 0.20cfm/sf.
- All new construction must maintain a score sheet for Green rating: LEED, CHIPS, etc.
- Roofing materials with high Solar Reflectance Index
- Efficient use of high r-value insulation exceeding Energy Code requirements
- Solar Ready Roofs
- Electric food service equipment in kitchens in lieu of gas.
- Eliminate use of kitchen exhaust hood when possible.
- Provide electric submeters to measure energy consumption at each building and specific systems such as HVAC, lighting, plug load, etc.
- Use of tankless water heaters when feasible.
- Low flow plumbing fixtures
- Auto shut-off lavatory fixtures
- Xeriscape type landscaping
- Locate trees to minimize direct sunlight on buildings and windows
- Use of linoleum flooring in lieu of vinyl
- Low or no VOC paints
- Carpet tile with high recycled content
- Construction Waste Management Plan with waste diversion of 70% minimum

It is recommended that the School Board adopt the following policies/procedures that reduce energy use through strict regulations on new building construction.

4.1 Implement energy and water efficiency performance standards that are higher than required under building code.

M-DCPS should implement performance standards that are higher than currently required [10] [11] [12].

- Implementation Costs: 2%–3% of total construction cost
- Implementation Savings/Benefits: 65%-80% less energy than conventionally constructed schools
- Resources for Funding: capital construction budgets
- Estimated Carbon Reduction: dependent on number of new buildings
- Schedule to Complete: by end of 2022

[10] https://betterbuildingssolutioncenter.energy.gov/accelerators/zero-energy-schools
[11] https://www.ashrae.org/technical-resources/aedgs/zero-energy-aedg-free-download
[12] https://thejournal.com/articles/2019/08/19/first-net-zero-school-opens-in-florida.aspx

4.2 Achieve and sustain a maximum Energy Use Intensity (EUI) of 25 in all new structures.

M-DCPS should achieve and sustain a maximum EUI of 25 in all new buildings, achieve a high performance Water Use Intensity (WUI), and achieve a score above minimum certification level for LEED or EnergyStar.

- Implementation Costs: 2%-3% design premium and 2%-3% construction premium
- Implementation Savings/Benefits: 30%-40% less energy than conventionally constructed schools
- Resources for Funding: to be determined
- Estimated Carbon Reduction: to be monitored
- Schedule to Complete: by end of 2022

4.3 Implement commissioning (includes building envelope testing) in all new projects.

Commissioning would be implemented for all projects that have HVAC components (addition at existing campus).

- Implementation Costs: dependent on size of project
- Implementation Savings/Benefits: better performing equipment, reduction in energy consumption dependent on size of project
- Resources for Funding: ESSER Funds
- Estimated Carbon Reduction: to be monitored (dependent on project)
- Schedule to Complete: by end of 2022

4.4 Implement a pilot project featuring Very High Efficiency (VHE)-HVAC systems.

M-DCPS should Identify mid-sized projects for new construction or retrofitting air conditioning systems to use this technology and monitor the results [Institute for Market Transformation (IMT)].

- Implementation Costs: $0
- Implementation Savings/Benefits: to be monitored
- Resources for Funding: N/A
- Estimated Carbon Reduction: to be monitored
- Schedule to Complete: within 2 years

RENEWABLE AND CLEAN ENERGY

As previously discussed in the 100% Clean Energy section above, and taking into consideration that Florida Power and Light (FPL) is projecting to achieve a generation mix with 37% clean by 2030, getting the district completely off the grid is the only way to achieve 100% clean energy. While we believe it is important to begin the process of moving towards this goal, we realize the resources needed to achieve this by 2030 are not available. Therefore, the following recommendations are provided to move towards the overall goal of 100% clean energy, while in the nearer future focusing on reducing energy consumption and achieving net zero energy where the opportunities are available.

5. RENEWABLE AND CLEAN ENERGY

5.1 Rooftop solar installation strategies.

When roof replacement is required the cost of the new roof is a sunk cost. There is no return on this substantial 25-year investment. However, when solar is also added as the roof is replaced, a unique investment opportunity is created. Standard roofing warranties are 20-25 years and standard solar warranties are also 20-25 years so there is warranty alignment between the assets.

During this warranty period, the power produced by the solar system typically offsets the incremental cost of the solar system and many times also provides a financial means of recovering the replacement cost of the roof as well. The combined investment ultimately preserves taxpayer dollars.

Below are our recommendations for solar installation based on the age of the school roof:

Prioritize New Roofs/New Schools: Approve the installation of rooftop solar on all new schools IF the projected financial benefit of the solar system will recover the incremental cost of the solar AND recover a minimum of 50% of the cost of the new roof during the combined warranty period of both assets.

Existing Roofs <8 years old: Evaluate for a retrofit solar installation in combination with a third-party lease. Projects shall be approved in all instances where the monthly lease cost is less than or equal to the power that would otherwise be purchased from the utility.

Existing Roofs 8-15 years old: These are not good candidates for rooftop solar. Other solar installation methods like ground mounted solar or solar parking canopies should be evaluated on these properties.

Existing Roofs >15 years old: All roofs that need replacement should include solar IF the projected financial benefit of the solar system recovers the incremental cost of the solar AND recovers a minimum of 50% of the cost of the new roof during the combined warranty period of both assets.

We should also explore alternative benefactor financing options such as organizations like Collective Sun that can take advantage of federal tax credits to reduce the upfront cost of the system[13] [14].

- Implementation Costs: $0 → contingent on using Energy Service Agreements (ESAs)
- Implementation Savings/Benefits: Current rooftop solar prices (if not on an ESA) are $2.00 per Watt or $20.00 per square foot installed.
  - If ESA is used, no upfront cash is required and the project is cash flow neutral.
  - If purchased with cash, the solar system will generate approximately $12 per square foot of free cash flow during the 25-year warranty period.
  - Third party benefactor financing should also be evaluated in all cash purchase scenarios because the School Board is unable to capitalize on available tax equity directly. Model assumes the school size is >100,000 sq ft.
- Resources for Funding: ESAs or third party financial institutions who will monetize available tax equity on behalf of M-DCPS (Benefactor Model Financing)
- Estimated Carbon Reduction: 70.9 metric tons per year for every 10 kW of solar installed
- Schedule to Complete: start immediately, 10% of eligible schools per year

[13] https://irecusa.org/our-work/solar-schools/
[14] https://generation180.org/brighter-future-2020/

5.2 Install solar with battery backup for evacuation shelters.

We recommend partnering with the County to pursue funding necessary to install solar capacity to cover site level consumption with battery back up to provide power needed for Evacuation Shelters during a power outage (e.g., lights, essential building functions/cooling capacity for rooms used for shelter). M-DCPS should explore a solar leasing program that will lock in rates. M-DCPS can also implement coordination with EV vehicle-to-grid as a battery backup option.

- Implementation Costs: $450-$500/kWh of storage
- Implementation Savings/Benefits: 100% of annual electricity costs; safety during power outage
- Resources for Funding: FPL has agreed to partially fund this during rate case negotiations
  - M-DCPS and the County should advocate for more
  - FEMA BRIC and HMGP funds could also be pursued to provide matching funding
  - FPL has discussed piloting this setup in schools that serve as shelters
- Estimated Carbon Reduction: 70.9 metric tons per year for every 10 kW of solar installed
- Schedule to Complete: start immediately, full completion by 2030

5.3 Work with FPL to reduce emissions.

We recommend partnering with the County, municipalities, and other large corporate FPL customers to form a coalition to work together towards implementing more clean energy options. M-DCPS should reach out to Microsoft and Google to push for stronger action from FPL to reduce GHG emissions of the grid. Ideally, the coalition should meet on a regular basis with a partnership commitment from FPL to meet these large customers' goals through new programs designed to go beyond the Solar Together program offerings, such as solar facilities tariff.

FPL may be authorized to offer a four-year voluntary pilot program pursuant to which commercial and industrial customers on a metered rate may elect to have FPL install and maintain a solar facility on their site for a monthly tariff charge (the "Solar Power Facilities Pilot Program"). Participating customers would select from a variety of options including, but not limited to, solar trees, solar canopies, and solar benches. Through a fixed monthly charge over the ten-year term of the customer agreement, all project capital costs and expenses will be recovered from program participants, such that the general body of customers will not be impacted.

We recommend M-DCPS also investigate leasing roofs or properties for FPL solar installations, and the World Resources Institute can be engaged for advice on this approach[15].

- Implementation Costs: potentially revenue neutral after 10 years
- Implementation Savings/Benefits: accelerated reduction of carbon emissions and waste
- Resources for Funding: to be determined
- Estimated Carbon Reduction: 243,000 CO_2e metric tons
- Schedule to Complete: FPL rate case should be decided by end of October, consider setting up first coalition meeting in 2022

5.4 Push for policy changes to allow for Power Purchase Agreements (PPAs).

Power Purchase Agreements are currently unavailable in Florida, forbidden by law. The next best option for us currently is to use Energy Service Agreements (ESAs) to finance the installation of solar panels throughout the District. The benefits of doing so will allow immediate installation of PV cells, greatly accelerating our march to clean energy. The Superintendent's 5-year Strategic Plan has committed to providing 5,000 solar panels. ESAs are key to achieving this.

The coalition described in Recommendation 5.2 could also advocate for changes to regulations to allow for PPAs to become available within Florida. PPAs would allow organizations to contract with independent power producers to procure electricity generated through renewable means onsite. In a PPA agreement a third party would bear all costs associated with the design, installation, and maintenance of a renewable energy producing asset on M-DCPS property. This third party provider would also assume risk of loss. M-DCPS would simply agree to purchase clean energy produced onsite from the third party provider over a contractually agreed upon period of time. The cost of this clean energy is generally at a discount when compared to the cost of the gray energy that would otherwise be purchased from the utility. Due to the fact that electricity produced onsite would still be net-metered and require a grid connection, this solution will not completely eliminate carbon emissions, but it will reduce the school's carbon footprint and will radically increase the amount of renewable electricity in development.

- Implementation Costs: $0 to pass resolutions and negotiate with the Public Service Commission / Utilityon changes. Potential for heavy lobbying costs.
- Implementation Savings/Benefits: Immediate overall reduction in total delivered power costs of 7%-9%. Delivered power is considered 100% clean.
- Resources for Funding: N/A
- Estimated Carbon Reduction: 70.9 metric tons per year for every 10 kW of solar installed
- Schedule to Complete: start immediately

[15] https://www.wri.org/research/actions-large-energy-buyers-can-take-transform-and-decarbonize-grid

5.5 Utilize public/private partnerships to gain access to new technologies through pilot programs and experimental projects.

The renewable energy field is experiencing rapid innovation. As the effects of Global Climate Change become more evident, the urgency for making the transition grows and grows. This urgency is driving exploration and experimentation throughout the renewable energy sector, from generation to storage to controls. Due to the intermittent availability of renewable energy, storage is a key area of ongoing development, with multiple technologies under investigation as a potential solution that can deliver low-cost, long-term storage of electricity after it is generated from renewable sources. Lithium Ion, Solid State, Flow batteries of various chemistries, Compressed Air, micro-wind turbines, and gravitational systems are all under development. These emerging solutions will need to be tested and evaluated in real-world settings, so the District could play a part by allowing companies to test technologies as they work towards commercial readiness. This could help the technologies to mature to a market-ready state and allow the District to adopt some of these emerging technologies at a reduced cost. Pilot project and product demonstration agreements should be used for the purpose of testing and evaluating these technologies, products, and services.

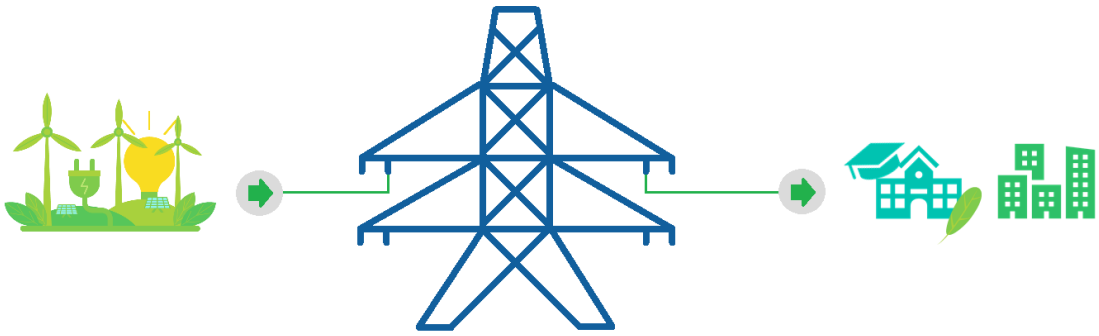
Guidance for Pilot Projects can be found in Miami-Dade County IO 3-38, and are adapted below for M-DCPS:

1) period cannot exceed 12 months from initiation of the pilot project (MOU);
2) must be at no cost to the District except for any ordinary cost to review such technology, products, or services;
3) cannot contain any exclusive dealing, in-kind or advertising commitments by the District;
4) must provide for indemnification of the District;
5) must provide for District ownership of any data generated during testing and observation; and
6) must be terminable at will by the District.

- Implementation Costs: $0
- Implementation Savings/Benefits: access to innovative solutions
- Resources for Funding: N/A
- Estimated Carbon Reduction: to be monitored
- Schedule to Complete: start immediately

5.6 Begin the evaluation process for procuring Renewable Energy Certificates equal to remaining energy usage (after all energy savings measures are implemented).

Renewable Energy Certificates (RECs) are a market-based instrument that certifies the bearer owns one megawatt-hour (MWh) of electricity generated from a renewable energy resource. Once the power provider has fed the energy into the grid, the REC received can then be sold on the open market as an energy commodity. Renewable energy certificates (RECs) give companies, institutions, and individuals a simple way to offset their carbon footprint and support clean energy. RECs always come from renewable energy, so buying them would allow the District to claim the renewable energy attributes of that electricity.



In addition, M-DCPS should consider expanding its participation in SolarTogether (a local FPL REC program) as supplemental to those facilities where solar will not be installed. SolarTogether is likely the best option for RECs to be considered as a transitional step. This is a fall back to be used during the transition as a last resort in the event that we don't achieve 100% clean energy by 2030.

- Implementation Costs: pricing for RECs varies with supply and demand and are currently around $8 per REC
- Implementation Savings/Benefits: claim credit for less carbon emissions
- Resources for Funding: to be determined during implementation
- Estimated Carbon Reduction: 176,447 metric tons (based on 1,000 lbs CO_2e per mWh)
- Schedule to Complete: purchase RECs by 2030

TRANSPORTATION, REDEFINING WASTE, AND GREENING OPERATIONS

6. TRANSPORTATION

6.1 Replace 999 diesel buses with quiet, clean Electric School Buses (ESBs).

M-DCPS buses travel approximately 13.4 million miles a year (based on 2019 mileage)[16], safely transporting students to and from school. However, these buses produce diesel exhaust which has a negative impact on children's developing lungs and brain function. Diesel exhaust has been linked to cancer, heart disease, lung disease, and Hodgkin's disease[17]. Replacing loud diesel buses with quiet, clean, electric vehicles will provide a safer and healthier ride for students and will improve air quality in high-pollution corridors where underserved communities are disproportionately exposed to health risks[18]. Additionally, exposure to diesel emissions has been linked to lower attendance[19] and academic performance[20]. Nationally, 480,000 school buses account for 80% of all buses nationwide, yet less than 1% are electrified[21]. In Florida, the transportation sector accounts for 48% of greenhouse gas emissions[22]. Electrifying the entire fleet of US school buses would reduce US greenhouse gas emissions by 35%.

The Nonprofit World Resource Institute[23] is partnering with M-DCPS to help accelerate the electrification of the bus system using grant funding and revenue neutral programs. We recommend fully converting the M-DCPS bus fleet to electric vehicles by 2030.

Currently, M-DCPS has approximately 999 active buses (676 are 2009 or older) and there is no dedicated budget for bus replacement/purchases. The yearly bus fuel cost is approximately $2.3 Million (based on diesel fuel expensed for 2020-21 fiscal year). In addition, the average annual cost per bus for parts is $3,673 and for labor is $5,895 for the fiscal year 2020-21.

[16] https://dot.dadeschools.net/#!/fullWidth/3310
[17] https://www.wsj.com/articles/the-surprising-academic-impact-of-reducing-school-bus-emissions-11558471990
[18] https://www.lung.org/clean-air/outdoors/who-is-at-risk/disparities
[19] https://www.brookings.edu/blog/brown-center-chalkboard/2019/04/21/fixing-school-buses-is-an-effective-and-cheap-way-to-improve-students-health-and-academic-performance/
[20] https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3351840
[21] https://www.epa.gov/dera/reducing-diesel-emissions-school-buses
[22] https://southeastfloridaclimatecompact.org/ghg-inventory/
[23] https://www.wri.org/initiatives/electric-school-bus-initiative

Implementation Costs: adding ESBs through the VW settlement program will make acquiring ESBs no more costly than purchasing a traditional bus

- New diesel/gas school bus = $95,000-$100,000 depending on configuration/accessories
- New ESB = $345,000 → VW grant will cover ⅔ of the ESB costs = no extra costs

Implementation Savings:

- Over 60% savings ($3.1 Million) in fuel and reduced maintenance (see Appendix III)
  - $2.5 Million Fuel savings (53.14%) & $630,000+ Maintenance savings (10.7%)
- ESB leasing option includes:
  - Installation of charging stations and necessary infrastructure, including utility coordination and facilitation
  - Covers costs of required maintenance
  - Project financing to capture the long-term cost savings on fuel/maintenance
  - Proactively and strategically position bus deployments to absorb federal and state subsidies → pass on savings from federal and state funding to the district
  - Driver and mechanics training
  - Possibility for student vocational training collaboration
- Added benefit: ESB batteries could serve as *backup power source for emergency shelters*. A single EV bus battery has 10-15 times the battery storage capacity of a Tesla Powerwall (200+ kWh vs 14-15 kWh). The buses could cycle through, each serving as a backup source to keep the location powered for however long it would be needed.

Resources for Funding:

- Received $11.6 Million from VW settlement funds for school buses only
  - 50 buses over next 4 years to subsidize extra cost of electric
  - Limited to buses from 2009 or older (676 buses)
  - Additional VW funds are earmarked for ESBs for future disbursement (planning on $116M total of $166M total VW allocation to Florida)
- Infrastructure bill[24]: $2.5-$5 Billion available beginning in 2022 for EV buses
- Tax credits (pending passage of BuildBackBetter federal legislation):
  - Alternative Fuel Infrastructure Tax Credit: if extended, this will provide a 30% credit on charging equipment. May require collaboration with a tax equity partner unless the credit is made refundable.
  - 45Y Credit for Qualified Commercial Vehicles – if enacted, this will provide a tax refund worth 30% of the upfront price of an ESB or 100% of the incremental price of an ESB compared to a diesel, whichever is lower.
- Build back better: $10 Billion for electric vehicles including ESBs and other fleet vehicles
- ESSER funds swap: capital projects that are funded → use ESSER instead and redirect those funds to purchase buses

[24] https://www.epa.gov/newsreleases/more-17-million-rebates-available-fund-school-buses-reduce-diesel-emissions-and

Estimated Carbon Reduction: According to the AFLEET tool from Argonne labs, a full fleet conversion would result in approximately 150,000-250,000 metric tons of greenhouse emissions reduction over their lifetime use (about 246 metric tons per bus).

Schedule to Complete: 18% of buses converted to EV in 5 years (2026) = 180 buses

- VW grant buses will be delivered 8–12 months after grant money received
  - 2022–2024 = 20 buses. 2024–2026 = 30 buses
  - Reevaluate after first 20 buses, in year 2023
- 2026-2030 = work with WRI to find funding and implementation opportunities to convert an additional 150 buses per year for a total of 780 buses by 2030

6.2 Investigate reducing bus idling time based on emissions output.

Bus Idling wastes fuel, reduces engine life, and creates hazardous air quality, especially in bus loading areas. One hour of bus idling burns a half gallon of fuel. More critically, an Environmental and Energy Study Institute (EESI) training on reducing school bus idling notes that diesel exhaust has a greater tendency to accumulate in the bus interior when the bus engine is running but the bus is stationary. This especially impacts young children who inhale 50% more pollution according to the Environmental Protection Agency. Boarded students breathe this exhaust for all or some portion of their bus ride to and from school. Eliminating needless idling is vital for driver and student health. Yearly training and ongoing monitoring to reduce bus idling will reduce wear and tear on engines, limit harmful exhaust exposure, save on fuel costs and reinforce a culture committed to stakeholder health and reducing environmental impacts and costs.

M-DCPS currently has a Diesel Exhaust and School Bus Idling program (see Board Policy #8400). Additionally, the Department of Transportation has established a “turn engine off after idling 10 minutes” policy. The 10 minute idling period is the minimum time required to meet the Performance Specifications outlined in the National School Transportation Specifications and Procedures. These Air Conditioning Specifications are required to sustain a “Standard Performance” of the 2 to 3 units mounted on a school bus. Additionally, M-DCPS transports a number of students who are required to have an Air Conditioned environment as established in their Individualized Education Program (IEP). M-DCPS also has 224 school buses equipped with wheelchair lifts that require the engine to be in operation while the lift goes through its cycles. Regrettably, this exposes wheelchair bound students to even greater exhaust levels during the chair lift process.

Our recommendation is to reduce the bus idling time to a lower amount based on measured emissions output. This policy should apply to all buses except wheelchair lift equipped buses. To the extent practical, the District should post "No Idling" signs to alert bus drivers and parents to turn off vehicles when waiting or parked. The School District should also relocate school building air intake systems more than 100 feet away from school bus parking areas when practical and should take other measures to reduce intake of school bus exhaust where relocating systems is not feasible (e.g., regulating closure of air intake vents).

A driver of a diesel school bus (a) must turn off the bus upon reaching a school or other destination and must not turn on the engine until necessary to depart from the school or destination; and (b) must park the bus at least 100 feet from a known and active school air intake system, unless the School District has determined that alternative locations block traffic, impair student safety or are not cost-effective. In addition, M-DCPS should offer No Bus Idling training[25], and create a reporting app for bus idling violations (similar to New York's Citizens Idling Complaint 15 RCNY §39-02[26]).

- Implementation Costs: $0 - create Google Form for reporting purposes
- Implementation Savings/Benefits: Fuel Savings
- Estimated Carbon Reduction: 1 hour bus idling = ½ gallon of fuel
  - Carbon savings = 10 minutes of car idling = one pound of carbon dioxide
  - Not only does idling add to human health costs, but it also adds to the financial cost of driving a vehicle.
    - Idling for more than 10 seconds wastes more fuel than turning the engine off and on[27]
- Resources for Funding: N/A
- Schedule to Complete: start immediately

[25] https://www.eesi.org/files/idle_reduction_guide.pdf
[26] https://www1.nyc.gov/nycbusiness/description/idling-regulations
[27] https://zbook.org/read/1460a1_idling-gets-you-nowhere-environmental-defense-fund.html

6.3 Increase carpooling rates by 20% by 2030.

According to Project Drawdown, carpooling has no implementation costs and could reduce emissions by 4.2–7.7 gigatons of carbon dioxide worldwide while saving US $2.8–5.2 trillion in operating costs.

M-DCPS should encourage schools to use particular ride sharing apps (e.g., Carma Carpooling, Sidecar, Trees for Cars), and recognize students/teachers on a monthly basis who add to the carpooling increase.

- Implementation Costs: Free
- Implementation Savings/Benefits: South Florida Commuter Services[28]
  - FREE services include, but are not limited to:
    - Guaranteed Rides Home (via Uber, Lyft or taxicab)
    - Preferential Carpool Parking & Permits
    - Ride-Matching Services
    - Employer Management and Reporting Portal
    - Bike to Work Events
    - Incentives and Customized Challenges
- Estimated Carbon Reduction: Parent/Student commuting can be as much as 50% of the transportation footprint.
  - *See* Carbon Free Pathways for MAST Academy noting that fewer than 50% of students take public or school bus transportation and private ridership amounts to approximately $300k in fuel costs; same cost as electrifying the campus
- Schedule to Complete: Immediate roll out for 2022-2023 school year with a kick off campaign to correspond to FDOT[29], carpool/mobility week. November 1-5, 2022.

6.4 Bike and walk to school: implement safe routes to schools and bike infrastructure.

Bike commuting improves student well-being, mentally and physically, and reduces polluting emissions. Currently, biking to school is promoted through Board Member announcements, but appears to have limited application in most schools. Schools can increase ridership by promoting bike to school days, offering bike racks, and promoting rider schoolpools. When cycling ridership increases, roads become more bike safe.

[28] https://1800234ride.com/school-pool/companies-colleges-universities/program-info/
[29] https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/mobilityweek.shtm/information-guide-2021.pdf?sfvrsn=cd36aefb_2

According to ProjectDrawdown, bike infrastructure is ranked #59 among the top 100 solutions to Drawdown worldwide emissions, with a potential 2.31 GT worldwide reduction. By building bike infrastructure rather than roads, municipal governments and taxpayers can realize US$2.7–US$7.5 trillion in construction savings and US$827–US$2400 billion in lifetime operating savings. To increase ridership, schools should provide bike racks and promote bike to school days.

- Implementation Costs: "Bike to School Day" = $0
- Implementation Savings/Benefits: improved health, reduction in carbon emissions from other transportation methods
- Resources for Funding: Bike racks = Bike305 donations (bike rack at every school).
- Schedule to Complete:
  - Confirm bike rack availability for all schools by March 2022 to correlate with Florida's bike month.
  - Ask South Florida Commuter Services to help create a biking school pool with their survey system program by August 2022.
  - Offer bike safety clinics and free bike resources, such as helmets, twice a year: Mid-September in time for Bike to School Day on October 6th and February to correlate with Florida's Bike to School in March.
    - Free helmets and educational materials available[30]

6.5 Promote car charging options for students and teachers with designated low emission Electric Vehicle (EV) parking spots.

There should be at least two designated spots per school, and the spots should be reevaluated after 4 years. M-DCPS should also explore the possibility of making chargers available for overnight charging (when school parking lots are empty) at certain locations for a fee to other local governments and possibly the general public.

- Implementation Costs: TBD (cost to paint the designated parking spaces)
- Implementation Savings/Benefits: adding car charging capacity increases rate of EV parking 4-fold
- Resources for Funding: Revenue Neutral; sell a $5/month parking pass to allow for self-charging on campus with a 110V outlet
- Schedule to Complete: designate parking spots by end of 2022

[30] https://www.pedbikesrc.ce.ufl.edu/pedbike/default.asp

7. REDEFINING WASTE

According to Project Drawdown, reducing food waste and adopting plant rich diets are the number 3 and 4 most impactful solutions to the climate crisis. In the United States, more than a third of our food is never eaten, squandering land and water resources and needlessly emitting greenhouse gases during production. Interventions can reduce loss and waste, as food moves from farm to fork, thereby reducing overall demand. After taking into account the annual adoption of plant-rich diets, if 50%–75% of food waste is reduced by 2050, avoided emissions could be equal to 13.6–26.0 gigatons of carbon dioxide. Reducing waste also avoids the deforestation for additional farmland, preventing 77.1–75.1 gigatons of additional emissions. Project Drawdown considers reducing food waste to be a critical aspect to reducing greenhouse gases. The Task Force recommends implementing district-wide education campaigns that prompt student behavioral changes to result in reduced waste. M-DCPS will collaborate with OCCE to provide student education campaigns to reduce plate waste through "Taste, Don't Waste."

We recommend M-DCPS diverts 50% of all school waste from landfill through recycling, composting, and source reduction by 2026; the current goal is only 5%. This goal could be easily increased to 50% by adding comprehensive recycling and cafeteria composting services. Florida has a 75% recycling goal[31] and the Environmental Protection Agency (EPA) has a 50% waste diversion goal.

M-DCPS solid waste accounts for almost 16K CO_2 metric tons, which is equivalent to 60% of the emissions generated from M-DCPS fleet vehicles. Industrial recycling and composting are the #56 and #60 for Project Drawdown Solutions respectively. M-DCPS should pilot sustainability cafeteria programs, including plastic reduction and composting uneaten prepared food, in 10% of schools including Ed Fund Schools (27 elementary schools across 9 districts) and schools that express interest in the program (e.g., Green Apple Schools).

7.1 Waste diversion: recycling and composting.

M-DCPS should perform a waste analysis to find out waste composition which can drive subsequent waste policies. This might be part of an educational experience. In addition, M-DCPS should require waste data disclosure and regular waste analysis to be included with any negotiated waste hauling contract.

[31] https://floridadep.gov/sites/default/files/FinalRecyclingReportVolume1_0_0.pdf

7.1.1 - Recycling

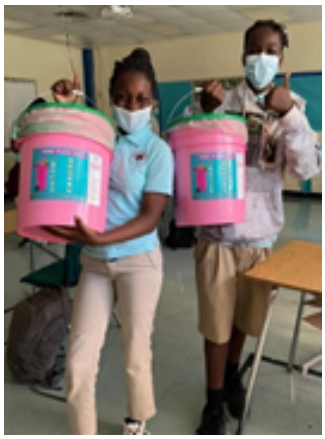
On October 12, 2021 an M-DCPS issued an RFP Proposal for $5.14 Million per year (around $5,000+ per year per school) for trash and recycling for the next 5 years. There is one price for both services, and there are currently no built in incentives for waste diversion. Trash is picked up by Waste Management (daily; 6-yard units, 1-5 units per school). Recycling is picked up by Coastal Recycling and is currently limited to cardboard (weekly, 6-yard recycling container, pay per unit). Building contractors are also required to achieve 50% waste diversion rates consistent with Florida regulations. We recommend that vendors indicate how they will assist M-DCPS in meeting its waste diversion strategic plan goal, including offering waste audit information. Vendors should indicate maximum waste diversion potential.

Our recommendation is to increase the M-DCPS recycling to include bottles and cans. In addition, we want to improve recycling rates through better recycling labels (e.g., from Recycle Across America) and educational programs such as “Know Where To Throw”.

- Implementation Costs: $750 per year per school ($75/month)
  - Vendor e.g.,: Lady Green Recycling (includes educational training)
- Resources for Funding: government grants and private partners
  - Pepsi Recycle Rally: free bins for schools and competitions
  - EPA Solid Waste Management Assistance Grants
  - Recycle Across America Labels: Bank of America/Whole Foods ($30K for labels)

7.1.2 - Composting

Currently, there is no composting program in Miami-Dade County. We recommend coordinating with the County to provide funding and logistical assistance to roll-out composting in the school setting. M-DCPS bulk purchases millions of compostable trays for the cafeteria setting (which do not contain PFAS and are therefore compostable), but none are currently able to be composted. Some small-scale food waste composting is currently being conducted as demonstration projects (e.g., culinary classes, teacher projects). Our recommendation is to initiate composting in M-DCPS schools, particularly for the compostable trays.



- Implementation Costs: $1,000 per year per school ($99/month)
  - Vendor e.g., Compost 4/Life (South Dade); Renewable (North Dade)
    - 80% of kitchen food waste can be diverted from landfill
- Resources for Funding: government grants and private partners
  - EPA has grants for food waste/materials reduction[32]
    - Valued at minimum of $50k up to $300k
  - WWF - $5K (Food Waste Warriors Grant program reopen 2022)

7.1.3 - Volunteers

We recommend the creation of a volunteer sustainability corps (e.g., Americorps, university students, high school students). M-DCPS should coordinate with local universities to attract college volunteers for community service learning, and can find a partner organization to help administer the volunteer program for a sustainability corps to help teach composting to students in the cafeteria during all lunch hours. Food waste curricula (such as World Wildlife Fund's Food Waste Warriors) should be employed for all grades as guest lecturers in classrooms while executing on the concept in the cafeteria setting. Volunteers can also help schools become certified as Florida Department Environmental Protection Green Schools. In addition, M-DCPS could offer service learning sustainability class periods for high school students and integrate service learning opportunities with part-time M-DCPS employment being offered to hire cafeteria employees.

- Implementation Costs:
  - A Volunteer Florida grant is valued at approximately $21,000 per volunteer.
  - 75% by Volunteer Florida.
  - Matching, which can include in kind already existing admin costs = 24%.
- Implementation Savings/Benefits: can help with the transition to reduce food waste

Schedule to Complete:

- Increase waste diversion goal from 5% to 50% within 5 years (requires including composting)
  - 2022-2023: Pilot waste diversion and volunteers in 40 schools (10% of all schools) with recycling upgrades, compost, and proper labels.
  - Target FL DEP Green Apple Schools first ($2,000 per school for supplemental recycling and composting programs)
- Encourage schools to add recycling and composting pillar goals to the School Improvement Plan

[32] https://www.grants.gov/web/grants/search-grants.html?keywords=epa%20food%20waste

7.2 Plastic waste reduction.

Students report that they are especially troubled by the amount of plastic waste generated in the school setting. They are aware of the marine hazards of plastic waste and the microplastics humans and animals ingest weekly. Plastics do not degrade; rather they break down to smaller parts. Humans ingest up to a credit card worth of plastic every week. Microplastic has been found in bees and deep ocean marine life.

7.2.1 - Cutlery modifications

M-DCPS currently spends $600,000 per year on spork and napkin packets. We recommend the School Board considers cutlery modifications described below to reduce plastic waste.

- Implementation Costs/Savings:
  - Bring your own cutlery to school: free
  - Regular cutlery + dishwasher:
    - Minnesota Public Schools: using real cutlery saved money over plastic[33]
    - Prevented 6,712 lbs of trash, saved $23,000 over 3 years
    - Dishwashers require additional staff, maintenance and costs of dishware
    - Reduced greenhouse gases by 77%
  - Napkin/Spork options: $2,800 per school
    - Current Cost: Plastic spork with napkin = $0.02
    - Alternatives
      - Birchwood spork and napkin = $0.024
      - Lean Orb Wood = $0.017 per spork
      - Napkin dispenser with napkins = $0.007
      - Fiber breakfast bowl = $0.042, Paper cup = $0.04
  - Resources for Funding:
    - M-DCPS DFN initiate a pilot of compostable cutlery/napkin dispenser to schools throughout the district
  - Schedule to Complete: 2022 → pilot in 40 schools (10%), full transition by 2025

7.2.2 - Bulk Purchasing in lieu of single serve options

The current breakdown of school lunch costs by the School Nutrition and Meal Cost Study is: food = 44%, labor = 45%, other direct costs (supplies, equipment, utilities, etc.) = 9.5%.

[33] https://www.pca.state.mn.us/living-green/case-study-schools-move-reusable-utensils

- Implementation Costs/Savings:
  - Milk dispenser: $3,200 with delivery
  - Include cost and usage of cups
    - Milk cartons make up at least 50% of a school's lunch trash volume
    - Students waste 30% of all milk in cartons
    - Post-milk dispenser waste study: 52% increase in milk consumed
  - Cereal dispenser: 1-gallon dispenser = $500
    - Include cost of bowls for use
    - Cinnamon toast crunch bulk packaging = $0.45 ounce
  - Ketchup touchless dispenser: $1,000 + ($0.013/cup)
  - Reduce plastic packaging within food handling sanitation and safety practices
    - Use trays that can separate fruit rather than wrap in plastic
- Schedule to Complete: projected to be completed by the end of 2024

7.2.3 - Vendors

District contracted trainers will provide students with education and guidance on recycling and composting to support programming identified in the Sustainability and Holistic Education section of this report.

- Implementation Costs/Savings: to be determined
- Resources for Funding: to be determined; external and internal resources will be vetted to initiate and sustain programming and services for students.
- Schedule to Complete: by the end of 2024

7.3 Reduce food waste and increase plant-rich diets.

According to Project Drawdown, reducing food waste and plant rich diets are the number #3 and #4 most impactful solutions to the climate crisis. In the United States, more than a third of our food is never eaten, squandering land and water resources and needlessly emitting greenhouse gases during production. Food waste generates 8% of worldwide emissions. Meat-centric diets come with a steep climate price tag, contributing to one-fifth of global emissions. Plant-rich diets dramatically reduce emissions and rates of chronic disease.

After taking into account the annual adoption of plant-rich diets, if 50%–75%of food waste is reduced by 2050, avoided emissions could be 13.6–26.0 gigatons of CO_2. Reducing food waste also avoids deforestation for additional farmland, preventing 77.1–75.1 gigatons of emissions.

Currently, the District offers "Meatless Monday" and a daily vegetarian option for every meal. M-DCPS should analyze the current carbon footprint of school menu options and try to reduce

the carbon footprint of meals by 50%. We recommend offering more Climate Friendly Lunches and work with students to increase demand[34]. We also recommend buying locally as much as possible, since reducing the travel footprint of food transportation can also reduce carbon emissions (current Board Policy 6320.5: vendor and employment preferences). M-DCPS can collaborate with more local food providers, such as SouthEast Florida Food systems group, Feeding South Florida.

M-DCPS should work with volunteer groups (e.g., Volunteer Florida Sustainability Corps) to create a healthier cafeteria culture that increases plant-based recipes, local produce, reduces food waste, and incorporates composting while also reducing plastic waste. M-DCPS can also engage with community partners to help promote local and tasty plant-based recipes from school gardens. Community partners should have an opportunity to implement gardens at school and increase the number of community partners district-wide over the next 5 years.

- Implementation Costs: to be determined based on cost of plant-rich food options
- Implementation Savings: to be monitored
- Resources for Funding: Kirk Foundation, Miami Foundation
- Schedule to Complete: analyze current menu by end of 2022, implement plant-rich local conversion by end of 2025

8. GREENING OPERATIONS

8.1 Manage refrigerant and fugitive emissions.

According to Project Drawdown, the #1 most important solution to reducing global warming is refrigerant management. The primary chemical refrigerant, HFCs, is a potent greenhouse gas. Emissions are avoided by managing leaks and disposal and by phasing out the use of HFCs, wrestling in 89.74 FT Reduced CO_2. Every refrigerator and air conditioner contains chemical refrigerants that absorb and release heat to enable chilling. HFCs refrigerants have 1,000 to 9,000 times greater capacity to warm the atmosphere than CO_2. Effective disposal of refrigerants currently in circulation is essential because 90% of refrigerant emissions happen at the end of life. After being carefully removed and stored, refrigerants can be purified for reuse or transformed into other chemicals that do not cause warming.

Per the UM GHG Inventory, the current fugitive emissions risk is comparable to waste emissions measured at more than 12k CO_2e metric tons. M-DCPS should ensure maintenance staff or HVAC contractors are following regulations on refrigerant and fugitive emissions management.

[34] https://omdfortheplanet.com/take-action/schools/#form

8.2 Expand Food Forests in schools across the District.

The Education Fund works with the District to install sustainable outside learning labs (e.g., forest garden spaces) that (1) provide hands-on environmental and STEM/STEAM education, (2) improve shade and canopy, (3) promote biodiversity, (4) improve drainage, and (5) remove carbon from the atmosphere, among a multitude of other benefits. These sustainable labs are comprised of trees, bushes, banana circles, vines, and ground cover with natural pathways and whole class learning areas, covering up to 0.25 acres. These Food Forests turn wasteful grass areas of schools into areas that improve the environment for the entire school community. As of the end of the 2021-22 school year, there are 28 schools within M-DCPS with Food Forests. To date, 208,000 pounds of organic food has been harvested on school sites, which is then used in both cafeteria meals and sent home with students.

We recommend M-DCPS DFN continues to partner with The Education Fund as well as other non-profits such as Green Haven Project, Million Trees Miami, and Citizens for a Better South Florida to expand the number of Food Forests in schools across the District. This partnership will also provide environmental and nutritional education to students and teachers across the District through hands-on lessons in the Food Forest, including harvesting for cafeteria and homebound use.

- Implementation Costs: Cost per Food Forest averages $30,000 to $50,000 per year
  - Dependent on size and educational and maintenance/harvesting support provided
- Implementation Savings/Benefits:
  - Improved soil health at schools with Food Forests due to organic compost, resulting in carbon sequestration and improved nitrogen outputs
  - Increased tree canopy reduces temperatures in schools and improves air quality
  - French drain pathways reduce flooding
  - Increased biodiversity of the area around the school

- School counselors and teachers have reported on the mental health benefits for students of the Food Forests, with international research showing the effect of trees and being in nature to improve mental health.
- Evaluations (using pre- and post-tests based on state of Florida standards) show up to 80 percent of students each year increase their science proficiency.

- Resources for Funding: the increased interest in sustainability, environmental education, STEM education, and mental health improvements provides various avenues for funding, with the most likely resources being;
  - Local governments including County and City Governments
  - State Government (grants and allocations)
  - Federal Government (US Department of Agriculture, US Department of Education, and US Environmental Protection Agency)
- Schedule to Complete: start immediately

8.3 Increase the number of Florida Department of Environmental Protection (DEP) Green Apple Schools by 10% each year.

"The Florida Green School Designation Program is an initiative of the Florida Department of Environmental Protection that designates and recognizes K-12 schools that make a voluntary commitment to conserve and protect Florida's natural resources" (FDEP, 2021). The program guides primary and secondary schools to evaluate operations, set goals, and take specific actions to continuously improve environmental performance. Interested schools conduct a property assessment and implement a specified number of environmental practices in five areas of sustainable operations: Communication and Education, Energy Efficiency, Water Conservation, Waste Reduction, Reuse and Recycling, and Air Quality. The program's durability is enhanced by a required 3-year renewal process and incentives to obtain more prestigious recognition as a bronze, silver, or gold school based on continued enhancements in environmental performance. All schools start at the Green Apple level, then work their way to Bronze, Silver and eventually Gold Apple status by implementing additional best management practices.

Currently, there are 32 schools designated as Green Apple Schools in Dade County. We recommend increasing participation to improve sustainability across the 6 focal areas of the program, building opportunities for student and staff engagement and active learning across initiatives.

M-DCPS should include Florida DEP Certification in the School Improvement Plan and create a manual and master list of contacts to help schools with application. Participating schools, principals, and teachers should also be incentivized with some form of financial/resource reward, and the Energy Rebate Incentive Program will share 75% of savings realized with the school. We also recommend developing metrics/criteria so that schools can self-assess progress, and ask schools to report on progress using the point system built into the designated Green Apple Schools program. Florida DEP Green Apple Schools certification also includes energy, water, and waste efficiency requirements, serving as a mini-audit of operations and creating awareness of high impact behaviors.

- Implementation Costs: Free
  - Staffing requirements: there are no additional staffing requirements, but principal buy-in is critical (application process requires a principal's signature).
  - Need input from custodians and zone mechanics to verify operational practices
- Implementation Savings/Benefits: Reduces environmental impacts and costs around school and if properly implemented could reduce energy, water, and waste costs.
- Resources for Funding: PTA support, ESSAC
- Schedule to Complete: announce goal for Earth Day 2022 (April)

8.4 Adopt an Environmentally Friendly Purchasing Policy.

Green procurement is the affirmative procurement of environmentally preferred products and services. These products or services have a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purpose. Environmental preferability is a function of various factors. These include: (1) recyclability and recovered material content; (2) performance and durability; (3) toxicity and biodegradability; and (4) life cycle energy/natural resource use. Green procurement is rooted in the principle of pollution prevention, which strives to eliminate or to reduce risks to human health and the environment. It means evaluating purchases based on a variety of criteria, ranging from the necessity of the purchase in the first place to the options available for its eventual disposal.

We recommend using the policy provided by the Florida Department of Environmental Protection Green Schools office[35] and creating a list of preferred local vendors that comply with purchasing policy[36].

- Resources for Funding: Partner with the County for bulk purchasing to amplify buying power in alignment with County's Resolution 1053-09.
- Schedule to Complete: Adopt policy June 2022 for upcoming school year

[35] https://sftool.gov/greenprocurement/green-services/9/cafeteria-food-services
[36] https://urbanschoolfoodalliance.org/our-impact/

8.5 Parking greening and innovation.

The purpose of these recommendations is to maximize the value of M-DCPS-owned property allocated for parking uses, improve stormwater management, and significantly reduce M-DCPS impacts to Urban Heat Island Effect. M-DCPS Design Criteria should be reviewed and amended to incorporate these recommendations as appropriate.

8.5.1 - Existing Parking Lots

M-DCPS should conduct a County-wide parking needs analysis to identify sites where parking spaces can be eliminated and replaced with stormwater management assets or green spaces (such as, but not limited to, gardens, pocket parks, outdoor "reading rooms" and play spaces) for student use. M-DCPS should also modify existing parking lot design guidelines to define and allow for "parklets", and install solar panels that double as shade structures.

- Implementation Costs: $2,500 for assessment per school
- Implementation Savings/Benefits: reduced Urban Heat Island Effect, improve stormwater management, increased open space for student use
- Resources for Funding: capital budget
- Schedule to Complete: 10% of school parking lots per year

8.5.2 - New Construction

M-DCPS should lobby relevant authorities for local control of parking requirements. We recommend M-DCPS revises the design criteria to include the following for all new construction:

1) Require the incorporation of rain gardens at all sites
2) Double the amount of bicycle parking spaces required at all sites
3) Double the tree requirement for all sites and include a requirement for shade trees along pedestrian connections to parking lots, pick-up/drop-off loops, and bus areas as well as a requirement that trees line parking rows, not just the perimeter of parking lots.
4) Require efficient stormwater plans that include water-polishing components. Incorporate pervious asphalt as part of parking lot design criteria
5) Implement an asphalt maximum as a percentage of the overall parking lot site
6) Introduce E/V charging stations and update list of preferred landscaping

- Implementation Costs: $0 (use volunteers to spearhead effort)
- Implementation Savings/Benefits: reduced Urban Heat Island Effect, improve stormwater management, increased open space for student use
- Resources for Funding: N/A
- Schedule to Complete: start immediately

8.5.3 - Opportunity Inventory

We recommend building an inventory of M-DCPS-owned parking lots that includes the following: location, total square footage, total spaces, and neighboring land uses. Secondly, we recommend developing and applying a parking lot site ranking system that considers the following: allowable intensity, adjacent use compatibility, local parking needs, and investment opportunities.

In phases, issue Requests for Proposals for Public/Private Partnerships to develop green parking garages and possible additional uses on highly-ranked parking lot sites. Additional uses should include, but not be limited to, the following: M-DCPS workforce housing, child and adult daycare facilities, preschools, institutional uses, compatible commercial uses such as bookstores and cafes.

- Implementation Costs: cost of building the inventory (e.g., hiring a firm to conduct survey)
- Implementation Savings/Benefits: in addition to reducing asphalt/building footprint, revenue potential is high
- Resources for Funding: capital budget (inventory/analysis); individual project funding TBD
- Schedule to Complete: 2023: target RFP

SUSTAINABILITY AND HOLISTIC EDUCATION

The most important role that is played in sustainability is by the people. Sustainability education is an important vehicle to educate both adults and children around practical ways to reduce resource consumption. Through heightened awareness of both the importance of conservation and of practices to conserve, students and adults may become more conscious of behaviors and can even serve as agents of change in their communities.

> *"In the end we will conserve only what we love; we will love only what we understand; and we will understand only what we are taught." - Baba Dioum, 1968*

A fully rounded education system not only encompasses science, but also teaches students to cope, adapt, and care for the well-being of the planet, others, and themselves. When we power our schools with 100% clean energy, we expand educational opportunities focused on sustainability and clean energy. This can help lay a path for post-secondary students to secure green jobs in the rapidly growing clean energy sector.

9. SUSTAINABILITY AND HOLISTIC EDUCATION

9.1 S²TEAM: work with the STEAM program to include a sustainability component in order to expand sustainability focus within schools.

9.1.1 - S²TEAM

An effective implementation plan that will support the long-term goals of the Clean Energy Taskforce in Sustainability Education and Workforce Development will require an investment in our current M-DCPS STEAM (Science, Technology, Engineering, Art, Mathematics) School Designation Program. The Program was developed to ensure students are prepared for the challenges of tomorrow through high-quality curriculum and ongoing school site support that promotes critical thinking, problem solving, and integration of the STEAM disciplines. Schools are provided the opportunity to earn the distinction of becoming a bronze, silver, or gold designated school based on rubric guidelines that support school students and teachers.

This program encompasses a rigorous year-long process that focuses on areas such as state and national assessments, course offerings, teacher professional development, student competitions, showcases for all stakeholders, community partnerships through the infusion of higher-order thinking skills through a standard-driven intentional STE(A)M integration.

STEAM has been supporting M-DCPS schools since the 2015-2016 school year and has proven to be effective at raising science and mathematics student achievement as well as having a positive school culture impact. The STEAM School Designation program has been well received by the applicant schools, parents, teachers, and students for over six school years and it continues to grow in popularity, currently serving over 150 schools. For the above-mentioned reasons, it is imperative that the following investments be considered for the effective implementation plan of the long-term goals of the Clean Energy Taskforce in Sustainability.

S²TEAM will incorporate sustainability in various aspects of the STEAM program to include the sustainability concepts of energy conservation, renewable energy, water stewardship, and recycling. The existing rubrics will incorporate these concepts within the programs. Dream in Green created teacher surveys that are tied to the competencies for Environmental Education that they share at the end of the program. These may be helpful for development and evaluation of S²TEAM[37]. Below are recommendations to further improve and expand the S²TEAM program.

1) Work to expand the S²TEAM program to include schools in more areas of the County.

Currently, the STEAM School Designation Program supports 150-180 schools (50-60 per region; 2020-21 school year). The recommendation is to increase this number to 180-210 schools (60-70 per region) for the 2024-25 school year and reassess each year for possible growth. Four staff members currently support 150 schools. This should be increased to 3 supervisors and 6 curriculum support specialists. These staff will be responsible for administrator and teacher professional development (including a required sustainability focused professional development activity yearly), liaison training, rubric creation, partnership affiliating agreements, competitions curriculum alignment, school promotion, STEAM Expo, adjudication process, and integration of sustainability curriculum and practices in the STEAM School Designation Program

- Implementation Cost: $900,000 annually for personnel

2) Create S²TEAM Liaison stipends to support the S²TEAM efforts of all applicant schools.

Currently, the Liaisons are not paid. The recommendation is to recognize and honor their effort at school board meetings and/or STEAM Expo as well as provide a $1,500 stipend per Liaison. Combination schools such as K-8 and 6-12 grade configurations benefit from two liaisons to

[37] https://forms.gle/8CezJQ8bZFCU9DQh8

ensure the work is focused by grade band. The Liaison will be required to participate in accepted sustainability focused teacher training and to ensure a sustainability element in S²TEAM efforts.

- Implementation Cost: $270,000-$315,000 annually (dependent on number of schools)

3) Provide yearly financial school support for initiatives in the School Designation rubric.

Currently, schools find their own funding. The recommendation is to provide $3,000 per school yearly for competition materials, showcase materials, and transportation to S²TEAM Expo and other competitions.

- Implementation Cost: $540,000-$630,000 annually (dependent on number of schools)
- ImplementationSavings/Benefits: priceless
- Resources for Funding: general fund
- Schedule to Complete: secure funding by the start of the 2022-23 school year

9.1.2 - Expanding Sustainability Curricula

Students are naturally interested in sustainability. The practical and interdisciplinary nature of sustainability challenges inspires curiosity about the causes and solutions to climate change. The direct engagement of students to lived experiences provides a pathway to encourage students into STEM fields. While M-DCPS has strong STEM programs and existing partnerships with local environmental organizations, implicit focus upon sustainability can be strengthened.

We recommend a thorough review of existing sustainability programs and the development of strategies focused on sustainability and ensure that more schools can connect. Dream in Green has the largest presence with over 100 schools. Any school participating in the Green Schools Challenge will also do a survey to participate in State level Green Apple Schools. CLEO has a climate leadership program primarily in High Schools. The District needs to achieve equitable distribution of these programs throughout the District. Our specific recommendations include:

1) Evaluate staffing and resource allocation at the District to support programs and prioritize allocations to support enhanced sustainability related efforts.

2) Encourage schools to adopt an integrated sustainability curriculum that bridges sustainability education across all subject areas. Consider incorporating multidisciplinary teacher training and standards aligned lesson plans offered through nonprofit partners focusing on sustainability and climate change such as Dream in Green, The CLEO Institute, Fairchild Tropical Garden, and The Everglades Foundation. When considering new textbooks, look for integration of sustainability and climate issues throughout. Give free subscriptions to age-appropriate publications for reading programs (e.g. National Geographic, Science Dojo, Curiosity Stream, Discovery Kids) and plan climate-themed plays/presentations or exhibits of climate/sustainability-related art on campus.

3) Encourage sustainability focal areas for school trips and special projects. Allocate budget towards field trips (in-person or virtual) to renewable energy plants, water treatment plants, local natural resources, labs and research institutions, and green buildings. In addition, offer tours or host guest speakers and create mobile labs for hands-on learning.

4) Encourage students to pursue science fair projects based on climate and environmental topics (special awards based on each field)[38] as well as interdisciplinary projects (project-based learning) on local climate issues (e.g., Earth Week letter-writing campaign incorporating persuasive writing, civics, and science).

5) Implement the Climate Leadership Information Program in more schools, train students to become certified climate speakers, and administer a sustainability and awareness program.

6) Implement the Climate Leadership Information Program in more schools and train students to become certified climate speakers as well as administer a sustainability and awareness program.

7) Host Climate 101 presentations for non-instructional staff, PTA, and community members, and host a climate career day or week and invite vocational/trade schools, clean energy businesses, scientists, community leaders, and other relevant organizations.

- Implementation Costs: funding for actual resources to provide schools with materials and transportation for competitions
- Implementation Savings/Benefits: increased environmental awareness, sustainability practices, STEM engagement; knowledge of sustainability and resilience career pathways
- Resources for Funding: FIU/DIG/CLEO could assist with alignment, coaching, PD, but these organizations need resources to do this work
- Schedule to Complete: PD in summer of 2022 for implementation in Fall 2022/23

[38] https://www.siwi.org/prizes/stockholmjuniorwaterprize/

9.2 Partnerships: build and expand upon existing partnerships with universities, community based organizations, local governments, and the private sector.

M-DCPS has long standing partnerships with regional universities, county agencies, and community based organizations (e.g., University of Miami, Florida International University, Dream in Green, the CLEO Institute, Everglades Foundation, Fairchild Challenge, Science Museum, Biscayne Nature Center, and Wellness in the Schools). M-DCPS should strengthen existing relationships and work to promote and facilitate collaborations with these partners in order to leverage ongoing sustainability efforts in the region. M-DCPS should also work with Miami-Dade County to collaborate wherever possible to promote sustainability and share plans.

In order to facilitate and coordinate partnerships, staff time should be devoted toward these efforts and staff responsibility description should be adjusted to include focus on partnerships. These efforts should focus on identifying barriers to collaboration with partners and the identification/implementation of strategies to overcome those barriers. For example, task force interactions reveal that time and attention from school Principals are needed to build upon and expand efforts of sustainability education and outreach with partner organizations.

This recommendation seeks to build strategies to expand upon existing relationships and foster greater involvement across more schools.

Climate education is one of the most important aspects of working towards a sustainable future. Community partnerships and collaborations with institutions of higher education will expose M-DCPS students to the latest Climate science and teachers will be supported through professional development focused on environmental literacy. M-DCPS and the Resilient305 PIVOT implementation team will convene action leads and collaborators to discuss advancing implementation of this action item. CLEO's programs (e.g., Climate Across the Curriculum teacher training program, CLIP program for after-school peer-to-peer education, summer Climate Action Lab) will be helpful resources for M-DCPS educators and students to learn about the impacts of the climate crisis and take effective action to mitigate and adapt to them.

Schools and communities are intricately connected and improvements to one can benefit the other. M-DCPS should encourage community participation in existing events that celebrate sustainability (e.g., Earth Day) and create additional events to bring more awareness to ongoing sustainability efforts. The curriculum should be expanded where possible to include participation of the community (staff, families, etc.). Care should be taken to ensure that all communities are represented and have equal access to events throughout the District. Specifically, sustainability events should be created in areas that are under-enrolled to bring sustainability to those communities. Additionally, M-DCPS can work with organizations like HandsOn Miami to coordinate events to improve school facilities and surrounding neighborhoods.
Below are some specific recommendations to expand existing partnerships:

1) Establish MOUs to facilitate research and engagement partnerships with university partners

2) The Office of Resilience and Sustainability should establish a regular (bi-weekly) review of potential grant opportunities that relate to resiliency and sustainability priorities and identify the team that should be included in the grant application process. We recommend incentivizing administrative staff at schools to partner with community based organizations like Dream in Green, Fairchild Challenge, and CLEO. Encourage sustainability education focused professional development opportunities for Principals (master plan points) and strategize around how to present a clean energy plan to principals. We recommend expanding FDOE endorsements for teachers (i.e., gifted, special education, EFL) to include a County endorsement for sustainability education. M-DCPS should also have the county make a big push for administrators and teachers who fulfill the sustainability endorsement.

3) Offer teacher Professional Development with the CLEO institute, Dream in Green, and Fairchild Botanic Gardens.

4) Include a budget item for organizations (e.g., Dream In Green, CLEO) which are supported by grants, donations, and sponsorships, who provide programs like "Green Schools Challenge" program free of charge. These groups also provide mini-grants for schools through the generosity of foundations like the Batchelor Foundation. They have not been able to expand because of lack of capacity and funding. If a budget item is not feasible, we suggest creating a District contract like those provided for “after school” programs. M-DCPS should also provide an opportunity for organizations to meet with principals/administrators, incentivize principals, teachers, and families to participate, and measure and track participation.

5) Increase M-DCPS student enrollment in summer programs (e.g., The CLEO Institute’s Climate Action Lab, Summer Youth Internship Program) to increase climate literacy, communication, and advocacy among high school students.

   - Implementation Costs: Staff time devoted to programmatic goals, budget item to support partner organizations
   - Implementation Savings/Benefits: improved sustainability education, greater understanding of behavioral linkages to impacts
   - Resources for Funding: N/A
   - Schedule to Complete: start immediately

9.3 Electric Mobile STEAM Lab retrofit initiative.

As a result of the 2021-2022 Means to Accelerate Performance (MAP 2021-2022 MAPs Presentation.pptx , slide 15), it is recommended that four (4) e-buses be secured for the Electric Mobile STEAM Lab retrofit initiative. The below should be added to the Clean Energy Task Force report to the board.

The M-DCPS Electric Mobile STEAM lab project aims to replace and expand the current STEM mobile labs fleet of three buses with an electric mobile lab fleet to support the district's sustainability goals and the integration of STEAM. The initiative calls for a replacement and expansion of the fleet to four Electric STEAM mobile units to service schools in the North, South, East, and West areas of the county. The initiative will require substantial funding support for the purchase of the electric bus, retrofitting of the vehicle, maintenance, driver, STEAM CSS, hardware and supplies.

Below please find the projected per unit cost for one Electric Mobile STEAM Lab retrofit.

- Implementation Costs: $2,500,000 for Year 1 will serve the four Electric Mobile STEAM Lab retrofits mentioned in the MAP. An additional ongoing yearly cost of $170,000 will be needed in year 2 and beyond to cover salaries/maintenance.
  - Cost Year 1 per mobile lab
    - Salary: STEM Mobile Lab Educator (12-mo including fringes) $92,884
    - Salary: STEM Mobile Lab bus driver: $32,000
  - Electric bus cost: $325,000
  - Electric bus maintenance: $10,000
  - STEM Mobile Lab Hardware: $30,000
  - STEM Mobile Lab bus retrofit: $125,000
  - Supplies: STEM Mobile Lab Consumables $6,000
- Implementation Savings/Benefits: to be monitored
- Resources for Funding: to be determined
- Schedule to Complete: start immediately

9.4 Connect curriculum and student initiatives with other policy recommendations.

Review curriculum in schools and identify sustainability connections and design lessons/suggestions for how to include sustainability across subjects with initiatives in this plan. Ensure that other policy recommendations within the report include educational components for students where possible (e.g., access to energy dashboards for greater student involvement, interaction with gardens as active learning spaces, development of marketing materials to educate about resources and resource use throughout schools). Evaluate the implementation of

the policy recommendations and the impact on teachers, students, and families. Thoughtfully plan roll out and presentation of plan to schools with prioritized action plan.

- Implementation Costs: to be determined
- Implementation Savings: to be monitored
- Resources for Funding: to be determined
- Estimated Carbon Reduction: to be monitored
- Schedule to Complete: start immediately

9.5 Design and install signage informing and educating school communities about resource use and behaviors.

Add icons around school that explain sustainability concepts: i.e., UN SDG goals.

- Implementation Costs: $50 printing cost for foamboard production of the UN SDG or Project Drawdown Poster
- Implementation Savings: to be monitored
- Resources for Funding: to be determined
- Estimated Carbon Reduction: N/A
- Schedule to Complete: start immediately

FINAL REMARKS

Miami-Dade County is ground zero for climate change, with cascading impacts—in the form of hurricanes, sea level rise, flooding, extreme heat, and harmful algal blooms—threatening its future. M-DCPS has taken commendable steps towards sustainability-minded design standards, criteria, and green initiatives. We are proud of the efforts made to date and believe that adopting these recommendations will renew and expand our sustainability efforts towards the ultimate goal of achieving 100% clean energy. Achieving the stated recommendations will require cooperation from multiple departments throughout M-DCPS as well as collaboration with community-based organizations, universities, local governments, and the private sector. By adopting these recommendations, M-DCPS can be on the forefront of climate action and lead our community towards a more secure future for our children, the leaders of tomorrow.

ACKNOWLEDGMENTS

The Clean Energy Report could not have been completed without the dedication and passion of our community. Thank you to all of our partners, organizations, and dedicated experts who have contributed their time and knowledge in support of this report. We look forward to working together and shaping the implementation of these recommendations.

Taskforce Voting Members

Jane Gilbert - Chair - Former City of Miami Resiliency Officer
Michele Drucker, Esq. - Vice Chair - Assistant Chief Counsel, Dept. of Homeland Security
Rachel Streitfeld, Esq. Land Use, Environmental Atty
William Dozier, Dozier and Dozier Construction
Dr. Jessica Bolson, FIU Asst. Professor Environmental Policy
Greg Hamra, LEED Leadership, Environmental Policy
David Williams, City of Miami Gardens, Council member
Dr. Lee Swanger, Mechanical Engineer
Carlos Rosell, BDI Construction
Jim Murley, Miami-Dade County Chief Resilience Officer
Matt Jeffries, AGT (Commercial Solar)
Philip Donovan, Architecture, three net-zero energy schools
Roger Ball, Facilities
Juliana Velez, Community Outreach Manager
William Barimo, Executive Director, Facilities
Jeffrey Ware, Facilities Maintenance and Operations
Britnee Robinson, School Operations
James Hicks, School Operations, Transportation
Audra Wright, Food and Nutrition
Martha Diaz, Financial Services
Mario DeBarros, Procurement
Cristian Carranza, Office of Academics and Transformation
Robert Barrera, AFSCME, Office of Labor Relations
Ruben Gomez, DCSAA, Office of Labor Relations
George Ellis, DCSMEC, Office of Labor Relations
Erick Hueck, UTD, Office of Labor Relations
Alejandro Palacio, FOP, Office of Labor Relations
Tabitha Fazzino, Office of Intergovernmental Affairs and Compliance
Thorn Grafton, Zyscovich Architecture
Jerry Bell, Assistant Director, Planning Miami-Dade County, Dept. of Regulatory and Economic Resources

Non-voting Members

Nathaly Simon, ECO Sustainability Office
Erick Laventure, Admin. Director, Design & Sustainability
Jennifer Wright, Editorial Consultant
Carlton Kirby, Design Manager, Design & Sustainability

APPENDIX

Appendix I. List of technical resources.

- https://www.sierraclub.org/climate-parents/resources-for-schools
- https://www.epa.gov/sites/default/files/2017-06/documents/k-12_guide.pdf
- https://www.energysmartschools.gov
- https://www.energystar.gov/sites/default/files/tools/K_12_August_2018_EN_508.pdf
- https://www.energystar.gov/sites/default/files/tools/K12EnergyEfficiencyStudentToolkit.pdf
- https://www.nrel.gov/docs/fy02osti/31607.pdf
- EPA Emissions Calculator: https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator
- NextEra (FPL) Emissions Factors: https://www.nexteraenergy.com/sustainability/overview/about-this-report/by-the-numbers.html
- Additional information about Climate Action Strategy (CAS): https://www.miamidade.gov/green/library/climate-action-strategy-final-draft.pdf
- Differences between retro-commissioning and auditing: https://www.facilitiesnet.com/energyefficiency/article/Retrocommissioning-vs-Energy-Audit-Facilities-Management-Energy-Efficiency-Feature--12569
  - Case study: http://cbei.psu.edu/wp-content/uploads/2015/04/BRT-Case-Study_Las-Colinas.pdf

Appendix II. List of potential candidate schools for GEPC.

1. Andover MS	18. Miami Arts Studio 6-12 at Zelda Glazer
2. Braddock, G. Holmes SHS (**)	19. Miami Carol City SHS
3. Bryan, W. J. ES	20. Miami Coral Park SHS (*)
4. Citrus Grove ES	21. Miami Edison SHS
5. Citrus Grove MS	22. Miami Springs SHS
6. Coral Gables SHS	23. Morgan, Robert Ed Center & Tech College (**)
7. Ferguson, John A. SHS	24. Morgan, Robert SHS (**)
8. Goleman, Barbara SHS (**)	25. Norland MS
9. Hialeah Gardens ES	26. North Miami Beach SHS
10. Hialeah Gardens MS	27. Parkway Ed Complex
11. Hialeah MS & Earhart, Amelia ES	28. Reagan, Ronald W./Doral SHS
12. Homestead MS	29. Richmond Heights MS
13. Homestead SHS	30. Riverside ES
14. Hopkins, Lindsey Tech College	31. Roberts, Jane S. K-8 Center
15. Krop, Dr. Michael M. SHS	32. Turner, William H. Tech Arts SHS & Adult Ed
16. Lentin, Linda K-8 Center	33. Washington, Booker T. SHS
17. Merritt, Ada K-8 Center	34. Varela, Felix SHS

(*) Representative School
(**) Priority School

Appendix III. Electric buses cost savings model for Florida.

Cost savings model for Florida, using the comparison of the same brand Type-C Electric School Bus vs. Diesel	
Price of Electricity ($/kWh)	0.1006
Price of Diesel ($/Gallon)	$2.01
Battery Size (kWh)	226
Battery Range (Miles)	140
Miles/kWh	0.62
Tank size (Gallons)	80
Tank Range (Miles)	464
Miles/Gallon	5.8
$/Mile Diesel Fuel	$0.35
$/Mile Electric Charge	$0.16
Total Fuel Costs Diesel	$4,643,793.10
Total Fuel Costs Electric	$2,176,121.71
Fuel Cost Savings Diesel to Electric	$2,467,671.39
Fuel Cost Savings Diesel to Electric	**53.14%**
Coast savings Maintenance	
Diesel Fleet Maintenance spending	$5,883,385.00
Electric maintenance savings/Bus/year	$631.06
Electric Fleet Maintenance Spending	$5,253,585.00
Savings	**$629,800.00**
Maintenance cost savings Diesel to Electric	**10.70%**

Appendix IV. M-DCPS Existing Design Guidelines (as of October 2021)

Division 0 - Sustainability 1.2(H)(2): For new construction and projects containing major re-roofing work, A/E design shall include provisions for solar panels to be installed on the roof decks of new buildings, PE shelters, covered dining shelters, and covered walkways/drop-offs.

Division 0 - Site 1.3(D)(1)(b): (Site and building design shall include) A separate entrance, main drop-off zone, and driveway, 20-22 feet wide, for private vehicles and mini-buses, paved, fully curbed, and with covered accessibility to the facility. Provide a minimum of 50 linear feet of covered walkway along this drop-off area.

Division 0 - Site 1.3(D)(1)(c): A separate M-DCPS school bus entrance, loading zone, and driveway, 24 feet wide, and the length of the drop-off sized as determined by M-DCPS Transportation Main Office and the Miami-Dade County Public Works Department for the expected number of buses. Provide a minimum of 150 linear feet of covered walkway along bus drop-off area. It shall be paved, fully curbed, with covered accessibility from the facility. Locate next to the main student entry or to a secondary student entry.

Division 0 - Site 1.3(D)(3): Faculty, administration, student and visitor parking areas shall comply with the FBC and the following:

a. For faculty and staff at Primary Learning Centers and Early Childhood Centers increase the FBC requirements to provide 1.5 spaces for each member. For faculty and staff at all other school facilities increase FBC requirements to provide 1.25 spaces for each member.
b. For students in grade 11 and 12, increase FBC requirements to provide 1 space for every 5 students.
c. Parking areas shall be fully curbed except behind wheel stops. Use cast-in-place concrete or reinforced extruded concrete (not asphalt) curbing.
d. Locate parking areas to provide safe and direct access to an appropriate designated entry.
e. Parking areas shall be separate and not be part of the road system or be used as student drop-off areas. Provide efficient use of available land for parking areas with double loaded parking schemes, when possible, to reduce amount of paved areas and increase percentage of pervious surfaces.
f. Protect planted areas next to driveways, drop-off areas and parking lots from vehicular traffic with concrete curbing, bollards, wheel stops or other effective means accepted by M-DCPS and complying with applicable drainage requirements.
g. Provide separate staff parking and student parking areas, each with fencing.
h. Parking garages will be considered on a per-project basis when feasible.

Division 0 - Site 1.3(D)(4): Provide concrete sidewalks from bus and car drop-off zones and from staff, visitor, student and accessible parking areas to the facility entrances.

Division 2 – General 1.1(C): The following energy conservation and environmental concerns shall be addressed:

1. Use of xeriscaping
2. Water efficient irrigation systems
3. Limited use of hard surface areas
4. Use of landscaping for shading facility
5. Additional suggestions to help M-DCPS continue to be a leader in energy conservation and environmental concerns.

Division 2 – Civil 1.2(G)(1): Life cycle cost analysis shall determine use of:

a. Asphalt concrete paving
b. Portland cement concrete paving