



NELP

Navy Environmental Leadership Program

bulletin



Alternative Fuel Vehicle Program

Our mission

The Navy Environmental Leadership Program (NELP) was established to find new and innovative ways to manage Navy environmental programs. It includes a West Coast base at Naval Air Station (NAS) North Island, California and an East Coast base at Naval Station (NS) Mayport, Florida. Recently, the West Coast NELP responsibility has been transferred from NAS North Island to the regional level, Navy Region Southwest (NRSW).

The NELP mission includes testing new technologies and management strategies, then sharing successes and lessons learned throughout the Navy and Marine Corps. NELP's ultimate goal is to preserve the environment through providing focused leadership, identifying innovative technical initiatives in all aspects of shore station environmental management, expediting compliance and cleanup, and ensuring stewardship of natural and cultural resources.

In keeping with NELP's mission to accelerate cleanups and improve environmental management techniques, NELP has undertaken a series of projects focused on NRSW's alternative fueled vehicle (AFV) fleet. In response to Presidential Executive Orders (EO) 12844 and 13031 and to comply with the goals of the Clean Air and Energy Policy Acts, the Navy Public Works Center (PWC) San Diego began integrating AFVs into NRSW's fleet in 1993. Since 1993, the AFV fleet within NRSW has grown to include more than 400 compressed natural gas (CNG) powered vehicles, 17 electric vehicles, 4 hybrid-electric vehicles, and more than 100 electric utility carts.

This bulletin presents the latest AFV initiatives being conducted within NRSW. Specifically it focuses on the NRSW electric and CNG vehicle programs, infrastructure development, and procurement program. These programs are being evaluated under NELP in partnership with the PWC Transportation Department, and Naval Facilities Engineering Service Center (NFESC).

Electric Vehicle Program

Testing Electric Vehicles at San Diego Naval Installations to Meet AFV Goals

To reduce fuel consumption and air emissions—two major concerns at Navy bases—NRSW NELP has undertaken a series of projects focused on electric powered vehicles. NAS North Island is one of seven installations the Navy has designated to test the use of electric powered zero emission vehicles as alternatives to the current gasoline- and diesel-powered fleet. Beginning in 1997, 10 Chevrolet S-10 electric pickups were obtained as part of a Navy-wide evaluation of electric vehicles. These vehicles added to the existing fleet of 3 electric vans, 5 electric carts, and more than 100 electric utility vehicles. The electric

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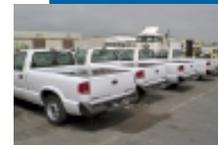
Electric Vehicle Infrastructure Development

New Vehicles Need Accessible Charging Stations

To accommodate the acquisition of electric vehicles within NRSW, the Navy has developed an infrastructure to support operation of electric vehicles. The infrastructure consists of electric vehicle charging stations, maintenance facilities, and a vehicle inspection program. Within NRSW, infrastructure development has primarily consisted of the installation of electric vehicle charging stations; maintenance requirements have been limited because the electric vehicles are still under warranty. To date, 17 charging stations have been installed at five bases within NRSW San Diego area to accommodate interbase use of the electric vehicles. Because the power requirements for each ve-

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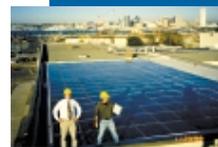
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Electric Vehicle Program

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vehicle fleet continued to expand during the first quarter of fiscal year (FY) 2000 with the acquisition of six Chrysler Electric Powered Interurban Commuter (EPIC) minivans and one Ford Ranger electric pickup truck. The location of each of the electric vehicles is depicted on the NRSW San Diego Metro Area map on Page 3.

The electric vehicles are being evaluated within NRSW under NELP in partnership with PWC Transportation and NFESC. NFESC is coordinating the electric vehicle demonstration at all seven Navy facilities, and has developed general guidance for data collection and reporting for the electric vehicle evaluations. PWC procures and leases vehicles within the region.

To evaluate the performance of the electric vehicles, energy usage and mileage data are collected on a monthly basis. In addition, operating and maintenance characteristics as well as feedback from the vehicle users are documented. This information is presented in an annual report summarizing quantitative data on vehicle reliability and operating costs, and qualitative data on vehicle performance. The first annual AFV report, published in March 1999, focused on the performance characteristics of the Chevrolet S-10 electric pickup trucks. Subsequent annual reports will be expanded to incorporate the new electric vehicles and other aspects of NRSW's AFV program.

Chevrolet S-10 Electric Pickup Truck—The Chevrolet S-10 electric pickup, developed by General Motors (GM), is a two-seat electric vehicle used by the Navy for local transport of equipment and personnel. This front wheel drive vehicle weighs 4,300 pounds and has a maximum payload of 850 pounds. The vehicle is powered by a 114-horsepower alternating current (AC) electric engine, which runs on a 1,400-pound rechargeable battery pack, consisting of 26 separate, maintenance-free lead-acid batteries. The Chevrolet S-10 also features regenerative

braking. When coasting or braking, the regeneration system converts kinetic energy into electricity, which returns to the battery pack, thereby extending the driving range of the vehicle. GM claims that the electric pickup has a range of 40 to 60 miles on a full charge. However, based on actual experience driving the Chevrolet S-10 pickups, the vehicles exhibited a range varying from 25 to 40 miles.

Ten Chevrolet S-10 electric pickups were purchased by PWC from Chevrolet through the General Services Administration (GSA) for approximately \$34,600 each. The purchase agreement included a 3-year or 36,000

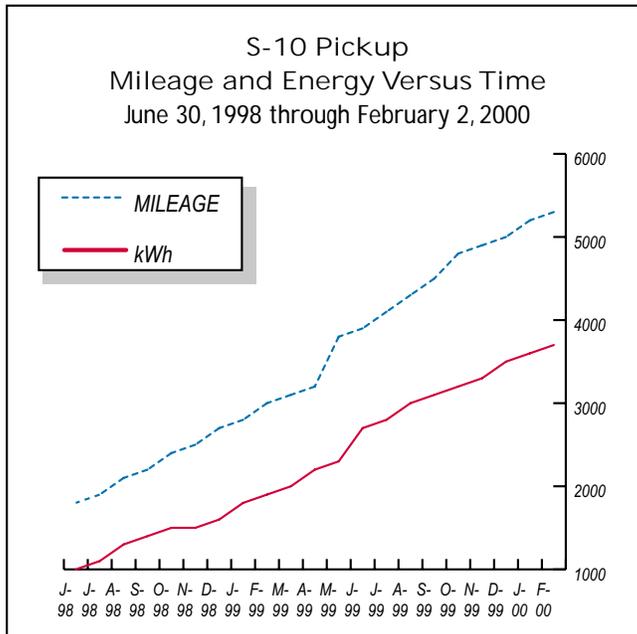


Figure 1

mile bumper-to-bumper warranty. The Chevrolet S-10 electric pickup trucks were used to replace gasoline pickups at several tenant activities on NAS North Island. One exterior inductive charging station was installed at each tenant activity that was assigned a vehicle.



S-10 Electric Vehicle Fleet

CNRSW Electric Vehicle Program Partners



Electric Vehicle, Charging Station, and CNG Refueling Station Location Map – NRSW San Diego Metro Area



■ Chrysler EPIC minivan

- 1 Navy Submarine Base San Diego, Building 140
- 2 Navy Antisubmarine Warfare Training Center, Building 50
- 3 Broadway Complex, Building 115
- 4 NAS North Island, Building 678 (2 vehicles)
- 5 Naval Station San Diego, Building 3436

■ Ford Ranger electric pickup truck

- 4 NAS North Island, Building 678
- 15 Naval Station San Diego, Building 272 (Loaner program vehicle)

■ CNG Refueling Station

- 17 Shell Station at the Corner of Laurel and Pacific Coast Hwy
- 18 NAS North Island, NEX Gas Station
- 19 NAVSTA Building 3509

■ Chevrolet S-10 electric pickup truck

- 6 NAS North Island, Building 794
- 7 NAS North Island, Building 691
- 8 NAS North Island, Building 334
- 9 NAS North Island, Building 3 (2 vehicles)
- 10 NAS North Island, Building 1457
- 11 NAS North Island, Building 802
- 12 NAS North Island, Building 1454
- 13 NAS North Island, Building 700
- 14 Broadway Pier, Building 1

■ Public Electric Vehicle Charging Station

- 16 County of San Diego Administration Building

Electric Vehicle Program

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Based on the monthly mileage and energy usage data collected from the electric vehicles, the 10 electric pickups logged more than 54,000 miles and used an estimated 36,000 kilowatt-hours (kWh) of electricity from the period June 1997 through February 2000. During this period, the average energy efficiency for the electric vehicle was about 1.46 miles per kilowatt-hour (mi/kWh), which is down from a high of 1.65 mi/kWh in June 1997. The cause of the decrease in energy efficiency is unknown; however, it is likely related to seasonal changes in ambient air temperature, changes in battery pack condition, and amount of vehicle use. Figure 1 presents a graphical depiction of the cumulative monthly mileage and energy usage for the ten Chevrolet S-10 pickups from June 1998 to February 2000.

During the period from September 1997 through February 2000, the electric pickups required extensive maintenance. The 10 vehicles were taken in for repair more than 50 times for problems related primarily to batteries, coolant leaks, axle replacement, and power steering. Maintenance and repairs took more than 750 days to complete. The most common maintenance problems involved the batteries. The battery packs have since been replaced with new lead-acid batteries, and vehicle maintenance requirements have been significantly reduced. Since the vehicle are still under warranty, no vehicle maintenance costs were incurred by the Navy other than vehicle down time.

Results from a survey of users of the Chevrolet S-10 pickups suggest that users expectation for the electric pickup were met, although some users identified concerns with vehicle braking, acceleration, and noise level. Job applicability scores for the electric pickups were slightly less than for those of the gasoline-powered vehicles. The main factors for the electric pickups lower job applicability scores were the vehicle's reliability and, to a lesser extent, its range and payload capacity. The majority of users identified these factors as being less than satisfactory for their work related needs. The electric pickup interior comfort and gauge scores suggest that vehicle

users are generally satisfied with this aspect of the vehicle, although some users identified concerns with the air conditioner, heater, and defroster. Charging scores for the electric vehicles were among the highest, suggesting that charging the vehicle did not adversely effect vehicle operation.

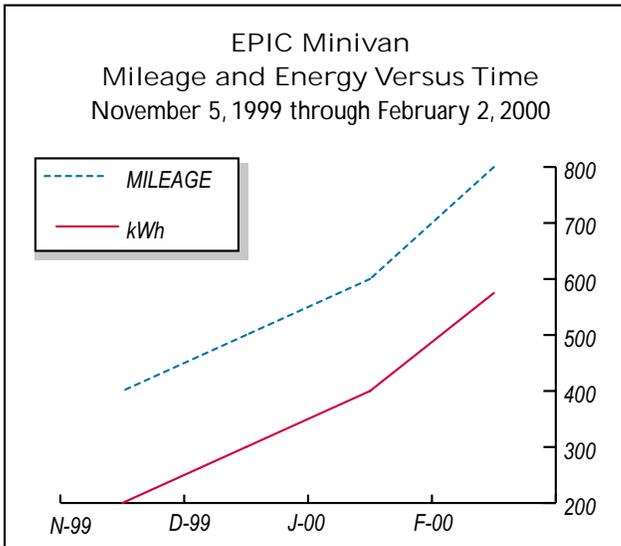
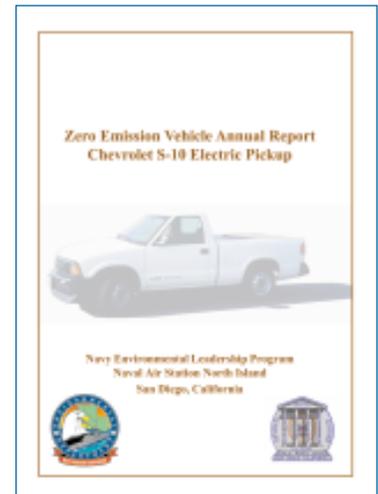


Figure 2

payload. Power to the EPIC is supplied by a 100-peak-horsepower AC induction motor and a single speed, front-wheel-drive transaxle for smooth and quiet operation. The motor is powered by 28 individual 12-volt nickel-metal-hydrde batteries, which combine to provide 336 volts of power. Because of the nickel-metal-hydrde battery's lighter weight and increased energy density, the batteries provide the EPIC with a range of 80 to 90 miles, compared to 60 to 70 miles with previous generation lead-acid batteries. The vehicle's range is also extended by the EPIC's regenerative braking system. The EPIC comes with an off-board 14 kW conductive charger, which is included in the vehicle lease cost.



S-10 Recharging Station



ZEV Annual Report



Chrysler EPIC Minivan

Compressed Natural Gas Vehicle Program

Reducing greenhouse air emissions

Currently, NRSW maintains a fleet of approximately 400 vehicles within the San Diego Metro Area that use compressed natural gas (CNG) as an alternative fuel. The CNG vehicles are composed primarily of pickup trucks and passenger vans, and include vehicles that have been converted to CNG, bifuel vehicles that run on both CNG and gasoline, and CNG vehicles obtained directly from the manufacturer. Of the 400 existing CNG vehicles, approximately 100 are CNG conversion vehicles, 100 are CNG bifuel vehicles, and 200 are CNG manufactured vehicles.

Beginning in 1993, PWC began converting gasoline-powered pickup trucks and vans to run on CNG to meet the requirements outlined in the Energy Policy Act of 1992. Conversion of gasoline-powered vehicles to CNG fuel continued from 1993 through 1996. During this period, approximately 300 pickups and vans were converted to CNG. Because of maintenance problems with the converted CNG vehicles, PWC stopped converting vehicles in 1996 and began procuring and leasing bifuel and CNG vehicles directly from the manufacturer. As the CNG fleet has aged, many of the original converted CNG vehicles have been sold at auction and replaced. Reportedly, the converted CNG vehicles have been sold at prices comparable to gasoline-powered vehicles at auction.

A survey of Navy CNG vehicle users at NAS North Island suggests that the CNG vehicles met user expectations for performance, job applicability, and interior comfort and gauges. The most common complaint voiced by Navy personnel is that the CNG vehicles have limited range and require frequent refueling. Typically, the CNG vehicles within NRSW have a range varying from 80 miles for pickups to 200 miles for vans.

CNG Vehicle Acquisition—According to PWC maintenance personnel, the CNG vehicles require about the same maintenance as gasoline powered vehicles and are currently in the shop less than 2 percent of the time annually. Acquisition costs for CNG vehicles are also about the same as the costs for their gasoline counter part, which is about \$15,000 for a pickup truck. Based on the performance of the CNG vehicles to date, NRSW plans to continue expansion of their CNG vehicle fleet. For fiscal year 2000, PWC plans on procuring and leasing approximately 250 new CNG pickups and vans, including about 25 bifuel vehicles. PWC is also focusing on obtaining low-emission vehicles for all other vehicles procured or leased.

CNG Vehicle Infrastructure—To accommodate refueling of the CNG vehicles, the Navy has installed CNG fueling stations at NAVSTA, NAS North Island, and Marine Corps Air Station Miramar. The CNG fueling stations use quick-fill, self-service dispensers, and fuel is paid for at the pump using a government-issued fuel card. This network of fueling stations is augmented by six public CNG fueling stations and 14 other commercial CNG fueling stations operated by San Diego Gas & Electric (SDG&E) within San Diego County. In fact, the fueling facility at NAS North Island was funded and constructed by SDG&E; it is the first fueling station in the country that has been installed on a military base that allows access to and use by the general public.

CNG Vehicle Environmental Benefits —CNG powered vehicles are clean - they emit 85 percent less nitrogen oxide, 70 percent less reactive hydrocarbons, and 74 percent less carbon monoxide than similar gasoline powered vehicles. It is estimated that conversion to CNG results in a reduction of over 3 tons of hydrocarbon emissions over the life of the vehicle. The use of CNG vehicles significantly reduces emissions of ozone precursors and will help the San Diego County air basin reach attainment of Clean Air Act ambient air quality standards for ozone.



CNG Pickup Truck



CNG Powered Passenger Van at NAS North Island CNG Fueling Station



CNG Powered Passenger Van at Naval Station San Diego CNG Fueling Station

For more information about NRSW's compressed natural gas program, please contact the NRSW Pollution Prevention Manager, Ed Bonnes at (619) 524-6330 or Bonnes.Ed.K@asw.cnrsw.navy.mil

Electric Vehicle Program

Six Chrysler EPIC minivans were leased by PWC for 3 years from Chrysler for \$16,200 per vehicle (\$450 per month). The lease agreement includes a bumper-to-bumper warranty for the 3-year lease period. In November 1999, the six EPIC minivans were used to replace gasoline vans at San Diego area activities within NRSW. One exterior conductive charging station was installed at each activity that was assigned a vehicle.

Based on the November and February 2000 monthly mileage and energy usage data collected from the six EPIC minivans, the vehicles logged more than 4,700 miles and used an estimated 3,300 kWh of electricity. During this period, the average energy efficiency for the electric vehicle was approximately 1.66 mi/kWh. A graphic depiction of the cumulative monthly mileage and energy usage for the six Chrysler EPIC minivans from November 1999 to February 2000 is presented as Figure 2 (on page 4). To date, the EPIC minivans have experienced few maintenance problems, and vehicle users have been impressed with the vehicle's performance. Additional information on the EPIC minivans performance and cost will be presented in the Second Annual Alternative Fueled Vehicle Report, which is scheduled for publication in April 2000.

Ford Ranger Electric Pickup Truck—The Ford Ranger electric pickup truck is a two-seat electric vehicle used by the Navy for local transport of equipment and personnel. The rear wheel drive vehicle is powered by a 90-horsepower, high-efficiency 3-phase AC induction electric engine and has a payload of 700 pounds. Power to the engine is provided by 39 individual 8-volt nickel-metal-hydrate batteries, which provide a total of 312 volts. The Ranger also features regenerative braking. According to Ford, the Ranger has a range of 50 miles on a full charge and can reach speeds of 75 miles per hour.

One Ford Ranger electric pickup was leased by PWC for 3 years from Ford for \$14,650 per vehicle (\$407 per month). The lease agreement includes a bumper-to-bumper warranty for the 3-year lease period. In January 2000, the Ford Ranger was used to replace a gasoline-powered pickup at NAS North Island. One exterior conductive charging station was also installed. Information on the Ranger performance and cost will be presented in the Second Annual Alternative Fueled Vehicle Report.



Ford Ranger Electric Pickup Truck



Hybrid Electric Tow Tractor

Electric Vehicle Benefits

- *The electric vehicles are much quieter than gasoline-powered vehicles*
- *Since the vehicles produce no emissions, the total air emissions associated with base activities are reduced*

Hybrid-Electric Vehicle—In a joint Air Force/Navy technology demonstration program, a variety of hybrid-electric vehicles (HEVs) are being evaluated for possible future use. An HEV is an electric vehicle that also has a small internal-combustion engine and an electric generator on board to charge the batteries, thereby extending the vehicle's range. The batteries may be charged continuously or only when they become depleted. HEVs can function as a pure electric vehicle for relatively short commutes while retaining the capability of a conventional automobile to make long trips. HEVs offer the advantages of conventional gasoline vehicles in terms of refueling requirements; however, they provide roughly two to three times the fuel economy of a conventional internal combustion engine vehicle and are almost as clean as electric vehicles.

One of the HEVs being demonstrated at NAS North Island is a Hybrid Electric Tow Tractor (HETT). The HETT is an Air Force MB-4 Tow Tractor with a modified hybrid electric drive train technology that is used to tow heavy loads such as large military aircraft. The design specifications for the vehicle are a weight of approximately 26,500 pounds, a calculated drawbar pull greater than 14,000 pounds, and a turning radius of less than 300 inches, while in four-wheel steering



Hybrid Electric Bus

Electric Vehicle Program

mode. The HETT is using a MB-4 chassis that has an enclosed cab for the operator and one passenger. The design is compatible for towing C-130 aircraft and is operable at temperatures from -25° Fahrenheit (F) to 110° F for two hours under full load conditions before recharging and/or refueling is necessary. Since a tow tractor is only used intermittently, two hours of electric power is usually sufficient. In an instance of continuous long-term use or when no power outlet is available, a diesel-motored generator automatically supplements the energy stored in the battery when the battery is low. Due to its the high operating voltage, the generator can be used as a battery charger when no power outlet is available. The battery also can be recharged at charging stations.

The Navy is also evaluating a hybrid-electric shuttle bus and two hybrid-electric vans. These vehicles are being used for local transport of Navy personal and equipment. The HEV bus and vans use commercially available components, including a Ford Motor Company E-350 chassis, a 75kw continuous output UQM™ alternator (motor/generator), and a 2.5 liter diesel internal combustion engine. The UQM™ alternator is designed to reduce electromagnetic interference and run the engines at controlled speeds to achieve maximum engine efficiency and reduced emissions. The HEV bus and vans do not require any external equipment to operate and maintain, and can be operated anywhere without the need for costly recharging or refueling infrastructure. By utilizing these hybrid electric vehicles, fuel consumption and associated emissions are reduced by up to 50 percent over conventional gasoline-powered vehicles.

Hybrid-Electric Vehicle Benefits

- *Reduces air emissions and diesel fuel consumption*
- *Saves money because electricity costs less than petroleum fuel*
- *Saves time usually lost on recharging electric vehicles because hybrid capabilities allow batteries to be charged in the field without a break in service*

Utility Carts—In addition to the electric vans and pickup trucks, electric utility carts have been in use for some time within NRSW. The electric utility cart, a two-seat vehicle, is designed for short-distance residential travel; it produces virtually no air emissions. Recently, NRSW acquired several utility carts known as Neighborhood Electric Vehicles (NEVs), developed by Bombardier. The NEV runs on an electric motor fed by lead-acid batteries that can be recharged using a residential 110-volt outlet. Approximately 8 hours are required to fully charge a battery from zero charge. The vehicle weighs 1,300 pounds, has a 25-to 40-mile range, and reaches a maximum speed of 30 miles per hour (mph). The carts are locally approved for city streets for speeds up to 45 mph. Each NEV costs about \$7,500. Electric utility carts, such as the E-Z Go have been used by Naval Aviation Depot (NADEP) for several years with great success. More than 110 electric carts are currently in use at the NADEP facility in San Diego.

Utility Cart Benefits

- *Uses standard electrical outlet for charging*
- *Reduces the consumption of petroleum*
- *Produces zero emissions*
- *Maintenance-free batteries and strong performance record*



Hybrid Electric Cargo Van



Bombardier NEV



Electric Cart

For more information about NRSW's electric vehicle demonstration program, please contact the NRSW Pollution Prevention Manager, Ed Bonnes at (619) 524-6330 or Bonnes.Ed.K@asw.cnrsw.navy.mil

Federal Government AFV Leadership

NRSW AFV Program Leading the Way

In compliance with EO 13031, Federal Alternative Fueled Vehicle Leadership, 75 percent of the vehicles acquired by NRSW in 1999 were AFVs. Currently, about 250 vehicles are purchased annually within NRSW, of which approximately 190 are AFVs. To meet its mandated goal, NRSW has been aggressively purchasing CNG-powered vehicles along with electric and hybrid-electric vehicles. To meet its AFV acquisition goals in the future, NRSW is evaluating use of biodiesel, which is a diesel fuel substitute produced from renewable sources such as vegetable oils, animal fats, and recycled cooking oils. Biodiesel has a similar operating performance to conventional diesel fuel and fulfills the environmental and energy security requirements outlined in EO 13031, the Energy Policy Act, and Clean Air Act.

Several bases within NRSW are being used to evaluate electric and hybrid-electric vehicles for the Navy. Information from these demonstrations will be disseminated Navy-wide to facilitate the use and acceptance of AFVs. Information on the NRSW AFV program is also being shared with the local community. As one of the largest fleet owners in the San Diego Area, NRSW is an active member of the San Diego Regional Clean Fuels Coalition and will be presenting information on NRSW's AFV program at the Clean Cities Coalition Conference, which will be held in San Diego in May 2000. NRSW continues to look for better, faster, and cheaper ways for the Navy to transport equipment, personnel, and supplies, and to keep their AFV program on the cutting edge.



Roof Integrated Photovoltaic System at NAS North Island.

A roof integrated photovoltaic system was installed in October 1999 at NAS North Island and is being used to supply a portion of the energy used to recharge three electric vehicles and two electric utility carts. NRSW is using this project to showcase an environmentally responsible means to generate and use energy with no emissions. In addition, the project will be used to educate Navy personnel on the application and benefit of electric vehicles and photovoltaics. This project is the first significant opportunity to integrate the experience and expertise of Navy environmental and energy managers to implement an energy project using the concepts of pollution prevention. By bringing this project to successful fruition, the synergy generated from this new partnership is being expanded to additional projects and exported to other Navy facilities. Additionally, this project complies with EO 13123, Greening the Government Through Efficient Energy Management, and qualifies under the President's Million Solar Roofs Initiative.

AFV REGULATIONS

Providing the Framework for Development of the NRSW's AFV program

Clean Air Act Amendments of 1990—Regulates both transportation fuel content and allowable air emissions from transportation vehicles.

The Energy Policy Act of 1992—Establishes goals for replacing 30 percent of the projected U.S. consumption of motor fuels with alternative and replacement fuels by 2010 and outlines the requirements for acquisition of alternative fuel vehicles by Federal agencies.

EO 12844, Federal Use of Alternative Fueled Vehicles, April 1993—Provides that the Federal Government will acquire, subject to the availability of funds and considering life cycle costs, AFVs in numbers that exceed by 50 percent the requirements set forth in the Energy Policy Act.

EO 13031, Federal Alternative Fueled Vehicle Leadership, December 1996 (supersedes EO 12844)—Establishes the Federal Government's responsibility to exercise leadership in the use of AFVs, including a mandate for AFV acquisition by Federal agencies of 75 percent in FY 1999 and thereafter.

In keeping with NRSW's leadership approach to AFVs, PWC Utilities and NELP have initiated a renewable energy project that combines photovoltaics and electric vehicles.

Partnerships

Leveraging Federal Resources and Expertise to Expand the NRSW AFV Fleet

The success and development of NRSW's AFV program is directly attributable to building successful partnerships with Navy activities within and outside the region as well as Federal agencies and private enterprise. Over the last 5 years NELP and PWC have partnered on numerous projects within the region to highlight the benefits and synergy between AFVs and the environment. PWC and NELP have taken a team approach to the NRSW AFV program, which leverages each partner's strengths. PWC has been able to provide expertise in vehicle acquisition, infrastructure development, and maintenance, while NELP provides experience evaluating technologies, preparing reports, and conducting technology transfer. Additionally, NELP has been able to obtain funding through the environmental department, pollution prevention branch, to acquire electric vehicles. By building a strong base of support from all involved stakeholders, the NELP and PWC partnership has been able to provide both the technical ability and the will-power to ensure that AFV projects are completed in a timely and successful manner.

In 1997, NRSW received 10 Chevrolet S-10 electric pickup trucks from NFESC as part of the centrally managed, Navy-wide evaluation of electric vehicles. In partnership with NFESC, PWC and NELP have been evaluating the performance and cost characteristics of these electric vehicles. NRSW is also partnering with DOE under the Incremental Funding and National Loaner Programs. Under the DOE's Incremental Funding Program, NRSW is working through GSA to obtain competitive vehicle lease and purchase prices. Additionally, through buy down of the incremental costs between gasoline- and electric-powered vehicles, NRSW has further reduced the cost to the Navy of acquiring electric vehicles. Through the Incremental Funding Program, the Navy has saved more than \$26,000. Additionally, through DOE's National Loaner Program, a Ford Ranger electric pickup truck has been provided free of charge on a trial basis for use at Naval installations with the San Diego area. Under this program, NRSW is also partnering with SDG&E on infrastructure development and electric vehicle education and training. By building on the technical expertise and resources of all involved stakeholders, NRSW has been able to expand their AFV fleet, while at the same time minimizing cost to the Navy.

DOE INCREMENTAL FUNDING PROGRAM

Partnership with DOE To Make Electric Vehicles More Affordable

The six Chrysler EPIC minivans and the Ford Ranger electric pickup were acquired by PWC through GSA under 3-year lease agreements with Chrysler and Ford. The lease agreements qualified for funding assistance through the U.S. Department of Energy (DOE) Incremental Funding Program. DOE's Incremental Funding Program was established to encourage and support the leasing of electric vehicles by Federal fleets by providing funding to "buy-down" the incremental costs of electric vehicles. Under this program, DOE reimbursed the Navy 50 percent of the incremental cost between the difference of GSA's cost to lease a vehicle powered by a gasoline engine and the additional cost to lease an electric version of the same vehicle. For example, the GSA lease rate for a gasoline-powered small pickup is approximately \$220 per month, while an electric Ford Ranger with nickel-metal-hydride batteries can be leased for \$450 per month. The difference, or incremental cost, is \$230 per month. DOE pays half of this amount, or \$115. Over the 3-year lease period, the Navy qualified for approximately \$26,500 in incremental funding assistance from DOE.

DOE NATIONAL LOANER PROGRAM

Navy Personnel Gain More Experience With Electric Vehicles



NRSW is currently participating in the National Loaner Program sponsored by the DOE. The purpose of the program is to provide exposure to and encourage the use of electric vehicles. Under this program electric vehicles are provided on a trial basis for periods lasting up to 2 months. The infrastructure (charging station) is also provided; however, installation of the vehicle charging station is the responsibility of the user. Currently, an additional Ford Ranger electric pickup truck and portable charger has been provided by SDG&E, the local National Loaner Program implementation agency, for use by the PWC Utility Department at NAVSTA San Diego. SDG&E is also providing education and training on the use of the electric vehicle. This program is being used by the Navy to provide additional tenant activities with direct, hands-on experience with the use and capabilities of electric vehicles.

For more information about NRSW's AFV partnerships, please contact the NELP Coordinator, Mike Magee at (619) 524-6357 or Magee.Mike.H@asw.cnrsw.navy.mil.

Electric Vehicle Infrastructure Development

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Epic Recharging Station

hicle type differs; three different types of charging stations have been installed.

For the Chevrolet S-10 electric pickup trucks, eight outdoor, floor-mounted and two indoor, wall-mounted Delco Electronics 6.6 kilowatt (kW) charging stations were installed by PWC to recharge the Chevrolet S-10 electric pickup battery packs. The battery charger converts the alternating current distributed by electric utilities to the direct current needed to recharge the battery. The Delco Electronics chargers use inductive coupling. This coupling uses a paddle that fits into a socket on the car. The outdoor, floor-mounted charging stations each cost approximately \$3,500, and the indoor, wall-mounted charging stations each cost approximately \$2,100. Trenching, labor, and supply costs were about \$4,500 for each station (floor- and wall-mounted).

For the Chrysler EPIC minivans, six pedestal-mounted conductive vehicle charging stations manufactured by Lockheed Martin Control Systems (LMCS) were installed by PWC. The charging station supply cable plugs into the charging socket of the EPIC minivan using a specially designed mating connector. The cost for the LMCS off-board charging station was included in the lease price of the vehicle. Trenching, labor, and supply costs for each charging station ranged from \$3,500 to \$5,000.

To accommodate recharging of the Ford Ranger electric pickup trucks, Power Control Stations (PCS) manufactured by Avcon were installed by PWC. Each PCS cost approximately \$300, and trenching, labor, and supply costs were about \$1,500 for each unit.

For more information about NRSW's AFV fleet, please contact the PWC Transportation Manager, Bob Madrigal at (619) 556-7587 or MadrigalR@pwcsw.navy.mil.

Federal Government AFV Leadership

NRSW AFV Program Leading the Way

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CLEAN CITIES COALITION CONFERENCE

Navy Leads the Way in AFVs

As a member in the San Diego Clean Fuels Coalition, NRSW will be a presenter at the DOE sponsored Clean Cities Coalition Conference, to be held in San Diego, California on May 7 through 10, 2000. The San Diego Regional Clean Fuels Coalition is a partnership of public agencies, private agencies, businesses, and interested citizens dedicated to reducing the San Diego Region's dependence on conventional petroleum-based fuels in order to improve the region's air quality. In support of the conference, information on NRSW's AFV program and other Navy-wide AFV programs will be presented to highlight the Navy's leadership role in promoting the commercialization and development of AFVs.

PHOTOVOLTAIC SYSTEM SUPPORTS ELECTRIC VEHICLES

Generating and Using Energy with No Air Emissions

Under NELP, a 21.6 kW roof-mounted photovoltaic system was installed on Building 678 at NAS North Island in October 1999. The PV system is connected to the building's electrical grid and is offsetting the energy used by three electric vehicle charging stations and two utility cart charging stations at Building 678. In addition to offsetting a portion of the peak energy demand of the building, using the PV system to charge electric vehicles showcases an environmentally responsible means to generate and use energy with no air emissions. Over a 25-year period, the PV system is estimated to reduce carbon dioxide (CO₂) emissions by 754 tons, sulfur dioxide (SO₂) emissions by 8.15 tons, and nitrogen oxides (NO_x) emissions by 3.57 tons. The photovoltaic system will be monitored and evaluated over a 1 year period to assess the effectiveness of the system.

For more information about NRSW's AFV leadership activities, please contact the PWC Energy Manager, Ken Decker at (619) 556-6855 or DeckerKW@pwcsw.navy.mil.

For questions or comments, visit the NELP website at <http://nelp.navy.mil> or contact NRSW NELP Coordinator Mike Magee by telephone at (619) 524-6357 or e-mail at Magee.Mike.H@asw.cnrsw.navy.mil.



<http://nelp.navy.mil>

