4. SPECIAL PROJECTS AND REPORTS

A. Marine Molten Carbonate Fuel Cell Demonstration Module (CG)

The U.S. Coast Guard (CG) Research and Development Center, U.S. Department of Transportation, recently released a research report (CG-D-12-99) titled *Marine Molten Carbonate Fuel Cell Demonstration Module: USCGC VINDICATOR Ship Interface Studies.* This report documents a comprehensive investigation of the impact upon USCGC VINDICATOR ship systems resulting from a future conversion to fuel cell power. VINDICATOR was selected as a candidate for development of the technical issues, and as a potential demonstration of a marine fuel cell power plant.

According to the report, a clear trend towards the design and installation of integrated electric propulsion systems in ships has emerged in the last few years. Most of the new cruise ships employ diesel generators to produce propulsion and hotel power for the ships. The U.S. Navy, as well as many other foreign navies, is considering the use of integrated electric plants in future naval ships. The implementation drivers are primarily lower life cycle cost, and low vibrations and noise levels. The fuel cell offers several advantages over diesels. These include higher thermal efficiency (51 vs. 35%); a flat efficiency curve; and lower emissions, vibrations, noise, and heat signature. Presently, however, fuel cell initial costs are significantly higher than for diesels, and some additional work is needed on desulfurization and diesel fuel reforming technologies. With some further development and cost advantages from mass production, molten carbonate fuel cells may become competitive with and even ultimately replace marine diesels.

The U.S. Navy is sponsoring the development of two types of marine fuel cell power modules for the marine industry: a molten carbonate (MC) fuel cell and a proton exchange membrane (PEM) fuel cell. In conjunction with the Navy, the Coast Guard tasked John J. McMullen, Associates, Inc. to develop the ship interfaces required for a MC fuel cell installation and to develop a dynamic simulation incorporating the MC fuel cell as the primary power provider. The USCGC VINDICATOR, a TAGOS 1 Class vessel, was selected as the test bed for this installation study. The ship has an electric integrated propulsion power system powered by four, 600 kW, Caterpillar diesel generators and two fixed propeller shafts, each powered by an 800 hp direct current motor.

This final technical report summarizes several studies which investigated the impact upon the USCGC VINDICATOR ship systems resulting from the replacement of the existing four Caterpillar diesel generators with MC fuel cells. A conceptual arrangement of the machinery space and interfaces with auxiliary systems was developed. The larger dimensions, i.e., length, height, and width of MC fuel cells compared to diesel generators, require modifications in the machinery room. In particular, removal of the void bulkheads on both sides of the machinery room is required in order to provide access to the four fuel cell modules. The machinery service systems, i.e., seawater, lubrication oils, fresh water, fuel, and compressed air, are all affected, although to a relatively minor degree. The ship's performance in terms of stability and seakeeping were evaluated and are expected to remain unchanged. Limited maneuvering

simulations, i.e., ship forward acceleration and reversing, were performed. These simulations showed that the application of power produced by fuel cells is expected to cause insignificant changes in the maneuvering performance of the ship.

Several conclusions are supported by this report. The proposed fuel cell modules are compatible with existing ship interfaces with relatively minor modifications. The fuel cell modules are larger than the diesel generators they replace and thus require removal of the non-structural side shell within the main diesel generator room. Existing air handling, exhaust, and fuel delivery systems within the engine room can be reused. Ship performance (stability and seakeeping) is unchanged. Range is increased due to higher efficiency of the fuel cells. In summary, conversion to fuel cell power appears technically feasible.

This report provides an in-depth examination, based upon an actual ship application, of the technical issues relevant for future selection of a fuel cell power alternative. In cooperation with the U.S. Navy, ongoing studies are also addressing the expected commercial availability and costs of several fuel cell power options. Together, they should provide the Coast Guard with the information to make rational evaluations of the potential of fuel cell technology on board its vessels.

For further information, contact Dr. Stephen Allen, U.S. Coast Guard Research and Development Center, 1082 Shennecossett Road, Groton, CT 06340-6096, (phone: (860) 441-2731).

B. Inland Waterway Vessels and Pollution (PIANC)

The International Navigation Association (PIANC) has published a technical report (ISBN 2-87223-110-2) titled *Inland Waterway Vessels and Pollution*. According to this analysis for the European Union, a well functioning transport system is a very important requirement for a modern industrialized society with expanded trade and integration between countries. Transport is also responsible for an increasing portion of energy consumption and thereby for many of the harmful effects on the environment. Pollution from transport is a significant component for all transport modes with direct pollution in the road, sea, and air sectors and mainly indirect pollution from the electricity production for railways.

The essential harmful impact on the environment from transport can be summarized as follows: (1) operational pollution (air pollution, water pollution, soil pollution, and noise); (2) the use of land and barrier effects; (3) risk inherent in the carriage of dangerous goods; and (4) congestion. This report concentrates on operational pollution and the ways to minimize the effects by selecting and developing the different transport chains for cargo transport. The main areas that have been considered are as follows: (1) air pollution from exhaust gases; (2) noise from the different transport modes and their vehicles; and (3) water pollution and reception facilities.

Overall statistics for the energy consumption and air pollution from exhaust emissions caused by different transport modes do not exist. In order to show the situation, six European examples with comparison between road, railway, and inland river/sea shipping were chosen. The

consumption of energy and the pollution from exhaust gases like CO_2 , NO_x, and SO_2, which cause global and regional damage, have been calculated. The calculations show that a better use of shipping related transport chains could considerably reduce both the energy used and the emissions of CO_2, NO_x, and SO_2 compared with road traffic. The same situation is also valid concerning energy NO_x and SO_2 compared with railway traffic in continental Europe. The emissions of CO_2 are of the same order for shipping and railway related transport chains. In order to guide transport choice towards the most environmental way of transport, it is, however, essential to apply the same rules concerning charges both for the different transport modes and for emissions from the transport and industry sectors. The exhaust pollution from electricity producing power plants is also an indirect pollution for electricity driven trains.

The noise disturbance is an effect that concerns all transport modes. Measurements show, however, that shipping has a much lower noise level and duration of noise than especially the road traffic, but also the railway traffic. The average noise levels from a motorway and from the railway traffic are approximately 10 decibels louder than for ship traffic. As the decibel values are rated in a logarithmic scale, an increasing volume of 10 dB would be described by the average listener as a doubling of loudness. The noise from a motorway is a continuous sound while a ship only produces a temporary disturbance when passing. The noise from rail traffic is of intermittent type with a frequency between that of road and waterway traffic.

There are problems with waste and waste disposal for all the transport modes. There are today no common international rules for road and railway traffic. For European shipping, there exist two different systems concerning reception facilities for ship related wastes. There is one system for purely inland navigation and another for international sea traffic, with a specific application for the Baltic Sea. The requirements and the financing are different for the two systems. It is essential to establish links between these two systems so that collection and disposal of ship related waste can function smoothly.

There is no doubt that a better use of shipping related transport chains based on inland river/sea shipping could solve many of the congestion problems in Europe. Shipping also has the best potential of all cargo transport modes to minimize the negative environmental impact from transport.

For further information, contact the PIANC General Secretariat, Graaf de Ferraris-gebouw, 11th floor, Box 3, 20 Boulevard du Roi Albert II, B-1000 Brussels, Belgium.

C. Environmental Management Framework for Ports (PIANC)

The International Navigation Association (PIANC) has published a technical report (ISBN 2-87223-111-0) titled *Environmental Management Framework for Ports and Related Industries.* Since 1992, many countries in the world have adopted the concept of sustainable development as the basis of national environmental policies. This report provides a generic framework that could be used as a guide to implementing environmental management in ports and related industries to the level appropriate for a particular country.

The report briefly examines the main international legislation and conventions that must be considered and highlights the general background issues for managing the environment. It gives an overview of the proposed Environmental Management Framework (EMF). The degree of detail required at each stage of the EMF depends on whether the framework is being applied at the international, national, or company level. The EMF is generic in form allowing the socioeconomic status of the country to be taken into account and therefore should be practical worldwide.

Component 1 of the EMF aims at developing a general policy statement and relies on identifying and understanding the relevant environmental concerns, legislation, and stakeholder views. Component 2 provides a general management structure for use in assessing all of the information that may impact on the environment and formulating management-acceptable, prioritized strategies and goals. The aim is to deliver environmental improvement. Component 3 is the mechanism by which the planned improvements are implemented. This involves the setting up of procedures, training, and control of operations. It also involves monitoring to determine whether the actions taken are working. Component 4 evaluates the effectiveness of the procedures and determines whether they have been carried out by means of audits and reviews that provide the basis for continual improvement.

The report also focuses on each component of the framework, giving guidance on the method of application and the issues that must be considered. Actual methods will depend on the specific objective and problem and on the financial resources, technology, and personnel available. Outcomes or deliverables from each component of the EMF feed into the next component. Each component can be considered in its own right, but the complete management system is only valid if all components are addressed at the appropriate and consistent level of detail. The report is structured around a series of framework diagrams, which provide an index to the various sections of the report.

For further information, contact the PIANC General Secretariat, Graaf de Ferraris, 11th floor, Box 3, 20 Boulevard du Roi Albert II, B-1000 Brussels, Belgium.

D. Inland Waterway Technical Studies (TRB)

The Transportation Research Board (TRB) of the National Research Council (NRC) has published circular number 491, dated December 1999, and titled *Inland Waterway Technical Studies*. This TRB circular focuses on research issues of concern to the inland waterway transportation industry. This circular's papers were presented at the TRB 1999 Annual Meeting. Most of these papers are the result of major U.S. Army Corps of Engineers (ACE) studies on the Upper Mississippi River-Illinois Waterway, the Ohio River and tributaries, and the Apalachicola-Chattahoochee-Flint waterway systems.

Two papers deal with project justification. One of the primary concerns about the analysis of proposed and existing waterway projects in recent years has been whether the analyses have accounted properly for all possible benefits. Efforts have been made to improve the information available and the techniques for determining the impacts of insufficient waterway capacity.

Another paper presents a method for assessing the cost of increasing air emissions and fuel usage due to increased transportation requirements via less efficient modes of transportation due to the inability of the waterway transportation system to efficiently move the projected demand in a timely manner. Low volume waterways and ports are facing increasing pressure to reduce or eliminate maintenance and upkeep. Many of these waterways serve important functions for the local and regional areas they serve. Still another paper presents a methodology for analyzing the impacts of assessing underutilized inland waterways, particularly driven by limitations on water depths.

Limitations on understanding the interactions of tows transiting the inland waterways and the surrounding environment have led to concerns about the impacts of increased tow traffic and restrictions on expanding the capacity of portions of the inland waterway system. A paper presents a scheme for assessing the impacts of tow traffic on the environmental system of the Upper Mississippi River and Illinois Waterway. This methodology is based on an increased understanding of the hydraulic characteristics of the waterways, tow impacts on the localized hydraulics during passage, and the impacts of these hydraulic changes on the environment developed through research. Another paper presents a method for modeling the impacts of tow traffic on the waterway hydraulics that can be used as a basis to assess the environmental changes due to changes in traffic volume or changes in the waterway characteristics.

Increasing costs of upgrading and replacing locks along with limited finances available to perform major rehabilitation and replacements have caused delays in providing much needed improvements to the inland waterways. Major efforts have been made in recent years to research and develop new designs that will reduce these costs. One paper presents the results of research on one of the areas of innovative lock design – development of safe in-chamber culvert systems. Development of this type of filling system will allow great reductions in the cost of building lock walls and filling systems without creating unsafe turbulence in the lock chamber; however, lock filling times generally will be increased. Another paper presents research efforts aimed at reducing the costs of guide- and guard-walls for locks by determining the impact loads due to tows landing on and/or colliding with these walls. This information will allow more efficient and less costly wall designs; important factors in both new lock construction and lock rehabilitation.

For further information, contact Ms. Joedy W. Cambridge, Transportation Research Board, National Research Council, 2101 Constitution Avenue, NW, Washington, DC 20418, (phone: (202) 334-2167).

E. New York and New Jersey Harbor Navigation Study (ACE)

The New York District of the U.S. Army Corps of Engineers (ACE) has published a Feasibility Report and Environmental Impact Statement to address the future navigation needs of New York and New Jersey Harbor. The study was coordinated with the nonfederal partners, i.e., the State of New York (assisted by the City of New York), the State of New Jersey, and the Port Authority of New York and New Jersey. The purpose of this study is to identify, screen, and select navigation channel improvements. Alternatives considered include no action, nonstructural

alternatives, and structural alternatives. Structural alternatives include deepening plans for anchorages and federal navigation channels. Nonstructural alternatives and the no-action plan do not improve navigation in the Port. Deepening channels to individual destinations improves navigation for vessels calling at those destinations.

The recommended plan provides for navigation improvements, which will permit access by larger, deeper-draft vessels to four main container terminals. Improvements consist of channel deepening, channel realignment, turning basin construction, and berth deepening. No expansion of Port facilities is directly attributable to the recommended plan. Economic forecasts project an increase in Port commerce regardless of whether navigation channel improvements are implemented. These increases will be handled to the extent possible through operational changes and advances in technology with or without channel deepening. Plans were developed to avoid and minimize environmental impacts where possible; mitigation will be provided as necessary.

The National Economic Development (NED) Plan is the District Engineer's recommended plan for project authorization and consists of deepening the following channels: Ambrose Channel, Anchorage Channel, Bay Ridge Channel, the Kill Van Kull, the Newark Bay Channels, Port Jersey Channel, and the Arthur Kill to Howland Hook. The channels will be deepened to 50 ft MLW except in areas of rock or otherwise hard material where they will be deepened to 52 ft MLW, with the exception of the Ambrose Channel, which will be deepened and maintained to 53 ft MLW. All channels will be maintained at 50 ft MLW with the exception of Ambrose Channel, which will be maintained at 53 ft MLW.

For further information, contact Mr. Frank Santomauro, Chief, Planning Division, New York District, U.S. Army Corps of Engineers, Jacob K. Javits Federal Building, 26 Federal Plaza, New York, NY 10278-0090, (phone: (212) 264-0223).

F. Oil Spills in Freshwater Environments (API)

The American Petroleum Institute (API) has published a regulatory and scientific affairs report (API publication #4675) titled *Fate and Environmental Effects of Oil Spills in Freshwater Environments*. Dated December 1999, this report summarizes and documents potential environmental effects from inland oil spills into fresh surface waters. It identifies, describes, and compares the behavior, fate, and ecological implications of crude oil and petroleum products in inland waters. The document is intended to provide basic information necessary for the formulation of spill response strategies that are tailored to the specific chemical, physical, and ecological constraints of a given spill situation. In separate chapters, the report: (1) describes the relevant features of various inland spill habitat types; (2) discusses the chemical characteristics of oils and the fate processes that are dependent thereon; and (3) summarizes reported results of ecological and toxicological effects both generally and with specific references to distinct organism groupings. This research effort provides technical information for persons responsible for inland spill response and cleanup, for researchers, and for others dealing with protection of the environment from possible oil spill hazards.

Significant findings of this report include the following:

1. Inland water habitats susceptible to oil spill effects were categorized as follows: open water, large rivers, small lakes and ponds, small rivers and streams, bedrock, manmade structures, sand, mixed sand and gravel, gravel, vegetated shorelines, mud, and wetlands. The respective sensitivities of these habitats to oil spill impact depend on substrate permeability, the extent of physical removal rates by currents, and the extent of use by animal and plant communities. Mud and wetland habitats tend to be most sensitive to oiling, and open waters, large rivers, and sand habitats least sensitive. Unfortunately, the ease of oil removal tends to be inversely proportional to habitat sensitivity.

2. Processes affecting the fate and behavior of spilled oil in inland waters include: spreading and drift, emulsification and dispersion, evaporation, dissolution, sorption/sedimentation/sinking, photodegradation, and biodegradation. The rate at which each of these occurs will be regulated both by prevailing environmental conditions and by the chemical makeup of the spilled product. In general, lighter molecular weight constituents and lighter, more refined products will be more susceptible to the fate processes listed. Although the lighter oils remain in the environment for a shorter time, they tend to be more toxic to aquatic species than the heavier oils.

3. Spilled oil products will affect freshwater organisms both directly, as a result of physical and toxicological processes, and indirectly, as a result of habitat impacts, nutrient cycling disruptions, and alterations in community and trophic relationships. An oil's toxicity is primarily a function of the solubility of its components in water. Toxicity should be predictable from an oil's composition and that of its water-soluble fraction, especially its aromatic content. Refined petroleum products and lighter oils tend to be more toxic than heavier crudes and weathered products.

4. Immediately following an oil spill, effects on aquatic plants and animals tend to be due to the physical coating or entrapment of exposed organisms. Membrane damage, respiratory blockage, loss of insulation and buoyancy, smothering of sediments, and disrupted swimming and feeding behaviors each may contribute to the initial loss of organisms from within a spill zone. Additional toxic effects may occur as a result of the dissolution of oil constituents in water, and numerous laboratory studies describe the toxic responses of organisms to oil exposure. However, post-spill field observations suggest that the toxicological effects of spilled oil tend to be less extensive than the physical ones. The extent of direct physical exposure of organisms to spilled, undissolved product seems to be the primary determinant of organism effects. The greater the probability that a plant or animal will directly encounter spilled product before the oil has had a chance to weather or dissipate, the greater the chance that organism will be adversely affected by the spill.

5. Secondary effects of oil spills can also have dramatic impacts on ecological communities, including alterations in nutrient cycling, reductions in dissolved oxygen

concentrations, decreases in species diversity, loss of habitat, and disruptions of trophic relationships. Each effect may produce adverse consequences to ecosystems exposed to spilled oil.

For further information, contact Ms. Alexis E. Steen, Water Program Coordinator, Regulatory and Scientific Affairs, American Petroleum Institute, 1220 L Street, NW, Washington, DC 20005, (phone: (202) 682-8339).

G. Marine Transportation System National Advisory Council (MARAD)

On January 13, 2000, (65 FR 2224), the Maritime Administration (MARAD), U.S. Department of Transportation, announced the establishment of the Marine Transportation System National Advisory Council (MTSNAC). The MTSNAC will advise the Secretary of Transportation, via the Council Sponsor (the Administrator of the Maritime Administration) and the Interagency Committee on the Marine Transportation System (ICMTS), on matters relating to the Marine Transportation System (MTS) – waterways, ports, and their intermodal connections.

The MTSNAC is being established in accordance with the recommendations made in the Report to Congress titled *An Assessment of the U.S. Marine Transportation System*. The Council will consider matters relating to current and future MTS needs. The Council will be composed of representatives from not more than 30 non-federal organizations from the marine transportation industry as designated by the Secretary of Transportation. The member organizations will represent a cross section of the diverse components that comprise the MTS including private sector organizations and state and local public entities. At least two meetings will be held each calendar year.

The MTSNAC is an advisory body and will not develop regulations, formulate policy, or determine federal budget priorities. The Council will provide advice and make recommendations to the Secretary of Transportation concerning the following matters:

1. Waterways, ports and their intermodal connections and services required to meet current and future MTS needs;

2. National strategy, policy, and goals in the areas of safety, environment, mobility, competitiveness, and security of the MTS;

3. Strategies to ensure a safe, environmentally sound, and secure MTS that improves the global competitiveness and national security of the United States;

4. International standards on the delivery and collection of maritime information and data;

5. Issues and concerns brought to the Council by elements of the marine transportation industry; and

6. Such other matters related to those above that the Secretary may charge the Council with addressing.

For further information, contact Ms. Kathleen R. Dunn, Office of Intermodal Development (MAR-810), Maritime Administration, U.S. Department of Transportation, 400 Seventh Street, SW, Washington, DC 20590, (phone: (202) 366-2307).

H. U.S. Coast Guard Roles and Missions (DOT)

On March 25, 1999, President Clinton signed Executive Order 13115 establishing the Interagency Task Force on Coast Guard Roles and Missions. Sixteen senior members of the Administration undertook this effort of stewardship to provide advice on appropriate roles and missions for the U.S. Coast Guard in 2020, particularly in the deepwater operating area. The effort consisted of research, field trips, review of stakeholder comments, and debate. The results appear in the Task Force Report, signed on December 3, 1999, and released in February 2000.

The Task Force report provides the following overarching conclusions: (1) the Coast Guard's roles and missions support national policies and objectives that will endure into the 21st century; (2) the United States will continue to need a flexible, adaptable, multi-missioned, military Coast Guard to meet national maritime interests and requirements well into the next century; (3) in order to hedge against tomorrow's uncertainties, the Coast Guard should be rebuilt so as to make it adaptable to future realities; (4) in keeping with its well-deserved reputation as one of the federal government's most effective and efficient organizations, the Coast Guard should continue to pursue new methods and technologies to enhance its ability to perform its vital missions; (5) the recapitalization of the Coast Guard's deepwater capability is a near term national priority; and (6) the deepwater acquisition project is a sound approach to that end, and the Interagency Task Force strongly endorses its process and timeline.

The Task Force report provides mission specific conclusions, including the following:

1. The Task Force's analysis confirms the important national interest in alien migrant interdiction operations and the Coast Guard's role as the agency with primary responsibility for maritime interdiction and at-sea enforcement of U.S. immigration laws.

2. There is a continuing important national interest in reducing the maritime flow of illicit narcotics into the United States, and the Task Force confirms the role of the Coast Guard as the agency with primary responsibility for maritime drug interdiction.

3. The Task Force confirms the important national interest of the Coast Guard's continuing to perform its national defense missions. By building flexible cutters designed for today's fast paced law enforcement operations and continuing the routine and appropriate Navy training of its cutters and personnel, the Coast Guard will be able to conduct the appropriate defense missions and maintain the flexibility to conduct specialized missions as assigned.

4. The Task Force's analysis confirms the important national interest in preserving and protecting the living marine resources of the United States in the Exclusive Economic Zone (EEZ) and on the high seas and the role of the Coast Guard as the agency with primary responsibility for at-sea enforcement of U.S. laws and regulations in furtherance of this national interest.

5. The work of the Task Force confirms the important national interest in protecting the Nation's marine environment and the role of the Coast Guard in leading that effort by conducting at-sea enforcement of fisheries laws and preventing and responding to oil and hazardous chemical spills.

6. The Task Force recognizes the important national interest of providing maritime safety and supports the Coast Guard's enduring role in these maritime safety interests.

7. The Task Force sees a fundamental link between the health of the Nation's ports and waterways and its economic and military security and endorses the vital role of the Coast Guard in protecting and maintaining these gateways to the world.

8. The Task Force affirms the important national interest in the federal government's providing the services the public expects and demands in the most efficient manner possible and notes that the Coast Guard performs its vital services in an effective and efficient manner.

9. The United States needs a Coast Guard that can effectively and efficiently carry out the national interests and missions assigned. Today, the service is struggling to do that; its deepwater assets are reaching the ends of their economic service lives while the challenges to U.S. national maritime interests are increasing. The deepwater project affords the Coast Guard a unique opportunity to develop and field a cost-effective and integrated system of cutters, aircraft, sensors, and associated support systems that will meet the Nation's maritime security needs.

For further information, contact the Office of the Coast Guard Commandant (G-C), U.S. Coast Guard, 2100 Second Street, SW, Washington, DC 20593, (phone: (202) 267-2380). The report is available on the Coast Guard's website (http://www.uscg.mil/news/rolesandmissions.html).

I. Nationwide Permits (ACE)

On March 9, 2000, (65 FR 12818), the Army Corps of Engineers (ACE or Corps), U.S. Department of Defense, published a final notice that issues 5 new Nationwide Permits (NWPs) and modifies 6 existing NWPs to replace NWP 26 which expires on June 5, 2000. The Corps is also modifying 9 NWP general conditions and adding 2 new NWP general conditions. The new NWP general conditions will increase protection of designated critical resource waters and waters of the United States within 100-year floodplains.

In December 1996, the Corps decided to replace NWP 26, which authorizes discharges of dredged or fill material into headwaters and isolated waters of the United States, with activity-specific NWPs. The new and modified NWPs authorize many of the same activities that NWP 26 authorized, but the new and modified NWPs are activity-specific, with terms and conditions to ensure that these activities result in minimal adverse effects on the aquatic environment. The new and modified NWPs will substantially increase protection of the aquatic environment, while efficiently authorizing activities with minimal adverse effects on the aquatic environment. The maximum acreage limits of most of the new and modified NWPs is ½ acre. Most of the new and modified NWPs require notification to the district engineer for activities that result in the loss of greater than 1/10 acre of waters of the United States. This notice also constitutes the Corps application to states, tribes, and the U.S. Environmental Protection Agency for the Clean Water Act section 401 water quality certification (WQC) and Coastal Zone Management Act (CZMA) consistency determination processes.

For further information, contact Mr. David Olson or Mr. Sam Collinson, U.S. Army Corps of Engineers Headquarters (CECW-OR), 20 Massachusetts Avenue, NW, Washington, DC 20314, (phone: (202) 761-0199).