

1993 LCMR Work Program Abstract
for the Period Ending June 30, 1995

This project was funded from the Future Resources Fund and a School District Match

Title: Photovoltaic Demonstration Project

Program Manager: Patrick F. Quinn, A.I.A.

Organization: Saint Paul Public Schools, ISD 625

Legal Citation: M.L. 93 Chapter 172, Section 14, Subdivision 4(b)

Appropriation Amount: \$230,000.00 (LCMR budget) and \$120,000 (School District match)

STATEMENT OF OBJECTIVES

Design and Construct a Photovoltaic Demonstration Project to generate electricity. Provide an educational tool for the Environmental Magnet Program of Battle Creek Elementary School.

Overall Results:

In addition to generating valuable data regarding this use of alternative energy source, the system will reduce the school's dependence on power generated by fossil and nuclear fuels and demonstrate the current state of the art of photovoltaic technology. The system is generating approximately 11.5 kilowatt or about 5 percent of the school's annual electrical consumption. The system will enrich the Environmental Magnet Program by making available an alternative energy system to the students and faculty and incorporating application software for their use. The educational process is supplemented by providing a "hands-on" example of a functioning system.

Project Results Use and Dissemination:

A body of historical data on this system is being compiled and will be readily available to interested parties. Information may be disseminated in printed form and may also be available on the Internet. The electronic transmission of this data will be facilitated by the anticipated installation of a technology system at this school during the summer of 1996.

LCMR FINAL WORK PROGRAM UPDATE REPORT

I. Photovoltaic Demonstration Project

Program Manager: Mr. Patrick F. Quinn
 Executive Director, Plant Planning and Maintenance
Agency Affiliation: Independent School District No. 625
 Saint Paul Public Schools
Address: 360 Colborne Street
 St. Paul, MN 55102
Telephone: (612) 293-5140

A. Legal Citation: M.L. 93 Chapter 172, Sec. 14, Subd. 4(b)
 Total Biennial LCMR Budget: \$230,000
 Match: \$120,000
 Balance: LCMR: \$0
 Match: \$0

B. LMIC Compatible Data Language: N/A

C. Status of Match Requirement: District will provide up to \$120,000.

This appropriation is from the future resources fund to the commissioner of public service for a grant to the Saint Paul school district for purchase and installation of a Photovoltaic demonstration system at the Battle Creek Environmental Magnet School.

II. Narrative: This system will provide a clean, alternative source of electrical power generation for Battle Creek Environmental Magnet School that will supplement the existing public utility by converting sunlight directly into electricity using Photovoltaic technology. This is a demonstration project that will augment the environmental magnet studies at Battle Creek elementary school.

III. Statement of Objectives:

- A. Design and construct a Photovoltaic demonstration project to generate electricity.**
 (LCMR: \$230,000)
 (Match: \$100,000)
- B. Provide an educational tool for the environmental magnet program.**
 (Match: \$20,000)

(A more detailed cost breakdown will be provided at a future date as a separate exhibit.)

IV. Objectives:

A. Design and construct a Photovoltaic Demonstration Project to generate electricity.

A1. Narrative: Design, construct and install a Photovoltaic electrical generating system at Battle Creek Environmental Magnet School.

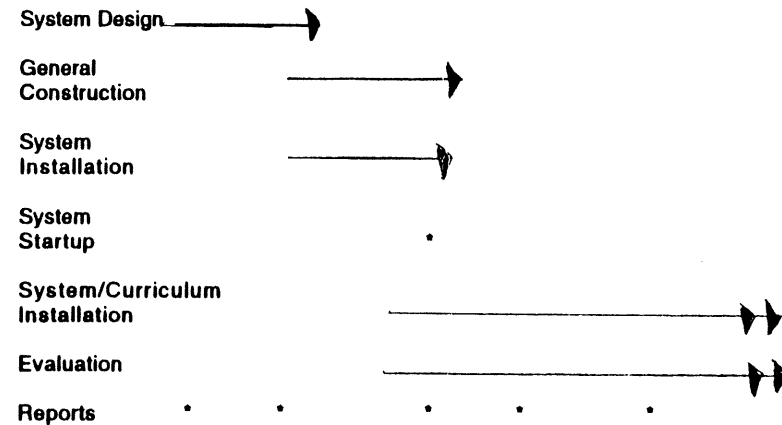
A2. Procedures: This system will involve the installation of Photovoltaic panels on the roof of the environmental magnet school. It will also include installation of control and monitoring equipment. Demonstration equipment for curriculum enhancement will also be included.

A3. Budget:

a. Amount budgeted:			
Design fees		\$ 28,000	
Construction		202,000	
	Subtotal	230,000	LCMR
Construction		100,000	district match
	Total	\$330,000	

b. Balance:			
Design fees		\$ 0	
Construction		0	
	Subtotal	0	LCMR
Construction		0	district match
	Total	\$ 0	

A4. Timeline: 7/93 1/94 6/94 1/95 6/30/95



A5. Status: The project has been constructed. The four basic curriculum components enumerated in the January 1, 1994 report have been implemented.

A6. Benefits: Sunlight is the energy source of the future. This system will reduce the school's dependence on power generated by fossil and nuclear fuels and demonstrate the current state of the art of Photovoltaic technology. The system will generate approximately 11.5 kw or about 5% of the school's average annual electrical consumption and it will serve the 470 students in the program.

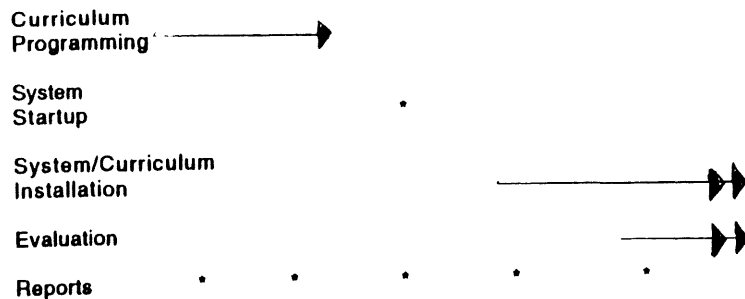
B. Provide an educational tool for the environmental magnet program.

B1. Narrative: Design and implement a curriculum that takes advantage of Photovoltaic technology and provides application opportunities for staff and students.

B2. Procedures: Demonstration display cases, scientific classroom instruments and movable demonstration carts will be included in the project to be certain that all students can avail themselves of educational experiences in Photovoltaic technology.

B3. Budget:
 a. Amount budgeted: \$20,000 (District Match)
 b. Balance: \$0

B4. Timeline: 7/93 1/94 6/94 1/95 6/30/95



B5. Status: Curriculum has been developed. Specific demonstration equipment and software to support this curriculum is on-site. Discussion is in progress about acquisition of additional equipment and software.

B6. Benefits. Photovoltaic system will enrich the Environmental Magnet Program by making available an alternative energy system to the students and faculty and incorporating application software for their use. The educational process will be supplemented by providing a "hands on" example of functioning system.

V. Evaluation: On-going evaluation of this system and scrutiny by the scientific community will enhance its effectiveness and provide a database for future systems in the region. Data collection will be automatic and data analysis will become an integral part of the educational curriculum. Software and hardware to accomplish this is included in the system. The design team is considering the installation of systems by more than one manufacturer in order to develop cooperative data. The Evaluation Team will consist of:

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|------------------------|--|
| Patrick F. Quinn. | Executive Director, Plant Planning and Maintenance |
| Gerald Madigan | Principal, Battle Creek Elementary School |
| Jim Eaton | Curriculum Coordinator, Battle Creek Elementary School |
| Metta Belisle | Teacher, Battle Creek Elementary School |
| Angela DeLong Gatzlaff | Architect, Adkins Association |
| Jim Giefer | Electrical Engineer, Gausman & Moore, Inc. |
| John L. Roche | Research Specialist, 3M |
| Mark Rogers | Northern States Power, Research Department |

VI. Context: The body of knowledge supporting the technology has grown since the first silicon wafer was developed in 1954. Its use in satellites and other electrical generating systems as well as great strides made in the efficiency of the product, has laid the groundwork for a burgeoning industry that has crossed the threshold of feasibility. Photovoltaic technology is now available commercially in products from calculators and lawn lighting to electrical systems such as this.

Public and private investment in Photovoltaic has increased significantly since the enactment of the Public Utility Regulatory Policies Act (PURPA) in 1978. This act provided the impetus for a fourteen-fold increase in the number of projects from 1976 to 1982. The system described in this proposal was designed under a grant funded from the proceeds of the US Department of Energy, Stripper Well Exemption Litigation, MDL No. 378. The remaining funding will come from the future resources fund and school district match.

Economic payback on this system is long, as is typical of cutting edge technology. But payback must also be measured in terms of the values conveyed to these students of the environment and in the highly visible nature of this project. Large-scale electrical generating systems are now being constructed on every continent. This project will be one of the first large-scale systems in this region and the first such funded by LCMR.

The scientific and public utility communities support this proposal and participated in the research and design in order to ensure its success. The budgeted amount of \$230,000 for construction assumes an additional contribution of \$120,000 from industry and the school district to defray a portion of the system costs.

VII. Qualifications:

Program Manager: Patrick F. Quinn is a registered architect and is the Executive Director of Plant Planning and Maintenance for the Saint Paul Public Schools. In his previous capacity, he was a partner in an architectural firm which was a consultant to the Saint Paul Public School District, led the planning team for this project and ultimately authored the proposal for a Photovoltaic Generating System, a booklet which explains this proposal in detail.

Patrick Quinn is a member of the American Institute of Architects and is a registered architect in Minnesota and Wisconsin. He is also a member of the Council of Educational Facility Planners International.

Cooperators/Other

Investigators: The consultant team for this project will be the Adkins Association, Inc., Architects, and Gausman and Moore, Mechanical/Electrical Engineers.

VIII. Reporting Requirements: This is the final status report.