

**An Integrated Approach
To
Financing
Energy Efficient, Green School Projects**

AIR INNOVATIONS CONFERENCE

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About EMSI

EMSI is an international consulting firm with offices in Washington, D.C., Springfield, MO, and China. We provide services in sustainable design, innovative financing and risk management, and technology transfer.

Our mission is to foster a global sustainable built environment through projects that are profitable and environmentally responsible. EMSI's clients are real estate developers, municipalities, school boards, and manufacturers of green building products. For more information please visit our website at www.emsi-green.com.



Why Green Schools?

- **Economics** – energy/water savings up to 50% at time of rising price of electricity
- **Environmental** – pollution emissions reductions associated with energy savings
- **Health** – children are particularly vulnerable to poor environmental conditions (toxic materials, air pollution, etc.)
- **Learning** – students more engaged; daylighting improves learning
- **Curriculum** – green schools become “living labs” for science, energy and environmental education.
- **Magnets** –green schools attract students and teachers, better teacher retention



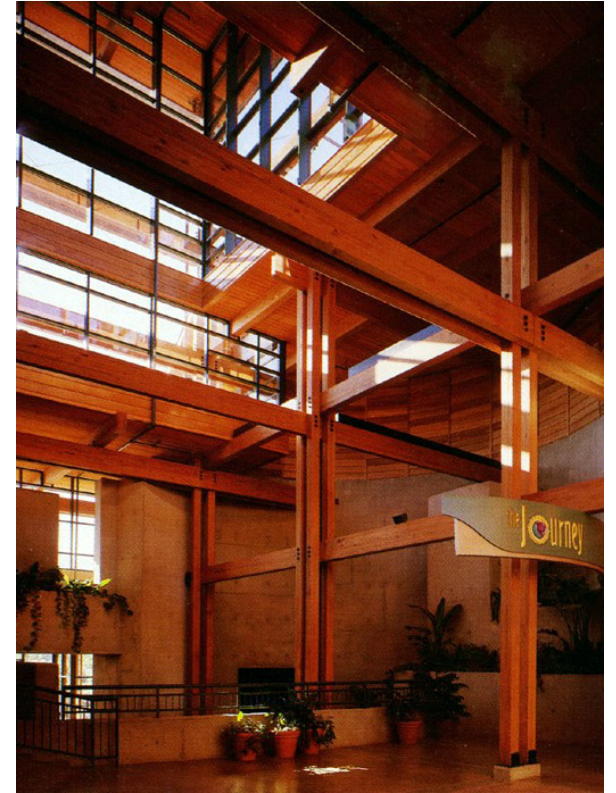
Green Schools Continued...

- Average age of many school buildings is 40-50 years (for example, Ohio)
- Rising enrollment from population growth
- \$20 billion spent on new school construction every year
- State and local incentives available
- Schools are large energy consumers, 1/3 of energy is wasted
- Parents ask schools to build green



The Challenge

- Increasing pressure/ desire from states (PA, NJ, MA, CA, etc.) for green schools (new construction)
- Incremental capital cost usually 1-5%, can be higher
- Schools often lacking in incremental funding
- Essentially unfunded mandates



Our Solution: GreenCap

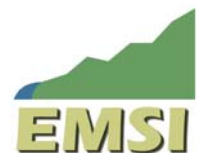
An Integrated Financing Approach that...

- Addresses the funding gap that school districts face in the design and construction of new, high performance schools
- Targets the *incremental* capital cost
- Brings new resources to capital improvement programs (CIP), encourages school boards to support sustainable design
- Includes technical, high performance design



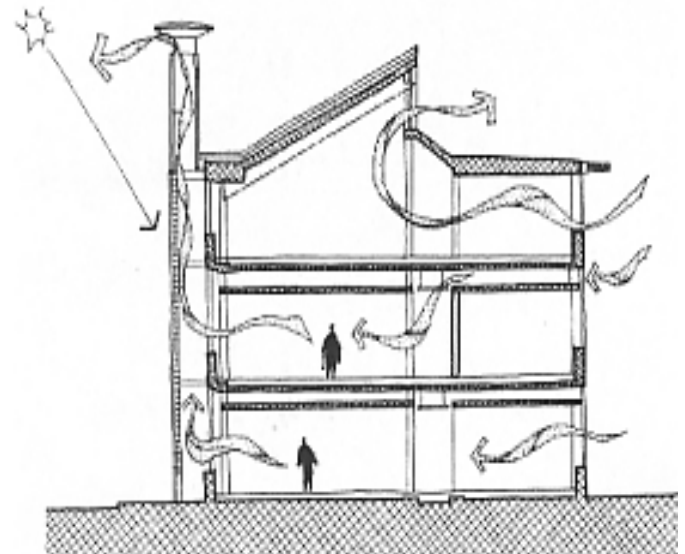
GreenCap Overview

- Conduct design and engineering of high performance, green school
- Energy/water savings are “security package” for loan (from either public or private source – whichever is more competitive)
- Establish savings monitoring and verification protocol
- Access financing through grants, loans, build-own-operate, performance contracting



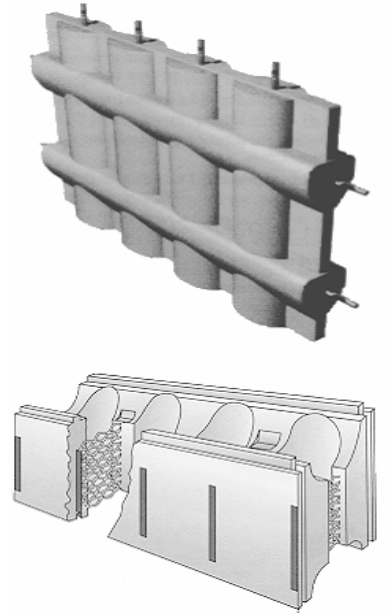
Building Design

- Establish baseline model (ASHRAE 90.1 or comparable) from which energy savings can be monitored and verified
- Optimize daylighting, natural ventilation
- Implement water management strategies
- Incorporate non-toxic materials, local and recycled materials



Building Design (2)

- Optimize thermal envelope
- Optimize mechanical systems (HVAC, building and lighting controls)
- Optimize systems for secure and safe school
- Optimize use of cost-effective renewable energy systems



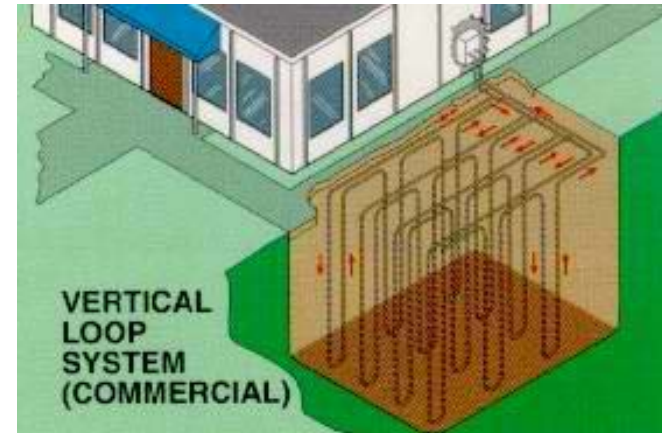
Design (3)

- Evaluate various high performance scenarios (models) for their economic return through whole-building and other technical analyses
- Calculate incremental capital cost of green school project (financed portion)
- Perform advanced building commissioning
- Obtain LEED NC or other building certification (CA-CHPS, MASS-CHPS)



Typical Measures

- Energy management systems
- Energy efficient lighting
- Automatic light dimming
- High performance HVAC and variable speed drives (VSD)
- Energy recovery systems
- High performance glazing
- Water conserving fixtures



Finance Strategies

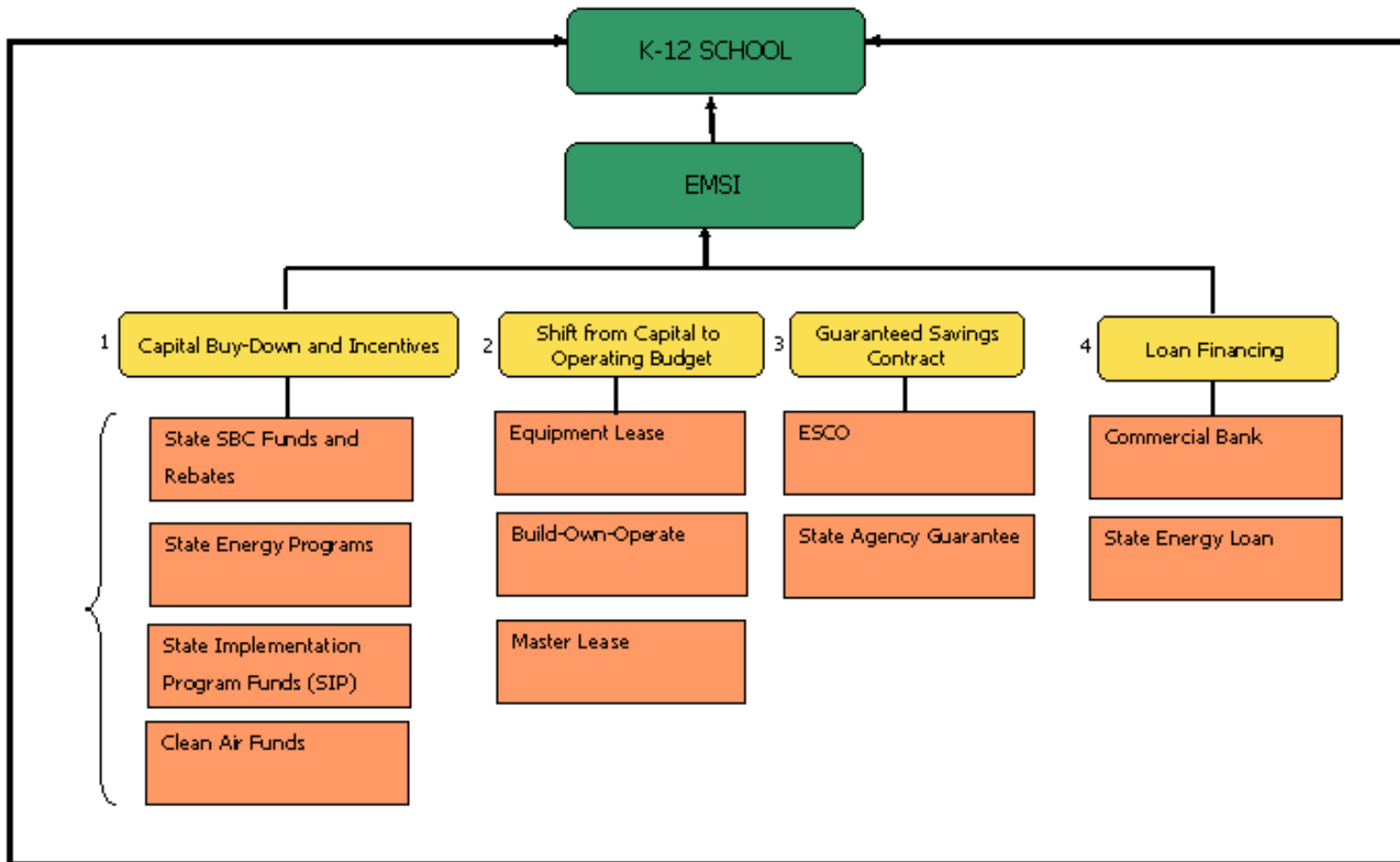
- Help secure commercial *debt financing* (through bank partners)
- Arrange for *loan guarantees*, where needed by bank
- Access *grant financing* for renewable energy and distributed generation systems through state and federal programs
- Energy Saving *Performance Contract* (ESPC)
- *Build-Own-Operate* for renewable energy

Build-Own-Operate and Solar Schools

- Solar energy systems provider and investor group pays up-front cost of installing large-scale PV system on school (25-100kW).
- PV systems are integrated with roofing thereby making installation more cost-effective (modules are the roof)
- School enters into PPA with Systems Integrator at competitive rates – excess sold back to grid
- Investor gains steady revenue and tax breaks
- Example: San Diego Schools



GreenCap Financial Resources



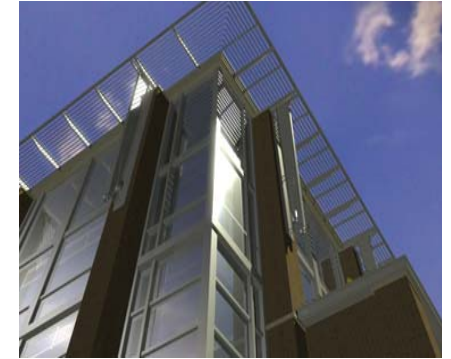
The Math – An Example

Assumptions

- School project = 100,000 square feet
- @ \$200/sq ft., construction cost = \$20,000,000
- “Green premium” = 2% = \$400,000
- Annual baseline energy cost: \$1.80/sq ft. = \$180,000
- Annual energy savings: 33% = \$0.60/sq ft. = \$60,000



The Math - Example



Capital “Buy Down”

Keeping it Simple – Example uses Grant / Loan

- Secure \$100,000 through *grant* and/or use other “cost buy down” options
- Public and private grants (SIP, planning grants)
- System Benefit Charges - Utilities
- Loan requirement reduced from \$400,000 to \$300,000

Example

Secure savings / financing

- Establish baseline and cost savings to meet lending requirements (cost savings must exceed loan payments – debt coverage ratio)
- Energy savings replaces collateral
- Choose most competitive loan finance source from public and private sector (state energy office, private FI)
- “Reserve” \$50,000 of projected \$60,000 in annual savings for loan repayments
- Equipment Leasing / Master Leasing can be used to shift from capital to operating budget



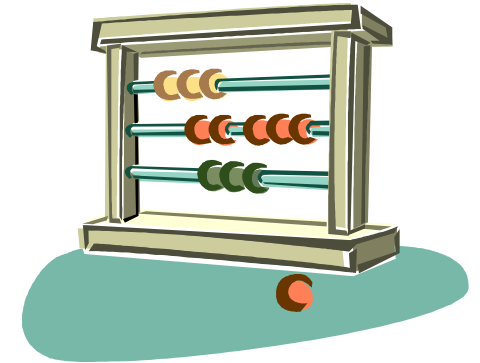
The Math - Example

Crunching the Numbers

For \$300,000 loan

@ 6% interest, loan period = **7.5 years**

@ 8% interest on loan period = **8.25 years**



Case: Bethel Middle School and ESPC

- In 2003, New Bethel Middle School decided to pursue LEED certification
- Bethel partnered with Trane to secure commercial financing
- Trane guaranteed savings based on future operating and maintenance savings
- District secured \$987,000 loan to cover HVAC, DDC EMS, daylighting system, LEED certification
- Annual savings are \$88,000



Case: New Culpeper High School (Design)

- EMSI provided LEED consulting on a new 250,000 ft² high school in Culpeper, VA
- High performance features included:
 - Ground Source Heat Pumps
 - Double pane low-e glazing
 - Energy recovery ventilators (ERVs)
 - Occupancy sensors in classrooms and offices
- Energy savings: \$68,717 over baseline



Case: Coatesville Elementary School (Design) Emissions Reductions from GSHP and PV

Total energy saved is 151, 118 kWh and cost savings are \$19,095 / yr

Pollutant	Emissions Per Year
Nitrogen Oxides (NOx)	615 lbs
Particulate Matter (PM)	249 lbs
Volatile Organic Carbons (VOCs)	9.44 lbs
Carbon Dioxide (CO2)	179 tons
Sulfur Dioxide (SO2)	1,456 lbs

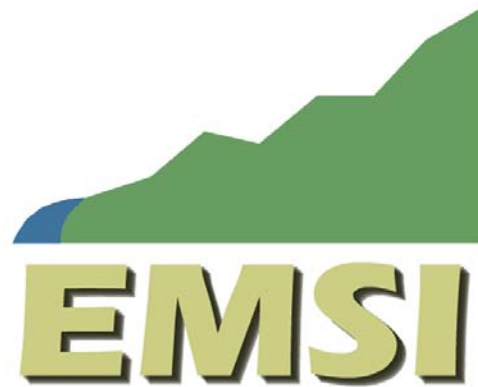


School Projects

- Montgomery County Schools, MD
- Culpeper High School, VA
- Stoutland High School, MO
- Coatesville School District, PA
(pending state approval)



THANK YOU!



Contact

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