

We are going **green**
at Plymouth-Canton Community Schools



Welcome by Judy, recognize elected officials

Dr. Fiegel – introduction to presentation, we brought you to the Park today to show you first hand how these projects will benefit our students

3rd largest district in the state, 19,000 students

Academically successful district, with below average per pupil funding

We have a need for a new Middle School



Show this slide to emphasize the “big picture” – the overall needs in the district. The \$130 million in projects, which would include the replacement of this building.

We have a 1917 middle school that needs to be replaced, if we could build a new one, it would be done with renewable energy as a priority

We end the presentation tying back in the big picture idea of replacing Central – with a totally energy-minded facility

P-CEP Growth

Year	Enrollment
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2001-02	4,627
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2002-03	4,929
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2003-04	5,031
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2004-05	5,400
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2005-06	5,670
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2006-07	5,823
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2007-08	5,943
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2008-09	6,054
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Salem High School Lunchroom

1,427 new students in 8 years

6,000 at this Educational Park, projecting 500 more in growth in the next several years. Size of the complex offers some unique renewable energy opportunities and we want to show you 2 of those projects today – cooled gym, solar covered walkways



We have 130 million in projects in the pipe that will create more than a thousand jobs, the first \$13 million in projects will create 90-110 new direct jobs, 50-60 indirect jobs – so that’s about 140-170 new mid and high tech jobs in Michigan

5 types of projects

Solar / Thermal / Electric
Wind / Electric
Thermal Heat Recovery
Natural Cooling Strategies
High Efficiency Lighting

We can characterize them as 5 types of projects

There is now technology that would allow us to have our next new building be 100% renewable energy

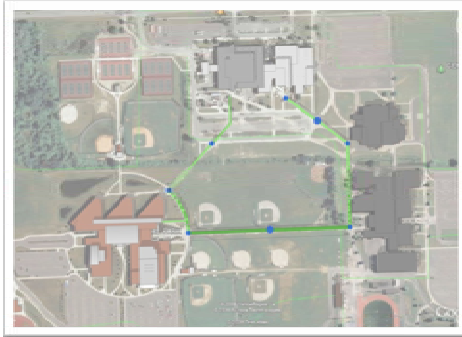
Introduce Reyn Hendrickson – StarPak in Canton

Damian Farrell – Damian Farrell Design Group in Ann Arbor

Plymouth High School Gymnasium



Campus Covered Walkways



Current Energy Inefficiencies - Gymnasium

- Uncomfortably hot with almost no air flow
 - Lighting produces excessive heat and expensive to operate
 - No air conditioning system
 - Very little natural light



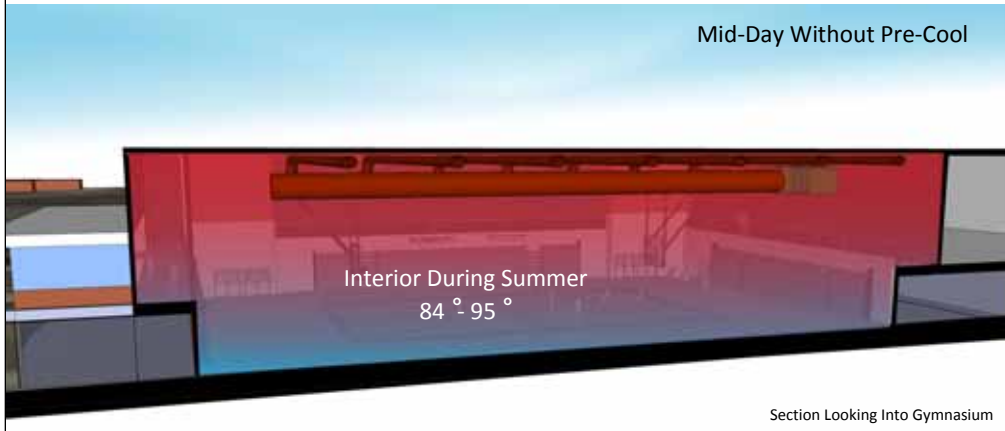
Section Looking Into Gymnasium

Solutions

- Pre-Cool Gymnasium with night air
- Use well water for additional pre-cooling (existing duct system)
- Dehumidify air to increase comfort
- Mist roof to reduce heat transfer into Gymnasium
- Add natural lighting
 - Add solar tubes
 - Replace existing lighting fixtures



Mid-Day Without Pre-Cool



Section Looking Into Gymnasium

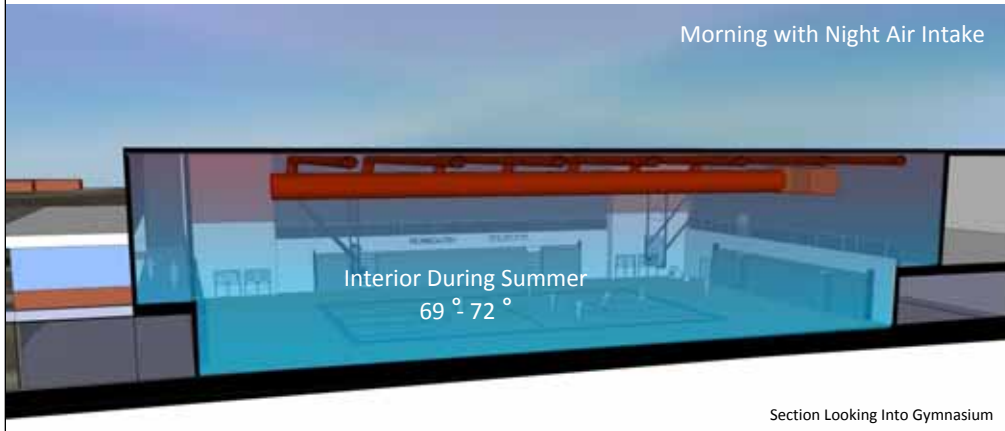
The current conditions during the summer are....

Solutions

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Morning with Night Air Intake



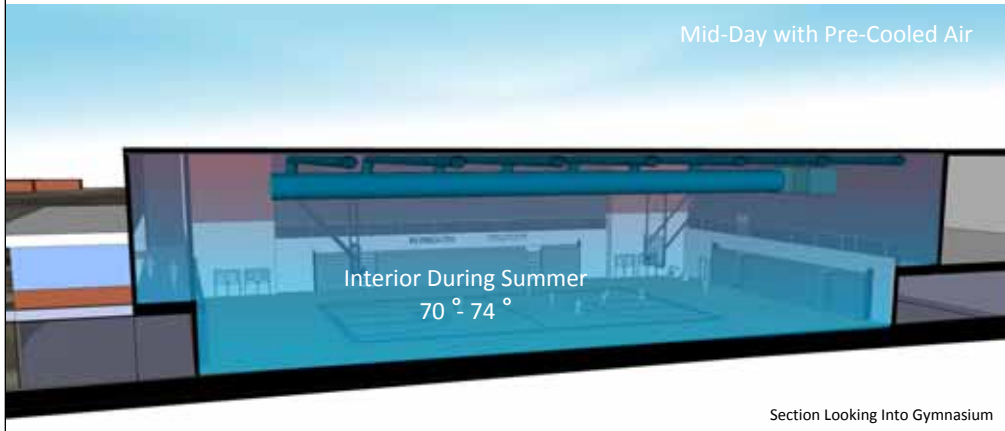
Section Looking Into Gymnasium

Solutions

- Pre-Cool Gymnasium with night air
- **Use well water for additional pre-cooling (existing duct system)**
- Dehumidify Air to Increase Comfort
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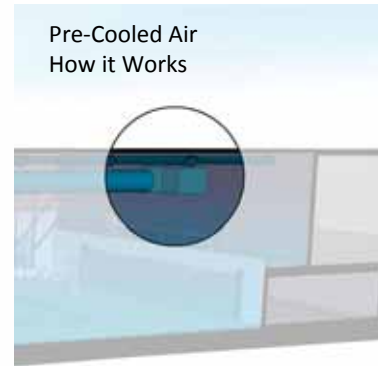
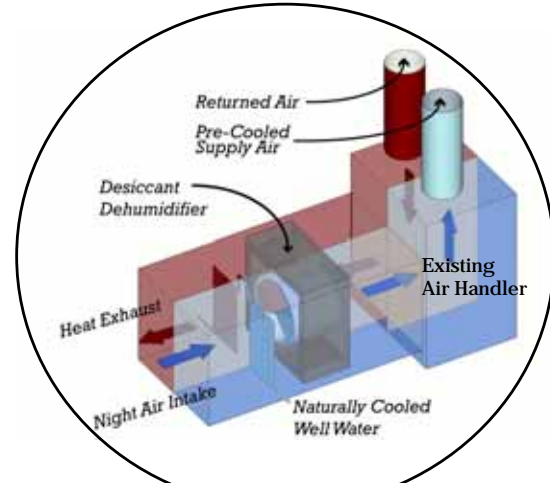
Mid-Day with Pre-Cooled Air



Section Looking Into Gymnasium

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Pre-Cooled Air
How it Works

Solutions

- Pre-Cool Gymnasium with night air
- Use well water for additional pre-cooling with existing duct system
- Dehumidify air to increase comfort
- **Mist roof to reduce heat transfer into Gymnasium**
- Add natural lighting
 - Add solar tubes
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Roof Top Misting Systems

- During extreme heat days system can eliminate solar heat gain
- Reduce and maintain interior ambient temperatures around 72 °

Solutions

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Existing Gymnasium Lighting



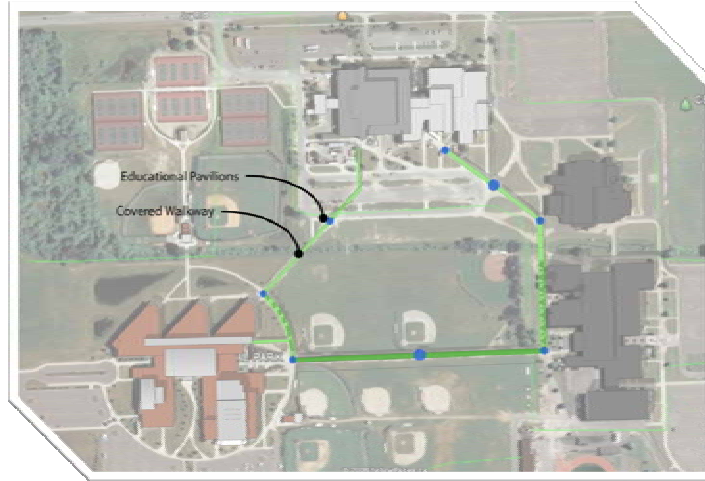
Induction Lighting
60% more efficient



Solar tube
100% more efficient

Current Energy Inefficiencies - Walkways

- No protection from Inclement weather
- Constant maintenance during Winter
 - Snow removal
 - Salting
 - Repairs due to required winter work

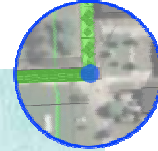


Solutions- Walkways

- Covered Walkway Paths
 - Connection of all schools on campus. Physically and Socially
 - Fun, youthful, and artful icon that has direct connection to campus.
 - Security and surveillance easily managed
 - Minimal maintenance
 - Translucent paneling system, see how the system works.



Educational Pavilion



Solutions- Walkways

- Educational Tool
 - Use to teach about sustainable technologies
 - Means to study new career paths
 - Dashboard displays to show how the building systems work and are monitored.
 - Using IES energy modeling software as part of demonstration learning tool.



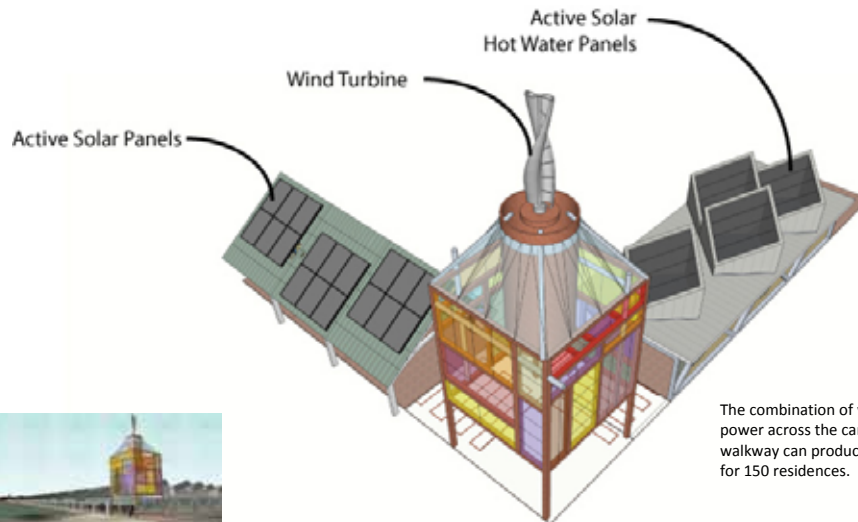
Educational Pavilion



Solutions- Walkways



- Energy Generation
 - Active Solar Power Collection
 - Wind Power Collection
 - Passive Hot Water Heating
 - Preheat walkway in winter to eliminate snow removal requirements.



Solutions- Walkways



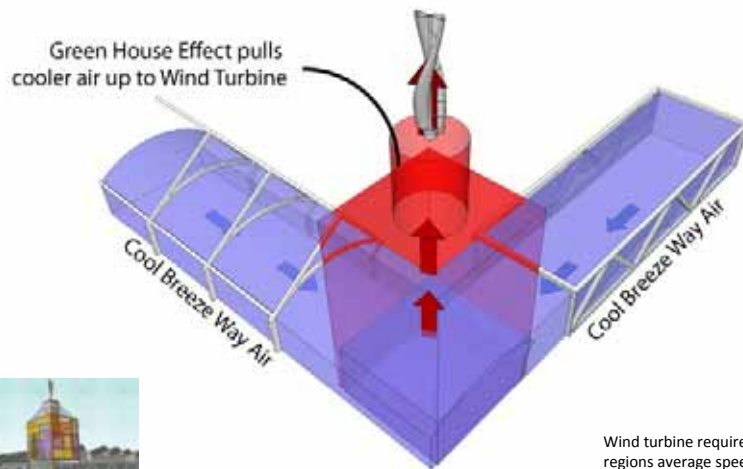
- Energy Generation

- Active Solar Power Collection

- Wind Power Collection

- Passive Hot Water Heating

- Preheat walkway in winter to eliminate snow removal requirements.



Wind turbine requires 4 MPH winds, the regions average speed is 9 MPH.

Solutions- Walkways

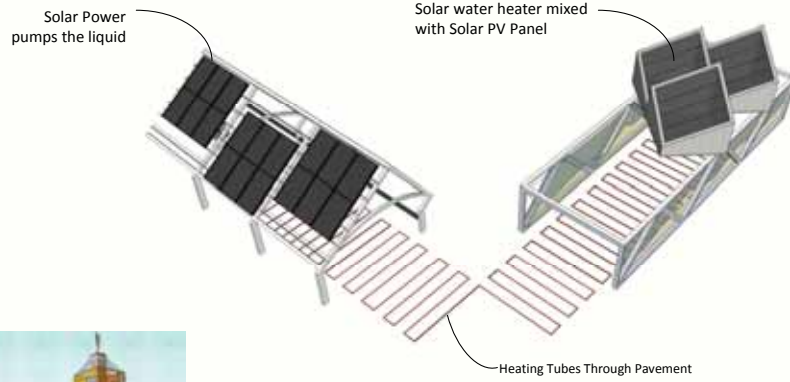


- Energy Generation

- Active Solar Power Collection
- Wind Power Collection

- Passive Hot Water Heating

- Preheat walkway in winter to eliminate snow removal requirements.



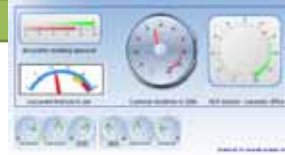
The Next Step

Energy Audit

- Integrated Environmental Systems
 - Software system that stores all energy data
 - Gives the most amount of accurate analysis on how to improve building performance
 - Run multiple energy cost scenarios to determine the largest energy return with least cost

Example

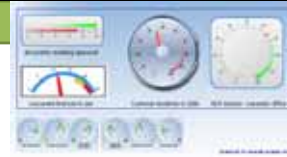
The Gymnasium is audited and processed through the software. After looking at a few energy alteration scenarios we find that with an increase in roof insulation, a white roof coating over the existing and a change in light fixtures the current energy cost can be reduced by 50%. This quantifies to 10k dollars per year in savings and can pay for itself in two years. The exercise takes minimal time and the decision was easily determined make minimal changes for a high value.



The Next Step

Energy Monitoring System

- Richards Zeta Building Intelligence
 - Computer hardware & software
 - Minute by minute detail that indicates performance.
 - Know about maintenance issues immediately
 - System is able to be manipulated to reduce energy cost



Example

A notice from the computer notifies that the heaters in Canton High School are not performing at the chosen energy level. The facility maintenance worker at the school looks at the heater. It is easily observed that the filters need changing. The software verifies that that was indeed the issue. The equipments lifespan is able to be lengthened and energy costs are reduced.



Future Project : Middle School

- Energy Generation
 - Seasonal Heating
 - Seasonal Cooling

Traditional Heating & Cooling Systems



Requires Electricity and Gas to Operate

Natural Heating & Cooling Systems



Requires No Electricity or Gas to Operate

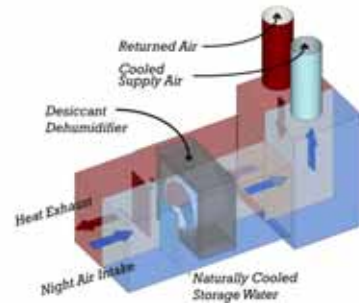
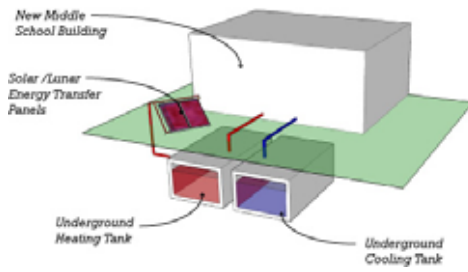
Future Project : Middle School

- Energy Generation
 - Seasonal Heating
 - Seasonal Cooling

How it works:

Two Underground Storage Tanks Used for Storage of Water.

- In the summer the heating tank stores solar heated water
- In the winter nights the cooling tank gathers nature made free ice
- During each following season the tanks are used in lieu of the energy required by a traditional HVAC system
- Stored ice and hot water persists for many months due to desirable surface to volume ratio



Bottom Line – We did the Math

Initial
Investment =
\$13 million

Projected Energy
Savings First Year =
\$2.1 million

Energy Savings
(accounting for rising
costs) pay off
investment in 4.5 years

\$13 million is shovel ready, rapid turn around, lots of jobs – 140-170 jobs for our community – we have some very exciting projects we'd like to accomplish right now

Renewable Energy Initiatives for PCEP: Draft Presentation to School Board for Jan 13, 2009

nyyn

Goal: Install Renewable & Energy Efficiency Measures which generate instant positive cashflow, additionally achieving selected other PCEP objectives. As soon as practicable, examine elementary & middle schools.

Examples of Measures: 1. Air condition the Plymouth HS gym with renewable measures, eliminating BOTH \$300,000 equipment front cost AND \$40-55,000/yr electricity cost
2. Create covered walkways connecting the 3 high schools, which serve as rack-mounting for rapid payback Solar Thermal and PV systems.

Actions Required: Meet mid-2009 deadline to apply for zero interest Clean Renewable Energy Bond ("CREB") money available from Federal Government
Install approved measures over 2 years, starting with fastest payback measures so as to achieve strongest positive cashflow.

Decision Criteria: a. Pick those renewable and efficiency measures which assure instant positive cashflow to the District
b. Achieve educational objectives, bringing a renewable energy curriculum component alive
c. Show environmental leadership to the community, as the nation gears to upgrade the energy infrastructure
d. Whenever possible, use this initiative to solve other pressing problems in key facilities (covering walkways, for instance)

Recap of Measures	Capacity		Elms& Middle Schools	PCEP High Schools	Savings, 1stYr	est REC cost potential	Payback projected w/ utility increases			
	kw	btu at peak					years	ROI		
Wind & Photovoltaic electricity	700	kw at peak		\$902,000	\$2,780,000	\$249,018	\$270,000	7.1	14.0%	\$68,171
Solar Thermal	14,500,000	btu at peak		\$1,538,000	\$960,000	\$467,074	\$0	5.3	18.8%	\$748,291
Efficiency & cooling measures	1,500	kw		\$1,939,000	\$2,105,000	\$1,012,257	\$267,000	3.2	31.3%	\$900,589
Heat Recovery	15,000,000	btu at peak		\$272,000	\$243,000	\$220,412	\$0	2.3	43.8%	\$240,716
Misc, incl Intelligent Bldg System	various			\$1,347,000	\$784,000	\$364,227	\$28,000	5.4	18.4%	\$625,763
total of all measures:				\$6,058,000	\$6,930,000	\$2,312,987	\$471,000	4.6	22.2%	

These assumptions are used above:

- 6.0% yearly utility rate increases
- 12 year CREB term
- \$100 est REC value \$/kw (range as of Jan 2009 is very wide due to several key unknowns)

Glossary:

- Photovoltaic:** "Volts from Photons" — that is, solar electricity. Abbreviated "PV"
- "at Peak":** Rated output of a system with intermittent inputs
- Solar Thermal:** Solar energy for heating of air and/or water
- Energy Efficiency:** Catchall for measures optimizing timing, zoning & operational efficiency including selected LED, CFL, & other lighting retrofits
- Cooling Measures:** Enhanced geothermal systems as well as off-peak ice-making
- Heat Recovery:** Capture of heat streams currently wasted—example: heat in boiler flues
- Intelligent Bldg System:** Energy management system to a) negotiate with utilities for best rates, b) detect faults early (broken fan belts, dirty filters, etc.) automatically, c) optimize performance & integration all renewable measures shown, d) graphically display real-time data for both facility staff and related curricular objectives

This is a reference for the audience to explain we've thought out the best use of the first \$13 million in projects – and shows the ROI and specific numbers involved. This is a quick slide – tell them to reference the details on their own



Pic of Central Middle School fade into Discovery Middle School – explain we have our next dream middle school planned, land purchased, it could be 100% renewable energy – you can do an entire building that will operate off the power grid