Imagine...

Texas Boasts Net Zero School

By Scott Layne

"The word 'energy' incidentally equates to the Greek word 'challenge.' I think there is much to learn in thinking of a federal energy problem in that light. Further, it is important for us to think of energy in terms of a gift of life." Thomas Carr

Just imagine…a school designed and constructed to produce as much energy on site as that which is consumed from the electric grid. The electricity and gas bills would be 10% or less of that of a typical building; there would be no water bills for site and landscaping irrigation. What was merely a conceptual thought as little as five years ago is today a reality. This is due, in large part, to changing technologies associated with the production of renewable energies. In fact, as little as three years ago, the costs to provide equipment relative to the production of renewable energies would have exceeded the actual building construction costs, thereby making it unrealistic to consider this type of structure.

In March, 2010 Irving ISD began construction on its eighth middle school. The school, named after Lady Bird Johnson, will be a net zero school; that is, as much energy will be produced on site as what is consumed from the electric grid over a one-year period. It will be the first school of its type in the state of Texas. To the best of our knowledge, it will be the first net zero middle school and one of the largest net zero public schools in the country.

Renewable energy sources, such as solar, wind, and geothermal, will be produced on the campus. Solar panels will be used to harvest the power of the sun: free solar power…abundant solar power…simple…smart, and most importantly, sustainable. Wind turbines will be incorporated that will produce electricity, be an educational tool for students, and serve as a visible landmark for the use of renewable energies. Geothermal heating and air-conditioning will be utilized that will allow for the constant temperature of the earth's subsurface to adequately heat and cool the interior spaces.

Why net zero?

"I'd put my money on the sun and solar energy. What a source of power! I hope we don't have to wait till oil and coal run out before we tackle that." Thomas Edison

Compelling reasons to move to a net zero platform include the following…

…the environment. Global warming is an international concern. According to the Environmental Protection Agency, greenhouse gas emissions in the U.S. have risen by 17% from 1990 to 2007. A major source of demand for

energy and materials that produce greenhouse gas emissions is found in buildings. By constructing a net zero building, we believe we are doing our part to contribute to the reversal of this negative trend.

...the economy. In 2008, the U.S. spent over $475 billion on foreign oil. This is money taken out of our pockets and sent to foreign countries. Projected over the next 10 years the cost will be $10 trillion; the greatest transfer of wealth in the history of mankind. America imports 12 million barrels of oil a day; Saudi Arabia only produces 9 million barrels a day. So, what if most of that money and the jobs associated with it could remain in this country? The significant and positive impact this would have to our economy staggers the imagination.

...education. Studies have shown that a lower absenteeism rate via improved health of students and teachers will result through the reduction of emissions and the use of day-lighting. Studies have also shown that test scores will improve by as much as 14%. Locally, this project will save taxpayers millions of dollars over the life of the building in terms of energy and maintenance.

...and above all, this project defines a sustainable, healthy built environment and minimizes its carbon footprint and demand on our natural resources. That's a lesson timely fit for today's classroom and a target worthy of our best efforts.

Why not net zero on renovation projects?

In order to fully comprehend and appreciate the concept of net zero, one must understand that a major component for its success lies within the initial building design. Think about it: as much energy must be produced on site as what is consumed from the electric grid. So, higher initial building consumption results in more energy being needed and produced on location. The more that is produced on site, the greater the expense for the purchase of renewable energy production equipment.

With that in mind, the building must be designed and constructed to utilize state-of-the-art design standards relative to energy conservation. Less initial building load equates to less power being generated at the site, meaning reasonable costs for the purchase of equipment for the generation of renewable energies.

Highly efficient construction applications such as increased insulation values in the walls and roof, high efficiency LED lighting, daylight harvesting and light shelf applications, high-efficiency glazing, and wireless computer networks will be integrated into the design to ensure the net zero concept is achievable. All of these strategies are critical to reducing energy needs within the school, and significantly contribute to the end result of this building.

Why not net zero on existing structures? It's simple…cost. Most of our educational facilities were built during a period in which energy costs were not a major concern. In Irving ISD, the average building age is 36 years. This means, in essence, that the buildings were constructed based on *initial* costs and not energy conservation. To retrofit these buildings now to result in net zero energy consumption would be cost prohibi-

tive. Obviously, there are many things that can be accomplished to renovate a structure to be more energy efficient without attempting to gain a net zero consumption rate.

Why not net zero on all new projects?

There is only one reason, at this time, that a district would not construct all net zero facilities, and that is MONEY. In keeping with the same thought process of the retrofits, these types of buildings cost more to construct, not only in terms of upfront design considerations to make the buildings more efficient, but also in the acquisition of equipment to produce renewable energies. An increase of 15-20% in construction costs can be associated with this type of project. Listed on the chart are the sustainable design costs to date, relative to our Lady Bird Johnson Middle School.

As indicated in the chart, the district has calculated additional costs of approximately 15%. In time, the costs for the more efficient design applications and the use of renewable energies production equipment will decrease due to changing technologies. In terms of Return on Investment (ROI) of this type of structure, the chart on page 8 indicates the payback at approximately 10-12 years.

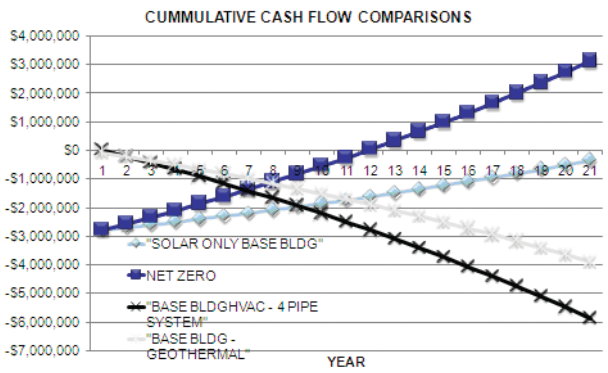
The most important part...the students.

"I believe that the U.S. can and should be a global leader in the development of alternative energy sources…"
President Barak Obama

A building of this type not only makes for long-term financial sense, but provides creative and meaningful learning opportunities for the students. Clearly, the paradigm will shift in terms of the pedagogical approach within Lady Bird Johnson Middle School. Students will be challenged to think beyond the horizon in order to create a future infused with hope ~ indeed, theirs will be an imaginative learning environment; in many ways, we believe we will be educating tomor-

Lady Bird Johnson Middle School

Sustainable Design Data		152,250 sf
	cost	cost per sf
Solar Array - 600KW array	$2,976,972.00	$19.55
Wind Turbines	$143,217.00	$0.94
12 Skystream wind turbines (approx $12,000 each installed)		
Geothermal HVAC	no additional cost	
Water Well	$277,194.00	$1.82
Water collection tank	$27,125.00	$0.18
collects water from roof and gray water at athletics		
Native landscaping/ bio swales	$3,000.00	$0.02
Increased building envelope		
Energy monitoring system - Convis	$265,000.00	$1.74
Monitors all energy used and produced		
Daylight sensor system		
Intergration into science curriculum		
Recycling centers - located throughout building		
Kitchen Pulper	$65,000.00	$0.43
Pulper $65,000/Full dish machine $28,000		
Energy Star Rated Kitchen equipment		
Sustainable interior finishes		
Paint, Carpet, rubber, wood		
Building components with recycled content		
Concrete, steel, interior finishes, ect.		
Recycling construction material during construction		
LEED Components		
LEED basic commissioning	$18,200.00	$0.12
USGBC LEED Registration	$450.00	$0.00
USGBC LEED Certification	$5,180.00	$0.03
Energy model	$9,800.00	$0.06
Construction Budget	$25,650,000.00	$168.47
GMP Approved	$29,407,559.00	$193.15
net zero design difference	$3,757,559.00	$24.68



row's energy leaders right here in Irving ISD.

From the time a student steps onto campus, the learning process begins. At the main entry to the campus, there will be a monitor that will display all energy consumption and production levels. Additionally, the design lends to learning nodes strategically placed throughout the building. Each of the two floors will contain nodes related to geothermal, solar, wind, and rainwater collection. A display area at each node will contain a cross-sectional view of the applicable equipment utilized for the building. As well, multiple interactive monitors will be placed near the nodes to provide live data of the applicable system as well as general information about the building.

When initially designed, the Board of Trustees had the foresight to look beyond the students residing within the building and insist the building become a learning lab for all students of the district. With that thought in mind, the architects placed a large learning lab, the Omni Room, at the front of the building. As various grade levels come to the building as a part of their science studies, demonstrations of the equipment will be provided in this room. Small groups of students will then tour the building and experience and interact with the various learning nodes. A stairwell with access to a roof platform will be provided to allow students to view the vast array of solar panels. As I consider the uniqueness of this new school, I cannot help but think of Walt Disney's famous quote that simply states: "Crowded classrooms are a tragic waste of our greatest national resource – the minds of our children." I'm certain he would be supportive of this concept!

Curriculum is being created to allow for all grade levels to incorporate the various green technologies into their applicable grade level. Students will learn through practical, hands-on experience; issues such as geothermal science, rainwater collection, solar panel usage, wind turbine efficiency, and recycling will be readily accessible. Students and staff will be educated on how to use the entire school as an extension of the classroom. In effect, the building becomes a three-dimensional learning space; learning environs are built into the very construct of the space. The students will learn, in effect, responsibility for energy conservation; in time, they will learn to become stewards of the environment, providing a cleaner world for future generations.

This project is a very big – and dare I say logical – step in the right direction. However, we have a long way to go: we must all work smarter to ensure future generations understand the importance of protecting our environment…in the hope that they will yet become better stewards of our environment. We, as parents, patrons, and planners of our communities, must lead by example. One Irving parent put it best when she said, "Creating the future of learning requires us to invest in the natural energy resources at hand. The return on the investment is beyond calculations or comprehension because it will continue to foster growth that is neither finite nor quantifiable. Using renewable energy for educational institutions means limitless opportunities for the generations to come…and my child certainly stands to benefit from the insight of the Irving ISD administration."

Today, this project is very unique and special. However, I hope that someday it's not so special and not so unique because it's the norm. It can and should become the norm…because it's the responsible way to build, to protect the environment, conserve our precious and limited resources and ensure that generations to come can enjoy this orb we call home. It can be done…we should insist on it, we should fight for it, and taxpayers should know that they are getting the biggest bang for their buck…not only measured in dollars and cents but also in student performance, health, and attendance. It's just the right thing to do. ■

Scott Layne

Scott Layne serves as Assistant Superintendent for Support Services for the Irving Independent School District. His main responsibilities include: maintenance, custodial services, environmental compliance, security, transportation, energy management, warehouse, food service, athletics, and construction. He has served as the District liaison for the 1997, 2001, and 2007 bond referendums. His career in public education began in the Katy Independent School District in 1982. A member of the CEFPI International Board of Directors, Scott serves as the Southern Region Representative.

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Corgan Associates, Inc. is the Design Architect and Architect of Record for the Irving ISD Lady Bird Johnson Middle school, the largest net Zero public school in the country. Corgan Associates, Inc. is an architectural and interior design practice headquartered in Dallas with offices in New York, Phoenix and Beijing; and project offices in Miami, Sacramento and Abu Dhabi.