

THE VIRTUAL BUILDING

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INTRODUCTION

The potential for industrial growth in Monroe County is unprecedented at the current time. The number of requests for information (RFIs) that have been sent to the county by TVA and TNECD in the past three years have been at an all-time high. Unfortunately, Monroe County has very few industrial buildings that meet the needs of potential prospects looking to locate in the county, and thus the county has been unable to respond to many of the RFIs. The few buildings the county does have are not very desirable for a variety of reasons such as lack of size, age of facility, and low ceiling heights. The county could consider building a speculative building, but it is not economically feasible nor a politically a smart move to build spec buildings in the hopes that the building would meet the needs of a prospective tenant. The county has over 2,000 acres of potential industrial land but no available existing buildings sit on any of the acreage.

Therefore, this capstone project will be focused on the use of virtual building concepts through the use of Building Information Modeling (BIM) as a tool which will allow the county to submit building options for RFIs which the county up to now has been unable to submit.. Monroe County is a rural area with limited resources. The virtual building concept should allow the county the opportunity to compete with more metropolitan areas that have better building resources from which to choose.

VIABILITY

Virtual buildings in the past have not been considered a viable source or as an option in marketing or recruiting industry. Times have changed though in our current technological age. Software programs exist that can help plan, design, and virtually construct a building. Architectural and engineering firms are now offering cost effective “virtual” building design packages that can include video and building/site tour narration in addition to building layouts, plans and timelines. Information from these virtual design packages can be placed on economic development websites and inserted in prospect RFI’s and presentations. City, Counties, Industrial Development Boards and other local agencies can pool financial resources to cover the costs which can typically range from \$20,000 to \$50,000 depending on the complexity of the design package.

TVA (Tennessee Valley Authority) is interested in the concept as well as the Tennessee Department of Economic and Community Development (TNECD). TVA and TNECD are interested in finding out if a virtual building program will enable communities without existing buildings to compete for projects for which they would otherwise be eliminated. “The need for virtual buildings is here. It only makes sense to offer another available option to compete in the building market”. “The concept needs to be advertised as an available building option. It’s a real way to compete” Aaron Stewart, Senior Program Manager, Rural Initiatives, TVA Economic Development.

At the current time, a community may be overlooked as a possible location for a prospect, when in fact the community may have all the required infrastructure within their industrial park and only lack an existing available building to satisfy a project's (company's) criteria. The virtual building concept could possibly give the community a chance to compete for the project.

The virtual building concept is more than just a piece of property that can have a building put on it. The concept gives the prospect the flexibility to build the building to meet the specific needs of the company's operation. Virtual buildings can be built to the prospect's specifications whereas existing buildings may have to be modified to meet the needs of the prospect. Allen Neel, with the East TN Economic Development Agency, states, "It is very rare to find an existing building that fits the customer's' needs without modifications". This fact is especially true with regard to ceiling heights, floor thickness, location and number of dock doors, and the location of the building on the property. The true potential for the virtual building concept is unknown at the present, but the concept, if viable and marketable, could be developed into a statewide program to help promote rural communities that lack available existing buildings.

THE NEED FOR VIRTUAL BUILDINGS

Monroe County is considered a Tier 3 "at risk county" by the Tennessee Department of Economic and Community Development standards. It is the fifth largest county in land mass in the state. The size contributes to the dispersion of population and the lack of resources within

the county. The State of Tennessee defines areas located outside of cities and towns as “rural”. Rural areas have low population density. Rural areas often have a lot of undeveloped land, farmland, or forest. Most of the land area in Tennessee is rural. Based on the 2010 Census, 93% of Tennessee is rural. 70 of 95 counties had at least 50% of their residents living in the 38,330 square miles of rural Tennessee [**http://www.tn.gov/ecd/section/governors-rural-task-force#sthash.pCyYeSAq.dpuf**](http://www.tn.gov/ecd/section/governors-rural-task-force#sthash.pCyYeSAq.dpuf).

Due to the rural location of Monroe County there is a significant lack of supply of buildings for rent, lease, or purchase. The industries located in the county have primarily built the buildings each one is housed in at the current time. There are currently thirteen expansions within these industries with no buildings to meet their specific needs. The land is available for these expansion, but without existing building option.

In the past three years Monroe County has been unable to compete for projects that required viable space to rent, lease, or buy as outlined in RFI (request for information) distributed by TVA and TNECD. Historical data shows the county received sixteen RFIs in 2014, fifteen RFIs in 2015, and 12 so far in 2016. The lack of existing buildings is costing Monroe County the chance to compete for these projects.

Many communities have built speculative buildings in past years, but building a spec building is not always the answer. For one, depending on the size and scope of the building, construction costs can range from \$750,000 to as much as \$2,000,000, and as mentioned previously there is a lack of funding availability. TNECD offers infrastructure incentives for new

and expanding industries, but there are no community incentive programs that provide funding for communities to construct spec buildings. In addition, there is no guarantee having a spec building will insure landing a project. While many communities have been successful in attracting an industry to locate in their “spec building” there are just as many communities which have a costly, empty spec building still waiting for a tenant. An empty spec building is certainly a potential asset, but unfortunately it can also serve as a constant reminder of the lack of jobs as well as perceived “money down the drain”. The virtual building concept would allow Monroe County to compete for “building projects” in a creative, cost effective manner.

COLLABORATION OF ENTITIES

Monroe County is trying to compete for industrial prospects with more urban communities such as Knoxville, Oak Ridge and Maryville. These communities tend to have more building options available to attract potential businesses and industry. In order to combat this problem, Monroe County and City governments have pledged their allegiance to work together to recruit potential industries into the county. The governments consist of the cities of Sweetwater, Tellico Plains, Vonore, and Madisonville as well as county government officials (Team Monroe County).

Team Monroe County has met and discussed the “lack of buildings issue” many times and believes the virtual building concept will enable the county to submit on more project RFIs and will increase the county’s chances to recruit a new industry and/or help existing companies

with their expansion plans. The Virtual Building Project in Monroe County is being spearheaded by the Monroe County Department of Economic Development and the East Tennessee Economic Development Agency. These offices will serve as a liaison between the entities and agencies involved in the creation of these buildings. The other entities will include the Niles Ferry Industrial and Design & Review Committee. This committee is in charge of the county owned industrial park and will decide which available lands will be used in these projects. As stated earlier the Tennessee Department of Economic and Community Development will support this project through any available incentives or grants that meet the criteria for help and TVA is interested in using this project in Monroe County as a possible pilot site for a case study on the viability of virtual buildings.

The local utilities in Monroe County that consist of Fort Loudon Electric and Sweetwater Utilities are also available and working to supply information for the utility needs for the virtual building project.

PREPARATIONS AND CRITERIA FOR THE VIRTUAL BUILDING

There are certain criteria that need to be put into place so that this idea can become a reality. The first criteria are the potential site has to meet certain regulation points before it can be qualified to market. The first of these points is the land or site must be located in an industrial park. Secondly, there would have to be a pad ready site in place that would include access to all major utilities to the site. (If this is not available or incomplete then the potential site would have

to be readied before being considered). The Tennessee Department of Economic and Community Development has established a reimbursable grant to assist communities in Tier 2 and Tier 3 counties with the preparation of sites through the Select Tennessee Certified Sites program and PEP Property Evaluation Program <http://www.tnecd.com/sites/certified-sites/apply-now#sthash.pc9NlReI.dpuf>. This grant is part of the newly announced Rural Economic Development Fund. Tennessee is investing \$6 million in a site development grant to aid eligible communities. This first-of-its-kind grant opportunity will transform economic development sites to shovel-ready status as part of the nationally recognized Select Tennessee Site Certification program. This grant provides funding for utilities, site prep, permits and other site specific criteria and will reduce construction timelines. The grant could be boost for virtual building concept because it will help reduce uncertainty. If the utilities are in place, permits have been completed, and the site is ready for immediate construction then the virtual building might be a more viable option for some companies.

In order to make the concept successful there will also need to be a team in place in the county that would market these buildings to prospective clients. This team would consist of among others a general contractor, civil engineer, an architect, geotechnical services, the utility companies, and state and federal agencies that have connections in the county.

WHAT IS A VIRTUAL BUILDING

The definition of the Building Information Modeling (BIM) is a digital representation of physical and functional characteristics of a facility. A BIM is a way to share knowledge resources for information about a facility forming a reliable basis for decisions during its life-cycle; defined as existing from earliest conception to demolition. Traditional building design is largely reliant upon two-dimensional technical drawings (plans, elevations, sections, etc.). Building Information Modeling extends this beyond 3D, augmenting the three primary spatial dimensions (width, height and depth) with time as the fourth dimension (4D and cost as the fifth (5D). BIM therefore covers more than just geometry. It also covers spatial relationships, light analysis, geographic information, and quantities and properties of building components (for example, manufacturers' details).

For the professionals involved in a project, BIM enables a virtual information model to be handed from the design team (architects, landscape architects, surveyors, civil, structural and building services engineers, etc.) to the main contractor and subcontractors and then on to the owner/operator; each professional adds discipline-specific data to the single shared model. This reduces information losses that traditionally occurred when a new team takes 'ownership' of the project, and provides more extensive information to owners of complex structures. This is the way of the future so that you can plan for what you need in a cost effective way. Monroe County has partnered with other agencies as listed to put these criteria in place that would bring the virtual building to a reality.



MARKETING THE VIRTUAL BUILDING

Virtual buildings in the past have not been considered a viable option to market as an available building. But times are changing with the advancement of these virtual technologies so that the specifications can be determined through the virtual building of the building. It is using this technology to not only see what the building will look like, to a tool used to sell a finished product that can be replicated on a site ready piece of property in a short period of time. Not only will this be marketed in Monroe County, but it can be used as a pilot site so that it can be replicated in other areas of the state. As I stated previously, TVA is interested in this project and the State of Tennessee already has in place guidelines for the use of BIM in state building

projects. TN.gov states the intent of these BIM standards is to provide for the consistent development and management of Building Information Models on state building projects. These BIM standards apply to Designers and their Consultants, and/or to Contractors and their Subcontractors, selected by the State of Tennessee Real Estate Asset Management (STREAM), the University of Tennessee (UT), and the Tennessee Board of Regents (TBR) for projects designated to use BIM. Additionally, these BIM standards may be voluntarily used by Designers, and/or may be voluntarily used by Contractors, working on State projects that choose on their own to use BIM and agree to do so according to the State's standards.

<http://www.tn.gov/finance/article/fa-osa-bim-standards#sthash.aeq9lASc.dpuf> (relevance?)

BENEFITS OF VIRTUAL BUILDING

There are several advantages to using this type of design. First is the improved collaboration and collective understanding of what is needed in the design of a specific building. It also allows for a coordination of the drawings and documents in one concise place. By doing this it will help with an improvement of the overall quality of the project. By having a core set of real time information that would be accessible to everyone involved in the project, time will be saved, communications will be improved and errors will be reduced that are caused by having conflicting information or out of date information from hard copy documents. This streamlined and cohesive approach will allow for better cost control and more efficiency of the supply chain management. This would allow for significant improvement in the efficient use of materials and

cut down on the waste of products, time, and labor. Aaron Stewart, TVA Target Market Specialist, states “The benefit of a virtual building is that the site is already prepared to go; minimal planning is needed; environmentally everything is complete; and the plans and the cost is optional with the flexibility to meet the needs”.

DRAWBACKS TO VIRTUAL BUILDING

There are drawbacks to this virtual building concept as well. Many companies do not want to commit to something such as an industrial building without having any real example to compare it to. But as stated previously Monroe County does not have an inventory of existing buildings. There is also the risk of the project not being completed on schedule and within budget. This risk is lowered by the improvement of the more efficient use of materials, time and labor by all involved. This in itself will help sell the project with a more efficient comprehensive collaboration of all involved. Site selectors may be hesitant to support this initiative, but as sites become eligible and meet the criteria for an approved site, and then this will be another option that has not been cultivated in the past.

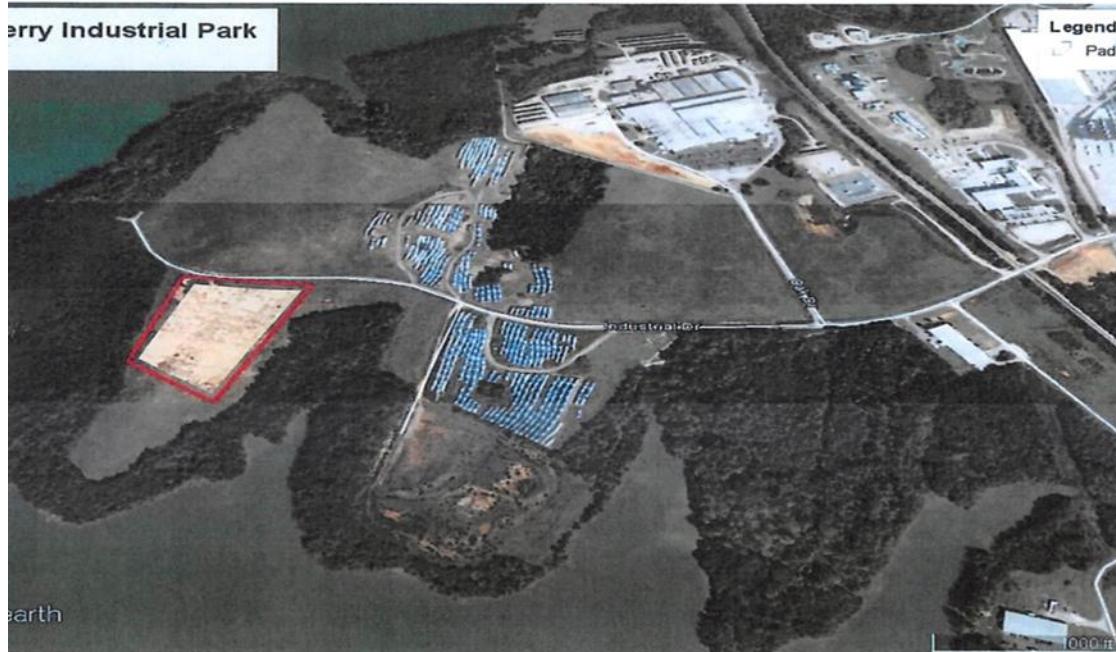
CONCLUSION

Monroe County is at a pivotal point in its economic growth. The county has numerous advantages that make it an attractive location for expanding business and industry. Monroe County sits in an ideal location between Chattanooga and Knoxville with distribution access to

interstates heading in every direction across the country. The region has excellent educational facilities (UT Knoxville, Chattanooga, community colleges, TCATs) as well as access to premium healthcare and two metropolitan airports (Knoxville and Chattanooga).

Regarding industrial land, many communities would relish having an industrial park like 75 Regional Commerce Park, a 160 acre industrial park that sits alongside Interstate 40 in Sweetwater. In Vonore, the Niles Ferry Industrial Park comprises 676 acres with ten existing industries in the park. The park is accessible by State Highway 411, and has rail access via CSX. Approximately 150 acres are prime industrial land is still available for industrial prospects.

(See below: Niles Ferry Industrial Park with pad ready site)



Monroe County is also Tennessee's largest boat manufacturing county in terms of both the number of companies and jobs. Boat manufactures can access Tellico Lake from the Niles Ferry Industrial which makes easy and convenient testing of the product. The regional boat manufacturing workforce is as skilled as any in the country. Monroe County's seven-county labor area has a labor force population of approximately 164,000. The current unemployment rate sits around 4.5%.

With all the positive assets previously mentioned, Monroe County still cannot compete for projects which require an existing facility. In order to solve this problem in a cost effective manner, Monroe County needs to be creative and proactive. The Monroe County Team believes implementing the virtual building concept will show potential prospects the county is both creative and pro-active as well as unified in their efforts.

With a ready and well-prepared team in place, industrial pad ready sites available for construction, and all permits completed, a prospect can rest assured their project will run smoothly and efficiently and can meet the project timeline. I fully support this program and what it can do to support our local counties to compete in the ever growing market". "Virtual buildings are a viable way to compete because you have already done most of the work for the prospect. Time is money" Gary Human, State of Tennessee, Southeast Regional Director TNECD.

It is time for Monroe County to think out of the box. Monroe County must come up with creative ways to compete in the market for potential growth and employment within the region. I

believe the virtual building concept is a creative and cost effective way for the county to offer building options to prospects interested in the area. My hope is that this project runs smoothly and eventually results in the successful location of an industry. My hope is, as well, that Monroe County becomes a pilot site for this innovative approach. As of today the initiative has been started with a group meeting consisting of several different agencies to get this project started. Some of these group and agencies represented were TVA, State of Tennessee Economic and Community Development, East Tennessee Economic and Community development, MBI Architectural Firm, Joseph Construction, Fort Loudon Electric Cooperative, as well as local government officials and me, Bryan Hall. I am excited about the positive possibilities and outcomes for the virtual building project and thank you for the opportunity to submit my Capstone paper.

(Please see attached requirement sheet listed below).

Site Requirements:

- In a publically owned industrial park or under contracted option with set sale price
- Specific site identified
- Pad ready
 - Site should be in a marketable position and in a controlled environment, meaning, the proposed building footprint (and conceptual support aprons, parking lots, and roadways) should be cleared of vegetation and maintained accordingly and development should be easy to conceptualize, ◦ The building footprint should at least be rough graded flat, ◦ Site of sufficient size for proposed building and parking
 - SOC communities allowed to have engineering plans and recent/updated cost estimate
- Site large enough for multiple variations of the building (i.e. - options for expandability)
- Pre-permitted
- Utilities to the site or reasonably close
 - Delivery of construction level utilities immediately and permanent utilities within 9 months from an announcement. This would include having all Easements secured and ready for construction.
- Utility specs
 - Gantt chart and cost estimates for extensions if necessary
- Major site studies completed such as environmental, geological, etc.

Proposed Industrial Building Requirements:

- Best possible location on the site regardless of cost
- Consider a minimum building size and ability to double.
 - Not less than 100,000 SF for rural counties (unless community can prove their market is less than 100,000 SF ◦ Not less than 50,000 SF for SOC counties
- Lease and/or Purchase options
- Pre-Permitted
- Building Footprint and Layout (CAD)
 - Maybe 2 or 3 layout options
 - Building type, walls, roof
 - Power service, HVAC placement
- 30' min. eave height (or according to local restrictions)
- Column Spacing
 - Open-span
 - A client can be told the cost would go down by X if a column construction alternative were chosen.

- Docks
 - No less than two dock-high per 50,000 SF with the ability to add more.
- Utility placements
- Parking
- Expandability - two directions are preferable
- Office space location
 - Plenty of space to add exterior office in case the office need is large
- Construction time / Occupancy, including additional site prep
 - If the building footprint will require mitigation, I would advise choosing another site or doing that mitigation now, where possible.
- Building rendering, photos or 3D computer generated.

RESOURCES

[http://tn.gov/health/article/healthy-places-rural-areas#sthash.HIL1wcRr.dpuf.](http://tn.gov/health/article/healthy-places-rural-areas#sthash.HIL1wcRr.dpuf)

<http://www.tn.gov/ecd/section/governors-rural-task-force#sthash.pCyYeSAq.dpuf>

<http://www.tnecd.com/sites/certified-sites/apply-now#sthash.pc9NlReI.dpuf>

<http://www.tn.gov/finance/article/fa-osa-bim-standards#sthash.aeq9lASc.dpuf>