TVC Systems is Proud To Be Here At UNH

- We are proud to have been selected by EMCOR as a part of the UNH CHP construction team
- We are proud to have worked with all of the members of the team who made this complex project come to life
- We are proud to be a part of the UNH CHP support team

We Would Like to Mention the Principal Members of That Team

- EMCOR
  - **In particular Tom Pace and Brad Larrabee – EMCOR's project management team who led all of us to a successful completion**
  - O&G Industries-Site and Building
  - JC Higgins-Mechanical
  - Keystone-Code Mechanical
  - Mass Electric-Electrical
  - Bruce Thurston-Startup & Commissioning Engineer

We'd Like to Offer You Our Observations On How You Might Facilitate an Efficient and Trouble Free Design and Build of Your CHP Project

How to avoid the perils of construction
and to take the important steps
that will result in a project that works
as it should on time and within budget

Let Me Give You TVC Systems Qualifications

- Thirty-five years in the Industrial Control and Information Systems business
- Nearly twenty-five years of experience in CHP, DP and alternate fuel projects
- Nearly twenty projects from 500 KW to 240 MW; 10K lb/hr to 600K lb/hr of steam
- A unique prospective because we are, by reason of our tasks, the last construction phase company on the project
- We are very actively involved in startup and commissioning so we tend to find out what went well and what didn't
- We stay until everything works. This can unnecessarily be a very long time if the project is not put together well

Projects That Don't Go Well Frequently Have One or Perhaps Several of the Issues Listed Below In Common

- ***Unrealistic Schedule***
  - If the time is insufficient the end cost will be high and the completion very difficult to reach
- ***Little or no Project Methodology or Plan***
  - If you don't have a method and a plan you won't have a project that is on time, that works as it should or is within budget
- ***Unrealistic Budget***
  - If money is budgeted or spent unrealistically the results are costly
- ***Lack of Care in Selection of the Engineer of Record***
  - The engineer begins the process and sets the stage for success
- ***Lack of Care in Selection of the Project Construction Team***
  - Randomly taking the low bid of all the trades without prequalification won't help make the project a success from any standpoint
- ***Weak Project Management***
  - A weak project manager is akin to a weak conductor of a symphony orchestra, nothing plays together

Schedule Realistically

- Set and hold a realistic start date as well as an end date
- Compressing the time to perform the work will lead to problems that may take a long time to fix and budgets that are overrun
- The old saying "Time is money" certainly applies here

Have a Well Thought Through Project Methodology and Plan

- A solid project methodology for your construction project is essential
- A strong plan for project implementation must be in place before the job is bid
- Criteria for selection of key components and players has to be established
- Permitting and major equipment selection and deliveries must be established well before construction begins
- A firm start and end date must be established and held to

Establish a Realistic Budget

- The cost of major equipment is easy to obtain, and frequently a lot of the budgeted money is spent here without regard to funding of the remainder of the project
- Cost of construction is much more difficult to establish accurately and much harder to budget, leaving it frequently under-budgeted so that the project runs into financial shortfalls when it reaches the construction phase
- This leads to taking the lowest possible bids in construction, without qualification, and cutting corners in this essential area

All Engineering Firms Are Not Qualified for All Projects

- Not a great many engineering firms in this area have the necessary extensive experience in construction of CHP, DP or alternate energy plants
- Many have Building Automation System experience, which ***is not*** a qualifier for expertise in CHP/DP
- Some of those who do have the appropriate CHP/DP experience lack the necessary resources to properly perform some projects
- Make certain that you buy an engineering and design package with enough information at the start of the construction phase for the construction team to perform the project
- Do not rely on the engineer to be totally responsible for the control of the plant
- Price should not be a first criteria
- ***Experience is very close to everything***

The Construction Team Matters

When John Glenn was asked what went through his mind when the first sub-orbital rocket left the ground his answer was

"Everything in this thing went to the low bidder"

He lucked out, it worked

- The low bidder is not always the least expensive way to get your project done
- Experience and qualifications should be the first consideration in bidder selection
- Construction is a cooperative effort not a competitive sport - A good construction team works as a team
- The team that has worked together before works better on your project than a randomly selected group who have not worked successfully together on past projects

Your Project Manager is of Prime Importance

- *Your Project Manager* is the leader of the band
- Again - ***Experience counts for nearly everything***
- *Your Project Manager* should be the great coach who makes the construction team a winning team because they play as a team
- When things get tough (and they do on every construction project) *Your Project Manager* is the one who finds a way to pull the team together and make things happen
- Take a lot of care in the selection of *Your Project Manager*, monitoring and listening closely and carefully so that you can get the help he/she needs when needed
- Give *Your Project Manager* the latitude to make the decisions that must be made in a timely manner

Here's What Happens When You Get The Right Plan and The Right Team

- You have the right plan to realistically perform the project on time and within budget and it all works at the end
- You have enough money budgeted in the right areas to select the right equipment and right players to do the project right
- You have an engineer who is experienced and dedicated to the job and is equipped and staffed to give you everything that you need to do the project right from the beginning
- You have the right construction team with the experience to make it happen and will work seamlessly together to that successful end
- You have the right person with the right experience in project management to make certain the construction phase is on time, within budget and trouble free
- You have the right CSI to make all the pieces play together at the end like a well tuned orchestra
- ***You have a successful project that is on time, within budget and most importantly - Works as it should at startup!!***

Remember It's A Critical Process

Not An Office Building

- Use engineering, hardware, software and a construction team that has experience in and understands the critical processes of CHP projects and their control
- You will experience both monetary and functional problems if the project is approached, designed, budgeted, bought and built as and by those whose area of expertise is in Building Automation Systems
- BAS engineering, equipment and construction techniques have their place and time, but ***not*** in critical real time process control applications

Lastly –
If You Noticed That I Used The Word
Experience
Frequently - It Was On Purpose

- Let's take look at the big, well established companies who are no longer in the energy services business
- Keyspan, Select Energy & Sempra to name but a few who were great companies with lots of operating experience who failed in the construction of CHP and DP plants when they went into the energy services business and began to build and operate this type of plant
- To a large degree they failed because of lack of construction and small plant operations experience
- **EMCOR has survived because of construction and operation experience on the appropriate level**

Absolutely nothing beats
EXPERIENCE
on the road to success

A Little More About
How to Get The Best from
Your Control Systems Integrator

- Conventionally, the Control Systems Integrator (CSI) bids the project with construction trades and low bid takes the job
- While this may work for the construction trades on some projects you may not be getting the best value for your dollar using this method of selection of the CSI
- The tasks of the CSI and the trades differ markedly
- Here's how and why -

Here's How
the Trades Work

- As part of the construction package, the Construction Trades get detailed plans and specifications. If the design engineer did his job right, there is very little or no system engineering for them to do
- The Trade Contractors use government certified workmen, called masters and journeymen to perform their work. Excepting consideration of similar project experience, ***which I don't mean for you to take lightly***, this levels the playing field to a significant degree between trade contractors
- Nearly all Trades work is performed on site on materials delivered to the site

The CSI on the Other Hand

- Conventionally, the CSI's construction package consists of a Process and Instrumentation Diagram (P&ID) and some Instrument Data Sheets, and sometimes a written specification, with widely (and sometimes wildly) varying detail
- The CSI then begins to perform the engineering that will become the control system. This effort initially involves development of a Functional Spec, Sequence of Operations and System Architecture drawing to fully describe the control system, and continues into panel layout and point to point drawings, with a submittal and approval process each step of the way
- The CSI must knit communications protocols to and from all of the major equipment control systems and all of the Balance of Plant control requirements into a single, unified control system
- The CSI must build the control system to acceptable standards
- The CSI must be responsible for the functionality and communication of the field instrumentation
- The CSI must Factory Test the system to make certain that it works before it is installed (always near the end of the project) so that startup and commissioning go as smoothly as possible
- Ninety percent of the CSI's work is performed in their offices and shop
- If done properly, ten percent of the CSI's task is performed in the field

Resulting in a Big Difference In Task and a Big Difference in Skills Required

- Since the CSI's tasks are to a large extent engineering, the method of selection of the CSI should be similar to that of the method of selecting the engineer of record
- Since the CSI has requirements to not only engineer but to build and test as well, their capability to do this **in house** should be part of the evaluation
- Since the CSI needs to connect all of the pieces of the plant into a single control system, they need to be included in the review of vendor offerings to assure proper communication is available between all subsystems
- Since the CSI needs to connect to and interface with the control systems field instrumentation, they need to have a large role in their selection, purchase and installation
- Since the CSI depends on the trades to install the control system, they need a role in close supervision of installation to assure smooth startup and commissioning

The CSI's Tasks are Obviously Very Different from Those of The Trades

- The CSI performs a substantial amount of engineering
- The CSI needs to review all major components for communication compatibility
- The CSI performs most of its work off site in a specialized shop which, for quality considerations, they should control
- The CSI needs to fully pre-test both the hardware and software before shipment to site
- The CSI needs to assure the appropriateness of the field control instrumentation
- The CSI needs to assure installation of system
- The CSI is the last major player on the job who must make everything play together
- The CSI is as unhappy as you are when it doesn't work because they can't get off the project and on to the next one!

So Where Does The CSI Fit Strategically?

- In the design phase reviewing engineers field instrumentation specifications
- Reviewing major equipment purchase specifications
- Reviewing major equipment submittals
- Building and testing the control system in a UL 508A shop
- Supervising electrical and mechanical controls installation
- Calibrating instrumentation furnished by the major equipment manufacturers when necessary
- Working closely with the startup engineer
- Working closely with the commissioning agent

What You Should Look For In CSI Qualifications

- CSIA Certification –The only recognized certification of CSIs (see www.controlsys.org for details)
- A lot of demonstrated experience in CHP, DP and alternate energy projects
- The capacity and staffing to perform the project within the schedule
- A UL 508A shop in house to meet local and national code requirements
- Ability to completely “hard wire” to “burn in” and factory test not only software but the panel components and wiring as well, prior to shipment to the field
- Ability to provide, in house, shop and field calibration capability
- Has, on staff, a journeyman or preferably a master electrician with substantial I&C experience to supervise the installing contractors
- Has demonstrated 24/365 support capability – so you are assured that you can find help when you need it
- Has periodic maintenance support capability

A Happy Ending

- If you follow the simple suggestions outlined herein, you will wind up with a successful project that is on schedule, within budget and operates as it should for a long, trouble free life
- The plant will begin to give you the return you counted on at startup and continue for years to come