• DTE Energy (NYSE:DTE) is a Detroit-based diversified energy company involved in the development and management of energy-related businesses and services nationwide. Its operating units include an electric utility serving 2.2 million customers in Southeastern Michigan and a natural gas utility serving 1.2 million customers in Michigan. The DTE Energy portfolio includes non-utility energy businesses focused on power and industrial projects, natural gas pipelines, gathering and storage, and energy marketing and trading. As one of Michigan's leading corporate citizens, DTE Energy is a force for growth and prosperity in the 450 Michigan communities it serves in a variety of ways, including philanthropy, volunteerism and economic progress.

• DTE Energy has more than 10,000 employees in utility and non-utility subsidiaries involved in a wide range of energy-related businesses. The company's growing non-utility businesses are built around the strengths, skills and assets of DTE Energy's electric and gas utilities.
DTE Energy Operating Units

Utility Businesses:

- **DTE Gas** – 1.2 million customers in Michigan, founded in 1849, service area throughout the upper and lower peninsulas
- **Citizens Gas** – Small natural gas utility serving customers in portions of Michigan’s Lenawee County
- **DTE Electric** – 2.2 million customers in Michigan, founded in 1903, service area in the eastern portion of the lower peninsula

Non-Utility Businesses:

- **DTE Biomass Energy** – Capture of landfill gas
- **DTE Energy Trading** – Energy sourcing solutions, management of gas transportation, storage, and power generation assets
- **DTE Gas Storage** – 90 Bcf storage connected to Vector and DTE Gas
- **DTE Pipeline Company** – Manages gas transmission pipelines (Vector, Millennium, and Bluestone Gathering)
- **Power & Industrial Group** – Industrial Energy Services, Renewable Energy, and Environmental Controls
- **Midwest Energy Resources Group** – Coal handling services
DTE Gas Pipeline System

- Upper and Lower Peninsula of Michigan:
  - 2,500 Miles of Transmission Pipeline (300 psig to 1,800 psig)
  - 125 Gate Stations
  - 8 Compressor Stations (40 Compressor Units, 117,000 Hp)
  - 4 Utility Storage Fields (141 Bcf of Storage Capacity)
  - 19,000 Miles of Distribution Pipeline (300 psig or less)
  - 1.2 Million Customers
Bluestone Pipeline System

- States of Pennsylvania and New York:
  - 45 miles of transmission pipeline
  - 2 delivery interconnects (Tennessee Gas and Millennium Pipeline)
  - 2 mainline compressor stations (11 compressor units, 22,000 Hp, remotely controlled)
  - 4 Central Delivery Points
  - Capacity to move 975 MMcf of production gas to market each day
Control Room is staffed 24 hours per day, 7 days per week, 365 days per year.

3 Controllers work from 7:00 AM to 7:00 PM (Day Shift)
- 1 Controller works the Southeast Area (Storage and Southeast Michigan)
- 1 Controller works the Greater Michigan Area (Upper Peninsula and Northern Lower Peninsula)
- 1 Controller works the Bluestone Pipeline

2 Controllers work from 7:00 PM to 7:00 AM (Night Shift)
- 1 Controller works the Southeast Area
- 1 Controller works the Greater Michigan and Bluestone Areas
In the years proceeding 2011, there were a number of pipeline incidents across the country that resulted in large financial losses, personal injuries and deaths.

In response to the accidents, of which controller fatigue, incorrect SCADA displays, and alarm management played a part, the Pipeline and Hazardous Materials Safety Administration (PHMSA) created regulations regarding Control Room Management / Human Factors. The rule went into effect on August 15, 2011.

The rule covers ten specific areas:

- Develop a CRM Plan
  Required in 2012 & 2013

- Define Roles & Responsibilities of Controllers and Management during normal, abnormal, and emergency operations

- Provide Adequate Information to Controllers through SCADA Displays, Point to Point Verification, and shift change

- Alarm Management
  Workload studies, review of safety related alarms, points taken off scan or inhibited

- Change Management
  Process of identifying and informing Controllers of hydraulic changes, alarm limit changes, etc.

- Fatigue Mitigation
  Identifying Controllers too fatigued to perform their job, providing fatigue countermeasures

- Compliance & Deviations
  Documenting deviations from plan with explanations as to why they were necessary

- Operating Experience
  Training on actual events and why they happened both in our own company and nationwide

- Training
  Providing adequate training on procedures, emergency response, abnormal operating conditions, system hydraulic configurations

- Compliance Verification
  Submitting required documentation to PHMSA
Issues with Previous Control Room Layout

- The Control Room was “retrofit” into an existing space when there were only two Gas Controllers and a Manager (area shown is about 1,900 ft²)
- The small table was our meeting space
- Training facilities were limited to two computers that we “shoehorned” into a corner and along the wall
- Manager, Supervisor, CRM Engineer (and at one point Director) were all stationed within the Control Room
- Bluestone console layout was different than the other two consoles and was not sit/stand
- All dialog or phone calls could be overheard by Gas Controllers, creating distractions for them
- All visitors and guests of management had to enter the Control Room in order to conduct their business
- Restrooms were located outside of two locked doors creating a potential issue if the Controller forgot to take their badge for re-entry
- Control Room was located on the 16th floor, which provided excellent physical security, however, created egress issues in the event of an evacuation
Goals for New Control Room

- DTE wanted a professional look and feel to the new space, so we retained the services of a Control Room design firm when the decision was made to build.
- Firm had designed several other Control Rooms for other Utilities and Pipeline Companies and had several great ideas we incorporated into our new facility.
- Major features that DTE needed within the new area included:
  - Space, space, and more space!!!!
  - Separate office space for management
  - A dedicated training room
  - A dedicated conference room
  - Enough space within the Control Room for potential future expansions, if needed
  - Location, location, location – needed easier egress from the facility, yet did not want to sacrifice the physical security afforded by our previous location

- So, the first step was to find a location that was big enough for what we needed and secure enough to also fit our needs……
Reducing Distractions within the Control Room

- One of our goals was to provide the Controllers with more space and less distraction than they had in the previous Control Room layout.
- Control Room manager, SCADA and measurement manager, and director are located outside the main Control Room. No visitors need to enter the Control Room in order to meet or visit.
- Conference and training rooms are located outside of main Control Room, allowing meetings and training to occur without creating distractions within the Control Room.
- Supervisor and CRM Engineer are still located inside main Control Room, however, they are located far enough from the Controllers as to not provide a distraction.
- Also purchased Bluetooth headsets for all phones (Controllers and management), so that speaker phone conversations are minimized.
Training Room

- Designed a new training space, separate from the main Control Room
- Training room was included to have a space for the installation of simulator software (improvement to Controller training)
- Training room will have identical corporate and SCADA computer setups to actual Control Room
- Training room is designed for up to two Controllers to train simultaneously
- Space is also available for a moderator, if necessary
- Training room includes a smaller version of the display wall that is in the main Control Room
• Conference room was designed with a glass wall between itself and the main Control Room
• The glass wall is bowed out slightly into the Control Room
• The glass is “snap glass” which can be changed from cloudy which is not able to be seen through to….
Conference Room (Continued)

• …clear with the flip of a switch
• Conference room was designed with this feature for two reasons
• First, the room can be a gathering area / “war room” for emergencies / incidents
• The room is equipped with modern phone and video phone systems
• TV inside the conference room is linked to the display wall inside the Control Room, which allows SCADA displays to be shown on the TV monitor
• Second, during tours, people can see the entire control room without going inside and creating distractions for the Controllers
The Control Room was designed for five fully functional and identical work consoles (eliminating differences in the Control Room console layout).

Three of the consoles are for the Controllers on shift and the two additional work stations can be used for point to point verifications or other work that requires SCADA and/or corporate computers.

The Control Room was designed with enough space for up to two additional consoles if necessary (future expansions), all power and cabling is already in place.
Control Room (continued)

• Installed a 5x3 display wall with four side TVs, that allow space for news, weather, and SCADA displays to be shown simultaneously and interchangeably

• Each console has a work table attached for laying out large maps, prints, or books. Gives the Controller space to layout materials without cluttering up the console area

• Each console is sit/stand, with environmental controls (lighting, heater, and cooling fan), allowing each Controller to customize their immediate environment and reduce fatigue
Kitchen features a dining area away from the consoles for small breaks but still maintains the capability to see displays on the wall board as well as talk to other Controllers.

Fatigue mitigation measures now have their own space. We have a stationary bicycle, and a treadmill that will have a corporate computer. Other measures include small weights, exercise bands, and sitting balls that work the core muscles.
Emergency Egress

- In the 16th floor Control Room, if there was a fire or evacuation siren, everyone on the floor except for the Gas Control Manager and Controllers would line up by the emergency exits and await further instructions. Gas Controllers would not evacuate until a real emergency was declared.
- If we were required to actually leave the facility, over 1,000 people would have a head start on us exiting down 16 flights of stairs. The emergency evacuation route away from our campus also could create traffic jams that could interfere with our ability to exit the parking structure, potentially slowing the Controllers from reaching the Backup Control Center.
- Since the new Control Room is located on the first floor, no stairs are required, once the emergency is deemed real, Gas Control can initiate our evacuation procedure and exit the facility immediately.
- Controllers have access to the Director parking area on nights and weekends which is located about 5 minutes outside of Gas Control. Controllers could evacuate Gas Control and be out to their cars within minutes. Gas Control’s evacuation route is not affected by the evacuation of the remainder of the buildings in the complex.
- During the week, dayshift Controllers have access to parking across the street from our complex, again away from the main evacuation route for the other employees.
- DTE is working through the logistics of providing the Gas Controllers with 24/7 access to the Director’s parking area, but there are currently space issues that need to be addressed.
Questions