

Connecticut Clean Cities Future Fuels Project

Clean Cities Recovery Act: Vehicle & Infrastructure Deployment

2011 DOE Vehicle Technologies Program Review

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This presentation does not contain any proprietary, confidential or otherwise restricted information.

Overview

Timeline

- 1 February 2010 start
- 31 January 2014 end
- 43% complete
(31 March 2011)

Budget

- \$29,497,104 Total
 - \$13,195,000 DOE
 - \$16,302,104 Recipient

Barriers

- Lack of available AFVs and AF infrastructure
- Lack of consumer acceptance due to lack of widespread education

Partners

- GNHCCC – Lead
- All CT Clean Cities Coalitions
- State and Local Governments
- Private Industry
- Utilities and Non-profits

Project Objectives – Relevance

Utilize a “System of Systems” approach to development and deployment efforts which will enable the state of Connecticut to leverage the work completed under the *Connecticut Clean Cities Future Fuels Project* to tackle the two primary barriers identified in the state: lack of available AFV’s and AF infrastructure and lagging consumer acceptance of AFV’s.

- Create new jobs in the state of Connecticut and to a lesser degree in other states which host supporting organizations of the project work
- Contribute to the retention of existing jobs, especially in Connecticut and down stream at the manufacturing level (both in and out of state)
- Spur short-term and long-term economic growth through the strategic deployment of multiple commercial fleets in high visibility locations and public access Alternative Fuel stations, creating cost savings for local companies which in turn will spur corporate growth and new job creation
- Utilize existing collaborations and engage in new collaborative partnerships during the project work that will allow Clean Cities to leverage the in-project investment by the USDOE and Project Partners to continually increase the use of Alternative Fuels through fueling capability at the 5 public access stations included as part of the project work

Project Objectives – Relevance

- Install new infrastructure or upgrade existing infrastructure that will support operation of Alternative Fuel and Advanced Technology Vehicles throughout the state of Connecticut
- Deploy Alternative Fuel and Advanced Technology Vehicles throughout the state in direct response to the Clean Cities mission of reducing petroleum use, increasing fuel economy and reducing emissions
- Ensure that vehicles capable of using alternative fuel do so to the greatest extent possible through the increase of fuel availability and public awareness campaigns
- Provide training for operators, 1st Responders and the general public as appropriate regarding the benefits of AFV's and Advanced Technology Vehicles, contributing to greater acceptance and ultimately to increased utilization
- Engage diverse strategies to accomplish the greatest degree of public awareness exposure (and subsequent acceptance) for Clean Cities, Alternative Fuels, Alternative Fuel Vehicles and Advanced Technology Vehicles throughout the state primarily with regional and national reach being a secondary consideration in these task efforts, contributing to acceptance and greater levels of technology adoption by fleets and individual consumers
- Report on the success of the project through collection of vehicle, infrastructure and training information and disseminate to appropriate agencies and organizations to further the process of educational transition among relevant target audiences.

Overall Project Approach

- Statewide project approach engaging all 4 USDOE designated Clean Cities Coalitions in the state for the first time in state history to deploy 286 Alternative Fuel and Advanced Technology Vehicles which will fuel at one (or more) of 10 individual locations across the state.
- Multiple Co-PI's representing multiple disciplines required for successful completion of the project work and leveraging existing Clean Cities networks within the state
- Compartmentalized contracting system allowing for microscopic monitoring of progress including schedule and budget – without additional personnel resources to accomplish this level of progress monitoring
- Contractual reporting requirements tied to Internet based repository, resulting in savings of time and money for submissions, reduces labor requirements to create digital archives of audit ready records as all submissions are easily traceable and digital upon arrival

Overall Project Approach – *continued*

- Strategic geographical locations chosen for fueling stations and fleet deployments to maximize fueling capability, vehicle class, fuel and application – combined to offer in-state examples of the varied offerings in the arena of Alternative Fuels and AFV's
- Potential NEPA issues considered during program development process and no projects – stations or fleets were chosen for this “shovel ready” project that indicated long delays to address requirements of the NEPA. 100% of project vehicle NEPA's have been approved by DOE and 90% of fueling station NEPA's have been approved at the time of submission (remaining NEPA submitted to DOE in March 2011 after finalizing site agreements and no issues were apparent that would indicate delay)

FUELS and VEHICLES General Approach

- Fuel neutral approach –
 - 5 fuels;
 - 10 locations;
 - 5 public access stations;
 - Major corridor ease of access for all public sites;
 - Ensures capability for statewide and regional mobility using Alternative Fuels
- Fueling capability for the largest public transportation fleet of Hydrogen buses on the East Coast traveling over 200,000 miles per year in and around the Greater Hartford and Greater New Haven areas of the state
- Fleets and Fueling for three large commercial operations, representing 238 of the in-project vehicle deployments – representing 15 Million Miles Traveled Annually on busy Connecticut Highways and Interstates



Vehicles – Approach

Strategic diversity with regard to fuel, application, vehicle class and geographic placement in the state ensures statewide mobility for >90% of the in-project deployments and increases future fuel load additions in this ARRA project funded through

the DOE Vehicle Technologies Program

- 12 fleets (3 fully deployed, 3 fleets partial deployed)
- 5 Fuels – CNG, LNG, Hydrogen, B20 and Electric
- 5 Applications: Public Transportation, Municipal Fleets and 3 different Commercial Operations
- 3 Classes: Light, Medium and Heavy-Duty Vehicles
- 10 Zip Codes: Geographic diversity of locations, primary focus on heavily congested, high visibility areas – all positioned on or near Major Corridors



28 Heavy Duty AFVs



8 Medium Duty AFVs



248 Light Duty AFVs



2 Light Duty Hybrids

286 Vehicle Deployments

Fueling Approach/Locations

COMMISSIONED/OPERATIONAL

- Bridgeport- 1 LNG/CNG Station **P**
- Norwich — NPU; B20, efficiency upgrade to existing CNG Station **P**
- Meriden- 1 CNG Station

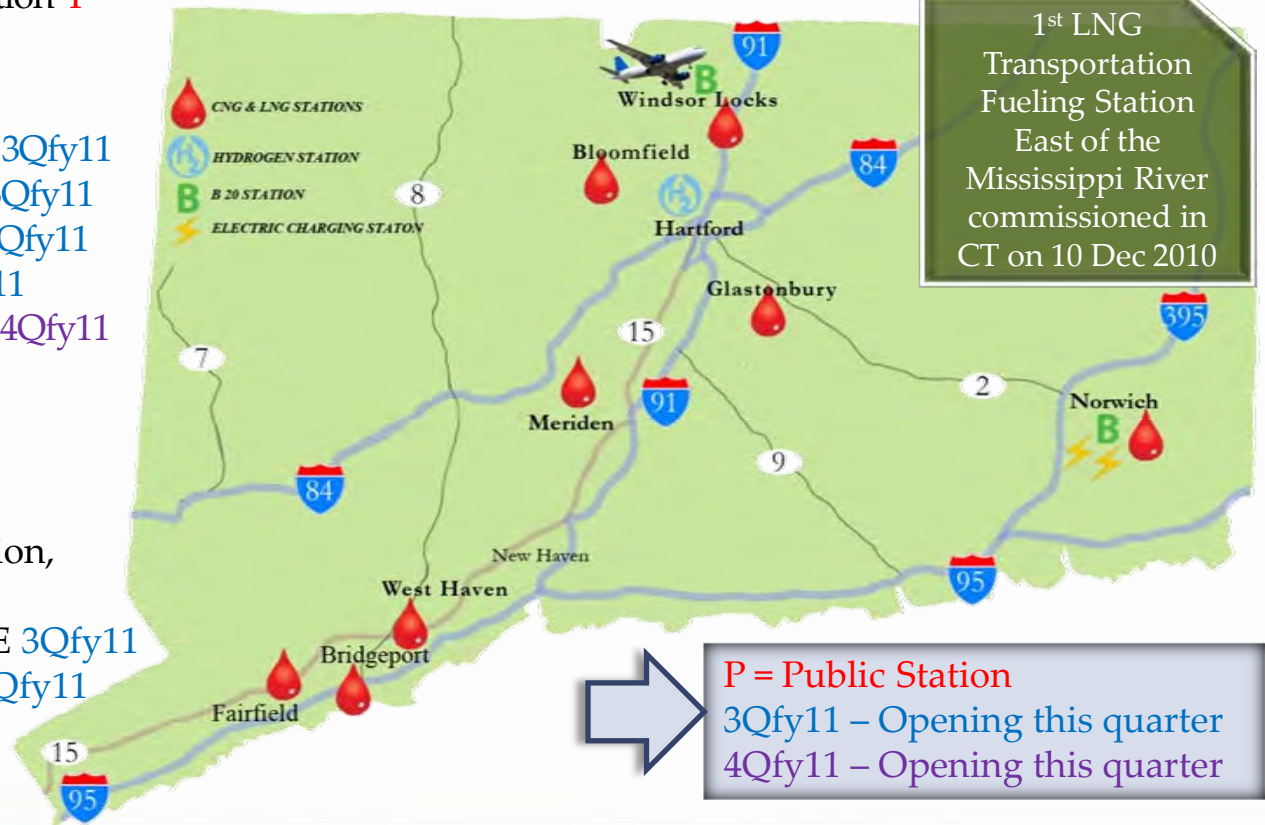
UNDER CONSTRUCTION

- West Haven- 1 CNG Station **P** 3Qfy11
- Bloomfield- 1 CNG Station **P** 3Qfy11
- Glastonbury- 1 CNG Station 3Qfy11
- Fairfield- 1 CNG Station 3Qfy11
- Hartford- 1 Hydrogen Station 4Qfy11

FINAL PLANNING And CONSTRUCTION BEGINS 3Qfy11

- Windsor Locks- 1 CNG Station, 1 EVSE, and 1 B20 **P** 4Qfy11
- Norwich — CMEEC; 2 EVSE 3Qfy11
- Norwich — NPU; 8 EVSE 3Qfy11

Fueling Installations located on or near major corridors with Public Access stations positioned along heaviest traveled roadways



Outreach/Education/Marketing/Training

Multiple approaches planned and implemented to reach target audiences with factual information about Alternative Fuels, Alternative Fuel Vehicles and Advanced Technology Vehicles as well as the benefits and availability of them. The *Connecticut Clean Cities Future Fuels Project* actively uses the following to accomplish the greatest levels of exposure to key target audiences and the general public:

- Website
- Multiple Social Media Platforms
- Public Events focused at local and statewide levels
- Local and Regional Media, including:
TV, Radio, Print and Internet publications



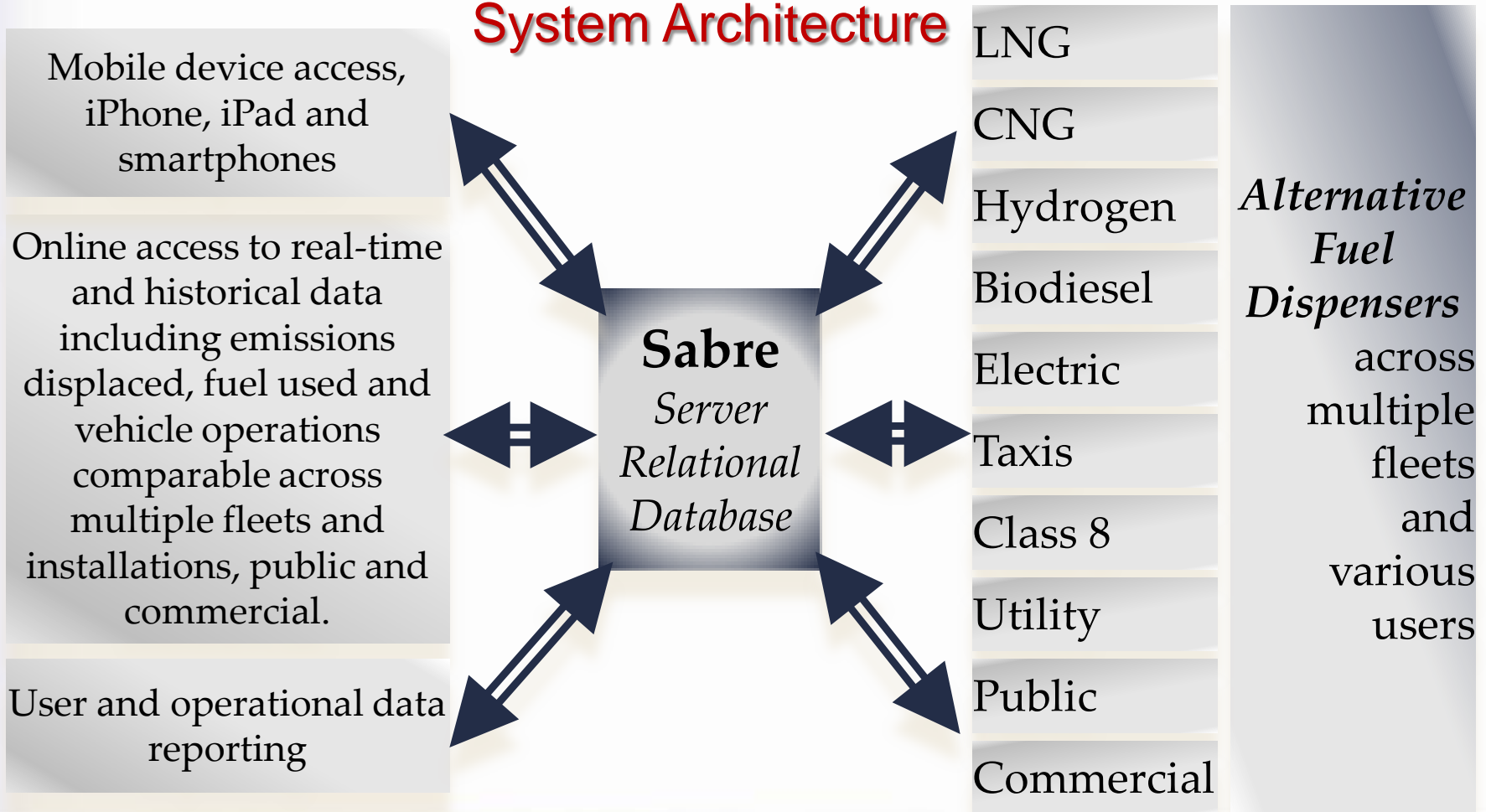
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Outreach/Education/Marketing/Training

- Target groups stakeholder expansion (public/private fleets, local governments, First Responders, State Fire Marshal, etc.) to cast a broader net for exposures, possible adoption of technologies and fuels, training and safety – all leading to greater levels of understanding and ultimately increased utilization of Alternative Fuels, AFV's and Advanced Technology Vehicles
- On-site or digital tours of Alternative Fuel stations and fleets for educational groups, fleets, planners, policy groups and other relevant groups
- On-line access to videos of training sessions conducted during project to allow refresher courses, easier training of new hires, showcasing ease of use and safety of AFV's and their fueling stations to potential adopters of these technologies
- Semi-automated data collection will reduce risk of human error, save time and in the long-run save money, provide additional validation to project results of Alternative Fuel use and petroleum displacement, and make compilation of costs analysis (for case studies) faster with the highest levels of accuracy

Data Collection – Approach

System Architecture



Data Collection – Approach

Core Technologies

- Cross Platform (Windows / Linux / Mac OS / iOS4)
- Web-Centric / Standards based technologies

- **HTML5** - Graphical User Interface (GUI), On-line and Off-line data storage and manipulation with mobile access
- **CSS3** - Interactive graphics model with minimal bandwidth requirements
- **Objective-C** - On-line emissions displacement reporting
- **MySQL** - Relational Database



Project Milestones

Milestone Description / Task No.	Scheduled Date	Status
50% Vehicles Ordered (Task 2.2)	1/31/2011	Completed
Permits and NEPA requirements (Task 2.1)	1/31/2011	Behind 60d*
Outreach Events Year 2 Plan (Task 5.1)	1/31/2011	Completed
AFV & Fueling Infrastructure Showcase Year 2 Plan (Task 5.0)	1/31/2011	Completed
Outreach Events Year 1 (Task 5.1) & AFV & Fueling Infrastructure Showcase Year 1 (Task 5.0)	2/10/2011	Completed
SCADA Deployed (Task 3.1) & Completion of Curricula (Task 4)	4/29/2011	On-Track
100% Fueling Infrastructure Under Construction (Task 2.1)	4/30/2011	Ahead
Manuals for Web ERP Complete & Interactive Graphical User Interface & Web Based RDM Deployed (Task 3.1)	5/30/2011	On-Track
100% Vehicles Ordered (Task 2.2) & 50% Fueling Infrastructures Commissioned (Task 2.1)	6/30/2011	On-Track
75% Vehicles Ordered (Task 2.2)	1/31/2011	On-Track
Automated Report Generator Deployed & Automated Alert Generator Deployed (Task 3.2)	9/30/2011	On-Track
Fueling Infrastructure Complete (Task 2.1) & Vehicles Delivered and in Service (Task 2.2)	1/31/2012	Ahead
Outreach Events Year 3 Plan (Task 5.1)	1/31/2012	On-Track
AFV & Fueling Infrastructure Showcase Year 3 Plan (Task 5.1)	1/31/2012	On-Track

*Permits/NEPA behind schedule for one location. Documents have been submitted in March after site contracts were finalized and ready for project

Technical Accomplishments

- Sub-recipient Agreements signed with 31 of 31
- NEPA Documentation Submitted for
 - ✓ 100% of vehicle purchases and conversions
 - ✓ 100% of infrastructure locations
- 100% of Vehicle NEPA's approved by DOE
- 90% of Infrastructure NEPA's approved by DOE
- Training
 - ✓ Coordination with all Manufacturers and Suppliers Completed
 - ✓ Operator and First Responder Materials Completed – LNG/CNG
 - ✓ 24 Training Classes Completed through March 11, 2011 with 264 Attendees
- Vehicles
 - ✓ 81 New In-Project Vehicles Added during the past year
 - ✓ 181 Vehicles Ordered
 - ✓ 39 Vehicles Received
 - ✓ 35 Vehicles Deployed
 - ✓ All Vehicles on-track for delivery/deployment prior to January 31, 2012



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Technical Accomplishments

Stations

- ✓ 2 New Stations Completed and Operational in Meriden and Bridgeport
- ✓ 2 Fuel Station Upgrades Completed and Operational in Norwich at NPU
- ✓ 6 Stations under construction with 4 commissioning events planned prior to June 30, 2011
 - ✓ 2 remaining stations slated for opening during 4Qfy2011
- ✓ All stations on-track for completion prior to December 31, 2011



Bridgeport L/CNG

10 December 2010

*1st LNG Station East of
the Mississippi River*



Meriden CNG

19 October 2010



Hartford Hydrogen

Fleet Dedication
Station Location Announcement
15 October 2010



Technical Accomplishments

Outreach/Education/Marketing Results

- ✓18 Events
- ✓808 Event Attendees
- ✓Media/Marketing Exposures 84,010,445
(30% of Viewers/Circulation)
- ✓Possible Exposures: 279,906,035



Marketing/Media Activities

- ✓9 Press Releases Issued
- ✓One major marketing collateral developed, published and distributed throughout the state, to project partners and vendors, the USDOE and other Clean Cities Coordinators (20,000)
- ✓13 Local/Regional TV Spots
- ✓2 Local/Regional Radio Interviews
- ✓69 Internet Publications
- ✓75 Local/National Print Publications (Newspapers)
- ✓7 Trade Publication Stories



Collaborations/Partnerships

Project Team

Non-Profit Partners

- Greater New Haven Clean Cities - **PRIME**
- Capital Clean Cities
- Norwich Clean Cities
- Southwestern CT Clean Cities

Local Government Partner

- City of Bridgeport
- Town of Glastonbury
- City of Meriden
- Town of Fairfield

Utilities Partners

- Norwich Public Utilities (NPU)
- CMEEC
- Southern Connecticut Gas Company
- Connecticut Natural Gas Corporation

State Agencies & Organizations Partners

- CONNDOT
- CTTRANSIT

Supporting Organizations

- Connecticut DECD
- Connecticut DEP
- Yankee Gas

Private Industry Partners

- Innovation Drive – **1st Tier Sub**
- Sabre Engineering
- Signature Transportation Parts & Service, Inc.
- Big Fish Ad/PR
- Enviro Express
- Avalence
- Metro Taxi
- The Yellow Cab Company
- Clean Energy (CE)
- Air & Gas Technologies (AGT)
- Nana Corporation
- Executive Valet Parking
- R&G Services
- Baker Equipment
- Bonner Electric, Inc.
- Manchester Honda
- Matthews Bus

**31
Partner
Organizations**

*No designation indicates
2nd Tier Sub or
Supporting as indicated*

Future Work

- 75% of Vehicles Deployed and in Service
- Complete PMP Update and ARRA Reporting (Quarterly)
- Conduct 3-5 public outreach/marketing events
- Finalize remaining NEPA Requirement for final Infrastructure location
- 100% of Vehicles Ordered
- 100% of Vehicles Deployed and in Service
- Conduct Public Openings for remaining Stations & Fleets prior to 1/31/12
- Complete Remaining Training Curricula Development & Delivery
- Deploy SCADA as part of Data Collection System
- Complete Manuals for Web ERP
- Complete Interactive Graphical User Interface
- Deploy Web Based RDM
- Deploy Automated Report Generator
- Deploy Automated Alert Generator
- 100% Fueling Infrastructures Completed/Commissioned

Summary Connecticut Clean Cities Future Fuels Project (CTCCFF)

- **Relevance:** The CTCCFF Project is contributing to jobs retention/creation, economic growth, substantial increases in both Alternative Fuels availability and AFV deployments across multiple applications/fuels; solidifying the base for future growth in AF use without additional capital investments for infrastructure.
- **Approach:** Strategic fleet and fueling locations, diverse fuels & vehicle types/ applications, comprehensive training/data collection and an aggressive portfolio of programs for Outreach, Education and Marketing all contribute to successful project completion (at or above estimated levels) and long-term opportunities for increasing adoption of AFV's, Advanced Technology Vehicles and Alternative Fuels. This "System of Systems" approach addresses multiple goals of the VT Program and the Clean Cities Mission of reducing petroleum fuel usage in the transportation sector.
- **Technical Accomplishments:** Sub-awards and Vehicle NEPA's are completed; Infrastructure NEPA's 90% complete; Training development/delivery underway with 264 trained through 11 March 2011; 81 new AFV's added to project work; 63% of vehicles ordered and 12% in-service; 30% of Infrastructures commissioned, 60% under construction and all deployments on track for on-time completion; 18 Outreach Events; 808 Attendees; > 84 Million Media/Marketing Exposures
- **Collaborations:** 4 Clean Cities Coalitions; 31 total Partner Organizations representing local & state government, utilities, non-profits and private industry – contributing >55% of the project costs in Non-Federal Cost Share.
- Changes in FY11/12 will be guided by DOE guidance and Merit Review Meeting input.

Technical Back-up Slides

Data Collection

Users

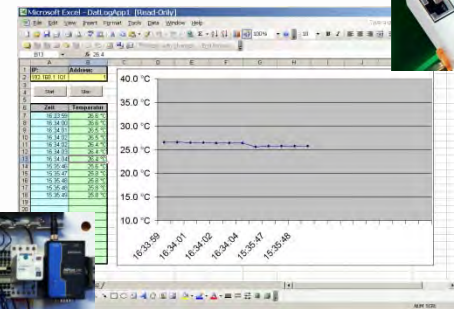
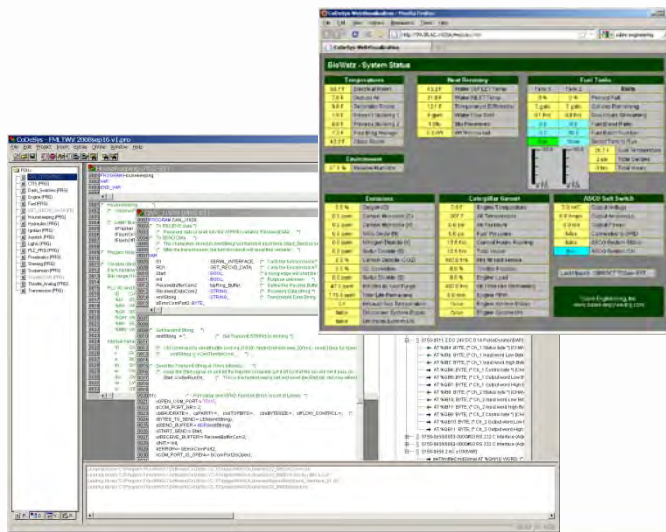
Users interact with a website that allows them to enter & read data & create reports from a relational database. Site is Mobile Accessible.

A relational database allows the users to sort and query data into usable reports that enables data comparison. i.e. compare different sites during different periods.

Behind the Scenes

Each site will have a Sabre provided control box that will integrate and read data via Modbus/TCP, Ethernet/IP and direct I/O. Data is web pushed via WAGO CoDeSys Java & Modbus through on-site broadband connections.

The individual site data is pushed to a central server running Dreamweaver with a ColdFusion/Java backend supporting MySQL datasets. The server(s) are running in redundant locations.



Displacements

Over the project's 4-year life the environmental benefits will include displacing (or eliminating):

- More than 6 Million Gallons of petroleum
- More than 11 Million pounds of Greenhouse Gases (GHG)
- Over 500 Thousand pounds of Carbon Monoxide (CO)
- Over 300 Thousand pounds of Nitrogen Oxides (NOx)
- Over 50 Thousand pounds of Volatile Organic Compounds (VOC), and,
- Over 3 Thousand pounds of Fine Particulate Matter (PM2.5)

DOE Required Stickers - Completed

Clean Alternative Fuel Vehicle



U.S. Department of Energy

www.cleancities.energy.gov



www.ct-futurefuels.com

Clean Advanced Technology Vehicle



www.ct-futurefuels.com



U.S. Department of Energy

www.cleancities.energy.gov

- Bumper stickers shown as representative samples
- All Window, Bumper and Station decals/stickers have been completed and are being applied as stations commission and vehicles deploy.