EV Micro-Climate Plan for the State of Tennessee

The EV Project Implementation Plan

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<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>Alternating Current</td>
</tr>
<tr>
<td>ARRA</td>
<td>American Reinvestment and Recovery Act</td>
</tr>
<tr>
<td>CCN</td>
<td>Certified Contractor Network</td>
</tr>
<tr>
<td>DC</td>
<td>Direct Current</td>
</tr>
<tr>
<td>DCFC</td>
<td>Direct Current Fast Charger</td>
</tr>
<tr>
<td>DOE</td>
<td>Department of Energy</td>
</tr>
<tr>
<td>DOT</td>
<td>Department of Transportation</td>
</tr>
<tr>
<td>EPRI</td>
<td>Electric Power Research Institute</td>
</tr>
<tr>
<td>EV</td>
<td>Electric Vehicle</td>
</tr>
<tr>
<td>EVSE</td>
<td>Electric Vehicle Supply Equipment</td>
</tr>
<tr>
<td>kW</td>
<td>kilowatt</td>
</tr>
<tr>
<td>LOI</td>
<td>Letter of Intent</td>
</tr>
<tr>
<td>MPO</td>
<td>Metropolitan Planning Organization</td>
</tr>
<tr>
<td>ORNL</td>
<td>Oak Ridge National Laboratory</td>
</tr>
<tr>
<td>PHEV</td>
<td>Plug-in Electric Vehicle</td>
</tr>
<tr>
<td>RPA</td>
<td>Regional Planning Agency</td>
</tr>
<tr>
<td>SAE</td>
<td>Society of Automotive Engineers</td>
</tr>
<tr>
<td>SMART</td>
<td>Smart Model Area Recharge Terminal</td>
</tr>
<tr>
<td>SOC</td>
<td>State of Charge</td>
</tr>
<tr>
<td>TAZ</td>
<td>Traffic Analysis Zone</td>
</tr>
<tr>
<td>TVA</td>
<td>Tennessee Valley Authority</td>
</tr>
<tr>
<td>TVPPA</td>
<td>Tennessee Valley Public Power Association</td>
</tr>
<tr>
<td>U.S.</td>
<td>United States</td>
</tr>
<tr>
<td>VAC</td>
<td>Volts Alternating Current</td>
</tr>
</tbody>
</table>
1 Purpose

The purpose of this Electric Vehicle (EV) Micro-Climate document is to record the process used by The EV Project for distributing, locating, and selecting electric vehicle supply equipment (EVSE) sites. The input to this document is the work of the Long-Range EV Charging Infrastructure Plan for Tennessee.

This plan details the process for and outlines the continued importance of stakeholder engagement in the design and development process of The EV Project infrastructure. The EV Project is the largest deployment of EVs and electric vehicle infrastructure in the history of the United States (U.S.).

This document also provides a deliverable for the Department of Energy (DOE) contract for The EV Project and is a standard offering as part of ECOtality North America’s (ECOtality) Micro-Climate planning process.

Tennessee is one of seven states to experience the electrification of the transportation industry through the DOE Vehicle Demonstration and Vehicle Infrastructure Evaluation (DE-FOA-0000028). Through a highly collaborative and interactive approach including policy makers, utilities, local and state government, grass roots organizations, the DOE, major employers, charge operators and leaders of industry, ECOtality implements the EV Micro-Climate in The EV Project to successfully deploy EV infrastructure for the purpose of creating a Lessons Learned report about EVs and EV charging infrastructure.

The ECOtality EV Micro-Climate™ is a process by which custom EV infrastructure results from the implementation of a standard process: a truly rich, highly functional and scalable EV charging infrastructure and growth strategy. This process involves a series of documents created together with a key stakeholder group that together comprise the framework from which the infrastructure develops. Continued stakeholder engagement ensures that the projects goals and objectives are met and provides opportunity to discuss the advantages and challenges of using electricity as a fuel for our vehicles.

The EV Micro-Climate™ program is an integrated turn-key program that advances select areas for the adoption of electric transportation. Beginning with extensive feasibility and infrastructure planning studies, the program provides a blueprint for a comprehensive EV infrastructure system and provides detailed action plans for its successful execution and continued maintenance.
2 National Scope

On August 5, 2009, ECOtality, a subsidiary of ECOtality, Inc. (NASDAQ:ECTY) was awarded a $99.8 million grant from the U.S. DOE. This grant made possible The EV Project, which was launched on October 1, 2009.

On June 16, 2010, The EV Project was expanded to include the cities of Los Angeles, California and Washington, D.C. The EV Project was granted an additional $15 million by the DOE. With the partner match, the total value of the project is now approximately $230 million.

The EV Project will deploy nearly 15,000 EVSE charging stations in 16 cities located in six states (Oregon, Washington, California, Arizona, Tennessee and Texas) and the District of Columbia. Nissan North American and General Motors/Chevrolet are partners in The EV Project. The EV Project will provide participant drivers of the Nissan LEAF zero-emissions electric car and the Chevrolet Volt plug-in hybrid (PHEV) with extended range a residential charger at no cost and installation credit which will support most, if not all of the costs of installation, as long as qualifications are met. In exchange for this, the participants will agree to allow data to be collected on their vehicle and charging equipment to support the lessons learned phase of The EV Project.

The EV Project will collect and analyze data to characterize vehicle use in diverse topographic and climatic conditions, evaluate the effectiveness of charge infrastructure, and conduct trials of various revenue systems for commercial and public charge infrastructure. The ultimate goal of The EV Project is to take the lessons learned from the deployment of these first 8,300 EVs, and the charging infrastructure supporting them, to enable the streamlined deployment of the next 5,000,000 EVs.
Figure 1. EV Project Area Map
3 Electric Vehicle Charging Station Technology

3.1 Standard Level 2 EVSE Connector

For widespread EV adoption to occur, a standard for connecting the vehicle to the electric grid was required. The Society of Automotive Engineers (SAE) standardized the connector for Level 2 charging as the J1772, as shown in Figure 2.

Figure 2. Standardized EV Charging Connector – J1772

Figure 3. EV Charging Equipment with Standard Connector
3.2 AC Level 2

EVSEs that use the standardized J1772 connector provide an alternating current (AC) charge. An EV owner can receive a boost in their state of charge (SOC) in 1-3 hours or a complete charge in 4-8 hours, depending on the vehicle, voltage and SOC of the vehicle. EV operators are encouraged to charge their EVs at a home charging station to 100% SOC and use the publicly available charging stations to extend the range of the vehicle.

AC Level 2 is typically described as the “primary,” standard,” or “preferred” method for the EVSE for both private and publicly available facilities, and specifies a single-phase branch circuit with typical voltage ratings from 220 – 240 volts AC (VAC). The J1772-approved connector allows current as high as 80 amps AC (100 amp rated circuit). However, current levels that high are rare, and a more typical rating would be 40 amps AC, which allows a maximum current of 32 amps. This provides approximately 7.7 kilowatt (kW) with a 240 VAC circuit.

The EV Project will install BLINK Charging Stations in two models of AC Level 2 charging stations: Wall Mount and Pedestal.
Figure 4. Level 2 Wall Mount Unit

Figure 5. Level 2 Pedestal Unit
3.3 DC Fast Charging

Direct Current (DC) Fast Charging, or “Fast Charging”, is designed for commercial and public applications and is intended to perform in a manner similar to a commercial gasoline service station in that recharge is rapid. Typically, a DC Fast Charger (DCFC) would provide a 50% recharge in 10 to 15 minutes. EV charging using a DCFC brings DC current directly to the vehicle battery. An EV owner can receive a boost in their SOC in 5-15 minutes or receive up to 80% SOC in less than 30 minutes.

Not all vehicles are equipped to receive a DC charge. The Nissan LEAF and Mitsubishi i-Miev are the only two vehicles currently available in the U.S. that offer a DC charging port. The connector has not been standardized by the SAE to date. The EV Project DCFC stations will use the connector that is the standard in Japan. The Nissan LEAF offers the DC charging port as an option. The EV Project provides this option at no cost for participating vehicles.

![Image of CHAdeMO DC Charging Connector]

Figure 6. CHAdeMO DC Charging Connector
4 Tennessee Scope

By September of 2011, a mature EV charging infrastructure will exist in the State of Tennessee. Through a highly collaborative and interactive approach including policy makers, utilities, local, state and federal government agencies, grass roots organizations, major employers, charging station operators and leaders of industry, ECOtality implements the EV Micro-Climate Process to complete the electrification of transportation and paradigm shift in the fueling of vehicles occurring through The EV Project.

4.1 Geographic Area

4.1.1 Electric Vehicle Charging Infrastructure Area Map Design

The EV Project established eligibility boundaries for participant residences surrounding the major cities in the project. These areas were then identified by their zip codes. In determining the area of coverage for the public infrastructure, the State Advisory Board considered the zip codes of those eligible for The EV Project vehicle participation, Nissan LEAF Hand Raiser data, the anticipated demographics of EV purchasers, topography, population, retail areas, major employer locations, and overall commuting patterns.

Early Adopters

Through the Nissan Customer Journey (http://www.nissanusa.com), those interested in receiving additional information were registered as a hand raiser from 4/20/10 until May 2010. Later, they could reserve a LEAF with a $99 deposit. The anonymous geographic locations of those that registered through this process were reviewed on a periodic basis. The demographics of hybrid owners to date were another layer of data reviewed. Together, these two data layers demonstrated where early adopters would be located.

4.1.2 Area Specifics

Through the evaluation process for anticipated EV owner demographics, the demographics of hybrid and alternative fuel vehicle purchasers, overall population density, local topography, local and statewide traffic patterns were reviewed from a state perspective. The Tennessee Department of Transportation (DOT) along with the Nashville Metropolitan Planning Organization, Knoxville Transportation Organization and the Regional Planning Agency and Planning & Design Studio from Chattanooga, developed a sustainable mapping model for evaluating the areas where EVs are likely to travel.

From a grid perspective, understanding the areas where home based EV charging stations are is a new consideration for electric infrastructure growth strategies and long range planning. The local utilities, led by Nashville Electric Service, have created a standard mapping methodology for projecting the likely regions where electric vehicle home charging stations may appear.
4.1.3 Major Employers

The State of Tennessee’s Department of Economic and Community Development supplied information on the location of the top 100 employers statewide (Appendix A). Employers affect traffic patterns and help determine commuter behavior. Their locations were considered a key element in the understanding EV travel patterns.

4.1.4 Traffic Patterns

EVs will intermingle with overall traffic and therefore the existing and projected traffic flows were heavily weighed within The EV Project infrastructure design. The Tennessee DOT provided data and data interpretation for this consideration.

4.1.5 The EV Project Infrastructure Coverage Map

The cities of Chattanooga, Knoxville, Nashville, and the connecting corridors comprise the core focus of The EV Project. This gives Tennessee the largest area of EV charging coverage from a national perspective. The following map illustrates the major city metropolitan areas along with nearby cities within The EV Project territory.

Figure 7. Tennessee Metropolitan Areas in The EV Project
### 4.2 Charging Station Objectives

#### 4.2.1 Equipment

Table 4-1, below, represents the number of charging ports and participants that are planned to be included in the Tennessee EV Project Geographic Area.

<table>
<thead>
<tr>
<th>Hardware Infrastructure</th>
<th>Tennessee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 2 Vehicle Participants</td>
<td>1000</td>
</tr>
<tr>
<td>Level 2 Commercial EVSE</td>
<td>1200</td>
</tr>
<tr>
<td>Level 2 Municipal EVSE</td>
<td>150</td>
</tr>
<tr>
<td>DC Fast Charging Ports</td>
<td>60</td>
</tr>
<tr>
<td>Solar Assisted L2 EVSE</td>
<td>125</td>
</tr>
</tbody>
</table>

#### 4.2.2 Diversity of Choice by Charging Location Type

For The EV Project, understanding EV usage and driver behavior will allow an understanding of how to grow the EV public infrastructure once The EV Project data collection and analysis phases are complete.

The public infrastructure site selection process starts with a 25 mile circle from the city center for the three major metropolitan areas. Within this 25 mile circle, there will be a blanketing of EV charging infrastructure for public use. The 10 mile radius circles are overlapped to identify target areas where a diversity of choice by charging location type will be sought. Offering a location choice at which an EV owner will be able to charge will provide important information for the planning and development of the growth of EV infrastructure. The following show the diversity circles within each of the three project cities:
Figure 8. Chattanooga Infrastructure Planning Circle

Figure 9. Knoxville Infrastructure Planning Circle
4.2.3 Commercial Locations

For the 1,200 AC Level 2 charging stations, the following site types will be targeted within The EV Project: The goal of diversity by location of facility where charging occurs is created with the intention of understanding the places where people are most likely to recharge their EVs using AC Level 2 charging stations. Since little is known related to the types of venues expected to be visited, this diversity will provide valuable insight once EV driver behavior is observed.
Table 4-2. Targeted Venues and EVSE Quantities

<table>
<thead>
<tr>
<th>Venue</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airports</td>
<td>6</td>
</tr>
<tr>
<td>Community Center/Parks</td>
<td>60</td>
</tr>
<tr>
<td>Convention Centers</td>
<td>15</td>
</tr>
<tr>
<td>Destinations</td>
<td>80</td>
</tr>
<tr>
<td>Educational</td>
<td>60</td>
</tr>
<tr>
<td>Grocers</td>
<td>125</td>
</tr>
<tr>
<td>Hotels</td>
<td>80</td>
</tr>
<tr>
<td>Libraries</td>
<td>15</td>
</tr>
<tr>
<td>Malls</td>
<td>125</td>
</tr>
<tr>
<td>Medical/Hospital</td>
<td>80</td>
</tr>
<tr>
<td>Parking/Park &amp; Rides</td>
<td>80</td>
</tr>
<tr>
<td>Police</td>
<td>15</td>
</tr>
<tr>
<td>Restaurants</td>
<td>125</td>
</tr>
<tr>
<td>Retail</td>
<td>125</td>
</tr>
<tr>
<td>Theaters/Museums/Arts</td>
<td>80</td>
</tr>
<tr>
<td>Universities</td>
<td>80</td>
</tr>
<tr>
<td><strong>Sub Total:</strong></td>
<td><strong>1151</strong></td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td><strong>49</strong></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1200</strong></td>
</tr>
</tbody>
</table>

These targets will be satisfied through the combined efforts of National Accounts from ECOtality and the local efforts of stakeholders and the Stakeholder Services Area Manager.

4.2.4 Municipal Locations

The three core The EV Project cities will experience a blanketing of public charge infrastructure. Each of these cities was provided a targeted quantity of AC Level 2 charging stations. They each evaluated the properties they owned to determine which were most likely to serve the early adopters and that would demonstrate the areas support for EVs.
4.3 Charging Station Planning

4.3.1 Chattanooga Hamilton County Regional Planning Commission and the Regional Planning Agency (RPA)

The Chattanooga-Hamilton County Regional Planning Commission was created in the early 1950's as a result of a state law. The Planning Commission is a voluntary body of 15 members largely appointed by the Mayor of the City of Chattanooga and the Hamilton County Mayor. Its role is to make zoning and land use recommendations to the local legislative bodies and to make final decisions on subdivision requests for Hamilton County and most municipal governments. The Regional Planning Agency (RPA) is a joint agency of the City of Chattanooga and Hamilton County. The staff is comprised of professional city planners, urban designers, researchers, graphic designers and administrative personnel. Its major responsibilities include developing land use plans and transportation plans, administering zoning, proposing development policies, and reviewing new subdivisions and other development projects. The RPA sends Staff recommendations for zoning requests to the Chattanooga-Hamilton County Regional Planning Commission and other area Planning Commissions.

The RPA created area maps to assist in the planning of EV infrastructure for the Chattanooga area. Three separate maps were created to better understand the demand for EV infrastructure for three different uses: Tourism/Recreation, Employment and Residential.

Traffic Analysis Zones (TAZs) and Census Block Groups were chosen as the main unit of analysis for the maps. TAZs were chosen because they are available for most large metro areas, contain household and employment data and include forecasts. Census Block Group data was chosen because it is available for all metro areas and contains income and education information. The table below outlines the GIS layer used, potential sources for that data and maps that referenced the GIS layer.

<table>
<thead>
<tr>
<th>GIS Layer</th>
<th>Data Source</th>
<th>Maps Using GIS Layer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerial</td>
<td>Planning Dept./GIS Dept./ESRI World Imagery</td>
<td>Tourism, Residential, Employment</td>
</tr>
<tr>
<td>Travel Demand Model (TDM)</td>
<td>Planning Dept./GIS Dept.</td>
<td>Residential</td>
</tr>
<tr>
<td>Traffic Analysis Zones (TAZ)</td>
<td>Planning Dept./GIS Dept.</td>
<td>Residential</td>
</tr>
<tr>
<td>2000 Census Block Groups</td>
<td>Planning Dept./GIS Dept./ESRI 2000 TIGER Data</td>
<td>Residential</td>
</tr>
<tr>
<td>2000 Census Summary File 3</td>
<td>Planning Dept./GIS Dept./Census Website</td>
<td>Residential</td>
</tr>
<tr>
<td>County</td>
<td>Planning Dept./GIS Dept./ESRI 2000 TIGER Data</td>
<td>Tourism, Residential, Employment</td>
</tr>
<tr>
<td>Street Layer</td>
<td>Planning Dept./GIS Dept./ESRI 2000 TIGER Data</td>
<td>Tourism, Residential, Employment</td>
</tr>
<tr>
<td>Water</td>
<td>Planning Dept./GIS Dept./ESRI 2000 TIGER Data</td>
<td>Tourism, Residential, Employment</td>
</tr>
<tr>
<td>Airport</td>
<td>Planning Dept./GIS Dept.</td>
<td>Tourism, Residential, Employment</td>
</tr>
<tr>
<td>Top 20 Employers</td>
<td>Planning Dept./GIS Dept./Chamber of Commerce</td>
<td>Employment</td>
</tr>
<tr>
<td>EV Charging Stations</td>
<td>EVProject Local Advisory Board</td>
<td>Tourism, Residential, Employment</td>
</tr>
<tr>
<td>Recreation / Tourist Sites</td>
<td>Planning Dept./Parks Dept./GIS Dept.</td>
<td>Tourism</td>
</tr>
<tr>
<td>Transit Data</td>
<td>Transit Agency/Planning Dept./GIS Dept.</td>
<td>Tourism</td>
</tr>
</tbody>
</table>

*Figure 11. GIS Layer Information*

The maps generated also show the locations for the planned EV Infrastructure charging stations.
Tourism/Recreation Map

The tourism/recreation map identifies the major tourism and recreational attractions in the Chattanooga area. This information was overlaid on top of the public EV charging stations to show where the two overlap.

Figure 12. Chattanooga Tourism/Recreation Infrastructure Map
Employer/Employee Map

The second map was a heat map layer showing concentration of employees within the study area with the employment field of the TAZ used as the population field (Figure 13).

Figure 13. Chattanooga Employment Infrastructure Map
Residential Map

Household concentrations were mapped again with the project locations of the EV Charging Infrastructure (Figure 14). Some basic research was done on the target market for EVs, specifically early adopters. Overall, very little public information is available but several sources suggesting higher income and education levels being two primary factors. Using this information, the early adoption block groups were identified as those where 1/3 or more of the households made over $75,000 dollars (double the area median household income) and where 1/3 or more of the individuals over 24 are college educated.

Figure 14. Chattanooga Residential Infrastructure Map
4.3.2 Nashville MPO

The Nashville Area Metropolitan Planning Organization (MPO) is a multi-county association (Figure 15) of local governments directed by a board of city and county mayors from across the greater Nashville area who have a shared responsibility to help the region fulfill its goals for livability, prosperity, sustainability and diversity through strategic investments in transportation infrastructure. That includes investments in roads and bridges, but also walking, biking, and mass transit too.

At its core, the MPO is responsible for two important tasks. 1) To develop a regional transportation plan that sets forth a vision for how our transportation system will serve residents, businesses, and visitors over the next couple of decades; and 2) To select projects and programs for federal funding. The MPO mayors, working closely with Tennessee DOT, are focused on funding projects and programs that are most beneficial to the region as a whole.

The guiding principles, regional goals, and major objectives of the Tennessee MPO’s 2035 Regional Transportation Plan are identified in Appendix B.

Figure 15. Nashville MPO Region

The Nashville MPO determined that MPOs have a major role to play in contributing data, modeling, and transportation planning expertise to EV policies and EV infrastructure planning and determined that “…because EVs are already being sold and charging stations are being installed, the comprehensive planning that should have been done in front of this paradigm shift in transportation is lagging.” (Nashville MPO “How do EVs integrate with the area’s overall support of clean fuels, clean air and existing green transportation initiatives?”)
4.3.3 EV Charging Infrastructure Suitability Factors

In order to establish the most suitable areas of the region for the deployment of publicly accessible AC Level 2 EVSE, the Nashville MPO established five (5) main suitability factors that reflect the varying degrees of potential demand across census blocks.

1. Proximity to Interchange Locations: Census blocks within ¼ mile of existing controlled access interchanges (Figure 16).

![Figure 16. Proximity to Interchange Locations](image)
2. Proximity to Transit Stations/Park-N-Ride Lots (Figure 17): Census blocks within ¼ mile of existing transit stations and park and ride lots.

![Figure 17. Proximity to Transit Stations](image)

3. Average Distance of “Home-Based/Other” Trips (Figure 18): Average distance of trips that end in a census block made for a “home-based/other” purpose (e.g., home to school, home to grocery, gas station to home, etc.) as predicted for the base year (2008) by the MPO’s regional travel demand model.

![Figure 18. Average Distance of HBO Trips](image)
4. Percentage of Trips made as “Non-Home-Based/Other” (Figure 19): The percentage of trips that end in a census block made for a “non-home-based/other” purpose (e.g. work to school, gas station to movie theatre, etc.) as predicted for the base year (2008) by the MPO’s regional travel demand model.

![Figure 19. Percentage of Trips Made as NHB](image)

5. Users per Day (Figure 20): Relative measure of customers/visitors in each census block as dictated by the number and type of retail establishments (e.g. storefronts, movie theatre, sporting venues, etc.) in the block and other blocks within a ¼ mile radius.

![Figure 20. Users per Day](image)
Working with the Stakeholder team, the MPO will develop a set of weights to adjust the relative importance of the individual factors. These maps can then be layered to create a map of the ideal locations for EV infrastructure. The initial modeling results in an un-weighted score.

The final map would show the most desirable locations which meet the weighted factors, which would be shown in red with lesser importance in yellow, light green and darker green locations (Figure 21). The intent then would be to solicit charging site hosts in the areas identified by the weighted composite.
5 Special Projects

5.1 Solar Assisted Charging Stations

The Tennessee portion of The EV Project has an additional type of charging infrastructure deployed: solar-assisted charging stations. Oak Ridge National Laboratory (ORNL) received $6.8M in grant funding within the DOE’s $99.8M American Recovery and Rehabilitation Act (ARRA) funding under DE-EE-0002194 for this demonstration project.

ORNL, in conjunction with the Electric Power Research Institute (EPRI) and the Tennessee Valley Authority (TVA), will install the SMART (Smart Model Area Recharge Terminal) Station to analyze the technical issues arising from vehicle charging infrastructure (grid response, etc.) and to collect data on performance, component reliability, etc. and provide subsequent data reduction and analysis for deployment feedback (Appendix C).

These charging stations have AC Level 2 EVSE units and will be implemented under a solar canopy within the TVA SMART Station. There are 125 charging stations that will be solar-assisted charging stations (Appendix D).

![Figure 22. Oak Ridge Solar Assisted Recharging Concept](image-url)
5.1.1 Corridor Charging

Providing for the travel between the project’s core cities of Chattanooga, Knoxville and Nashville is another unique aspect to the Tennessee portion of The EV Project. The State of Tennessee will place charging stations along I-24, I-75 and I-40 to allow for the ability for a DCFC equipped EV to travel between the three cities on battery power only. DCFCs will be placed at strategic locations along these corridors to facilitate this travel.

5.1.2 Other Special Projects

Within The EV Project, there is opportunity for other special projects and pilot projects.

ECOtality is exploring the opportunity to participate in various special projects, including: smart grid integration with the Nashville Electric Service, Knoxville Utilities Board, and Electric Power Board; a Workplace Charging Impact Study coordinated by the Chattanooga, Knoxville, Nashville and State Chambers of Commerce; and a local Garage-Less Needs Analysis led by the Metropolitan Planning Organization. Additional special projects may be considered.
6 Implementation Process

6.1 EV Micro-Climate Program

ECOtality is highly experienced with installing EV charging stations in residential, commercial and public environments, and has installed more charging stations for on-road applications than any other company. ECOtality has developed its EV Micro-Climate program, as means of utilizing this experience to develop rich charge infrastructures, focused on AC Level 2 and DCFC systems, as efficiently and cost effectively as possible.

Figure 23. EV Micro-Climate Component Planning

6.2 Fueling Paradigm Shift

The EV Micro-Climate program is an integrated turn-key program that advances select areas for the adoption of electric transportation. Beginning with extensive feasibility and infrastructure planning studies, the program provides a blueprint for a comprehensive EV infrastructure system and provides detailed action plans for its successful execution and continued maintenance. ECOtality coordinates activities with relevant governmental organizations, utilities, automotive manufacturers, and strategic regional organizations to ensure that key cities are prepared for consumer adoption of electric transportation.
The implementation of an EV Micro-Climate includes physical charge infrastructure installations at residential, commercial and public locations, as well as comprehensive regulatory, public awareness and marketing programs to support the various value chains associated with the EV Micro-Climate.

The EV Micro-Climate™ is a process by which a custom EV infrastructure results from the implementation of a standard process. Documenting the process by which a highly functional and scalable EV charging infrastructure is grown through public/private partnerships creates “Best Practices” for wide spread EV adoption. EV Micro-Climate™ results in an understanding of how consumers use EVs and charging infrastructure, which leads to the publication of Lesson Learned. Together, with a core stakeholder group, the EV Micro-Climate™ creates a framework from which the infrastructure develops. Ongoing stakeholder engagement ensures that the projects goals and objectives are met in the near term and provides opportunity to discuss the opportunities and challenges of using electricity as a fuel.

### 6.3 Stakeholder Involvement

The key deliverables for The EV Project are Best Practices for the implementation of EV charging infrastructure, Lessons Learned about how vehicle operators use EVs, and the charging infrastructure. The EV Micro-Climate Program involves significant stakeholder interaction of the processes by which the stakeholder groups manage.

![Figure 24. EV Micro-Climate Stakeholder Interaction](image)
This standard process results in a custom infrastructure, whether it is applied on the macro level, as in the case of The EV Project, or on the micro level, as with a particular organization or fleet as in the Clean Commute Program in New York City.

The Micro Climate Process encourages a very interactive relationship with all stakeholders. To manage this process, ORNL has provided a password protected web portal for information sharing and exchange. Through the web portal, the various project documents, research material, media clips, project presentations, meeting notes and agendas, and schedules for the ECOtality staff are made available to the group for maximum stakeholder input. The result of the EV Micro Climate Process is a truly rich, highly functional and customized EV charging infrastructure.
7 Stakeholder Organization

There are four Advisory Boards that have been created for The EV Project in the State of Tennessee. The Advisory Boards review and contribute content to documents in The EV Project Process.

Figure 25. Tennessee State Advisory Board

7.1 EV Project Documents

The project documents include: The EV Project Infrastructure Deployment Guidelines (published separately), the Long Range EV Charging Infrastructure Plan for Tennessee (published separately), and this document, the EV Project Micro-Climate Plan.

The documents involved will remain active and under ongoing evaluation resulting in continually relevant project documentation of the Best Practices for growing EV charging infrastructure.
7.2 Area Advisory Boards

The Advisory Boards consisted of core members and member organizations from both the utility and private sector. The focus during Phase I of the infrastructure design was on the overall education of the near term needs to achieve the long term EV infrastructure growth plan and policy issues, technology developments, impacts, opportunities and the considerations involved with wide spread EV adoption.

During the second phase of the Infrastructure Design, the board membership expanded to include members and organizations involved in alternative fuels, sustainable transportation, the private sector, and those interested in EVs and EV charging.

The Area Advisory Boards have a Local Government Chair and a Utility Co-Chair. The Area Advisory Board Chair functions as another point of contact for local area stakeholders, leads the local messaging, leads the siting focus group for the local area’s municipal allocation of assets and assists in the coordination of the media and commercial partner outreach. The Area Advisory Board Utility Co-Chair functions as the point of contact for issues from a utility perspective for the area.

Area Advisory Board Chairs and Utility Co-Chairs

Nashville Area Advisory Board
- Chair: Assistant Director, Mayor’s Office of ECD
- Utility Co-Chair: NES

Knoxville Area Advisory Board
- Chair: Program Manager, Sustainability Policy & Communications
- Utility Co-Chair: Business Manager, Environmental Stewardship

Chattanooga Area Advisory Board
- Chair: Executive Director, CARTA
- Utility Co-Chair: COO, EPB

Figure 26. Area Advisory Boards
7.2.1 Area Advisory Board Coverage

Each Area Advisory Board will serve the needs of the core project city and the surrounding area. The Chattanooga area encompassed 25 miles from city center in Chattanooga and dips into Georgia.

Figure 27. Chattanooga Area Board Planning Region
The Knoxville Area serves 25 miles from city center of Knoxville and the surrounding area.

Figure 28. Knoxville Area Board Planning Region

The Nashville Area serves 25 miles from city center of Nashville and the surrounding area.

Figure 29. Nashville Area Board Planning Region
7.3 Area Board Focus

The function of the Area Advisory Board is to actively engage in The EV Project for the purposes of understanding the impacts of wide spread EV adoption. These members individually and as member organizations work together to coordinate happenings of the EV Project, work through challenges that arise and to collaboratively create a custom electric vehicle charging infrastructure for the specific needs of the local area.

7.4 Board Dedication

The Advisory Boards meet regularly through teleconferences and group. During the meetings key stakeholders are educated on The EV Project deliverables, needs, goals and challenges for purposes of interactively engaging them in the design and implementation of the truly rich and highly functional EV charging infrastructure. Notes from these meetings are documented and disseminated back to the group. Each stakeholder organization contributes time, energy, staff and resources to The EV Project on a continuing basis.
8 Considerations Councils

In order to ensure that each opportunity and challenge is properly addressed throughout The EV Project, councils are formed for each major area of concern:

- Permitting, Inspection and Standards
- Utility Considerations
- Siting Council
- Public and Educational Outreach

These councils will meet periodically to ensure that project milestones are reached and that issues are either solved or logged and strategies created. Quarterly, these councils will present to the Advisory Boards as to developments occurring within each area of focus.

These councils will also be responsible for coordinating and composing the addendums necessary for keeping The EV Project documents current. Scheduled addendum submission dates are:

- November 2010
- March 2011
- December 2012
- June 2013

Figure 30. Considerations Councils
8.1 Permitting, Inspection and Standards

The installation of EVSE requires permitting and inspection from the local permitting and inspection office. The Considerations Council for Permitting, Inspection and Standards will seek to create a streamlined permitting and inspection process for The EV Project and for Best Practices for wide spread EV deployment and keep current on EV charging equipment and installation standards. The State of Tennessee’s Department of Commerce and Insurance will lead this effort for permitting and inspection. The State of Tennessee has a strong interest in understanding how to ensure that the permitting and inspection processes can provide for a standardized and streamlined process. The EPRI in conjunction with the TVA will lead this effort for developing standards.

8.2 Utility Considerations

The use of electricity as a fuel requires the understanding and analysis of generation and electric grid impacts. EPRI and TVA, along with the Tennessee Valley Public Power Association (TVPPA) will jointly work toward collecting the relevant industry, technology and policy developments for the utility considerations and provide for the methodology for information dissemination to the utilities involved within the Tennessee market and through the TVA territory. This will keep the utility industry abreast of developments in The EV Project and in the EV and EVSE industry.

8.3 Siting Considerations Council

Siting of the EV charging stations engages all stakeholder organizations.

In order to ensure that a diverse set of charging site hosts are found to achieve a functional EV infrastructure, there needs to be input from multiple resources. The siting council consists of focus groups for industry specific consideration.

8.3.1 Zoning and Land Use Focus Group


8.3.2 Hospitality Siting Focus Group

Led by the Tennessee Hospitality Association.

8.3.3 Medical/Hospital Siting Focus Group

Led by the Tennessee Hospital Association.

8.3.4 University Siting Focus Group

Led by the State of Tennessee Department of Economic and Community Development and Oak Ridge National Laboratory.
8.3.5 Destinations Siting Focus Group
Led by the State of Tennessee Department of Tourist Development in conjunction with the Tennessee Hospitality Association.

8.3.6 Retail and Grocery Siting Focus Group
Led by the Tennessee Retail Association and Tennessee Grocer and Convenient Store Association.

8.4 Public and Educational Outreach
Messaging within The EV Project will involve many facets within each member organization, area and with the various stakeholder groups. The State of Tennessee Department of Economic and Community Development, Southern Alliance for Clean Energy, and Oak Ridge National Laboratory will be key resources for this effort.
9 Infrastructure Design, Planning and Installation Schedule

9.1 Phase I

From March until June 2010, Phase I of The EV Project Infrastructure Design involved weekly teleconference meetings with each Advisory Board to discuss matters related to the successful implementation of a truly rich and highly functional EV charging infrastructure. Each series began with an initial kickoff meeting and working sessions in each area.

Each member organization was invited to participate with any members of their organization that they deemed necessary. Agendas were provided and notes taken for each meeting (Appendix E). There was a near 100% participation rate in the Phase I The EV Project Advisory Board meetings and teleconferences.

9.2 Phase II

During Phase II, from July through June 2011, stakeholders participate in advisory board meetings, and create considerations councils and focus groups.

Considerations councils will meet regularly to explore specific topics and be responsible for keeping the project documents current and relevant through the release of regularly scheduled updates and addendums.

Focus groups will assist in the siting of charging stations. They will hold strategy sessions, design industry specific messaging about EVs and The EV Project, and bring together industry leaders in roundtable discussions to identify how EV adoption will affect their businesses, find opportunities for case studies and conduct industry specific outreach.

9.3 Phase III

From October until December 2011, Phase III of The EV Project, also referred to as The EV Project Roadmap Process, will seek EV charging hosting sites that will create the diversity of choice in charging location type which will result in a truly rich EV charging infrastructure. Sites will be identified and site installation assessments will begin.

The considerations councils and focus groups begin meeting regularly to explore the challenges and opportunities for wide spread EV adoption. The considerations councils will bring updates to the advisory boards at least once each quarter:

- February
- May
- August
- October
9.4 Phase IV

During the next phase in The EV Project, from January until December 2011, installation of publicly available charging stations will take place. Each potential hosting partner will initiate The EV Project Hosting Partnership process by submitting an executed Letter of Intent (LOI) for The EV Project participation. The LOI demonstrates that an organization is interested in evaluating whether their location would be an ideal location for EV charging. The Hosting Partner is not obligated to participate in The EV Project through the LOI and The EV Project is not obligated to install The EV Project EV charging equipment at the site. The LOI is the first step in the process for being considered a potential charging location and The EV Project Charging Site Host.

There will be a site assessment performed on each site to determine the ideal low cost installation scenario. The certified contractor network (CCN), managed by ECOtality, will perform the site assessments and document any cost differential between the low cost installation scenario and the Charging Site Host’s preferred installation site. Each commercial AC L2 EVSE unit installation will have $1,200 (per unit) grant funding budget for installation costs from The EV Project.

9.5 Phase V

Concurrent with the installation of the EVSE and continuing until the end of The EV Project, the collection and analysis of the data provided by the residential and public EVSE as well as the data provided by the Project vehicles will be conducted. This will result in understandings of the behavior of the EV driver, their use of public infrastructure and lessons learned related to the effectiveness of public infrastructure in the encouragement of the deployment of EVs.

9.6 The EV Project Legacy

The State of Tennessee, by participating in The EV Project, takes a leadership role in furthering the understanding of EVs and charging infrastructure. With a continued focus on sustainability and the environment, the collaborative effort that is taking place through the EV Micro-Climate process, allows Tennessee to demonstrate how working together, through public and private partnership can have a lasting positive impact for the region and set the example for sustainable practices. As market penetration continues to grow, the Tennessee Valley has the strategies in place to support EVs.
Appendix A – Largest Tennessee Employers
Largest Employers In Tennessee
By Individual Company Location – 500 + Employees

State of Tennessee
Department of Economic and Community Development
Division of Research and Planning

April 11, 2008
## LARGEST EMPLOYERS IN TENNESSEE
### By Individual Company Location - 500+ Employees

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<thead>
<tr>
<th>Company Name</th>
<th>Location</th>
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<th>Contact Name</th>
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<td>A &amp; L Industrial Construction &amp; Maintenance Inc</td>
<td>Kingsport, TN</td>
<td>1440 Shipley Ferry Rd E</td>
<td>423-239-3826</td>
<td>840</td>
<td>Roy L Adams</td>
<td>President</td>
<td>New industrial building construction; industrial or commercial cleaning services</td>
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<tr>
<td>A &amp; L Industrial Construction &amp; Maintenance Inc</td>
<td>Kingsport, TN</td>
<td>1780 Jared Dr</td>
<td>423-246-1082</td>
<td>1000</td>
<td>Boyd Lewis</td>
<td>Accounting Mgr</td>
<td>Industrial building &amp; warehouse construction</td>
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<tr>
<td>Aadg Inc</td>
<td>Milan, TN</td>
<td>9159 Telecom Dr</td>
<td>731-686-8345</td>
<td>600</td>
<td>Linda Newman</td>
<td>Exec Officer</td>
<td>Manufactures metal doors, sash &amp; trim</td>
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<tr>
<td>Accredo Health Inc</td>
<td>Memphis, TN</td>
<td>1640 Century Center Pkwy</td>
<td>901-385-3600</td>
<td>729</td>
<td>David D Stevens</td>
<td>CEO</td>
<td>Manufactures diagnostic substances; kidney dialysis center</td>
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<tr>
<td>Advanced Call Center Technologies LLC</td>
<td>Johnson City, TN</td>
<td>3035 Boones Creek Rd</td>
<td>423-283-5000</td>
<td>683</td>
<td>Joseph Lembo</td>
<td>Member</td>
<td>Telephone service</td>
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<td>Advantage Personnel Consultants Inc</td>
<td>Chattanooga, TN</td>
<td>5502 Brainerd Rd</td>
<td>423-499-9397</td>
<td>1500</td>
<td>Ann Fowler</td>
<td>President</td>
<td>Personnel management consulting services</td>
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<td>Adventist Health System Sunbelt Healthcare Corp</td>
<td>Madison, TN</td>
<td>500 Hospital Dr</td>
<td>615-865-2373</td>
<td>1070</td>
<td>Melissa Waddey</td>
<td>COO</td>
<td>Medical hospital</td>
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<tr>
<td>Aerospace Center Support</td>
<td>Tullahoma, TN</td>
<td>100 Kindell Dr Ste A211</td>
<td>931-454-3000</td>
<td>1200</td>
<td>Gary P Hobbs</td>
<td>Principal</td>
<td>Facilities support services</td>
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<td>Aerospace Testing Alliance</td>
<td>Tullahoma, TN</td>
<td>600 William Northern Blvd</td>
<td>931-454-4397</td>
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<td>David Elrod</td>
<td>General Manager</td>
<td>Engineering services</td>
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<tr>
<td>Affinion Benefits Group Inc</td>
<td>Franklin, TN</td>
<td>801 Crescent Centre Dr 200</td>
<td>615-764-2400</td>
<td>550</td>
<td>Dan Tarantin</td>
<td>CEO</td>
<td>Packaging &amp; labeling services</td>
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<td>AGC Flat Glass North America Inc</td>
<td>Kingsport, TN</td>
<td>PO Box 929</td>
<td>423-357-2400</td>
<td>750</td>
<td>Norman Dykes</td>
<td>Supervisor</td>
<td>Manufactures flat float glass</td>
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<td>AGC Life Insurance Co</td>
<td>Nashville, TN</td>
<td>American General Center</td>
<td>615-749-1000</td>
<td>1311</td>
<td>Rodney O Martin</td>
<td>Ch of Bd</td>
<td>Life insurance carrier</td>
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Largest Employers in Tennessee                                      Page 1
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<td>Home health care services</td>
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<tr>
<td>Aim Healthcare Services Inc</td>
<td>PO Box 292377</td>
<td>Nashville, TN 37229</td>
<td>615-503-1000</td>
<td>1500</td>
<td>Mr Jim Sohr, President</td>
<td>Financial management services for business; systems software development service; data processing &amp; preparation services</td>
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<td>Alcoa Inc</td>
<td>300 N Hall Rd</td>
<td>Alcoa, TN 37701</td>
<td>865-977-2011</td>
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<td>Ms Faye Martin, Office Manager</td>
<td>Aluminum refining &amp; smelting; manufactures aluminum</td>
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<td>Allstate Security</td>
<td>4770 Cromwell Ave Ste 14</td>
<td>Memphis, TN 38118</td>
<td>901-794-4069</td>
<td>500</td>
<td>Mr William Richardson, President</td>
<td>Employment placement services</td>
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<td>ALSTOM Power Inc</td>
<td>1119 Riverfront Pkwy</td>
<td>Chattanooga, TN 37402</td>
<td>423-752-2100</td>
<td>600</td>
<td>Robin Sentell, VP Human Res</td>
<td>Engineering services; steel fabricator</td>
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<td>American Building Maintenance Co of Georgia</td>
<td>4181 Senator St</td>
<td>Memphis, TN 38118</td>
<td>901-368-9800</td>
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<td>Mr Scott Steward, Manager</td>
<td>Janitorial &amp; custodial services</td>
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<td>American General Center</td>
<td>Nashville, TN 37250</td>
<td>615-749-1000</td>
<td>1000</td>
<td>Mr James Weakley, CEO</td>
<td>Life insurance carrier</td>
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<tr>
<td>American Ordnance LLC</td>
<td>2280 Highway 104 W Ste 2</td>
<td>Milan, TN 38358</td>
<td>731-686-6101</td>
<td>522</td>
<td>Mr Bill Teske, Engineer</td>
<td>Manufactures missile warheads</td>
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<td>American Residential Services</td>
<td>860 Ridge Lake Blvd</td>
<td>Memphis, TN 38120</td>
<td>901-820-8400</td>
<td>1300</td>
<td>Mr William E Le Baron, President</td>
<td>Plumbing service; general electrical contractor; appliance installation service; retails electric household appliances</td>
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<td>American West Trading Co Inc</td>
<td>5576 Highway 70 W</td>
<td>Waverly, TN 37185</td>
<td>931-296-4771</td>
<td>600</td>
<td>Mr Charles E McCoy, CEO</td>
<td>Manufactures men's boots; manufactures women's boots; wholesales boots</td>
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<td>America's Collectibles Network Inc</td>
<td>10001 Kingston Pike Ste 57</td>
<td>Knoxville, TN 37922</td>
<td>865-692-6000</td>
<td>1800</td>
<td>Mr Charles A Wagner III, Ch of Bd</td>
<td>Home shopping television order house</td>
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<td>Anderson Services LLC</td>
<td>6016 Brookvale Ln 110B</td>
<td>Knoxville, TN 37919</td>
<td>865-584-6714</td>
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<td>Mr John E Skladan, President</td>
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<td>336111</td>
<td>Manufactures motor vehicles &amp; car bodies; manufactures motor vehicle parts &amp; accessories</td>
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<td>Armstrong Hardwood Flooring Co</td>
<td>PO Box 4009 Oneida, TN 37841</td>
<td>423-569-8526</td>
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<td>Mr Floyd Sherman, CEO</td>
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<td>Armstrong World Industries Inc</td>
<td>565 Hartco Dr Oneida, TN 37841</td>
<td>423-569-9058</td>
<td>500</td>
<td>Mr Phil Christianson, Manager</td>
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<td></td>
<td>442210</td>
<td>Retails floor coverings</td>
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<tr>
<td>Astec Inc</td>
<td>PO Box 72787 Chattanooga, TN 37407</td>
<td>423-867-4210</td>
<td>700</td>
<td>Mr Don Brock, Ch of Bd</td>
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<td></td>
<td>333120</td>
<td>Manufactures construction machinery; manufactures burners, furnaces, boilers &amp; stokers; manufactures heat exchangers, condensers &amp; components</td>
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</tr>
<tr>
<td>Asurion Corp</td>
<td>650 Grassmere Park 101 Nashville, TN 37211</td>
<td>615-837-3000</td>
<td>1500</td>
<td>Mr Bret Comolli, CEO</td>
<td></td>
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<td>811198</td>
<td>Automotive road service; automobile owners association</td>
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<tr>
<td>Asurion Insurance Services Inc</td>
<td>648 Grassmere Park # 300 Nashville, TN 37211</td>
<td>615-832-1146</td>
<td>1190</td>
<td>Mr Bret Comolli, CEO</td>
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<td>524210</td>
<td>Insurance broker</td>
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<tr>
<td>AT&amp;T Mobility LLC</td>
<td>5155 Citation Dr 104 Memphis, TN 38118</td>
<td>901-541-8500</td>
<td>600</td>
<td>Mr Dan Zamrdt, Manager</td>
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<td></td>
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<tr>
<td></td>
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<td>423690</td>
<td>Wholesales mobile telephone equipment</td>
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<tr>
<td>Automotive Components Holdings LLC</td>
<td>PO Box 1355 Nashville, TN 37202</td>
<td>615-350-7500</td>
<td>950</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>327211</td>
<td>Manufactures flat glass; manufactures motorcycle parts &amp; accessories</td>
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<tr>
<td>Autozone Inc</td>
<td>PO Box 2198 Memphis, TN 38101</td>
<td>901-495-6500</td>
<td>1608</td>
<td>Mr William C Rhodes III, President</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
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<td>441310</td>
<td>Retails automotive parts; retails business &amp; non-game software</td>
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<tr>
<td>Company Name</td>
<td>Address</td>
<td>Phone</td>
<td>Employees</td>
<td>Contact Name</td>
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<td>Industry Notes</td>
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<tr>
<td>Baptist &amp; Physicians Local Services Bureau Inc</td>
<td>350 N Humphreys Blvd, Memphis, TN 38120</td>
<td>901-227-5117</td>
<td>500</td>
<td>Mr Stephen C Reynolds</td>
<td>President</td>
<td>Hospital management services</td>
</tr>
<tr>
<td>Baptist Health System of East Tennessee</td>
<td>PO Box 1788, Knoxville, TN 37901</td>
<td>865-632-5011</td>
<td>2500</td>
<td>Mr Bill Torrence</td>
<td>Senior VP</td>
<td>Medical hospital</td>
</tr>
<tr>
<td>Baptist Hospital of East Tennessee Inc</td>
<td>PO Box 1788, Knoxville, TN 37901</td>
<td>865-632-5200</td>
<td>1800</td>
<td>Dale Collins</td>
<td>CEO</td>
<td>Medical hospital</td>
</tr>
<tr>
<td>Baptist Hospital West Inc</td>
<td>10820 Parkside Dr, Knoxville, TN 37922</td>
<td>865-218-7011</td>
<td>2000</td>
<td>Mr Warren Payne</td>
<td>President</td>
<td>Medical hospital</td>
</tr>
<tr>
<td>Baptist Memorial Hospital-Memphis</td>
<td>6019 Walnut Grove Rd, Memphis, TN 38120</td>
<td>901-226-5000</td>
<td>4000</td>
<td>Mr Stephen C Reynolds</td>
<td>President</td>
<td>Medical hospital</td>
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<tr>
<td>Bates Acquisition LLC</td>
<td>PO Box 249, Lobelville, TN 37097</td>
<td>931-593-2251</td>
<td>800</td>
<td>Not Available</td>
<td></td>
<td>Manufactures molded rubber products</td>
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<tr>
<td>Bechtel Jacobs Co LLC</td>
<td>PO Box 4699MS729, Oak Ridge, TN 37831</td>
<td>865-241-2000</td>
<td>735</td>
<td>Mr John Hickey</td>
<td>CFO</td>
<td>Environmental remediation services</td>
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<tr>
<td>BellSouth Corp</td>
<td>333 Commerce St Ste 2104, Nashville, TN 37201</td>
<td>615-214-6520</td>
<td>1200</td>
<td>Mr Marty Dickens</td>
<td>President</td>
<td>Telecommunications consulting services; wireless telecommunications carrier &amp; service; electrical contractor</td>
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<tr>
<td>Blount Memorial Hospital Inc</td>
<td>907 E Lamar Alexander Pkwy 1F, Maryville, TN 37804</td>
<td>865-983-7211</td>
<td>1850</td>
<td>Ms Joy Hurm</td>
<td>Corp Secy</td>
<td>Medical hospital</td>
</tr>
<tr>
<td>Bluecross Blueshield of Tennessee Inc</td>
<td>801 Pine St, Chattanooga, TN 37402</td>
<td>423-755-5600</td>
<td>4144</td>
<td>Ms Vicky B Gregg</td>
<td>President</td>
<td>Hospital &amp; medical insurance carrier</td>
</tr>
<tr>
<td>Bobby Thomas</td>
<td>2300 Sitler St, Memphis, TN 38114</td>
<td>901-774-6533</td>
<td>500</td>
<td>Bobby Thomas</td>
<td>President</td>
<td>Freight forwarding services</td>
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<tr>
<td>Boeing Co</td>
<td>767 Boeing Rd, Oak Ridge, TN 37830</td>
<td>865-481-7602</td>
<td>750</td>
<td>Mr Donald Long</td>
<td>General Manager</td>
<td>Manufactures motorized aircraft; manufactures aircraft parts &amp; equipment; manufactures search &amp; navigation systems</td>
</tr>
</tbody>
</table>
Boeing Oak Ridge Co
767 Boeing Rd
Oak Ridge, TN 37830
Phone: 865-481-7100 Employees: 901
Contact: Mr Jerre Armstrong, Mfg Spvr
336413 Manufactures aircraft body assemblies & parts; manufactures search & navigation systems

Bradley County Memorial Hospital
PO Box 217
Brentwood, TN 37024
Phone: 423-559-6000 Employees: 850
Contact: Mr Ken Jackson, CFO
622110 Medical hospital

Bridgestone Firestone North American Tire LLC
PO Box 500
Morrison, TN 37357
Phone: 931-668-5500 Employees: 745
Contact: Mr Ron Benoit, Opers Mgr
441320 Tire dealer

Bridgestone Firestone North American Tire LLC
1201 Bridgestone Pkwy
La Vergne, TN 37068
Phone: 615-793-7581 Employees: 1800
Contact: Mr Jim Posey, Opers Mgr
441320 Tire dealer

Brother Industries Inc
7819 N Brother Blvd
Bartlett, TN 38133
Phone: 901-377-7777 Employees: 1200
Contact: Hiromi Gunji, Ch of Bd
333313 Manufactures typewriters & parts

Brother International Corp
7777 N Brother Blvd
Bartlett, TN 38133
Phone: 901-379-1051 Employees: 1200
Contact: Mr Jerry Dodds, Manager
333298 Manufactures household sewing machines & attachments; wholesales industrial sewing machines

BWXT Y-12 LLC
PO Box 2009
Oak Ridge, TN 37831
Phone: 865-574-1000 Employees: 4750
Contact: J A Fees, Ch of Bd
332993 Manufactures missile warheads; manufactures guided missiles & space vehicles

C B L & Associates Management Inc
2030 Hamilton Place Blvd # 500
Chattanooga, TN 37421
Phone: 423-855-0001 Employees: 1500
Contact: Mr Charles B Lebovitz, CEO
531120 Shopping center & mall operator

Calhoun Newsprint Co
PO Box 188
Calhoun, TN 37309
Phone: 423-336-2211 Employees: 900
Contact: Mr Walter Brunson, General Manager
322130 Paperboard mill

Calsonic North America Inc
PO Box 350
Shelbyville, TN 37162
Phone: 931-684-4490 Employees: 803
Contact: Mr Jim Batchlor, Manager
333415 Manufactures complete heating equipment

Calsonic North America Inc
201 Garrett Pkwy
Lewisburg, TN 37091
Phone: 931-359-4001 Employees: 640
Contact: Not Available
336399 Manufactures motor vehicle body components & frames

Calsonickansei North America Inc
PO Box 350
Shelbyville, TN 37162
Phone: 931-684-4490 Employees: 1000
Contact: Kiyoto Shinohara, President
336391 Manufactures motor vehicle air conditioning; manufactures motor vehicle parts & accessories
<table>
<thead>
<tr>
<th>Company Name</th>
<th>City</th>
<th>State</th>
<th>Address</th>
<th>Phone</th>
<th>Employees</th>
<th>Contact Name, Title</th>
<th>Industry Details</th>
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<tbody>
<tr>
<td>Cendant Travel Inc</td>
<td>Nashville</td>
<td>TN</td>
<td>PO Box 291987</td>
<td>615-874-3000</td>
<td>550</td>
<td>Mr Scott Hancock, President</td>
<td>Travel agency</td>
</tr>
<tr>
<td>Ceramaspeed Inc</td>
<td>Maryville</td>
<td>TN</td>
<td>1227 McArthur Rd</td>
<td>865-681-7070</td>
<td>500</td>
<td>Mr Kevin R McWilliams, CEO</td>
<td>Manufactures electric household cooking appliances</td>
</tr>
<tr>
<td>Charleston Hosiery Inc</td>
<td>Cleveland</td>
<td>TN</td>
<td>PO Box 2190</td>
<td>423-472-5095</td>
<td>600</td>
<td>Mr William R Sanders, President</td>
<td>Manufactures men’s, boys’ &amp; girls’ hosiery; manufactures women’s hosiery</td>
</tr>
<tr>
<td>Chattanooga-Hamilton County Hospital Authority</td>
<td>Chattanooga</td>
<td>TN</td>
<td>910 Blackford St</td>
<td>423-778-2141</td>
<td>600</td>
<td>Mr Jeff Abbott, Maint Mgr</td>
<td>Children’s hospital</td>
</tr>
<tr>
<td>Claiborne County Hospital &amp; Nursing Home</td>
<td>Tazewell</td>
<td>TN</td>
<td>1850 Old Knoxville Rd</td>
<td>423-626-4211</td>
<td>575</td>
<td>Ms Nancy Steadman, Opers Mgr</td>
<td>Medical hospital; skilled nursing care facility</td>
</tr>
<tr>
<td>Clayton Homes Inc</td>
<td>Maryville</td>
<td>TN</td>
<td>PO Box 9790</td>
<td>865-380-3000</td>
<td>1500</td>
<td>Mr Paul Nichols, President</td>
<td>Manufactures mobile homes; personal installment sales finance; provides property damage insurance; provides credit &amp; other financial responsibility insurance; mobile home site leasing &amp; rental; mobil</td>
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<tr>
<td>Cleveland Care &amp; Rehabilitation Center</td>
<td>Cleveland</td>
<td>TN</td>
<td>2750 Executive Park NW</td>
<td>423-476-4444</td>
<td>900</td>
<td>Ms Helen L Stout, President</td>
<td>Skilled nursing care facility</td>
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<tr>
<td>CMH Homes Inc</td>
<td>Maryville</td>
<td>TN</td>
<td>5000 Clayton Rd</td>
<td>865-380-3000</td>
<td>850</td>
<td>Mr Kevin T Clayton, President</td>
<td>Mobile home dealer</td>
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<tr>
<td>Comcast Corp</td>
<td>Nashville</td>
<td>TN</td>
<td>660 Mainstream Dr</td>
<td>615-255-5900</td>
<td>600</td>
<td>Mr Virgil Caudill, General Manager</td>
<td>Pay television distribution</td>
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<tr>
<td>Comdata Network Inc</td>
<td>Brentwood</td>
<td>TN</td>
<td>5301 Maryland Way</td>
<td>615-370-7405</td>
<td>1200</td>
<td>Mr Richard Packard, Branch Manager</td>
<td>Data processing &amp; preparation services</td>
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<tr>
<td>Comdata Network Inc</td>
<td>Brentwood</td>
<td>TN</td>
<td>5301 Maryland Way</td>
<td>615-370-7405</td>
<td>1200</td>
<td>Mr Richard Packard, Director</td>
<td>Data processing &amp; preparation services</td>
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<tr>
<td>Commercial Furniture Group Inc</td>
<td>Newport</td>
<td>TN</td>
<td>810 W Highway 25 70</td>
<td>423-623-0031</td>
<td>500</td>
<td>Mr Michael Nelson, Opers Mgr</td>
<td>Manufactures restaurant furniture; manufactures wood office furniture</td>
</tr>
</tbody>
</table>
Concord EFS Inc
PO Box 30668
Memphis, TN  38130
Phone:  901-371-8000   Employees:  595
Contact:  Mr Charles T Fote,  CEO
522320  Electronic funds transfer network, including
switching; wholesales automatic teller
machines; charge account service; trusts,
fiduciary & custody services

Cookeville Regional Medical Center
142 W 5th St
Cookeville, TN  38501
Phone:  931-528-2541   Employees:  1000
Contact:  Ms Paula Randolph,  Corp Secy
622110   Medical hospital

Correct Care Solutions LLC
3343 Perimeter Hill Dr # 300
Nashville, TN  37211
Phone:  615-324-5750   Employees:  1300
Contact:  Mr Jerry Boyle,  CEO
621111   Dispensary operated by physicians

Cosmolab Inc
1100 Garrett Pkwy
Lewisburg, TN  37091
Phone:  931-359-6253   Employees:  500
Contact:  Ms Holli Montgomery,  President
325620   Manufactures cosmetic preparations

County of Shelby
1075 Mullins Station Rd
Memphis, TN  38134
Phone:  901-386-4361   Employees:  500
Contact:  Mr Larry Lucas,  Branch Manager
622110   Medical hospital; public health program
services

Covenant Transport Inc
PO Box 22997
Chattanooga, TN  37422
Phone:  423-821-1212   Employees:  1000
Contact:  Mr David R Parker,  CEO
484121   Over the road trucking

Covenant Transportation Group Inc
400 Birmingham Hwy
Chattanooga, TN  37419
Phone:  423-821-1212   Employees:  5000
Contact:  Mr David R Parker,  President
484121   Over the road trucking

Cracker Barrel Old Country Store Inc
PO Box 787
Lebanon, TN  37088
Phone:  615-444-5533   Employees:  603
Contact:  Mr Michael A Woodhouse,  President
722110   Full service chain family restaurant; retail gift
shop

CSC Investments LLC
2600 Executive Park NW
Cleveland, TN  37312
Phone:  423-479-8208   Employees:  500
Contact:  Mr Dan Cooke,  Member
722110   Full service American restaurant

Cumberland Medical Center Inc
421 S Main St
Crossville, TN  38555
Phone:  931-484-9511   Employees:  850
Contact:  Mr Jim M Mackin,  President
622110   Medical hospital

Cummins Inc
4155 Quest Way
Memphis, TN  38115
Phone:  901-546-5600   Employees:  800
Contact:  Mr Edmund G Yu,  Controller
333618   Manufactures internal combustion engines;
wholesales new motor vehicle parts &
supplies

Dana Corp
100 Plumley Dr Bldg 12
Paris, TN  38242
Phone:  731-642-5582   Employees:  650
Contact:  Ms Prescilla Lemons,  Vice President
326291   Manufactures rubber products for mechanic;
use
Davidson Hotel Co LLC
3340 Players Club Pkwy Ste 200
Memphis, TN  38125
Phone:  901-761-4664   Employees:  4000
Contact:  Mr Glenn Summers,  Manager
721110   Hotel

Dbj Enterprises Inc
PO Box 2428
Cleveland, TN  37320
Phone:  423-478-0003   Employees:  525
Contact:  Ms Doris Johnson,  President
722211   Limited service fast-food chain restaurant

Deloitte & Touche LLP
4022 Sells Dr
Hermitage, TN  37076
Phone:  615-882-7600   Employees:  1000
Contact:  Mr Thomas Ratz,  Corp Secy
541219   Accounting, auditing & bookkeeping services

Denso Manufacturing Athens Tennessee
2400 Denso Dr
Athens, TN  37303
Phone:  423-746-0000   Employees:  890
Contact:  Mr Mark Hori,  CEO
336322   Manufactures automotive alternators

Denso Manufacturing Tennessee Inc
1720 Robert C Jackson Dr
Maryville, TN  37801
Phone:  865-982-7000   Employees:  2200
Contact:  Masahiko Hattori,  President
336322   Manufactures automotive alternators; manufactures motor vehicle electrical equipment

Deroyal Industries Inc
1601 State Highway 33
New Tazewell, TN  37825
Phone:  423-626-8858   Employees:  700
Contact:  Ms Rebecca Livesay,  Manager
339113   Manufactures surgical appliances & supplies

Devilbiss Air Power Co
213 Industrial Dr
Jackson, TN  38301
Phone:  731-423-7000   Employees:  870
Contact:  Mr Tom Dewitt,  President
333912   Manufactures air & gas compressors; manufactures high pressure cleaning equipment; manufactures electric motor & generator parts

Dmc-Memphis Inc
3000 Getwell Rd
Memphis, TN  38118
Phone:  901-369-8100   Employees:  540
Contact:  Gene J Faile,  CEO
622110   Medical hospital

Dollar General Corp
100 Mission Rdg
Goodlettsville, TN  37072
Phone:  615-855-4000   Employees:  700
Contact:  Mr David L Bere,  President
452990   Variety store

Eagle Bend Mfg Inc
1000 Jd Yarnell Ind Pkwy
Clinton, TN  37716
Phone:  865-457-3800   Employees:  600
Contact:  Mr Bill Jones,  General Manager
336399   Manufactures motor vehicle parts & accessories; manufactures stamped automotive products

East Tennessee Baptist Hospital
137 E Blount Ave
Knoxville, TN  37920
Phone:  865-632-5011   Employees:  2000
Contact:  Dale Collins,  President
622110   Medical hospital
East Tennessee Childrens Hospital Association Inc
PO Box 15010
Knoxville, TN 37901
Phone: 865-541-8000 Employees: 1200
Contact: Mr Robert Koppel, President
622110 Children's hospital

Eastman Chemical Co Inc
PO Box 511
Kingsport, TN 37662
Phone: 423-229-2000 Employees: 10000
Contact: Brian J Ferguson, CEO
325211 Manufactures plastics materials & resins; manufactures cyclic crude & intermediates; manufactures industrial organic chemicals; manufactures cellulose manmade fiber products

Electric Power Board of The Metropolitan Government of Nashville & Davidson
1214 Church St
Nashville, TN 37246
Phone: 615-747-3831 Employees: 700
Contact: Decosta Jenkins, President
221112 Generates fossil fuel electric power

Emerson Electric Co
669 Natchez Trace Dr
Lexington, TN 38351
Phone: 731-967-3000 Employees: 600
Contact: Mr David Gray, Controller
335312 Manufactures electric motors; wholesales electric motors

England Inc
402 Old Knoxville Hwy
New Tazewell, TN 37825
Phone: 423-626-5211 Employees: 1450
Contact: Mr Rodney England, President
337121 Manufactures upholstered household furniture

Enterprise Electric LLC
1300 Fort Negley Blvd
Nashville, TN 37203
Phone: 615-350-7270 Employees: 500
Contact: Mr Steven J Kirby, Member
238210 Electrical contractor

ePerformax Inc
8001 Centerview Pkwy Fl 3
Cordova, TN 38018
Phone: 901-751-4800 Employees: 550
Contact: Ms Teresa Hartsaw, President
561422 Telemarketing services; marketing consultant service

Federal Express Corp
PO Box 727
Memphis, TN 38101
Phone: 901-369-3600 Employees: 1000
Contact: Mr David Dromczek, President
492110 Provides private air letter delivery services; delivery services by vehicle; over the road trucking; air freight service

Federal Express Corp
40 Fed Ex Pkwy
Collierville, TN 38017
Phone: 901-263-7104 Employees: 1500
Contact: Not Available
492110 Provides private air package delivery services; ground courier services

Federal Express Corp
PO Box 727
Memphis, TN 38194
Phone: 901-224-5075 Employees: 3000
Contact: Mr Ted Weise, Manager
481112 Air freight service

Federal Express Corp
PO Box 727
Memphis, TN 38194
Phone: 901-369-3600 Employees: 3000
Contact: Mr Frederick W Smith, Ch of Bd
492110 Provides private air package delivery services; over the road trucking; package delivery services by vehicle; air freight service

Federal-Mogul Corp
1 Grizzly Ln
Smithville, TN 37166
Phone: 615-597-6700 Employees: 900
Contact: Mr Darel Callis, Branch Manager
339991 Manufactures gaskets & sealing devices
<table>
<thead>
<tr>
<th>Company Name</th>
<th>Address</th>
<th>Phone Number</th>
<th>Employees</th>
<th>Contact Name, Position</th>
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<tr>
<td>Federal-Mogul Fap Inc</td>
<td>1 Grizzly Ln, Smithville, TN 37166</td>
<td>615-597-6700</td>
<td>600</td>
<td>Mr Richard Newson, President</td>
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<tr>
<td>FedEx Corp</td>
<td>942 S Shady Grove Rd, Memphis, TN 38120</td>
<td>901-818-7500</td>
<td>1600</td>
<td>Mr Frederick W Smith, President</td>
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<tr>
<td>Fiberweb Inc</td>
<td>1000 Industrial Rd, Old Hickory, TN 37138</td>
<td>615-847-7000</td>
<td>500</td>
<td>Mr Dean Gaskins, President</td>
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<tr>
<td>First Horizon National Corp</td>
<td>165 Madison Ave, Memphis, TN 38103</td>
<td>901-523-4444</td>
<td>633</td>
<td>Mr Michael D Rose, Ch of Bd</td>
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<tr>
<td>First Tennessee Bank National Association</td>
<td>PO Box 84, Memphis, TN 38101</td>
<td>901-523-4444</td>
<td>1000</td>
<td>Mr Charles George, Manager</td>
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<tr>
<td>Fisher &amp; Co Inc</td>
<td>Highway 13 S, Linden, TN 37096</td>
<td>931-589-2195</td>
<td>644</td>
<td>Mr Tim Tabor, Branch Manager</td>
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<tr>
<td>Five Rivers Electronic Innovations LLC</td>
<td>PO Box 1830, Greeneville, TN 37744</td>
<td>423-636-5100</td>
<td>700</td>
<td>Mr Gary Greenway, Vice President</td>
</tr>
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<tr>
<td>Fleetguard International Corp</td>
<td>PO Box 6001, Cookeville, TN 38502</td>
<td>931-526-9551</td>
<td>1100</td>
<td>Mr Vernon Wilson, Manager</td>
</tr>
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<td>Flextronics Logistics USA Inc</td>
<td>5200 Tradeport Dr, Memphis, TN 38141</td>
<td>901-215-2700</td>
<td>1300</td>
<td>Mr Michael McNamara, Principal</td>
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<tr>
<td>Flextronics Semiconductor Design Inc</td>
<td>6380 E Holmes Rd, Memphis, TN 38141</td>
<td>901-379-2300</td>
<td>500</td>
<td>Mr Raymond Degraas, Manager</td>
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<td></td>
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<tr>
<td>Food Lion LLC</td>
<td>2453 Murfreesboro Pike, Nashville, TN 37217</td>
<td>615-399-1707</td>
<td>1000</td>
<td>Mr Keith Altshuler, President</td>
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<tr>
<td></td>
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</tr>
<tr>
<td>Fort Sanders Regional Medical Center</td>
<td>1901 W Clinch Ave, Knoxville, TN 37916</td>
<td>865-541-1111</td>
<td>1500</td>
<td>Mr Keith Altshuler, President</td>
</tr>
</tbody>
</table>

*Manufactures motor vehicle parts & accessories; retails automotive parts*
*Manufactures television sets*
*Manufactures blowers & fans; manufactures motor vehicle parts & accessories*
*Administrative management services*
*Retail supermarket chain*
*Hospital with professional nursing school*
<table>
<thead>
<tr>
<th>Company Name</th>
<th>Address</th>
<th>City, State Zip</th>
<th>Phone</th>
<th>Employees</th>
<th>Contact Name</th>
<th>Contact Title</th>
<th>Industry Description</th>
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<tbody>
<tr>
<td>Fred's Inc</td>
<td>PO Box 18356</td>
<td>Memphis, TN 38181</td>
<td>901-365-8880</td>
<td>1035</td>
<td>Mr Michael J Hayes, CEO</td>
<td></td>
<td>Variety store; wholesales variety store merchandise; drug store</td>
</tr>
<tr>
<td>Fred's Stores of Tennessee Inc</td>
<td>4300 New Getwell Rd</td>
<td>Memphis, TN 38118</td>
<td>901-365-8880</td>
<td>600</td>
<td>Mr Michael J Hayes, CEO</td>
<td></td>
<td>Variety store</td>
</tr>
<tr>
<td>Frucon Construction Corp</td>
<td>PO Box 1568</td>
<td>Jackson, TN 38302</td>
<td>731-423-7162</td>
<td>500</td>
<td>Mr Joe Peitre, Owner</td>
<td></td>
<td>Residential construction</td>
</tr>
<tr>
<td>Galen Health Care Inc</td>
<td>1 Park Plz</td>
<td>Nashville, TN 37203</td>
<td>615-344-9551</td>
<td>800</td>
<td>Mr Sam Hazen, President</td>
<td></td>
<td>Medical hospital</td>
</tr>
<tr>
<td>Gap Inc</td>
<td>100 Gap Blvd</td>
<td>Gallatin, TN 37066</td>
<td>615-230-2300</td>
<td>1000</td>
<td>Mr Gregg Mitchell, Manager</td>
<td></td>
<td>Warehousing &amp; storage facility; wholesales men's &amp; boys' clothing; wholesales women's &amp; children's clothing</td>
</tr>
<tr>
<td>Gateway Health System Inc</td>
<td>PO Box 3160</td>
<td>Clarksville, TN 37043</td>
<td>931-645-3976</td>
<td>1000</td>
<td>Mr Walton Smith Jr, Ch of Bd</td>
<td></td>
<td>Medical hospital</td>
</tr>
<tr>
<td>Gaylord Entertainment Co</td>
<td>1 Gaylord Dr</td>
<td>Nashville, TN 37214</td>
<td>615-316-6000</td>
<td>3622</td>
<td>Mr Colin V Reed V, President</td>
<td></td>
<td>Traveler accommodations; radio broadcasting stations with a country music format; business support services</td>
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<tr>
<td>Gaylord Opryland USA Inc</td>
<td>2802 Opryland Dr</td>
<td>Nashville, TN 37214</td>
<td>615-889-6600</td>
<td>4000</td>
<td>Mr Edward L Gaylord, Ch of Bd</td>
<td></td>
<td>Theme park</td>
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<tr>
<td>Gca Services Group Inc</td>
<td>4710 Western Ave</td>
<td>Knoxville, TN 37921</td>
<td>865-588-8063</td>
<td>3500</td>
<td>Mr Buddy Helton, Principal</td>
<td></td>
<td>Building &amp; office cleaning service</td>
</tr>
<tr>
<td>General Mills Inc</td>
<td>PO Box 129</td>
<td>Murfreesboro, TN 37133</td>
<td>615-890-9900</td>
<td>700</td>
<td>Pat Murphy, Plant Manager</td>
<td></td>
<td>Manufactures flour &amp; other grain mill products; manufactures frozen bakery products; manufactures food preparations</td>
</tr>
<tr>
<td>Gillette Co</td>
<td>PO Box 3390</td>
<td>Cleveland, TN 37320</td>
<td>423-478-6000</td>
<td>800</td>
<td>Ms Tammy Williams-Man, Exec Officer</td>
<td></td>
<td>Manufactures dry cell batteries</td>
</tr>
<tr>
<td>Company Name</td>
<td>Address</td>
<td>City, State  Zip</td>
<td>Phone</td>
<td>Employees</td>
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<td>Industry Notes</td>
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<tr>
<td>Goodman Manufacturing Co, LP</td>
<td>1810 Wilson Pkwy</td>
<td>Fayetteville, TN 37334</td>
<td>931-433-6101</td>
<td>1100</td>
<td>Ms Karen Counts, Manager</td>
<td>Manufactures complete domestic or industrial air conditioning units; manufactures household electric ranges; manufactures household trash compactors; manufactures heating equipment &amp; supplies</td>
<td></td>
</tr>
<tr>
<td>Goody’s Family Clothing Inc</td>
<td>PO Box 22000</td>
<td>Knoxville, TN 37933</td>
<td>865-966-2000</td>
<td>641</td>
<td>Mr Isaac Dabah, Ch of Bd</td>
<td>Retails family clothing</td>
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</tr>
<tr>
<td>Greenbank</td>
<td>100 N Main St</td>
<td>Greeneville, TN 37743</td>
<td>423-639-5111</td>
<td>500</td>
<td>Mr Stan R Puckett, President</td>
<td>State commercial bank</td>
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<tr>
<td>Haggar Clothing Co</td>
<td>1645 Parkway Ste 460</td>
<td>Sevierville, TN 37862</td>
<td>865-428-3050</td>
<td>500</td>
<td>Mr Joe Hagger III, CEO</td>
<td>Retails family clothing</td>
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</tr>
<tr>
<td>Hamilton County Department of Education</td>
<td>2501 Dodds Ave</td>
<td>Chattanooga, TN 37407</td>
<td>423-209-5650</td>
<td>570</td>
<td>Ms Lana Elliot, Director</td>
<td>Human resource, social work &amp; welfare administration services; direct sales food service</td>
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<tr>
<td>Hardin’s-Sysco Food Services LLC</td>
<td>4359 Bf Goodrich Blvd</td>
<td>Memphis, TN 38118</td>
<td>901-795-2300</td>
<td>600</td>
<td>Mr Peter Scatamacchia, President</td>
<td>Wholesales general line groceries; wholesales packaged frozen meats; wholesales medical equipment &amp; supplies; wholesales fresh meat; wholesales fresh vegetables; wholesales industrial &amp; persona serv</td>
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<tr>
<td>Harton, John W Regional Medical Center Inc</td>
<td>1801 N Jackson St</td>
<td>Tullahoma, TN 37388</td>
<td>931-393-3000</td>
<td>500</td>
<td>Mr Robert Bigley, CEO</td>
<td>Medical hospital</td>
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<tr>
<td>Haven Behavioral Healthcare Inc</td>
<td>330 Mallory Station Rd B4</td>
<td>Franklin, TN 37067</td>
<td>615-206-7720</td>
<td>1000</td>
<td>Mr Vernon Westrich, President</td>
<td>Psychiatrist office</td>
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<tr>
<td>Haywood Corp</td>
<td>751 N Dupree Ave</td>
<td>Brownsville, TN 38012</td>
<td>731-772-3690</td>
<td>700</td>
<td>Mr Jonathan Fain, President</td>
<td>Makes rubber &amp; plastic hoses &amp; beltings</td>
<td></td>
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<tr>
<td>HCA Inc</td>
<td>100 Northcrest Dr</td>
<td>Springfield, TN 37172</td>
<td>615-384-2411</td>
<td>650</td>
<td>Mr Scott Raynas, Manager</td>
<td>Medical hospital</td>
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<tr>
<td>HCA Information Services Inc</td>
<td>2555 Park Plz</td>
<td>Nashville, TN 37203</td>
<td>615-344-9551</td>
<td>1100</td>
<td>Noel Williams, President</td>
<td>Data processing &amp; preparation services</td>
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<tr>
<td>Company Name</td>
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<tr>
<td>Hca-Hospital Corp of America Inc</td>
<td>1 Park Plz, Nashville, TN 37203</td>
<td>615-327-9551</td>
<td>800</td>
<td>Mr Thomas F Frist Jr, Ch of Bd</td>
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<tr>
<td></td>
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<td></td>
<td>622110 Medical hospital; psychiatric hospital</td>
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<tr>
<td>Henry County Medical Center</td>
<td>PO Box 1030, Paris, TN 38242</td>
<td>731-642-1220</td>
<td>500</td>
<td>Ms Elaine Hodge, Corp Secy</td>
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<td>622110 Medical hospital; skilled nursing care facility</td>
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<tr>
<td>Herschend Family Entertainment Corp</td>
<td>1020 Dollywood Ln, Pigeon Forge, TN 37863</td>
<td>865-428-9422</td>
<td>2500</td>
<td>Mr Ken Bell, Branch Manager</td>
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<td>713990 Amusement concession services</td>
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<tr>
<td>Hershey Co</td>
<td>PO Box 2038, Memphis, TN 38101</td>
<td>901-775-2960</td>
<td>555</td>
<td>Mr Mike Clements, Prdtn Mgr</td>
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<td></td>
<td>311340 Manufactures chewing gum; wholesales chewing gum; manufactures candy &amp; other confectionery products</td>
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<tr>
<td>Hillcrest Medical Nursing Institute Inc</td>
<td>PO Box 59040, Knoxville, TN 37950</td>
<td>865-687-1321</td>
<td>500</td>
<td>Ms Teresa Webster, CEO</td>
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<td>623110 Intermediate care facility; skilled nursing care facility</td>
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<td>Hilton Hhonors Worldwide LLC</td>
<td>755 Crossover Ln, Memphis, TN 38117</td>
<td>901-374-5000</td>
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<td>561499 Business support services</td>
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<tr>
<td>Hotel Corp of America</td>
<td>PO Box 550, Nashville, TN 37202</td>
<td>615-344-9551</td>
<td>800</td>
<td>Mr Thomas F Frist Jr, CEO</td>
<td></td>
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<tr>
<td>Hotel Peabody, LP</td>
<td>149 Union Ave, Memphis, TN 38103</td>
<td>901-529-4000</td>
<td>500</td>
<td>Mr Jack A Belz, Partner</td>
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<td>721110 Hotel</td>
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<tr>
<td>Idleaire Technologies Corp</td>
<td>410 N Cedar Bluff Rd, Knoxville, TN 37923</td>
<td>865-342-3600</td>
<td>542</td>
<td>Mr Michael Crabtree, President</td>
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<td></td>
<td>336211 Manufactures specialty motor vehicle bodies manufactures refrigeration &amp; heating equipment</td>
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<td>Impact Logistics Inc</td>
<td>7200 Goodlett Farms Pkwy, Cordova, TN 38016</td>
<td>901-377-5298</td>
<td>1100</td>
<td>Mr David Hamilton, CEO</td>
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<td>561320 Help supply services</td>
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<td>Imperial Guard &amp; Detective Services Inc</td>
<td>2555 Poplar Ave, Memphis, TN 38112</td>
<td>901-726-6636</td>
<td>900</td>
<td>R Q Brewer, President</td>
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<td>561611 Detective agency</td>
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<tr>
<td>Indian Path Hospital Inc</td>
<td>2000 Brookside Dr, Kingsport, TN 37660</td>
<td>423-857-7000</td>
<td>585</td>
<td>Mr Martin McLorain, CEO</td>
<td></td>
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<td></td>
<td></td>
<td>622110 Medical hospital</td>
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</table>
Ingram Book Group Inc
1 Ingram Blvd
La Vergne, TN 37086
Phone: 615-213-5000 Employees: 2048
Contact: Mr James E Chandler, President
424920 Wholesales books, periodicals & newspapers

International Paper Co
6400 Poplar Ave
Memphis, TN 38197
Phone: 901-419-7000 Employees: 3000
Contact: Mr John V Faraci V, CEO
322121 Paper mill; manufactures corrugated boxes; manufactures container, packaging & boxboard; manufactures liquid tight food containers including milk containers; manufactures coated & laminated paper; pu

International Paper Co
4113 Willow Lake Blvd
Memphis, TN 38118
Phone: 901-419-9000 Employees: 3000
Contact: Not Available
322121 Paper mill

International Rehabilitation Associates Inc
PO Box 1465
Nashville, TN 37202
Phone: 615-244-5600 Employees: 900
Contact: Mr Bryan Sethzer, Vice President
524114 Health insurance maintenance organization

Jackson Hospital Corp
367 Hospital Blvd
Jackson, TN 38305
Phone: 731-661-2000 Employees: 550
Contact: Mr Tim Puthoff, CEO
622110 Medical hospital

Jackson-Madison County General Hospital
708 W Forest Ave
Jackson, TN 38301
Phone: 731-425-5000 Employees: 3193
Contact: Mr Bruce Belebsoe, Ch of Bd
622110 Medical hospital

Jacobs Technology Inc
877 Avenue E
Arnold AFB, TN 37389
Phone: 931-454-3000 Employees: 1300
Contact: Mr Roger Star, General Manager
541330 Engineering services; testing laboratory

Johnson City Medical Center Inc
400 N State Of Franklin Rd
Johnson City, TN 37604
Phone: 423-431-6111 Employees: 2080
Contact: Ms Diane Stine, Corp Secy
622110 Medical hospital

Johnson Controls Interiors LLC
1501 S Molloy Ln
Murfreesboro, TN 37129
Phone: 615-890-5559 Employees: 657
Contact: Mr Gerald Curry, Plant Manager
336360 Manufactures automobile seats

Johnson Controls Interiors LLC
659 Natchez Trace Dr
Lexington, TN 38351
Phone: 731-968-3601 Employees: 630
Contact: Mr Jed Curry, Exec Officer
336399 Manufactures motor vehicle parts & accessories; manufactures institutional furniture

Johnson Controls Interiors LLC
PO Box 989
Athens, TN 37371
Phone: 423-745-5807 Employees: 700
Contact: Mr Chris Brauss, Plant Manager
336360 Manufactures automobile seats

Jones Bros Inc
PO Box 727
Mount Juliet, TN 37121
Phone: 615-754-4710 Employees: 1000
Contact: Mr Robert A Jones, Ch of Bd
237310 Bridge construction; general highway & street construction service; irrigation land leveling service; driveway, parking lot & blacktop contractor; excavation & grading, building construction contract
Jostens Inc
PO Box 923
Clarksville, TN  37041
Phone:  931-647-5211    Employees:  500
Contact:  Mr David Dunlap,  Controller
511199  Atlas, map & guide publishing; book printer; book publisher

Jtekt Automotive Tennessee-Morristown Inc
5932 Commerce Blvd
Morristown, TN  37814
Phone:  423-585-0999    Employees:  545
Contact:  Mr Ike Funahashi,  Ch of Bd
336330  Manufactures motor vehicle power steering equipment

Jtekt Automotive Tennessee-Vonore Co
55 Excellence Way
Vonore, TN  37885
Phone:  423-884-9200    Employees:  780
Contact:  Mr Michael Bowers,  Partner
326199  Manufactures plastic automotive parts

Kayser-Roth Corp
220 Broadway St
Dayton, TN  37321
Phone:  423-775-1551    Employees:  503
Contact:  Mr Steve Wimberly,  Manager
315111  Dyeing & finishing women's full & knee length hosiery

Kellogg Co
2168 Frisco Ave
Memphis, TN  38114
Phone:  901-743-0250    Employees:  750
Contact:  Lee Romine,  Corp Secy
311230  Manufactures cereals

Kellwood Co Inc
208 N Sportwear Division
Rutherford, TN  38369
Phone:  731-665-6511    Employees:  500
Contact:  Mr Enoch Harding,  Division Pres
315234  Manufactures women's, misses' & juniors' suits & coats; manufactures men's & boys' coats & suits; manufactures women's & misses' outerwear

Largest Employers in Tennessee

Kenco Logistic Services Inc
PO Box 1607
Chattanooga, TN  37401
Phone:  423-756-5552    Employees:  2500
Contact:  Mr James D Kennedy III,  Ch of Bd
531130  Self storage warehousing; crating goods for shipping

Kimberly-Clark Corp
PO Box 59051
Knoxville, TN  37950
Phone:  865-541-7000    Employees:  600
Contact:  Mr James E Lopas,  Principal
322121  Paper mill

King Industries Inc
PO Box 16608
Chattanooga, TN  37416
Phone:  423-622-4500    Employees:  550
Contact:  Mr Bill King,  President
238220  Mechanical contractor

Knoxville News-Sentinel Co
PO Box 59038
Knoxville, TN  37950
Phone:  865-523-3131    Employees:  580
Contact:  Mr Bruce Hartmann,  President
511110  Publishes & prints newspapers

Kordsa Inc
PO Box 599
Hixson, TN  37343
Phone:  423-643-8300    Employees:  600
Contact:  Dincer Celik,  President
313111  Manufactures spun staple nylon yarn

Landair Transport Inc
PO Box 938
Greeneville, TN  37744
Phone:  423-783-1300    Employees:  761
Contact:  Mr Scott M Niswonger,  CEO
484121  Over the road trucking

11-Apr-08
<table>
<thead>
<tr>
<th>Company Name</th>
<th>Address</th>
<th>City, State, Zip</th>
<th>Phone</th>
<th>Employees</th>
<th>Contact Name</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laughlin Memorial Hospital Inc</td>
<td>1420 Tusculum Blvd</td>
<td>Greeneville, TN 37745</td>
<td>423-787-5000</td>
<td>500</td>
<td>Mr Charles H Whitfield Jr</td>
<td>CEO</td>
</tr>
<tr>
<td>Manheim Auctions Inc</td>
<td>1450 Lebanon Pike</td>
<td>Nashville, TN 37210</td>
<td>615-244-2140</td>
<td>600</td>
<td>Robin Treadway</td>
<td>Manager</td>
</tr>
<tr>
<td>La-Z-Boy Inc</td>
<td>PO Box 457</td>
<td>Dayton, TN 37321</td>
<td>423-775-3900</td>
<td>500</td>
<td>Mr David Brown</td>
<td>CEO</td>
</tr>
<tr>
<td>Manufacturers Industrial Group</td>
<td>PO Box 1048</td>
<td>Lexington, TN 38351</td>
<td>731-967-0001</td>
<td>900</td>
<td>Andre Gist</td>
<td>Member</td>
</tr>
<tr>
<td>Lebanon Hma Inc</td>
<td>1411 W Baddour Pkwy</td>
<td>Lebanon, TN 37087</td>
<td>615-444-8262</td>
<td>500</td>
<td>Vins Cherry</td>
<td>CEO</td>
</tr>
<tr>
<td>Mars Snackfood Us LLC</td>
<td>3500 Peerless Rd NW</td>
<td>Cleveland, TN 37312</td>
<td>423-479-8611</td>
<td>678</td>
<td>George Linden</td>
<td>President</td>
</tr>
<tr>
<td>Lee Co</td>
<td>331 Mallory Station Rd</td>
<td>Franklin, TN 37067</td>
<td>615-567-1000</td>
<td>600</td>
<td>William B Lee</td>
<td>CEO</td>
</tr>
<tr>
<td>Marvin Windows of Tennessee Inc</td>
<td>101 Marvin Dr</td>
<td>Ripley, TN 38063</td>
<td>731-635-5190</td>
<td>700</td>
<td>John W Marvin</td>
<td>CEO</td>
</tr>
<tr>
<td>Maury Regional Hospital Inc</td>
<td>1224 Trotwood Ave</td>
<td>Columbia, TN 38401</td>
<td>931-381-1111</td>
<td>2000</td>
<td>Robert Otwell</td>
<td>CEO</td>
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<tr>
<td>Mahle Metal Leve</td>
<td>PO Box 748</td>
<td>Morristown, TN 37815</td>
<td>423-581-6603</td>
<td>1300</td>
<td>Not Available</td>
<td></td>
</tr>
<tr>
<td>Mayfield Dairy Farms LLC</td>
<td>PO Box 310</td>
<td>Athens, TN 37371</td>
<td>423-745-2151</td>
<td>525</td>
<td>Scott C Mayfield Jr</td>
<td>President</td>
</tr>
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</table>

Largest Employers in Tennessee Page 16
11-Apr-08
<table>
<thead>
<tr>
<th>Company Name</th>
<th>Address</th>
<th>City, State ZIP Code</th>
<th>Phone Number</th>
<th>Employees</th>
<th>Contact Person, Title</th>
<th>Industry/Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maytag Corp</td>
<td>PO Box 2790</td>
<td>Cleveland, TN 37320</td>
<td>423-472-3371</td>
<td>2500</td>
<td>Mr Tom Chatman, VP Operations</td>
<td>Manufactures indoor cooking equipment</td>
</tr>
<tr>
<td>Maytag Corp</td>
<td>2500 Dr F E Wright Dr</td>
<td>Jackson, TN 38305</td>
<td>731-424-3500</td>
<td>600</td>
<td>Ms Janice Page, Manager</td>
<td>Manufactures household dishwashing machines</td>
</tr>
<tr>
<td>McKee Foods Corp</td>
<td>PO Box 750</td>
<td>Collegedale, TN 37315</td>
<td>423-238-7111</td>
<td>3795</td>
<td>Mr Mike M Kee, President</td>
<td>Manufactures fresh bakery cakes; manufactures cookies; manufactures food preparations; manufactures cereals</td>
</tr>
<tr>
<td>Memphis Publishing Co</td>
<td>495 Union Ave</td>
<td>Memphis, TN 38103</td>
<td>901-529-2211</td>
<td>750</td>
<td>Mr Joseph Pepe, President</td>
<td>Publishes &amp; prints newspapers</td>
</tr>
<tr>
<td>Meridian Comp of New York</td>
<td>20 Burton Hills Blvd 20</td>
<td>Nashville, TN 37215</td>
<td>615-665-7538</td>
<td>553</td>
<td>Mr Haywood Cochrane, CEO</td>
<td>Mental health physicians' office &amp; clinic</td>
</tr>
<tr>
<td>Methodist Medical Center of Oak Ridge Inc</td>
<td>PO Box 2529</td>
<td>Oak Ridge, TN 37831</td>
<td>865-835-4000</td>
<td>1442</td>
<td>Jan McNally, President</td>
<td>Medical hospital</td>
</tr>
<tr>
<td>Metropolitan Government of Nashville &amp; Davidson County</td>
<td>1414 County Hospital Rd</td>
<td>Nashville, TN 37218</td>
<td>615-862-7000</td>
<td>562</td>
<td>Jn Henderson, Finance Spvr</td>
<td>Convalescent home; county supervisors' &amp; executives' office</td>
</tr>
<tr>
<td>Metropolitan Government of Nashville &amp; Davidson County</td>
<td>72 Hermitage Ave</td>
<td>Nashville, TN 37210</td>
<td>615-862-4150</td>
<td>692</td>
<td>Mr John M Stone, Director</td>
<td>Medical hospital; county government administration of public health programs</td>
</tr>
<tr>
<td>Metropolitan Government of Nashville &amp; Davidson County</td>
<td>750 S 5th St</td>
<td>Nashville, TN 37206</td>
<td>615-862-8700</td>
<td>542</td>
<td>Ms Millie Carman, Manager</td>
<td>Garbage collecting, destroying &amp; processing services; government public utility commission</td>
</tr>
<tr>
<td>Metropolitan Government of Nashville &amp; Davidson County</td>
<td>621 Mainstream Dr</td>
<td>Nashville, TN 37228</td>
<td>615-862-4500</td>
<td>643</td>
<td>Mr Lester Williams, Branch Manager</td>
<td>Water supply services; government waste management program administration office</td>
</tr>
<tr>
<td>Company Name</td>
<td>Address</td>
<td>City, State, Zip</td>
<td>Telephone</td>
<td>Employees</td>
<td>Contact</td>
<td>Industry Description</td>
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<tr>
<td>Metropolitan Government of Nashville &amp; Davidson County</td>
<td>511 Oman St</td>
<td>Nashville, TN 37203</td>
<td>615-862-8400</td>
<td>500</td>
<td>Mr Roy Wilson, Director</td>
<td>Recreation services; county government urban &amp; community development</td>
</tr>
<tr>
<td>Metropolitan Government of Nashville &amp; Davidson County</td>
<td>1818 Albion St</td>
<td>Nashville, TN 37208</td>
<td>615-341-4403</td>
<td>650</td>
<td>Mr Reginald Coopwood, CEO</td>
<td>Medical hospital; county government administration of public health programs</td>
</tr>
<tr>
<td>MI Windows &amp; Doors Inc</td>
<td>704 12th St</td>
<td>Smyrna, TN 37167</td>
<td>615-459-4161</td>
<td>500</td>
<td>Mr David Kelley, General Manager</td>
<td>Manufactures metal doors, sash &amp; trim; millwork</td>
</tr>
<tr>
<td>Michael Moulton Telephone</td>
<td>333 Commerce St</td>
<td>Nashville, TN 37201</td>
<td>615-214-5916</td>
<td>1700</td>
<td>Mr Michael Moulton, Manager</td>
<td>Wired telecommunications carrier &amp; service</td>
</tr>
<tr>
<td>Middle Tennessee Medical Center</td>
<td>PO Box 1178</td>
<td>Murfreesboro, TN 37133</td>
<td>615-396-4100</td>
<td>1000</td>
<td>Mr Gordon B Ferguson, CEO</td>
<td>Medical hospital</td>
</tr>
<tr>
<td>Monitor Systems Inc</td>
<td>2521 Russell St Ste C</td>
<td>Kingsport, TN 37660</td>
<td>423-247-5300</td>
<td>580</td>
<td>Mr Tom Hammons, President</td>
<td>Limited service fast-food chain restaurant</td>
</tr>
<tr>
<td>Morgan Keegan &amp; Co Inc</td>
<td>50 N Front St</td>
<td>Memphis, TN 38103</td>
<td>901-524-4100</td>
<td>900</td>
<td>Mr Allen B Morgan Jr, Ch of Bd</td>
<td>Security broker service</td>
</tr>
<tr>
<td>Morristown-Hamblen Hospital Association</td>
<td>PO Box 1178</td>
<td>Morristown, TN 37816</td>
<td>423-586-4231</td>
<td>600</td>
<td>Mr Richard Clark, President</td>
<td>Hospital, affiliated with AMA residency</td>
</tr>
<tr>
<td>Mountain State Health Alliance Inc</td>
<td>400 N State Of Franklin Rd</td>
<td>Johnson City, TN 37604</td>
<td>423-431-6360</td>
<td>1200</td>
<td>Mr Dennis Vonderfecht, President</td>
<td>Medical hospital; management services</td>
</tr>
<tr>
<td>MTD Products Inc</td>
<td>PO Box 927</td>
<td>Martin, TN 38237</td>
<td>731-587-4279</td>
<td>650</td>
<td>Mr Steve Baker, Mfg Spvr</td>
<td>Manufactures residential hand or power lawnmowers; manufactures motor vehicle frames</td>
</tr>
<tr>
<td>M-Tek Inc</td>
<td>1020 Volunteer Pkwy</td>
<td>Manchester, TN 37355</td>
<td>931-728-4122</td>
<td>1317</td>
<td>Mr Steve Baker, Mfg Spvr</td>
<td>Manufactures finished injection molded plastic products; manufactures motor vehicle parts &amp; accessories; manufactures hardware</td>
</tr>
<tr>
<td>Mueller Co Ltd</td>
<td>1401 Mueller Ave</td>
<td>Chattanooga, TN 37406</td>
<td>423-698-8811</td>
<td>550</td>
<td>Mr Trey Elmendors, Exec Officer</td>
<td>Manufactures fire hydrant valves; malleable iron foundry; manufactures industrial process flow instruments</td>
</tr>
</tbody>
</table>
National Seating Co  
200 National Dr  
Vonore, TN  37885  
Phone:  423-884-6651  
Contact:  Mr Vernon Lowe,  President  
337127  
Manufactures transportation seats  

Newell Office Products Inc  
1427 William Blount Dr  
Maryville, TN  37801  
Phone:  865-977-5477  
Contact:  Mr David Klatt,  President  
337214  
Manufactures office furniture; manufactures partitions & fixtures  

Newell Rubbermaid Inc  
1427 William Blount Dr  
Maryville, TN  37801  
Phone:  865-977-5428  
Contact:  Mr Brian Rhoades,  Manager  
493110  
Warehousing & storage services  

Nhc Op LP  
PO Box 1398  
Murfreesboro, TN  37133  
Phone:  615-890-2020  
Contact:  Andrew W Adams,  President  
623110  
Skilled nursing care facility  

Nissan Motor Acceptance Corp  
333 Commerce St  
Nashville, TN  37201  
Phone:  615-725-1655  
Contact:  Mr Steve Lambert,  President  
522291  
Personal automobiles & furniture financing  

Nissan North America Inc  
983 Nissan Dr  
Smyrna, TN  37167  
Phone:  615-459-1400  
Contact:  Mr Bill Krueger,  VP Operations  
336111  
Manufactures automobiles  

Nissan North America Inc  
PO Box 685001  
Franklin, TN  37068  
Phone:  615-725-1000  
Contact:  Mr Carlos Ghosn,  President  
423110  
Wholesales commercial vehicles; assembles complete automobiles including specialty; personal automobiles & furniture financing; ship, boat, machine & product design services; product testing laborato  

Nissan North America Inc  
PO Box 272  
Decherd, TN  37324  
Phone:  931-962-5000  
Contact:  Mr Charles D Cooper Jr,  Plant Manager  
441110  
Retails new & used automobiles; manufactures motor vehicle parts & accessories  

Nissan North America Inc  
610 Enon Springs Rd E  
Smyrna, TN  37167  
Phone:  615-355-2000  
Contact:  Mr Rick Jackson,  Manager  
423110  
Automotive brokers  

NorthCrest Medical Center  
100 Northcrest Dr  
Springfield, TN  37172  
Phone:  615-384-2411  
Contact:  Ms Judy Cole,  Corp Secy  
622110  
Medical hospital  

Northwest Airlines Inc  
2491 Winchester Rd Ste 203  
Memphis, TN  38116  
Phone:  901-922-8480  
Contact:  Mr Steve Holme,  Manager  
481111  
Passenger airline services  

Nu-Foam Products Inc  
PO Box 5648  
Chattanooga, TN  37406  
Phone:  423-698-6911  
Contact:  Mr Charles L Moeller,  President  
326150  
Manufactures plastic foam products
Oak Ridge Associated Universities Inc
PO Box 117
Oak Ridge, TN 37831
Phone: 865-576-3000 Employees: 500
Contact: Mr Ronald D Townsend, President
541712 Scientific research agency

Olan Mills Inc
PO Box 23456
Chattanooga, TN 37422
Phone: 423-622-5141 Employees: 600
Contact: Olan Mills II, Ch of Bd
541921 Still or video photographer; commercial lithographic printing

Old Dominion Freight Line Inc
308 Roy Messer Hwy
White Pine, TN 37890
Phone: 865-674-6151 Employees: 900
Contact: Mr John Eberling, CEO
484121 Over the road trucking

Orange Grove Center Inc
615 Derby St
Chattanooga, TN 37404
Phone: 423-629-1451 Employees: 680
Contact: Ms Carla Cooper, Human Res Dir
624310 Vocational training agency

Ozark Motor Lines Inc
PO Box 181077
Memphis, TN 38181
Phone: 901-251-9711 Employees: 725
Contact: Mr Michael E Hopper, CEO
484121 Over the road trucking

Paccar Inc
PO Box 487
Madison, TN 37116
Phone: 615-865-8910 Employees: 1100
Contact: Mr Joe Scattergood, Plant Manager
333924 Manufactures industrial trucks & tractors

Parkridge Hospital Inc
2333 McCallie Ave
Chattanooga, TN 37404
Phone: 423-698-6061 Employees: 785
Contact: Mr Jeff Fee, CEO
622110 Medical hospital

Parkwest Medical Center
PO Box 22993
Knoxville, TN 37933
Phone: 865-373-1000 Employees: 1100
Contact: Ms Barbara Blevins, Chief
622110 Medical hospital

Perkins & Marie Callender's Holding Inc
PO Box 17126
Memphis, TN 38187
Phone: 901-766-6400 Employees: 850
Contact: Mr Joseph Trungale, CEO
722110 Full service chain family restaurant

Pictsweet LLC
PO Box 119
Bells, TN 38006
Phone: 731-422-7600 Employees: 1000
Contact: Toby Leigh, Director
311411 Manufactures quick frozen & cold pack vegetables; mushroom farming; over the road trucking; vegetable & melon farm

Pilgrim's Pride Corp
PO Box 991
Chattanooga, TN 37401
Phone: 423-756-2471 Employees: 800
Contact: Mr Rodney Walker, Principal
311615 Poultry slaughtering & processing

Pinnacle Airlines Corp
1689 Nonconnah Blvd Ste 111
Memphis, TN 38132
Phone: 901-348-4100 Employees: 1010
Contact: Mr Donald Breeding, Ch of Bd
481111 Passenger airline services
Pinnacle Foods Group Inc
PO Box 2688
Jackson, TN 38302
Phone: 731-426-6200 Employees: 500
Contact: Mr Henry Higgs, Controller
311813 Manufactures frozen bakery products; fresh or frozen fish & seafood processing; manufactures food preparations; manufactures frozen food products

Plus Mark Inc
PO Box 549
Greeneville, TN 37744
Phone: 423-636-2118 Employees: 900
Contact: Mr Bob Hartman, Vice President
322221 Manufactures waterproof or coated wrapping paper

Porter-Cable Corp
PO Box 2468
Jackson, TN 38302
Phone: 731-668-8600 Employees: 1000
Contact: Mr Charles M Brown, President
333991 Manufactures power hand tools

Primus Automotive Financial Services Inc
PO Box 680020
Franklin, TN 37068
Phone: 615-315-7900 Employees: 1700
Contact: Mr Andy Menzyk, President
522291 Personal automobile loans, including insurance

Priority Fulfillment Services Inc
4650 E Shelby Dr
Memphis, TN 38118
Phone: 901-795-8441 Employees: 650
Contact: Mr Scott Talley, Manager
561110 Management services

Procter & Gamble Manufacturing Co
PO Box 2104
Jackson, TN 38302
Phone: 731-423-7100 Employees: 1100
Contact: Mr Derek Easton, Plant Manager
311919 Manufactures potato chips & other potato-based snacks

Progressive Communication Services Inc
3618 Old Hickory Blvd
Old Hickory, TN 37138
Phone: 615-847-3302 Employees: 750
Contact: Ms Annette Pilote, President
541690 Telecommunications consulting services

Prologix Distribution Services LLC
6016 Brookvale Ln 110B
Knoxville, TN 37919
Phone: 865-584-9765 Employees: 2093
Contact: Bo Castle, President
484110 Local trucking without storage services; over the road trucking

Promus Operating Co Inc
755 Crossover Ln
Memphis, TN 38117
Phone: 901-374-5000 Employees: 1300
Contact: Mr Thomas L Keltner, President
721110 Traveler accommodations; selling or licensing of franchises; hotel or motel management services

Propex Inc
PO Box 22788
Chattanooga, TN 37422
Phone: 423-855-1466 Employees: 1800
Contact: Mr Joseph F Dana, President
313210 Manufactures polypropylene broadwoven fabric; nonwoven fabric mill; broadwoven cotton fabric mill; manmade, fiber & silk textile finishing plant

Provident Life & Accident Insurance Co
1 Fountain Sq
Chattanooga, TN 37402
Phone: 423-755-1011 Employees: 1500
Contact: Mr Thomas R Watjen, CEO
524113 Life insurance carrier; direct accident & health insurance carrier

Psychiatric Solutions Inc
6640 Carothers Pkwy # 500
Franklin, TN 37067
Phone: 615-312-5700 Employees: 1680
Contact: Mr Joey A Jacobs, President
621112 Psychiatric clinic; psychiatric hospital
Quality Industries Inc
PO Box 7016
La Vergne, TN  37086
Phone:  615-793-3000    Employees:  620
Contact:  Mr Fred Appel,  President
332322  Sheet metal fabricator; manufactures stamped automotive products; manufactures metal stampings

Quebecor World Inc
PO Box 1406
Dyersburg, TN  38025
Phone:  731-286-5555    Employees:  1000
Contact:  Ms Susan Dew,  Plant Manager
323110  Offset printing; book binding service; book printer; periodical publisher

Quebecor World Inc
451 International Blvd
Clarksville, TN  37040
Phone:  931-553-4400    Employees:  1000
Contact:  Mr Greg Bumb,  VP Admin
323110  Commercial lithographic printing; book printer; periodical publisher

Quebecor World Inc
4000 Highway 51 N
Covington, TN  38019
Phone:  901-476-0495    Employees:  800
Contact:  Mr David Lewis,  Plant Manager
511120  Periodical publisher; book printer

R R Donnelley & Sons Co
801 Steam Plant Rd
Gallatin, TN  37066
Phone:  615-452-5170    Employees:  800
Contact:  Mr Dennis Wall,  Vice President
323110  Offset printing; book binding service; imprinting service; commercial gravure printing

RehabCare Group
3535 Kirby Rd Apt N405
Memphis, TN  38115
Phone:  901-366-1819    Employees:  1000
Contact:  Ms Pam Yarboro,  Director
621498  Specialty outpatient clinic

Renaissance Hotel Operating Co Inc
611 Commerce St
Nashville, TN  37203
Phone:  615-255-8400    Employees:  500
Contact:  Juris Vasilevskis,  Controller
721110  Traveler accommodations; eating place; drinking establishment

Roadway Express Inc
3240 Franklin Limestone Rd
Antioch, TN  37013
Phone:  615-331-4701    Employees:  500
Contact:  Mr Steve Swarthout,  Manager
484121  Over the road trucking; local trucking without storage services

Roadway Express Inc
3310 Gill Rd
Memphis, TN  38109
Phone:  901-348-1600    Employees:  1000
Contact:  Mr Chuck Downing,  Manager
488490  Freight trucking terminal; local trucking without storage services; over the road trucking

Robert Orr-Sysco Food Services LLC
PO Box 305137
Nashville, TN  37230
Phone:  615-350-7100    Employees:  694
Contact:  Mr Gary Kennedy,  VP Operations
424420  Wholesales frozen vegetables & fruit products; wholesales cooking oils & shortenings

Saint Francis Hospital
5959 Park Ave
Memphis, TN  38119
Phone:  901-765-1000    Employees:  1700
Contact:  Mr Dave Archer,  President
622110  Medical hospital; skilled nursing care facility

Sanford, LP
PO Box 470
Shelbyville, TN  37162
Phone:  931-684-4133    Employees:  800
Contact:  Mr Howard Broadfoot,  Plant Manager
339942  Manufactures lead pencils & art goods; retails writing supplies
<table>
<thead>
<tr>
<th>Company Name</th>
<th>Address</th>
<th>Phone</th>
<th>Employees</th>
<th>Contact Name</th>
<th>Position</th>
<th>Services/Products</th>
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<tbody>
<tr>
<td>Sanitors Southwest of Memphis Inc</td>
<td>3043 Broad Ave</td>
<td>901-452-3770</td>
<td>626</td>
<td>Mr Ed Walsh</td>
<td>General Manager</td>
<td>Janitorial &amp; custodial services</td>
</tr>
<tr>
<td>Sara Lee Corp</td>
<td>2000 Biffle Rd</td>
<td>731-627-3271</td>
<td>850</td>
<td>Mr Eugene Smith</td>
<td>Plant Manager</td>
<td>Wholesales meat &amp; meat products; meat processing</td>
</tr>
<tr>
<td>Saturn Corp</td>
<td>PO Box 1500</td>
<td>931-486-5049</td>
<td>7000</td>
<td>Mr John Palan</td>
<td>Project Manager</td>
<td>Manuf actures motor vehicles &amp; car bodies; manufactures motor vehicle parts &amp; accessories</td>
</tr>
<tr>
<td>Science Applications International Corp</td>
<td>PO Box 2501</td>
<td>865-481-4600</td>
<td>577</td>
<td>Mr George Harper</td>
<td>Program Manager</td>
<td>Commercial physical research services; manufactures liquid crystal displays; manufactures cathode ray tube computer terminals</td>
</tr>
<tr>
<td>Scripps Networks Inc</td>
<td>9721 Sherrill Blvd</td>
<td>865-694-2700</td>
<td>800</td>
<td>Mr John Lansing</td>
<td>President</td>
<td>Pay television distribution</td>
</tr>
<tr>
<td>Sea Ray Boats Inc</td>
<td>2600 Sea Ray Dr</td>
<td>865-522-4181</td>
<td>800</td>
<td>Ms Cynthia Trudel</td>
<td>President</td>
<td>Builds &amp; repairs fiberglass boats</td>
</tr>
<tr>
<td>Sea Ray Boats Inc</td>
<td>5502 Island River Dr</td>
<td>865-637-3607</td>
<td>600</td>
<td>Mr Mike Fritts</td>
<td>Manager</td>
<td>Builds &amp; repairs fiberglass boats</td>
</tr>
<tr>
<td>Sea Ray Boats Inc</td>
<td>2601 Sea Ray Dr</td>
<td>865-525-9940</td>
<td>900</td>
<td>Mr Ken Harrell</td>
<td>Manager</td>
<td>Builds &amp; repairs boats</td>
</tr>
<tr>
<td>Sea Ray Boats Inc</td>
<td>2600 Sea Ray Dr</td>
<td>865-522-4181</td>
<td>3500</td>
<td>Ms Cynthia Truedell</td>
<td>President</td>
<td>Builds &amp; repairs fiberglass boats</td>
</tr>
<tr>
<td>ServiceMaster Co</td>
<td>860 Ridge Lake Blvd</td>
<td>901-597-1400</td>
<td>770</td>
<td>Patrick J Spainhour</td>
<td>CEO</td>
<td>Lawn care services; heating &amp; air conditioning contractor; termite control service; electrical contractor; building cleaning &amp; maintenance services; reupholstery &amp; furniture repair</td>
</tr>
<tr>
<td>Seton Corp</td>
<td>2000 Church St</td>
<td>615-284-6866</td>
<td>2900</td>
<td>Mr Tom Beeman</td>
<td>President</td>
<td>Medical hospital; mental health physicians’ office &amp; clinic</td>
</tr>
<tr>
<td>Sewell-Allen Inc</td>
<td>5150 American Way</td>
<td>901-362-3492</td>
<td>1100</td>
<td>Mr Richard James</td>
<td>President</td>
<td>Retail chain grocery store</td>
</tr>
</tbody>
</table>

Largest Employers in Tennessee
<table>
<thead>
<tr>
<th>Company Name</th>
<th>Address</th>
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<th>Employees</th>
<th>Contact</th>
<th>Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sharp Electronics Corp</td>
<td>Sharp Plaza Blvd, Memphis, TN 38193</td>
<td>901-795-6510</td>
<td>1000</td>
<td>Mr Hiroshi Kinoshita, VP Operations</td>
<td>Manufactures television sets; wholesales electrical entertainment equipment; manufactures household microwave ovens; photographic equipment &amp; supplies</td>
</tr>
<tr>
<td>Sheet Metal Workers International Association</td>
<td>PO Box 18740, Knoxville, TN 37928</td>
<td>865-689-2928</td>
<td>930</td>
<td>Mr Grover T Fuller, Manager</td>
<td>Labor organization; sheet metal fabricator</td>
</tr>
<tr>
<td>Shelby County Health Care Corp</td>
<td>842 Jefferson Ave, Memphis, TN 38103</td>
<td>901-545-7928</td>
<td>2000</td>
<td>Mr Bruce Steinhauer, CEO</td>
<td>Medical hospital</td>
</tr>
<tr>
<td>Siegel-Robert Inc</td>
<td>PO Box 233, Ripley, TN 38063</td>
<td>731-635-0671</td>
<td>625</td>
<td>Gene Parker, Branch Manager</td>
<td>Manufactures laminated plastics; manufactures motor vehicle parts &amp; accessories; manufactures glass products</td>
</tr>
<tr>
<td>Skyline Medical Group LLC</td>
<td>3441 Dickerson Pike, Nashville, TN 37207</td>
<td>615-769-2000</td>
<td>950</td>
<td>Ms Barbara Brennen, Exec Officer</td>
<td>Medical hospital</td>
</tr>
<tr>
<td>Southern Hills Medical Center</td>
<td>391 Wallace Rd, Nashville, TN 37211</td>
<td>615-781-4000</td>
<td>650</td>
<td>Mr Jack Bovender, President</td>
<td>Mental health physicians' office &amp; clinic; medical hospital</td>
</tr>
<tr>
<td>Southern Tennessee Medical Center L L C</td>
<td>185 Hospital Rd, Winchester, TN 37398</td>
<td>931-967-8200</td>
<td>9300</td>
<td>Lenae King, Principal</td>
<td>Hospital &amp; medical insurance carrier</td>
</tr>
<tr>
<td>St Jude Hospital</td>
<td>332 N Lauderdale St, Memphis, TN 38105</td>
<td>901-495-3300</td>
<td>2500</td>
<td>Douglas Tran, Project Manager</td>
<td>Medical hospital</td>
</tr>
<tr>
<td>Standifer Place LLC</td>
<td>2626 Walker Rd, Chattanooga, TN 37421</td>
<td>423-490-1599</td>
<td>500</td>
<td>Mr Don Sagar, Office Manager</td>
<td>Nursing home</td>
</tr>
<tr>
<td>State Farm Fire &amp; Casualty Co Inc</td>
<td>2500 Memorial Blvd, Murfreesboro, TN 37129</td>
<td>615-898-6000</td>
<td>1200</td>
<td>Ron G Nichols, Manager</td>
<td>Fire, marine &amp; casualty insurance &amp; carriers</td>
</tr>
<tr>
<td>Stellar Management Group Inc</td>
<td>4146 S Creek Rd, Chattanooga, TN 37406</td>
<td>423-265-7090</td>
<td>947</td>
<td>Mr Thomas Daniels, Manager</td>
<td>Wholesales electric garbage disposals</td>
</tr>
<tr>
<td>Stratos Boats Inc</td>
<td>880 Butler Dr, Murfreesboro, TN 37127</td>
<td>615-494-2090</td>
<td>750</td>
<td>Clark J Vitulli, President</td>
<td>Builds &amp; repairs small lobster, crab or oyster boats</td>
</tr>
</tbody>
</table>

Largest Employers in Tennessee

Page 24

11-Apr-08
<table>
<thead>
<tr>
<th>Company Name</th>
<th>Address</th>
<th>Phone</th>
<th>Employees</th>
<th>Contact</th>
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<tbody>
<tr>
<td>Summit Medical Center</td>
<td>5655 Frist Blvd</td>
<td>615-316-3000</td>
<td>1050</td>
<td>Mr Jeff Whitehorn, CEO</td>
</tr>
<tr>
<td>Sumner Regional Health Systems Inc</td>
<td>555 Hartsville Pike</td>
<td>615-452-4210</td>
<td>875</td>
<td>Mr William T Sugg, President</td>
</tr>
<tr>
<td>Sunbeam Products Inc</td>
<td>150 Cadillac Ln</td>
<td>931-668-4121</td>
<td>670</td>
<td>Mr Gregory Sweeton, Plant Manager</td>
</tr>
<tr>
<td>SunTrust Banks Nashville</td>
<td>PO Box 305110</td>
<td>615-748-4000</td>
<td>1135</td>
<td>Mr Robert E McNeilly, President</td>
</tr>
<tr>
<td>Technicolor Home Entertainment Services Inc</td>
<td>4155 E Holmes Rd</td>
<td>901-433-4100</td>
<td>3500</td>
<td>Mr Tom Thoms, Finance Manager</td>
</tr>
<tr>
<td>Tecumseh Products Co</td>
<td>PO Box 1329</td>
<td>423-949-5470</td>
<td>600</td>
<td>Mr Bruce Bacon, Plant Manager</td>
</tr>
<tr>
<td>Tennessee Department of Human Services</td>
<td>400 Deaderick St Fl 15</td>
<td>615-313-4700</td>
<td>1000</td>
<td>Mr Rick Brown, CFO</td>
</tr>
<tr>
<td>Tennessee Department of Mental Health &amp; Developmental Disabilities</td>
<td>PO Box 586</td>
<td>901-745-7200</td>
<td>1298</td>
<td>Mr Leon Owens, Superintendent</td>
</tr>
<tr>
<td>Tennessee Department of Mental Health &amp; Developmental Disabilities</td>
<td>5908 Lyons View Pike</td>
<td>865-584-1561</td>
<td>500</td>
<td>Dj Smith, Corp Secy</td>
</tr>
<tr>
<td>Tennessee Department of Mental Health &amp; Developmental Disabilities</td>
<td>11100 Highway 64</td>
<td>731-228-2000</td>
<td>600</td>
<td>Mr Bob Galloway, Exec Officer</td>
</tr>
<tr>
<td>Tennessee Dept of Health</td>
<td>975 E 3rd St</td>
<td>423-778-7811</td>
<td>4000</td>
<td>Mr Jim Brexler, Manager</td>
</tr>
</tbody>
</table>
Tennessee Tbdn Co
PO Box 1887
Jackson, TN  38302
Phone:  731-421-4800    Employees:  500
Contact:  Tokuji Yamauchi,  Partner
Manufactures motor vehicle parts & accessories

Tennessee Valley Authority
400 W Summit Hill Dr
Knoxville, TN  37902
Phone:  865-632-2101    Employees:  1000
Contact:  Mr William B Sansom,  Ch of Bd
Provides electric power generation services

Tennessee Valley Authority
PO Box 2000
Soddy Daisy, TN  37384
Phone:  423-843-6000    Employees:  3000
Contact:  Masoud Bajestani,  President
Provides electric power generation services; utilities regulation & administration services

Tennessee Valley Authority
1101 Market St
Chattanooga, TN  37402
Phone:  423-751-8656    Employees:  700
Contact:  Mr Joe Bynum,  Principal
Electric services; utilities regulation & administration services

Tennessee West Healthcare
708 W Forese T Ave
Jackson, TN  38301
Phone:  731-425-5000    Employees:  2627
Contact:  Mr Jim Moss,  President
Medical hospital

Tennsco Corp
PO Box 1888
Dickson, TN  37056
Phone:  615-326-0685    Employees:  650
Contact:  Johnnie Morris,  Branch Manager
Manufactures office furniture

Thomas & Betts Corp
8155 T And B Blvd
Memphis, TN  38125
Phone:  901-252-8000    Employees:  675
Contact:  Mr Dominic J Pileggi,  President
Manufactures electric connectors; manufactures steel structural shapes & pilings; manufactures industrial electric heating units & devices

Tom James of New Orleans Inc
263 Seaboard Ln
Franklin, TN  37067
Phone:  615-771-1122    Employees:  1000
Contact:  Mr Spencer Rays,  President
Retails men's & boys' clothing; manufactures men's & boys' coats & suits

Tom James Stores Inc
263 Seaboard Ln
Franklin, TN  37067
Phone:  615-771-1122    Employees:  500
Contact:  Mr James M Eachern,  Ch of Bd
Retails men's & boys' clothing

Tri Star Energy LLC
PO Box 282249
Nashville, TN  37228
Phone:  615-313-3600    Employees:  500
Contact:  Ms Sherry Taylor,  Manager
Variety store

TRW Automotive US LLC
PO Box 250
Lebanon, TN  37088
Phone:  615-444-6110    Employees:  650
Contact:  Mr William Wallace,  Exec Officer
Manufactures motor vehicle steering mechanisms; manufactures fluid power pumps & motors
TRW Automotive US LLC
2101 W Main St
Rogersville, TN 37857
Phone: 423-272-2171 Employees: 800
Contact: Mr Mike Kelly, General Manager
336350 Manufactures motor vehicle gears; manufactures iron or steel forgings

TUTCO Inc
500 Gould Dr
Cookeville, TN 38506
Phone: 931-432-4141 Employees: 526
Contact: Mr Patrick McCaffrey, President
335211 Manufactures heating units for electric appliances

Tyson Foods Inc
PO Box 669
Union City, TN 38281
Phone: 731-886-4700 Employees: 1300
Contact: Mr Keith Riley, Branch Manager
311615 Chicken slaughtering & processing; poultry hatchery

Tyson Foods Inc
PO Box 8
Shelbyville, TN 37162
Phone: 931-684-8180 Employees: 1200
Contact: Mr Mark Harmon, Plant Manager
311615 Chicken slaughtering & processing; poultry services

U S Fence Inc
PO Box 100
Bulls Gap, TN 37711
Phone: 423-235-4113 Employees: 1000
Contact: Mr Ken Klatt, VP Operations
326199 Manufactures plastic fencing accessories

U S Xpress Inc
4080 Jenkins Rd
Chattanooga, TN 37421
Phone: 423-510-3000 Employees: 8100
Contact: Mr Max L Fuller, President
484121 Over the road trucking

U T Medical Group Inc
920 Madison Ave
Memphis, TN 38103
Phone: 901-448-7000 Employees: 600
Contact: Vondale Rogers, Office Manager
621111 General & family practice physician or surgeon office

Unipres USA Inc
PO Box 799
Portland, TN 37148
Phone: 615-325-7311 Employees: 600
Contact: Not Available
336370 Manufactures stamped metal automobile body parts

United Methodist Publishing House
PO Box 801
Nashville, TN 37202
Phone: 615-749-6000 Employees: 675
Contact: Mr Neil M Alexander, President
511130 Books publishing & printing; wholesales books, periodicals & newspapers; retails books; publisher; periodical publisher

United Parcel Service Inc
705 Massman Dr
Nashville, TN 37210
Phone: 615-889-5700 Employees: 1500
Contact: Terry Simmons, Branch Manager
492210 Parcel delivery services by vehicle

United Parcel Service Inc
3675 Swinnea Rd
Memphis, TN 38118
Phone: 901-547-6950 Employees: 1500
Contact: Mr Mike Repischka, Manager
492110 Ground courier services; air courier services

United States Department of the Air Force
100 Kindel Dr Ste A315
Arnold AFB, TN 37389
Phone: 931-454-6602 Employees: 2000
Contact: Mr William Gonce, Branch Manager
541380 Product testing laboratory; united States Air Force
<table>
<thead>
<tr>
<th><strong>United States Department of the Navy</strong></th>
<th><strong>US Army Corps of Engineers</strong></th>
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<tbody>
<tr>
<td>7800 3rd St</td>
<td>157 N Main St B202</td>
</tr>
<tr>
<td>Memphis, TN 38106</td>
<td>Memphis, TN 38103</td>
</tr>
<tr>
<td>Phone: 901-874-5804  Employees: 2300</td>
<td>Phone: 901-544-3226  Employees: 500</td>
</tr>
<tr>
<td>Contact: Not Available</td>
<td>Contact: Mr Cole Smith, Principal</td>
</tr>
<tr>
<td>D21210 Dentists’ office &amp; clinic; united States Navy</td>
<td>541330 Engineering services; united States Army</td>
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<tr>
<th><strong>University Health System Inc</strong></th>
<th><strong>US Fence Inc</strong></th>
</tr>
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<tbody>
<tr>
<td>1924 Alcoa Hwy</td>
<td>PO Box 100</td>
</tr>
<tr>
<td>Knoxville, TN 37920</td>
<td>Bulls Gap, TN 37711</td>
</tr>
<tr>
<td>Phone: 865-544-9430  Employees: 2000</td>
<td>Phone: 423-235-4113  Employees: 500</td>
</tr>
<tr>
<td>Contact: Mr Joseph Landsman, President</td>
<td>Contact: Mr Mark Burton, Manager</td>
</tr>
<tr>
<td>622110 Medical hospital</td>
<td>444190 Fencing dealer; manufactures treated lumbe</td>
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<thead>
<tr>
<th><strong>University of Tennessee</strong></th>
<th><strong>Ut-Battelle LLC</strong></th>
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<tbody>
<tr>
<td>1520 Cherokee Trl Ste 200</td>
<td>PO Box 2008</td>
</tr>
<tr>
<td>Knoxville, TN 37920</td>
<td>Oak Ridge, TN 37831</td>
</tr>
<tr>
<td>Phone: 865-544-9430  Employees: 3500</td>
<td>Phone: 865-576-2900  Employees: 4000</td>
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<tr>
<td>Contact: Mr Joseph Landsman, CEO</td>
<td>Contact: Mr Brian Kaldenbach, Manager</td>
</tr>
<tr>
<td>621112 Medical center</td>
<td>541712 Energy research services</td>
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<thead>
<tr>
<th><strong>UNUM Group</strong></th>
<th><strong>Varco Pruden Buildings Inc</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Fountain Sq</td>
<td>PO Box 7527734</td>
</tr>
<tr>
<td>Chattanooga, TN 37402</td>
<td>Memphis, TN 38125</td>
</tr>
<tr>
<td>Phone: 423-755-1011  Employees: 500</td>
<td>Phone: 901-748-8000  Employees: 1100</td>
</tr>
<tr>
<td>Contact: Mr Thomas R Watjen, President</td>
<td>Contact: Mr Chuck Haslebacher, President</td>
</tr>
<tr>
<td>524113 Accident insurance carrier service; life insurance carriers; provides group hospitalization service plans; provides pensions</td>
<td>332311 Manufactures prefabricated metal buildings &amp; components</td>
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<thead>
<tr>
<th><strong>US Army Corps of Engineers</strong></th>
<th><strong>Verizon Business Network Services Inc</strong></th>
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</thead>
<tbody>
<tr>
<td>PO Box 1070</td>
<td>1725 N Shelby Oaks Dr</td>
</tr>
<tr>
<td>Nashville, TN 37202</td>
<td>Bartlett, TN 38134</td>
</tr>
<tr>
<td>Phone: 615-736-5538  Employees: 800</td>
<td>Phone: 901-377-5937  Employees: 1100</td>
</tr>
<tr>
<td>Contact: Roem Hildt, Manager</td>
<td>Contact: Mr Edgar Cooney, Branch Manager</td>
</tr>
<tr>
<td>541330 Engineering services; united States Army</td>
<td>517911 Long distance telephone communications services</td>
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Veterans Health Administration
1030 Jefferson Ave
Memphis, TN 38104
Phone: 901-577-7250  Employees: 2000
Contact: Mr Patrick Coney, CFO
923140 Veterans’ affairs administration services; medical hospital

Volunteer Behavioral Health Care System
PO Box 4028
Chattanooga, TN 37405
Phone: 423-756-2740  Employees: 600
Contact: Mr Larry Thompson, COO
621420 Outpatient mental health clinic; mental hospital

Vought Aircraft Industries Inc
1431 Vultee Blvd
Nashville, TN 37217
Phone: 615-361-2000  Employees: 650
Contact: Ricky Davis, Opers Mgr
336413 Manufactures aircraft wing assemblies & parts

Wackenhut Corp
1321 Murfreesboro Pike # 155
Nashville, TN 37217
Phone: 615-360-6546  Employees: 500
Contact: Mr Andre Dedlack, Branch Manager
561612 Security guard service

Wackenhut Corp
2158 Union Ave Ste 500
Memphis, TN 38104
Phone: 901-278-7777  Employees: 500
Contact: Not Available
561611 Lie detection services

Walker Die Casting Inc
PO Box 1189
Lewisburg, TN 37091
Phone: 931-359-6206  Employees: 550
Contact: Mr Robert H Walker, Ch of Bd
331521 Manufactures aluminum die castings

Wal-Mart Stores Inc
2000 Old Fort Pkwy
Murfreesboro, TN 37129
Phone: 615-893-0175  Employees: 500
Contact: Mr Tim Fox, Manager
452112 Discount department store; retail supermarkets or hypermarket, greater than 100,000 square feet

Wal-Mart Stores Inc
6777 Clinton Hwy
Knoxville, TN 37912
Phone: 865-938-6760  Employees: 500
Contact: Mr Scott Nickens, Branch Manager
452112 Discount department store; retail supermarkets or hypermarket, greater than 100,000 square feet

Wal-Mart Stores Inc
3360 Tom Austin Hwy
Springfield, TN 37172
Phone: 615-384-9561  Employees: 500
Contact: Mr Greg Lee, Manager
811111 General automotive repair services; discount department store; retail supermarkets or hypermarket, greater than 100,000 square feet; pharmacy & drug store

Wal-Mart Stores Inc
570 Enon Springs Rd E
Smyrna, TN 37167
Phone: 615-355-1029  Employees: 500
Contact: Mr Chris Ward, Manager
452112 Discount department store; retail supermarkets or hypermarket, greater than 100,000 square feet

Wal-Mart Stores Inc
2200 Brookmeade Dr
Columbia, TN 38401
Phone: 931-381-6892  Employees: 550
Contact: Mr Richard Bald, Manager
452112 Discount department store; retail supermarkets or hypermarket, greater than 100,000 square feet
Wal-Mart Stores Inc
8480 US Highway 64
Memphis, TN  38133
Phone:  901-384-9997    Employees:  500
Contact:  Mr John Moreschi,  Manager
452111  Department store; general automotive repair services; portrait studio; pharmacy & drug store; grocery store; tire dealer

Wal-Mart Stores Inc
1112 Nashville Pike
Gallatin, TN  37066
Phone:  615-452-8452    Employees:  500
Contact:  Mr Steve Williams,  Manager
452112  Discount department store; retail supermarkets or hypermarket, greater than 100,000 square feet; retails auto & home supplies; portrait studio; pharmacy & drug store; beauty salon

Wal-Mart Stores Inc
475 S Davy Crockett Pkwy
Morristown, TN  37813
Phone:  423-587-0495    Employees:  500
Contact:  Mr John McElroy,  Manager
452112  Discount department store

Wal-Mart Stores Inc
1030 Hunters Xing
Alcoa, TN  37701
Phone:  865-984-0154    Employees:  500
Contact:  Boy Smith,  Manager
452112  Discount department store; retail supermarkets or hypermarket, greater than 100,000 square feet

Wal-Mart Stores Inc
1001 Over Mountain Dr
Elizabethton, TN  37643
Phone:  423-543-8133    Employees:  500
Contact:  Mr Donnie Wills,  Manager
452112  Discount department store; pharmacy & drug store

Wal-Mart Stores Inc
2196 Emporium Dr
Jackson, TN  38305
Phone:  731-664-1157    Employees:  500
Contact:  Mr Jeff Shultz,  Manager
452112  Discount department store; retail supermarkets or hypermarket, greater than 100,000 square feet

Wellmont Health System
PO Box 238
Kingsport, TN  37662
Phone:  423-224-4000    Employees:  1800
Contact:  Mr Bert Whitaker,  Principal
622110  Medical hospital; skilled nursing care facility

Westgate Resorts Marketing
915 Westgate Resorts Rd
Gatlinburg, TN  37738
Phone:  865-430-4036    Employees:  500
Contact:  Mr Shaun Barone,  General Manager
721110  Resort hotel

Williamson County Hospital District Inc
4321 Carothers Pkwy
Franklin, TN  37067
Phone:  615-435-5000    Employees:  1100
Contact:  Mr Dennis Miller,  President
622110  Hospital, affiliated with AMA residency

Willis North America Inc
26 Century Blvd
Nashville, TN  37214
Phone:  615-872-3000    Employees:  500
Contact:  Kerry Calaiaro,  Project Manager
524210  Insurance broker

Wilson Sporting Goods Co
PO Box 387
Humboldt, TN  38343
Phone:  731-784-5335    Employees:  625
Contact:  Mr Gary Staggs,  Plant Manager
339920  Manufactures baseball equipment & supplies, general
Wolf Tree Experts Inc
PO Box 5416
Knoxville, TN  37928
Phone:  865-687-3400   Employees:  602
Contact:  Mr Tom Wolf,  President
237110  Utility line construction

Wright Medical Technology Inc
PO Box 100
Arlington, TN  38002
Phone:  901-867-9971   Employees:  500
Contact:  Barry F Bays,  Ch of Bd
339113  Manufactures surgical appliances & supplies;
retails orthopedic & prosthesis applications;
manufactures electromedical equipment;
mental health physicians' office & clinic

Yates Services LLC
PO Box 877
Smyrna, TN  37167
Phone:  615-459-1701   Employees:  1900
Contact:  Mr Larry Guffey,  Member
561720  Building cleaning & maintenance services

Yellow Transportation Inc
7300 Centennial Blvd
Nashville, TN  37209
Phone:  615-350-8814   Employees:  750
Contact:  Mr William Anderson,  Manager
484121  Contract haulers

Yorozu Automotive Tennessee Inc
395 Mt View Industrial Dr
Morrison, TN  37357
Phone:  931-668-7700   Employees:  1000
Contact:  Yusuke Kawada,  President
336370  Manufactures stamped metal automobile
moldings or trim
2035 Regional Transportation Plan
Guiding Principles, Regional Goals, and Major Objectives
Endorsed by the MPO Executive Board, March 17, 2010

Guiding Principles
Guiding principles direct how the Nashville Area MPO -- working as part of a larger regional context comprised of the interests of local governments, non-profit organizations, the business community, and public citizens -- will contribute to overall quality of life for the region.

Guiding Principle #1: Livability
MPO plans and programs will work to enhance the quality of life in the region by supporting initiatives that increase opportunities for affordable housing, education, jobs, recreation, and civic involvement without increasing the burden on citizens to enjoy their community.

Guiding Principle #2: Sustainability
MPO plans and programs will strive to support growth and prosperity without sacrificing the health, environment, natural and socio-cultural resources, or financial stability of this or future generations.

Guiding Principle #3: Prosperity
MPO plans and programs will contribute to the continued economic well-being of the greater Nashville area by investing in transportation solutions that increase access to education, jobs, and amenities, reduce the cost of living and doing business, and attract new investment to the region.

Guiding Principle #4: Diversity
MPO plans and programs will recognize the multitude of needs and the variety of perspectives and backgrounds of the people that live and work in the greater Nashville area by promoting a range of transportation choices that are designed with sensitivity to the desired context.

Regional Goals
The regional goals embody a general set of strategies by which the Nashville Area MPO will seek to help the region in its pursuit of quality growth as directed by the overarching guiding principles.

Goal # 1: Maintain and Preserve the Efficiency, Safety, and Security of the Region's Existing Transportation Infrastructure.

Goal # 2: Manage Congestion to Keep People and Goods Moving.

Goal # 3: Encourage Quality Growth and Sustainable Land Development Practices.

Goal # 4: Protect the Region's Health & Environment.

Goal # 5: Support the Economic Competitiveness of the Greater Nashville Area.

Goal # 6: Offer Meaningful Transportation Choices for a Diverse Population including the Aging.

Goal # 7: Encourage Regional Coordination, Cooperation, & Decision-Making.

Goal # 8: Practice Thoughtful, Transparent Financial Stewardship by Ensuring that Transportation Improvements meet Regional Goals.
Major Objectives

The major objectives represent specific strategies and actions that the MPO wishes to implement en route to achieving the regional goals of the 2035 Regional Transportation Plan.

Objective #1: Adopt a “fix-it-first” mentality in directing transportation funding. Initial focus should always be on the maintenance or improvement of existing facilities.

Objective #2: Strive for quality over quantity. Build out all elements of priority projects or phases rather than stringing funding out over several incomplete projects or incomplete phases.

Objective #3: Shift investment strategies towards providing a diversification of modes, rather than solely on strategies focused on roadway capacity.

Objective #4: Improve marketing and promotion of successful existing transportation services. It is acceptable to use federal transportation funds to do this.

Objective #5: Provide opportunities and define roles for all types of organizations and/or individuals (public or private) to assist in the implementation of programs and projects.

Objective #6: Improve the coordination of land use, urban design, transportation, rural and environmental feature preservation, and economic development policies and decisions through incentives and/or policies.

Objective #7: Encourage the development of context sensitive solutions to ensure that community values are not sacrificed for a mobility improvement.

Objective #8: Increase efforts to improve the form and function of transportation corridors in order to contribute to the “sense of place.” Such investments can: improve attractiveness to visitors or prospective businesses or residents; compliment existing natural and cultural resources; improve the function of the road for a variety of users; and foster civic pride toward public investments in infrastructure.

Objective #9: Consider how transportation policies, programs, and investment strategies affect the overall health of people and the environment including air quality, physical activity, biodiversity, and the natural resources.

Objective #10: Invest in the development of walkable communities that offer citizens the ability to access residences, jobs, retail, recreation, and other community amenities without the need to rely on an automobile.

Objective #11: Invest in a modern regional mass transit system to maintain the region’s economic competitiveness with other metropolitan regions, and to ensure continued economic prosperity in the face of growing energy costs, environmental concerns, and increasingly expensive automobile traffic.

Objective #12: Work to ensure that Middle Tennessee is given priority consideration in proposed national plans for high-speed rail. Identify opportunities to coordinate regional mass transit planning efforts with super-regional and national efforts to invest in rail infrastructure.

Objective #13: Provide proper guidance to the region for how to bridge the gap between the MPO’s "cost-feasible" plan and the ultimate vision for how transportation will shape the future of the region.
Appendix C – TVA Smart Station
Tennessee Valley Authority Smart Modal Area Recharge Terminal (SMART) Station Project

Volume 1 – Base Design Report
Tennessee Valley Authority Smart Modal Area Recharge Terminal (SMART) Station Project
Volume 1 – Base Design Report

1020782

Final Report, June 2010

EPRI Project Manager
J. Halliwell
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Eaton Corporation

NOTE

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CITATIONS

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Winthrop, ME 04364

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J. Nitzberg
B. Rogers
S. Sabine
J. Speeks
R. Thompson
B. Wilson

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The report is a corporate document that should be cited in the literature in the following manner:

PRODUCT DESCRIPTION

This report documents the base design for a Smart Modal Area Recharge Terminal (SMART) station. The base design is for a 10-space public vehicle charging facility, incorporating a solar photo-voltaic array/canopy with battery storage. Many of the design recommendations are based on the system design experience of Eaton Corporation in related energy applications and cover safety compliance and field integration. The design effort was conducted not only to develop a base design that can be used by other entities working to provide similar infrastructure, but also to investigate the opportunities and issues such a system presents. The design also allowed such elements as the feasibility and cost of modularity to be explored for a fully engineered system.

Volume 1 of this document discusses the base design effort. Volume 2 is planned to follow construction of the first system to document the build experience.

Results and Findings
A design incorporating several key project goals has been developed. This design can be used as a basis for a publically deployed charging infrastructure and as a way to gauge the potential costs of such infrastructure. It is possible to build complex charging infrastructure as described in this design report, but it is likely that budgetary constraints will be a key driver in the sizing of system elements.

Challenges and Objectives
Understanding and developing public charging infrastructure that incorporates multiple technologies has many challenges. Since consumer habits for the use of plug-in electric vehicles are not well understood, some assumptions as to potential use and location of such infrastructure must be made. Sizing of the various system elements must be made on general use assumptions for the system. The cost implications of these decisions can then be assessed. The objective of undertaking this design was to identify the opportunities and challenges that would need to be addressed to deploy more complex vehicle-charging hardware in the public space.

Applications, Value, and Use
The results from development of the base design are being used as the basis for continuing efforts to deploy a number of public charging stations throughout the Tennessee Valley and beyond. Understanding how the public will interact with this new infrastructure will allow future deployment of charging hardware in a way that best meets the needs of the driving public while doing so in the most cost-effective way.

EPRI Perspective
EPRI brings the unique perspective of a full knowledge of the electric system and the utility industry. If the electric grid is to become the “filling station pipeline” of the future, then utilities
must be at the forefront of infrastructure development and deployment. Understanding the grid impact of such systems, managing this load growth, and planning resources to meet future needs are essential to maintaining reliable and reasonably priced electric service. Providing reliable and reasonably priced electric service is basic to the electrification of transportation.

**Approach**
Based on a series of stakeholder meetings, a basic set of design requirements was developed and implemented in a base solar-assisted charging station design.

**Keywords**
Battery storage
Charging
Energy management
Electric vehicle
Electric vehicle supply equipment (EVSE)
Solar assist
ABSTRACT

This document details the design of a system providing plug-in vehicle charging infrastructure that includes a solar array, battery storage, and smart metering infrastructure. The system is referred to as the TVA Smart Modal Area Recharge Terminal or "SMART Station." The design effort has investigated system modularity, key components, required materials, and cost issues related to the construction of such a system. Many of the design recommendations are based on the system design experience of Eaton Corporation in related energy applications and cover safety compliance and field integration. The goal of this effort has been to investigate and produce a public design document that will allow other organizations considering the construction of similar infrastructure to have a base to work from. While no one design can be used universally for public infrastructure, it is hoped that this design can act as a starting point and knowledge base for the development of public infrastructure across the United States.

Volume 1 of this document discusses the base design effort. Volume 2 is planned to follow construction of the first system to document the build experience.
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INTRODUCTION

Troubled by the high cost of oil and concerned over both environmental impact of gasoline-powered vehicles and energy security for transportation, U.S. citizens and the current Administration are demanding the implementation of innovative vehicle and energy solutions. Electric vehicles (EVs) may serve as an important bridge from a transportation system based on hydrocarbons to one that uses electric energy. EVs offer benefits to the public through reduced carbon emissions and a more efficient and full use of the electric system, while providing the reliable and cost-effective transportation services they expect. Moreover, the EV may serve as the key to the revitalization of the U.S. automotive manufacturing sector, which would benefit the public through U.S. job creation and increased economic stability.

Nearly every major automotive manufacturer has announced plans to produce either a plug-in hybrid or all-electric vehicle, with 2010 anticipated to be the introduction year for many. Incentives to encourage the production and adoption of electric transportation are being offered by the federal government through low interest loans for manufacturers and consumer tax credits. The Department of Energy (DOE), through the American Recovery and Reinvestment Act of 2009 (ARRA), originates and manages the federal investment in new technologies and infrastructure. However, the success of the electric vehicle is largely dependent upon the quality and availability of a supporting infrastructure that presently does not exist and may potentially provide technical challenges. The Electric Power Research Institute (EPRI) is working with the electric and automotive industries to meet these challenges.

EPRI, working with the Tennessee Valley Authority (TVA), has contracted with Eaton Corporation to provide a baseline system design for a Smart Modal Area Recharge Terminal (SMART) Charging Station. Throughout the process of project formation and the design effort, the Oak Ridge National Laboratory (ORNL) was engaged to provide consulting advice to the project. This baseline design will be used as a benchmark for deployment of SMART Charging Stations (hereafter called “SMART Stations”), in a first phase focusing on the TVA service territory and then, potentially, nationwide.

Once constructed, these sites will enable research and provide critical data for the analysis of consumer behavior patterns relevant to EV charging and its impact on the electrical system. Also the physical and commercial arrangements required to build a system of EV charging stations will be known. These data can be used to help optimize future installations. The project will provide a basis for the design of larger or smaller systems, as well as more advanced systems that may be deployed nationally. It is expected that the increased availability of charging sites will encourage widespread consumer adoption of the EV.
Introduction

Goals Pursued in This Initiative

As part of a larger EPRI/TVA initiative, this base design attempts to address a variety of broader project goals that need to be met in the realm of research and awareness, both in the social and technical arenas. This design is one aspect of a project that seeks to create a public and open laboratory environment showing the benefits of the electric vehicle, solar, and battery technologies.

Four key goals being addressed in the base design are as follows:

- **Increase EV and renewable awareness**

  Awareness and knowledge varies widely among government officials and the general public about electric vehicles and renewable technologies. The SMART Station should enable an awareness of transportation electrification opportunities and supporting technologies. This will be done through direct means, such as placards and visual displays, and indirect means, such as positioning of the technology itself within a space, creating an educational experience. The architectural design of the SMART Station will have a progressive and premium feel in keeping with presenting a positive experience to the station user.

- **Apply grid-tied solar to assist vehicle charging**

  The application of a grid-tied solar photovoltaic array in the SMART Station will allow the system to offset a portion of the energy consumed by vehicle charging.

- **Apply dispatchable, grid-tied battery storage to assist vehicle charging**

  The stationary battery storage present in the SMART Station design enables testing and evaluation of different battery energy dispatch methodologies including compensating for output variation of the solar array in variably cloudy conditions, dispatch during peak time, compensation for peak system loads during daytime charging, and ancillary service support.

- **Explore the use of demand-response-enabled EV loads**

  Plug-in electric vehicles are among the newest and most significant loads anticipated in the next several years for the electric grid. Much like the air conditioning boom of the 1950s and 1960s, utilities will have to adapt the electric grid to support electric vehicles. It is desirable to develop demand response (DR) strategies for vehicle charging that utilities can apply to mitigate peak energy demands on the grid. This is especially true of daytime vehicle charging, which is expected to be the primary use of SMART Station infrastructure as described in this report. In its simplest form, DR can be implemented as on/off control of vehicle charging. Enhanced communications capabilities that are expected to become part of both electric vehicle supply equipment and the plug-in vehicle will enable more sophisticated control to be developed in the future such as dynamically controlling the vehicle charge power on a real-time basis. The SMART Station design will incorporate features to enable the exploration of these DR possibilities.
Objectives of the SMART Station Design

The base design was structured to address the following criteria:

- Enable all functionality to achieve the previously stated overarching project goals.
- Be both modular and expandable (allowing this design to be extended to fit other size installations in the service areas of other utilities)
- Provide an iconic image for a solar-assisted EV charging site.
- Provide a replicable design.
- Mitigate load clustering from the simultaneous charging of multiple vehicles.
- Ensure distribution circuit support flexibility.

A primary component for achieving the project goals is data collection, which enables studies in several areas of interest.

- Develop EV, solar, and battery storage usage models.
  Data collection enables usage models to be built that will help with understanding how each of these technologies individually and in combination can impact a local utility.
- Track consumer charging habits.
  Monitoring of space occupancy and energy usage will enable tracking of consumer charging habits at the charging station. A better understanding of system use profiles will allow rightsizing of the various system elements and will help to build an understanding of the economics of this type of public infrastructure.
- Influence the National Electric Code (NEC) diversification strategy for EV stations.
  Utilities and electrical inspectors are realizing that a diversification strategy needs to exist for sizing electric vehicle supply equipment (EVSE) in a building’s electrical distribution network. The SMART Station will enable data collection to allow scientific determination of the diversification factor for the public charging infrastructure.

_Diversification_ is the factor applied to a load when sizing upstream protection and utility service. Currently, EVSE is required in accordance with the National Fire Protection Association (NFPA-70) in the National Electric Code (NEC) Article 625.14 to “be considered a continuous load.” This means the 10-station SMART Station design with an EVSE listed for 32A output would have to be served by a utility service of a least 400A, allowing for the 125% protection of each circuit (NEC 625.21). The design described in this document is based on the continuous load duty factor.

- Study distributed ancillary services.
  Frequency regulation and synchronized reserves dispersed at the branches of the grid’s distribution network have interested many utilities, especially when done in a distributed
Introduction

manner. The data collection will allow distributed ancillary services to be studied more closely.

Each of these aspects was considered as part of the overall design effort. Chapter 2 covers the design concepts. Chapter 3 provides a discussion of vehicle energy needs and how they impact the SMART Station design. Chapter 4 discusses details of the design and a summary of lessons learned during the design process. Chapter 5 discusses structural and other considerations that influence system design choices. Chapter 6 discusses system cost metrics.
2
DESIGN CONCEPT

The design described in this report is the product of a series of discussions held among interested stakeholders within the state of Tennessee over several months in 2008 and 2009. Although the basic system concepts were developed, it was recognized that there was a need to fully develop these outline ideas and solidify a system design in order to allow a better assessment of the cost of the infrastructure and enable wider sharing of the lessons learned during the effort.

In the fall of 2009, Eaton Corporation was engaged to take input from the stakeholder team and develop a full system design. The design was driven by the requirements outlined in Section 1 of this document. The results of this design effort, a full set of system construction drawings and documentation, are contained in Appendix B of this report. These drawings provide and document a nearly build-ready system design. While this design incorporates many aspects of national and international codes and standards for electrical and construction practices, building and construction codes are still implemented and enforced at the local level. This means that several factors might prevent the immediate use of the design such as local building code variations, soil conditions for the canopy footers, local zoning requirements, and the seismic category for a chosen station site.

Figure 2-1 shows a conceptual drawing of the system as designed. The site is designed to provide for two “nose-to-nose” parking isles. An education and dynamic system display element is shown in the figure and is presented in more detail in Figure 2-2.

This section provides details for the as designed SMART Station. Sections following address some of the lessons learned and provide more detail on other system issues that have been considered throughout this effort.
Figure 2-1
Conceptual Drawings of the SMART Station
The base design described in this document has the following attributes:

- Ten parking spaces each with electric vehicle supply equipment (EVSE) rated at 32 A, 240 V (7.68 kW capacity)
- Approximately 2 kW of solar photovoltaic (PV) panels provided per charge space (Its primary function is to offset vehicle energy usage.)
- Nose-to-nose parking layout with a center access aisle
- Approximately 5 kWh of usable battery storage provided per charge space (Its primary functions is to allow mitigation of peak system power demand.)
- All subsystems are linked by being grid-tied.
- A covered parking canopy (approximately 33' x 55' [10 x 17 m]) with a minimum of 13.5' (4 m) of vehicle clearance
- A “drip-free” canopy design
- Subsystems modular at the two-space level
- Complete design from the service transformer through the charge station
- Provides for the inclusion of advanced metering infrastructure (AMI)
- Includes comprehensive data collection capabilities for energy flows within the system.
- Designed to provide a public showcase for SMART charging technologies and as a laboratory for SMART charging infrastructure.
Spaces are sized to provide accessibility for disabled drivers.

The design was produced assuming that an existing level parking area with sufficient space for the full system would be used.

As stated above, the design is based on grid-tied system elements. It was considered early in the design process that to maintain maximum flexibility in both sizing and actual hardware used for the various subsystems, the grid would be used as the energy interface. Integration of direct energy flows, such as from the battery direct to the vehicles is not considered. There is a great deal of freedom provided by using grid-tied hardware. This allows for full modularity of each system element: vehicle charging, battery storage, and a solar photovoltaic array. One could view the system as incorporating these three elements with each scaled from 0% to 100%.

With two-space modularity, the battery storage and solar arrays can be scaled from 0% to 100% in 20% increments. With individual EVSE hardware for each parking space, charging can be scaled in 10% increments. Additionally, having grid-tied systems decouples the internal design of each system, such as the dc bus voltage of the battery or solar array, from the overall system interconnects. Figure 2-3 illustrates the grid-tied concept.

![Diagram](image)

**Figure 2-3**
Simple Block Diagram of the System

The net power flows in the system can be tracked by measuring the energy input/output for each system element.
The primary system elements as shown in Figure 2-4 are:

- One each – Electrical equipment: main switch board: 120V/240 V single phase, 3 wire, 42 kA interrupt current, service entrance rated with 800 amp main breaker
- Ten each – Vehicle charging: Level 2 EVSE units: 32 amp @ 240 volts ac (7680 W)
- Five each – Solar array: 4.1 kW solar array; Sets of 10 each REC AE-US, multicrystalline solar panels
- Five each – Battery storage: pairs of stacked 3600 KVA grid interactive inverter/charger systems; 696 AH, 48 V battery storage systems
- One each – HVAC/lighting: climate control for battery space and system lighting

![Diagram of system elements]

**Figure 2-4**
Detailed System One-Line Diagram (see Appendix B for a full size version)

A modular design results in a slight cost penalty when compared to an optimized design with single large-capacity devices. This is due to the fact that multiple smaller inverters for the solar array and inverter/chargers for the battery system come at a slight cost premium. A cost-optimized design would likely incorporate a single solar array inverter and a single inverter/charger for the battery, both sized for the full system capacity. EPRI is currently exploring the use of micro-inverters for solar arrays. This represents carrying the modularity to
Design Concept

the lowest level, where each solar panel incorporates an inverter. The use of multiple smaller system segments allows for this design to be scaled to site needs.

A long-term project goal is related to the exploration of other battery technologies for stationary storage. Specifically, the secondary use of vehicle traction batteries for stationary storage is of interest. It was initially considered that lithium-ion batteries might be used in this base design, but this was set aside for this base design due to the lack of commercial availability of both batteries and charging infrastructure using lithium-ion technology. It is hoped that later in the program, as future SMART Stations are constructed, the incorporation of lithium-ion battery technology will be possible. This, again, is an option readily supported by the grid-tied nature of the battery system. By modifying the overall system controls, it is also possible that a future retrofit of lithium-ion batteries could be done in the field at a SMART Station site. This is supported by the fact that a Lithium-ion battery system would be much smaller and lighter than the existing lead-acid system.

Batteries carry with them a unique aspect not required by other system hardware—namely, climate control. Although batteries can operate over a wide temperature range, this range is more limited than would be expected to be encountered in an outdoor setting. In order to ensure available capacity, longevity, and reliability, the batteries must be housed in a climate-controlled environment. In addition, lead-acid batteries also require proper ventilation and provision for spill control within the battery space. Balancing provision of climate-controlled space with an iconic station look led the Eaton designers to recommend the use of a prefabricated electrical building. This structure is similar to the type of building commonly seen at cell phone tower sites. These structures are factory built with all custom electrical hardware installed prior to field delivery. In addition, they offer the added benefit of flexible exterior finish options to allow matching the structure to existing architectural features at a given site. This matching is critical to maintaining an iconic look and an excellent overall esthetic for the system. Sizing the floor space of the climate-controlled area for the lead-acid system ensures that adequate space will be available if a site wants to use lithium-ion batteries.
3

VEHICLE ENERGY NEEDS

Sizing of the various system elements is primarily tied to the energy needs of the vehicles using the SMART Station. This section covers the procedure that was used to estimate vehicle energy needs. These numbers represent a best guess at what type of usage a charging site might see. As has been previously stated, actually measuring the energy use profile for the SMART Station represents a key goal for this program.

Vehicle Battery Capacity

A typical value of energy usage per mile (1.6 km) for all-electric operation of a vehicle is about 240 Wh. For a vehicle to have a 100-mile (161-km) range, the onboard battery capacity to support all electric operation would need to be about 24 kWh. For a 200-mile (322-km) range vehicle, this increases to 48 kWh. This represents the upper bound of likely battery sizes for electric vehicles in the near term.

For plug-in hybrid electric vehicles (PHEVs), how manufacturers will size batteries is less clear and is driven by a number of factors including cost and the all-electric range of the vehicle. For a PHEV that can travel 40 miles (64 km), again assuming 240 Wh per mile (1.6 km), the battery would need to have a capacity of nearly 10 kWh. For a 20-mile (32-km) PHEV, the capacity requirement is halved to about 5 kWh. Note that while this does give a sense of vehicle battery sizing, it does not address how much energy a vehicle might use while at public charging infrastructure.

Actual energy use is a function of both battery capacity and, more important, the battery state of charge, that is, how far a vehicle has been driven before charging. Other factors such as driver aggressiveness, terrain, and climate will influence energy requirements but were not considered in these calculations.

Vehicle Charging Needs

Despite the fact that a number of electric vehicle programs have been announced by automotive manufacturers, widespread production of plug-in vehicles has not occurred to date. Specifications for such vehicles are often preliminary and subject to change. In order to estimate the charging needs at a public charging station, some basic assumptions can be made to yield ballpark power requirements for the system. Note that what we are seeking here is a reasonable upper bound on energy usage per vehicle and, thus, the energy requirements for the SMART Station as a whole.
Vehicle Energy Needs

Several assumptions must be made to calculate vehicle energy needs. Not included here are elements such as energy use related to preheating or precooling a vehicle while connected to the grid. The first assumption is the number of miles a vehicle is driven per year. Here we will use 12,000 miles (19,300 km) per year. A second parameter is the energy used by the vehicle per mile (1.6 km). Because we are interested only in the electrical energy usage needs of the vehicle, we will assume that for all electric vehicle operation it takes about 0.24 kWh of energy to travel 1 mile (1.6 km). Note that the actual number would vary by vehicle design (weight, aerodynamics) and driver habits. For a PHEV, if it is assumed that the vehicle operates in electric-only mode, often referred to as "charge-depleting" mode, for the full trip distance, then PHEV energy usage would be the same as it would be for an all-electric vehicle. Now we can calculate some key parameters:

Miles traveled per year = 12,000 miles (19,300 km)

Energy used per mile = 0.24 kWh/mile (0.24 kWh/1.6 km)

Energy used per year = 2,880 kWh

Miles traveled per day = 32.8 miles (52.8 km)

Energy used per day = 7.9 kWh

Miles per energy used = 4.17 mile/kWh (6.7 km/kWh)

If it is assumed that half a day’s driving is used to reach a destination where the public charging will occur, then:

Miles traveled to charge station = 16.4 miles (26.4 km)

Energy used per day = 3.9 kWh

Energy needed to charge (based on 80% charger efficiency) = 4.88 kWh

This total energy value will be used as one basis for calculating the SMART Station energy needs.

If it was assumed that a vehicle charger could operate at its maximum input power for the complete charge cycle, then the maximum energy available is shown in Figure 3-1. Note that the energy that arrives at the battery itself would be derated by the efficiency of the charger (likely in the 80%–90% range).
Figure 3-1
Maximum Energy Available Based on Charging Level (Level 1 is 120 Vac; Level 2 is 240 Vac)

Note that in Figure 3-1, Level 1 represents a maximum power of 1.92 kW; Level 2 with a 32 A current limit represents a maximum power of 7.68 kW; and Level 2 (80 A) represents a maximum power of 19.2 kW.

At the end of eight hours, the maximum energy that can be delivered is:

- 15.36 kWh for Level 1 20 A charging
- 61.44 kWh for Level 2 32 A charging
- 153.6 kWh for Level 2 80 A charging

Because of battery technology driven charging requirements, the actual charger power usage profile is likely to be more like that shown in Figure 3-2, where a tapering amount of energy is delivered to the battery near the end of charge.
Figure 3-2
A "Typical" Charging Energy Profile

Due to the lower power levels over time as shown in Figure 3-2, the actual charge time required to reach a given energy level will be longer than would be predicted by Figure 3-1 if the vehicle dwells in a space on charge longer than the initial maximum power time period. The actual charging energy profile seen across different vehicles will vary based on the vehicle charger design and battery chemistry.

It is anticipated that vehicle chargers will present a high (0.9 to 1.0) power factor to the grid. This is due to the fact that chargers are likely to be switch-mode-based solid-state inverters with power factor correction capability inherent in the design. Another characteristic of these chargers is that they provide a broad input voltage range over which they can operate (the capability to operate from 100 to 260 Vac would be typical).

The Vehicle Impact on SMART Station Energy Needs

The SMART Station energy needs for support of vehicle charging will be strongly influenced by several factors that include:

- Vehicle battery state-of-charge (SOC) at arrival
- Time the vehicle remains on charge
• How many vehicles use a space per day
• Capacity of the vehicle charger
• Idle time for spaces

The assumptions used here focus on the upper bound of the system capability and may not reflect the power capacities offered by vehicle manufacturers. Two scenarios are considered as a starting point for total site energy needs:
• Short dwell times and high turnover (as might be seen at a retail destination charging site)
• Long dwell times with no turnover (as might be seen at a work destination charging site).

The first scenario assumes that turnover at the SMART Station is very high. Vehicles using the station arrive with a low enough battery SOC that they charge at maximum power (as in the first 1.5 hours of Figure 3-2) during their entire dwell time in a space. Thus, the charging is power limited by either the vehicle maximum charging capacity or the capacity of the EVSE. Here we will assume that the EVSE capacity is the limit. In early discussions it was decided, based on TVA input, to limit the EVSE to a maximum 32 A charge current. This limits power to:

\[32 \text{ A} \times 240 \text{ Vac} = 7.8 \text{ kW}\]

If it is assumed that the SMART Station spaces are continuously occupied for about 4 hours a day, this gives the total energy usage as an upper bound:

\[7.8 \text{ kW} \times 4 \text{ hours} = 31.2 \text{ kWh per space per day}\]

Or 312 kWh for the whole site per day. This gives an annual energy usage of:

\[312 \text{ kWh/day} \times 365 \text{ days} = 113,880 \text{ kWh per year (upper bound)}\]

For the second scenario, it is assumed that a vehicle occupies a site for 8 hours as might be typical for a charging station located near a job site, has a high SOC, and low need of power, and that all the spaces at a site are filled every day. For a 10-space site, we can now calculate the lower bounds of the energy requirements:

Total power per space per day = 3.9 kWh

Total power per space per year = 1,440 kWh

Total site power per day = 39 kWh

Total site power per year = 14,400 kWh (lower bound)

As can be seen from these calculations, the actual energy profile for the SMART Station will vary greatly based on usage, or “load factor.” It also points out that having vehicles loiter in spaces for long periods will greatly reduce the utilization of the system capacity. These values
Vehicle Energy Needs

were used as metrics in the sizing of solar PV array and battery energy storage assets of the SMART Station.
4

DESIGN SELECTION AND LESSONS LEARNED

The initial design concepts for the solar-assisted charging station were developed in a series of meetings conducted over several months in 2009. These meetings included the participation of a number of Tennessee-based stakeholders. This effort yielded some basic design ideas that have been carried into this public design. Some of the key goals that were developed prior to starting the design included:

- Effectively integrate vehicles and the grid.
- Use solar power to offset vehicle energy use.
- Use battery storage to allow for mitigation of system peak load and to provide a platform for vertical integration of traction batteries in secondary use scenarios.
- Design an iconic look to boost public awareness of transportation electrification.
- Develop an on-premise public display system and possibly a website link that would allow the utility to see and share power and energy flows within the system. This enables the system to be used as an educational tool, promoting the electrification of transportation.

While there are a number of ways to connect the various system elements, for design flexibility it was decided that all system elements would be grid tied. This allowed for simplicity of interconnection and control and left the flexibility to change the basic structure of any system element without affecting the others. For example, if the battery were directly connected to the vehicle charging station and dc voltages used, this would lock the design to a specific battery chemistry and voltage range. By having a grid-tied battery system, the dc bus voltage of the battery is not of concern. All that need be considered for a grid-tied battery is that it provides the desired stored energy and peak power capability needed by the system. Another advantage of the use of grid-tied system elements is that all interconnects can be based on standard electrical hardware that is safety agency rated.

As with any project, there are always issues that require compromise to control total system price. The use of an equipment building to enhance the overall look of the site and to give a secure, vandal-proof housing for equipment proved to be very costly. Options, such as locating equipment in simple enclosures can be used to lower cost, but make maintaining an iconic look difficult. Since the battery requires a climate-controlled space, finding a location with existing conditioned space is also a potential option. One thing to be kept in mind related specifically to lead-acid batteries is the need for spill containment measures and proper ventilation. All battery types require consideration of fire suppression systems or measures.

While not included in the base design, a kiosk may be a useful addition to the system. A kiosk can be used to control charging access, assess fees for parking and/or charging, and provide
Design Selection and Lessons Learned

information to station users. Access control to charging was considered but not addressed in the base design.

Some comments are provided in the following section related to the primary system elements and the design process.

System Elements

Electric Vehicle Supply Equipment (EVSE)

Level 2 charging was selected for the SMART Station with a current limit of 32 A (40 A circuits) and at a voltage of 240 V. This was based on anticipated vehicle charging capacity, which is likely to be less than 10 kW for the foreseeable future, and to limit the required infrastructure for the overall system. A 240 V, 32 A EVSE can provide up to 7.68 kW of charge power. For an electric vehicle with a 0.24 kWh/mile energy usage and capable of charging at 7.68 kW, this represents roughly 32 miles (51.5 km) of range per hour of charge time. For the same vehicle, 6.6 kW charging represents 27.5 miles (44 km) of range per hour and 3.3 kW represents 13.8 miles (22 km) of range per hour. A system can also be structured to use 3 phase 208 Vac, but this requires phase load matching and, with the vehicles still being signal phase loads, results in a lower available power limit for vehicles of 6.66 kW.

There are a number of manufacturers of EVSE for public charging installations. Although the base design shows the use of an Eaton EVSE product, the design has been structured to allow substitution of any brand of EVSE. Minor modifications to the mechanical mounting scheme may be required, but the electrical infrastructure would remain unchanged. Elements of system control and data acquisition have been structured to use devices external to the EVSE, including the provision for separate revenue grade meters via standard meter sockets. There are EVSEs on the market that provide intelligence for control and communication, but the system is not currently designed to take advantage of these capabilities.

Features offered by commercially available EVSEs vary by manufacturer and model from simple metal enclosure boxes to elaborately shaped ergonomic designs with built-in intelligence. The EVSE's main function is to safely provide ac power to the vehicle and to properly implement the Society of Automotive Engineers (SAE) J1772 protocol for vehicle and EVSE interaction.

EVSEs have a cable that is used to connect to the vehicle. Stowing and management of the cable is considered to be a critical issue because the cable can be a trip hazard for station users if it is not properly stowed. EVSEs that are currently available generally rely on a cable that is stowed on the outside of the EVSE housing when not in use. The stowage is manual and requires that the user actively replace the cable usually by coiling the cable on a retaining hook. There are some recognized shortcomings in this scheme, and they will be assessed within our field trials of the base design. The addition of cable management, such as a reel mechanism, is possible but can add significantly to the cost and maintenance of EVSE hardware. Security of the charge cord is also a concern. Vandalism and copper theft are two primary shortcomings of having an exposed charge cable. To date, there are no commercial EVSE units that provide for secure storage of the charge cord.
**Battery Storage**

Early in the design process, it was recognized that batteries would require a climate-controlled space and, in some cases, ventilation for proper operation. This design effort has shown that the need for this climate-controlled space can have major cost implications for battery storage. The design described in this report shows that the addition of conditioned space essentially doubles the cost of the battery storage system.

A lithium-ion battery system was considered for the design, but initial research indicated that such a battery system with a capacity to meet the design goals was not available for purchase. Note that such a system would require an integrated battery management system and grid-tied inverter/charger. A lead acid battery system was finally selected based on availability and performance (power and energy capability) as well as longevity. The depth of discharge of a lead acid system is limited to something on the order of 50% for long life with repeated cycling. The actual capacity used in the base system design is roughly 167 kWh with a repeated cycle usable capacity of about 50 kWh.

The base design uses a set of 10 bidirectional grid tie inverters to connect the batteries to the grid. Ten units are required in order to support the 240 V ac system bus. The selected grid-tied inverter/charger system meets the requirements of UL 1741 for safety and provides an onboard data acquisition system for logging the data that are needed to support the full understanding of energy storage as it relates to the grid.

There are a number of other potential uses for the battery storage beyond ancillary services and local grid support. These include using battery energy to level the output of the solar array, reducing the peak system demand by dispatching energy to match vehicle load, and shifting the daytime station energy needs to night by storing battery energy at night and dispatching it during daylight hours.

A compelling reason for consideration of the use of lithium-ion batteries is the potential for second use of vehicle traction batteries. Vehicle manufacturers are looking for means to amortize the cost of traction batteries over a longer period of time in order to make the upfront cost of PEVs more acceptable to consumers. The potential to use “spent” traction batteries from vehicle applications may make the cost of such batteries very attractive for stationary storage use. There are many issues that need to be addressed in order to facilitate secondary use such as expected life of the batteries, failure mechanisms of older batteries, and recovery of functional cells from failed battery systems.

**Solar Photovoltaic**

In combining solar photovoltaic (PV) with a parking canopy, two primary design paths can be followed:

- An independent canopy with solar added on top.
- The solar panels form the canopy.
Design Selection and Lessons Learned

There are many different design paths that can be followed to develop a solar PV array integrated with a parking canopy. One key lesson learned in developing the design was related to the canopy/solar PV connection. There are products and designs that rely solely on the solar panels to form the actual roof-covering material for the canopy. Such products may be able to achieve a simpler mechanical design and also limit the issue of heat buildup under solar panels mounted above a roof structure, but there is one major drawback that must be considered. If the canopy consists solely of solar PV panels, then the amount of solar (and thus a major cost factor) is now tied to the sizing of the canopy. If the canopy size and solar PV sizing can be kept separate, this leaves open two degrees of freedom in cost control for the total design while simultaneously supporting a modular design function.

Selection of photovoltaic panels is based on a balance of performance and cost. The REC panels specified in the design, although not state of the art in efficiency, represent a cost-effective solution for the power levels sought in the system.

For the base design, assuming a location of Knoxville, Tennessee, the solar array performance is described in the following tables. Using a solar array power size of 20.5 kW with the National Renewable Energy Laboratory’s PVWatts' calculator for Knoxville with a default loss of 23% from dc to ac and using the estimated yearly energy output, the array provides the output shown in Table 4-1.

\[1\] National Renewable Energy Laboratory, PVWatts link:  

4-4
22.9 MWh/year or 62.8 kWh per day (average)

Table 4-1
PVWatts Calculations for Knoxville, Tennessee

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<thead>
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<th>PV System Specifications</th>
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Canopy

The canopy will consist of an open grid arrangement with a rain-protecting undergarment made of fully rated light steel. The design provides for support of the solar panels and gives a drip-free covering over the parking area. Figure 4-1 shows a side view of the design canopy.
Design Selection and Lessons Learned

Figure 4-1
Outline View of the Canopy Structure

If electric vehicle parking is to be viewed as a type of “premier” parking, then the canopy should minimize rainwater dripping on users. When the canopy is made up solely of solar panels, the racking system requires gaps in between the panels to allow heat expansion. This also allows rain to drip through. In the case of the Sanyo HIT-style panels, which can be “see-through,” there are several guttered racking systems available that serve both purposes, but at a cost premium when compared to standard panels. The base design uses standard panels with a corrugated 26 GA – 7/8” sheet metal skin under the panels to control water runoff and eliminate dripping through the solar panels. An optional rain gutter and diverter was included in this design. It is located at the end of the canopy and can be added to control the resulting rain runoff. Use of the guttering system may be investigated as part of the initial prototype construction effort.

SMART Station Control Features

The inclusion of smart control features for the SMART Station has only been peripherally addressed in the design effort. Provision has been made for an overlay data acquisition system as well as sockets to install advance revenue meters at the site. Since the metering infrastructure will vary by utility, this approach was taken to provide for a wide range of advanced control options. A more detailed implementation of smart control features is planned for a prototype system which will be documented in Volume two of this report.

Single-Row Design

During the design process of the SMART Station, a review of potential future sites for the stations made it obvious that there would be a need for a single-row canopy design in addition to
the nose-to-nose parking design described in this document. The single-row design was only partially developed, and a complete drawing package was not produced for the single row concept. Figures 4-2, 4-3, and 4-4 show the single-row concept applied to EPRI’s Knoxville lab facility. The canopy design was developed to the point that the cantilever design presented represents an engineered solution.

![Figure 4-2](image)

**Figure 4-2**
**Bird’s Eye View of a Single-Row SMART Station at EPRI’s Knoxville Facility**

Modularity for the single-row design remains at the two-space level for all of the system elements except the canopy. Since the canopy supports are now located at the edge of the system, the number of supports will vary from a minimum of two up to five when going from a two-space to a ten-space single-row design. The hardware elements for the canopy remain nearly identical to the two-row concept.
Figure 4-3
Street-Level View of a Single-Row Design at EPRI's Knoxville Facility
Lessons Learned

Following is a bullet list of some of the lessons learned during this effort:

- Systems that provide features beyond simple vehicle charging come at a cost premium. Understanding how these costs will impact business case construction for a SMART Station is still to be determined.

- While there are more advanced methods of coupling energy from solar and battery systems for vehicle charging, such as the use of a DC bus to transfer power, these may limit design flexibility. Grid-tied systems offer more degrees of freedom when selecting hardware for the various sub-systems. For example, the battery DC bus voltage is not a design constraint when choosing a grid-tied battery system while it is if the battery DC bus directly interfaces with the solar array.

- A canopy constructed using only solar panels for the roof structure is typically not drip free. This may not meet the expectation of a typical consumer for a parking canopy.

- While the base design should be a valuable resource for someone contemplating construction of a SMART Station system, site variations must be considered in order to estimate the overall system cost and final construction form.
Design Selection and Lessons Learned

- Modularity provides flexibility in the design, but comes at a cost premium when compared to a system that is designed and optimized to a tight set of specifications.
- The need for a climate controlled space for a battery system greatly increases the cost of energy storage.
- When batteries are employed, additional hazards, such as fire or spills, must also be addressed in the design process.

Engaging an architect early in the design process is valuable in addressing the system aesthetics. This ensures a balance between engineering needs and a desired system look.
All structures have been designed to be compliant with applicable federal regulations.

Foundation

Foundation criteria will be determined by the size of installation, grade topology, seismic zoning, and frost line. Drilled pier- or Sonotube\(^2\)-type foundations will be used for the canopy with flat pad construction for the equipment shelter. A generic footer design is represented in the SMART Station base drawing set and should be revised related to local site conditions.

Seismic

Seismic qualifications will be determined by geographical location. Design criteria will be based on seismic zones, seismic performance categories, and seismic design categories. This design reflects compliance with International Building Code (IBC) 2003.

Lighting

The SMART Station base design reflects the fueling station model. As such, the light levels specified in the design are typical for retail fueling establishments. While these light levels may be appropriate for commercial areas, they are likely to be excessive if the station were to be located in a typical work location parking area. The lighting levels used under the canopy at a specific site should take into account the existing light levels used in the parking area adjacent to the station. Matching the station light levels with existing light levels ensures that the parking area will continue to look uniform. Having an overlighted section of a parking area tends to make other parts of the parking lot look dark due to the human eye’s response to the light/dark contrast.

Wind

Wind loading will be determined by geographical location. Structures and associated equipment will be designed to withstand the code-specified wind load for its location. This design reflects compliance with IBC 2003.

\(^2\) Sonotube is a registered trademark of Sonoco Products Company.
Storm Water Run-Off Control

The base design assumes that construction is occurring on an existing paved area. As such, no consideration for storm water run-off was included in the design. If the construction of a SMART Station is at a green field site, then the addition of nonpermeable surfaces and storm water run-off issues will need to be considered and addressed based on local building codes. In some areas, this might require the inclusion of a storm water detention pond or other run-off control features.

Canopy and System Element Heights

This design reflects height restrictions found in IBC 2000. It is closely modeled on canopies found at commercial fueling stations. A design that is based on a residential carport concept with a shorter height canopy is a possibility. This would likely have a minimal impact on the structural aspects of the canopy, but might improve the visual impact of a system design. The type of traffic that will be in proximity to the station should be carefully considered in relation to vehicle height and the hazard of a vehicle inadvertently striking the canopy. Canopy height selection may also be influenced by avoiding shadowing from nearby structures, vegetation, trees, and overhead power lines.

Vandalism

As with any public/outdoor infrastructure, it is expected that the SMART Station hardware will be subject to vandalism. The use of an enclosure to house a number of critical system elements should enhance system security. One potential issue that could become a major maintenance cost issue for charging stations is copper theft. Once it becomes generally known among copper thieves that the cables found on EVSE are inherently safe, theft of charge cable may become a routine problem. The use of security cameras as an integral part of the canopy structure may help to mitigate such vandalism. All system equipment should be designed and installed for outdoor use with enclosures and weatherproofing appropriate to public infrastructure.

Zoning

Zoning issues related to construction are generally written and enforced at the local level. A primary consideration when building codes are consulted is the defined “use” of the infrastructure to be built. For example, paving an area to allow for vehicle parking would have a defined use of parking. You could consult local zoning codes in reference to parking and find what rules and standards apply to a project. “Vehicle charging” is a use that is unlikely to have been defined in existing building codes. This situation is exacerbated when you combine a solar canopy and a battery storage building.

The base design as proposed in this document would be suitable for a broad range of locations from workplace to apartment complexes, but in appearance the SMART Station closely resembles a fueling station (canopy, “fuel pumps,” and a service building). A zoning board could choose to consider a SMART Station in a fashion similar to a parking canopy, or they might treat
Structural and Other Considerations

it as a gas station based on retail sales. Each of these determinations would have a major impact on whether a given site is deemed suitable from a zoning perspective.

It is highly recommended that local codes enforcement and zoning officials be consulted early in the site selection and design process to provide guidance in defining system use. This may require providing details of anticipated system use, whether there will be fees collected for use of the system, and who the system users will be. Having clearly defined use early in the process will streamline the procurement of proper permits for system construction and may avoid the selection of a site that would prove to be unusable due to zoning issues.

When all of the elements described in this base design are combined, the full system begins to resemble a more conventional liquid fueling station. As such, when approaching the issue of zoning, the system “look” may contribute to limitations on location possibilities. This is based on the perception that, as a system, this base design more closely resembles a liquid fueling station than a parking area and may fall under retail zoning requirements for a given area. If the system use is defined as a fueling station, this might exclude it from being located in certain zoning types (such as a residential area).

Accessibility

In the United States, the installed configuration of public infrastructure must be designed to accommodate access by persons with disabilities. Under a federal law referred to as the Americans with Disabilities Act (ADA), there are carefully thought-out requirements that cover such issues as access to buildings, the mounting height of infrastructure, the location of ramps, and parking spaces specifically designed for accessibility. Vehicle charging is not specifically addressed in the ADA rules and guidelines as they currently exist; however, it is likely that the requirements will be modified to address vehicle charging in the future.

Rules from how an accessible space should be laid out, to how many spaces, if any, must be set aside for exclusive driver-with-disability use will need to be considered in constructing public infrastructure. As PEVs proliferate, the number of disabled drivers that will need access to charging will increase. It is recommended that charging station designers take a proactive stance in system layout, giving upfront consideration to accessibility early in the design process. Accessibility rules are generally interpreted and enforced at the local level with the federal ADA requirements as a baseline.

Tripping Hazards

The National Electric Code makes provision for the charge cord on an EVSE to be up to 25' (7.6 m) in length without cord management. The auto industry has not defined a standard for charge port location on vehicles. These two factors, when combined, will likely lead to the typical base installation of choice for an EVSE being one with a 25' (7.6 m) cord length.

For EVSE hardware currently available, cable management consists of requiring the charge station user to coil and hang the charge cable on a storage hook that is integral to the EVSE. It is easy to imagine that a station with ten 25' (7.6 m) long cords improperly stowed could present a
Structural and Other Considerations

potential hazard for tripping. This is especially true for a public installation that has multiple EVSE-equipped charging spaces whether configured as nose-to-nose in this base design or in a single-row configuration.

For the base design, overhead cable management was considered but set aside due to cost and complexity. Field installations will need to be closely monitored to access the real potential for tripping hazards to develop on a deployed system. Adequate signage should also warn users of the potential risk.
As part of the design effort, estimates of the cost of the various subsystems of the design have been carried out. These estimates are based on a mix of vendor quotes, design experience, and best guesses. This cost information has been used to scale the various system element costs. A very rough overall system cost estimate for the base design is in the range of $0.9M to $1.3M. Given that site-specific design issues and vendor pricing will depend on the products used and the sizing of the various subsystems, this should only be considered a ball-park figure.

Figure 6-1 shows the breakdown of subsystem costs as a percentage of the total hardware cost. The data are also provided in tabular form in Table 6-1. At first glance, solar PV is the primary cost driver of the system accounting for about 41% of the system hardware cost. Although the prefabricated building accounts for the next largest percentage at 24%, it needs to be noted that the use of battery storage drives the requirement for a conditioned space. Thus, a large part of the prefab building cost (approximately 20%) can be attributed to the battery storage system along with the grid-tied inverter/charger. When these elements are taken as a set, the lead acid battery system cost in this example accounts for about 39% of the hardware cost. Electrical equipment, the EVSEs, and advanced metering account for the remaining 16% of the total system hardware cost.
The design is modular in approach with two-vehicle charging spaces as the basic system element. This adds flexibility in meeting the needs of specific sites, such as available space. As such, the system elements can be readily scaled independently in order to drive the overall system cost. For a 10 space design, this results in increments of 20% of total capacity, or 5.1 kW solar increments and 10 kWh battery capacity increments.

When looking at total system cost, scaling of the solar PV array provides the strongest driver for cost control. Calculation of the impact of the solar array size is complicated by the fact that the area under canopy is determined by the number of parking spaces provided. As such, while the
cost is reduced by having a smaller total count of solar panels, canopy cost does not scale in
direct proportion if the same number of parking spaces are provided.

Reducing the battery storage capacity can also drive a lower cost. While the battery itself
accounts for about 13% of the system cost, scaling to a smaller battery will lower costs for the
inverter/charger and the prefab building.

It is expected that there are diminishing returns involved in scaling with either the solar PV or
battery systems. Overhead of base hardware and infrastructure drives the fact that using a half-
size solar array does not reduce the cost impact of solar by a factor of two.

One of the difficulties of accessing the overall cost of the system is in pinning down the
construction and installation costs, given that the use of a cross section of specialty technologies
is involved. Although there are construction aspects related to the system installation, much of
the work for the site would involve hardware installation that would typically be handled by an
electrical contractor. For most electrical contractors, the system involves technologies that are
likely to be outside their common installation experience. For three of the key system elements—
solar PV, battery storage, and vehicle charging infrastructure—these technologies have remained
in the realm of specialty installers, firms that generally only cover one of the technology areas.
Finding a contractor that has experience with all three technologies in the near term is very
unlikely. As such, the installation work for the full system may require the engagement of
several contracting firms to cover each of these technology areas.

It is expected that there will be regional variations in labor rates, contractor markups, and
construction practices along with site-specific issues that limit the ability to provide an accurate
total installed system cost. Figure 6-2 is offered as a “straw man” cost breakdown for the
complete system and is based on one possible overall system build scenario considered by Eaton.
As is expected, the materials now account for a smaller proportion of the overall system cost.
This again emphasizes that reduction of the sizing of one system element, while lowering the
total system cost, does not reduce costs on a 1:1 basis.
In defining system cost impacts, a fundamental question must first be considered. Who is the “consumer” for the system? If viewed from a system level, that is, the SMART Station owner’s point of view, there are different considerations with respect cost and benefit. This is contrasted with the charging consumer’s perspective in relation to the cost of charging. Clearly, lowering the overall system cost has the potential of benefiting both the system owner/operator and the charging consumer.

For the system owner, the actual upfront system cost and expected maintenance costs are key factors to be considered. For the consumer, the bottom-line cost of the charging service is of primary concern. Given the limited experience base for both system installation and operation costs and the lack of a clear understanding of consumer behavior, assessing the economic viability of a system such as described in this base design remains to be determined.

What economic benefits does the system owner gain? What are the long-term impacts on reliability and maintenance related to the battery and solar arrays? Will consumers accept a premium fueling rate to use this system based on personal ethos and offset the cost for charging infrastructure as is described? Until systems are constructed and operated under real world conditions, answers to these questions will remain elusive.
Life cycle costs have not been considered in this effort. Maintenance and ongoing station support are difficult to estimate based on our current knowledge base. Life cycle costs will be addressed in future work with the construction of actual systems and data collection over time.
A base SMART Station design has been completed. While no single design can be made truly universal in application, the design presented in this report can be used as a basis for other public installations of similar vehicle charging stations. Site specifics related to trenching, zoning, and physical layout will all have an impact on a system design for a specific location. By completing a full design, a number of issues were addressed and key questions identified. Users can use data gathered in this effort to answer such questions as “Do I want battery storage in my charging station?” and “What benefits would a battery storage system offer”. A follow on effort based on actual construction of such a station will be documented in Volume two of this report.
### DEFINITIONS AND ACRONYMS

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<th>Definition</th>
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<td>alternating current</td>
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Definitions and Acronyms

VFD variable frequency drive
VRLA valve-regulated lead acid
WAN wide area network
CONSTRUCTION DRAWING SET WITH BILL OF MATERIALS
**Bill of Materials**

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<tr>
<td>67890</td>
<td>Component B</td>
<td>5</td>
<td>each</td>
<td>Supplier Y</td>
<td>Notes 2</td>
</tr>
<tr>
<td>23456</td>
<td>Component C</td>
<td>3</td>
<td>each</td>
<td>Supplier Z</td>
<td>Notes 3</td>
</tr>
</tbody>
</table>

**Notes**
- Note 1: Detailed description of Component A.
- Note 2: Special handling required for Component B.
- Note 3: Component C requires a specific tool for assembly.

*Additional details and specifications for each component can be included in the comments column.*
The Electric Power Research Institute Inc. (EPRI, www.epri.com) conducts research and development relating to the generation, delivery and use of electricity for the benefit of the public. An independent, nonprofit organization, EPRI brings together its scientists and engineers as well as experts from academia and industry to help address challenges in electricity, including reliability, efficiency, health, safety and the environment. EPRI also provides technology, policy and economic analyses to drive long-range research and development planning, and supports research in emerging technologies. EPRI’s members represent more than 90 percent of the electricity generated and delivered in the United States, and international participation extends to 40 countries. EPRI’s principal offices and laboratories are located in Palo Alto, Calif.; Charlotte, N.C.; Knoxville, Tenn.; and Lenox, Mass.

Together...Shaping the Future of Electricity

Program:
Electric Transportation

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Appendix D – ORNL Solar Assisted Charging Demonstration Project
Of the $99.8 million awarded nationally through the American Recovery and Reinvestment Act to Ecotality North America, ORNL received $6.8 million. Last year this DOE Vehicle Demonstration and Vehicle Infrastructure Evaluation project was awarded an additional $15 million, and with the partner match the total value of the project is about $230 million.

In Tennessee, some of the 2535 planned charging stations will be located along Interstates 24, 75 and 40. The units are being supplied by Ecotality North America. While ORNL is home to experts in transportation, solar, grid, materials for battery storage and power electronics, partners, including the Tennessee Valley Authority and EPRI, bring to the table diverse capabilities that strengthen the team. Other regional partners include the Knoxville Utilities Board, the state of Tennessee, several cities and Nissan, whose Leaf became available in the U.S. late last year.

“Nissan applauds Oak Ridge National Laboratory for its leadership in the development of solar-assisted charging for electric vehicles,” said Tracy Woodard, director of government affairs for Nissan North America.

In Tennessee, buyers of electric vehicles are eligible for a $2,500 rebate from the state and a $7,500 federal tax credit.

—Ron Walli
Advisory Boards  
EVProject Documents Review and Training Session  
Agenda  

September 17, 2010  
1PM – 2PM CST  
1PM - 2PM EST  
Choose which time works best. 25 ports per session; so, please RSVP.  

Conference Call-in #: 212-XXX-XXXX; Participant Pass code: XXX  

Project Documents Teleconference Agenda:  

Guidelines  

Long Range Plan  

Implementation Plan  

Appendices
Advisory Board Weekly Conference Call
Agenda

September 21, 2010
11 AM CST

Conference Call-in #: 203-XXX-XXXX; Participant Pass code: XXX

Conference Call Agenda:

- Considerations Council Letters of Participation
  - First Meetings: by November 15th
- Advisory Board Updates in 2011:
  - February
  - May
  - August
  - October
- Addendums in 2010-2011
  - November 2010
  - March 2011
  - possibly one more opportunity prior to Dec 2012
- Hosting Partner Agreement & LOIs: Teamwork!
Knoxville Area
Advisory Board Weekly Conference Call
Agenda

September 22, 2010
10AM EST

EPRI hosts call-in

Dial In Number: XXX
Pin: XXX

Conference Call Agenda:

-Contract

-Hosting Partner Forum

-Considerations Council Meetings

-Championing issues
Nashville Area
Advisory Board Weekly Conference Call
Agenda

September 22, 2010
10AM CST

Dial In Number XXX
Participant Code: XXX

Conference Call Agenda:

- Contract
- Hosting Partner Forum
- Considerations Council Meetings
- Championing issues
Chattanooga Area Advisory Board
Bi-Monthly Conference Call
Agenda

October 5, 2010
2PM EST

Dial In Number: XXX
Conference ID: XXX
PIN: Not Required
Password: XXX

Topics and Agenda:

Participation Process:

- Letter of Intent
- Site Assessment
- Agreement / Proposal
- Construction Contracts
- Installation
- Orientation

Siting Update

Hosting Partner Forums:

- Invitees
- Goal
- Presenters
- Target Dates

Next meeting: Additional Members
Advisory Board Weekly Conference Call
Agenda

October 5, 2010
11 AM CST

Conference Call-in #: 203-XXX-XXXX; Participant Pass code: XXX

Topics and Agenda:

Participation Process:

- Letter of Intent
- Site Assessment
- Agreement / Proposal
- Construction Contracts
- Installation
- Orientation

Siting Update

Hosting Partner Forums:

- Invitees
- Goal
- Presenters
- Target Dates

Next meeting: Additional Members

Notes: TVPPA is creating an EV Task Force. A rep from this task force.

Nissan announced that there are 422 reservationists in the State of TN. They think that only 300 were in the EV Project territory. They have a contractual issue with AV and that is the sticking point on adding zip codes to the EVProject territory. They will provide marketing material for trade shows that we do.
Nashville Area Advisory Board Weekly Conference Call
Agenda

October 6, 2010
10AM CST

Dial In Number XXX
Participant Code: XXX

Topics and Agenda:

Participation Process:

- Letter of Intent
- Site Assessment
- Agreement / Proposal
- Construction Contracts
- Installation
- Orientation

Siting Update

Hosting Partner Forums:

- Invitees
- Goal
- Presenters
- Target Dates

Next meeting: Additional Members
Advisory Board Weekly Conference Call
Agenda

October 19, 2010
11 AM CST

WEBINAR

Topics and Agenda:

Recent EVPProject Announcements

- DC Fast Charger reveal
- BP

RECAP:
Participation Process:

- Letter of Intent
- Site Assessment
- Agreement / Proposal
- Construction Contracts
- Installation
- Orientation

Hosting Partner Forums:

- Invitees
- Goal
- Presenters
- Target Dates
Bi-weekly Update
December 14, 2010
State Advisory Boards
Agenda

• 2011 Update Schedule
• Results from Hosting Partner Forums
• Current Siting Focus
• Current Issues
• Upcoming Events
• Hosting Agreement
• Site Assessments
Bi-weekly Update
December 15, 2010
Area Advisory Boards
Agenda

• 2011 Update Schedule
• Results from Hosting Partner Forums
• Current Siting Focus
• Current Issues
• Upcoming Events
• Hosting Agreement
• Site Assessments
State Advisory Board Monthly Conference Call Agenda
January 11, 2011
11 AM CST
Conference Call-in #: XXX
Participant Code: XXX

- Meeting Planning for a physical meeting of the group
- Memphis – State Commitment, Zips and PR
- 2011 Milestones and Project Schedule
  - PR Event – Solar Assisted Charging Station Opening Jan. 25th
  - PR Event for EVP resident: Mid-February
  - Memphis HPF Tentative date: February 22nd (Peabody Hotel)
  - Hosting Partner Forum Knoxville: February 24th (Chamber)
  - Nissan Electric Drive Tour Knoxville Feb 25th-27th
  - Workplace Charging Impact Study Initial Comm. February 28th
  - Garage-less Needs Analysis Initial Comm. April 4th

2011 Update Schedule –
Second Tuesday of each month
11AM CST – Topics for Focus

January 11th – 2011 Milestones and Project Schedule
February 15th – Round 2 Hosting Partner Forum Prep and Workplace Charging
March 15th – DC Fast Charger Deployment
April 12th – Percent Completes for EVProject & Garage-less Needs Analysis
May 10th – EVProject Best Practices - Planning - Report
June 14th – LEAF and EV Market Penetration in TN and Nationally
July 12th – Round 3 Hosting Partner Forum Prep
August 9th – Diversity of Choice: Goals vs Actual
September 13th – EVProject Data Collection
October 11th – National Issues
November 8th – Garage-less needs analysis Report
December 13th – 2011 Goals vs Actual
January 12th AGENDA 10AM CST

- 2011 Milestones and Project Schedule
  - PR Event – Solar Assisted Charging Station Opening Jan. 25th
  - PR Event for EVP resident: Mid-February
  - Memphis HPF Tentative date: February 22nd (Peabody Hotel)
  - Hosting Partner Forum Knoxville: February 24th (Chamber?)
  - Nissan Electric Drive Tour Knoxville Feb 25th-27th
  - Workplace Charging Impact Study Initial Comm.: February 28th
  - HPF for Chattanooga Tentative date: March 22nd (Doubletree Hotel)
  - HPF for Nashville Tentative Date: March 24th (TBD)
  - Garage-less Needs Analysis Initial Comm.: April 4th
  - Completion of WCIS: April 11th
  - Completion of GNA: June 13th
  - Installs Complete: Sept. 2011
  - Hosting Partner Forums repeat November (for actual host sites)

2011 Schedule and Topics:

January 12th – 2011 Milestones and Project Schedule
February 9th – Round 2 Hosting Partner Forum Prep and Workplace Charging
March 9th – DC Fast Charger Deployment
April 13th – Percent Completes for EVProject & Garage-less Needs Analysis
May 11th – EVProject Best Practices - Planning - Report
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September 14th – EVProject Data Collection
October 12th – National Issues
November 9th – Garage-less needs analysis Report
December 14th – 2011 Goals vs Actual

Thank you all for your continued attention to and support of the EVProject!

Stephanie Cox
Stakeholder Services Area Manager - Tennessee

For additional information, please visit: www.theevproject.com
When: Monday, February 07, 2011 12:00 PM-2:00 PM (GMT-06:00) Central Time (US & Canada). Where: EPB 7th Floor

Note: The GMT offset above does not reflect daylight saving time adjustments.

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The purpose of the February 7th meeting will be to:
- reviewing siting efforts in the Chattanooga Area
- plan for the next hosting partner forum – March 22nd @ Doubletree Hotel 9AM-12
- discuss Chattanooga’s desire (or not) to pursue permitting and inspection training with TVA

The next EVProject Update teleconference was scheduled on the 9th of February; but, this physical meeting on the 7th will take the place of the February Monthly EVP update!

Looking ahead….The March teleconference meeting invite and agenda will be sent out March 1st for the March EVProject Update teleconference which will be held the 8th of March at 2PM EST. The main topic for the March 8th teleconference will be DC Fast Charger Deployment.

Chattanooga Area Advisory Board 2011 Teleconference Call Dates & Topics
March 8th – DC Fast Charger Deployment
April 12th – Percent Completes for EVProject & Garage-less Needs Analysis
May 10th – EVProject Best Practices - Planning - Report
June 14th – LEAF and EV Market Penetration in TN and Nationally
July 12th – Round 3 Hosting Partner Forum Prep
August 9th – Diversity of Choice: Goals vs. Actual
September 13th – EVProject Data Collection
October 11th – National Issues
November 8th – Garage-less needs analysis Report
December 13th – 2011 Goals vs. Actual

All Calls: Conference Call-in #: 212-XXX-XXXX; Participant Pass code: XXX
Knoxville Area Advisory Board February EVProject Update Teleconference

10 AM EST

Agenda:
- Round 2 Hosting Partner Forum Prep
  - Speakers
  - Invites
  - Goal
- Knoxville Area Siting Progress Update

All Calls: Conference Call-in #: 212-XXX-XXXX; Participant Pass code: XXX.

2011 Schedule and Topics:
February 9th – Round 2 Hosting Partner Forum Prep
March 9th – DC Fast Charger Deployment
April 13th – Percent Completes for EVProject & Garage-less Needs Analysis
May 11th – EVProject Best Practices - Planning - Report
June 15th – LEAF and EV Market Penetration in TN and Nationally
July 13th – Round 3 Hosting Partner Forum Prep
August 10th – Diversity of Choice: Goals vs. Actual
September 14th – EVProject Data Collection
October 12th – National Issues
November 9th – Garage-less needs analysis Report
December 14th – 2011 Goals vs. Actual
Nashville Area Advisory Board February EVProject Update

Teleconference
10AM CST

Agenda:
- Round 2 Hosting Partner Forum Prep
  - Speakers
  - Invites
  - Goal
- Nashville Area Siting Progress Update

All Calls: Conference Call-in #: 212-XXX-XXXX; Participant Pass code: XXX.

2011 Schedule and Topics:
February 9th – Round 2 Hosting Partner Forum Prep
March 9th – DC Fast Charger Deployment
April 13th – Percent Completes for EVProject & Garage-less Needs Analysis
May 11th – EVProject Best Practices - Planning - Report
June 15th – LEAF and EV Market Penetration in TN and Nationally
July 13th – Round 3 Hosting Partner Forum Prep
August 10th – Diversity of Choice: Goals vs. Actual
September 14th – EVProject Data Collection
October 12th – National Issues
November 9th – Garage-less needs analysis Report
December 14th – 2011 Goals vs. Actual
State Advisory Board Monthly Conference Call – February Agenda
February 15th
11 AM CST
Conference Call-in #: 212-XXX-XXXX; Participant Pass code: XXX.

- Round 2 Hosting Partner Forum Prep
  - Speakers
  - Invites
  - Goal
- Workplace Charging Impact Study
  - Timeframe
  - Scope
  - Parties involved

EVProject
MASTER CALL SCHEDULE:
State: 11AM CST
Chattanooga: Second Tuesday at 1PM CST
Knoxville: Second Wednesday at 9 AM CST
Nashville: Second Wednesday at 10 AM CST
Memphis: TBD
Subject: HPF Invitation

When: Tuesday, February 15, 2011 11:00 AM-12:00 PM (GMT-06:00) Central Time (US & Canada). Where: Teleconference

Note: The GMT offset above does not reflect daylight saving time adjustments.

State Advisory Board Monthly Conference Call–February Agenda
February 15th
11 AM CST
Conference Call-in #: 212-XXX-XXXX; Participant Pass code: XXX.

- Budget Increase
- Contract Rewrites
- MCP update

Knox idea for HPF
- Round 2 Hosting Partner Forum Prep
  - Speakers
  - Invites
  - Goal
- Workplace Charging Impact Study – do we want to work with other state?
  - timeframe
  - scope
  - parties involved

EVProject
MASTER CALL SCHEDULE:
State: 11AM CST
Chattanooga: Second Tuesday at 1PM CST
Knoxville: Second Wednesday at 9 AM CST
Nashville: Second Wednesday at 10 AM CST
Memphis: TBD
All Calls: Conference Call-in #: 212-200-5010 Participant Code: 65417
Subject: Chattanooga Area EVProject Advisory Board Monthly Update Teleconference

When: Tuesday, March 08, 2011 1:00 PM-1:30 PM (GMT-06:00) Central Time (US & Canada).
Where: Conference Call-in #: 212-200-5010 Participant Code: 65417

Note: The GMT offset above does not reflect daylight saving time adjustments.

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Main Agenda item: DC Fast Charger Deployment
Other: Micro-Climate Plan: bringing the pieces together

Chattanooga Area Advisory Board 2011 Teleconference Call
Dates & Topics
All Calls: Conference Call-in #: 212-XXX-XXXX; Participant Pass code: XXX.
March 8th – DC Fast Charger Deployment
April 12th – Percent Completes for EVProject & Garage-less Needs Analysis
May 10th – EVProject Best Practices - Planning - Report
June 14th – LEAF and EV Market Penetration in TN and Nationally
July 12th – Round 3 Hosting Partner Forum Prep
August 9th – Diversity of Choice: Goals vs. Actual
September 13th – EVProject Data Collection
October 11th – National Issues
November 8th – Garage-less needs analysis Report
December 13th – 2011 Goals vs. Actual
Subject: Chattanooga EVProject Advisory Board Monthly Update

When: Tuesday, April 12, 2011 1:00 PM-2:00 PM (GMT-06:00) Central Time (US & Canada). Where: Conference Call-in #: 212-200-5010 Participant Code: 65417

Note: The GMT offset above does not reflect daylight saving time adjustments.

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Chattanooga Area Advisory Board Monthly Conference Call – April Agenda
March 8th
1 PM CST / 2PM EST

Main Agenda items:

ADA and EV Charging
Current Siting Efforts: Mapping
Revised Project Schedule
Utility Reporting
Revised Host Agreement
ARRA: EVSE siting restrictions & installation guidelines
Micro-Climate Plan: bringing the pieces together

Chattanooga Area Advisory Board 2011 Teleconference Call Dates & Topics
All Calls: Conference Call-in #: 212-XXX-XXXX; Participant Pass code: XXX.

May 10th – EVProject Best Practices - Planning - Report
June 14th – LEAF and EV Market Penetration in TN and Nationally
July 12th – Round 3 Hosting Partner Forum Prep
August 9th – Diversity of Choice: Goals vs. Actual
September 13th – EVProject Data Collection
October 11th – National Issues
November 8th – Open
December 13th – 2011 Goals vs. Actual
Subject: State Advisory Board Monthly Update Teleconference
11AM 3-8-11

When: Tuesday, March 08, 2011 11:00 AM-11:30 AM (GMT-06:00) Central Time (US & Canada). Where: Conference Call-in #: 212-200-5010 Participant Code: 65417

Note: The GMT offset above does not reflect daylight saving time adjustments.

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State Advisory Board Monthly Conference Call – March Agenda
March 8th
11 AM CST

Main Agenda item:
DC Fast Charger Deployment
Other: Micro-Climate Plan: bringing the pieces together

All Calls: Conference Call-in #: 212-XXX-XXXX;
Participant Pass code: XXX.

2011 Schedule and Topics:
March 9th – DC Fast Charger Deployment
April 13th – Percent Completes for EVProject & Garage-less Needs Analysis
May 11th – EVProject Best Practices - Planning - Report
June 15th – LEAF and EV Market Penetration in TN and Nationally
July 13th – Round 3 Hosting Partner Forum Prep
August 10th – Diversity of Choice: Goals vs. Actual
September 14th – EVProject Data Collection
October 12th – National Issues
November 9th – Garage-less needs analysis Report
December 14th – 2011 Goals vs. Actual
Attached is EVProject Tennessee Implementation Plan’s city specific introduction guide discussed today.

Stephanie Cox  
Stakeholder Services Area Manager - Tennessee

For additional information, please visit: www.theevproject.com

Chattanooga Area Advisory Board Monthly Conference Call – March Agenda
March 8th  
1 PM CST / 2PM EST

Main Agenda item: DC Fast Charger Deployment
Other: Micro-Climate Plan: bringing the pieces together

Chattanooga Area Advisory Board 2011 Teleconference Call
Dates & Topics
All Calls: Conference Call-in #: 212-XXX-XXXX; Participant Pass code: XXX.

March 8th – DC Fast Charger Deployment
April 12th – Percent Completes for EVProject & Garage-less Needs Analysis
May 10th – EVProject Best Practices - Planning - Report
June 14th – LEAF and EV Market Penetration in TN and Nationally
July 12th – Round 3 Hosting Partner Forum Prep
August 9th – Diversity of Choice: Goals vs. Actual
September 13th – EVProject Data Collection
October 11th – National Issues
November 8th – Garage-less needs analysis Report
December 13th – 2011 Goals vs. Actual
**Tennessee EVProject Implementation Plan: City Specific Introduction**

Expected length is 3 pages

- logo / mantra / motto

- How do EVs integrate with the area’s overall support of clean fuels, clean air and existing green transportation initiatives?

- Will EV infrastructure planning change current transportation planning and patterns?

- How will permitting and inspection be handled in the region?

- How will EV’s impact to local businesses be addressed/handled/supported?

- How might EV infrastructure impact/support tourism?

- Will the area support EV adoption in the region? Why?

- Will the city consider EV for fleet? Why?

**Tennessee EVProject Implementation Action Plan**

March 23rd  First Draft due to ECOtality

March 30th  State Advisory Board - complete draft review session

April 6th  Revision suggestions due from Complete Document Review

April 15th  Revisions (Round 2) due to ECOtality

April 22nd  Final Group Review – Webinar with real time editing.

April 30  Final TN EVProject Implementation Plan Due
Subject: EVProject Knoxville Area Advisory Board Update

When: Wednesday, March 09, 2011 9:00 AM-9:30 AM (GMT-06:00) Central Time (US & Canada). Where: Conference Call-in #: 212-200-5010 Participant Code: 65417

Note: The GMT offset above does not reflect daylight saving time adjustments.

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Knoxville Area Advisory Board Update Monthly Conference Call – March Agenda
March 9th
9 AM CST / 10AM EST

Main Agenda item: DC Fast Charger Deployment

Other: Micro-Climate Plan: bringing the pieces together

All Calls: Conference Call-in #: 212-XXX-XXXX; Participant Pass code: XXX.

Complete 2011 Schedule and Topics:
March 9th – DC Fast Charger Deployment
April 13th – Percent Completes for EVProject & Garage-less Needs Analysis
May 11th – EVProject Best Practices - Planning - Report
June 15th – LEAF and EV Market Penetration in TN and Nationally
July 13th – Round 3 Hosting Partner Forum Prep
August 10th – Diversity of Choice: Goals vs. Actual
September 14th – EVProject Data Collection
October 12th – National Issues
November 9th – Garage-less needs analysis Report
December 14th – 2011 Goals vs. Actual
Subject: EVProject Nashville Area Advisory Board Update

When: Wednesday, March 09, 2011 10:00 AM-10:30 AM (GMT-06:00) Central Time (US & Canada). Where: Conference Call-in #: 212-200-5010 Participant Code: 65417

Note: The GMT offset above does not reflect daylight saving time adjustments.

*Nashville Area Advisory Board Update Monthly Conference Call – March Agenda
March 9th
10 AM CST
Conference Call-in #: 212-200-5010 Participant Code: 65417

Main Agenda item: DC Fast Charger Deployment

Other: Micro-Climate Plan: bringing the pieces together

All Calls: Conference Call-in #: 212-200-5010 Participant Code: 65417.

Complete 2011 Schedule and Topics:
March 9th – DC Fast Charger Deployment
April 13th – Percent Completes for EVProject & Garage-less Needs Analysis
May 11th – EVProject Best Practices - Planning - Report
June 15th – LEAF and EV Market Penetration in TN and Nationally
July 13th – Round 3 Hosting Partner Forum Prep
August 10th – Diversity of Choice: Goals vs. Actual
September 14th – EVProject Data Collection
October 12th – National Issues
November 9th – Garage-less needs analysis Report
December 14th – 2011 Goals vs. Actual
Subject: EVProject State Advisory Board Monthly Update - Teleconference

When: Tuesday, April 12, 2011 11:00 AM-12:00 PM (GMT-06:00) Central Time (US & Canada). Where: Conference Call-in #: 212-200-5010 Participant Code: 65417

Note: The GMT offset above does not reflect daylight saving time adjustments.

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State Advisory Board Monthly Conference Call – April Agenda
April 12, 2011
11 AM CST

Main Agenda items:
ADA and EV Charging
Current Siting Efforts: Mapping
Revised Project Schedule
Utility Reporting
Revised Host Agreement
ARRA: EVSE siting restrictions & installation guidelines
Micro-Climate Plan: bringing the pieces together

2011 Teleconference Call Dates & Topics
All Calls: Conference Call-in #: 212-200-5010 Participant Code: 65417.

May 10th – EVProject Best Practices - Planning - Report
June 14th – LEAF and EV Market Penetration in TN and Nationally
July 12th – Round 3 Hosting Partner Forum Prep
August 9th – Diversity of Choice: Goals vs. Actual
September 13th – EVProject Data Collection
October 11th – National Issues
November 8th – Open
December 13th – 2011 Goals vs. Actual
Knoxville Area Advisory Board Update
Monthly Conference Call – April
Agenda
April 13\textsuperscript{th}
9 AM CST / 10AM EST
Conference Call-in #:

Main Agenda items:
ADA and EV Charging
Current Siting Efforts: Mapping
Revised Project Schedule
Utility Reporting
Revised Host Agreement
ARRA: EVSE siting restrictions & installation guidelines
Micro-Climate Plan: bringing the pieces together

Complete 2011 Schedule and Topics:
May 11\textsuperscript{th} – EVProject Best Practices - Planning - Report
June 15\textsuperscript{th} – LEAF and EV Market Penetration in TN and Nationally (note that this date is NOT the second Wednesday of the month; but the third Wednesday)
July 13\textsuperscript{th} – Round 3 Hosting Partner Forum Prep
August 10\textsuperscript{th} – Diversity of Choice: Goals vs. Actual
September 14\textsuperscript{th} – EVProject Data Collection
October 12\textsuperscript{th} – National Issues
November 9\textsuperscript{th} – Open
December 14\textsuperscript{th} – 2011 Goals vs. Actual

Conference Call-in #: 212-XXX-XXXX; Participant Pass code: XXX.
Nashville Area Advisory Board Update
Monthly Conference Call – April Agenda
April 13th
10 AM CST

Main Agenda items:
Nashville MPO Mapping Methodology
ADA and EV Charging
Current Siting Efforts: Mapping
Revised Project Schedule
Utility Reporting
Revised Host Agreement
ARRA: EVSE siting restrictions & installation guidelines
Micro-Climate Plan: bringing the pieces together

Complete 2011 Schedule and Topics:
May 11th – EVProject Best Practices - Planning - Report
June 15th – LEAF and EV Market Penetration in TN and Nationally (note that this date is NOT the second Wednesday of the month; but the third Wednesday)
July 13th – Round 3 Hosting Partner Forum Prep
August 10th – Diversity of Choice: Goals vs. Actual
September 14th – EVProject Data Collection
October 12th – National Issues
November 9th – Garage-less needs analysis Report
December 14th – 2011 Goals vs. Actual

Conference Call-in #: 212-XXX-XXXX; Participant Pass code: XXX.
Subject: REPEAT: Nashville Area Advisory Board Meeting

Because the webinar and teleconference option did not function during last week’s meeting, we are repeating the session this coming Wednesday (and Thursday, if needed). Please do RSVP (if you need to have a Thursday time, please suggest a time from 1-4PM). We had technical difficulties last week, for which I apologize. There are important changes to the implementation of the EVProject and critical resources being provided on which ECOtality wants to ensure that all area stakeholders have had input.

REPEATED: Nashville Area Advisory Board Update
Monthly Conference Call – April
Agenda presented on April 13th
Date of this REPEATED SESSION: APRIL 20
10 AM CST

Main Agenda items:
Nashville MPO Mapping Methodology
ADA and EV Charging
Current Siting Efforts: Mapping
Revised Project Schedule
Utility Reporting
Revised Host Agreement
ARRA: EVSE siting restrictions & installation guidelines
Micro-Climate Plan: bringing the pieces together

Complete 2011 Schedule and Topics:
May 11th – EVProject Best Practices - Planning - Report
June 15th – LEAF and EV Market Penetration in TN and Nationally (note that this date is NOT the second Wednesday of the month; but the third Wednesday)
July 13th – Round 3 Hosting Partner Forum Prep
August 10th – Diversity of Choice: Goals vs. Actual
September 14th – EVProject Data Collection
October 12th – National Issues
November 9th – Garage-less needs analysis Report
December 14th – 2011 Goals vs. Actual

Conference Call-in #: 212-XXX-XXXX; Participant Pass code: XXX.
Main Agenda items:
Nissan Hand Raiser and Registrant Update
Micro-Climate Plan Review
ADA
Siting Efforts
2011 Teleconference Call Dates & Topics
All Calls: Conference Call-in #: 212-XXX-XXXX; Participant Pass code: XXX
May 10th – EVProject Best Practices - Planning - Report
June 14th – LEAF and EV Market Penetration in TN and Nationally
July 12th – Round 3 Hosting Partner Forum Prep
August 9th – Diversity of Choice: Goals vs. Actual
September 13th – EVProject Data Collection
October 11th – National Issues
November 8th – Open
December 13th – 2011 Goals vs. Actual
Knoxville & Chattanooga Area Advisory Boards

Monthly Conference Call –
May 11th
9 AM CST / 10AM EST
Con

Main Agenda items:

Nissan Hand Raiser and Registrant Update
Micro-Climate Plan Review
ADA
Siting Efforts

Complete 2011 Schedule and Topics:
May 11th – LEAF and EV Market Penetration in TN and Nationally
June 15th – EVProject Best Practices - Planning - Report (note that this date is NOT the second Wednesday of the month; but the third Wednesday)
July 13th – Round 3 Hosting Partner Forum Prep
August 10th – Diversity of Choice: Goals vs. Actual
September 14th – EVProject Data Collection
October 12th – National Issues
November 9th – Open
December 14th – 2011 Goals vs. Actual

Conference Call-in #: 212-XXX-XXXX; Participant Pass code: XXX.
Knoxville & Chattanooga Area Advisory Boards

Monthly Conference Call – May 11th
9 AM CST / 10AM EST
Conference Call-in #: 212-XXX-XXXX; Participant Pass code: XXX.

Main Agenda items:
Nissan Hand Raiser and Registrant Update
Micro-Climate Plan Review
ADA
Siting Efforts

Complete 2011 Schedule and Topics:
May 11th – LEAF and EV Market Penetration in TN and Nationally
June 15th – EVProject Best Practices - Planning - Report (note that this date is NOT the second Wednesday of the month; but the third Wednesday)
July 13th – Round 3 Hosting Partner Forum Prep
August 10th – Diversity of Choice: Goals vs. Actual
September 14th – EVProject Data Collection
October 12th – National Issues
November 9th – Open
December 14th – 2011 Goals vs. Actual

Conference Call-in #: 212-XXX-XXXX; Participant Pass code: XXX.
Nashville Area Advisory Board
Update
Monthly Conference Call – May
Agenda
May 11th
10 AM CST / 11AM EST
Conference Call-in #:
Webinar Registration:

Main Agenda items:
Nissan Hand Raiser and Registrant Update
Micro-Climate Plan Review
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Siting Efforts

Complete 2011 Schedule and Topics:
May 11th – LEAF and EV Market Penetration in TN and Nationally
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Conference Call-in #: 212-XXX-XXXX; Participant Pass code: XXX.
Advisory Board Monthly Update
June 14th – June 15th, 2011

Conference Call-in #: xxx

State Advisory Board - Tuesday June 14th 11AM CST
Register Now for Webinar at:

East TN Area Advisory Board (Knoxville and Chattanooga) - June 15th 9AM CST
Register Now at:

Middle TN Advisory Board (Nashville) - June 15th 10AM CST
Register Now at:

Main Agenda items:

Micro-Climate Plan:
Tennessee Implementation Process Document Review
MPO Interactive Map Demonstration
Siting Efforts

2011 Teleconference Call Dates & Topics
All Calls: Conference Call-in #: 212-XXX-XXXX;
Participant Pass code: XXX.

July 12-13th – LEAF and EV Market Penetration in TN and Nationally
August 9-10th – Round 3 Hosting Partner Forum Prep September
13-14th – Diversity of Choice: Goals vs. Actual October 11-12th –
National Issues and EVProject Data Collection November 8-9th –
Open
December 13-14th – 2011 Goals vs. Actual
State Advisory Board Monthly Update
June 14th, 2011
11AM CST

Conference Call-in #: XXX

State Advisory Board - Tuesday June 14th 11AM CST
Register Now for Webinar at:

Main Agenda items:
Micro-Climate Plan:
Tennessee Implementation Process Document Review
MPO Interactive Map Demonstration
Siting Efforts

2011 Teleconference Call Dates & Topics
All Calls: Conference Call-in #: 212-XXX-XXXX;
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July 12 – LEAF and EV Market Penetration in TN and Nationally
August 9 – Round 3 Hosting Partner Forum Prep September
13 – Diversity of Choice: Goals vs. Actual October 11 –
National Issues and EVProject Data Collection November 8
– Open
December 13 – 2011 Goals vs. Actual
East Tennessee Advisory Board Monthly Update
June 15th, 2011 9AM CST

Conference Call-in #: XXX

East TN Area Advisory Board (Knoxville and Chattanooga) - June 15th 9AM CST:

Main Agenda items:

Micro-Climate Plan:
- Tennessee Implementation Process Document Review
MPO Interactive Map Demonstration
Siting Efforts

2011 Teleconference Call Dates & Topics
All Calls: Conference Call-in #: 212-XXX-XXXX;
Participant Pass code: XXX.

- July 13th – LEAF and EV Market Penetration in TN and Nationally
- August 10th – Round 3 Hosting Partner Forum Prep
- September 14th – Diversity of Choice: Goals vs. Actual
- October 12th – National Issues and EVProject Data Collection
- November 9th – Open
- December 14th – 2011 Goals vs. Actual
Advisory Board Monthly Update
June 15th,
2011

Conference Call-in #: XXX

Middle TN Advisory Board (Nashville) - June 15th 10AM CST
Register Now at:

Main Agenda items:
Micro-Climate Plan:
Tennessee Implementation Process Document Review
MPO Interactive Map Demonstration
Siting Efforts

2011 Teleconference Call Dates & Topics
All Calls: Conference Call-in #: 212-200-5010 Participant Code: 65417.

July 13th – LEAF and EV Market Penetration in TN and Nationally
August 10th – Round 3 Hosting Partner Forum Prep
September 14th – Diversity of Choice: Goals vs. Actual
October 12th – National Issues and EV Project Data Collection
November 9th – Open
December 14th – 2011 Goals vs. Actual