Project Components

The Project will demonstrate three classes of technologies to help integrate 18,000 MW wind generation…

1 Synchrophasor Technology

2 Smart Meter Texas Portal

3 Smart Grid Community of the Future

Texas Future Community Overview

There is an existing Houston community called Discovery at Spring Trails that is developing energy efficient homes equipped with solar units and energy management systems. The developer, Land Tejas, has invited CCET to participate in this unique master-planned community. The intent is to:

➤ Leverage availability of efficient building envelopes for residential homes
➤ Implement a variety of community- and residential-level smart grid technologies that will empower neighborhoods and consumers to conserve energy:
  ➤ Solar (community and residential)
  ➤ Storage batteries (community and residential)
  ➤ Electric vehicle charging stations (community and residential)
  ➤ Smart appliances
  ➤ Home energy management (HEM) systems
➤ Implement and evaluate customer response to load shed and real-time price signaling
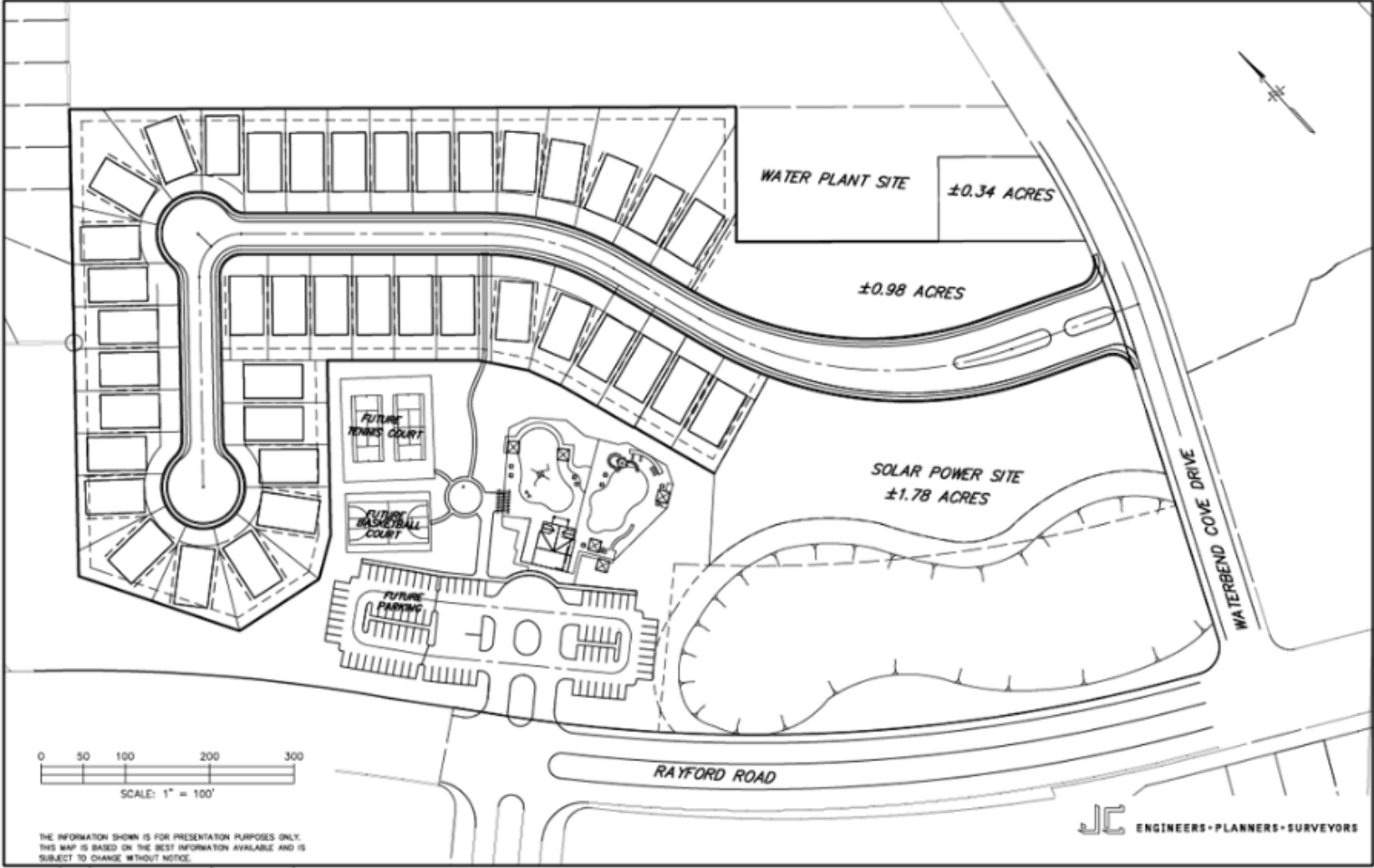
Discovery at Spring Trails

A master-planned solar-powered hybrid community located north of Houston:

# Incorporating a Water Treatment Plant and Solar Farm

Masco "Environments for Living (EFL) Certified Green"

The EFL program is Energy Star rated and Certified Green. EFL provides 2 guarantees for the first 3 years of the home: 1) temperature throughout the home will never vary more than 3 degrees from the thermostat set point, and 2) energy use for heating and cooling the home will not exceed stated levels.

Quality construction and materials "behind the walls":

1. Tight construction

2. Fresh air ventilation

3. Improved thermal systems

4. Right-sized heating and cooling systems

5. Air pressure balancing

6. Internal moisture management

7. Combustion safety
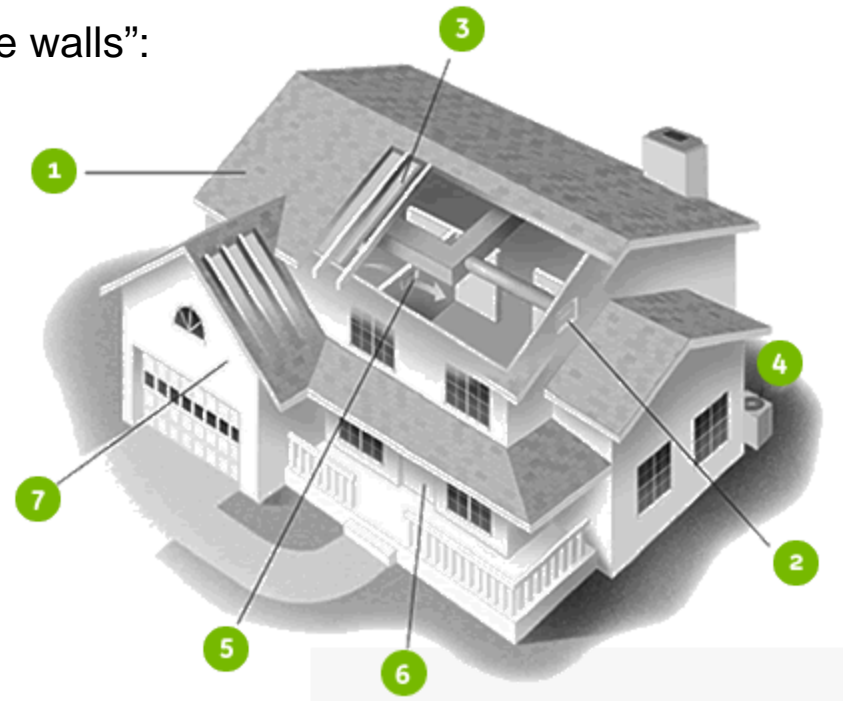
Also includes *low emissivity windows, energy efficient lighting, water conservation devices, and Energy Star appliances.*

CCET

ERCOT

DEPARTMENT OF ENERGY · UNITED STATES OF AMERICA

Demonstration Goals

➢ Educate consumers on smart grid and energy efficiency

➢ Quantify home construction efficiency by comparing energy use with comparable code-built homes in a neighboring community, Legends Ranch

➢ Determine the demand response potential of four tranches of homes, from code-built to "deep-green" homes

➢ Document consumer response to dynamic pricing models

➢ Determine the effects of residential demand generation

➢ Design an effective market transformation program

➢ Determine the economic value of community-level energy storage, solar farm, and centralized electric vehicle charging

CCET   ERCOT
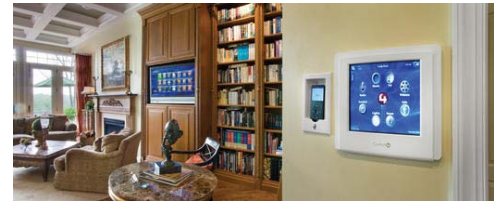
Featured Technologies and Services

High efficiency HVAC systems with central Indoor Air Quality (IAQ) systems

Electronic Vehicle (EV) charging

Rooftop solar for serving as Distributed Generation (DG) for each home

Home energy management services including an in-home display & software applications to help homeowners manage their electricity more efficiently

2-way metering capabilities to support DG and new-generation demand response programs
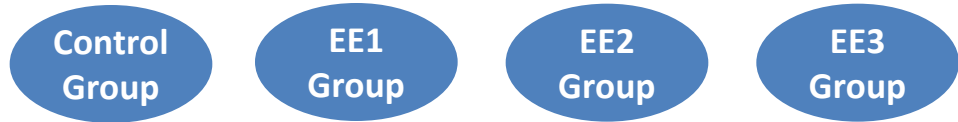

Extraordinary high building envelope efficiencies
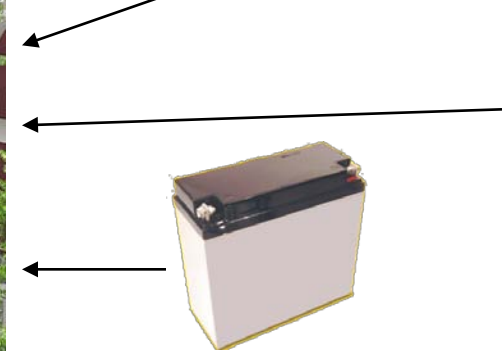
Home Battery storage

Smart appliances

Four Tranches of Homes

Four customer tranches will be used for the benefit of collecting quality, accurate data.

	Control Group	EE1 Group	EE2 Group	EE3 Group
Development	Legends Ranch	Legends Ranch	Discovery at Spring Trials	Discovery at Spring Trials
Number of Homes	TBA	TBA	TBA	TBA
Electric Vehicle (EV) charging stations	—	—	—	Yes
High-efficiency HVAC systems	—	—	High	Higher
HERS weatherization measures	Audit only	Audit with light measures	Audit with heavy measures	Full weatherization
Home display	—	—	Information only	HEM capabilities
Net metering	Standard	1-way	2-way, no net metering	2-way, full net metering
Photovoltaic (PV) roof panels	—	—	DG only, no grid participation	DG with grid participation
Smart appliances	—	—	Information only	HEM capabilities
Load control	—	1-way DR	2-way, light DR	2-way, full DR
Whole-home battery backup	—	—	—	Yes
Whole-home Indoor Air Quality system	—	—	High	Higher

Demonstration Approach

➢ Install and test equipment in the Discovery Center which will serve as the technology integration test and demonstration laboratory as well as a community outreach and education facility

➢ Stage events to inform Texas leaders and the public

➢ Use REP to enlist residential participants

➢ Install equipment in participant homes, and work closely with homeowners

➢ Install community-level components

➢ Perform interoperability and cyber security testing

➢ As part of data collection and analysis efforts spanning 2-3 years, implement various demand response and load control scenarios

➢ Document lessons learned and analyze the prospects for application of TFC technologies in the retrofit market

High-Level General Use Case

Focus on how various stages of ERCOT DR signaling entering the Future Community affect EMS, smart meters, and load control devices and then how these components interact with each other. Use cases will contrast the four tranches of homes. Community- and residential-level renewable energy sources will be included.

- ➢ REP issues "pure price" DR events involving an economic incentive such as critical peak pricing which HANs act upon
- ➢ "Contracted response" DR action from REP with contracts for adjusting load depending upon signals
- ➢ Utility issues "emergency curtailment" DR signals to HANs for consumers without individual contracts.
- ➢ Utility utilizes mass turn-off of meters for rotating intervals, but this will only be tested in a controlled environment.

Load-Shed Use Case

Upon detection of power drop from ERCOT's EMS system, ERCOT begins actions to reduce load. After Stage 2 DR using Load acting as a Resource (LaaRs) and Emergency Interruptible Load Service (EILS), ERCOT moves to Stages 3-5 and issues DR events to REP and utility. REP issues pricing event to customers, and REP and utility issue DR events to drop and curtail load. HANs act upon pricing and DR events. Homes demonstrate selective appliance turn-off and utilization of batteries or electric vehicles.