Environmentally Friendly Drilling Systems Program

U.S. Energy Association

February 8, 2011

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Tom Williams

Jim Slutz

www.efdsystems.org
EFD Program History

• Formed Team in 2005 (6 years)

• Texas A&M took lead to obtain U.S. Department of Energy Funding

• Formed Joint Industry Partnership to guide and co-fund program

• Phase 2 led by HARC with RPSEA funding

• Formed University/National Lab Alliance

• Initiated EFD-EU
Under our backyard
From the Past

(multiple wells at multiple sites)
To the Present

*(multiple wells at single sites)*
Focus on technologies for environmentally sensitive development of unconventional energy sources that can be used to maintain our standard of living and preserve our quality of life.

The objective is to identify, develop and transfer critical, cost effective, new technologies that can provide policy makers and industry with the ability to develop reserves in a safe and environmentally friendly manner.

**What gets measured, gets done.**

**What gets identified, gets dealt with.**

**What gets expected, gets respected.**
Population and Energy

World oil production vs world population

Opposition to O&G Activities

Local News

Developer protests Devon
By Joy E. Cressier/Staff Writer
Mar 30, 2006, 09:01

BURLESON — A local developer of the Burleson City Council’s March 9 development would interfere with production.

The council voted unanimously to lift the site, pushing the final decision until Devon is the owner of a gas lease off Creek Parkway and the Union Pacific.

Clayton Husband, the city’s director of development and the fire marshal’s office

Devon has applied for gas well permits reviewed by the planning and community department and the fire marshal’s office.

The proposed drill site is a 2-acre area southeast of the property.

Un-Well

Concerns are mounting over health effects of gas drilling.

By PETER GORMAN

Charles Morgan can’t sleep at night. The low-frequency noise from the 11 gas compressors at an Anadarko facility about a mile from his home in the little Freestone County community of Lanely gives him such bad headaches that he frequently has to take a motel room to get away from it. Sometimes he just gets into his pickup or Volkswagen and drives to a country lane elsewhere in the county to get free of it. On other occasions he’s found himself in the hospital emergency room.

Ashford: “I just hurt in general, and I find myself getting angry.” Photo by Naomi Vaughan.
The EFD Team
Co-funded by RPSEA, Industry, Environmental Organizations
Issues and Concerns

- Land Usage
- Water
- Air Quality
- Biodiversity
- Societal
Site Access

Main Components – Rollout Road
• Conformable
• Hinged board segments

Every site needs a road to link it to the outside world. New technology promises to protect sensitive environments from the damage that putting in a conventional road causes.
Water World

• **Life Cycle**
  - Use of non-potable water
  - Produced water management
  - Reuse, reinjection
  - De-watering of wells
  - Cost-effectiveness

• **Regulations/Policy**
  - Offshore discharges
  - Clean Water Act
Current Membrane Desalination Projects

- Marcellus Shale NY, PA, WV – pre-treatment
- Central Texas (Luling) – Desalination
- Coastal Texas – Geothermal Desalination
- South Texas (Eagle Ford Shale) – ground water aquifer protection

MI-SWACO Environmental Solutions

Applied Research Mobile Water Treatment Units 2009

Haynesville Shale – June 2010
How Rare is Clean Air?

- **Urban Issues**
  - Non-attainment
  - Permit levels
- **Cold-formed Ozone**
- **Use of Green Completion Technologies**
- **Regulations/Policies**
  - Clean Air Act
  - Greenhouse Gas Issues

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The EPA estimates that atmospheric emissions of approximately 250 mscf/yr or 100 metric tons of CO₂ equivalent (CO₂e) of methane per year could be avoided for each high-bleed controller converted.
Hydraulic Fracturing

**Issues**
- Frac fluid formulations
- Fracture containment
- Surface footprint
- Truck traffic
- Frac water flowback
- Frac water recycling
Develop tools for adaptive ecosystem management to assist integrated management of land, water and living resources that promotes conservation and sustainable use.

**Deliverables**

- Document ecosystem management tools and metrics that may be used in coastal, offshore and Arctic regions and then determine which tool(s) could be most applicable.

- Establish a network of researchers that can collaborate to advance the knowledge/application of ecosystem measurement tools and the understanding of risk management issues.
Energy Production and the Attwater’s Prairie Chicken

Work with the Nature Conservancy to study the effects of gas production operations on the Attwater’s Prairie Chicken

Deliverables
• Case study on gas production and the Attwater’s Prairie Chicken
Getting the Word Out

Free-access, searchable, database and website for best management practices (BMPs).

www.ilandgasbumps.org
Our big challenge: Core Values

- Companies successfully made safety a core value.
- Accomplished by leadership, documenting, measuring and training.
- To achieve the same success in environmental performance, will require leaders to also make this a core value.
## Scorecard Concepts

![Image of a product label and LEED facts]

### Nutrition Facts

- **Serving Size:** 8 crackers (28g)
- **Servings Per Container:** About 2

<table>
<thead>
<tr>
<th>Amount Per Serving</th>
<th>% Daily Value*</th>
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<tbody>
<tr>
<td>Calories 120</td>
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<td>Dietary Fiber Less than 1g</td>
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<td>Sugars 7g</td>
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<tr>
<td>Protein 2g</td>
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- **Vitamin A:** 0%
- **Vitamin C:** 0%
- **Calcium:** 10%
- **Iron:** 4%
- *Percent Daily Values are based on a 2,000 calorie diet.

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### LEED Facts

**Bldg. 27 Astronaut Quarantine Facility**

**LEED® Project # 1436**

**LEED Version 2 Certification Level:** CERTIFIED

**2/24/2006**

<table>
<thead>
<tr>
<th>Resources</th>
<th>Possible Points:</th>
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<tbody>
<tr>
<td><strong>Site &amp; Design</strong></td>
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<tr>
<td><strong>Material &amp; Resources</strong></td>
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<tr>
<td><strong>Energy &amp; Atmosphere</strong></td>
<td>20</td>
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<tr>
<td><strong>Innovation &amp; Design</strong></td>
<td>10</td>
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<tr>
<td><strong>IAQ Performance</strong></td>
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<td><strong>Operational Quality</strong></td>
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<tr>
<td><strong>Outdoor Water Use</strong></td>
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**Possible Points:** 90

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### LEED Scores

- **Silver:** 34 points
- **Effective Use of Sustainable Site:** 11 points
- **Water Efficiency:** 3 points
- **Energy & Atmosphere:** 20 points
- **Innovation & Design:** 10 points
- **IAQ Performance:** 14 points
- **Operational Quality:** 20 points
Focus Scorecard on Operation

Concept – USGBC LEED Program

Energy Production
Oil and Gas Operations

- Upstream
  - Field Development
    - Exploration
    - Drilling
    - Completions
- Downstream
  - Processing
  - Refining
  - Transportation
  - Distribution
Stakeholder Engagement is Important!

Stakeholders are all those who are affected, interested in or have the capacity to influence a project.

<table>
<thead>
<tr>
<th>Stakeholder Group</th>
<th>Members</th>
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<tr>
<td><strong>Academia</strong></td>
<td>Texas A&amp;M University College Station</td>
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Source: Connor Development Services Ltd
Tradeoff Scorecard Development

**EFD Facts**

**Project:**

**Location:**

**Ecosystem:**

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**Max Score**

**AIR**

10 0

**WATER**

15 0

**SITE**

15 0

**WASTE MANAGEMENT**

20 0

**BIODIVERSITY/HABITAT**

20 0

**SOCIAL**

20 0

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**Environmentally Friendly Drilling Scorecard**

**Project:**

**Location:**

**Ecosystem:** Semi-Arid

**Date:**

---

**Points Achieved**

<table>
<thead>
<tr>
<th>Credit</th>
<th>Possible Points</th>
<th>Score</th>
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**Waste Management**

**Possible Points:** 20

**Max Score**

**AIR**

10 0

**WASTE MANAGEMENT**

20 0

**BIODIVERSITY/HABITAT**

20 0

**SOCIAL**

15 0

---

**EFD Facts**

**Project:**

**Location:**

**Ecosystem:**

---

**Max Score**

**AIR**

10 0

**WATER**

20 0

**SITE**

20 0

**WASTE MANAGEMENT**

20 0

**BIODIVERSITY/HABITAT**

20 0

**SOCIAL**

0 0

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Outreach and Technology Transfer

Publications/Articles

Environmetally Friendly Exploration & Production

Exhibits

Presentations
EFD EU Initiative

• Identify and Transfer Innovation and Cost Effective Best Practices in US and Europe
  – Technology Transfer opportunity
  – EU regulatory requirements that have caused innovation
  – Identify applicable and cost effective practices (US and Europe)
  – Inform respective regulators about certain requirements that have not worked well

• Establish a non-government dialogue
• Gas Shale Play issues are of keen interest
• First International Workshop followed SPE in Florence September 2010
Next Phase

Technology Integration Program

• Integrated approach for applying new technologies

Description

• Field Tests in the Eagle Ford
• Web sites for virtual gas developments
• Outreach/Technology Transfer
Coastal Impacts Technology Program (CITP)

- Technology Road Mapping
- Environmental Impact Mitigation
  - Studies
  - Field Trials
- Inter-State Collaboration
- Workforce Development
  - Workshops
  - Web Site
  - Outreach efforts
The Environmentally Friendly Drilling Systems Program

- Technology Integration Program
- Ecosystem and Biodiversity Measurement and Assessment
- Coastal Impacts Technologies Program
- Disappearing Roads Competition
- E&P in Environmentally Sensitive Arctic Areas
- Galveston Bay Freshwater Inflows Group
- Land Conservation & Rural Stakeholders
- Air Quality
- Water Treatment and Re-use
- Waste Management
- Low Impact Roads
- Groundwater Monitoring Program
- Texas Coastal Management Performance Measure System
- Galveston Bay Status & Trends
- Produced water and frac water

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It’s not so hard to be green

Questions?

Thank you

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