

Landfill Gas-to-Energy Texas

**Texas Commission on
Environmental Quality**

May 6, 2003



Active LFG Utilization WM Sites

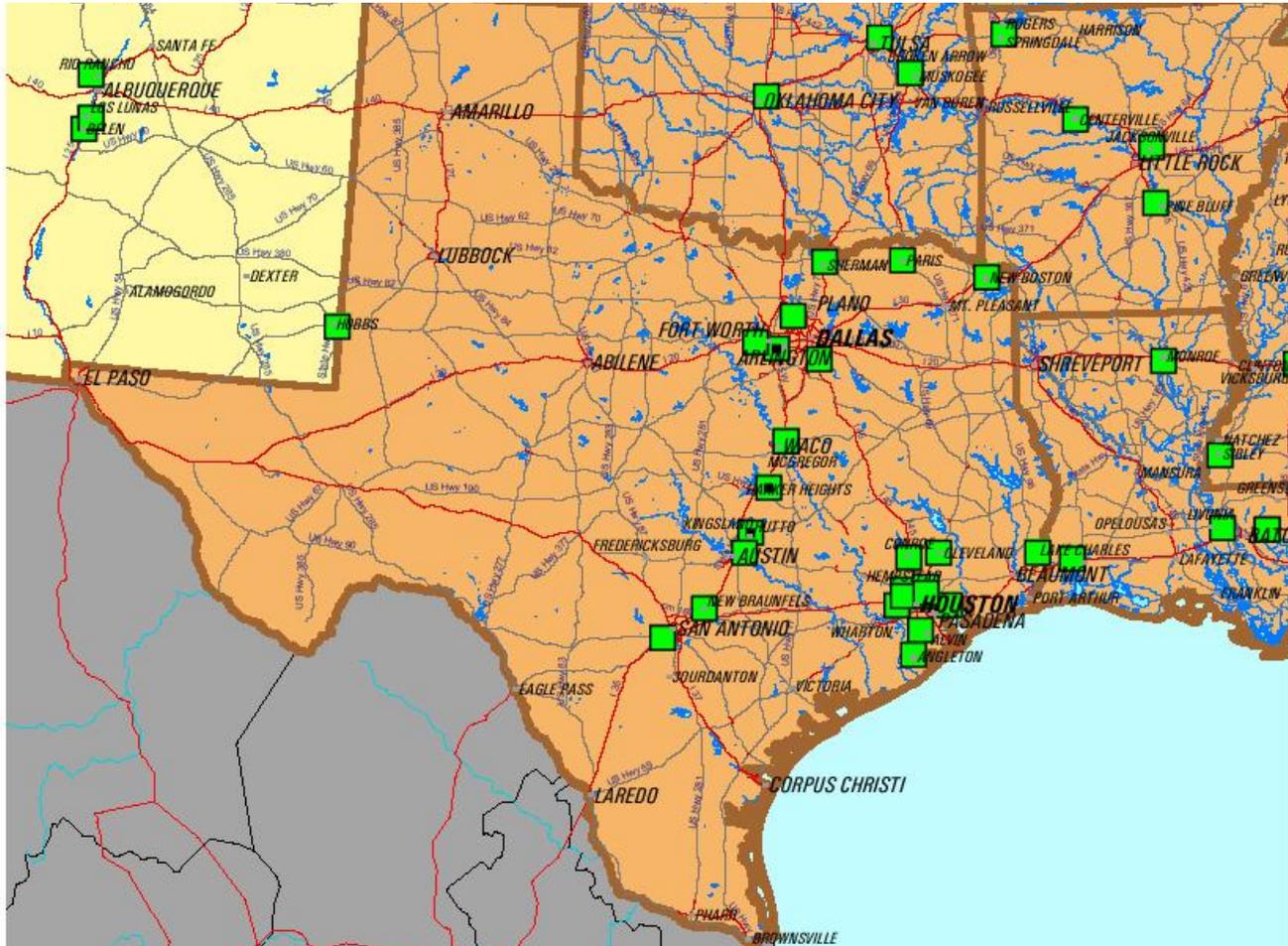
- 50 **Electric Energy:** On-site power plants
- 15 **Medium Btu:** Delivery by pipe line to user for use as fuel in boilers, utility power plants, asphalt plants, cement kilns, heating, nurseries
- 12 **Leachate Evaporators:** disposal of waste liquids
- 2 **High Btu:** processing to NG pipeline quality
- 17 Executed Contracts



WM Landfill Gas Development in Texas

- **WM owns 14 active and 2 closed MSW Landfills in Texas**
- **7 are currently under contract for LFG- 5 Active**
- **5 are currently under contract for right of first offer.**
- **1 is owned by WM Renewable Energy**
- **3 are being evaluated for development**





WM Landfill Gas Development in Texas

- ***Contracted with Reliant Energy*** - Atascosita, Baytown, Coastal Plains, Security, Bluebonnet, Conroe (all but Bluebonnet are currently active)
- ***Reliant has Right of First Offer on*** – Comal County, New Boston, Paris, Hillside, and Newton County.
- ***Contracted with EDI*** – Covel Gardens
- ***Being Evaluated for Development*** – Austin, Westside Landfill, Skyline Landfill.
- ***DFW Landfill*** – owned by WM Renewable Energy LLC.
- ***Landfills Operated by Waste Management*** – Lacy-Lakeview, Temple, Williamson County.



Options for LFG

Proven Technology

- **Direct sale of landfill gas by pipeline**
- **On site LFG power production facility**
- **High BTU gas production facility**

Developing Technology

- **Process to liquid natural gas (LNG)**



Benefits of Renewable Energy from Landfill Gas

- **Stable fuel price, dependable source**
- **Electricity generated during peak hours**
- **Not seasonal or dependant on weather**
- **Capacity 90% or more**
- **Generated close to population centers where the KW's are needed**



Landfill Gas to Electricity Challenges

- **Plants relatively small size – no economy of scale**
 - *competing with 100-1000 MW power plants*
- **Plants have to be sized to landfill gas production**
 - *gas production slowly increases over the life of a landfill and then slowly decreases*
 - *gas generation curves are only educated guesses of expected production*
 - *Waste streams into landfill may vary over time*
 - *landfill gas can not be stored economically*

Landfill Gas to Electricity Challenges

➤ **From avoided cost contracts, to Market Pricing**

- *Have to be savvy in the electric market, again competing with the large power plants*
- *Two options for sale of wholesale electricity are bilateral contracts and balancing energy markets prices*

Bilateral Contracts – 90-95% of generation, prices not known by ERCOT

Balancing Market – 5-10% of generation, near-real time pricing, every 15 minutes, highly volatile, \$0.0 to \$999.



Texas Renewable Portfolio Standard

- **Creates an opportunity for small renewable generators**
- **LSE's now need to purchase renewable energy.**
- **Where 2 or 3 MW's wouldn't have been worth their time, now they have interest.**
- **What about "old" renewable energy?**

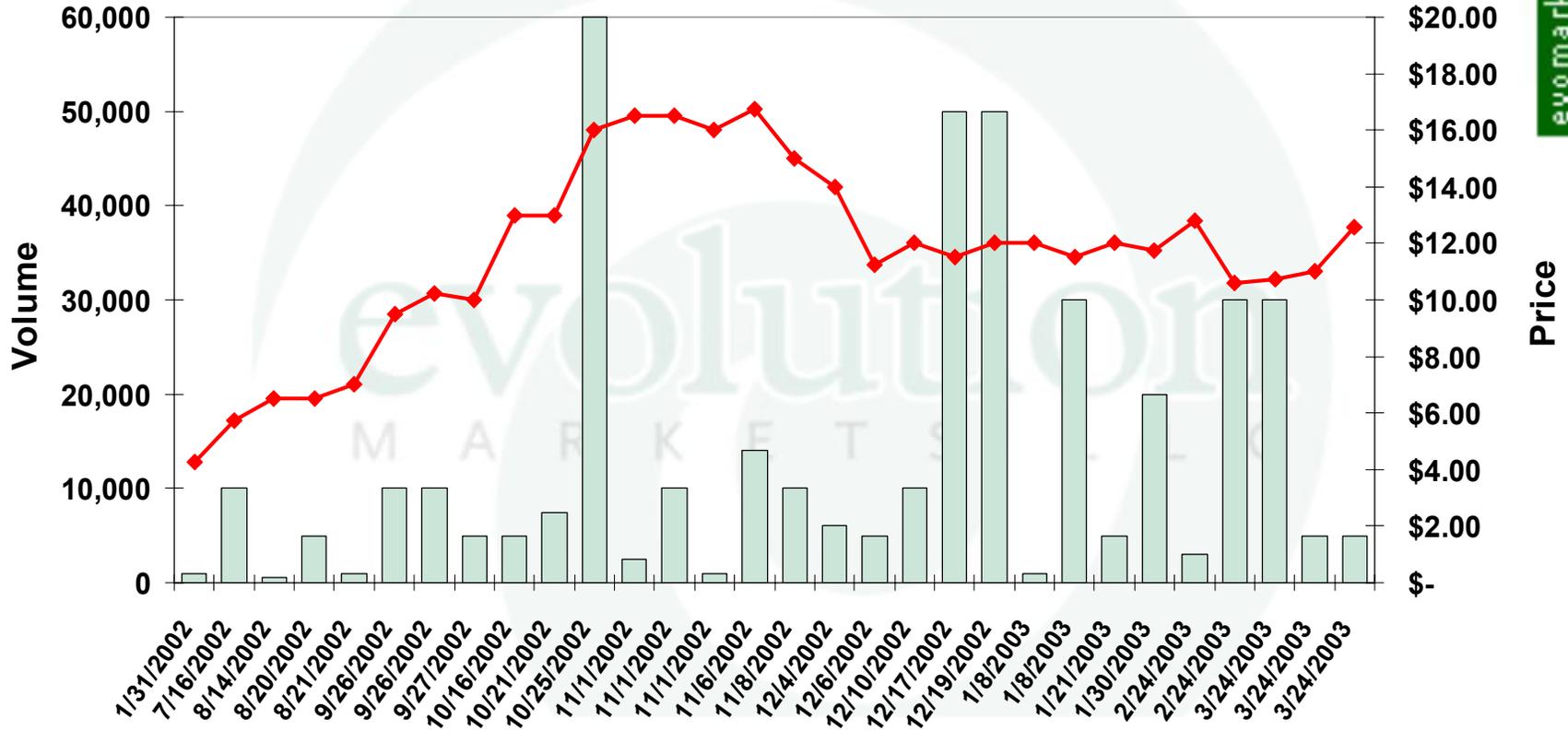


Texas REC Market

- Uses GIS system
- First in nation to trade
- Program success has been striking:
 - *400 MW mandated for 2002 - 2003, but*
 - *1000 MW already on line*
- Market participants notably more willing to take risk
- Two key factors:
 - *Certificates can be traded at any time*
 - *Certificates can be banked for 3 years*



2002 Texas REC Volumes and Prices



*Note: This chart displays market trades known to Evolution Markets.



3.2 MW Engine Plant

