# 2 SOLAR ON LANDFILLS OR OTHER UNDERUTILIZED SITES

Locating solar generation facilities on landfills or other underutilized sites can result in lower overall development costs from inexpensive land prices and tax incentives, and can offer community benefits by converting blighted areas or difficult to develop land into productive assets. These projects vary in their form, depending on what entity owns the land, what entity owns the solar generation facility, and what entity benefits from the energy produced.



Solar and energy storage applications can provide energy, capacity, shade, mobility, resiliency and other benefits to local communities. The North Central Texas Council of Governments (NCTCOG), with support from the Texas State Energy Conservation Office (SECO), identified a need for efficient approaches to evaluating solar and energy storage costs and benefits. This fact sheet, developed by Frontier Associates, presents information and analysis about one of five model solar applications likely to be of interest to local government officials. Frontier also produced a detailed report and Microsoft Excel-based financial pro forma templates that can be customized and applied to specific projects under consideration. All of this information may be obtained at www.GoSolarTexas.org.

Photo courtesy of HDR, Inc.

CLOSE UP

## TESSMAN ROAD LANDFILL, SAN ANTONIO

In San Antonio, the city's municipal electric utility, CPS Energy, contracted to purchase solar energy generated from the Tessman Road Landfill. The landfill is owned by Republic Services, Inc., and instead of a traditional clay cap, the design places flexible solar panels on the surface of closed sections of the landfill. The flexible solar strips can be configured to maximize the hours of sunlight exposure throughout the year, depending upon a landfill's design and site contours.

The solar facility complements an existing biogas-to-energy system, and electricity from both units can be used for onsite needs or sold to CPS Energy.

# BENEFIT-COST ANALYSIS

This fact sheet shows inputs and results from a benefit-cost model designed to illustrate current project economics for a selected solar application. Local government stakeholders may download the financial pro forma model and customize it to meet the specific requirements of projects being considered for their communities. In the hypothetical example modeled here, technical specifications, costs, and utility rates approximate current pricing in Texas at the time of original publication but do not represent any specific site or installed system.

## MODELED APPLICATION

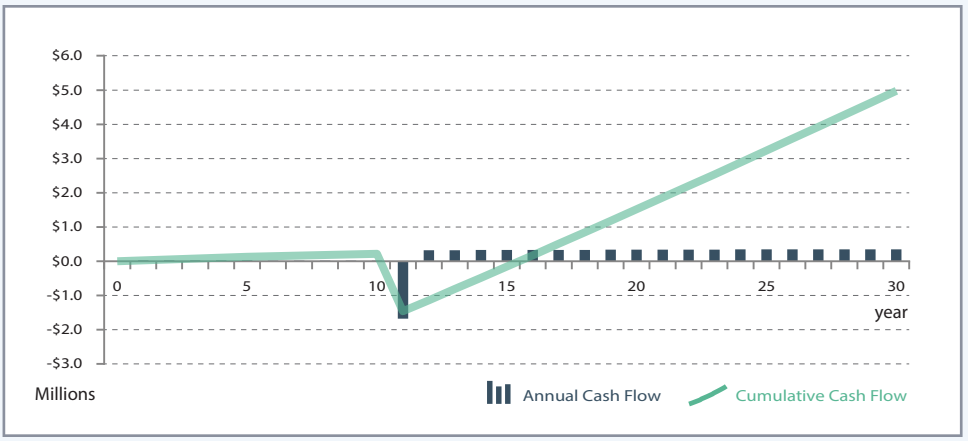
**2.5** MWdc ground-mounted — on a public facility in Fort Worth, directly purchased by local government

## ANNUAL ENERGY PRODUCTION — 4,636,072 kWh/year

## KEY FINANCIAL ANALYSIS METRICS

| | |
|---|---|
| INTERNAL RATE OF RETURN | N/A |
| NET PRESENT VALUE | $802,931 |
| SIMPLE PAYBACK YEARS | 1 |
| BENEFIT/COST RATIO | 1.7 |

## CASH FLOWS OVER TIME




## ASSUMED COST, RATES AND SYSTEM SPECIFICATIONS

### Deal Structure
Third party owned solar on public-owned land adjacent to a public facility with high and consistent energy consumption, such as a water treatment plant. Solar equipment is leased to the public buyer. System is located in Dallas.

### Solar System Specifications
2.5 MW ground mounted single-axis tracking array oriented due south at 0 degree tilt. Estimated life 30 years.

### Storage Specifications
No energy storage

### Lease Terms
Starting lease price: $27,000/month
Annual escalator: 1.5%
Purchase option exercised at year 10: $2.0 million

### Estimated Annual Operating Costs
$0 (covered by third party owner) during lease term
$66,961 starting in year 11 (after purchase)

### Site Loads and Excess Energy
PV system sized to serve approximately 50% of facility baseload demand; 10% of PV energy is assumed to be exported to the grid

### Site Electric Bill Rates
Charge for energy inflows: $0.08/kWh
Credit for energy outflows: $0.04/kWh
Demand charge: $0/kW (energy-only rate)

### Direct Financial Costs Modeled
Lease payments, lease purchase option at year 11, operating and maintenance costs years 11-30

### Direct Financial Benefits Modeled
Electric bill energy savings

### Additional Community Impacts
Local jobs and economic development
Avoided air emissions ($CO_2$, NOx, $SO_2$)
Productive utilization of unproductive land
Reduced risk/exposure to changes in electricity rates
Increased public awareness

## ADDITIONAL COMMUNITY IMPACTS

### LOCAL JOBS/ ECONOMIC DEVELOPMENT
from NREL JEDI model

During Construction Period ($2016)
- 42.4 jobs
- $2,833,594 in earnings
- $6,033,630 in total output

During Operating Years ($2016)
- 0.7 annual jobs
- $43,470 in annual earnings
- $72,167 in annual output

### ANNUAL AVOIDED AIR EMISSIONS from US EPA eGRID Power Profiler
- 6,039 pounds of nitrogen oxides (NOx)
- 19,086 pounds of sulfur dioxide ($SO_2$)
- 11,343,479 pounds of carbon dioxide ($CO_2$)

### ANNUAL GREENHOUSE GAS EQUIVALENCIES
from US EPA Greenhouse Gas Equivalencies Calculator

Annual $CO_2$ avoidance is equivalent to
- the greenhouse gas emissions from 12,472,873 miles driven by an average passenger vehicle, or
- the $CO_2$ emissions from 769 average homes' electricity use for one year, or
- the carbon sequestered by 134,875 tree seedlings grown for 10 years

### OTHER IMPACTS
Productive utilization of currently unproductive public land
Reduced risk/exposure to changes in electricity rates
Increased public awareness

Sponsored by North Central Texas Council of Governments
With support from SECO State Energy Conservation Office
Available at GO SOLAR Texas
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