

Mondial Energy and Solar Thermal

Cleaner Technology Conference
April 5, 2007

PRESENTATION OUTLINE

- **Mondial Energy Background**
- **Solar Thermal 101**
- **Solar Thermal in the Delmarva Poultry Industry**
- **Economic Analysis**

Mondial Energy Background

- **Privately owned Canadian Company based in Toronto**
- **Founded in 2004**
- **Beach Solar Laundromat Beta Test Site**



Mondial Energy Background

- **Projects underway focusing on long term residential senior's homes**
 - **First Commissioned building achieved one-ton challenge in less than one month.**
- **Contracts under negotiation - hotels, residential, dormitories, prisons.**
- **Environmental recognition**
 - **Green Design Award 2006 – City of Toronto**
 - **Energy Globe Award – International award recognizing sustainable endeavors**

Mondial's Business Model

- Mondial pays for installation & retains ownership.
- Mondial assumes maintenance responsibility.
- Monthly utility bill for thermal energy.
 - No sun, no bill
- 10 year fixed rates.
- Remote metering – Fat Spaniel

No upfront capital cost, no maintenance risk, but fixed energy costs with zero emissions.

Case Studies

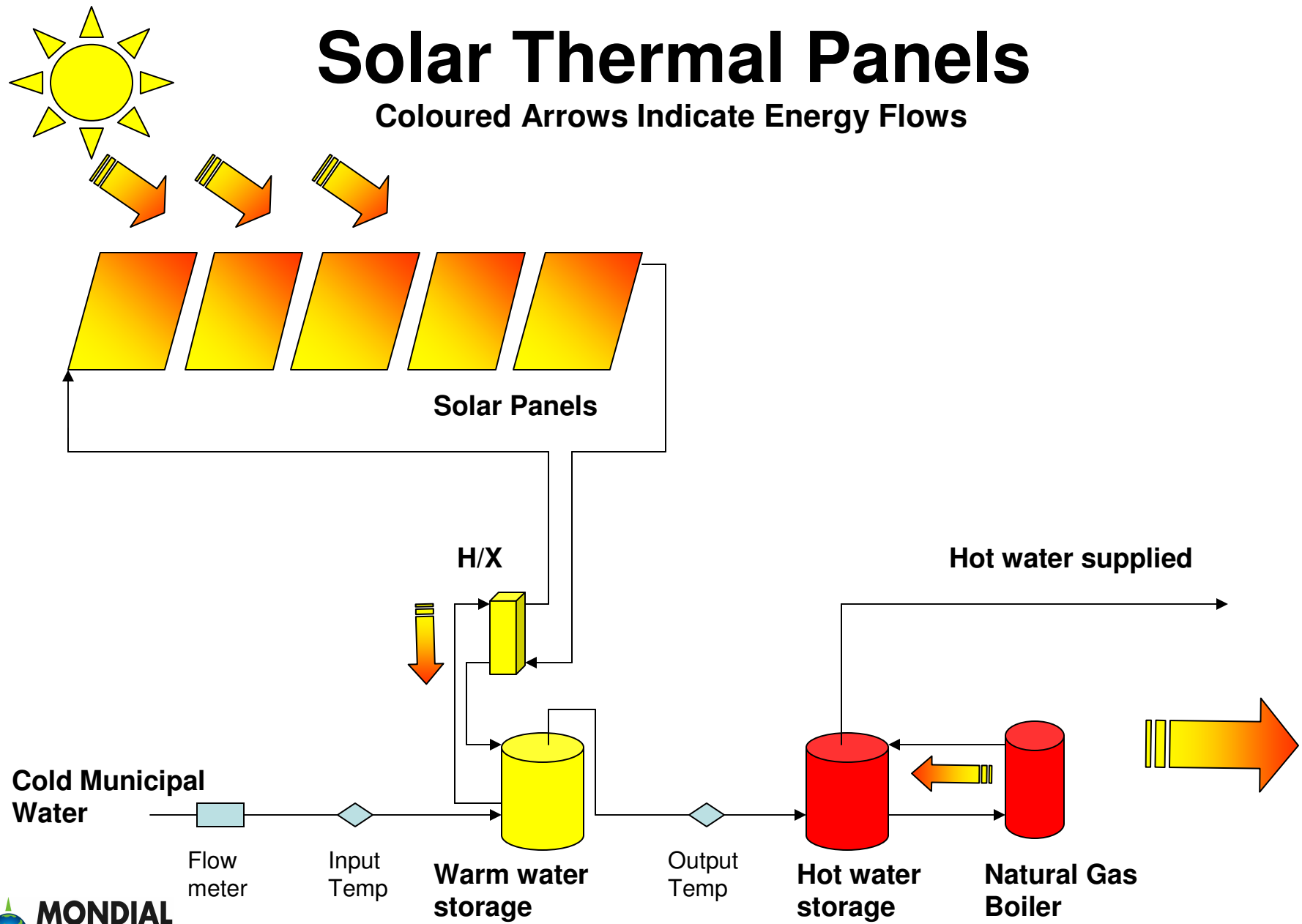
11 Coatsworth Crescent, Toronto, Canada



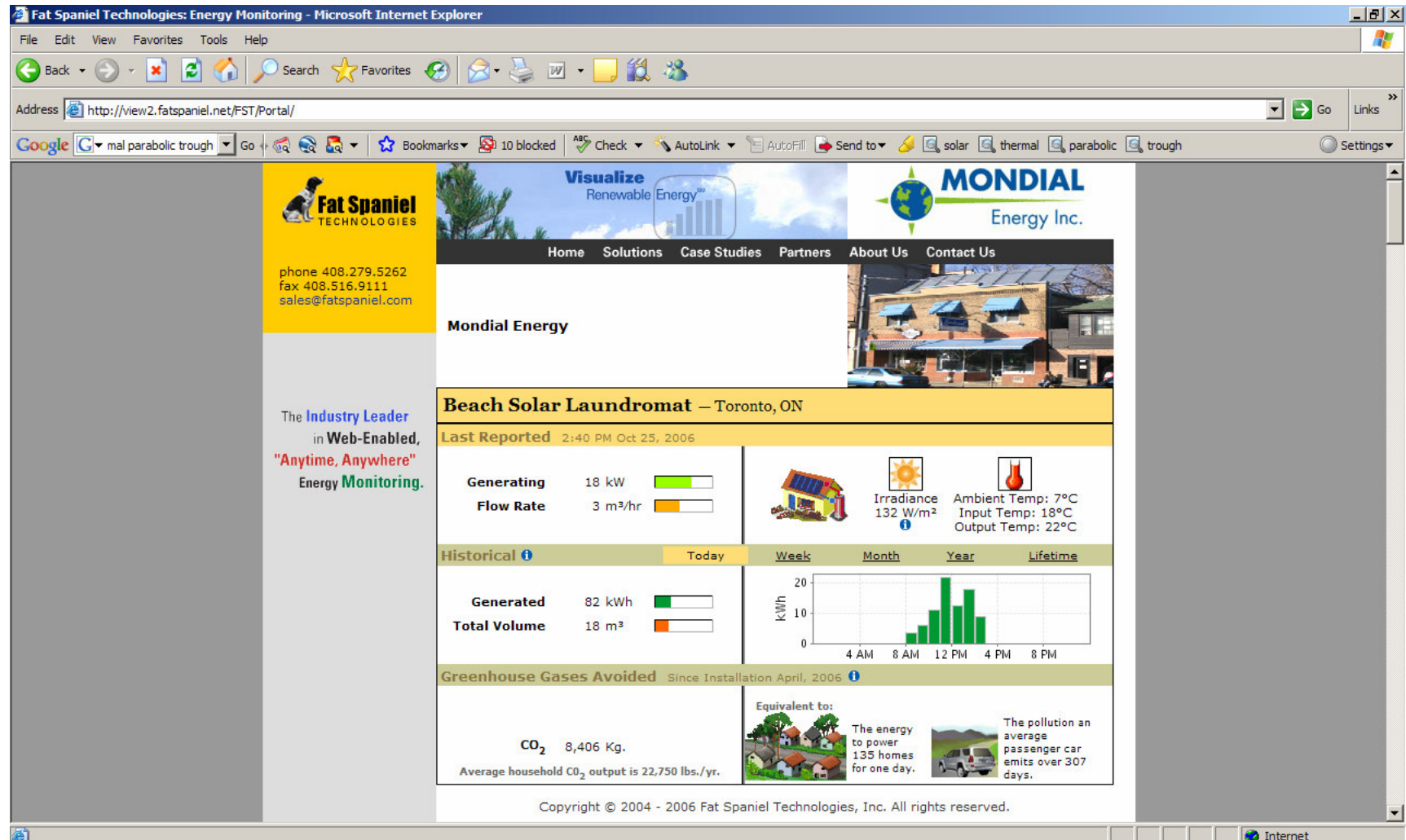
- 172 Suites – Non-Profit Seniors Housing
- 60 flat plate Solar Thermal Panels (1,800 sq.ft.)
- 603 GJ/year energy offset
- 32.7 tonnes/year avoided GHGs

Solar Thermal Panels

Coloured Arrows Indicate Energy Flows

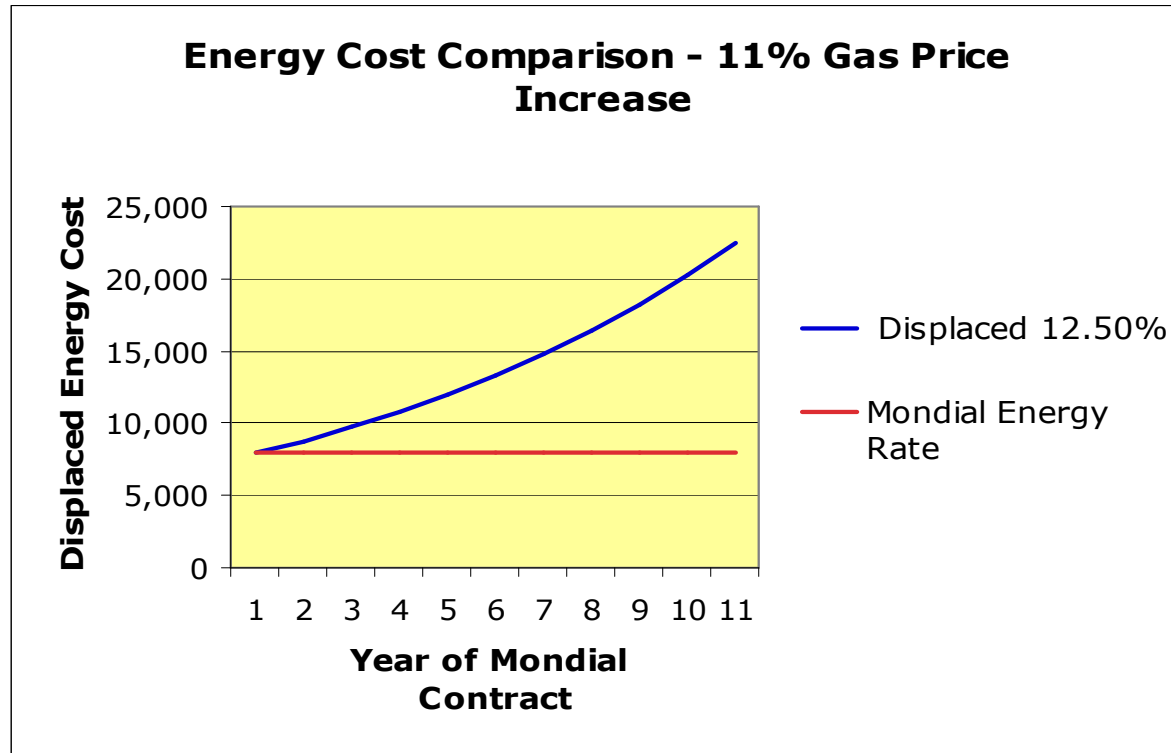


Mondial's Business Model



Senior Link Case Study 1

- Displacing natural gas for DHW
- Actual gas bills rose 11% per year between 1995 and 2005
- Assuming 50% of DHW load displaced by solar. (DHW 25% of bill)



Solar Thermal 101

Radiant energy of the sun to heat energy.

Many uses:

- **Domestic hot water,**
- **Preheating boiler and process water used in commercial and industrial processes,**
- **Producing steam for electrical generators,**
- **Space heating,**
- **Heating water for absorption refrigeration/air conditioning applications,**
- **Heating water for swimming pools.**

Solar Thermal 101

	<u>Solar Thermal</u>	<u>Photovoltaic</u>
Peak Power (W/SF2)	60	5-10
Efficiency (solar energy/captured energy)	80%	15%
Cost per kW	\$1,000-1500	\$6,000-10,000

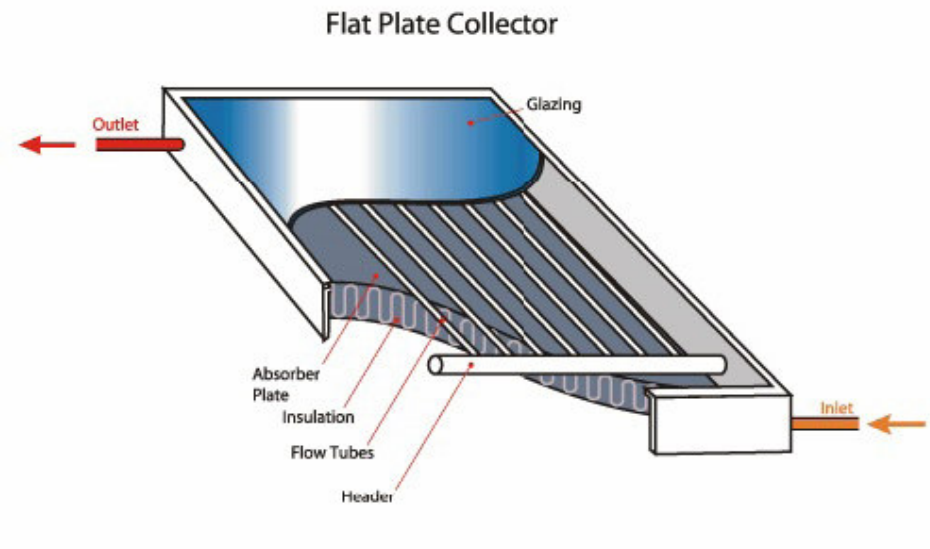
Solar Thermal 101

Solar thermal technologies are the most cost-effective when:

- **Consistent daily and year-round hot water demand.**
- **Hot water consumption is significant.**
- **Water temperatures required and methods used to heat water match the capabilities of solar thermal technologies.**
- **Storage space for solar heated water available.**

Types of Panels

1. Flat Plate Collectors



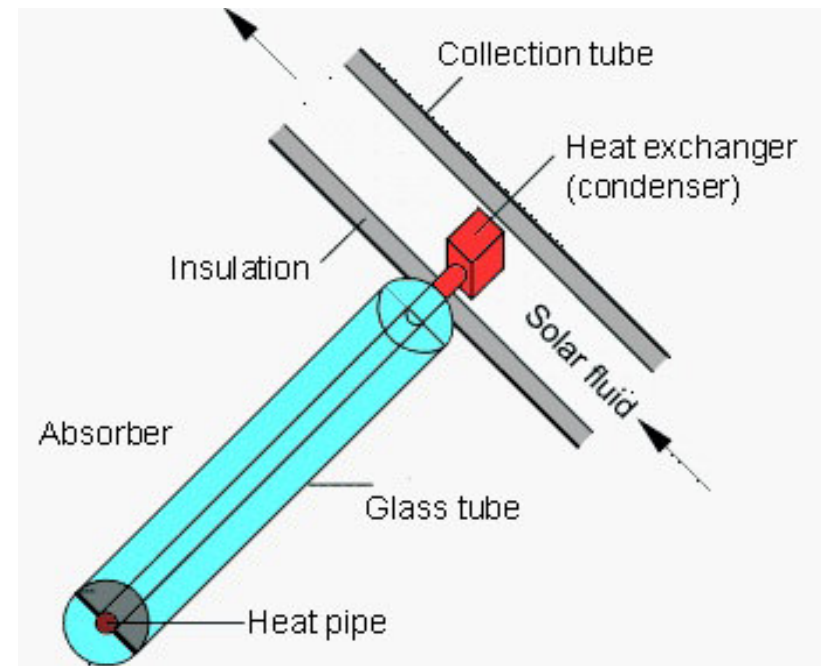
- Glass box, water/glycol flows in copper pipe bottom to top, absorbs radiation, conducts heat from high internal temperature
- 120 - 140°F storage temperatures
- DHW, industrial process heat, space heating

Types of Panels

2. Evacuated Tube Collectors



- **Concentric glass tubes with inner tube containing heat transfer fluid**
- **180°F temperatures**
- **More expensive**
- **Commercial hot water, steam, solar air conditioning.**



Types of Panels

3. Parabolic Trough Collectors



- **Concentric glass tubes with inner containing heat transfer fluid**
- **Mirror reflectors concentrate direct solar radiation (140 sq.ft. per reflector)**
- **Sufficient heat generated to drive generating turbines or high temperature heat exchange**
- **Needs direct radiation, suited to sun belt States**
- **>500 °F temperatures**

Delmarva Poultry Industry

In late 2004, DEMSR investigated the feasibility and cost-effectiveness of integrating solar thermal into preheating process water in feed mills, processing plants, hatcheries, and rendering facilities.

- Boilers and process heat use 41% of energy in DE industrial sector.**
- Broiler chickens are largest segment of agriculture in DE, MD and VA**

Source: “Solar Thermal Applications in the Delmarva Poultry Industry”, sponsored by Delaware Energy Office, Maryland Energy Administration, Virginia Department of Mines, Mineral and Energy, United States Department of Energy

Hatcheries

On egg delivery days, crates are cleaned with 140F water in morning hours.

- **Intermittent loads (not every day)**
- **Relatively small hot water demand**
- **Peak load demand not at peak generation (storage required)**

Better suited for solar adsorption cooling for air conditioning

Feed Mills

Feed mills process pellets for chicken feed, usually operate 5 days a week and use about 20,000 gallons of water per day to make 162.7 °C (325 °F) steam. The steam adds moisture to the feed so that pellets can be formed.

- **High temperature loads – evacuated tube collectors**
- **Study – not cost effective.**

Rendering Facilities

Cooking of byproducts at high temperatures to separate fats and proteins. Use make-up water for the boilers to make steam for the cooking process.

- **Small load**
- **Variable load**
- **High temperature required**
- **Other heat recovery systems available**

Processing Plants

Per USDA guidelines, carcass subject to semi-scalding water four times. 50% of daily hot water load used for cleanup.

- **High hot water load – over 200,000 gallons/day**
- **50% of load required in PM – peak solar production in early PM**
- **Temperature lift required consistent with solar technology**

Most cost-effective application of solar thermal in poultry facilities.

Economic Analysis

- **Costs**
 - **Solar Contractor or RETScreen**
 - **Incentives**
- **Energy Generated**
 - **RETScreen**
- **Displaced Fuel Cost**

**Costs*Rate of Return/Energy Generated < or =
Displaced Fuel Cost**

Solar in Massachusetts

- **Incentives**
 - **Keyspan Solar Thermal Rebate:**
\$3.00 per therm on first year savings, up to \$100,000 per project.
 - **Section 9006 of Farm Bill Grants and Loans:**
25% of qualifying costs for renewable energy systems, up to \$500,000.
 - **Federal Energy Policy Act:**
30% tax credit, MACRS depreciation.
- **Solar Resource**
 - **Only 4% less than Wilmington, DE**

Thank You

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