Case Study

Natural Gas, Electricity and Water Retrofit of Monticello Condominium, Saskatoon

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EMTF Presentation

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Monticello Condominium

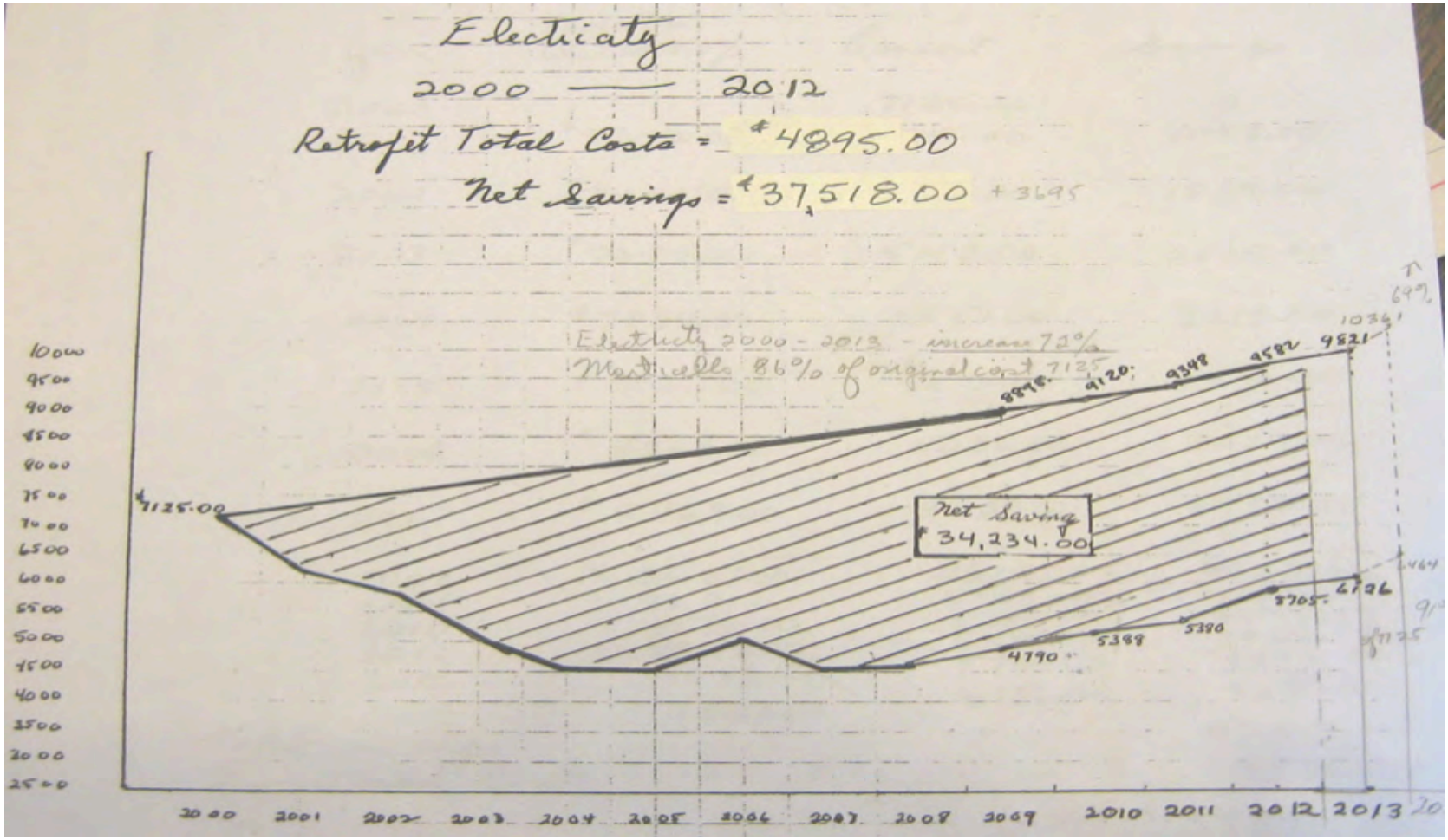
Monticello

- Built 1998
- 32 two bedroom suites
- Heated underground parking
- Individual electric meters for each suite
- Natural gas heating using a central boiler and baseboard convectors in each suite; one gas meter for entire building
- Natural gas fired domestic hot water
- Wood frame building with double glazed PVC windows

Electrical Consumption for common areas, hallways and parking lot

- 1999 $7125 for the year
- 2013 $ 6126 for the year even though the price of electricity has risen considerably
- If **no** conservation measures were implemented, the electricity bill in 2013 would be $10, 361 for the year (45% increase since 1999)

Graph of Electricity Consumption Costs for Common Areas, Hallways, Parking Lot 2000-2012
Upper Line: Costs with no conservation efforts



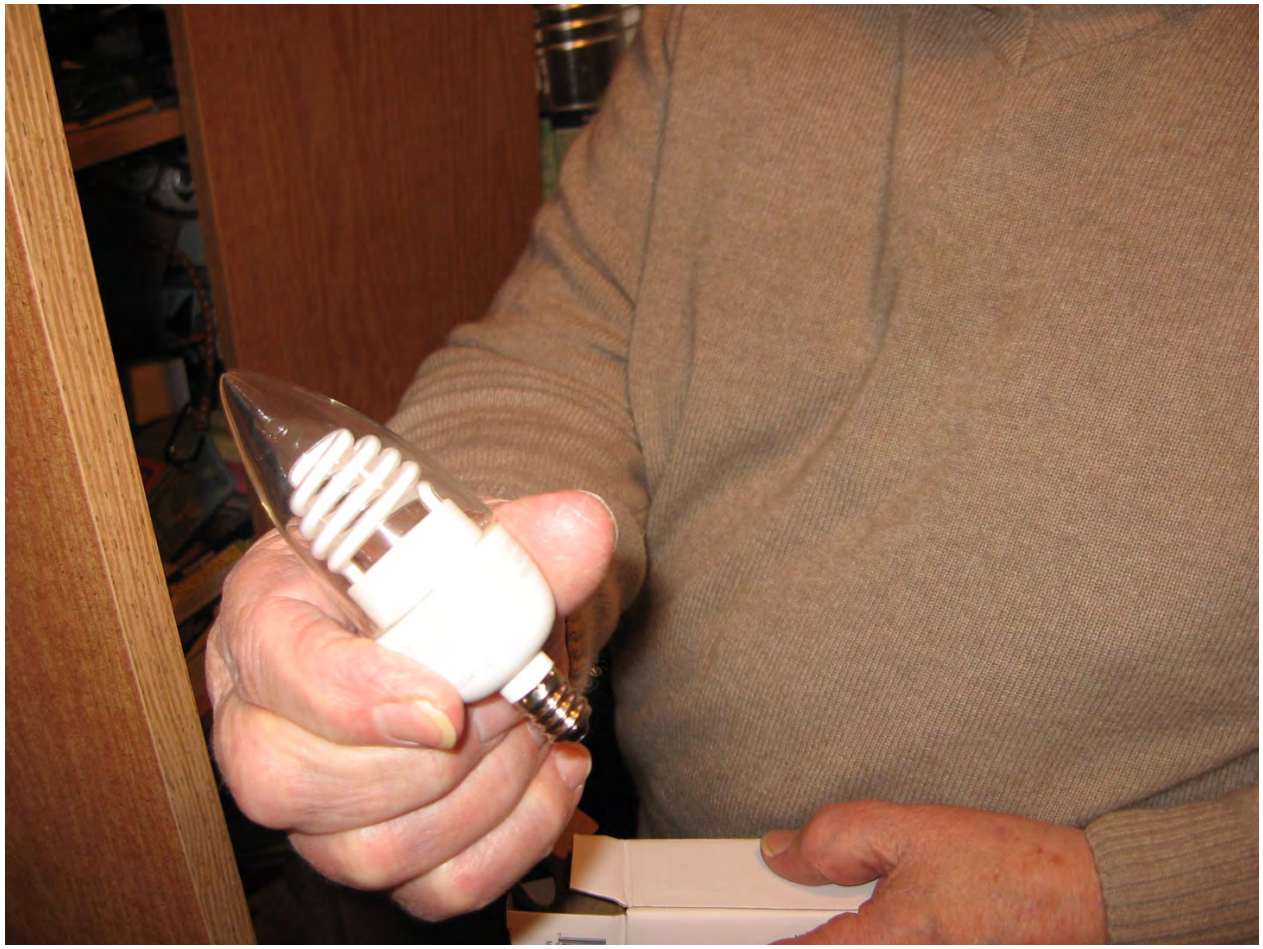
Electricity Retrofits

- 1. Replace Incandescent lamps in the underground garage
- 2. Replace incandescent lamps in the hallways
- 3. Replace incandescent lamps in the EXIT signs

Hallway Lighting Retrofit
(Lamps are on 24 hours a day)
60 W incandescent replaced by 13 W CFL

Entrance Lamps--
Incandescent lamps replaced with CFLs and Cold Cathode Lamps

Chandelier lamp replacement
3 watt– Cold Cathode lamp



Added benefits

- Longer life of lamps results in reduced maintenance costs of labour for replacement
- Cold cathode lamps have lasted 5.9 years (52,000 hours) without replacement
- Less climbing of ladders for hard to reach fixtures

Natural Gas Savings

- The hot water piping for space heating passed through the garage. This piping was NOT insulated. As a consequence, the garage was very hot, reaching as high as 82 F (28 C) at times and overheating the suites above the parking garage (there was no insulation in the ceiling of the parking garage.)

Frank Dietz pointing out the space heating and domestic hot water piping that was fitted with insulation by volunteers from the condominium. The parking garage temperature was also more comfortable after the piping insulation was installed.

Cost-benefit

- The pipe insulation had a materials cost of $3311.
- The net savings on natural gas costs over the period 2004 to 2013 was $61767 net after costs.

Space Heating Boiler—
Superhot Brand with 1.56 million Btu/hour input
Seasonal efficiency of about 60%. Note diameters of chimney

and draft diverter.

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Hot water conservation measure: Low Flow shower heads. US EPA Watersense program recommends a maximum flow of 7.6 L/minute (2 USGPM). These retrofit units are 1.5 USGPM)

Water Heating Equipment

Two atmospheric vented natural gas units with 225,000 Btu/hour input each; circulating pump was oversized and caused the return line to erode. New, right-sized pump solved the problem. Hot water pipes were originally uninsulated.

Dishwashers (and Laundry Machines): potential for savings in the future

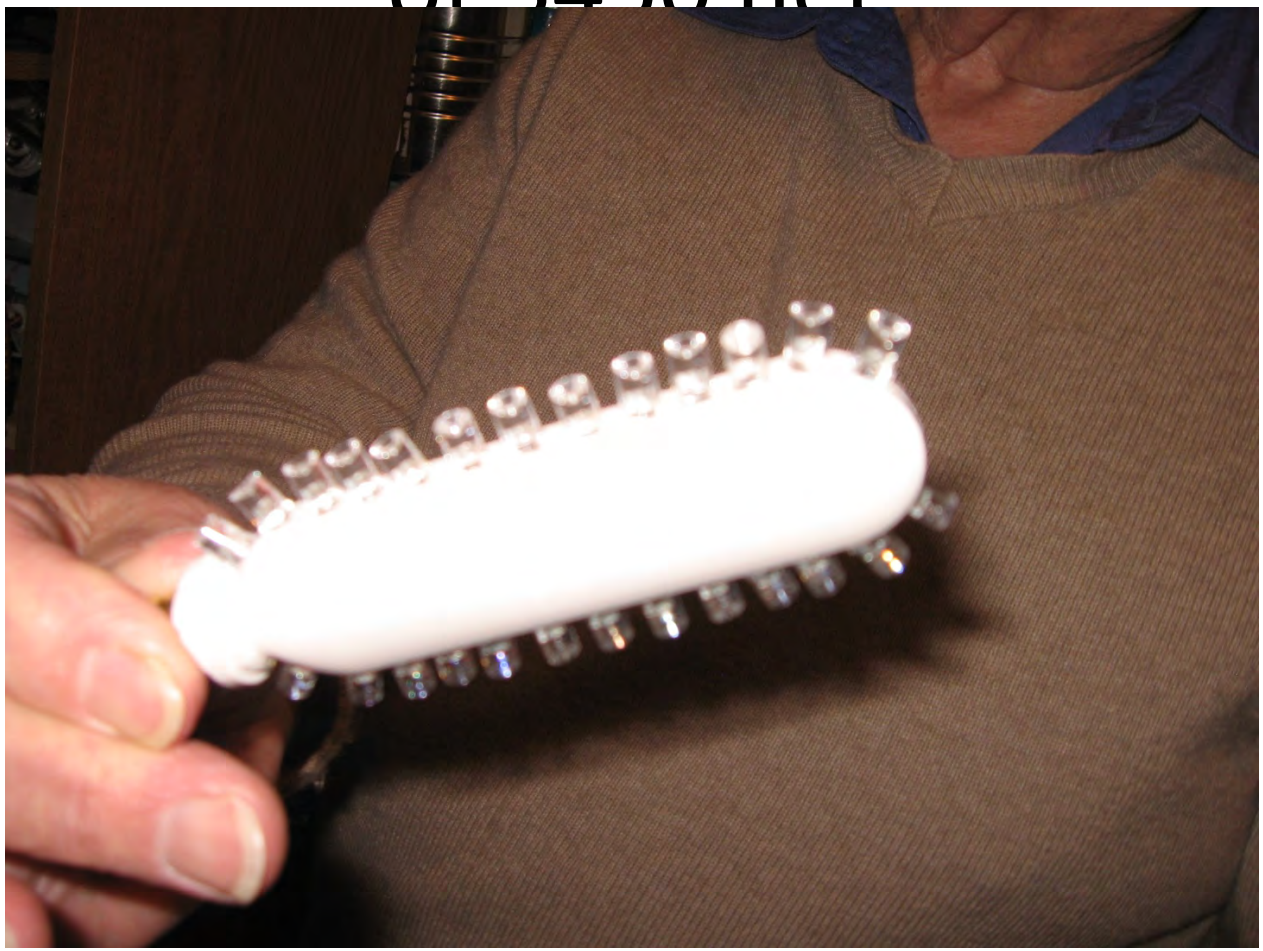
Hallway lamps

- 60 watt incandescent lamps replaced by 13 W compact fluorescent lamps
- In 2000 the cost of a CFL was $9.50, and in 2014 the price is $1.50 to $1.80

- Additional savings were found in reduced replacement labour, as CFLs had much longer life than the incandescent lamps
- In addition, the hallways are cooler in the cooling season because of less heat generation from the lamps. (78% reduction in lamp heat generation)

EXIT Sign Lamp Replacement

LED Lamps for EXIT signs
$350 cost for 32 lamps. Annual saving of $450 net



1.2 watt exit sign lamps replace 15 watt incandescent lamps

Parking Garage Lighting Retrofits

- 1. Replace 100 watt incandescent lamps with linear T8 fluorescent lamps along roadways
- 2. Put motion sensors on lamps in the individual parking stalls and use compact fluorescent lamps to replace 100 watt incandescent lamps

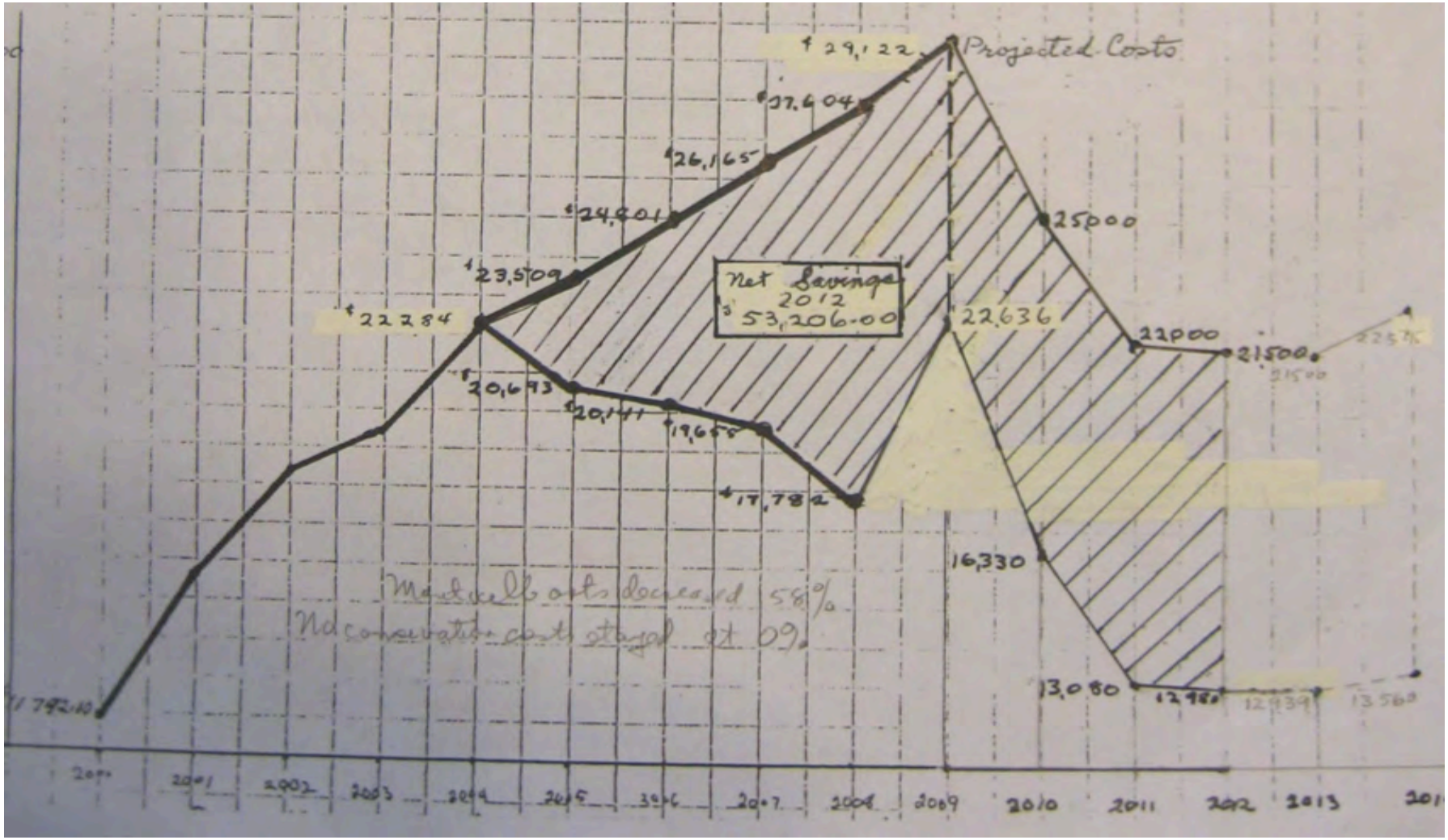
T8 Lamps in the Garage
(in the main road aisles the lamps must be on 24 hours a day for safety)

New CFL Lamps on motion sensor fixtures for the car stalls. Garage is kept at a minimum temperature of + 14 degrees C (57 F)
and lamps will start instantaneously

Entrance to Parking Garage on North
Thankfully, no heating pipes in the driveway

Frank Dietz pointing to heating and domestic hot water pipes that were originally not insulated

Natural Gas Annual Costs
Upper Line: Costs with no retrofit



Potable Water Conservation Measures

- 1. Replacement of all toilets in the building with dual flush 4/6 litre units except in 4 suites.
- 2. Low flow shower heads
- 3. Use of timers on the landscaping water supplies.
- 4. Faucet aerators

Dual Flush Toilet 4/6 litre

Faucet Aerators

Flow reduced to 1.5 GPM from 2.2 GPM

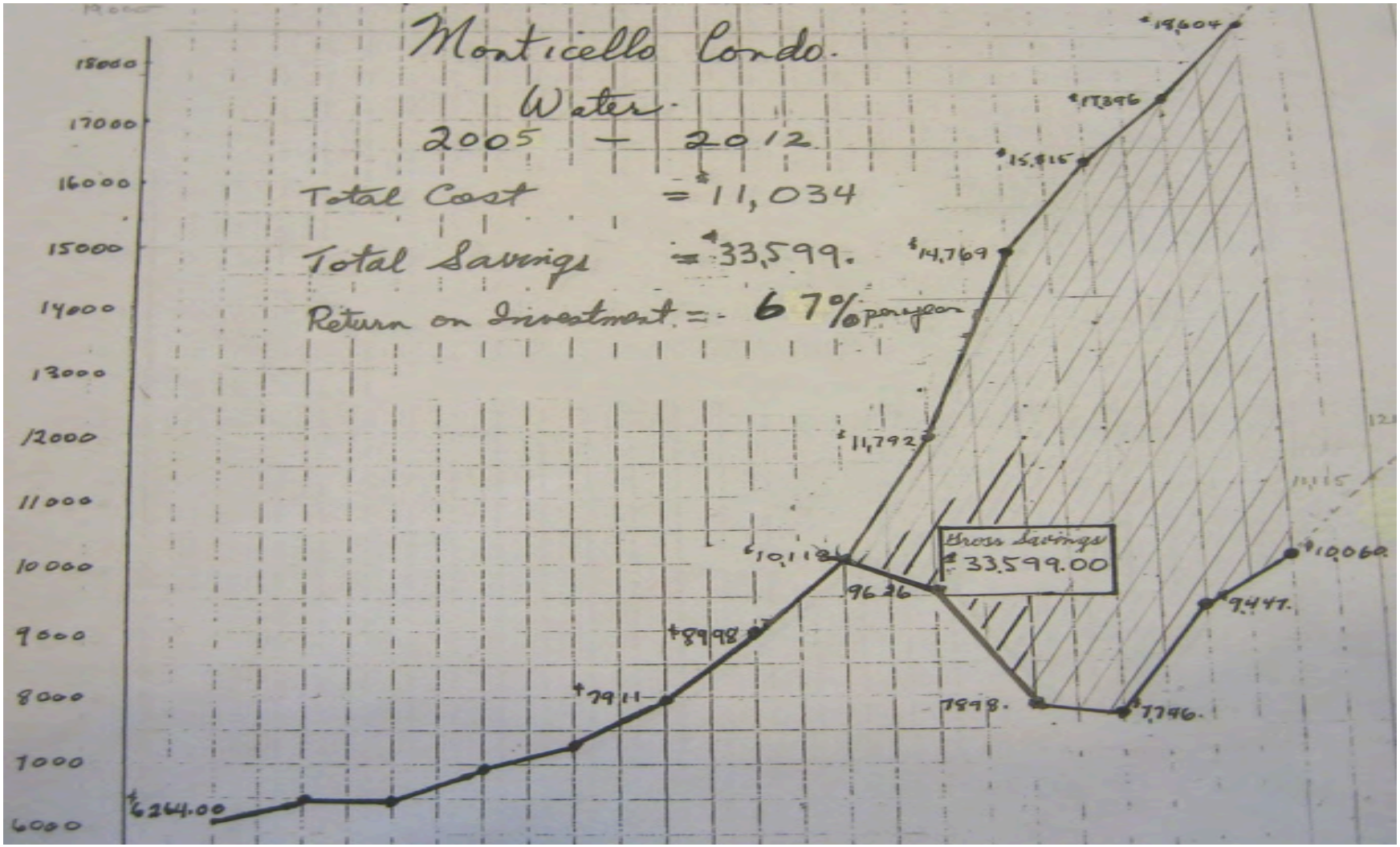
Faucet Aerators in bathroom sinks
Flow reduced from 2.2 to 0.5 GPM

Cost/Benefit of potable water savings

- Investment in new toilets, shower heads, faucet aerators, timers for outdoor sprinklers —cost of $11,034
- Cumulative net savings of $ 30,827to 2013
- Annual return on investment: 69% per year from 2008 to 2013
- 46% reduction in water use

Annual Water Costs

Upper Line: Cost with no retrofit



Summary of Savings for water, electricity and natural gas

- Savings
- Water 2008 to 2013 $41,861
- Electricity 2006-2013 $42,413
- N. Gas 2004-2013 $64,965
- Total Gross Savings $149,239
- Investment Costs $ 19,107
- Net Savings $ 130,132
- Annual return on invest. 60%

“What gets measured gets managed.” (Peter Drucker)

Potential Future Retrofits

- Energy Star dishwashers and clothes washers
- Replacement of atmospheric vented boiler with condensing boiler
- Replacement of atmospheric vented water heaters with condensing units
- Replacement of compact fluorescent lamps with light emitting diode (LED) lamps
- Replacement of T8 linear fluorescent lamps with LED linear fluorescent lamps
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Final words

- If you know of any other safe investments that can return 60% per year, please raise your hand.

Richard's Rules of Retrofitting (with Robert's Revisions 2014)

- **Electricity**
- 1.You cannot save any more energy than by turning a device off.
- 2. If it is on 24 hours a day, ask why and consider a motion sensor
- 3. Efficient fixtures can be as important as efficient lamps in reducing consumption
- 4. Make sure all appliances are Energy Star Tier III for best efficiency

- 5. Any electric motor that is on 24 hours a day should be of the highest efficiency.
- 6. Don’t forget that in addition to savings in energy costs, more efficient lamps generally requires less maintenance. Higher efficiency motors tend to last longer as they run cooler.

- **Heating:**
- 1. If the pipe is too hot to touch, the payback period on pipe insulation will be extremely short. The safety hazard will also be reduced.
- 2. If the pipe is insulated with asbestos, replacing the asbestos will have a very long payback period because of the hazardous material.

- **Potable Water Use**
- Cold Water
- 1. Toilets are usually the single largest indoor water users. Any more than 3 or 4 litres per flush is too much. (Older toilets used as much as 22 litres per flush.)
- 2. Shower Heads should use less than 7.6 litres of water per minute (2 US gallons per minute). Check the WaterSense web site for suitable models.

- 3. Faucet aerators are very cost-effective
- 4. Exterior landscaping water use should be minimized using timers on sprinklers. Any new vegetation should be native plant materials with minimal water requirements.
- 5. Energy Star Tier III clothes washers and dishwashers should be selected when equipment is replaced.

- **Hot Water Use**
- 1. Use Energy Star Tier III Dishwashers and Clothes Washers. Front loading clothes washers are preferred as they have higher spin speeds and clothes need less drying
- 2. Low flow shower heads and faucet aerators save both cold and hot water
- Check the EPA WaterSense Web Site for suitable models of water efficient devices

Attractive, Detached Residence. Needs major retrofitting.

Richard's Rules of Retrofitting

- **LIGHTING**
- **Lighting Rule #1:** *"You can never save more energy than shutting it off."*
- **Lighting Rule #2:** *"There is at least one person who won't like it."*
- **Lighting Rule #3:** *"Always retrofit lighting at night."*
- **Lighting Rule #4:** *"The occupancy sensor will turn the lights off when the company president is in the bathroom."*
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