



Sunny Days Ahead for Solar Energy

Dan Leckie Forum 2006

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Canadian Solar Industries Association

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CanSIA

The Global Solar Industry is Booming

- Globally
 - PV is the fastest growing energy source – 34% annually
 - Solar's cost is dropping faster than any other energy source
 - 5% annually for PV
 - in fact all conventional energy prices are increasing
 - Growth in Distributed Generation is now outpacing Central Generation
 - Major side benefits are being identified and accounted for
- Germany -50,000 people employed in the solar industries (another 100,000 in spin offs)
- China – over 10,000 manufacturers of solar water heaters
- Israel, China, Spain, Holland now require all new buildings to have solar – another 5-10 countries will soon be adopting a “solar obligation” or high energy requirements in their building code
- Austria – 1 out of 7 homes uses solar to heat water



The Future (at least for the next 20 minutes)

1. Myths
2. Solar Around the World
3. Solar in Canada
4. Challenges for Solar In Canada
5. Lessons Learned From Around the World
6. Opportunities



1. Myths



Solar Myth #1:

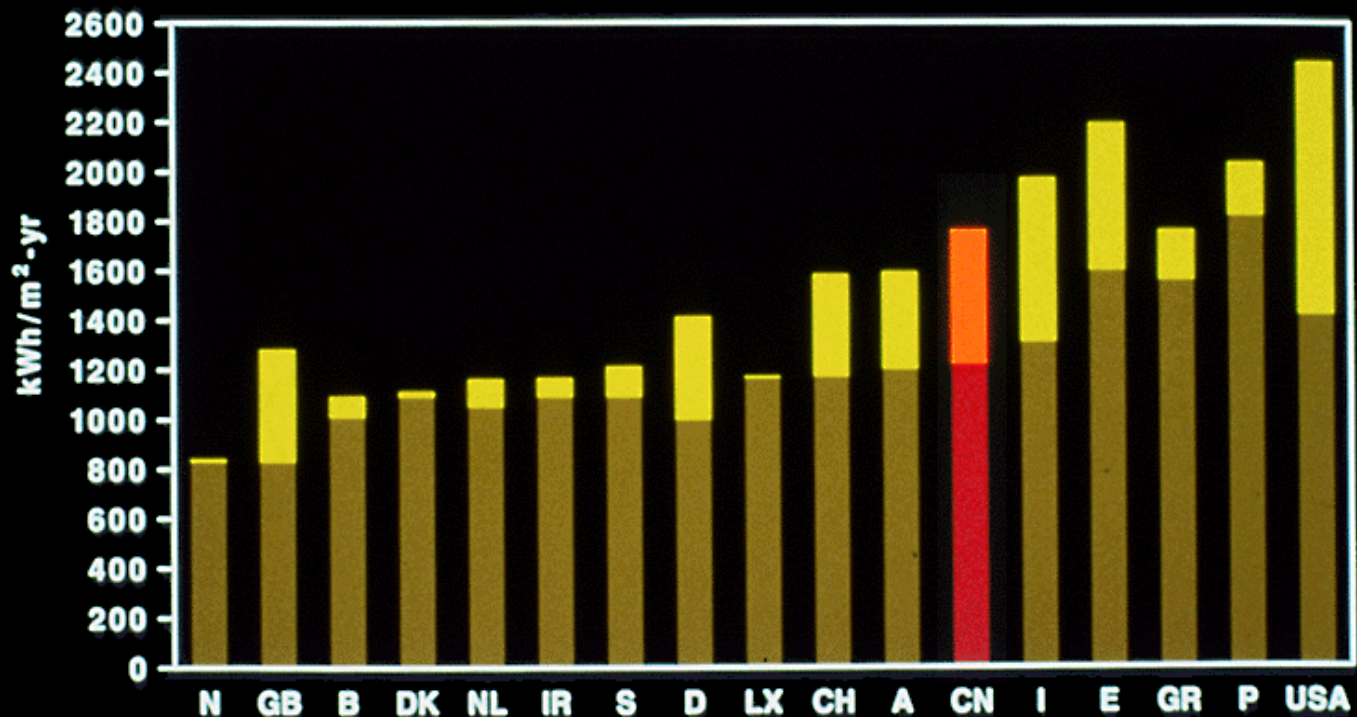
*Canada does not have enough
sunshine*

“Cold” does not mean a lack of sunshine



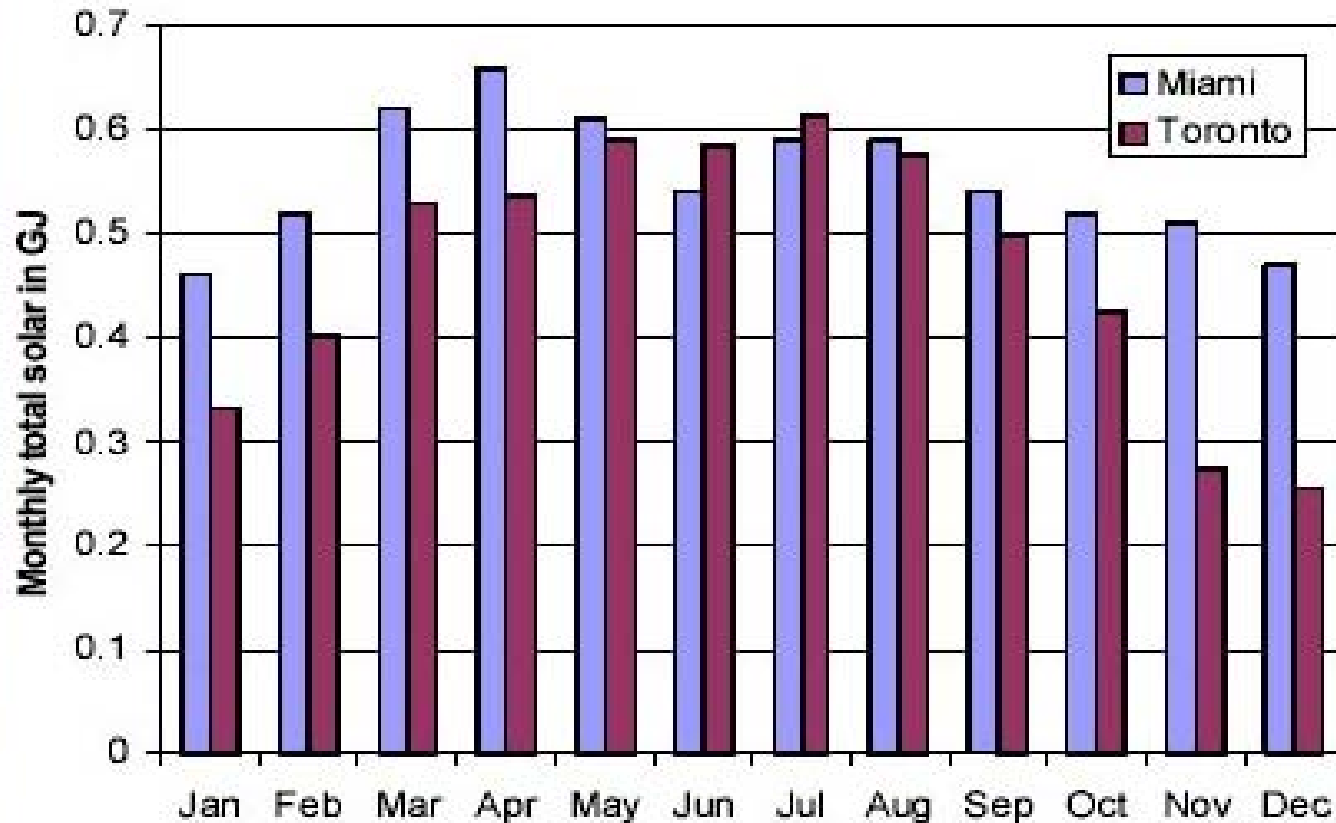
Canada has the Solar Resource

RANGE OF ANNUAL GLOBAL SOLAR RADIATION ON TILTED SURFACE



Toronto Has The Solar Resource

Solar Radiation in Miami and Toronto on slope=latitude

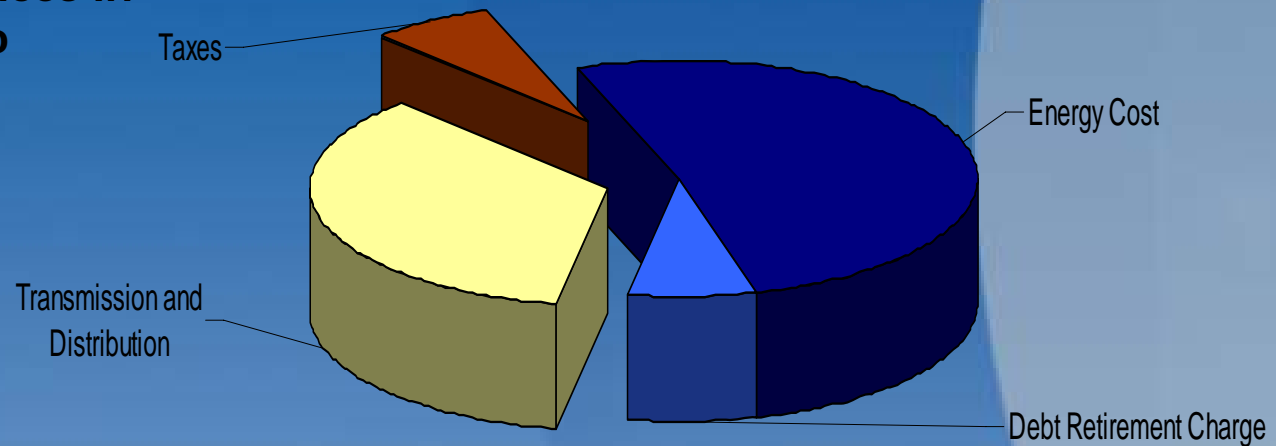


Solar Myth #2: *Energy costs are cheaper in Canada than in other countries*



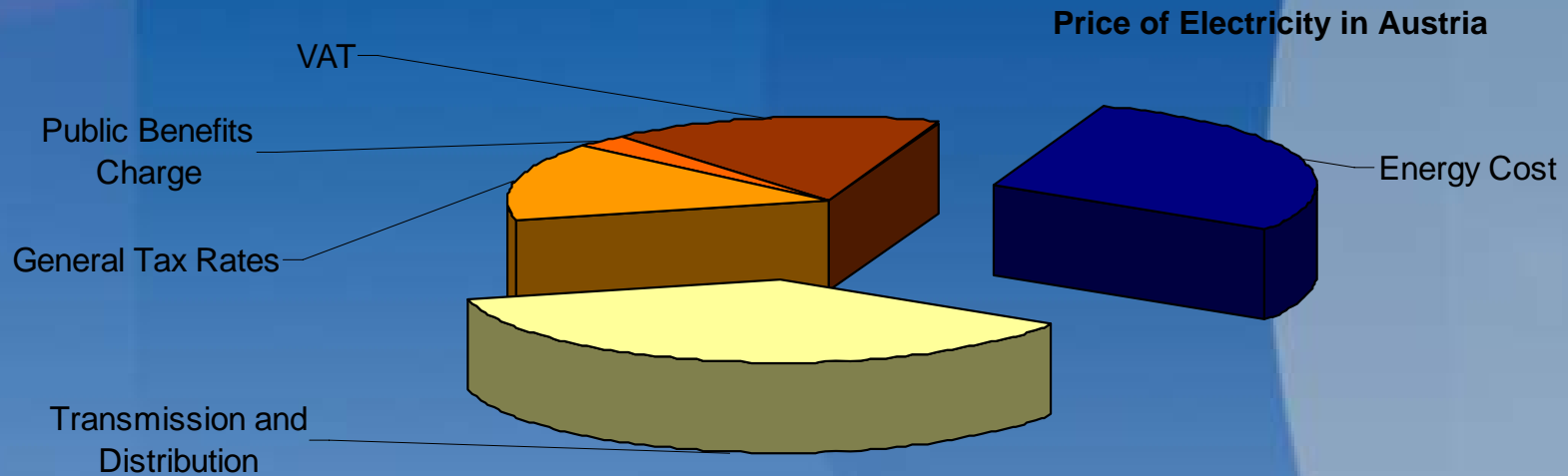
Are Energy Prices Cheaper in Canada?

Electricity Prices in Ontario



Energy Cost	\$0.057	Central power generation competes here
Distribution	\$0.034	
Taxes	\$0.006	
Total Energy Price	\$0.097	Solar Energy competes here

Reasons for Differences are Partially Due to Government Policies



	Ontario	Austria	
Energy Cost	\$0.057	\$0.064	12% higher
Distribution	\$0.034	\$0.083	144% higher
Taxes	\$0.006	\$0.077	<u>1180% higher</u>
Total Energy Price	\$0.097	\$0.224	130% higher

2. Solar Around the World

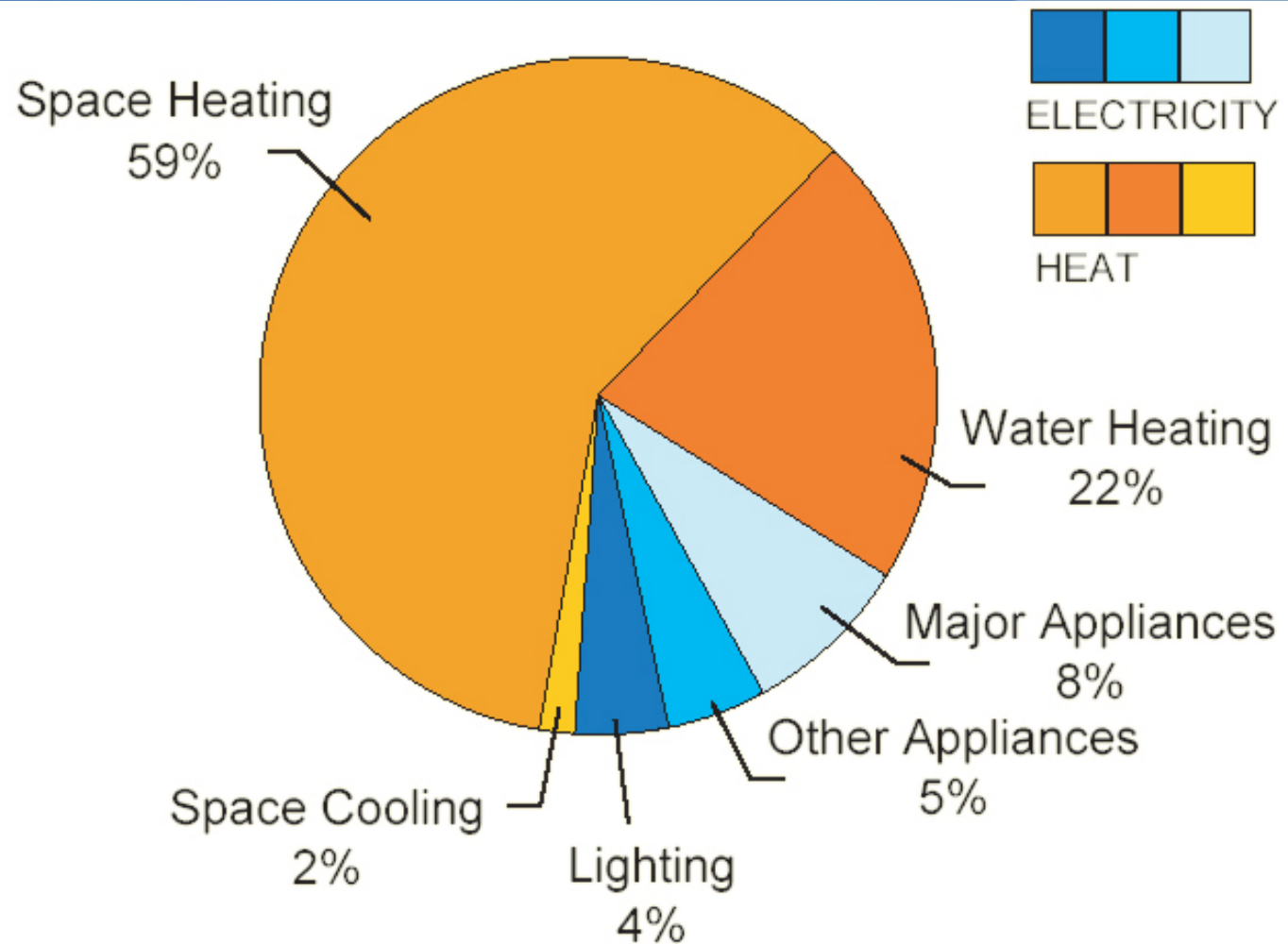


Solar Technologies – Not just One Technology

- One energy source - 3 main technologies
 - Passive
 - Daylighting
 - Passive Heating
 - Solar Thermal
 - Solar Pool Heating
 - Solar Water Heating
 - Solar Space Heating
 - Photovoltaics (PV) or solar Electricity
 - Consumer products
 - Off Grid
 - On Grid

Toronto's Homes

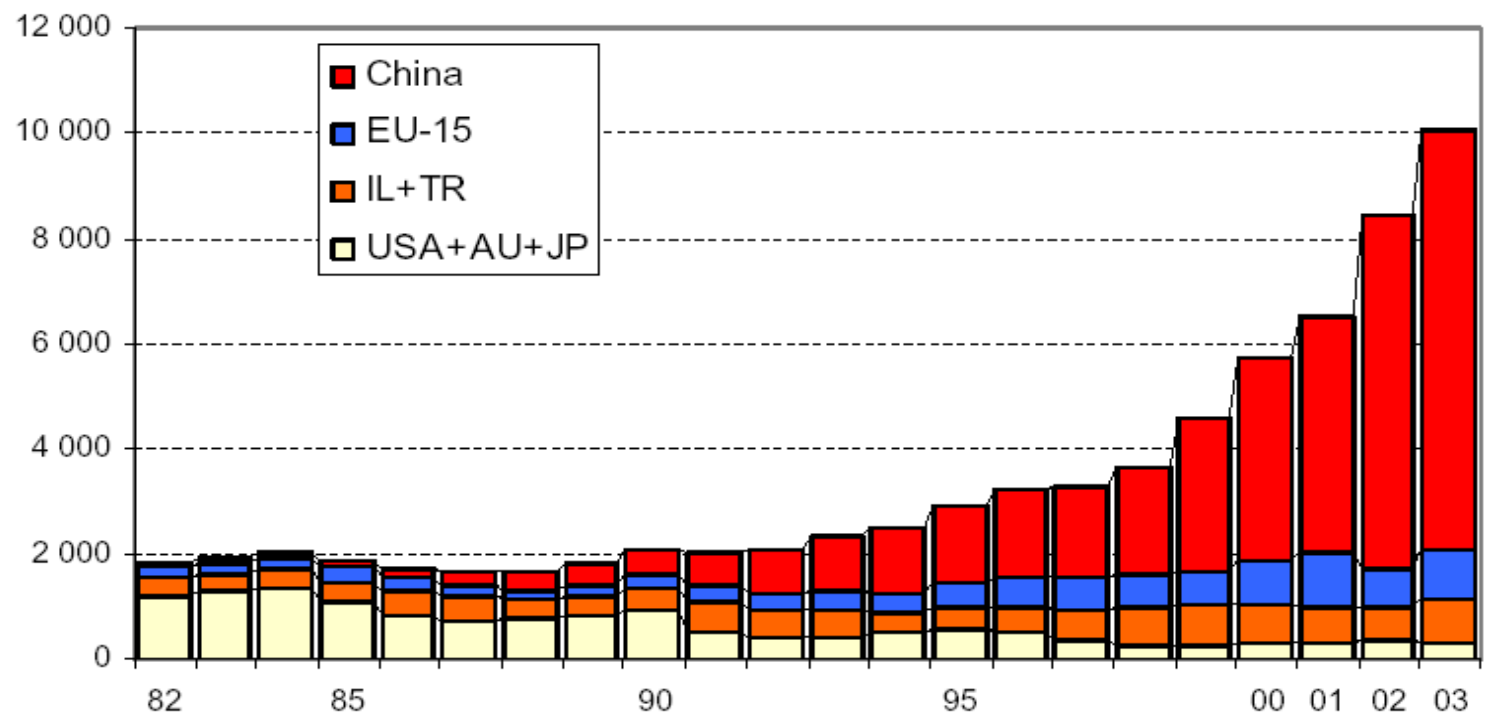
Three Demands for Energy



Solar Thermal Markets are Growing Globally

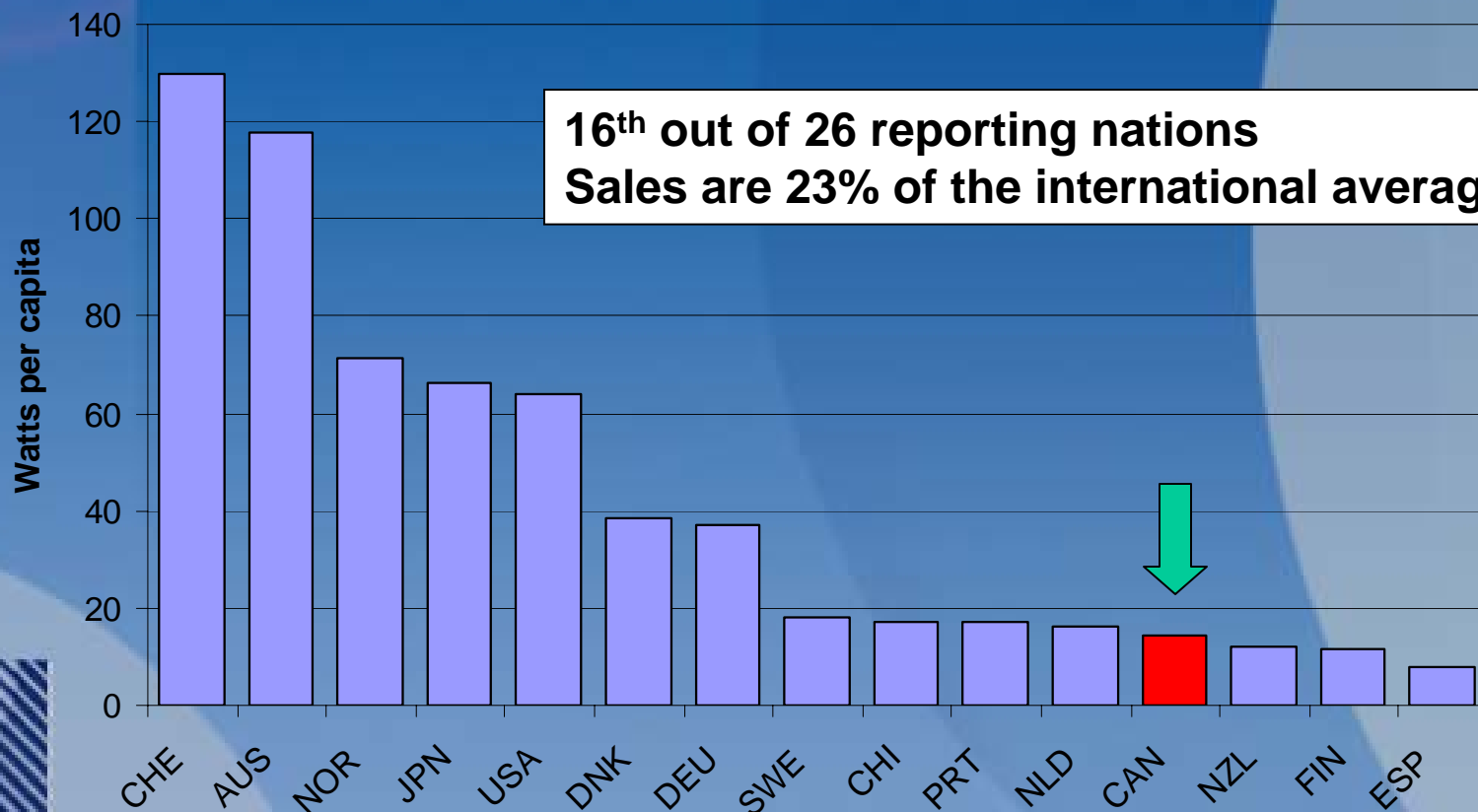
Solar heat (Glazed collectors) [MW/a]

Sources: IEA SHC, ESTIF



Solar Thermal Installed Capacity

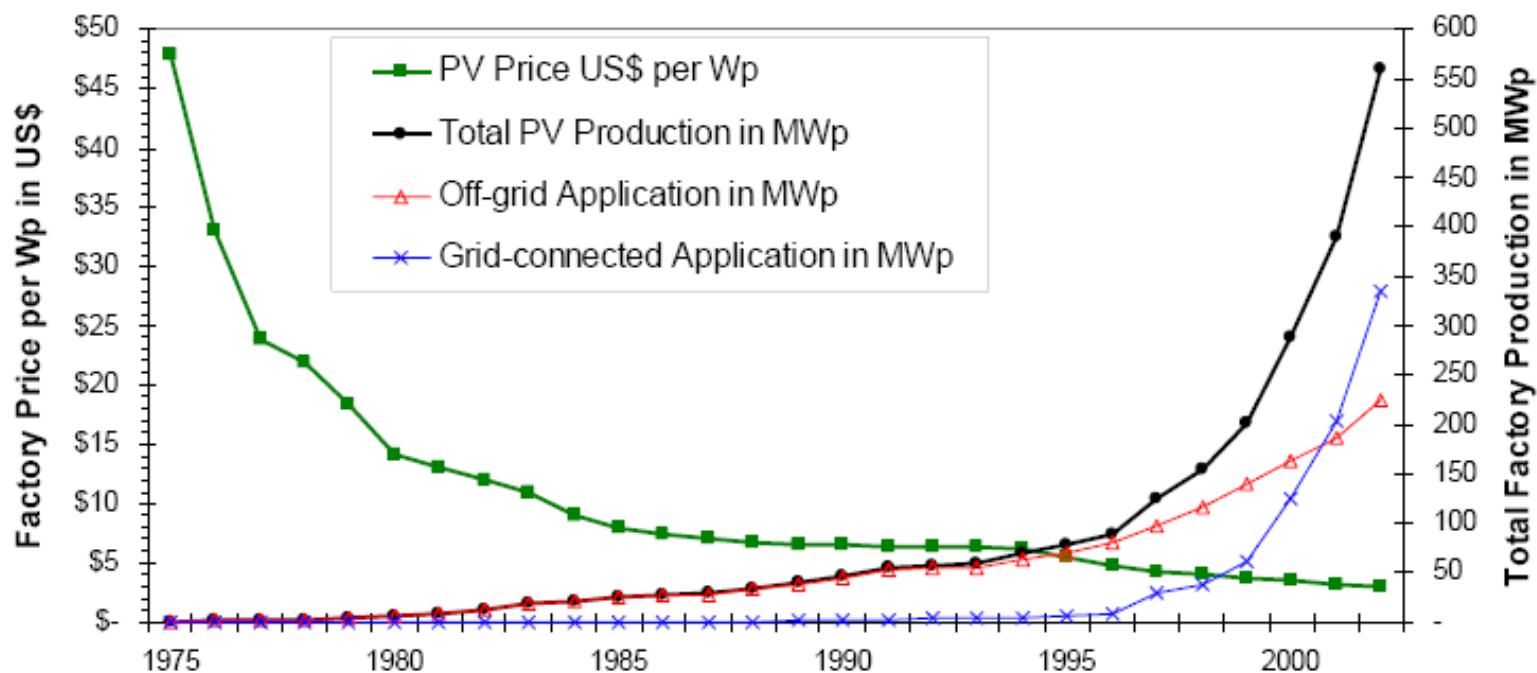
(2001) (Source: IEA)



Note: Israel (457), Austria (205) & Greece (190) not shown

PV Sales Climbing – Prices Dropping

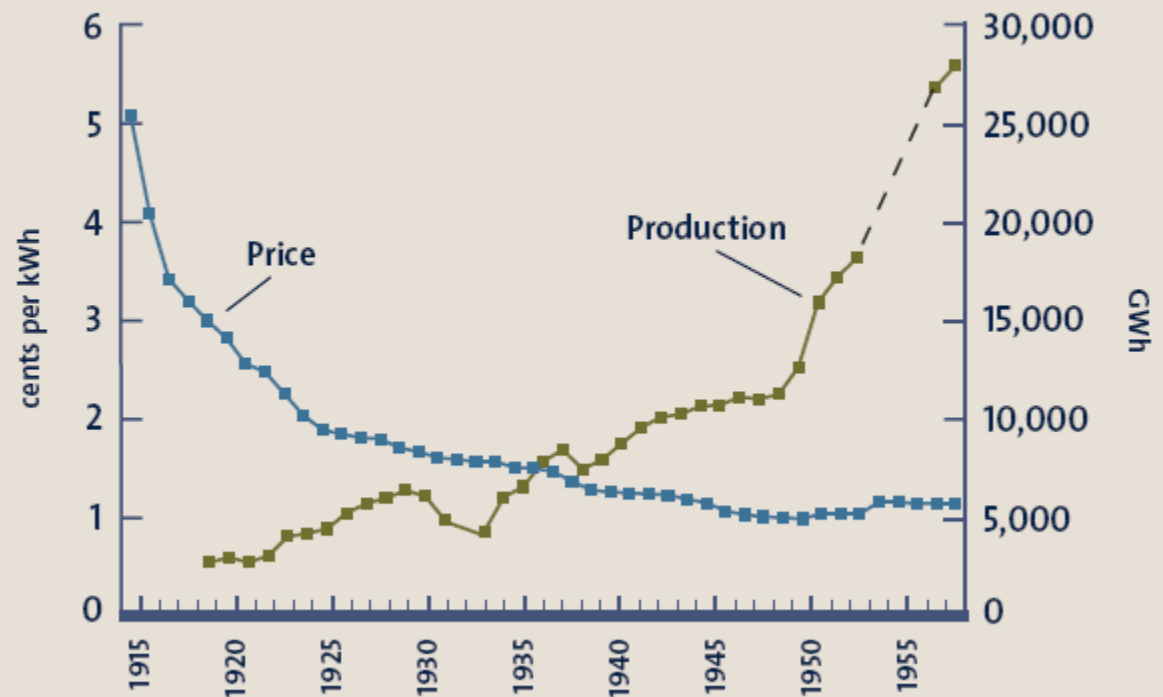
World PV Factory Production



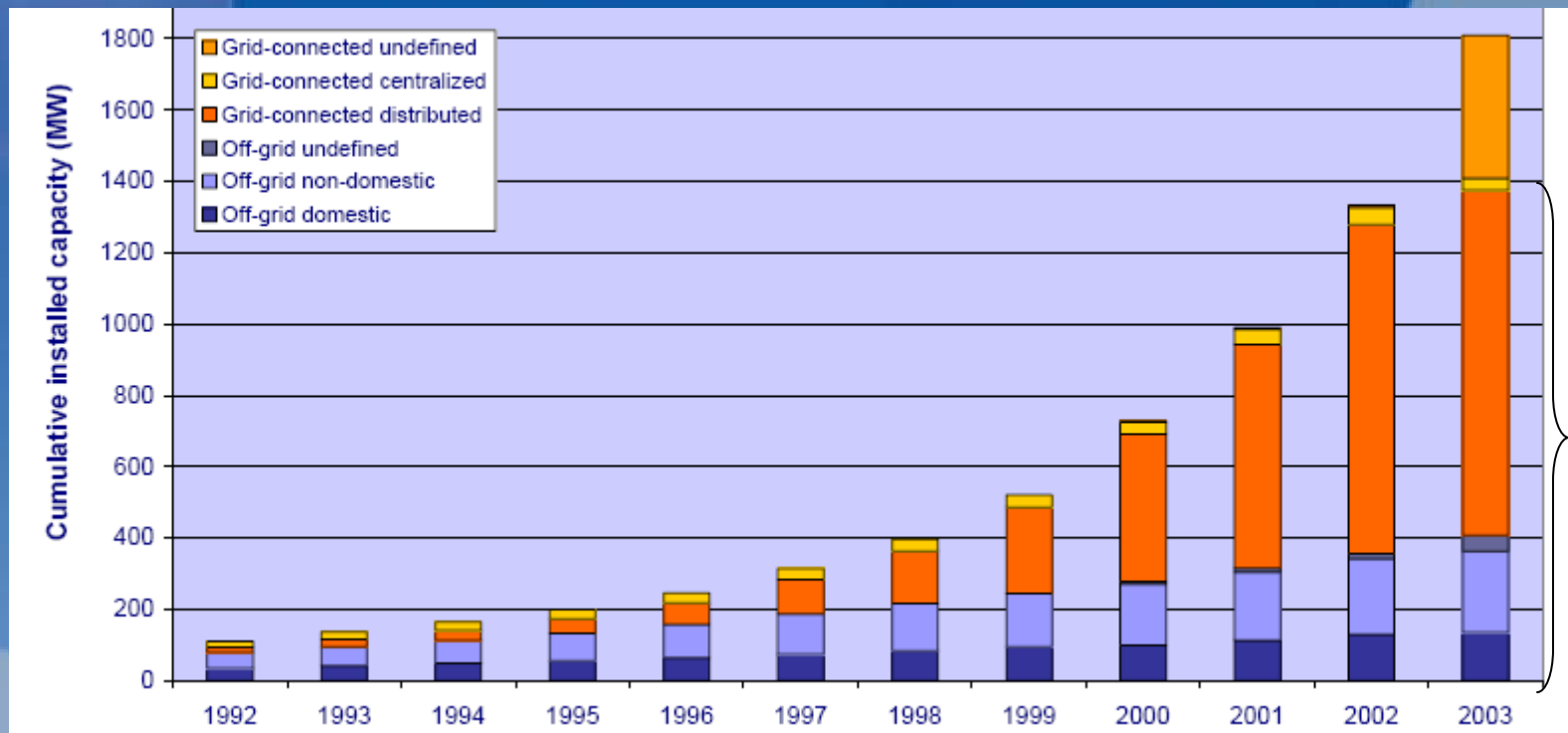
Historical Price of Hydro Electricity

Between 1915 - 1950 – 500% price reduction (5 cent to 1 cent/kwh) – all technologies start high on the price curve

Figure 1:
Ontario's Electricity
Prices and Production:
1914 to 1957



International Deployment of PV

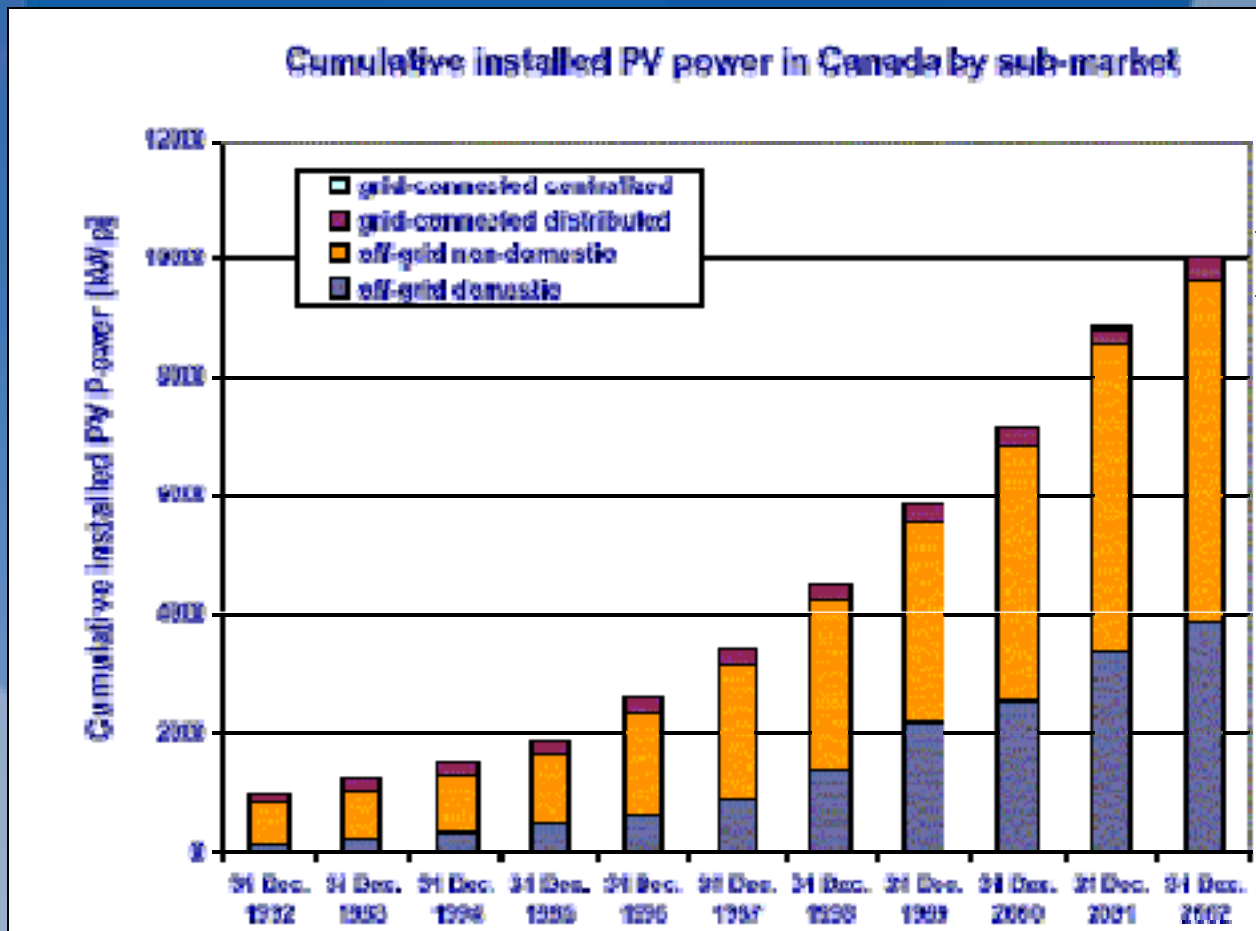


78 %
On
grid



Source: IEA (www.iea-pvps.org)

Canadian Deployment of PV



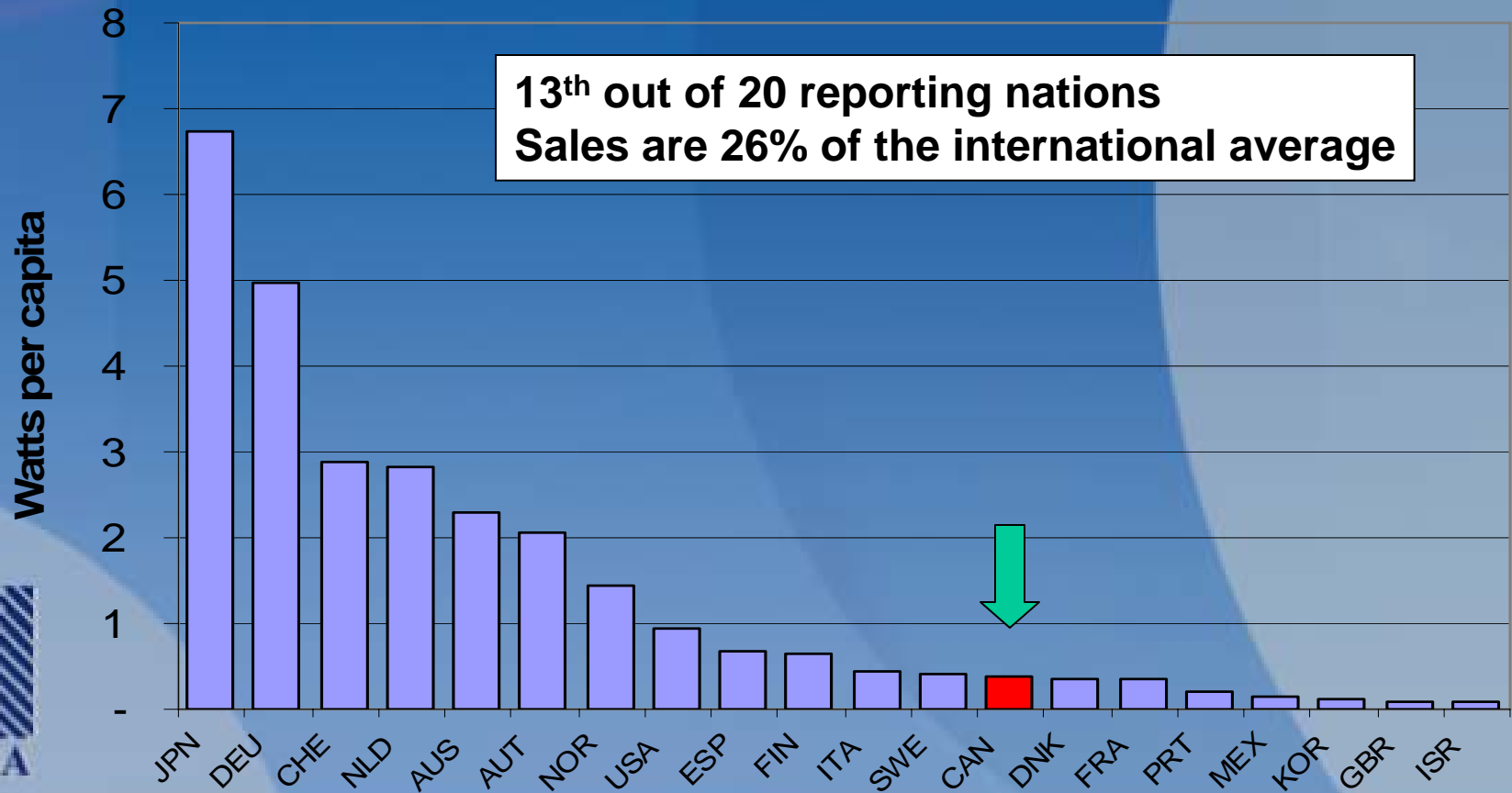
3.5 %
On Grid



Source: IEA (www.iea-pvps.org)

PV Installed Capacity

(2003) Source: IEA



3. Solar In Ontario



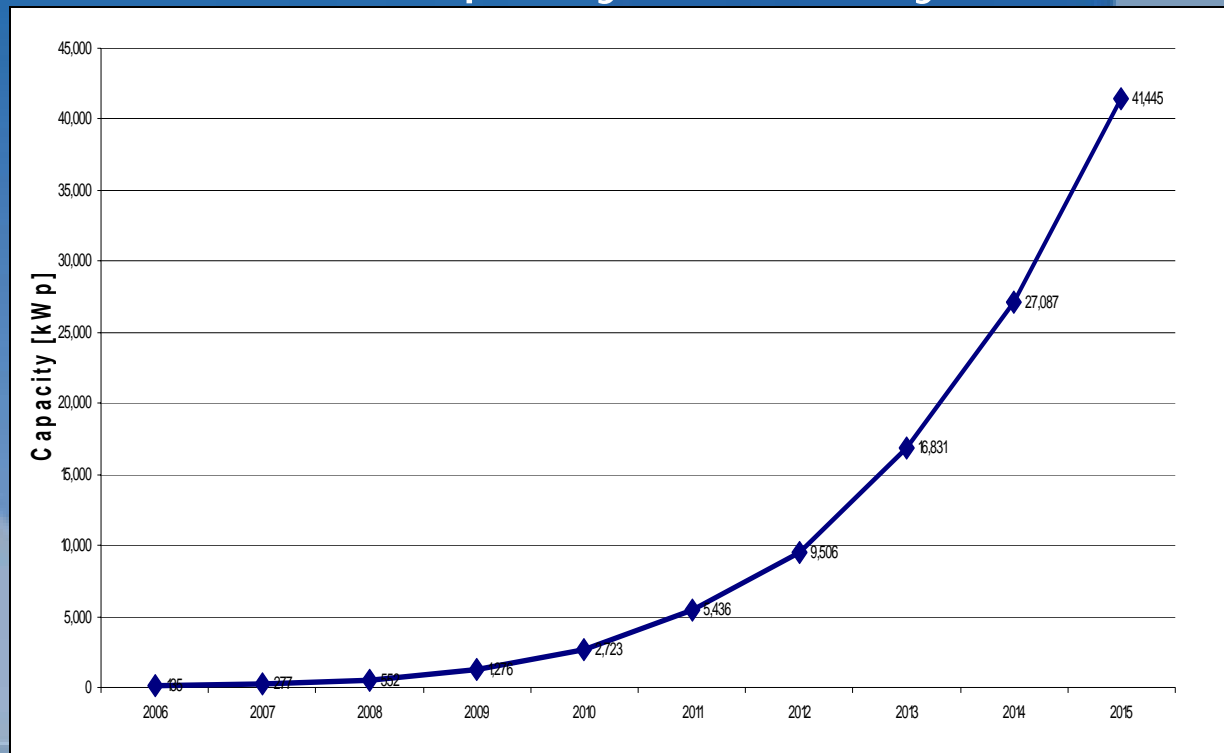
Feed-in Tariff Rates in Other Countries

Country	Technology (in \$CAN)				Contract Length	First Introduced
	PV	Wind	Hydro	Biomass		
Austria	\$0.960	\$0.125			13	1994
France	\$0.245	\$0.135			15	2000
Germany	\$0.923	\$0.140	\$0.123	\$0.185	20	1992
Italy	\$0.804	-			29	1992
Spain	\$0.676	\$0.106	\$0.106	\$0.106	>25	1998
Portugal	\$0.458	\$0.161	\$0.132		12	1998
Ontario	\$0.430	\$0.11	\$0.11	\$0.11	20	2006

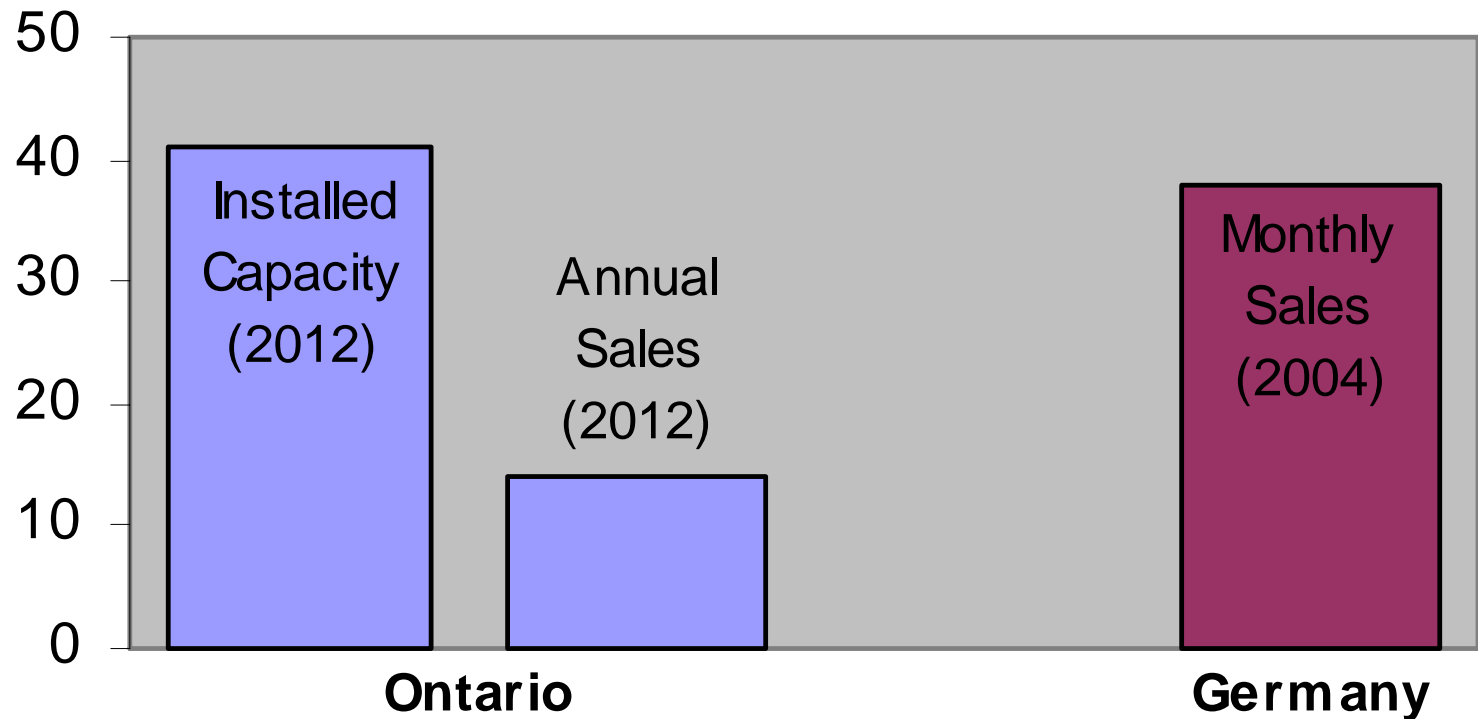
Ontario's PV Market about to Follow World Trends

By 2015:

- Annual sales: 15 MW per year
- Installed capacity: 15,000 systems or 40 MW

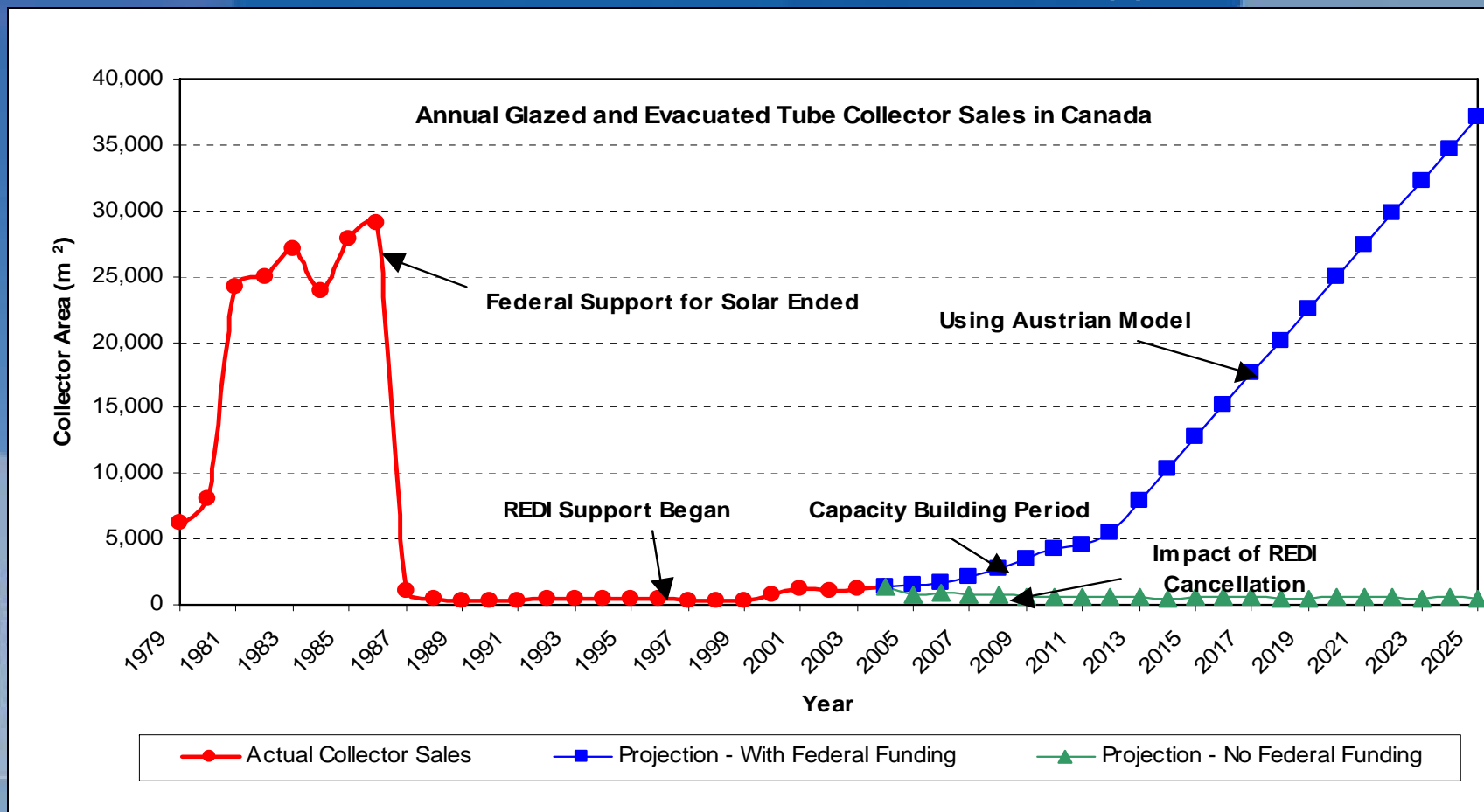


But Ontario Still Has a Long Way to Catch Up

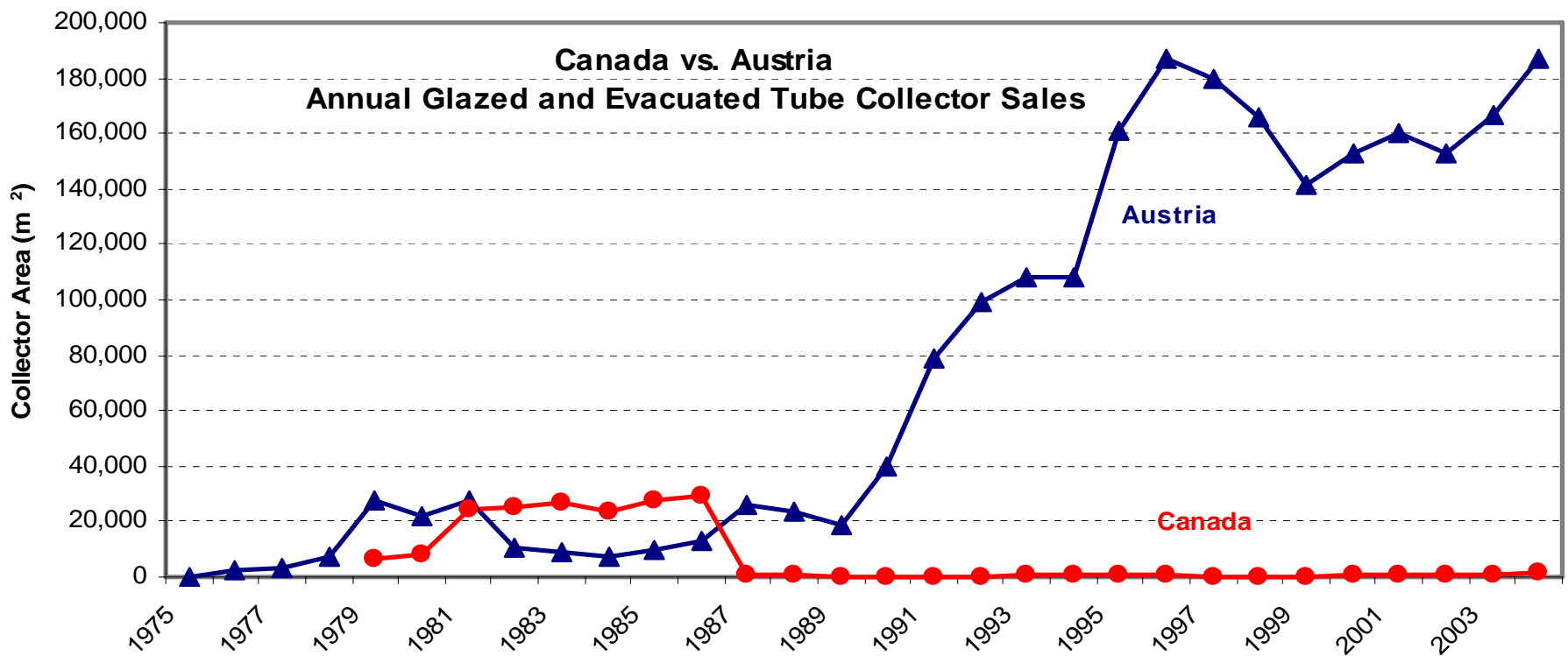


The Canadian Solar Thermal Industry is Beginning to Expand in Canada

- Solar DHW sales increased by 50% during 2002-2004
- But needs increased (and consistent) support



But Putting it in International Perspective – Canada has a long way to go....



A Vision of Solar in Ontario by 2025

	No. of Systems		Percent of Energy Market
Passive Solar	420,000 homes		22%
Solar Pools	120,000 pools		62%
Solar Domestic Water	800,000 homes		6.4%
Commercial Hot Water	2,000,000 m ²		6.9%
Commercial Solar Air Ventilation	3,600,000 m ²		1.3%
PV – New Homes (NZEH)	400,000 homes	1,200 MW	
PV – Existing Homes (SOCs)	400,000 homes	1,000 MW	
PV - Commercial Applications		1,000 MW	3.1%
Total		117.6	9% (of energy supply in markets)

4. Challenges for Solar In Canada



Solar Has Public Support

Would you like to see the following energy sources developed...

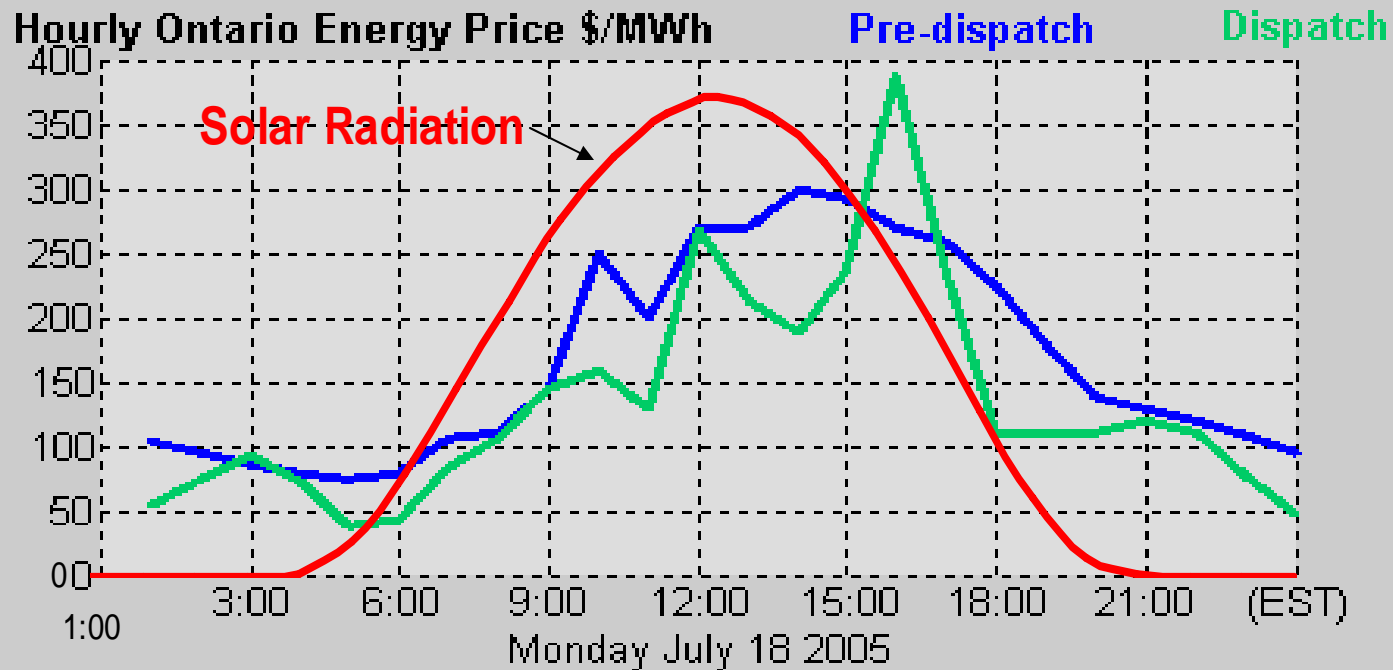
Energy Source	YES	NO
Solar	92 %	7 %
Wind	90 %	8 %
Hydro	82 %	17 %
Natural Gas	65 %	33 %
Increased electric. from US	8 %	91 %
Coal	21 %	76 %
Nuclear	32 %	64 %
Wood & other biomass	39 %	55 %



N = 1,201

GPC Research – Public Opinion Poll – Oct 05

Daily Power Demand and Solar Energy



- Solar's Peak Power Capacity is >60% at 99% of peak demand
- The price of electricity at peak capacity can be > \$0.40 per kWh

5. Lessons Learned



The Lesson from Spain – Solar Heating

- Federal
 - Loan Program (3%, 10 year term)
 - VAT reduction (0% - reduced from 16%)
 - Building Code requirement (2008)
- State
 - Training program for installers (1993)
 - Funding for installations on public buildings
 - 30% Subsidy for all solar heating (2001)
- Municipal
 - Solar Obligation
 - Barcelona introduced in 2001
 - 60 other municipalities followed
 - Led to Federal introduction
- Results (Andalusia Region – 8 million)
 - 1993 – 1.4 MW installed annually
 - 2003 – 14 MW installed annually
 - About 10,000 systems now sold annually
 - 4,000 working in the industry
 - 2010 – 700 MW target



General Lessons

- Solar needs a champion
 - Solar industry in the first stage of development in a country has many strong opponents that view it as a threat
 - Solar industry is too small initially to carry out effective advocacy – champions need to come from outside the industry - examples of Germany (city), Holland (city), Austria (city), Spain (city), Japan
- Support is needed at a number of levels
 - Subsidy – sends the message it's "the right thing to do"
 - Financing – brings down the up-front cost barrier
 - Regulation – Equalizes the playing field



Municipal Support is Critical

- Municipalities have actually lead in support of solar
 - Maintained the industry in the 1990s
 - Provided leadership which state and federal governments followed
 - Feed in tariffs were introduced by towns in Austria and Germany – now adopted at state and federal level across Europe (and now in Ontario)
 - A “Solar Ordinance” introduced in Barcelona in 2001 required all new buildings to install solar
 - Followed by 60 other municipalities in Spain
 - Adopted by the Spanish Government (2005)
 - Holland has a building energy standard – SDHW is one of the options to meet
 - now a European Union Directive (2006) – 4 European Countries now considering



6. Opportunities



How Can Toronto Support?

- Leadership
 - Leadership locally will spread to other municipalities
 - Provides justification for provincial and federal to also provide support
- Demonstration
 - High visibility projects increases confidence in solar technologies
 - Public swimming pools, schools – the solar park concept
- Fiscal & Regulatory Support
 - The City has the tools and can create the support mechanisms needed for solar (province and feds have a greater difficulty in doing as less interaction with builders and building owners)
 - Property tax rebates – reduced building permit fees – solar obligation – green pricing – leasing loan program through Toronto Hydro



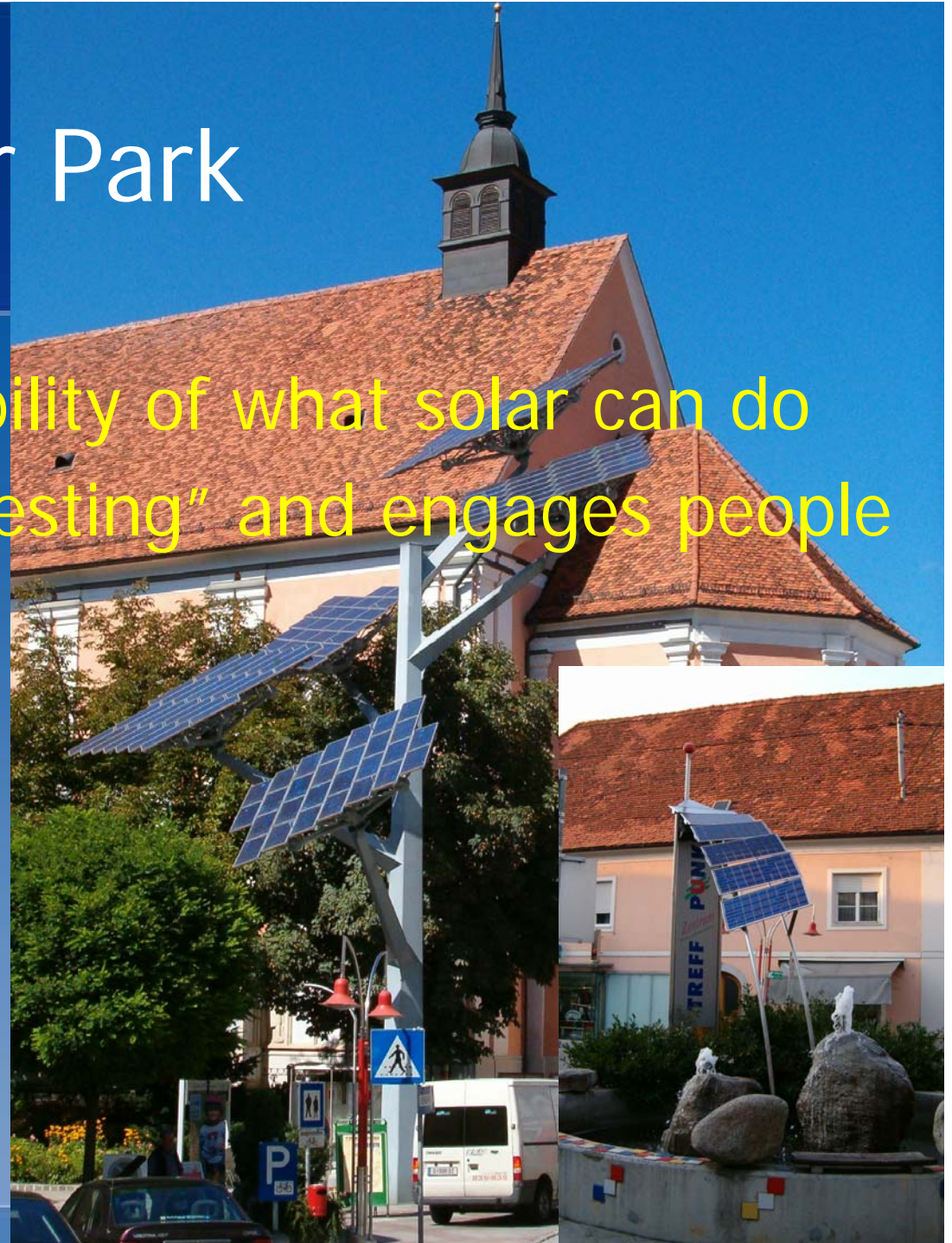
The Solar Obligation (The Barcelona Model)

- A requirement to use solar in new buildings or those who undergo major renovations
- Can have varying levels and focus on specific markets
 - i.e. swimming pools, solar ready, only projects that receive city funding
- Provide an incentive for builders to participate
 - Reduced building permit fees or a fast track process
 - Ease building restrictions (i.e height)



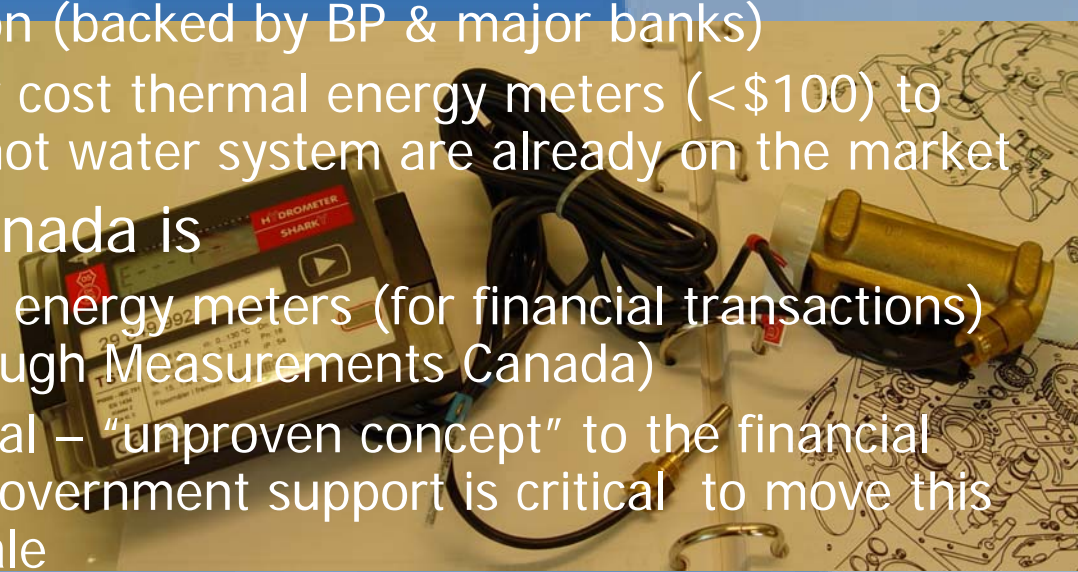
The Solar Park

- Provides high visibility of what solar can do
- Makes solar “interesting” and engages people



The Solar Utility

- Canadian solar firms are leaders in working towards this concept due to:
 - low electricity prices makes this the only current road to success
 - No financial support programs from governments
- Still relatively small scale in Canada however:
 - US – Sun Edison (backed by BP & major banks)
 - Germany – low cost thermal energy meters (<\$100) to meter a solar hot water system are already on the market
- Challenge in Canada is
 1. To get thermal energy meters (for financial transactions) approved (through Measurements Canada)
 2. Access to capital – “unproven concept” to the financial community – government support is critical to move this into a large scale



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