



The Solar Market

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A Fast Moving Market

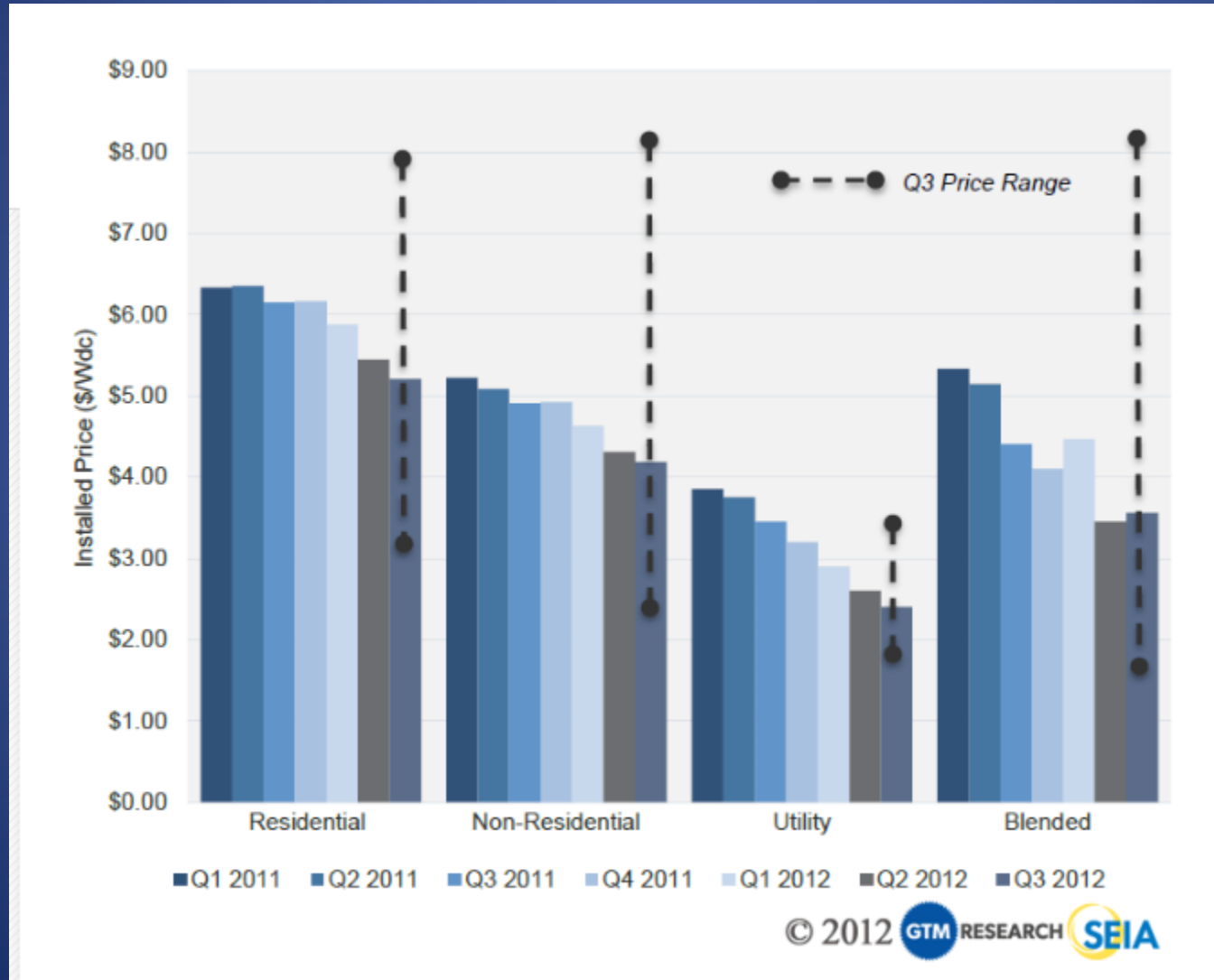
- Over the past 5 years, the solar market has transformed itself.
 - Exponential growth
 - Continued price declines
 - Mature capital markets
 - Market acceptance as a provider of peak energy & capacity
- 3.2 GWs were installed in 2012 (71% growth rate)
- 271,000 systems installed in the US

Solar PV Market Segments



- **Residential**
 - Primarily driven by the “Solar Lease”
 - *No upfront cost to homeowner*
 - Typically Net-Metered -thereby offsetting consumption of a home
- **Non-Residential (Commercial)**
 - Primarily commercial & industrial rooftops
 - Economies of scale reduce cost
 - More financing options
 - Net metered, standard offer and Buy/All Sell/All
- **Utility Scale**
 - Wholesale power to grid
 - Significant price reductions
 - Long term Power Purchase Agreements
 - *For Energy & Capacity*

Average Installed Price by Market Segment





Installed Costs

- Installed pricing down 19.3% Y/Y
 - \$5.45/watt Residential (-15.3%)
 - \$4.18/watt Non – Res (-14.7%)
 - \$2.60/watt Utility (-30.4%)
 - *Today: \$1.70/watt for utility scale*
- Module costs down a staggering 43%
 - Q3 2011 \$1.32/watt
 - Q3 2012 \$0.75/watt
 - *Today: \$0.65/watt*

Source: SEIA

Value of Solar – Unique Generation



1. Energy (MWhs)

- Peak LMP energy pricing

2. Capacity (MW)

- Displaces peaking capacity requirements

3. Distribution Energy (loss savings)

- 5-10% gain from locating generation near load

4. Distribution Capacity

- Reduces congestion on constrained feeders

5. Fuel Price Mitigation

- No fuel cost

6. Grid Security Enhancement

- Reduces potential for outages & blackout conditions

7. Local Economic Development

- Local construction jobs
- Long term maintenance employment

Value of Solar – MISO Example



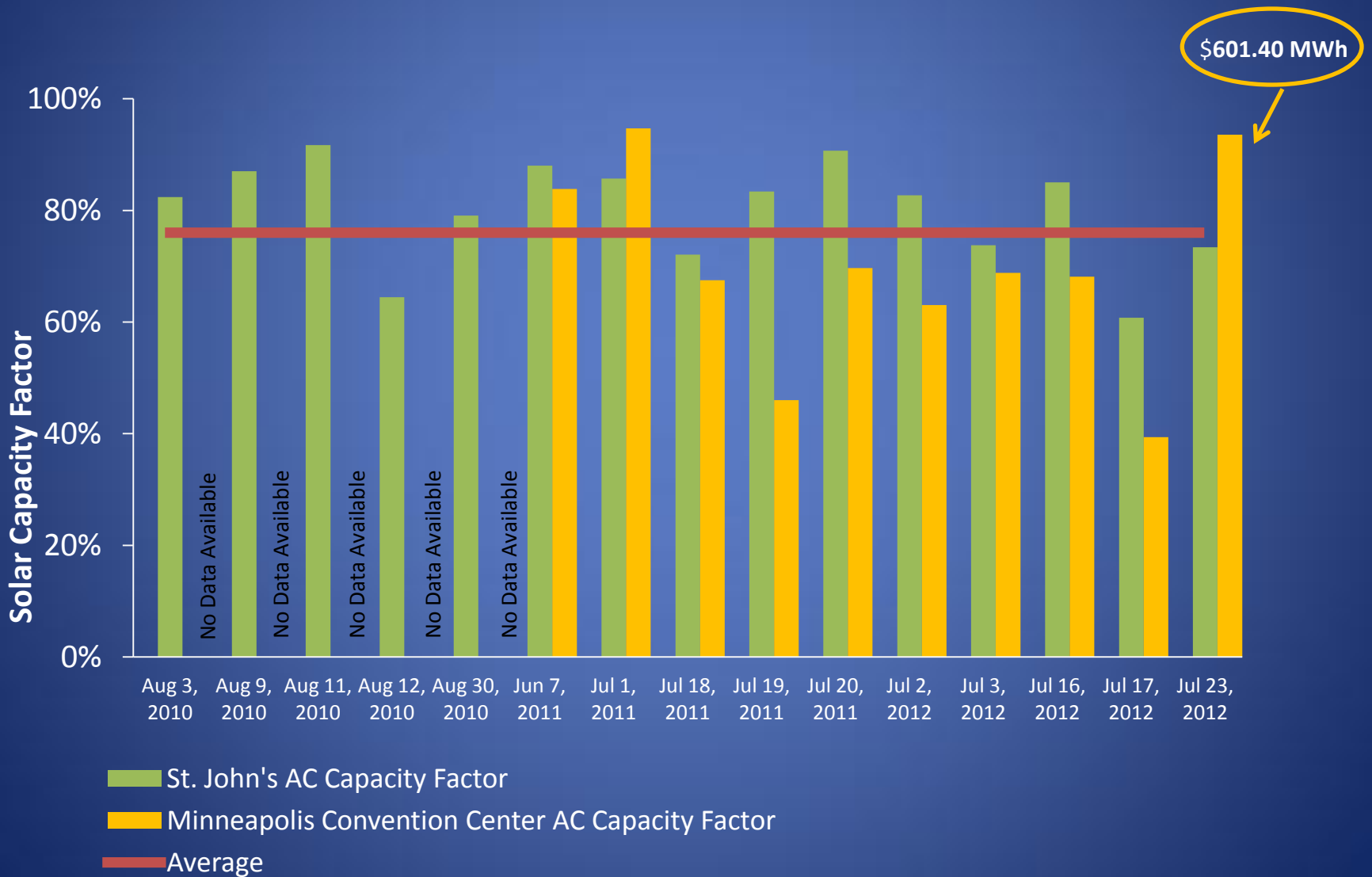
- Energy Value – Average Weekday Pricing 2011

Average Weekday System Marginal Energy Cost (Mills/kWh) Excluding TOD Holidays - TY 2011

Top Mos:	1	1	1	1	1	1	1	1	1	1	1	1	0	Yr	Top	1	1	
MCE	1	2	3	4	5	6	7	8	9	10	11	12	Smr	Wtr	Yr	Top	Yr	Yr
1	24	24	18	16	14	14	20	24	21	23	23	21	19.7	20	20	22.5	8Hr	6Hr
2	21	22	16	13	10	11	17	20	16	18	19	18	16.0	17	17	19.4		
3	20	21	15	12	8	9	16	17	13	16	17	16	13.8	16	15	17.7		
4	20	21	15	11	7	8	15	16	11	14	16	15	12.7	15	14	16.9		
5	21	22	16	13	9	9	15	16	13	17	18	16	13.2	17	16	17.5		
6	24	26	20	19	15	12	18	19	16	23	23	20	16.3	21	20	20.5		
7	24	34	25	25	20	16	23	24	21	30	31	28	21.2	28	26	27.0		
8	47	45	35	30	27	21	30	28	23	34	41	41	25.5	37	33	34.7		
9	51	45	44	36	34	24	36	36	28	36	48	47	30.9	43	39	40.7		
10	48	46	45	38	42	28	41	41	34	37	46	45	36.1	43	41	43.3		
11	50	46	47	43	47	33	46	47	39	38	47	46	41.0	46	44	47.4	31.0	35.6
12	44	48	42	42	47	33	50	51	41	38	42	45	43.5	43	44	48.4	34.9	40.2
13	39	43	35	39	47	34	53	53	40	37	39	38	44.7	39	41	48.2	38.8	43.8
14	37	40	34	39	46	35	57	55	42	36	41	37	47.1	39	42	49.8	42.4	46.3
15	35	38	31	36	43	35	60	57	40	35	37	34	47.9	36	40	50.7	45.4	48.0
16	34	36	29	34	40	36	63	59	38	35	37	33	49.1	35	40	52.1	47.6	49.4
17	36	36	29	33	37	34	61	59	36	35	40	40	47.5	36	40	52.0	49.0	50.2
18	49	40	29	31	31	32	56	53	33	36	57	64	43.5	42	43	52.5	50.1	50.9
19	50	50	40	29	26	30	51	48	29	37	45	57	39.4	42	41	49.6	50.4	51.1
20	42	45	43	29	24	28	46	44	32	38	40	48	37.4	39	38	44.1	49.9	50.2
21	36	39	32	30	26	26	41	43	32	35	36	39	35.8	34	35	40.3	48.9	48.4
22	35	37	28	29	26	25	37	42	35	38	39	37	34.8	34	34	38.1	47.4	46.1
23	30	31	25	26	24	23	32	36	29	34	33	31	29.8	29	29	32.5		
24	29	29	21	21	19	18	25	31	30	34	34	28	26.0	27	27	28.3		
Day	36	36	30	28	28	24	38	38	29	31	35	35	32.2	32	32	37.3		

Solar Generates During Peak Periods

2010-2012 – Solar Capacity during Xcel Super Peaks



Next Steps



- **Replicate What Minnesota Achieved in the Wind Industry**
 - Jobs (construction, design and manufacturing)
 - Increased energy tax base (keeping energy dollars in-state)
 - Dispersed economic benefits throughout the state
- **Utilize Lessons Learned in Other Regions**
 - Solar pricing and valuation metrics have already been established
 - Focus on all three market segments: Residential, Commercial & Utility Scale
- **Act Before Market Fully Matures**
 - Early adoption allowed Minnesota companies to play a major role in the US Wind Industry.
 - Minnesota can capture more than its share of the solar industry.