

SMUD'S ZERO ENERGY HOME PROJECTS

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Solar Advantage Home Program

SMUD



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SMUD's ZEH Experience

- Morrison Homes
- Premier Homes
- Lessons Learned
- Potential Impacts
- Local Government Incentives



Morrison Lakeside Community ZEH Project

ZERO
Energy Homes

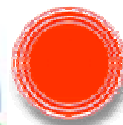


DOE's Zero Energy Home Program Goals

- Communities Built 2003 – 2004
 - 60% Reduction in Energy Bill
 - Annual Net-Zero Electricity Use
 - \$600 total annual energy bill
- Communities Built by 2010
 - Annual Net-Zero Energy Use



Complementary Programs In The Lakeside Project



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Sacramento Municipal Utility District

- Energy Star
 - (15% better than Title 24)
- ComfortWise
 - Third Party Inspections and Tests, Mechanical Design
- SMUD Energy Advantage Plus Home
 - 50% reduction in Title 24 cooling energy budget



SMUD's Participation

- Residential Services programs
 - Residential New Construction Rule 15 Hook-up fee discount
 - Lighting rebates
 - Energy Star Home (3rd party inspection) rebate
- Buydown of the AstroPower modules
 - Costs \approx \$8.75 /watt AC Installed
 - Builder paid \$2.60/w equip cost + Install \approx \$1.40/w
 - \$4.75/w ac PV buydown
- Marketing Support



LAKE SIDE ZEH FEATURES

<u>Measure</u>	<u>Base</u>	<u>ZEH</u>
Low Air Infiltration	No	Yes
Windows	Vinyl, Low-e	Vinyl, Low SHGC
<u>HVAC</u>		
FURN AFUE	0.78	0.92
A/C SEER	10	14 w/TXV
ACCA Design	No	Yes -- Short Runs
<u>Water Heating</u>		
Tank	50 gal storage	Tankless
EF	0.60	0.82
Distribution	Standard	Pipe insulation
Comfortwise Inspection & Tests		
Fluorescent Lighting		
2kW AC PV		



Morrison ZEH PV System

- 48 AstroPower GT 55 BIPV Modules
- One Source Circuit
- High-Voltage
- SMA 2500 Inverter
- PV System Sizing
 - T-24/Engineering Analysis
 - 36% - 41% > Title-24 2001 Standards



Premier Homes - ZEH Community

- 94-Unit Subdivision with Premier Homes, 04
- SMUD's Support
 - Buydown of the AstroPower modules
 - **Costs ≈ \$7.76 /watt AC Installed**
 - Builder pays \$4.36 PV equipment + install
 - \$3.50/watt AC (avg) PV Buydown
 - Rule 15 Hook-up fee discount
 - Lighting rebate
 - Energy Star Home (3rd party inspection) rebate
 - Marketing Support



Next Steps



- Evaluate ZEH/PV system
 - Power production
 - Monitor energy savings/ production
 - “Fit” with Home Builder practices
 - Homeowner acceptance/market appeal
- Evaluate distribution system impacts
 - Voltage Flicker and Harmonic Distortion
- Customer Satisfaction Survey
- Adopt into SMUD’s residential new construction program



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Lessons Learned - General

- Schedule is king.
- Clear preference for building-integrated PV systems over roof mounted PV systems.
- Builders want to use existing subcontractors.
- PV manufactures must be full service suppliers – installation and sales training.
- New home sales people need special training and on-going support.
- New home buyers are unfamiliar with the benefits of owning their own PV system.



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Lessons Learned – Morrison Lakeside ZEH

- Install Costs @ \$8.75/w AC
- **Lower than CEC Avg. Install Cost (\$9.85/w AC) and Falling at very low volume!**
- Less Complicated Installation
 - Fewer Pieces (48 vs 216)
 - One Source Circuit
- PV meets/exceeds expected kWh production
- Subcontractor Experience
- Sales Agents
- Buyer Expectations



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ZEH Potential Impacts

- Demonstrated total annual energy bill reduction without losing Off-Peak electricity sales
- Potential Peak Demand Savings- up to 7+ MW/year

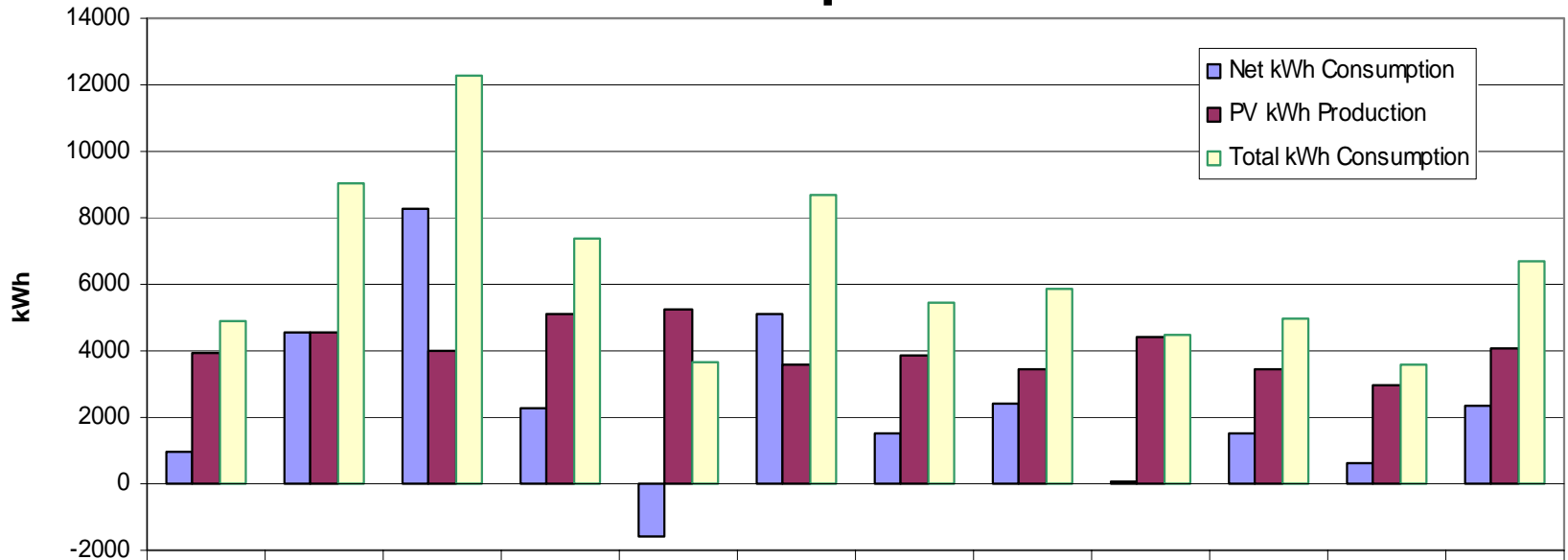


Beazer Powerhouse Results

- Offered as optional upgrade in 4 communities
- 18 Homes built (approx. 60 kW)
 - 11 occupied by owner for 1+ year
- ZEH possible
 - **8 of 11 owner occupied homes produce more energy than they use**



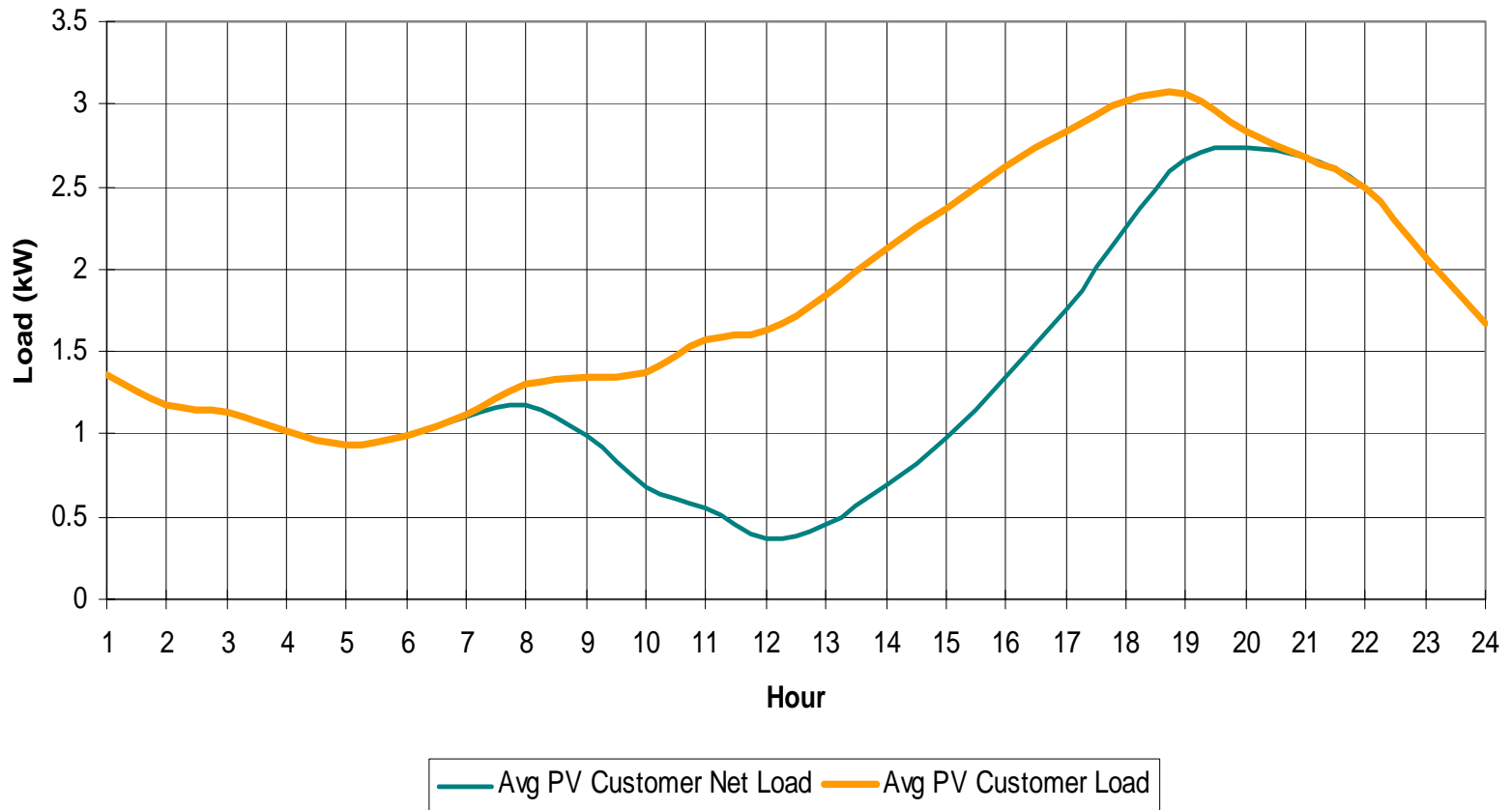
Beazer Powerhouse kWh Consumption



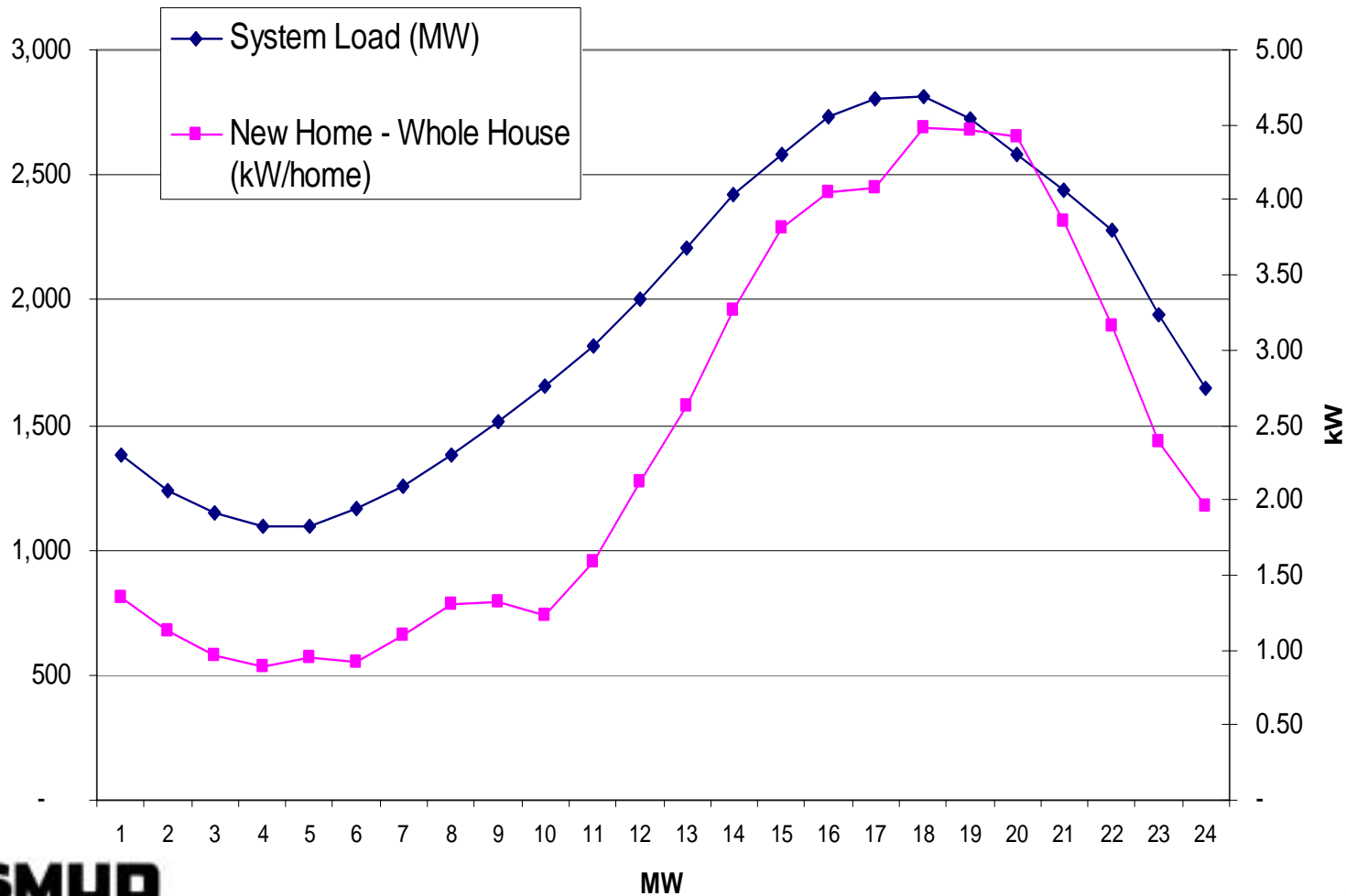
	Piazza Lot 34	Piazza Lot 41	Piazza Lot 44	Piazza Lot 48	Piazza Lot 52	Piazza Lot 57	Piazza Lot 63	Roseview Lot 66	Roseview Lot 108	Ashbourne Lot 40	8435 White Spruce	Average
Net kWh Consumption	945	4528	8271	2281	-1573	5079	1548	2388	47	1492	618	2329
PV kWh Production	3940	4523	3997	5120	5261	3594	3870	3454	4442	3481	2988	4061
Total kWh Consumption	4885	9051	12268	7401	3688	8673	5418	5842	4489	4973	3606	6669



SMUD Average PV Customer Load Profile - July



System Load July, 2003 vs New Home Load



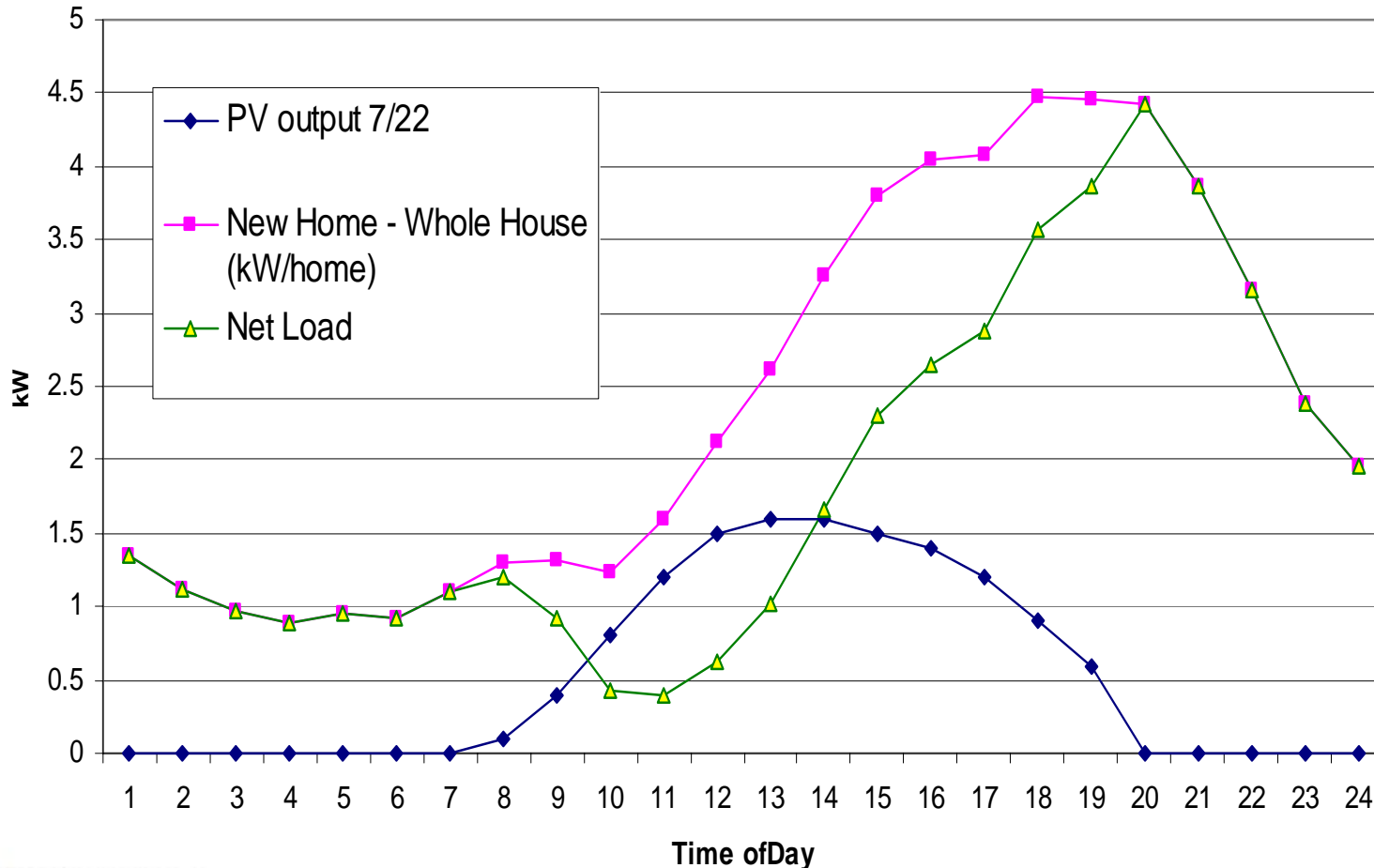
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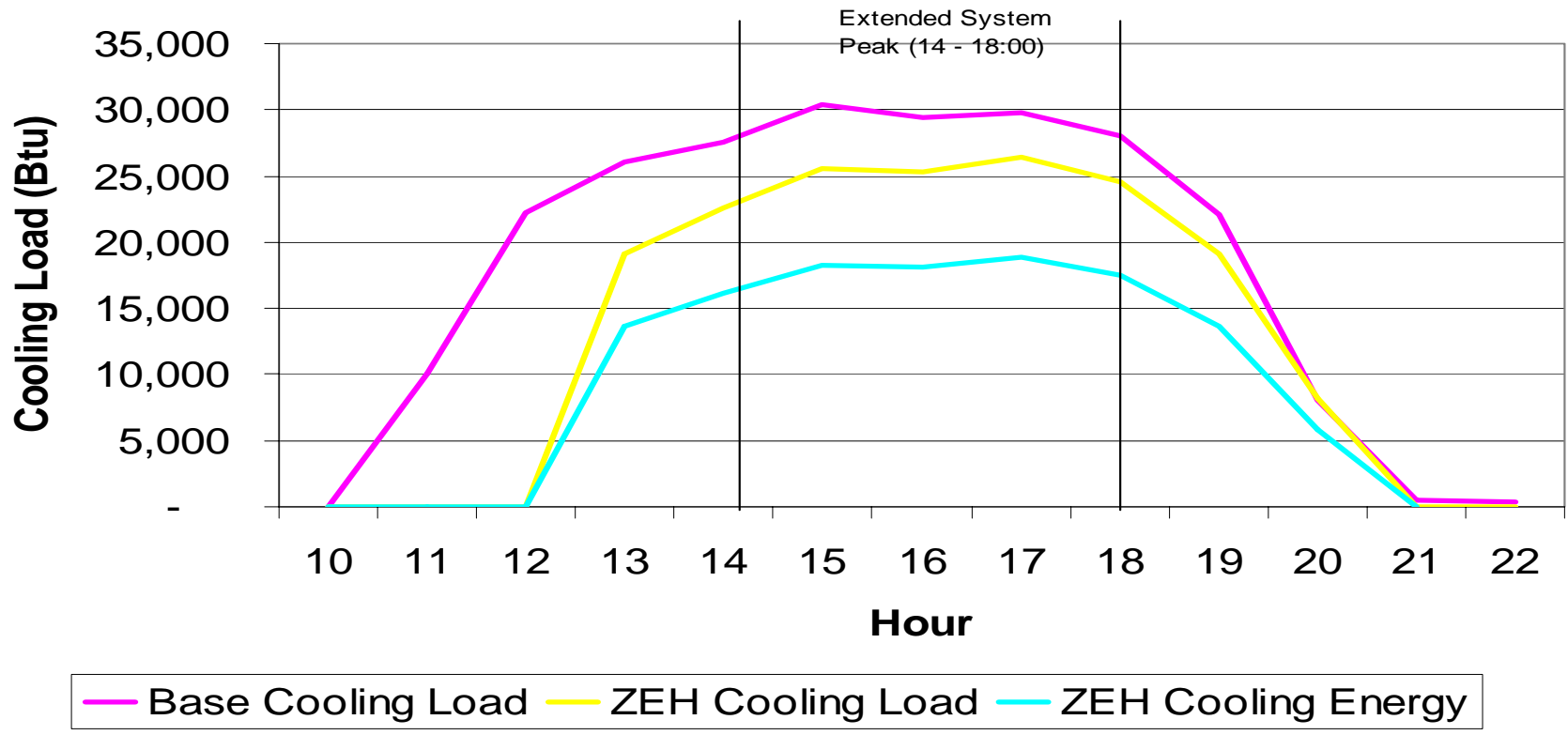


New Home Load vs PV Production



Morrison ZEH – Efficiency Only

ZEH - Cooling Load on July 10, 2003 (Based on Micropas)



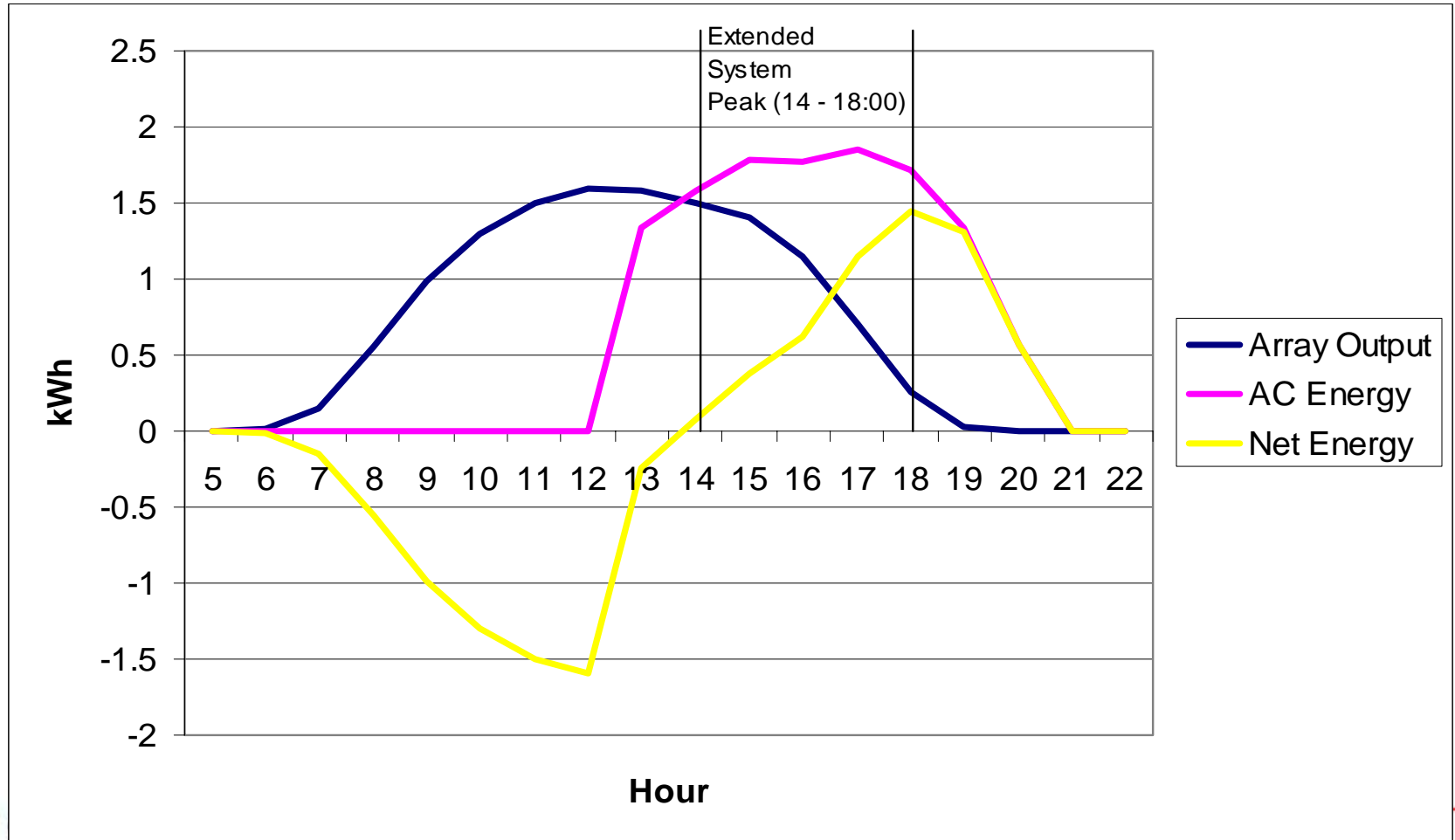
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Morrison Peak Load Impact Estimate



Local Government Incentives

- Local Government Commission/Building Industry Institute Studies
- Surveyed local Governments
- 8 “active” jurisdictions



Local Government Incentives

- Reduce/Eliminate Permit Fees
- Solar on Public Facilities
- Expedited Plan Check/Inspections
- Reduce/Eliminate Plan Check Fee
- Green Bldg Policies/Assistance
- Development Requirements
- Expedite Service Connection



WHERE DO WE GO FROM HERE?



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