

This presentation premiered at WaterSmart Innovations

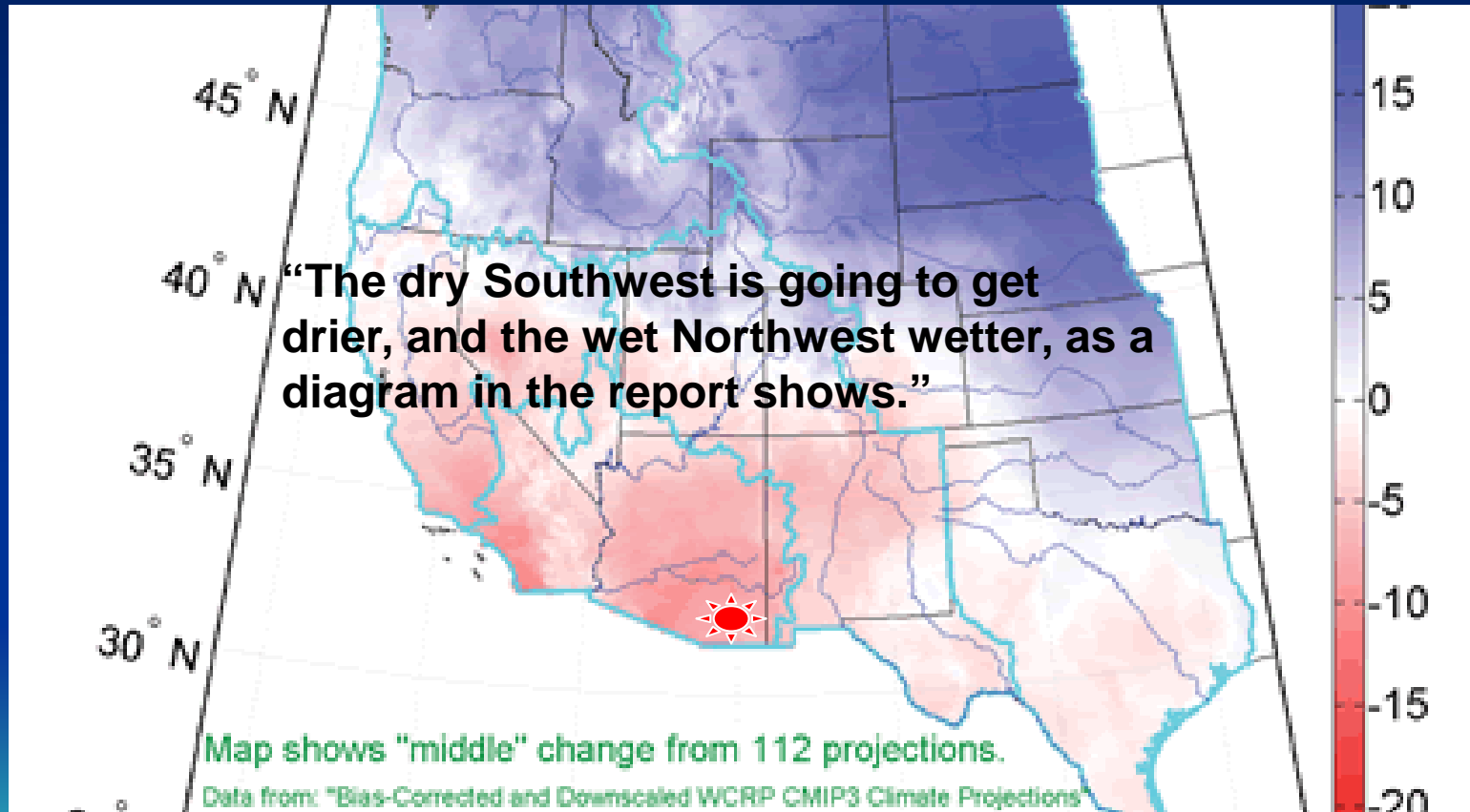
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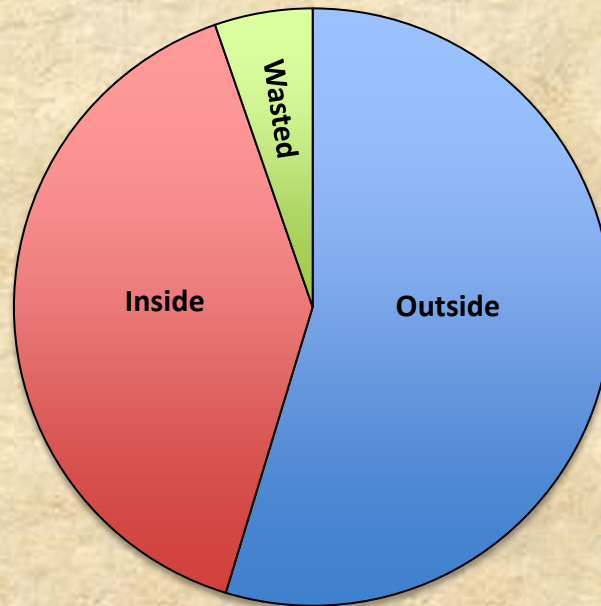
Managing Water in the West

(SECURE Water Act; Section 9503(c) – Reclamation
Climate Change and Water 2011)

April 2011



How water is used in USA



Conserving water: at what cost?

- **Wasted water/energy footprint**
 - What's yours?
- **A case study: Sierra Vista, AZ**
- **Δ mortgage vis-à-vis on-demand pumps**

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www.reality-llc.com



2009 Sierra Vista water/energy footprint*

(Wasted energy and water; **47K population**)

Costs (\$)

Likely

Energy

3.8M

Water

310K

Treat (city)

299K

Water (gal)

135M

CO₂ (metric tons emitted)

4,813

* Excludes Fort Huachuca, all commercial and government buildings, pre-June 2000 apartments



The Ripple Effect

(Wasted energy and water; **Sierra Vista, AZ 47K population**)

<u>Source</u>	<u>Energy (\$M)</u>	<u>Water (Mgal)</u>
1 ^o home	3.8	135

* Consumptive water: 2gal/kWhr and 0.9 gal/therm; ^ from CA Energy Comm study



The Ripple Effect

(Wasted energy and water; **Sierra Vista, AZ 47K population**)

<u>Source</u>	<u>Energy (\$M)</u>	<u>Water (Mgal)</u>
1° home	3.8	135
2° utilities*	n/a	18

* Consumptive water: 2gal/kWhr and 0.9 gal/therm; ^ from CA Energy Comm study



The Ripple Effect

(Wasted energy and water; **Sierra Vista, AZ 47K population**)

<u>Source</u>	<u>Energy (\$M)</u>	<u>Water (Mgal)</u>
1° home	3.8	135
2° utilities*	n/a	18
3° water^	0.1	

* Consumptive water: 2gal/kWhr and 0.9 gal/therm; ^ from CA Energy Comm study

The Ripple Effect

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4° treat^	0.1	

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graph TD; E1[3.8] --> W2[18]; W2 --> E3[0.1]; W2 --> E4[0.1];
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The Ripple Effect

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<u>Source</u>	<u>Energy (\$M)</u>	<u>Water (Mgal)</u>
1° home	3.8	135
2° utilities*	n/a	18
3° water^	0.1	2
4° treat^	0.1	3

* Consumptive water: 2gal/kWhr and 0.9 gal/therm; ^ from CA Energy Comm study

The Ripple Effect

(Wasted energy and water; **Sierra Vista, AZ 47K population**)

<u>Source</u>	<u>Energy (\$M)</u>	<u>Water (Mgal)</u>
1° home	3.8	135
2° utilities*	n/a	18
3° water^	0.1	2
4° treat^	<u>0.1</u>	<u>3</u>
Total	4.0	158

* Consumptive water: 2gal/kWhr and 0.9 gal/therm; ^ from CA Energy Comm study

A case study

(Sierra Vista, AZ)

- **June 2000**
 - Concern about reducing wasted water
 - City council mandated recirculation loops
 - Silent on pump choice
- **Late 2009**
 - Looked back
 - Examined 3,600+ building permits



Case study modeling

(Sierra Vista, AZ)

- Examine one housing unit in depth
- Conservative modeling
 - Official city data only
 - ‘gold standard’ of studies; EPA gathered
- Aggregate to community
 - Sensitivity analyses



A case study

(Sierra Vista, AZ)

- Reference point: standard plumbing

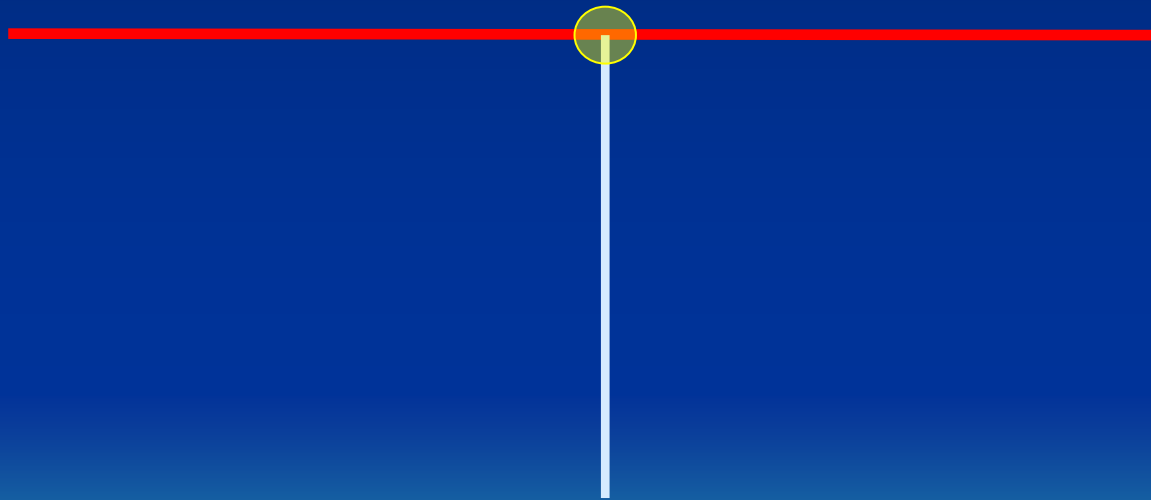


A case study

(Sierra Vista, AZ)

- Reference point: standard plumbing

Wasted Energy

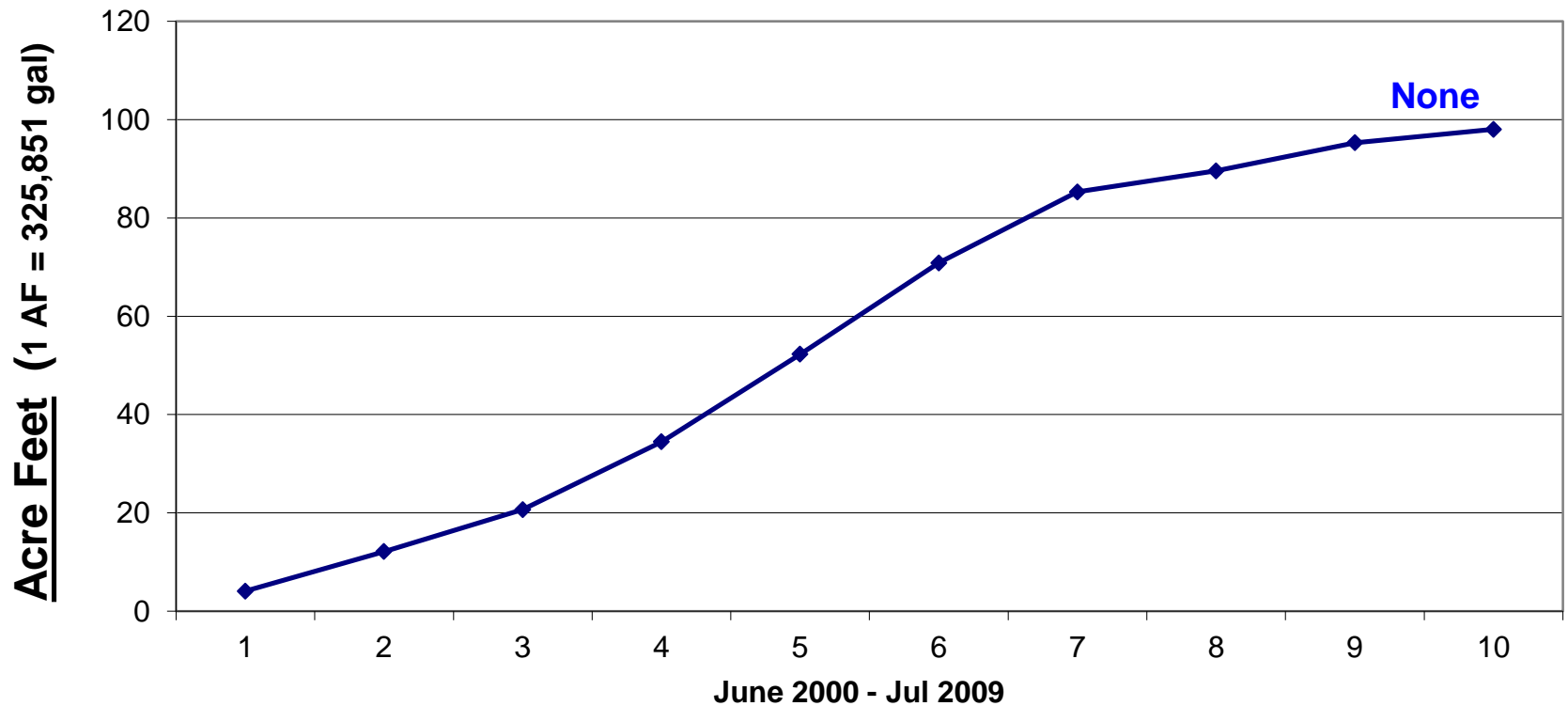


Wasted Water

Sierra Vista, AZ

(New residential construction permits; June 2000 – July 2009)

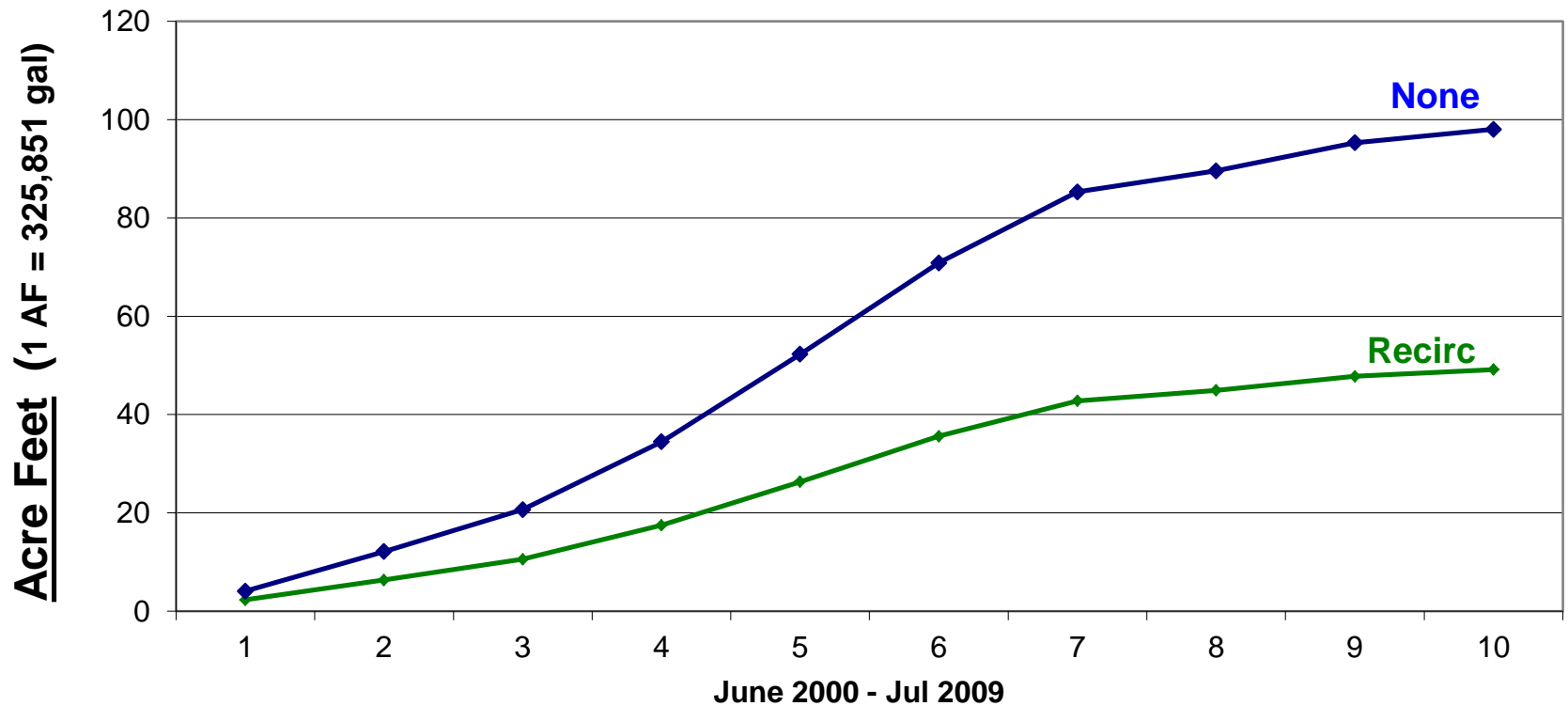
Annual Wasted Water



Sierra Vista, AZ

(New residential construction permits; June 2000 – July 2009)

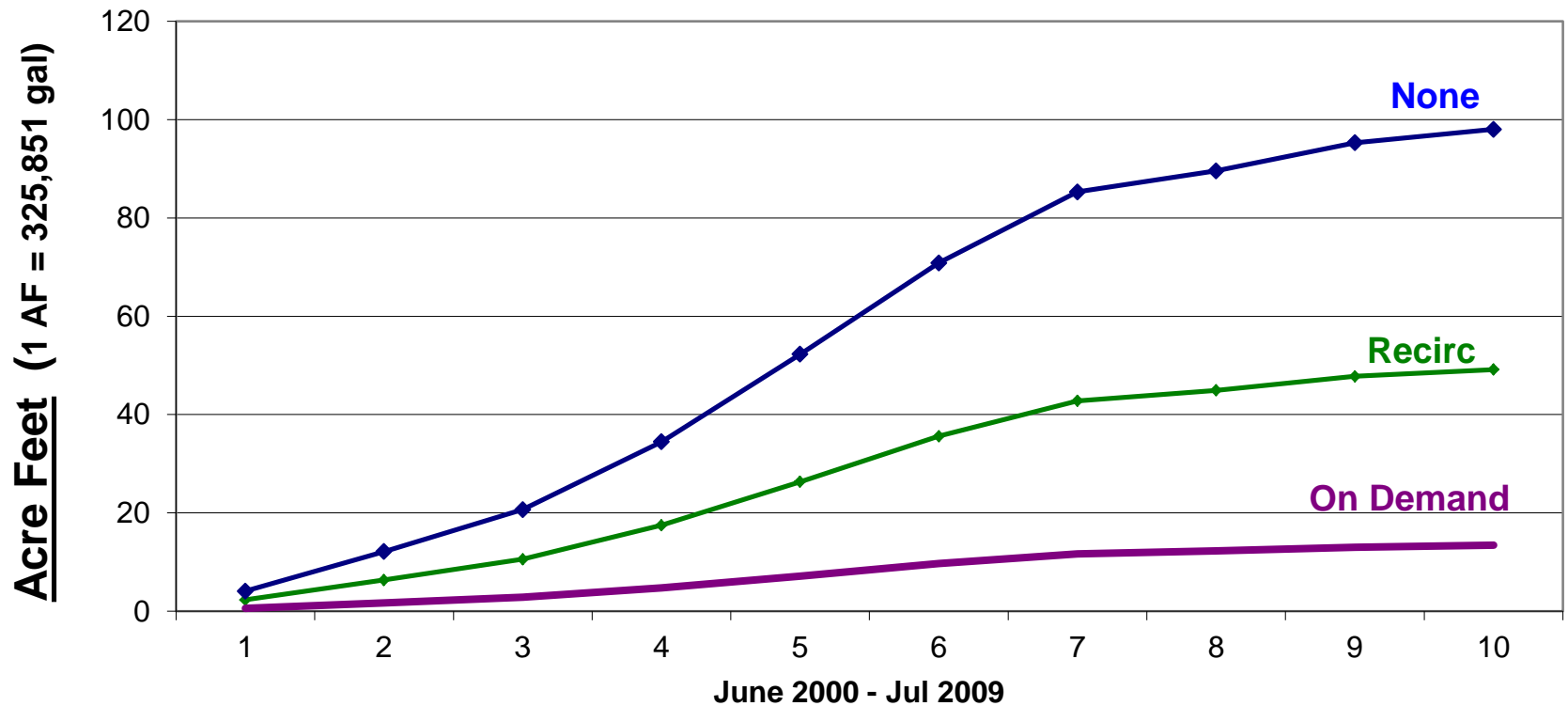
Annual Wasted Water



Sierra Vista, AZ

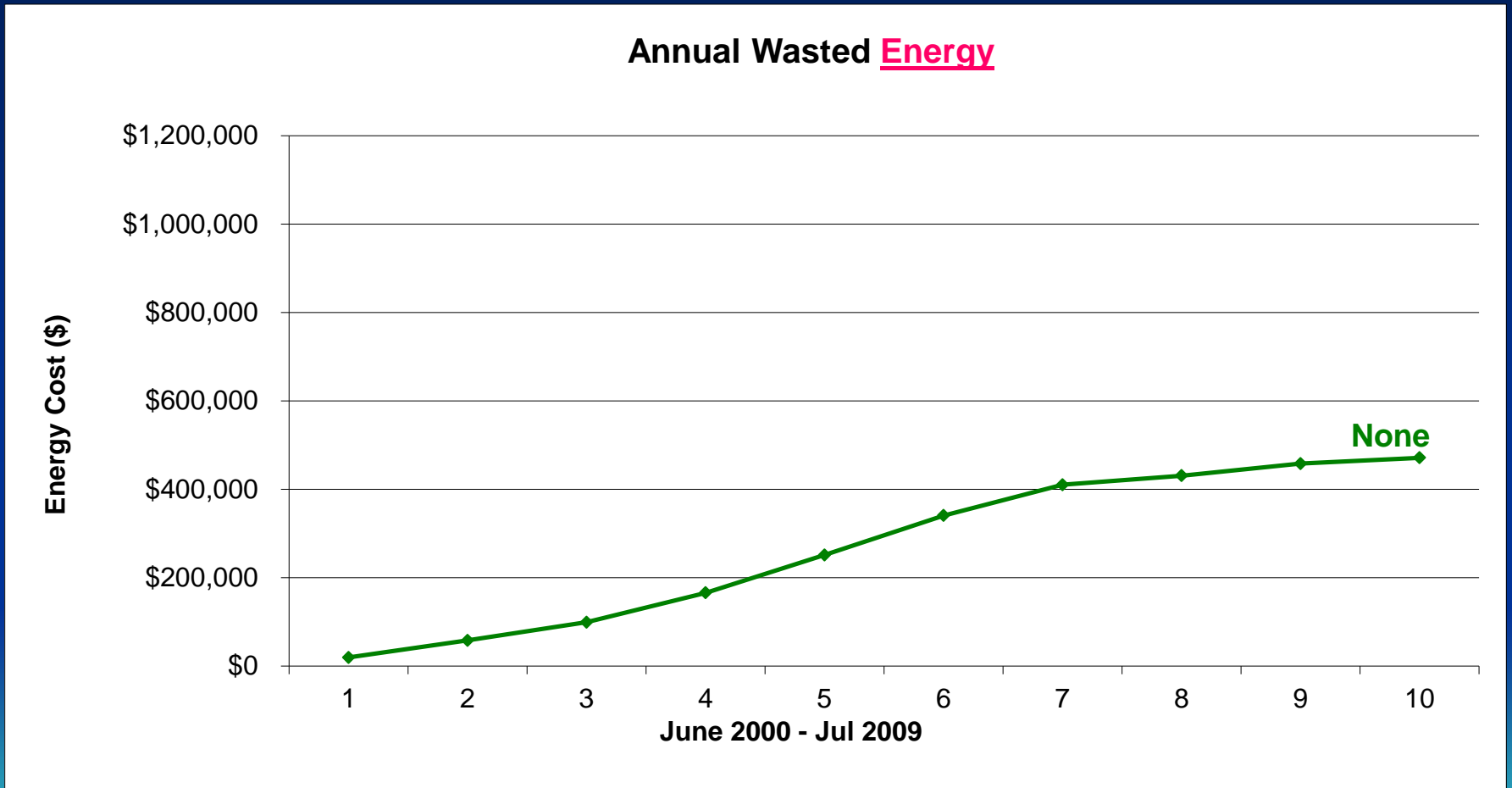
(New residential construction permits; June 2000 – July 2009)

Annual Wasted Water



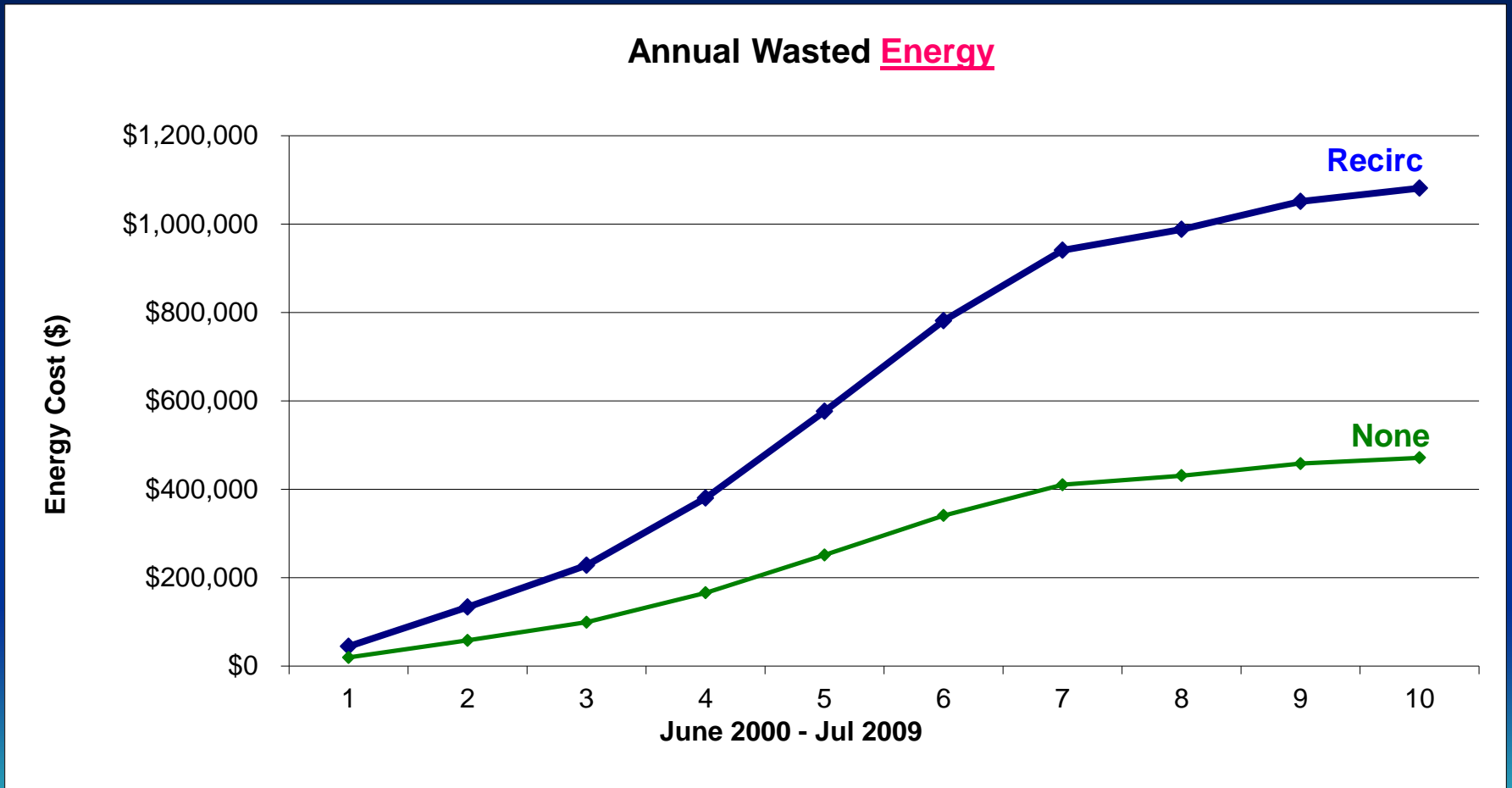
Sierra Vista, AZ

(New residential construction permits; June 2000 – July 2009)



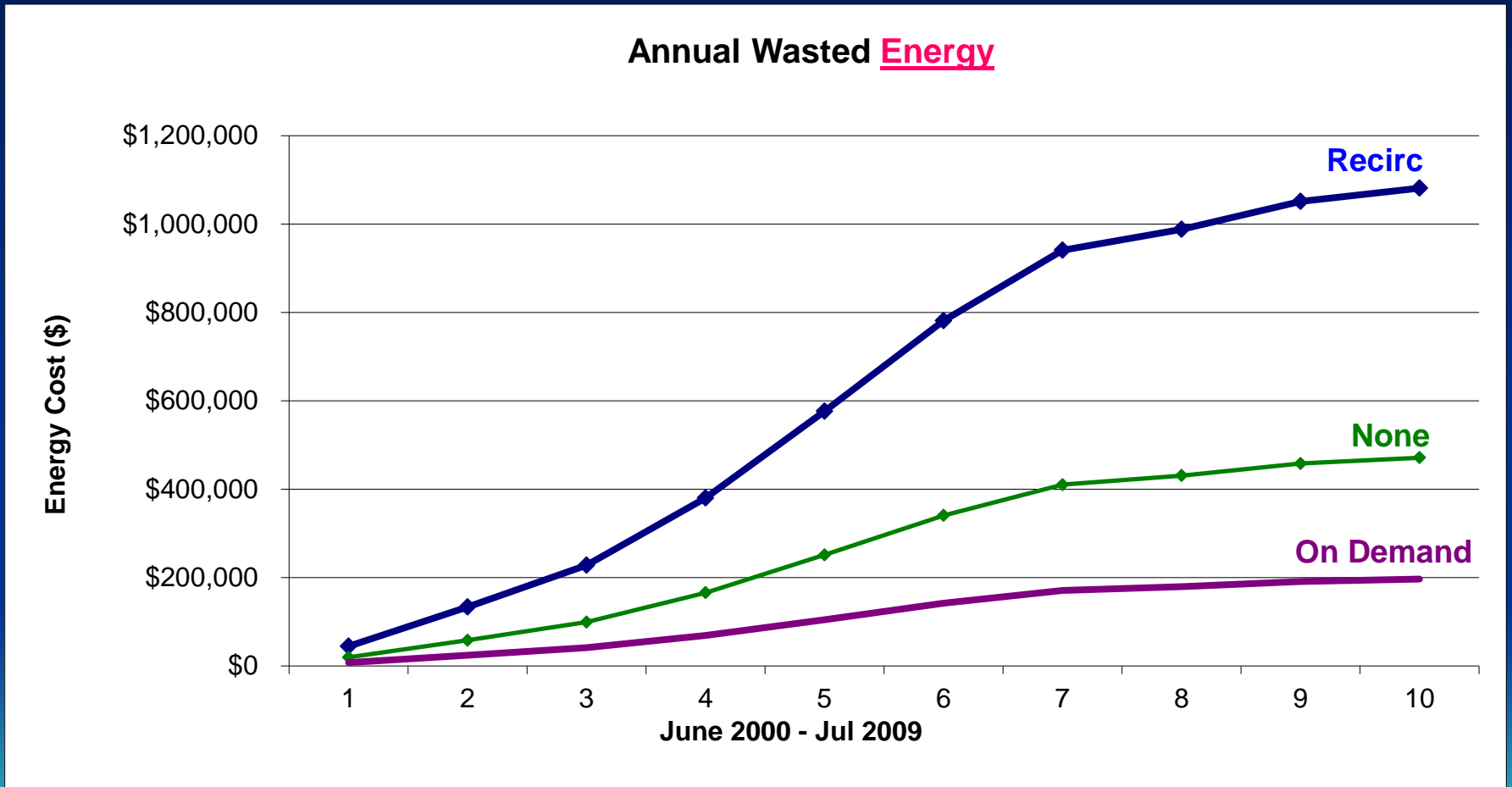
Sierra Vista, AZ

(New residential construction permits; June 2000 – July 2009)



Sierra Vista, AZ

(New residential construction permits; June 2000 – July 2009)



June 2000 Policy Consequences

(de facto policy became: timer pumps with recirculation line)

- Type pump timer
- Wasted water **-50%**
- Energy costs **+110%**
- Not using ~ 40%



June 2000 Policy Consequences

(de facto policy became: timer pumps with recirculation line)

<u>Type pump</u>	<u>timer</u>	<u>on-demand</u>
• Wasted water	-50%	-86%
• Energy costs	+110%	-58%
• Not using	~ 40%	

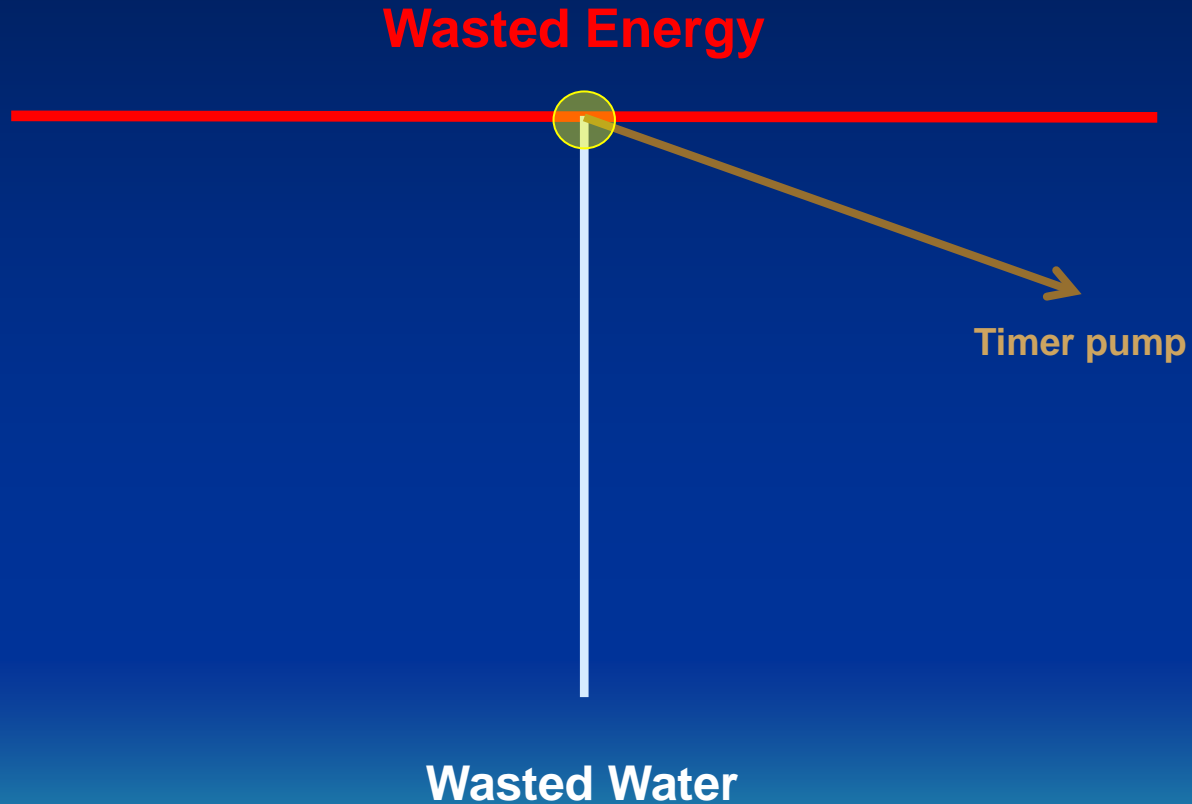
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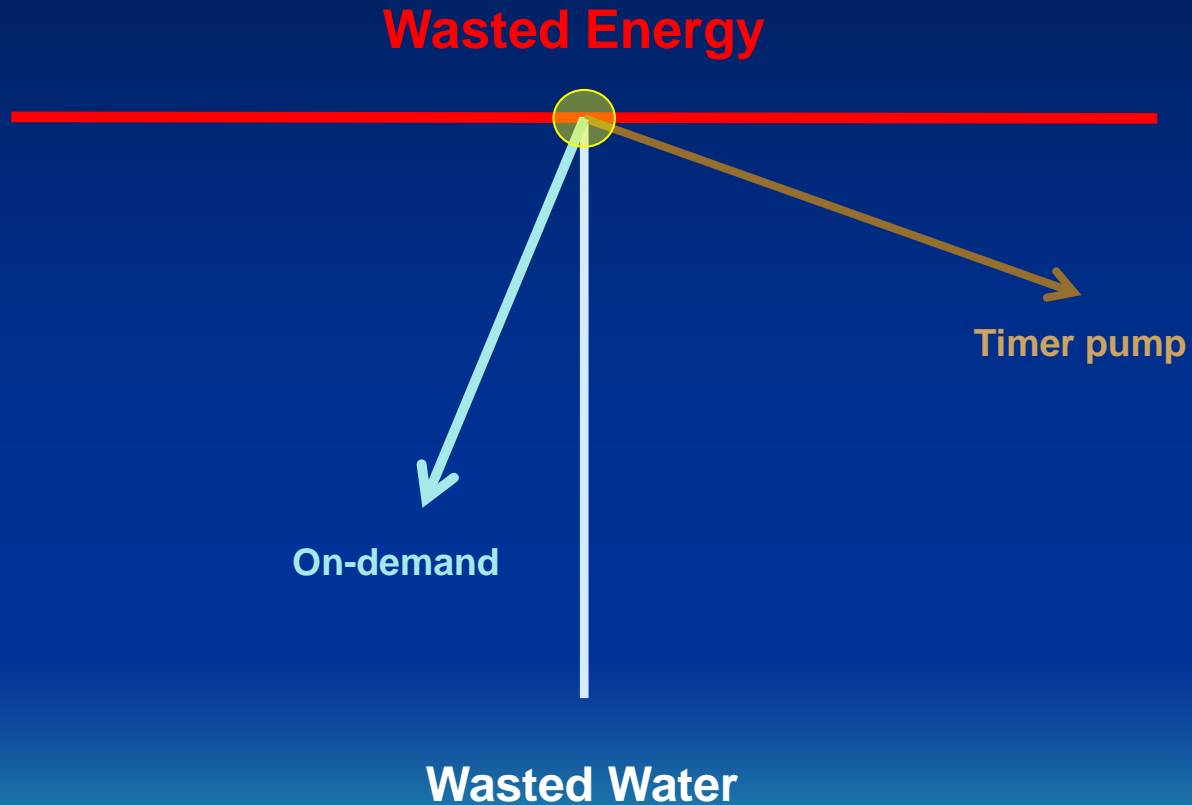
<u>Type pump</u>	<u>timer</u>	<u>on-demand</u>
• Wasted water	-50%	-86%
• Energy costs	+110%	-58%
• Not using	~ 40%	→ 0



Reference Point (Standard Plumbing)



Reference Point (Standard Plumbing)



Why on-demand pumps shine!

(Wasted energy & water: **electric** WH; annualized)

<u>Item</u>	<u>Standard</u>	<u>Timer*</u>	<u>On-demand</u>
• Install	\$0	\$800	\$800
• Energy, \$	\$152	\$787	\$76
• Water, \$	17	3	3
• Water, gal	8,700	1,200	1,200

* Timer pump operating 16 hours / day



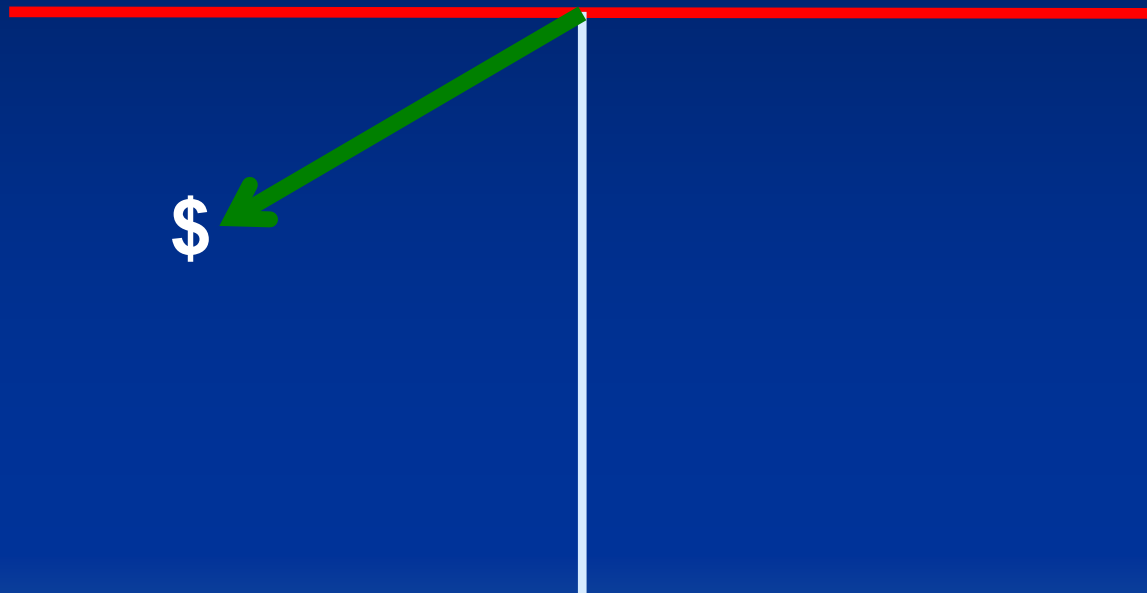
Lessons Learned

- Sierra Vista's 2000 mandate should have been:
 - Require on-demand pumps
 - Silent on dedicated recirculation lines
- 13-18 pumps offset water used by 1 new home
- $PV_{(\text{city's treat waste})} = \122 ; revenue neutral rebate
- On-demand pump dilemma:
 - *sticker shock versus value added*



Δ Mortgage vis-à-vis on-demand pump (An opportunity!)

Wasted energy



Wasted water

Δ Mortgage vis-à-vis On-demand Pump

- New construction
 - Builder: least-cost focus
 - Buyer: emotional / rational but unaware
- Trade off
 - Incremental (Δ) mortgage increase
 - No out-of-pocket expense
 - Utilities' cost avoidance



Δ Mortgage versus On-demand Pump*

(electric water heater; annualized)

<u>Item</u>	<u>Amount</u>
• Pump + install	\$800
• Δ Mort (15-yr, 4.75%)	-\$75
• Utilities conserved	\$106
• <u>Net savings</u>	\$31
• <u>and, water saved; gal</u>	6,100

* Based on 2010 EIA national energy costs, no local taxes; water & sewer = \$6/Kgal



Δ Mortgage versus On-demand Pump*

(natural gas water heater; annualized)

<u>Item</u>	<u>Amount</u>
• Pump + install	\$800
• Δ Mort (15-yr, 4.75%)	-\$75
• Utilities conserved	\$72
• <u>Net savings</u>	(\$3)
• <u>and, water saved; gal</u>	6,100

* Based on 2010 EIA national energy costs, no local taxes; water & sewer = \$6/Kgal



Conclusions

- Status quo has costs; baseline
- Water can be conserved while
 - Reducing total utility costs
 - Minimizing the ripple effect
- Δ mortgages / on-demand pumps = smart
 - \$0 out-of-pocket with a positive return!
- Need: consumer & builder education

