WAP
How Effective Are We?

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ENERGY OutWest

WAP-What is Our Goal?

- Installing measures?
- Sealing ducts?
- Replacing refrigerators?

Cost effectively reducing the energy burden of our clients.

Program Impact

- In WAP, we get a lot of feedback on measures; R-values, CFM50, pressure pan #, room pressures, computer software and on and on but…..

… how effective are we at reducing energy burden?

Measuring Effectiveness

- There is a real trend to improve our ability to measure (not just predict/estimate) the effectiveness of our programs.
  - DOE/Federal funding
  - DSM
  - State/local

What Do You Need to Measure Effectiveness?

- You need **data.**
  - Where you started (house as found).
  - What you did (measures installed).
  - What it cost.
  - What you saved (utility/energy use data).
- For us, collecting data became the key issue.

More and More Data

- Over the past years we have needed to collect more and more data for more and more people (federal, state, utilities).
  - Complex diagnostics and testing procedures.
    - Document results and insure compliance.
  - Invoicing
    - Who pays for what (with rehab, 6+ funding sources).
  - Justify funding (DSM).
    - What are you doing with my money?

Gathering Data Effectively

- It takes time ($$$) to collect data and send it to the various funding sources, each with varying needs and requirements.
  - Analysis of paper flow for a client though complete process (bill assistance and WAP) showed that a name and address were recorded (typed) up to 11 times.

Data Analysis Can Also Be a Mess

- Old way, paper, paper, paper – requires the extraction of the data from individual documents. (I've done this, it is not fun)

We Needed a New Way to Get Data

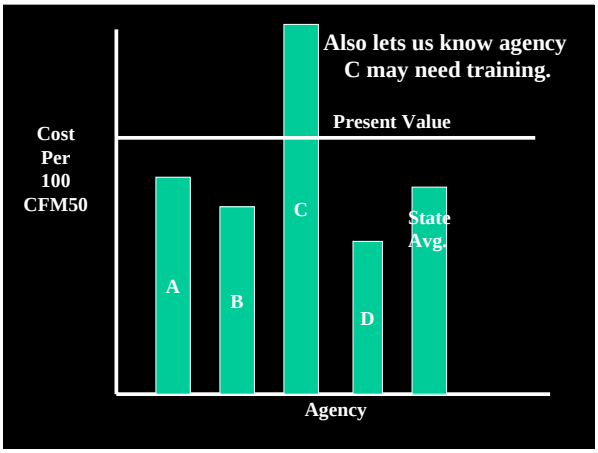
- Arizona has changed how we collect data and analysis effectiveness.
- Our goals:
  - Easy and simple for agencies (most important)
  - Right amount of data (why collect more than you need-only needs to cover the majority of jobs)
  - Keep it focused (not an invoicing/inventory or cost effectiveness tool).

How? www.azwap.org

- New way, web data base (started 7/1/05)– Data is collected on our web reporting system.
- All program participants can access data.
  - There are security protocols that limit agency and contractor access to only their jobs.
  - Once a job is completed, data can only be changed by Energy Office.

Data is Also a Great Training/Monitoring Tool

- We are also using this data to improve the effectiveness of what we do and how we do it.
  - Example - Query can be run on a variety of items; for example the average cost per CFM50 of duct leakage per agency or state-wide, how does this compare with present value of CFM50 of duct sealing.

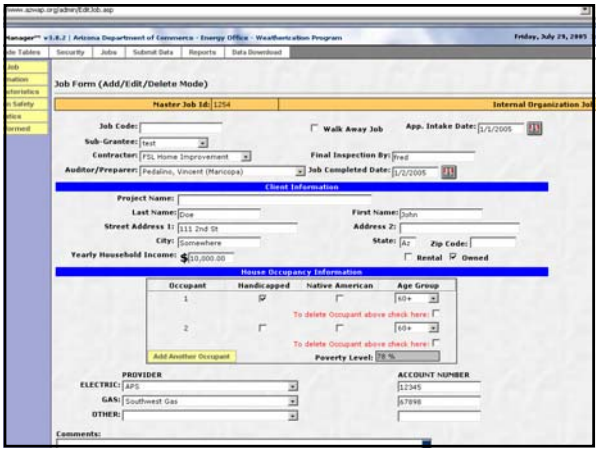


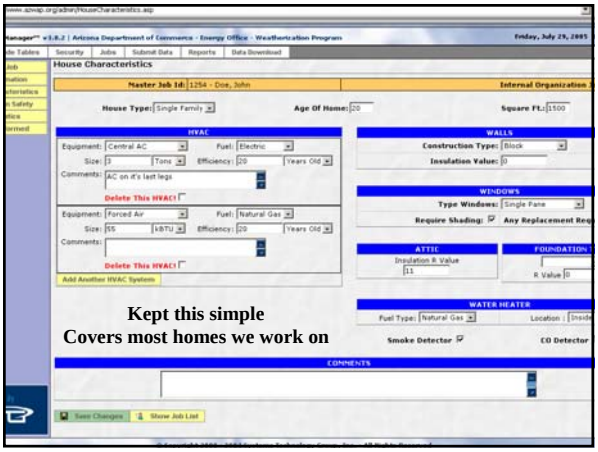
Web Reduces Work Load

- Data entered only once for all forms and users.
  - Greatly reduced the number of times a name and address are recorded.
- Different staff members can take responsibility for specific parts of the reporting process, all can access one file.
- Drop down menus for most entries.
- We can discuss data/issues, real time with agencies.
- Different entities only need access/download data needed.

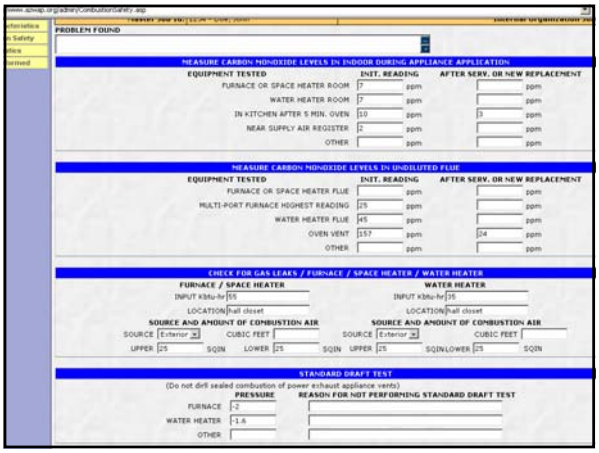
Web Report Format

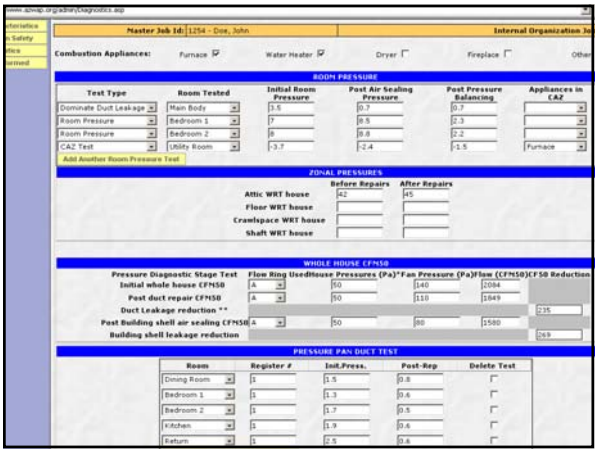
- Demographics (name, address, occupants, income, utility accounts #)
- House characteristics (as found)
- Diagnostics reports (pressure and CO)
- Work completed/cost

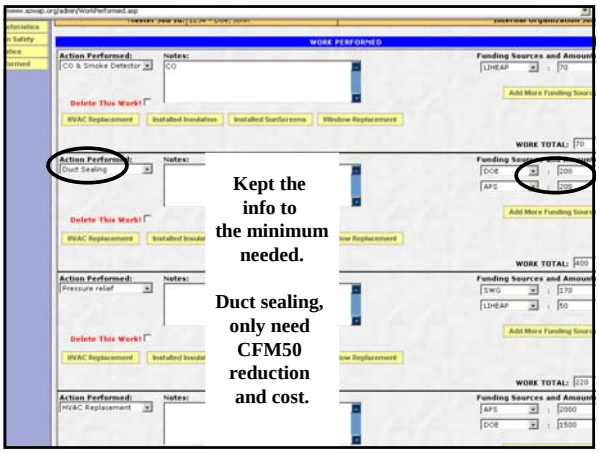


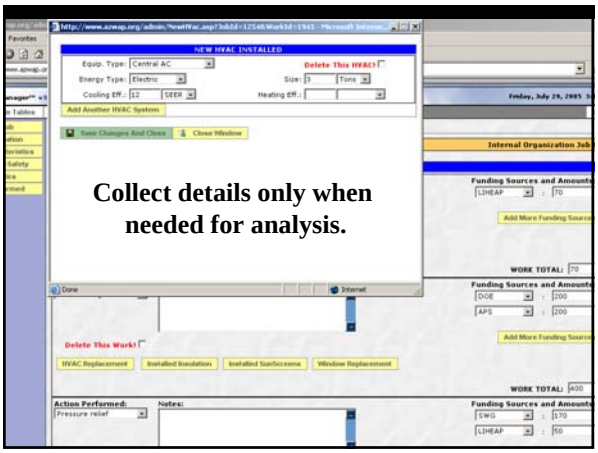


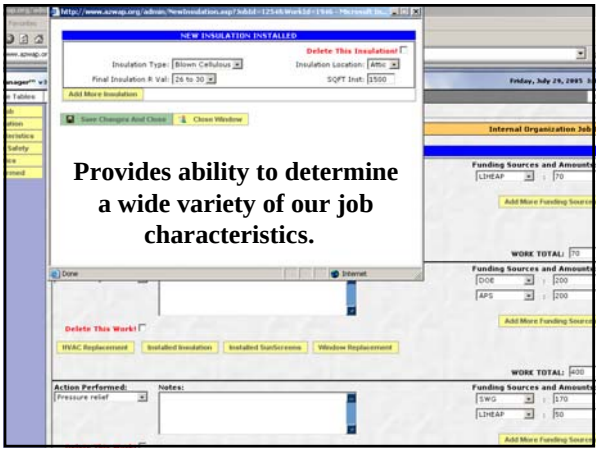
Kept this simple
Covers most homes we work on

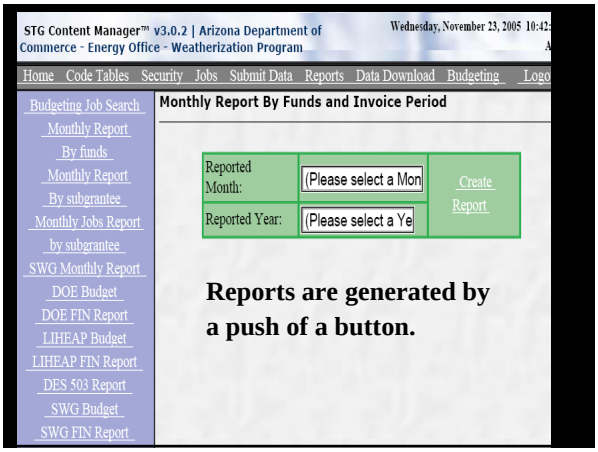












Data Base is Working

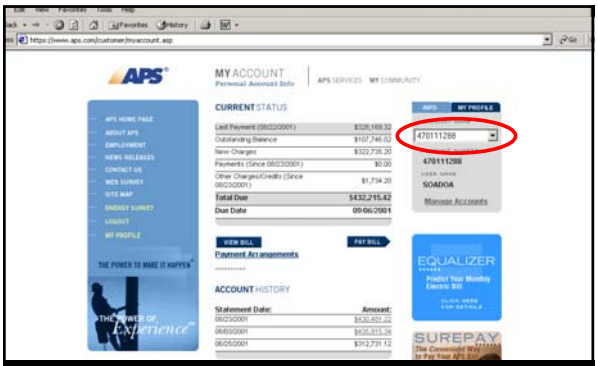
- The agencies like it, both field and office staff.
- Great tool for monitoring & reporting.
- Using to provide data for utility bill analysis.

Effectiveness

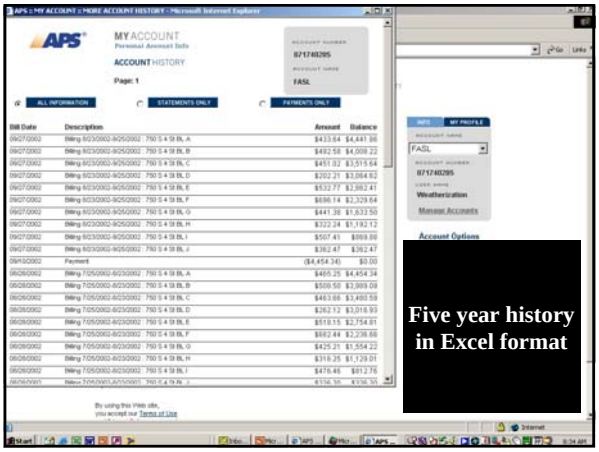
- Now that we know what we did and how much it cost, did we achieve our goal?
- Need to look at the bills to see impact on energy burden.

Utility Data

- We have developed a relationship with utilities to get data in a format that can be dumped into a spreadsheet.
- With our major utilities this is done over the web.
- Biggest issue to-date, three utilities merged, all data prior to merger is inaccessible. Greatly limited initial number of jobs reviewed.



We provide account number to utility, they load utility data on web (password protected)



Five year history in Excel format

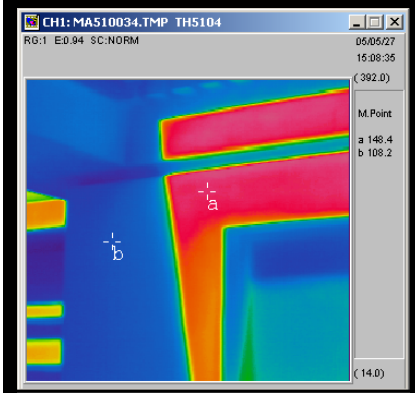
Utility Data is easily converted to a spreadsheet

	1999	2000	2001	2002	2003
Jan	1580.9	1650.41	1717.51	1706.64	1576.79
Feb	1441.6	1511.78	1523.79	1485.37	1449.21
Mar	1686.7	1904.13	1680.86	1744.15	1758.57
Apr	2064.6	2702.18	2434.62	2245.56	1756.26
May	3559	4304.16	4379.49	3065.68	3037.52
Jun	5383.4	5472.49	5056.97	4016.33	3491.86
Jul	6484.9	5429.73	5247.87	3860.77	3745.05
Aug	6361.1	6566.62	6050.38	4609.58	4705.3
Sep	5260.1	4952.66	5186.72	3832.81	3838.1
Oct	3050.5	3471.33	3518.97	2644.71	3003.6
Nov	2152.2	1727.36	2135.01	1681.74	2092.98
Dec	1668.7	1727.41	1780.71	1628	1795.61
	40694	41420.26	40712.9	32521.34	32250.9

Weather Normalizing Data

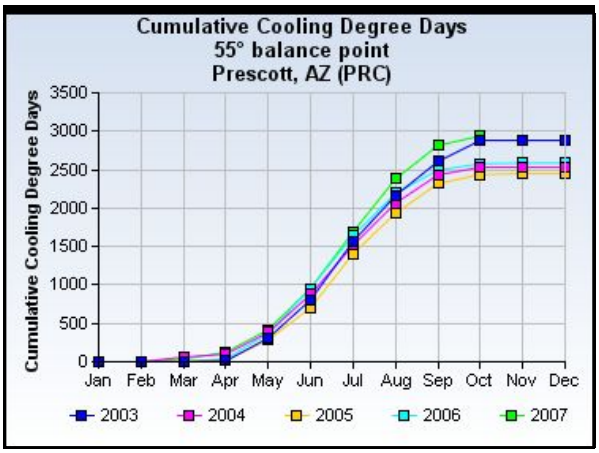
- When comparing utility data from one year to the next, need to factor out differences in weather.
- www.weatherdatadepot.com – good site for Degree Day data.
- CDD is just ambient temperature, not absolute difference, solar load remains constant from year to year. **CDD differences is not an absolute!**

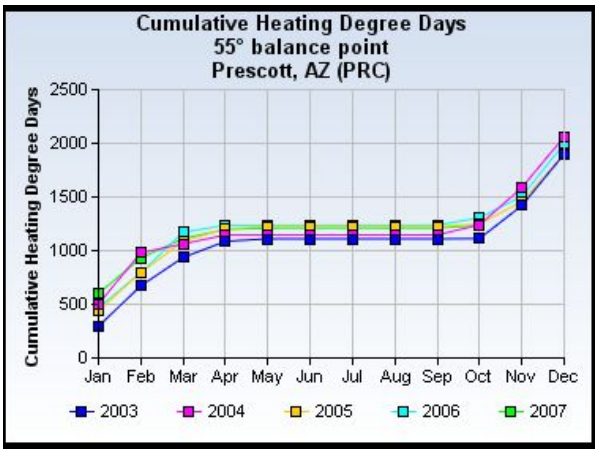
Partial Shaded Wall



Shaded - 108
Sun - 148

Heat flow (delta T) on sun struck wall is more than double shaded wall.





Weather

- I try to use a pre WAP year (I usually get 3 or 4 years of pre WAP data) where the HDD/CDD values are close to post WAP year.
- Again, this is more important with heating.

Other Issues

- Occupant changes (number of people increasing/decreasing)
- Other physical changes to the structure (appliances, additions…)
- Lack of data (new account, shut off…)

The more data, the easier it is to see the noise! Too much noise, don't use!

Get as Much Data as Possible

- Now I can get five years of data.
- Allows me to look at 3 before work, and one after work. Eliminate year work was competed.
- Gives a better indication that nothing has changed.
- If there are large swings in usage prior to work, difficult to use this data. What is causing changes?

Example

- Year 1 – 9,000 kWh
- Year 2 – 13,000 kWh
- Year 3 – 11,000 kWh
- Year 4 – work completed
- Year 5 – 7, 000 kWh

What is your base consumption?

What are your savings?

Example

Lower away!
An air conditioning unit is lowered by crane onto the roof of an apartment as part of a weatherproofing project for low-income housing in Avondale Feb. 21.

50 unit senior housing project

Project cost of $90,000

New AC units, duct sealing, pressure balancing and attic insulation.

Utility Data (50 units combined): Work completed in April

	1999	2000	2001	2002	2003
Jan	1580.9	1650.41	1717.51	1706.64	1576.79
Feb	1441.6	1511.78	1523.79	1485.37	1449.21
Mar	1686.7	1904.13	1680.86	1744.15	1758.57
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Jun	5383.4	5472.49	5056.97	4016.33	3491.86
Jul	6484.9	5429.73	5247.87	3860.77	3745.05
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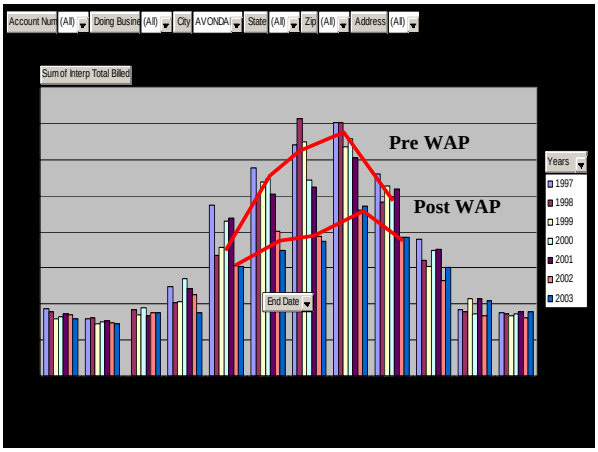

Results
Electric Only

- Pre WAP average of about $41,000 per year for 50 units.
- Post WAP average of about $32,400 per year for 50 units.
- Yearly saving of $8,600 per year.
- Present value of saving = $103,000
- SIR of 1.14 on electric savings only.

38 Home Analysis

- **Results Summary**
  - The SIR for funds spent on diagnostics, energy measures and health and safety measures was 1.17.
  - The SIR for funds spent only on diagnostic and energy measures was 1.39.

Evap to AC

- 19 unit apt. complex converted by owner from evaporative cooling to AC (10 SEER).
- WAP came in after AC install (duct sealing, insulation, pressure)
  - Average annual increase in electric usage of 2750 KWH ($250)
  - Average annual decrease in natural gas of 100 therms ($125)
  - Annual water savings assumed to be $100 per year

If owner would have installed 12 SEER units total utility cost would have been a wash.

Why Are We Doing This?

- Fine tune what we do and how we do it.
- In today's funding environment, we need to prove we are **worth** the investment.