

## Proposed Savings Methodology for EZConserve's Surveyor Software

Kenneth Anderson  
NW Energy Efficiency Alliance

The Surveyor software allows a network operator in a commercial facility with networked personal computers and monitors to set the power management features and to remotely turn-off the computers and monitors when they are not needed.

Because EZConserve's Surveyor is a new energy saving technology, the Northwest Energy Efficiency Alliance (Alliance) has retained an independent evaluation contractor, Quantec, LLC, to do a field verification of the energy savings. Until that study is complete the Alliance has used the following equation to determine an average estimated energy savings per computer and monitor where the EZConserve, Inc. Surveyor software is installed. This equation comes from the Lawrence Berkeley National Labs paper, LBNL-45917, "Electricity Used by Office Equipment and Network Equipment in the U.S.: Detailed Report and Appendices," by Kaoru Kawamoto, and others (Kawamoto-2001).

Unit Energy Consumption (UEC) is the average annual energy used by a computer or a monitor. UEC can be described by Equation 1.

$$\text{Equation 1} \quad \text{UEC} = (\text{SPM} \times (\text{PA} \times \text{HA} + \text{PL} \times \text{HL} + \text{PO} \times \text{HO}) / 7) \times 365 / 1000 + \\ ((1 - \text{SPM}) \times \text{PA} \times (\text{HA} + \text{HL}) + \text{PO} \times \text{HO}) / 7) \times 365 / 1000 + \text{EPC}$$

where

- UEC = Unit Energy Consumption for equipment type (kWh/year)
- PA = Average active mode power for computer or monitor (Watts)
- PL = Average low-power mode power for computer or monitor (Watts)
- PO = Average off mode power computer or monitor (Watts)
- HA = Hours of operation in active mode for computer or monitor (hours/week)
- HL = Hours of operation in low-power mode for computer or monitor (hours/week)
- HO = Hours of operation in off mode for computer or monitor (hours/week)
- SPM = Power-management-enabled rate for computer or monitor (%)
- EPC = Extra energy for printing or copying (kWh/year) (Zero for computers and monitors)
- 365 = days per year
- 7 = days per week

To determine savings, we first determine a typical or current UEC for both a computer and a monitor. Then we estimate how Surveyor will modify one or more of these variables to determine a Surveyor UEC. The difference between the typical UEC and the Surveyor UEC is the estimated energy savings.

### Typical UEC

A typical UEC is calculated by determining a typical or current value for each of the eight variables in Equation 1. Research investigators at Lawrence Berkeley National Labs and Arthur D. Little have completed several field surveys to determine typical values for these variables.

Table 1 -- Typical Current Values

	Computer	Monitor		Reference
PA	70	65	Watts	(Roberson-2002-Draft)
PL	9	5	Watts	(Roberson-2002-Draft)
PO	3	1	Watts	(Roberson-2002-Draft)
HA	98.4	62.9	Hours/week	(Roth-2002)
HL	7.2	57.7	Hours/week	(Roth-2002)
HO	62.4	48.0	Hours/week	(Roth-2002)
SPM	25%	60%		(Kawamoto-2001)
EPC	0	0	kWh/year	(Kawamoto-2001)

With these typical variables the typical UEC is 692 kWh/year for the desktop computer and monitor combined.

### Surveyor UEC

The next step is to determine which variables the Surveyor software can change if it is activated. Surveyor cannot change the typical equipment power levels found in the field, so PA, PL and PO are essentially constants. However, Surveyor can reduce the hours of use per week and increase the percentage of computers and monitors using Power Management.

How Surveyor will reduce hours depends on the current work habits of the computer users and how much change they will allow. Since no data has been gathered yet on how business and network managers will use Surveyor, the Alliance has made some reasonable assumptions for establishing typical energy savings. The Alliance assumed that aggressive settings for Power Management and turning-off the equipment at night could reduce 25 Active Hours (HA) per week, from 98.4 to 73.4 hours per week for the computer and 20 HA hours per week from 62.9 to 42.9 for the monitor.

The Surveyor also has the capability to increase the SPM or Power Management enabled percentage. An EPA study (EPA-2000) on 300 monitors in USDOE's Office of Energy Efficiency and Renewable Energy office building found that only 30% of monitors had enabled power management. Three months after the EZSave software (enables Power Management in monitors only) was implemented, 85% of all monitors were enabled and still using the EZSave power management settings. Therefore, the Alliance has assumed that EZConserve's Surveyor will move the SPM for computers from 25% currently enabled to 85% and monitor SPM will go from 60% currently to 85%.

Table 2 -- EZConserve Surveyor Values

	Computer	Monitor		Reference
PA	70	65	Watts	(Roberson-2002)
PL	9	5	Watts	(Roberson-2002)
PO	3	1	Watts	(Roberson-2002)
HA	73.4	42.9	Hours/week	(Alliance-2002)
HL	7.2	57.7	Hours/week	(Roth-2002)
HO	87.4	68.0	Hours/week	(Alliance-2002)
SPM	85%	85%		(Kawamoto-2001)
EPC	0	0	kWh/year	(Kawamoto-2001)

Based on these assumptions the computer and monitor will have a combined UEC of 479 kWh/year.

### Surveyor Estimated Energy Savings

Given that the typical energy use (UEC) for a current desktop computer and monitor is 692 kWh/year and that the Surveyor UEC is 479 kWh/year, the calculated Surveyor electrical energy savings is 213 kWh/year. Until the independent evaluation and field tests of the Surveyor are completed, the Alliance currently assumes energy savings of 200 kWh/year per computer and monitor.

### References

**Kawamoto-2001** - Kawamoto, Kaoru, Jonathan G. Koomey, Bruce Nordman, Richard E. Brown, Mary Ann Piette, Michael Ting, and Alan K. Meier. 2001, "Electricity Used by Office Equipment and Network Equipment in the U.S.: Detailed Report and Appendices." Energy Analysis Department, Lawrence Berkeley National Laboratory, Berkeley, CA. LBNL-45917, February, 2001.

**Roth-2002** - Roth, Kurt, W., Fred Goldstein, and Jonathan Kleinman. 2002, "Energy Consumption by Office and Telecommunications Equipment in Commercial Buildings, Volume I: Energy Consumption Baseline, Arthur D. Little, Inc. Cambridge, MA No. 72895-00, January, 2002.

**EPA-2000** – “Case Study: Automatic Activation of Energy Star Features in Monitors at US DOE’s Energy Efficiency and Renewable Energy Office.” Air and Radiation (6202J) Draft, December 2000.

**Roberson-2002** – Private conversation with Judy A. Roberson on work in draft.