

ESTABLISHING A WATER EVAPORATION CREDIT PROGRAM

ABOUT THE AUTHOR

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ABOUT TRIDENT NETWORK

Operating out of Frisco, TX, Trident Network is a service provider and system integrator that develops and assembles Machine-to-Machine (M2M) devices that remotely read sub-meters. Their MeterReader™ provides wireless access to multiple sub-meters and can measure Itron enabled water, electric or gas meters. Other brands will be accessible later in 2016. An integrated overflow sensor, "High & Dry" can also report cooling towers that reach overflow status or detect water leaks, helping to stop wasted water that might otherwise go undetected.

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WHAT ARE EVAPORATION CREDITS?

Evaporation credits, also known as sewer credits or evaporative credits, are offered by some water and sewer utility companies to allow for water volume that evaporates from cooling towers, evaporative condensers, irrigation systems, large humidifiers or ice machines. Most water and sewer utilities base sewer charges on water consumption. If 10,000 gallons of water flow through the water meter, it is assumed by the utility company that 10,000 gallons will be discharged to the sewer system. However, when evaporative equipment is in use and is on the customer side of the main water meter that assumption may not be correct, resulting in customer's paying for sewer services not used.

This white paper will explore the reasoning behind, basic design and installation of equipment necessary to capture evaporation credits, along with calculations for a typical installation. The availability of credits varies across the country and may depend on the sewer rate structure of the local utility. Some utilities have very specific written requirements for credits, while others may simply use a formula to estimate the volume of water that evaporates from a customer's site. Many utilities that do allow credits require customers to purchase and install utility meters so that they can be read with, and are compatible with, the utility's automatic meter reading (AMR) or radio systems. Some require customers furnish sub-meters in the same units the utility uses (gallons or cubic feet), and read and report the sub-meter readings monthly, quarterly or annually. There may be a monthly or annual administrative charge added to the water or sewer bill to cover the utility's handling of sub-meter readings and associated billing details.

Water cooled refrigeration and air conditioning systems are generally very efficient compared to air cooled equipment. There are hundreds of thousands of cooling towers and evaporative condensers in service around the world. When cooling season begins or summer temperatures climb, water use and associated costs increase as outdoor temperature rises. Since most water and sewer utilities calculate sewer charges based on water consumption, sewer bills also increase dramatically.

Sewer credits are often included in city ordinances or utility policies. Some details can be found through internet searches such as "*cooling tower evaporation credits*" or "*cooling tower sewer credits*". Others are buried within a maze of city departments or may be informal and known by only certain city or utility staff members. Persistence and patience are helpful when tracking down sewer credit details.

THE BUSINESS CASE

Evaporation credits can be a little known financial advantage for businesses that operate cooling towers or other evaporative equipment. Where allowed by local utilities, evaporation credits or sewer credits can dramatically reduce the impact of water cooled system operating costs and sewer charges. Sewer credits are often overlooked or misunderstood. Consider a business where profits are generally driven by sales. In many cases, sales volumes of \$20 to \$30 are required to produce \$1 in operating profit. So annual sewer credits of \$10,000 can create the same profit as \$200,000 to \$300,000 in sales. Regardless of sales volumes, sewer credits can be a great option to boost operating profits.

Robert developed a national Evaporation Credit Program for a national, big-box retailer over a 4-year period as part of a multi-year facility management engagement. That retailer is realizing over \$500,000 in annual savings with sewer credits from 90 sites with cooling towers. Just one cold storage warehouse reduced their annual sewer costs from 97% of their water costs to 51%. A grocery store in California recovered 90% of their equipment investment in the first three months of operation. Additional annual savings examples are listed in Figure 1.

EVAPORATION CREDIT SAVINGS

Facility	City	ST	Annual Savings
Grocery Store	Brentwood	CA	\$31,140
Grocery Store	Placerville	CA	\$30,123
Retail Store	Aventura	FL	\$22,153
Cold Storage Warehouse	Dallas	TX	\$16,554
Retail Store	Sarasota	FL	\$14,178
Retail Store	Fort Myers	FL	\$13,111
Retail Store	Florence	KY	\$12,888
Retail Store	Coral Springs	FL	\$11,532
Retail Store	Hialeah	FL	\$11,371
Retail Store	Langhorne	PA	\$9,731

Figure 1

Savings realized can fund energy projects or reduce operating costs. Equipment costs required to capture sewer credits are relatively low, with return on investment (ROI) typically between 6 and 24 months. Perhaps the biggest advantage is the perpetual nature of sewer credits – if managed properly, credits usually recur year after year.

LEED IMPLICATIONS

Installing sub-meters on cooling towers can also qualify for up to two points toward LEED certification for existing buildings. In LEED for Existing Buildings: Operations & Maintenance - Recertification Guidance, October 2013, continuous metering of water used for cooling towers with data logging can qualify for up to two LEED points. See Water Performance Measurement under *Water Efficiency details, page 42* for more information.

SITE BY SITE EVALUATION

The decision to install equipment to capture evaporation credits should be based on several factors:

- Local utility rates, especially sewer charges
- Annual sewer credit estimates
- Building location – southern climate, northern climate, etc.
- Normal hours of evaporative equipment operation – longer hours, higher potential.
- Size of cooling tower or evaporative equipment (total water consumption)
- Utility requirements – fees, application, engineered drawings, etc.
- Reporting requirements – monthly, annual, city reads, etc.
- ROI – expected recovery of investment

Properly researched and evaluated, evaporation credits can produce a stream of revenue from existing sewer budgets or expenses, allowing the redirection of those funds to new facilities or equipment upgrades. Savings are perpetual provided the program is monitored and managed. In addition, savings will grow as sewer rates increase from year to year. A typical Site Evaluation is shown in Figure 2.

SITE EVALUATION

STENAME Northern CA													Date
Address													
Qty, ST & Zip													
2013	January	February	March	April	May	June	July	August	September	October	November	December	TOTALS
\$ (SEWER)	\$5,918	\$5,740	\$5,744	\$5,230	\$6,610	\$6,769	\$7,829	\$8,665	\$8,473	\$6,577	\$5,283	\$5,013	\$77,851
\$ per GAL	\$0.011557	\$0.011555	\$0.011560	\$0.011559	\$0.011554	\$0.011552	\$0.011552	\$0.011549	\$0.011548	\$0.011554	\$0.011561	\$0.011558	\$0.011554
Gallons	512,065	496,774	496,906	452,513	572,112	585,938	677,669	750,249	733,742	569,181	456,948	433,742	6,737,839
KGAL (WATER)	512	497	497	453	572	586	678	750	734	569	457	434	6,738
Gallons	512,065	496,774	496,906	452,513	572,112	585,938	677,669	750,249	733,742	569,181	456,948	433,742	6,737,839
\$ (WATER)	\$2,001	\$1,929	\$1,964	\$1,778	\$2,215	\$2,253	\$2,608	\$2,860	\$2,784	\$2,206	\$1,809	\$1,689	\$26,106
\$ per GAL	\$0.003908	\$0.003884	\$0.003952	\$0.003929	\$0.003871	\$0.003845	\$0.003849	\$0.003812	\$0.003795	\$0.003875	\$0.003960	\$0.003871	\$0.003875
Sewer Cost =										298%		of water	
POTENTIAL SAVINGS		Install ROI	Months										
Reduce sewer by 30%	\$23,355	0.39	4.7										
Reduce sewer by 40%	\$31,141	0.30	3.6										
Reduce sewer by 50%	\$38,926	0.24	2.8										
Estimated Equipment Costs:													
1) Meters, MeterReader												\$4,425	
2) Installation												\$3,860	
3) Monitoring & Reporting												\$939	
TOTAL												\$9,224	

**ROI Estimates
Based on Prior
Experience**

**Sewer Costs
Relatively**

**Water & Sewer
Volumes Identical**

Figure 2

Applications, procedures, equipment specifications, meter reading schedules and reporting requirements vary. Where credits are not currently allowed, a formal appeal may be helpful. A California water utility's customer service department stated via phone no credits were allowed. A written appeal to the Utility Director resulted in approval and expected annual savings of over \$30,000 for one building. Savings can range from a few thousand dollars per year to over \$30,000 per year, with ROIs from a few months to twenty-four months. Credits may also be available for irrigation and large humidifiers and could apply to the waste water stream from reverse osmosis units if re-directed for alternative uses. The savings make evaporation credits very attractive for building owners willing to investigate the possibilities.

EQUIPMENT REQUIRED

Most water utilities require from one to three sub-meters installed to qualify for sewer credits – the most common configuration is two, one on the makeup line, another on the bleed or blow-down line. City furnished sub-meters are common, allowing the City to read the meters remotely with their equipment. Where customer meters are required, those should generally match the requirements and billing units of the utility.

Some utilities will read sub-meters with their automatic meter reading (AMR) system or radio based system. Others require customers to read and report meter readings regularly. Most companies accept reports through email, some require readings to be posted on their website; a few require a special form or faxed form each month.

Some customers have a staff member on site physically read and report their sub-meter readings. But due to the location of most sub-meters (equipment rooms, ceilings above other equipment), this method is very inefficient and can be unsafe, so it has become less attractive. In addition, if a staff member forgets or misses a monthly report, credits can be lost for two consecutive months. M2M solutions are much more effective and reliable.

Sub-meters must generally record in the same units used by the utility – gallons or cubic feet. A conversion formula may be allowed, but the results can create confusion in the utility company's billing department which often leads to billing errors. A Washington utility regularly converted sub-meter readings from gallons to cubic feet. However, the sub-meter registered in cubic feet, so the conversion was not required. A compromise covering 18 months resulted in a credit of over \$5,900.

SYSTEM DESIGN OPTIONS

There are generally three methods of metering cooling towers:

- One Sub-meter on the tower makeup line
- One sub-meter on the tower makeup and a second sub-meter on tower bleed or blow-down.
- Makeup meter, bleed meter, and third meter on the tower drain.

One Louisiana utility requires no meters at all, just proof the building has a cooling tower. Once convinced, a reduction in the sewer rate for that building is loaded into their billing system – credits are reported in the form of reduced sewer charges from that point forward.

Some utilities specify one sub-meter on the tower makeup line. The entire volume of make-up water qualifies for credits in some cities; others apply a multiplier to allow for the bleed or blow-down water that returns to the sanitary sewer system. For example, a Missouri city reduces the tower makeup water volume by 25% to allow for blow-down before the annual credit is issued.

Most utilities require two sub-meters – one on the makeup line and a second meter on the tower bleed as shown in Figure 3. Evaporation is calculated by subtracting the bleed volume from the makeup volume. The balance is evaporation or drift, and is not subject to sewer charges.

Typical Cooling Tower with Evaporation Meters & Cellular Transmitter

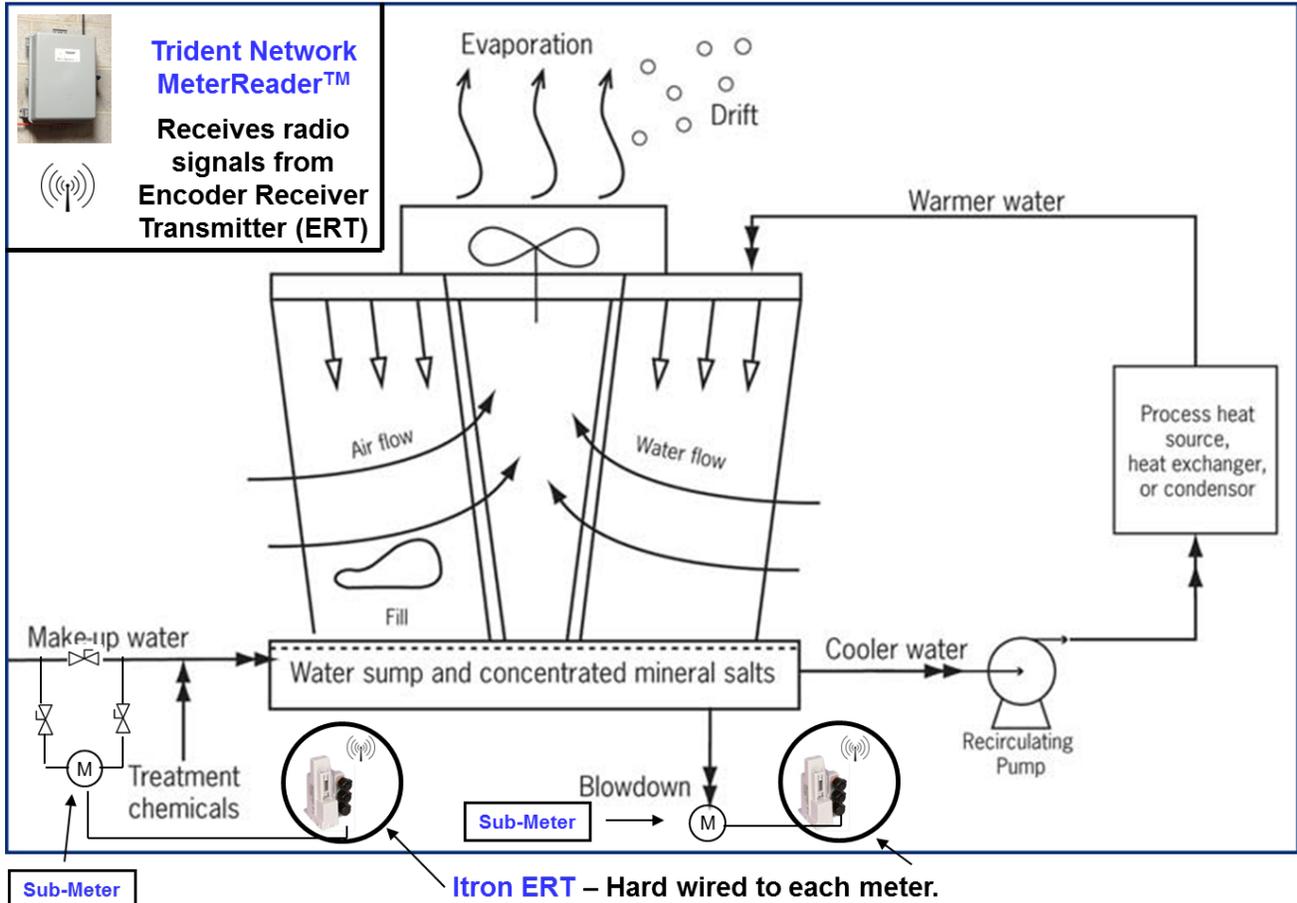


Figure 3

A few cities require a third sub-meter on the tower drain line. This meter usually captures water drained from the tower, water that overflows from the tower pan, and will often capture water discharged from a sand filter. The total volume of the drain meter is subject to sewer charges and will be deducted from sewer credits. A major city in Texas requires tower drains be re-piped through a sub-meter before sewer credits are approved. In some instances, the tower drain and blow-down lines can be combined into one line with one sub-meter.

TOTAL PROGRAM MANAGEMENT

Sewer credits produce great returns, but they may not be automatic. Most credits are calculated and posted to utility bills manually. Meter reading errors and billing errors can reduce savings from thousands of dollars per year to a trickle. Following are some examples:

- One Rhode Island site received \$401 one year until corrected to over \$4,000.
- The Manager of a Florida site retired – the company lost over \$20,000 in credits the following 16 months.
- Regular site and billing reviews for a major retailer produced an additional savings of almost \$32,000 over twelve months for just nine sites. Refer to Figure 4 below for additional savings details:

ADDITIONAL RETAIL

- Ø **Warwick, RI – additional \$3,440 credit. City calculation issue.**
- Ø **Hermitage PA – additional \$472 credit.**
- Ø **Toledo OH – additional \$319 credit.**
- Ø **N. Little Rock, AR – additional \$2,012 credit. City calculation issue.**
- Ø **Florence, KY – additional annual credit from Sewer District - \$4,700.**
- Ø **Springfield, MO – additional \$564 credit. City calculation issue.**
- Ø **Winston-Salem, NC – 2013 credits not posted - \$6,402 recovered.**

Total Additional Savings =

\$21,007

Figure 4

The Louisiana city mentioned above that applies a formula to allow for bleed, changed-out customer water meters in the fall of 2013. When the new meter was loaded into their billing system, it was coded incorrectly, and the customer lost their credits. Once contacted, the error was corrected and credits were reinstated.

Credits can reach further than the balance sheet. An effective Evaporation Credit Program can also detect equipment or operational issues. In Florence KY, makeup water volume soared during a cold spell in December 2013. The water line on the roof had frozen and burst. Early detection through daily sub-meter readings stopped the leak within three days – water savings were estimated at \$3,700. Unusually high winter volume in Arkansas uncovered a cooling tower leaking badly on the roof. Quick response stopped the leak and prevented potential roof damage from pooling water and freezing conditions. No volume on a blow-down meter in Houston TX uncovered the blow-down line filled with sand and dirt, blocking the line completely. Another zero blow-down reading in Fort Worth TX revealed a failed fill valve, putting the tower in overflow and wasting water by the hour.

During the off-season, when cooling tower operation is expected to be low, stuck float valves or leaks can usually be easily detected from sub-meter readings. For example, in December 2013 in Fort Worth, Texas, cooling towers should normally be dormant or off. When makeup water volume surged from no use to over 2,100 cubic feet (15,700 gallons) per day during an extreme cold snap, a mechanical failure was suspected. An on-site inspection found a broken fill line which had apparently frozen and burst the night before. Examples of water leaks detected through daily sub-meter monitoring are included in Figure 5.

WATER LEAKS DETECTED

CITY	ST	ISSUE	30 Day Leak Cost
Indianapolis	IN	Float valve stuck open (twice)	\$1,996
N. Little Rock	AR	Landlord Tower Leak	\$287
Florence	KY	Winter leak	\$4,499
Laguna Hills	CA	Tower Overflow	\$4,526
Clarksville	IN	Tower Overflow	\$2,262
Overland Park	KS	Tower Overflow	\$1,452
Fort Worth	TX	Winter leak	\$1,408
Hurst	TX	Winter leak	\$634
Baytown	TX	Tower Overflow	\$963

Average 30 Day Leak Cost = \$2,003

Figure 5

Overflow or leaking conditions can be harder to detect during the cooling season or normal tower operations. If a tower is using 3,000 gallons per day, and the float valve sticks slightly open increasing the daily volume by 10 to 20%, there may be no way to detect that overflow condition other than a physical inspection of the tower. Overflow sensors can provide a positive confirmation of tower overflow quickly and remotely.

ROADBLOCKS

Internal accounting rules can also create challenges. Sewer credits reduce operating costs, and the savings could be applied to new energy projects or other equipment replacements. But some companies' accounting practices will not allow reductions in the utility bucket to flow into the capital equipment account. So a dollar of potential energy reductions may be locked away by internal procedures.

Network cables and equipment need not be an obstacle to starting an Evaporation Credit Program. Wireless transmitters and encoded meter registers allow accurate, reliable data without the need for Ethernet or network cables. Automatic reporting may also be possible for some utilities, but a hands-on approach is currently the best option for evaluation of the site's water volume and water flow.

Many water utilities require their customers use a utility-furnished sub-meter with transmitters that match the utilities' automated meter reading system. This "encrypts" the meter readings so normally only the utility company receives the meter readings. If the customer also wants to track water consumption, manual reads may be necessary. However, it may be possible for the customer to also read the same sub-meters remotely with a signal splitter. The splitter allows an additional set of Encoder Receiver Transmitters (ERTs) to be installed so the meter readings can also be picked up by a customer's remote meter reader. Those meter readings can be transmitted to an external website that is accessible by the

customer. This gives the utility and the customer visibility and allows better water management along with sewer credits for the cooling tower.

SAVINGS SQUARED

If applied to other cost reduction projects, sewer credits can produce significant compound savings, call it sewer credits squared. When reductions in water and sewer costs are redirected toward energy projects, savings can be realized in both categories. Couple that with additional LEED points, and compound savings are evident.

Are your profits truly evaporating? Check out evaporative credits – it could be much more than \$\$\$ down the drain, especially considering the savings realized by some companies included in this report.