

**Metropolitan Domestic Water Improvement District
Board of Directors Meeting**

September 12, 2011

District Power Consumption and Interruptible Facilities

Synopsis

The Board of Directors is requested to discuss adding additional sites as interruptible facilities for power savings. At this time, the Board is requested to add specifically the Northeast Reservoir Boosters Station to the interruptible rate.

Background

The District had all of its facilities on interruptible power in 1994. That particular year experienced uncommon hot weather during the summer months, causing a dramatic strain on the water system as a whole. To assist the overall demand of the system, a connection with Tucson Water was installed at the Shannon and Oasis area. This gave some relief to meeting water demands. Tucson Electric Power (TEP) also experienced extraordinary demands on its electric system in which TEP directed the District to interrupt power. Realizing the interruptible rate was not an option for the District to meet its demands, the District returned all pumping facilities to firm or non-interruptible power in order to assure power would no longer be interrupted by TEP.

At that time, much of the District's water network was a series of stand-alone systems, not able to supplement or be supplemented from other systems. It was soon realized that major improvements would be required for reliability and redundancy and thus the District embarked on its first Capital Improvement Program.

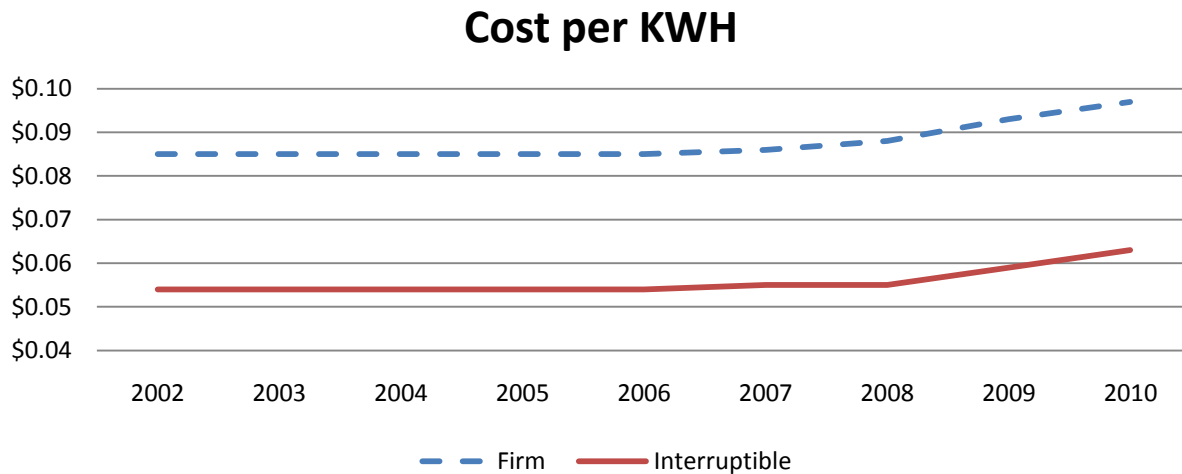
As improvements have progressed up to the present, the issue of redundancy was addressed via major transmission networks feeding large reservoirs. Additionally, auxiliary power was included with several improvements to legitimately qualify for TEP's interruptible rate. Presently, firm power is \$.097, while interruptible is \$.064 per kilowatt hour (KWH) respectively. Therefore, any power consumed at an interruptible site benefits by a cost reduction per KWH of just over 34%. The following depicts the interruptible rate for the affected facilities and related savings the District experiences.

Current Facilities on Interruptible

Facility - Year	Total KWH Since Start	Cost Firm	Cost Interruptible	Total Savings	Savings per Year
NLV – '01	6644403	\$ 587,729.74	\$ 407,353.01	\$ 180,376.73	\$ 18,037.67
Hardy - '04	2809763	\$ 248,537.20	\$ 172,260.09	\$ 76,277.11	\$ 10,896.73
Matter – 04	1804472	\$ 159,614.32	\$ 110,628.01	\$ 48,986.31	\$ 6,998.04
Jensen – '04	1979299	\$ 175,078.62	\$ 121,346.25	\$ 53,732.36	\$ 7,676.05
Deconcini – '01	6835177	\$ 604,604.63	\$ 419,048.93	\$ 185,555.70	\$ 18,555.57
S Shannon- '04	2535466	\$ 224,274.29	\$ 155,443.57	\$ 68,830.72	\$ 9,832.96
Or/Jaynes – '01	7278731	\$ 643,839.14	\$ 446,242.20	\$ 197,596.94	\$ 19,759.69
Escondido – '04	1370749	\$ 121,249.41	\$ 84,037.46	\$ 37,211.95	\$ 5,315.99
LPE – '04	251595	\$ 22,254.80	\$ 15,424.71	\$ 6,830.09	\$ 975.73
LPW – '04	515932	\$ 45,636.69	\$ 31,630.60	\$ 14,006.09	\$ 2,000.87
Bell** – '01	5100873	\$ 451,197.01	\$ 312,722.75	\$ 138,474.26	\$ 13,847.43
Chap – '04	491654	\$ 43,489.19	\$ 30,142.17	\$ 13,347.01	\$ 1,906.72
			Total	\$ 1,021,225.29	\$ 101,956.03

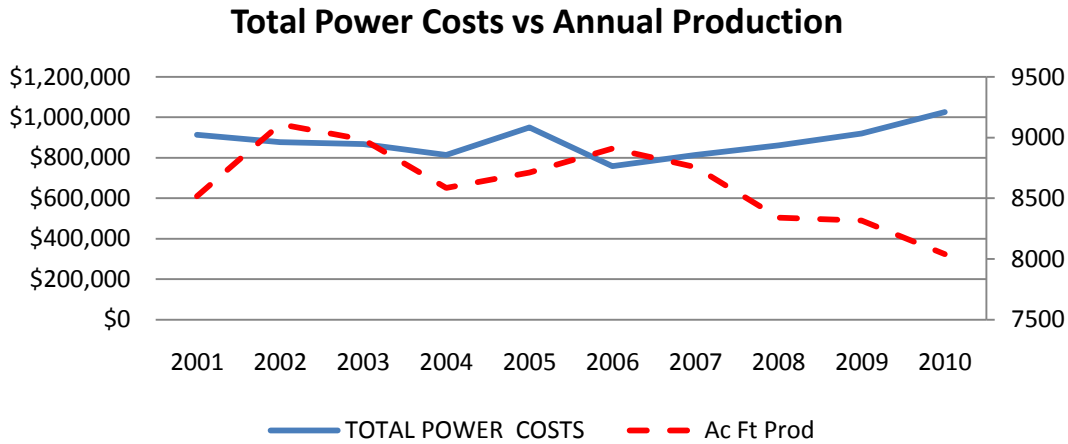
**Bell is no longer in service

KWH costs over the period of the 1990s to 2008 remained stable; however, TEP was authorized a rate increase in 2009. The cost per KWH increase over this period has been 12.5% for firm power and 18.5% for interruptible. The following depicts the cost per KWH over the last 10 years:

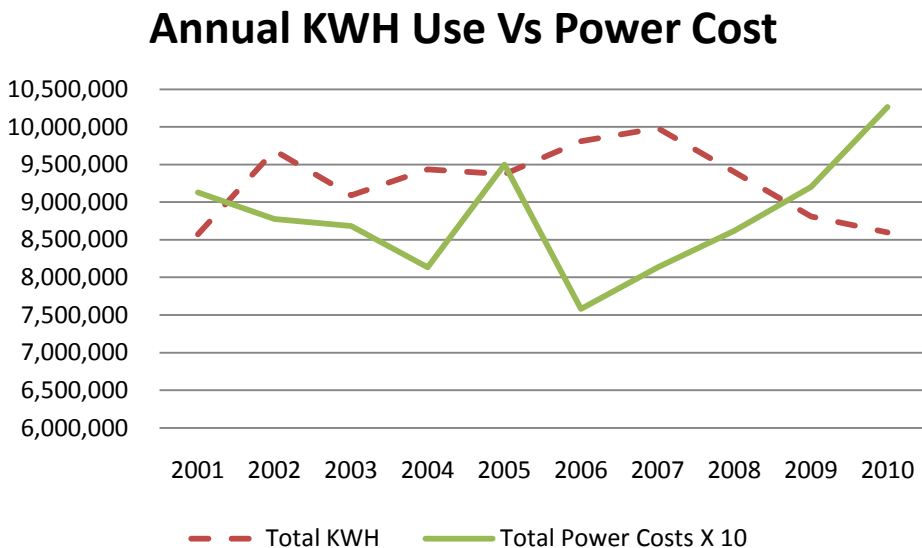


TEP has provided the District with its short range rate increase goals as follows: a rate increase will be requested in 2012 and more than likely in 2013. The percentage increase is not known; however, if recent history is any indication, the District should expect a 5-10% increase over the next two budget years.

Annual power cost in relation to annual production is depicted in the following graph:



For comparison, the impacts of power costs are primarily increasing in relation to decreasing annual KWH usage, as depicted in the following graph. Interestingly, several milestones are apparent below; in 2001, 4 major facilities were put on the interruptible rate; in 2004, 8 more mid-size sites were put on the interruptible rate; finally, TEPs rate increases affected annual power bills beginning 2009, as shown:



Pumping Stations are not included in the cost calculations for interruptible because booster stations serve to pump water that has already been pumped. Regardless, these station costs must be included in the annual scheme of power management. The Herb Johnson Reservoir has been on interruptible since 2004 and the Northeast Booster Station is to be on interruptible this month.

It is noteworthy to include the following listing of the power costs associated with these stations, plus Blackwell.

	Total KWH	Avg. Annual KWH	Annual - Boosters	
	Total Cost	Avg. Annual Cost	Total KWH	1,614,299
HJR - KWH	6,499,349	812,419	Total Annual Mean	
HJR - Annual \$	\$361,235	\$45,154	Cost	\$ 120,217.00
NERBS - KWH	2,170,626	723,542	Potential Annual	
NERBS - Annual \$	\$200,442	\$66,814	Costs	\$ 98,472.25
Blackwell - KWH	626,709	78,339	Potential Annual	
Blackwell - Annual \$	\$65,989	\$8,249	Savings	\$ 21,744.75

With present annual savings of \$102,000 for wells and additional booster/reservoir savings of over \$21,000, the District receives an annual benefit of \$123,000; yet, other opportunities require further scrutiny.

Issues

While the District benefits from the interruptible rate, strong consideration to the risks must be given. TEP allows an interruptible rate with stipulations – 1) the District must install remote shut-off to affected facilities via electronic signal generated from TEP, 2) interruptions can last for up to six hours daily, as identified in TEP’s tariff. In response to proviso 1 - remote shut-off electronics have been installed as required and this capability exists for any facility connected via telemetry – of which all Metro-Main facilities have this capability. In response to proviso 2 – TEP has required the District to interrupt on surprisingly few occasions while duration of interruption has never been up to six hours; regardless, the District must plan for the most extreme conditions where interruption is possible.

The most important wells are those serving the “A” zone. This zone has a major transmission network directly connected to the Herb Johnson Reservoir, plus is used to migrate to the newer Jim Tripp Reservoir. The two reservoirs represent 60-75% of daily flows – both receive water from “A” zone wells and at times from “B” zone boosters (Magee/Lacholla). The majority of the Districts smaller facilities have a redundancy from “A” zone, or neighboring District facilities via interconnect.

Wheeling

The opportunity to provide redundancy via a new interconnect with Tucson Water could be explored. A wheeling agreement is being considered for Tucson Water to provide up to 2,000 acre-feet per year at a rate of \$400 per acre-feet. Due to this redundant feature, all “A” zone wells could be on interruptible. Additionally, those facilities fed from “A” zone as back up, such as Escondido, Jensen, etc., could be strong candidates for the interruptible rate. Modeling of the interconnect would be required prior to implementation to assure water demands are met and interruptible rate is applicable.

The following table represents the potential additional savings from the remaining “A” zone facilities still on firm rate. The caveat is to assure there is adequate water supply during interruption.

A Zone Wells - Rate							
	GPM	GPD	KWH/Yr	Mill Gal/Yr	Annual \$ - Firm	Annual\$ - Int	Savings
TNE – Firm	560	676,029	689,808	246,750,760	\$ 61,294.00	\$ 45,527.33	\$ 15,766.67
TNW – Firm	619	277,617	283,771	101,330,331	\$ 25,663.00	\$ 18,728.89	\$ 6,934.11
TNN – Gas		0					\$ -
Mona Lisa - Firm	466	373,194	392,507	136,215,985	\$ 34,758.00	\$ 25,905.46	\$ 8,852.54
INA/CDO - Int	566	252,525	256,577	92,171,503		\$ 14,687.00	
Marlene - Firm	539	382,844	401,006	139,738,110	\$ 35,442.00	\$ 26,466.40	\$ 8,975.60
Thornydale - Firm	738	533,811	501,131	194,840,958	\$ 40,612.00	\$ 33,074.65	\$ 7,537.35
Oracle Jaynes - Int	532	615,489	727,873	224,653,580		\$ 41,145.00	
Deconcini - Int	367	309,012	683,518	112,789,456		\$ 39,281.00	
						Total Annual Savings	\$ 48,066.28

The following table represents the capacity of existing and two future “A” zone wells. While the wells can easily meet annual pumping requirements on their own, it is impractical to assume they can or will run at 100% duty cycle (24 hours per day). Therefore, supplementation from other District wells can make up the difference, where approximately 2,000 acre-feet would be required.

A Zone Wells - Firm Rate Capacity	Duty Cycle - Ac Ft per Year				Per Cent Use - Actual
	GPM	25%	50%	100%	
TNE - Firm	560	226	452	903	74
TNW - Firm	619	250	499	998	58
Mona Lisa - Firm	466	188	376	752	53
INA/CDO - Int	566	228	456	913	40
Marlene - Firm	539	217	435	869	63
Thornydale - Firm	738	298	595	1,190	51
Oracle Jaynes - Int	532	215	429	858	75
Deconcini - Int	367	148	296	592	74
Total Acre Ft Per Year		1,769	3,538	7,076	
Future "A" Zone Wells					
Matter - Int	400	161	323	645	
Riverside Xing -Int	600	242	484	968	
Total Acre Ft Per Year		2,172	4,345	8,689	

From the wheeling perspective, the District must assume a series of daily interruptions at peak periods. The maximum day pumped is 12 MG, of which 80% of demand is assumed for the "A" zone, or 9.6 MG. An interruption lasting 6 hours would represent a 600,000 gallon per day deficit, which more than likely could be made up with ancillary wells configured to commit to "A" zone (Alcott, Wildwood and Lattamore South). Further engineering analysis is required to confirm the above.

If feasible, the remaining small systems qualifying for interruptible could represent an additional \$12,000 per year savings, thus allowing the district \$60,000 in new power savings. Therefore, the cumulative optional power savings (adding those facilities already on interruptible rate) could be as high as \$163,000 per year.

Additionally, the life span of "A" zone wells will increase since they will run less often and the local aquifer will stabilize or improve. This would assure meeting ADWR requirements of maintaining water levels over time, allowing most, if not all, wells to better qualify as recovery wells. Presently, the District struggles to meet this requirement, as there are few options due to continued demands on all District wells. Also, the well maintenance frequencies could be reduced by at least 20%; thus, saving additional funds.

Pump and Motor Efficiencies

Another opportunity the District needs to pursue is pump and motor efficiencies. Staff has struggled with time restrictions to embark on this endeavor but the time is right to proceed. By improving efficiencies for given pump and motor assemblies, the District benefits in two ways: 1) increased life span of equipment via appropriate sizing and application, and 2) reducing power costs. In order to accomplish this, a kick start to the program by way of training key staff is required. Pump efficiency experts are few; however, one firm as approached the District with an offer to train staff to perform pump and motor efficiencies. Once trained appropriately, District staff can begin an ongoing program to identify and correct inefficient pump systems and reap the benefits of power savings and increased life span of pumping systems. The District already owns the equipment to perform efficiencies but the consultant services are required to fine tune the complete understanding of efficiency measurements, and will require future approval from the Board. The estimated cost for this work would not exceed \$9,000.

Interestingly, the District has experienced a higher cost of pumping per million gallons over the last ten years, measured as KWH/MG. The trend over this period has increased from 3,400 to 3,900 KWH/MG. Some of this increase is attributable to booster station pumping to the two large reservoirs; however, this fact should in no way preclude the need to identify inefficient pumping systems. When considering that the District pumps 2,000 MG per year, the savings become apparent. At this point, it is estimated an efficiency program should save the District an additional 2-5% per year, which equates to minimum of \$20,000 per year. The valid presumption of ever increasing power costs compels the District to pursue all options to control these costs as much as practical.

Noteworthy is the cost comparison of TEP power rates to Trico rates. Diablo Village and Lazy B are exclusively served by Trico, where the District's power cost is \$0.16 per KWH; at least 33% more than TEP's rate. Options are being pursued to determine if there are better electrical rates from Trico. The E&T system is serviced by TEP. The common challenge then is to optimize pump operation as efficiently as practical. One case in point, Diablo Village 2 was put into service with existing pump equipment provided by the previous owner. It became clear once the facility was put into operation, the overall efficiency was 5,200 KWH/MG, or 33% higher than the District average. In order to control this challenge, the well pump was been scheduled in the next few weeks to be sized appropriately.

Addition to Northeast Booster Station (NERBS)

The timing is appropriate to establish the interruptible rate for the NERBS facility. Staff is satisfied the station can operate properly during power interruption due to the inclusion of a stand-by generator. The lag in doing this has been to assure staff the generator would run as required, since it was also affected by the November 27, 2008 flood. This will represent an additional annual savings of \$17,000. Each candidate for interruptible rate requires signatures of the Board Chairman and is attached for this action.

Staff Recommendation

This agenda item is intended to provide the Board of Directors with an opportunity to discuss how the District could benefit from having additional wells and facilities on interruptible power. It also gives further information on how wheeling water from Tucson Water would assist with our power costs as well as the importance of pursuing aggressively a pump and motor efficiency program.

At this time, staff is only recommending having the Northeast Booster Station added with TEP as a facility under the interruptible rate. Staff would like to further explore and provide the Board with additional recommendations regarding other facilities for the interruptible rate. Also, staff would like to bring to the Board a recommendation to work with a consultant who would help the District move forward a pump and motor efficiency program.

Suggested Motion

I move to approve an agreement with Tucson Electric Power to have the Northeast Reservoir Booster Station to be under its interruptible power rate.

Respectfully submitted,

I concur with the above-noted recommendation.
Respectfully submitted,

Christopher W. Hill,
Deputy Manager

Mark R. Stratton, P.E.
General Manager