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Technical Review of the CSU Program Alternatives Analysis Model

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Overview

Great Western Institute (GWI) was retained by Colorado Springs Utilities (CSU) to review its ongoing water conservation planning efforts that will ultimately be used to develop and submit a plan to the CWCB for review and approval. Specifically, GWI focused its efforts on reviewing the CSU program alternatives analysis model (hereafter "the model") including program assumptions and calculations for purposes of commenting on the following:

- The appropriateness of the model to support the WC plan development including the model assumptions and spreadsheet mechanics;
- The reasonableness of the specified water conservation goals; and
- The effectiveness of the selected measures and programs in creating measurable results of saved water.

GWI will also comment upon the need for effective monitoring and verification efforts related to the proposed water conservation measures and programs, since the model does not provide for the explicit definition of expected monitoring and verification activities.

Data Provided

GWI met with Mr. Scott Winter of CSU on October 11 to receive hard copies of selected portions of the model, including:

- Revenue forecast;
- Water use per capita with higher population, corrected population sums and revised security population;
- Detailed list of labor and marketing assumptions;
- Summary of water conservation measures and programs annual savings and costs;
- Stream of costs, savings and benefit analyses for commercial high efficiency urinal rebates, commercial high efficiency toilet rebates and the water waste ordinance;
- Estimates of water savings and costs for ongoing water conservation measures and programs;
- 2007 water conservation plan Progam Implementation Schedule; and
- Various excel graphs related to predicted water conservation effectiveness over time.

During the meeting, Mr. Winter explained the background of the model, including some of the assumptions and processes used to develop the model (e.g., revenue forecasts) and how past modeling efforts were used to develop model inputs and support model assumptions (e.g., Maddaus's 2003 Evaluation of Water Conservation Program efforts).

As a follow-up to the meeting, GWI was provided with the spreadsheet model on October 30th for review and comment. Therefore, based on the meeting and subsequent communications, GWI conducted a review of the information provided, including the specific assumptions used to estimate future water savings and costs for selected measures and programs.

Review Comments

The model that GWI reviewed is robust and comprehensive. Overall, the model does an excellent job of organizing and combining the various data into the backbone of a comprehensive water conservation plan. The detail that is presented and contained within the model, from the revenue forecast that includes estimated rate increases over time to the detailed costs estimates and water savings predicted for each individual water conservation measure and program, is extraordinary and will prove to be valuable both during the preparation of the water conservation plan and performance of future plan updates.

There are a few areas of the model that improvements can be made to improve its future usability. Specifically, the cost assumptions used to support the project implementation schedule need to be more clearly documented. The costs presented in the assumptions worksheet include organization wide costs, whereas the costs in the project schedule implementation worksheet are those for the conservation section only. The assumptions worksheet should include columns showing both the total costs for the organization and for the conservation section to make it easier for future model users to understand the source of the implementation costs. The assumptions worksheet should include assumptions for all categories of expected future costs including labor hours, labor costs, incentive costs and other costs.

The cost estimates in the project implementation schedule also need to be developed using a more consistent set of assumptions. It will be important for the model to be simplified to the extent possible, in part through improved documentation of assumptions in the assumptions worksheet, such that future model users can more readily access and understand model assumptions.

Another potential area of improvement recommended by GWI relates to the documentation of future water savings. Some of the water savings are developed using detailed assumptions listed and documented on individual worksheets developed for each measure and program. Other water savings are estimated using methods that are not well documented. Again, this comment relates chiefly to the need better documentation to improve future model usability. The summary sheets that have been partially developed will be completed to a consistent end before the model is finalized and used to support the water conservation plan. It is anticipated that a summary sheet will be prepared for each measure and program that CSU will propose to implement in the water conservation plan.

It is important to understand the meaning of measures and programs within the framework of the CSU water conservation plan. Based on the prevailing literature (e.g.,

Water Use and Conservation, Amy Vickers, 2001), measures include both hardware devices and practices that actually reduce demand, whereas programs are strategic combinations of activities and measures (e.g., education and incentives with measures) that will bring about reduced water use demands. To this point, hardware measures are typically more reliable in achieving long-term water savings because they typically need to be installed only once and require no ongoing effort to maintain creating water saving. In contrast, educating water users to adopt low-water-use or native landscaping and irrigation practices can require considerable time and ongoing reminders are needed if water-efficient landscape and irrigation practices are to be maintained. The best water conservation programs link hardware installations with practices that support behavioral changes such that end user water demands are measurably reduced to levels that can be maintained and sustained. This is exactly the approach that CSU is proposing to take.

The water conservation measures and programs are focused on those activities that will occur over the next ten years, or until 2017. Any planning horizon beyond this time period, albeit valuable for long range and strategic planning, is wrought with extrapolations and estimates that do not necessarily support the short and midrange planning that is needed to develop the tactics which must be included in the water conservation plan. Therefore, this review will focus its efforts chiefly on an evaluation of the activities planned for the next ten years.

Staging future water conservation activities into a ten year time period serves a key function for CSU – it allows CSU to respond to how end users embrace and engage the various measures and programs being promoted and provided by the utility. As indicated above, behavioral changes, which occur as a result of institutional, business, association, and/or individual customer's response to key water conservation measures and programs, are important components of any water conservation effort. Meaningful water conservation requires that end users respond to the education, request and utilize rebates, conduct audits and/or adhere to ordinances being implemented by the water utility for water demand to be reduced. Given that behavioral changes strongly influence the acceptance and effectiveness of any water conservation measure or program, it is imperative that continuous and deliberate monitoring and verification of the proposed activities occur, and that the information collected is used to refine and alter the ongoing programs as they are implemented in response to customer behavior. CSU is proposing to implement monitoring and verification activities for just this purpose.

To this point, having water conservation measures and programs that include explicit means to monitoring customer/end user acceptance and adherence is vital to the overall success of the water conservation plan. Monitoring customer water use becomes increasingly important as water conservation programs mature, such as those measures and programs that CSU has implemented and is looking to implement. Therefore, key components of any revised or newly developed water conservation program must include individual customer water use tracking for existing customers, substantial education for new customers (including both residential and commercial water users),

and the use of deliberate customer feedback mechanisms such as surveys and polling to track perceptions and behaviors.

Program Breadth

The overall water conservation program is very well conceived and organized. The first one to two years of planned measures and programs leverages ongoing residential programs such as clothes washer and high efficiency toilet rebates with water conservation education to maintain current levels of water savings. During this same time period, CSU plans to develop and initiate implementation of key (and vital) commercial water conservation programs related to both the management of indoor and outdoor water demand.

Within three years (i.e., by 2010), the current residential programs (aside from toilet and washer rebates and customer education) will be phased out and the majority of CSU's water conservation resources will be used to improve commercial and residential outdoor water use. This is an appropriate focus for CSU given the expected growth in the commercial water use segment, and the current lack of measures and programs that have been implemented to support improved water conservation with CSU various commercial and residential customers.

Beyond 5 years, CSU looks to expand its water conservation programs to address builder incentives for residential construction. This is a valuable area for CSU to extend its water conservation activities, especially given the expected residential growth expected in the CSU service area. It is appropriate to postpone the development of builder incentives for some period of time (3 to 5 years) until specific programs are tested and evaluated in cooperation with the construction and land development community, both locally and in concert with regional, statewide, and national efforts (e.g., EPA's water sense program will have matured to help identify appropriate builder specific actions that achieve water savings).

By 2017, CSU will have a much different water conservation program than it currently operates. This is due in part to the CSU's intent to more directly address and support commercial water use conservation efforts. It also reflects CSU's desire to improve water efficiency regarding new construction leveraging expected improvements in new construction water conservation measures and programs that will be developed locally and by other western states. Overall the breadth of the CSU water conservation program implementation is well conceived and well documented, due in part to the comprehensive nature of the model.

It will be nonetheless imperative for CSU to develop explicit monitoring and verification procedures for each of the 25 measures and programs that are planned to be implemented to ensure that future water conservation efforts are based on quantifiable results to the extent possible (noting, of course, that water conservation education, which adds to each and every other implemented water conservation measure and program is not readily measured and verified as a stand alone effort).

Water Savings and Costs

The water savings that are predicted by CSU are fairly reasonable given the breadth of planned water conservation measures and programs, and the amount of resources that CSU is planning to commit to the implementation of these measures and programs. Nonetheless, GWI suspects that water savings will not be realize as quickly as predicted. This is due to the expectation that the measures and programs designed to support improved commercial water use efficiency will require more time than is currently budgeted to realize "real" water savings, due to the time required for data collection, customer acceptance, and customer implementation (which will be based in part on commercial customer annual budget cycles and cost benefit analyses).

GWI expects that predicted water savings due to the "expanded program savings" should be reduced for the period from 2008 to 2013 since there will most likely be a time lag between the implementation of the new commercial water savings programs and realized water savings. The predicted water savings for 2015 are reasonable; however, to realize the predicted 2015 water savings, it is vital for CSU to push water conservation education to new commercial and residential customers, including the new military users, during the 2008 to 2013 time period.

The cost of water saved for each of the 25 proposed water conservation measures and programs carried in the model are reasonable, although some of the commercial programs will likely be more cost effective than indicated. For example, builder incentive programs can be highly effective depending on the nature of the program.

In addition, commercial indoor audits can also be more cost effective, especially if the audits are followed with deliberate account tracking of individual accounts and regular feedback to those commercial customers that have implemented indoor improvements. This program can be further enhanced by publicized certification and awards.

Residential irrigation equipment rebates may also be more cost effective than currently represented. It is admittedly challenging to implement residential irrigation equipment rebates given that homeowners typically cannot install and program new equipment without a plumbing or landscape contractor, and therefore it is often the case that homeowners do not appropriately operate irrigation equipment correctly. However, if the irrigation rebate is combined with the tracking of an individual residential account to verify that improved outdoor water use occurs, this specific measure can be substantially more cost effective. Similarly, the residential sprinkler check program, which can be offered in concert with local non-profit organizations that are subsidized by the State (e.g., Center for Resource Conservation out of Boulder), can be substantially more cost effective in concert with individual account tracking and individualized customer feedback.

The water savings for new commercial rebates and audit programs may be higher than predicted, especially during the first few years of program rollout; however, some of the costs related to implementing these new programs are probably imbedded in the water conservation education effort – noting that commercial customer education and

awareness regarding CSU's efforts will be vital for the utility and its customers to realize water savings.

Lastly, the water savings that are expected to occur due to water conservation education seem somewhat inflated. As indicated above, water conservation education will go "hand in glove" with the other measures and programs that CSU is planning to implement such that water savings related to solely to educational efforts may be less than predicted. With strong marketing and enforcement of new water waste programs, and substantial marketing and penetration of the commercial and residential rebate programs (linked closely to training and customer audits), the overall savings predicted by the model are certainly attainable.

To this last point, the water savings and related cost of saved water are fairly consistent with the current state of the science, with the exception of water pricing, as noted below. There may be small discrepancies for any specific water conservation measure and/or program; however on the total, the plan provides a reasonable prediction of long-term water savings and costs.

The water pricing strategy that CSU proposes to implement to reduce water demand, including both residential inclining block rates and to a lesser extent commercial seasonal pricing, may not provide the savings expected. Water rates have been shown via recent studies (e.g., Kinney, et. al., Residential Water Demand in Aurora: Learning from Drought Crisis. Colorado Water Resources Research Institute February-March 2007; and Howe and Goemans, Journal of AWWA, October 2007) to produce elastic results (i.e., residential response to rate hikes does not necessarily correlate to water savings). Water savings related to residential water rate structures, which were predicted to be the second largest savings of any CSU proposed measures and programs, is not necessarily consistent with the current state of the science.

The relative elasticity of inclining block rate structures is fairly well documented. Therefore, the basic concept of linking water use to cost, which is a good one, is limited in its effectiveness since water in the US is generally undervalued (CSU's top rate of slightly over a nickel for one cubic foot of water in 2017 would translate to a cost of about $250 for a residential customer to fill a backyard swimming pool with potable drinking water). However, increasing water rates based on water usage when coupled with other meaningful water conservation measures and programs, as CSU is doing, improves the effectiveness of water conservation pricing. Nonetheless, it remains to be seen if inclining block rates for residential customers and seasonal pricing for commercial customers can produce the water savings predicted. Careful monitoring and verification of this program will be needed to ensure that the overall water savings predicted by the model actually occurs – either temporarily or permanently.

Monitoring and Verification

The value of water conservation in terms of generating "true" saved water (which relates to return on investment and, in the end, supports the fiduciary responsibility of CSU as a water utility) is based on the effectiveness of the monitoring and verification

effort to identify and quantify water demand reductions. To this point, the model did not provide an explicit definition of monitoring and verification tactics that CSU will implement to quantify water savings. Therefore, it will be imperative that CSU not only identify and detail the monitoring and verification activities that will be performed, by individual customer and customer type, but clarify how the data obtained through the monitoring and verification programs will be used to verify, refine and adjust the proposed water conservation measures and programs as information is collected and processed. The ultimate success and effectiveness of the water conservation plan will be dependent on the usefulness and applicability of the monitoring and verification program.

One key component of the monitoring and verification program should be the deliberate and regular use of customer surveys and audits. The vast majority of the marketing assumptions and related cost estimates for each of the 25 water conservation measures and programs identify in the model include paid media, collateral, direct mail, first source and related expenses. However, it is imperative that CSU utilizes formal and well funded customer feedback mechanisms such as surveys, focus groups and/or audits to gather information regarding end-use behaviors and responses to the proposed measures and programs. Without deliberate feedback mechanisms, the best conceived water conservation programs can flounder and become ineffective since the success of most measures and programs is reliant upon behavioral changes in the utility's customer base. Only through surveys, focus groups and/or audits can CSU gather the necessary information to understand and respond to its customer's behaviors, needs and desires regarding water use and water conservation.

It is unclear as to how feedback mechanisms are embedded in the proposed water conservation measures and programs to appropriately monitor the effectiveness of the proposed water conservation measures and programs and verify the projected water savings – by account, by water use segment and overall. Nonetheless, it is clear that there is a discrepancy between the current conversation staff resources and those needed to support development and implementation of the proposed measures and programs. Therefore, additional staff resources and outside professional services will be needed to effectively implement, and collect and characterize customer response to the various proposed measures and programs; and to verify predicted water savings. Based on the predicted level of customer penetration, at least 2 new FTEs will be needed to support the ongoing and proposed water conservation efforts; however, if additional penetration, and therefore water savings are needed, then additional conservation section resources in the form of staff and outside professional services will be required.

Summary

The model that GWI reviewed is robust and comprehensive. Overall, the model does an excellent job of organizing and combining the various data into the backbone of a comprehensive water conservation plan. Suitably, the water conservation measures and programs are focused on those activities that will occur over the next ten years, or until 2017. The model is predictably more accurate for this shorter period of time.

The overall water conservation program is very well conceived and organized. Of particular importance and effectiveness is the proposed phasing of residential and commercial measures and programs. CSU appropriately plans to utilize ongoing residential activities to improve current water efficiency, while more robust commercial programs are developed. By 2010, resources within CSU are shifted from residential programs to commercial programs, improving water use in the utility's two key customer bases – residential and commercial.

Although CSU has estimated the need for an appropriate amount of additional resources, in terms of staff time and funds, to implement the proposed water conservation measures and programs, it is somewhat unclear how CSU will verify that the predicted water savings have actually occurred. Therefore, it will be imperative that CSU develop explicit monitoring and verification procedures for each of the 25 measures and programs that are planned to be implemented to ensure that future water conservation efforts reduce water demand in an appropriate and cost effective manner.