# Turlock Irrigation District

# Operations Administration

## ISO Metering Study
## Phase 2

January 2002

## Introduction

A report was prepared by District staff (1), the purpose of which was to provide a configuration and cost estimate to install ISO-approved metering at District power plants and certain intertie substations. The ISO staff was consulted as to their requirements for this effort. In addition, some of the same ISO staff employees spent most of two days in the District visually inspecting the revenue metering equipment which was in place at that time at these power plants and substations. While the specific ISO tariffs and requirements speak to the installation of one ISO approved meter on each and every generator, it was agreed during these meetings with the ISO that existing metering points which record the total plant delivery would be acceptable. This would be less costly than meeting the ISO requirement of one meter on each generator, and was deemed to be acceptable at that time. What would be necessary, however, would be to replace the existing and somewhat aged District meters with approved ISO meters as well as to add a communications' network which would allow the ISO in Folsom, California to have the capabilities to "read" all of these meters in real time.

Since that document (1) was written, staff has inquired as to the incremental cost necessary to completely meet the one meter - one generator ISO requirement. This document was written in an effort to define that incremental cost.

## Conclusions

The additional cost which would be required to meet the specific ISO criteria of one meter on each generator is $259,936. Combining this with the cost included in the previous work (1) would define a project total of $484,006. This would result in a revenue metering system for the District that meets the ISO tariff criteria.

Changes would be necessary at three power plants – Turlock Lake, Hickman, and Don Pedro. The other power plants located within the District only have one generator so the requirement there is to only change out the one meter and add the communications as previously defined (1). For the three power plants noted above, additional metering and communications' circuits on the existing analog microwave system would be necessary. The cost broken down by plan and category is as follows:

| | |
|---|---|
| Don Pedro P/P | $138,801 |
| Hickman P/P | $ 23,370 |
| Turlock Lake P/P | $ 37,634 |
| Added Communications and Misc. Equipment | $ 36,500 |
| Contingency (10%) | $ 23,631 |
| Total | $259,936 |

Figure 1 shows details of these costs.

**Turlock Lake Power Plant**

The Turlock Lake Power Plant consists of three generators, each of which is rated at a little over one (1) megawatt. Revenue metering at this plant is placed at the "lines out" location and meters the energy flowing into the distribution system. There are no revenue metering systems on the individual generators. While instrument transformers do exist, connected on a per-machine basis, they are not revenue grade transformers; rather, they exist to provide input to panel meters, SCADA transducers, etc.

Since the original plan (1) had envisioned placement of a single ISO-approved meter to replace the "lines meter" mentioned above, one would need to add two additional meters to the project. This would be a total of three meters – one on each generator, but none on the lines. In addition, nine current transformers and three potential transformers would be added to serve these three meters. These instrument transformers could be standard, generic, domestic units.

Total cost for the Turlock Lake installation would be $37,634.

**Hickman Power Plant**

Hickman Power Plant is similar in construction to Turlock Lake except it has two generators with outputs of 535 kW per machine. The revenue meter at this plant is placed at the "lines out" of the project and is similar to the configuration of Turlock Lake.

To provide an ISO meter on each machine at Hickman, a second ISO meter would be supplied and both would be installed at the machine level. Six additional current transformers and three potential transformers would be installed. These transformers are also easily available.

Total cost for the Hickman Power Plant installation would be $23,370.

**Don Pedro Power Plant**

The Don Pedro Power Plant contains three generators rated at 55 megawatts each and a fourth unit rated at 38 megawatts. This bus at this plant is normally operated in what is referred to as a "split-bus." One of the larger units (normally #3) is configured to feed two lines that deliver power to the Modesto Irrigation District. The balance of the generators (#1, #2, and #4) is switched to feed lines to the Turlock Irrigation District. There is no electrical tie at the plant between these lines; they operate as two separate electrical systems. A line meter exists on the sum of the energy into the Modesto lines and a separate metering system is configured for the Turlock lines. It was originally contemplated and understood (1) that the ISO metering would be at this "lines" location.

Like the other two power plants, instrument transformers do exist at the generator level but are not revenue grade instruments and would need to be replaced. The units are located within the generator housings of the three larger machines and are installed in "draw-out" cabinets in unit #4. All would have to be replaced. Because of their locations, and unusual mounting and voltage levels, it would be more difficult and considerably more costly to install these replacements. Hickman and Turlock Lake installations can use "off-the-shelf" transformers of domestic manufacturer. The Don Pedro site will require specialized units.

Twelve current transformers and six potential transformers would need to be changed out. In addition, three more ISO meters (for a total of four) would be installed.

Total cost for the Don Pedro Power Plant installation would be $138,801.

**Communications**

In the prior work (1), the existing District microwave system was used to provide data lines from each meter and to connect them back to Turlock where they would be forwarded to the ISO via a leased high-speed data line. Because of the additional meters, it was necessary to provide more channel cards, modems and other communications equipment.

Cost for the additional communications equipment, spares, etc would be $36,500.

Figure 2 defines the method that would be used to provide communications from each of the meters to the ISO in Folsom, California.

(1) *Turlock Irrigation District, Operations Administration, ISO Metering Study*, dated July 2001

| **ISO Metering Study** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Phase 2** | | | | | | | | | | | |
| | | | Outside | Additional | Additional | Additional | Meter | Add'l Installation | Add'l Engineering | | |
| Site | Add'l Meters | Meter Cost | Eng. Cost | PT's & CT's | Comm. Cost | Equipment | Certification | Labor | Labor | Total | |
| Power Plants | | | | | | | | | | | |
| | | | | | | | | | | | |
| Hickman P/P | 1 | $3,500 | $1,800 | $3,990 | $0 | $1,520 | $1,500 | $10,710 | $350 | $23,370 | |
| | | | | | | | | | | | |
| Turlock Lake P/P | 2 | $7,000 | $2,300 | $5,250 | $0 | $2,400 | $3,000 | $17,334 | $350 | $37,634 | |
| | | | | | | | | | | | |
| Don Pedro P/P | 3 | $10,500 | $2,800 | $83,000 | $0 | $3,200 | $4,500 | $33,801 | $1,000 | $138,801 | |
| | | | | | | | | | | | |
| Other | | | | | | | | | | | |
| Broadway Yard | | | | | | $14,000 | | | | $14,000 | |
| | | | | | | | | | | | |
| Central Equipment | | | | | | $12,000 | | | | $12,000 | |
| | | | | | | | | | | | |
| Spare Equipment | | $ 7,000 | | | | $3,500 | | | | $10,500 | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | Total | | $236,305 | |
| | | | | | | | | | | | |
| | | | | | | | | 10% Contingency | | $23,631 | |
| | | | | | | | | | | | |
| | | | | | | | | **Grand Total** | | **$259,936** | |

Figure 1