Newsletter

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Applications/Solution for Customers success

TUCUMAN

Multi-end short line protection in TUCUMAN (Argentina)
Special application with REB 500 System

Background

TUCUMAN is located in the northwest of the Argentine Republic and is the natural geographical center of the region for communications, social life, economy and also because of its population. 475,000 people of the 1,142,247 inhabitants live in the capital city.

50 % of the province is mountainous, has a very varied climate with unique climatic zones and many different agricultural crops. TUCUMAN, province of great beauty is called "The garden of the Argentine Republic.

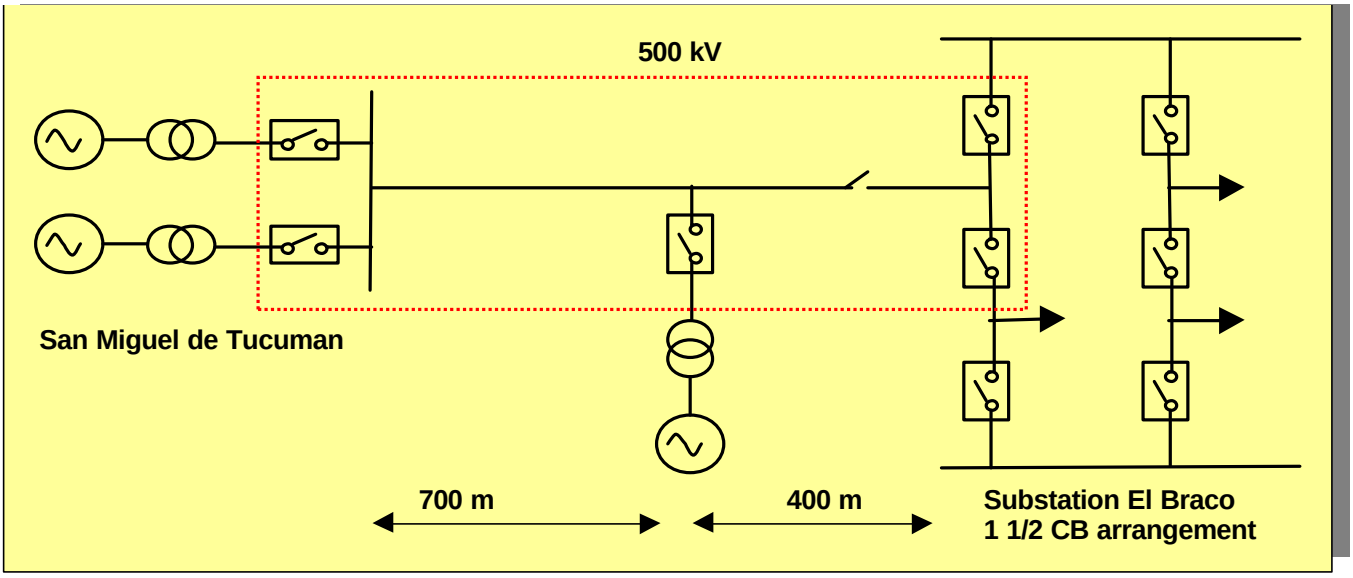
Many sites and places in TUCUMAN are evidence of the rich past that this province has had in the ancient world of the INCA empire.

Today however there are numerous industries established in TUCUMAN, it being the main industrial center of the whole northwest region with its numerous industries needing electrical energy, such as: sugar, citrus, paper, textiles, heavy trucks, metal works, food processing, plastics, oils, soap, glass, wood.

In that context a lot of investments have been made for the erection of power plants and the extension of the electrical network. Here one example:

- The power plant San Miguel is connected to a large station (El Braco) via a short 500 kV overhead line.
- This line is a multi-end line with 5 ends
- That given structure has to be protected

The ultimate requirement of the client is to have a selective protection with the highest possible security. This opened the opportunity to apply our system know-how in protection in order to solve his problem.



Single line arrangement of the five end line in Tucuman

Technical requirements

- The highest requirement is the selectivity. This selectivity has to be assured for the whole range of possible short circuit currents and also if one of the line ends is open.

- The network configuration is very unfavorable because of the low infeed on the left side (machines with about 165MVA) and the high fault current coming from the right side. The right side is a 11/2 breaker arrangement station with a maximum short circuit current of about 14 kA.

- The main protection schemes have to be duplicated.

- The protection has to remain stable even if one of the c. t. connections on the secondary side is open.

Realized solution

From the beginning it was clear that these requirements could only be fulfilled with a solution based on REB500.

The only way to assure the selectivity was to measure the current on each of the 5 ends, i.e. the realization of a differential principle. This has been achieved by the implementation of the REB500, installing a bay unit at each end of the line.

Due to the fact that the REB500 provides the facility to accommodate the nominal current without any auxiliary current transformers we could take care on the large ranges of short-circuit currents.

Main 1 as well as main 2 protection are REB500 systems.

In order to solve the case of open c.t. circuits we use two criteria:

- Supervision of the differential current
- Use of minimum voltage criteria. The REB500 automatically allocates the measured voltage to the corresponding zones. It should be noted that in case one or another isolator is open (e.g. the isolator indicated in the single line diagram) the REB500 splits the protected object in several zones. This feature is only available with decentralized REB500.

Precaution had to be taken on the back-up protection scheme installed in El Braco. The client required that in the case of a fault occuring on the connecting line between El Braco and San Miguel, the El Braco station had to be separated from the left side. These redundant back-up protections have been realized with two REL316*4 distance protections using only two zones each.

An additional advantage for the customer of the realized solution consists in the built-in fault recorder in each of the 4 protection schemes (two REB500 and two REL316*4). We can note that also in the REB500 the voltages are registrated by the fault recorder.
Furthermore we can use the same evaluation program WINEVE for all the 4 equipments.

Conclusion

It was possible to meet the challenge by working out an appropriate protection concept for such a sophisticated network configuration.
The proposed solution satisfies entirely the clients needs regarding both selectivity and security.
This application of REB500 system is a further milestone for a successful business with this system in Argentina.