

Interaction between AVR Reactive Power Control and High Power AC-DC Converter Control as possible cause of instability

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Abstract—Two oscillatory episodes took place in the Argentinean power system at 22:20 and 22:50, June 7th, 2008. The first one started when a 40 MVar capacitors bank was disconnected and the second one started when a 500 kV line was disconnected.

Both oscillatory episodes produced great variation of active and reactive power in several 330 kV and 500 kV power system nodes.

At first sight, these oscillations seemed inter-area electromechanical oscillations, but carried out studies suggest that this oscillatory behavior could be a consequence of interaction between Reactive Power Control of generators and the ac-dc Converter Control of high power loads.

Index Terms-- AC-DC Converter Control - Automatic Voltage Control - Modeling - Power System Dynamic Stability - Power System Stabilizer - Reactive Power Control - Simulation.

I. INTRODUCTION

ARGENTINA'S power system is composed by two parts: SIP (Sistema Interconectado Patagónico) and SADI (Sistema Argentino de Interconexión) as it is displayed in Fig. 1. The SIP is a small power system located in the south of Argentina with a peak load of 1200 MW, and the SADI is the biggest Argentinean power system with a peak load of nearly 20 GW.

Both systems are interconnected by a 360 km long 500 kV line between Choele Choel and Puerto Madryn substations. A 500/330 kV, 450 MVA autotransformer is connected at Puerto Madryn 330 kV substation.

Before and after SADI-SIP interconnection in 2006 several electromechanical oscillation episodes had taken place, some of them were reported [1]-[8].

The oscillatory episodes developed at 22:20 and at 22:50, June 7th, 2008, were observed in the SADI-SIP 500 kV interconnection line and in the two lines of 330 kV between Fuleufú and Puerto Madryn substations, see Fig. 1.

In a first approach, these oscillations were supposed to be inter-area electromechanical oscillations because the frequency of the power oscillations was near to 0.5 Hz. This was observed in the 500 kV SADI-SIP interconnection line.

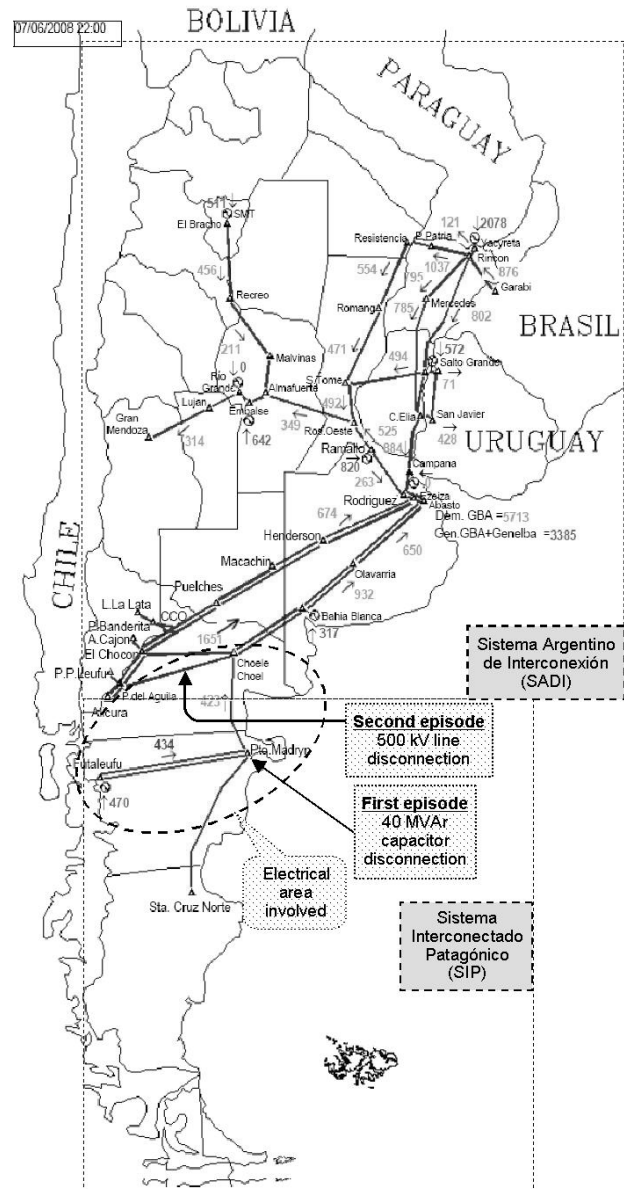


Fig. 1. 500 kV and 330 kV transmission systems. Pre-fault power flow: Saturday 22:20, June 7th, 2008.

However, studies carried out before and after these episodes demonstrated that the inter-area oscillation mode between SADI-SIP systems is well-damped.

To reproduce the oscillatory behavior of June 9, 2008, it was necessary to improve models of:

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