CIM Role in REGER

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Operador Nacional do Sistema Elétrico
A energia que liga o país.

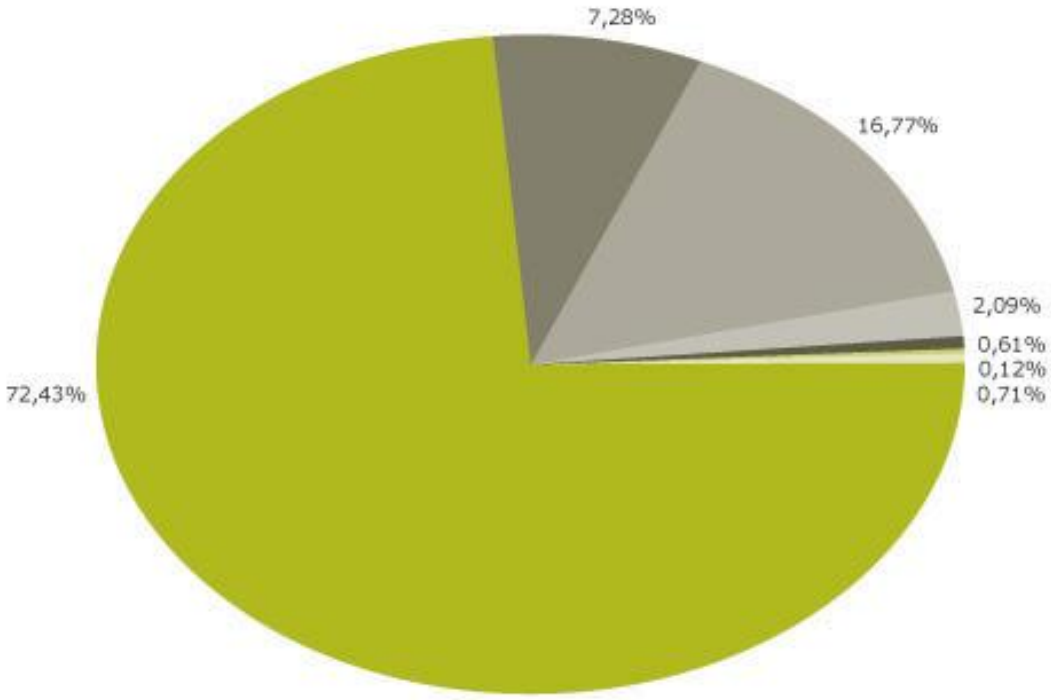
Introduction

ONS (the Brazilian ISO) was created in 1998 as a non-profit private company to be the responsible for the operation of the National Interconnected System (NIS), a large electric system with more than 90,000 km of high voltage transmission lines.

To accomplish it, ONS has four regional control centers and a national center, with a special concern to keep up with cutting-edge technology for monitoring and control.

Energy matrix (NIS)

Estrutura da Capacidade Instalada no SIN - MW

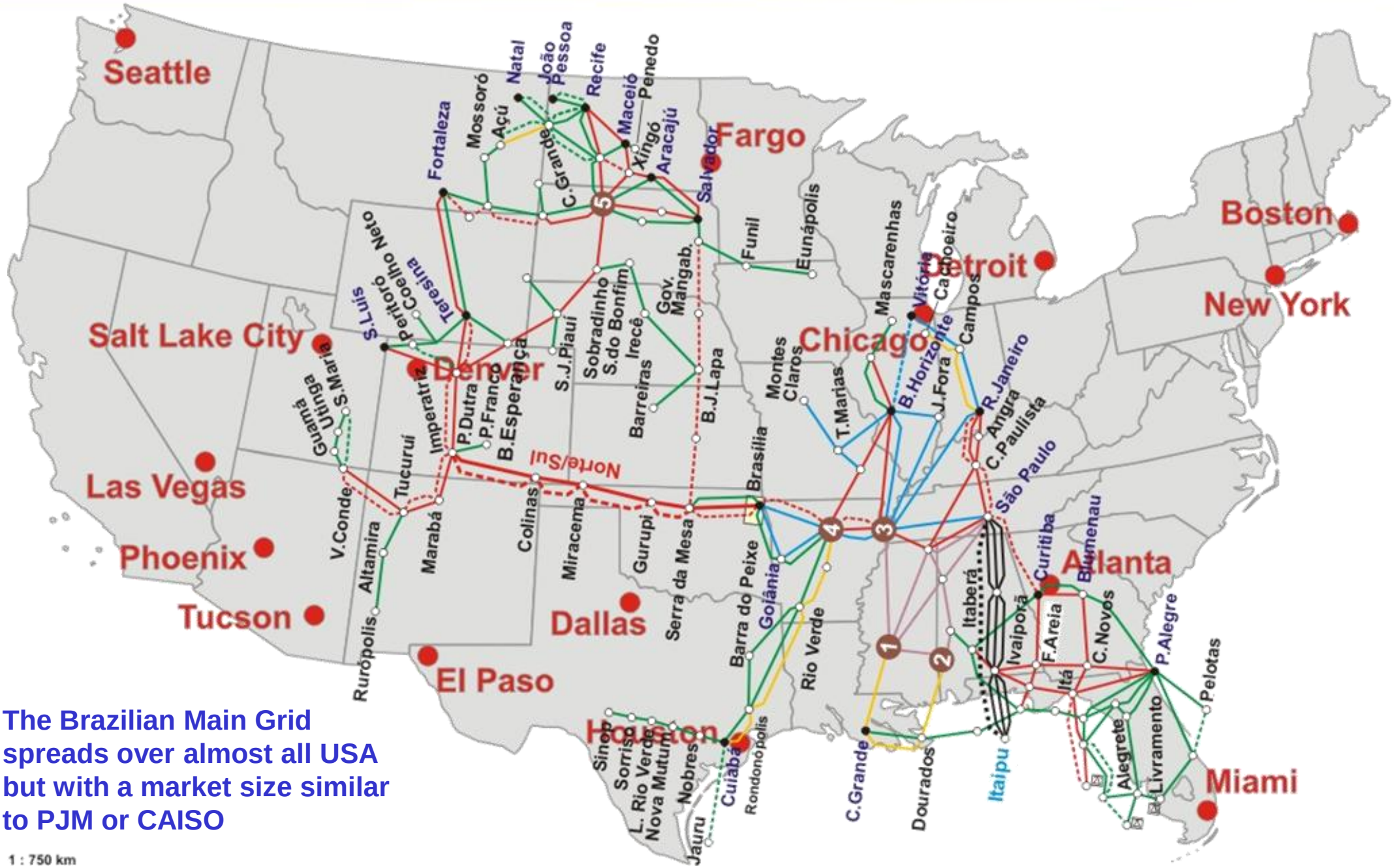


Hidro Nacional	69.677,6 MW	72,43%
Hidro Itaipu	7.000,0 MW	7,28%
Térmica Convencional	16.131,4 MW	16,77%
Termonuclear	2.007,0 MW	2,09%
Eólica	586,1 MW	0,61%
Biomassa	113,2 MW	0,12%
Outros	686,5 MW	0,71%
Total	96.201,9 MW	100,0%

Dados referentes a 31/12/2010.
O SIN conta com a disponibilidade de importação de 4.078 MW de Itaipu contratados ao Paraguai e de 2.192 MW da Argentina, Uruguai e ANDE/Paraguai.

A Capacidade Instalada do SIN não conta com as usinas que tenham sua capacidade instalada menor que 30 MW.

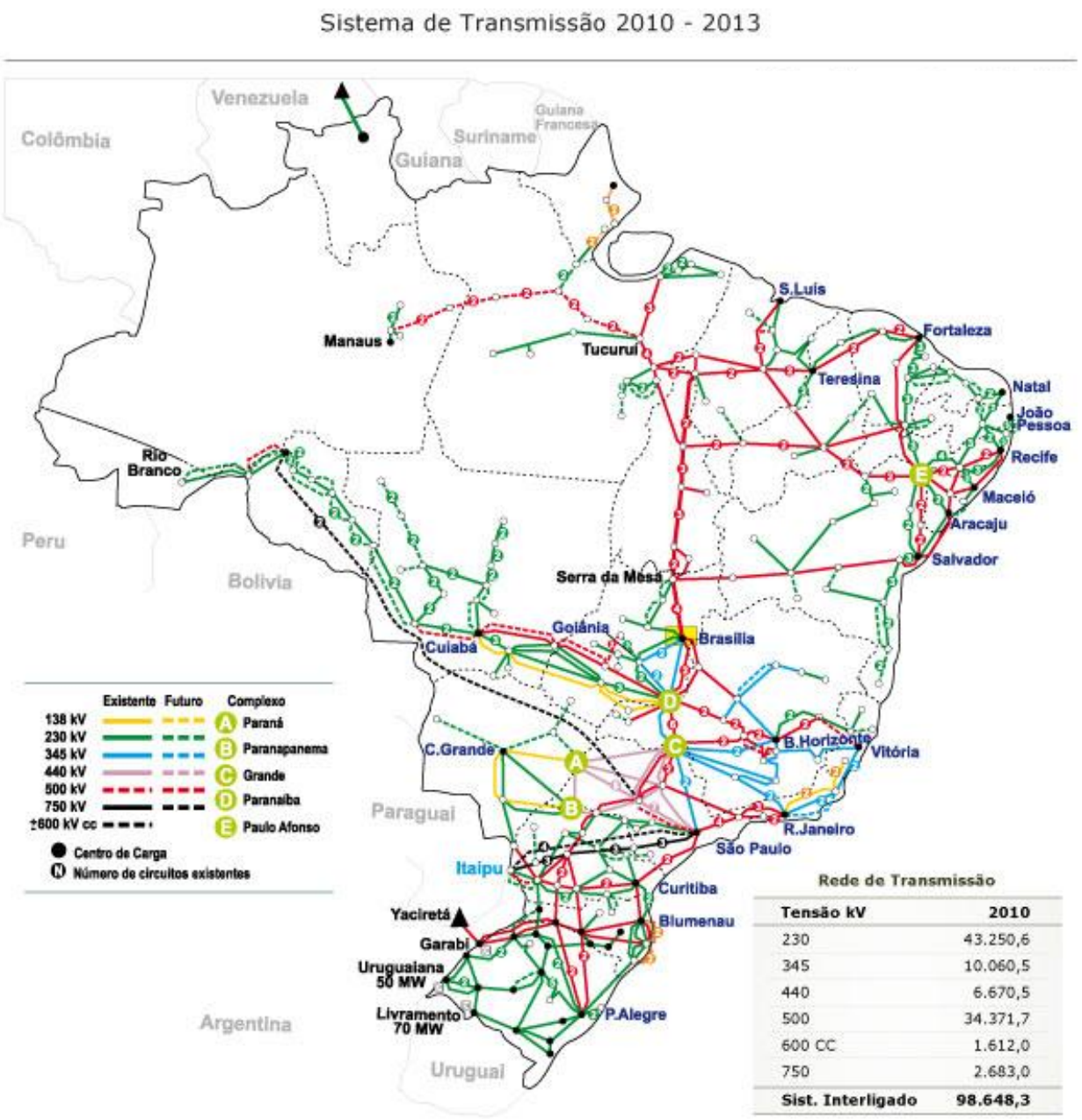
Brazilian NIS compared to the USA



The Brazilian Main Grid spreads over almost all USA but with a market size similar to PJM or CAISO

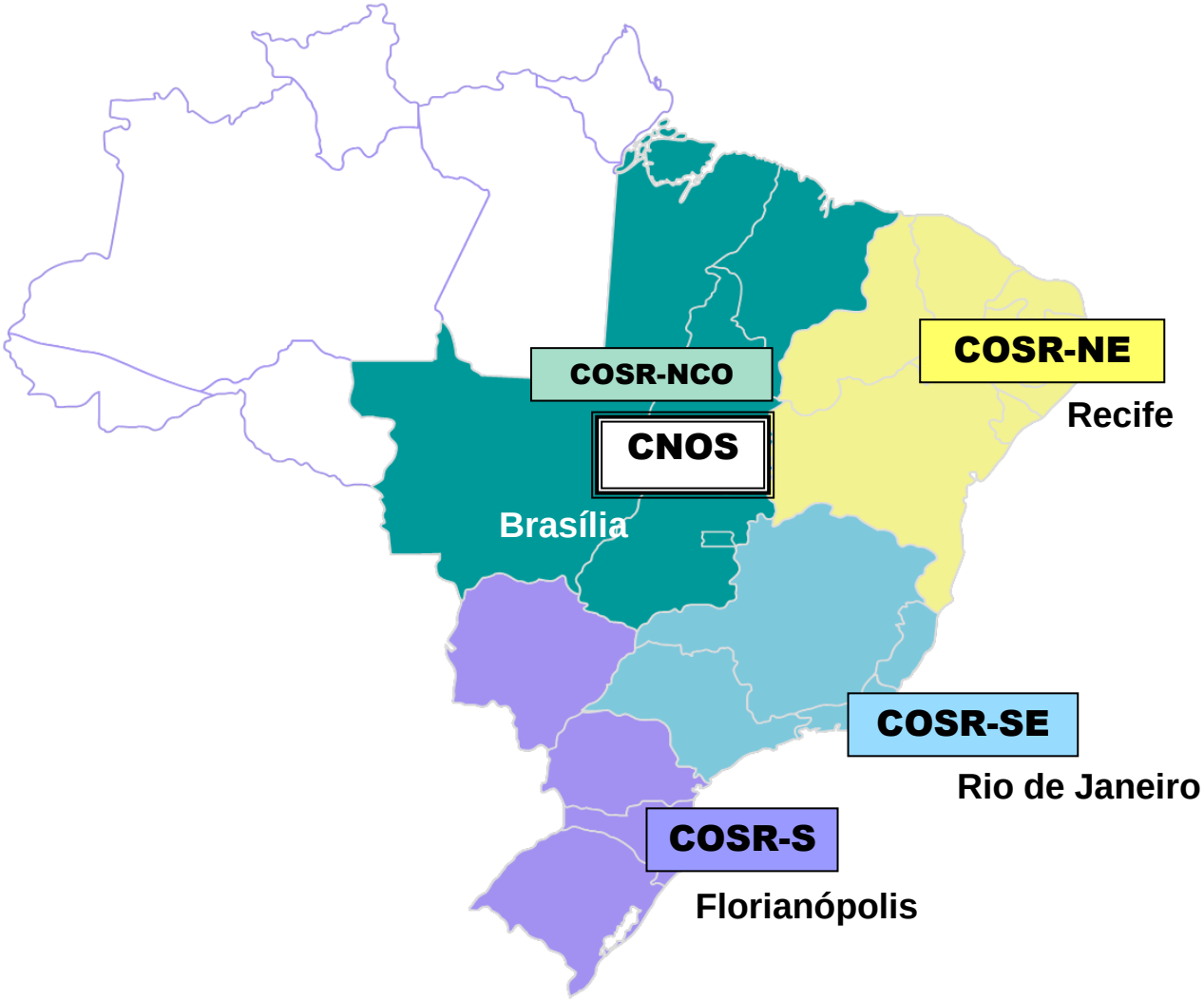
1 : 750 km

National Interconnected System (NIS)



2011	
Installed Capacity	96.201,9 MW
MAX Demand (FEB/2011)	71.052 MW
TLs > 230kV (Kms)	98.648,3 Km
TLs > 230kV (branches)	4322
Substations	2542
Transformers	1907
Associated Companies "Agents"	382

Current Control Center Structure



Control Center	EMS
CNOS	SAGE (CEPEL)
COSR-NE COSR-NCO COSR-S	EMP (ALSTOM)
COSR-SE	SOL (FURNAS)

Motivations for REGER project

Problens in the current structure:

- Difficulties in operation, maintenance and evolution of systems due to the use of three different technologies and various conditions of technical and commercial support;
- Not synchronized network with differences seen in real-time data between centers and history registry.
- Redundant data Entries in the different centers. Difficulty to ensure the consistency of information.
- Difficult to maintain information security
- Infeasibility of an effective plan for Control Centers contingency.
- Non-standard user-interface
- Technological obsolescence.

REGER – ONS new Power Management Network

Currently, ONS is implementing REGER, its new Power Management Network, a distributed and redundant supervision and control system, tightly integrated with other ONS corporate systems.

It has been designed following the premises established by VLPGO Group (WG Cigré D2.24), which ONS takes part.

In June 2009 the consortium formed by Siemens and Eletrobras CEPEL, signed an agreement with the ONS to provide the solution for the development, integration and deployment of REGER.

The solution proposed is based on:
SAGE (CEPEL EMS/SCADA), IMM (SIEMENS Model manager) and PI OSI software.

REGER – General View

Distributed and integrated System

High Availability

Redundancy:

Beyond the local redundancy of each element, each control center has a backup.

Information uniqueness:

Every information in REGER shall have only one source, no matter if it is an electrical equipment parameter, dynamic real-time measurement, or a historical record;

Standardization and integration:

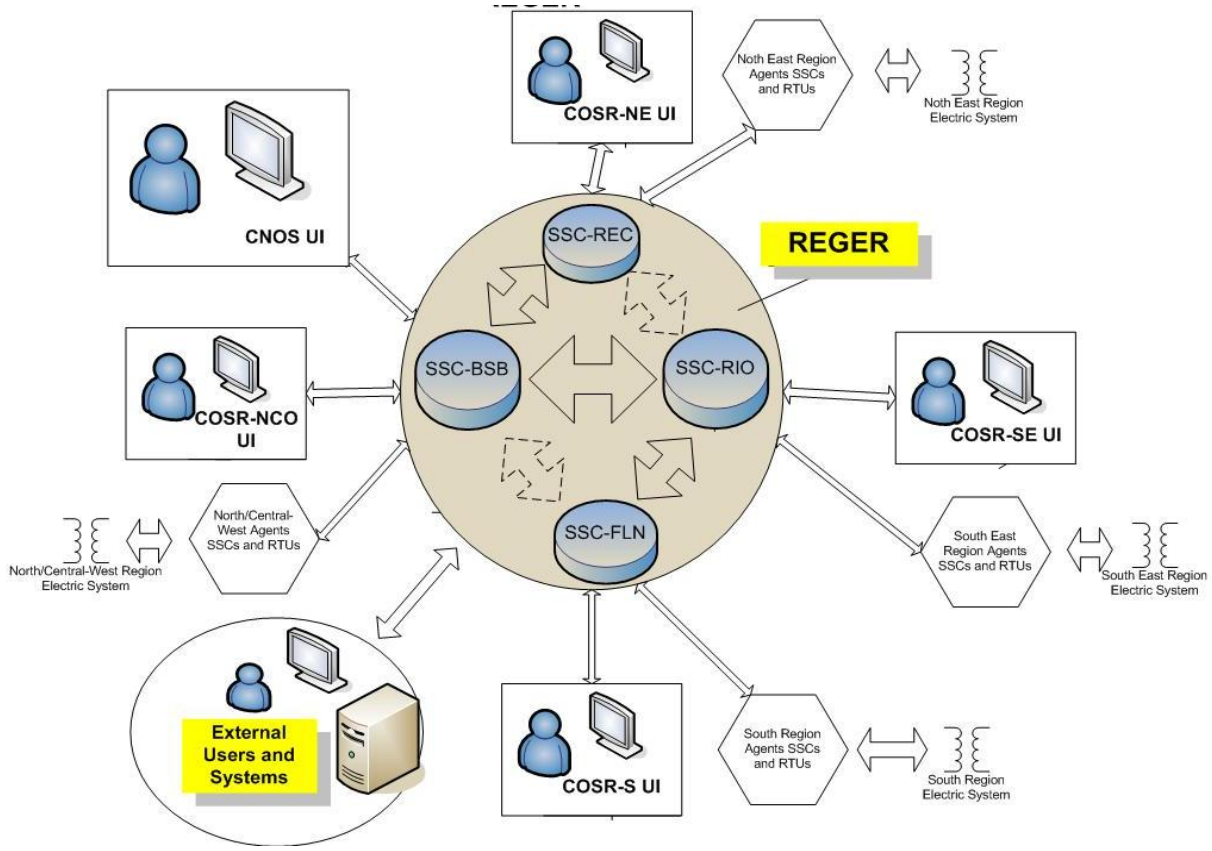
A common data model should be adopted for the interface between REGER and other ONS systems.
Especially the CIM standard was adopted allowing functional software integration independent from one provider.
Future integration with corporate systems should be through a service-oriented architecture (SOA).

Uniformity and Update of the Technology Platform

Cyber security:

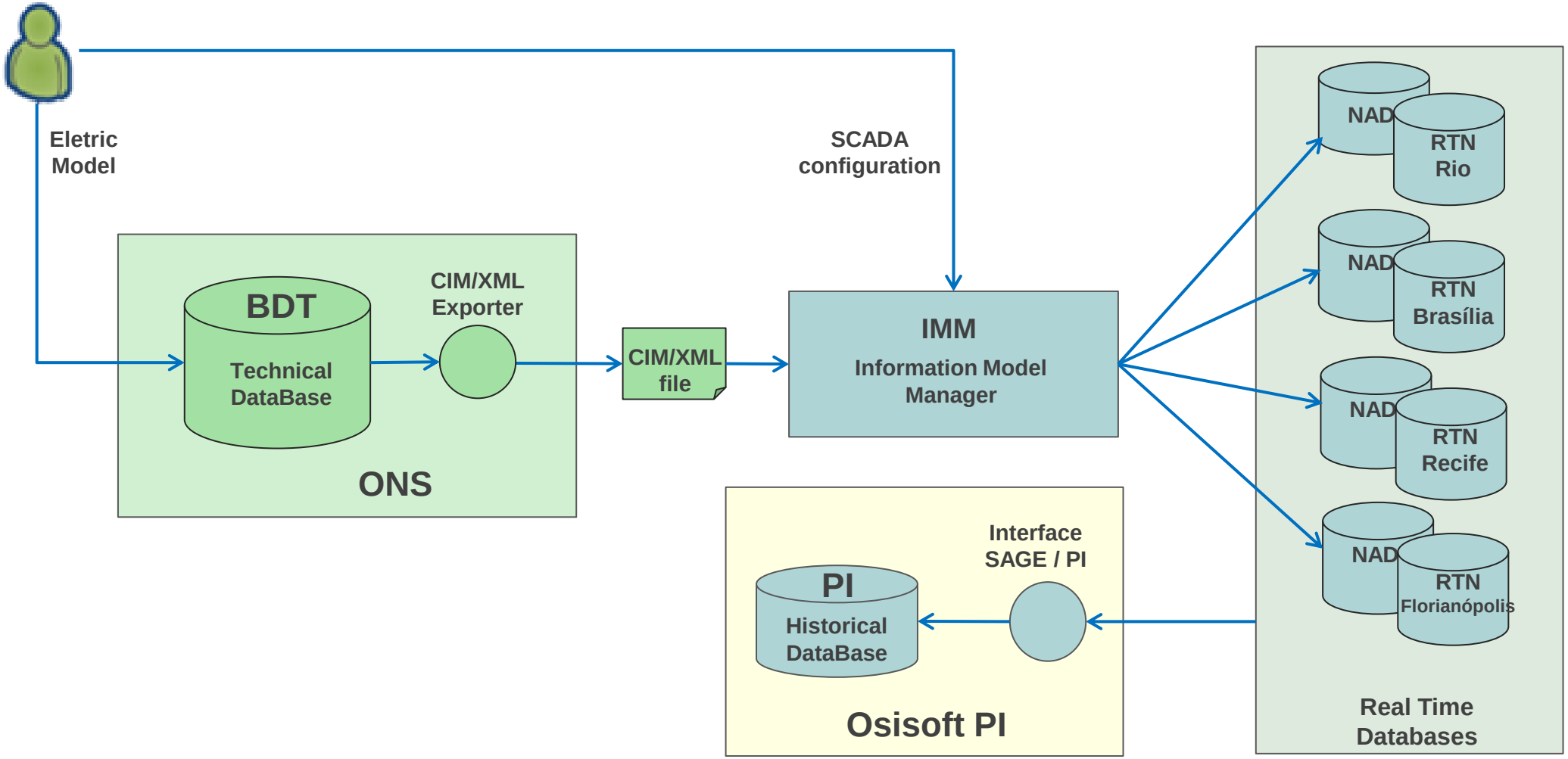
The new system should be adhering to international standards, in particular to NERC-CIP standards;

Reduced Total Cost of Ownership in the long-term vision (Evergreen)

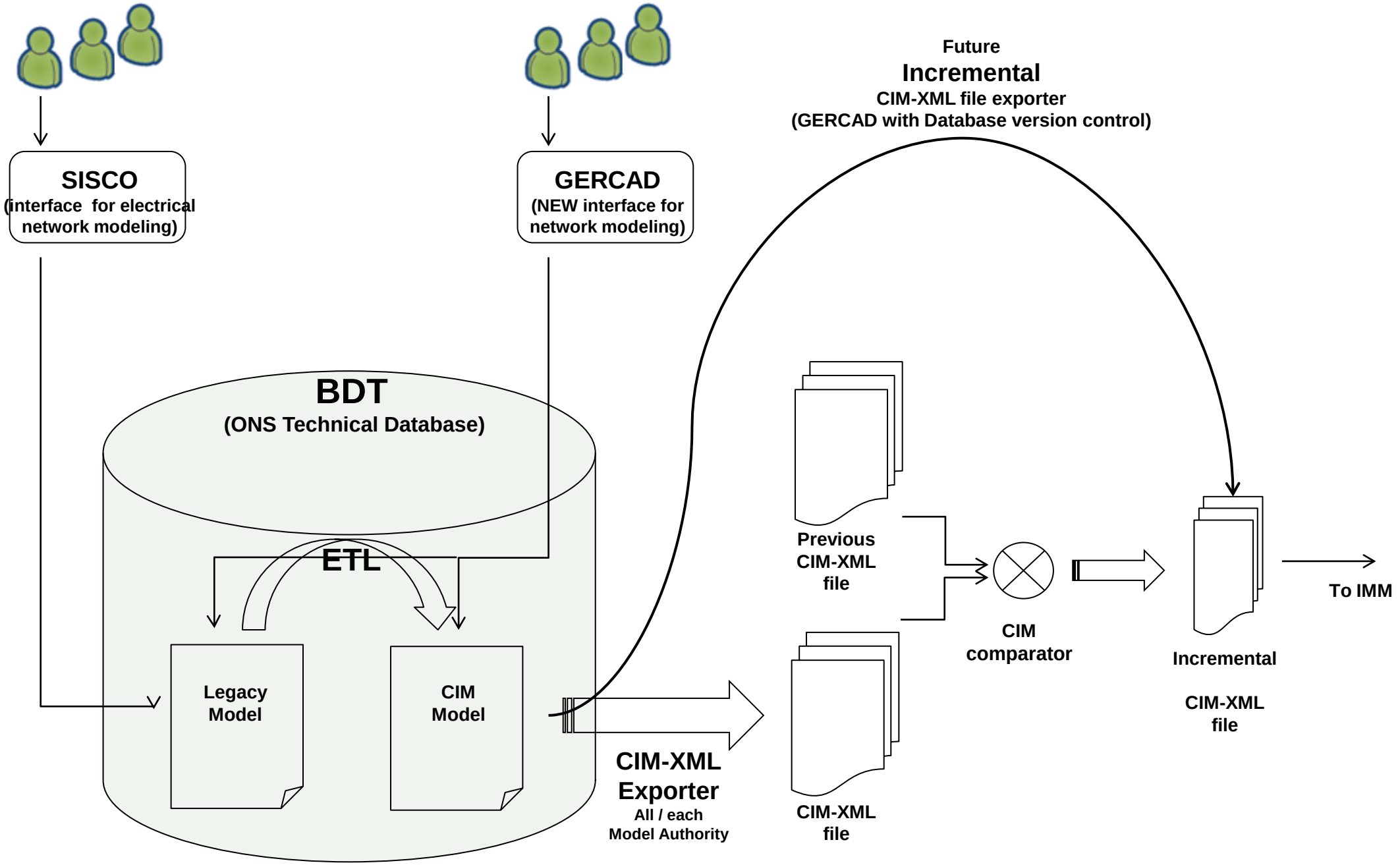


REGER – Database Architecture

The use of CIM is a key element in the architecture to integrate BDT (ONS Technical Database), where the whole Brazilian electric model is maintained, with REGER Master database maintained at IMM (SIEMENS).



CIM in REGER Architecture



ETL (Transformation to CIM model)

Software able to perform the translation of the legacy modeling, which is kept in standard relational database, to the CIM modeling.

In compliance to CIM version 13.

As a philosophy for this translation, we tried to keep it as strictly as possible to the CIM classes, avoiding extensions to the model.

However, to meet specific requirements of the new EMS (SAGE) a total of 19 classes and 170 attributes were extended in CIM. Of this total of 170 attributes, 49 were also extended in our legacy model to meet this new requirements.

The CIM-XML file exported from BDT (Whole Brazilian topology) has 230Mb.

The complete CIM-XML file exported from IMM (Topology + SCADA configuration) has 1,5Gb.

Option to export CIM / XML archives by Model Authority, complete (all MAs) and incrementally.

Future issues of interest

- Performance

  To generate an incremental CIM-XML file:
  - Run ETL,
  - Export complete CIM-XML file,
  - Compare this file to a previous one.

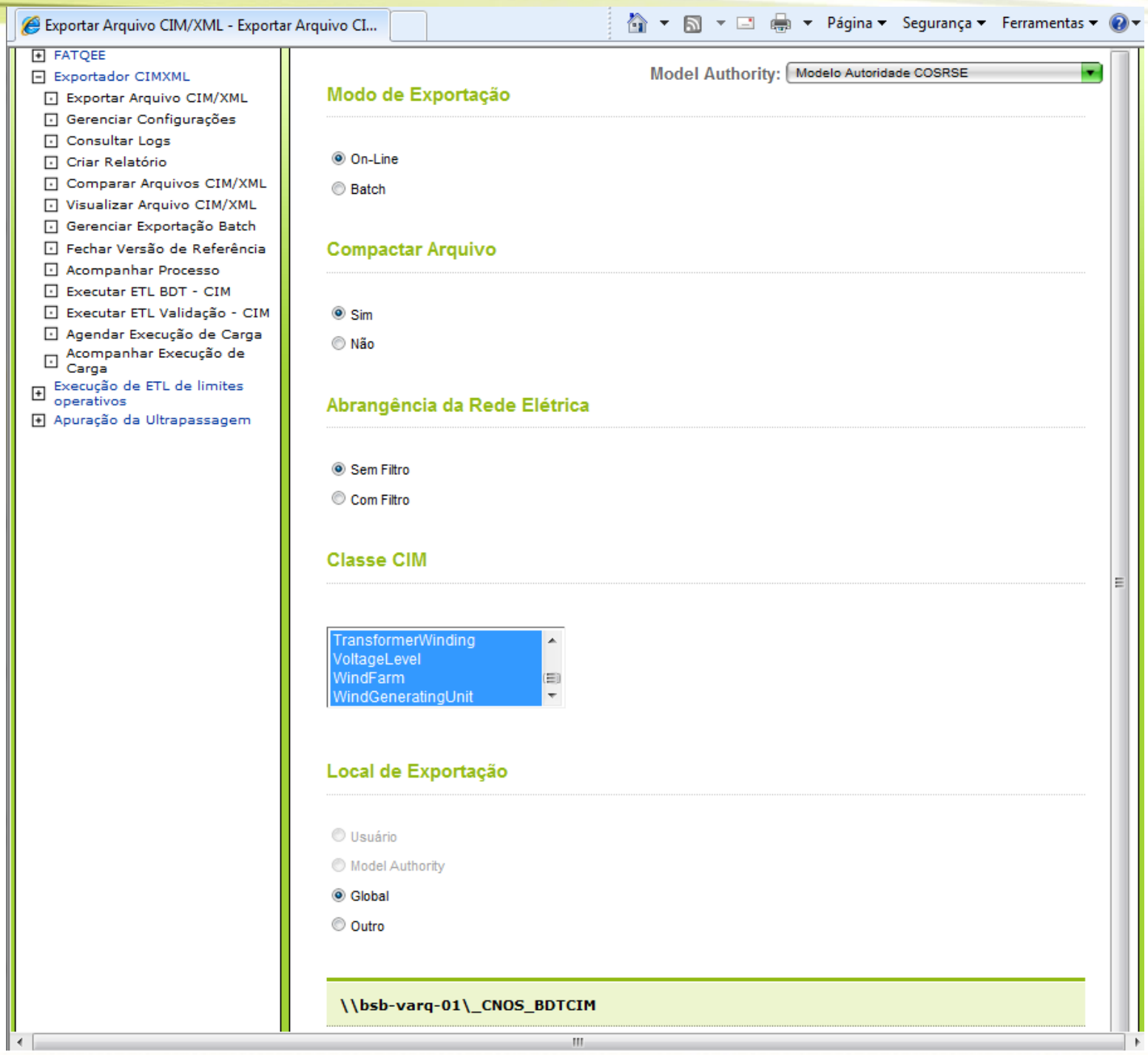
  Taking about 1h30m at the whole process to produce the incremental due:
  - excessive number of steps in the process,
  - size of Brazilian grid,
  - CIM-XML file size itself,

- Consistency of Electric model at BDT (Electric model only) and IMM (Electric Model + SCADA Conf.)

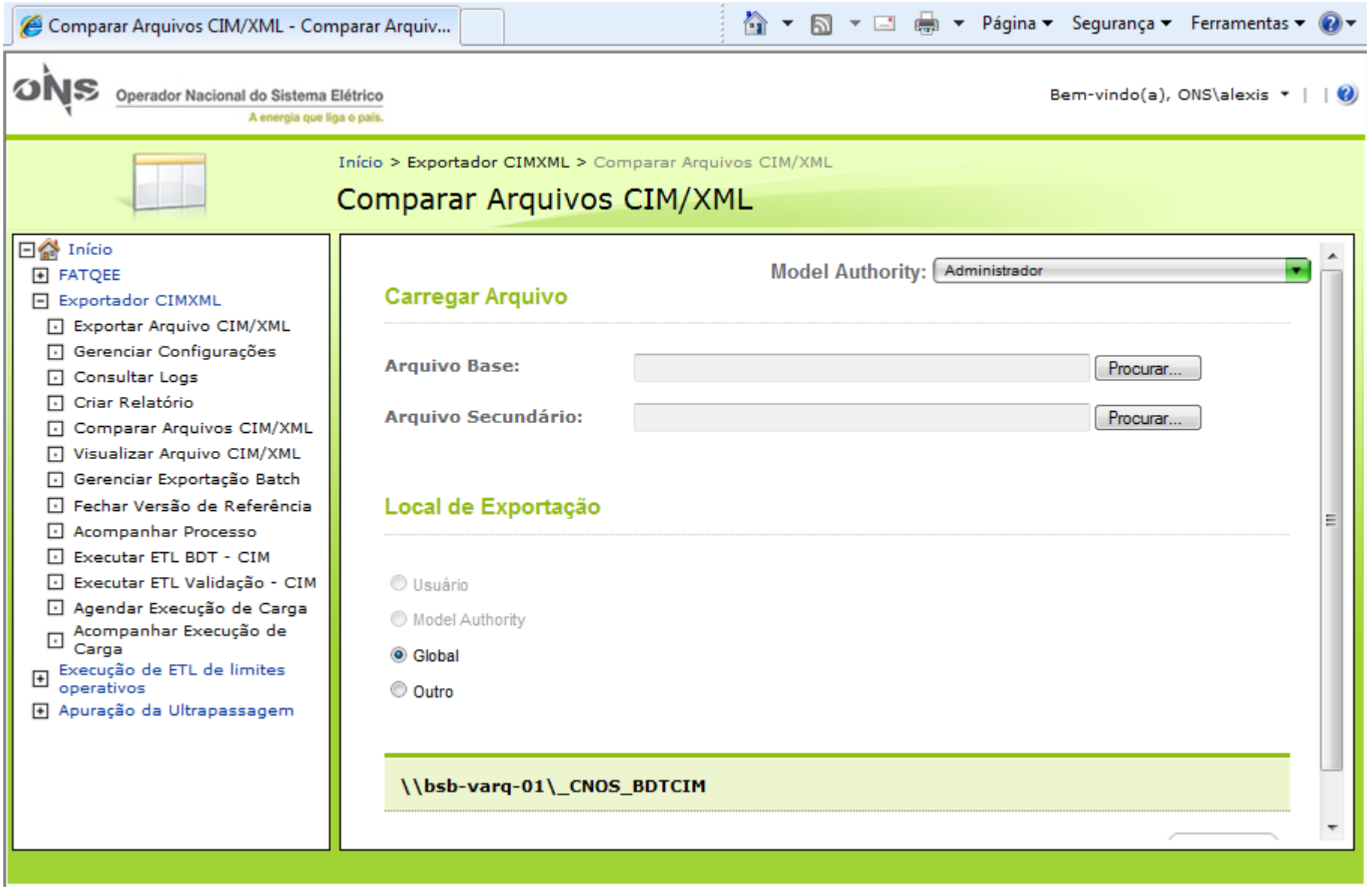
  As we have this two separated DBs we are studying a way of at any moment make a check of electric model consistency between them two. It would be desirable if this “comparison” of two databases could produce an incremental CIM-XML file with the differences.

- Policy of upgrade for future versions of CIM.

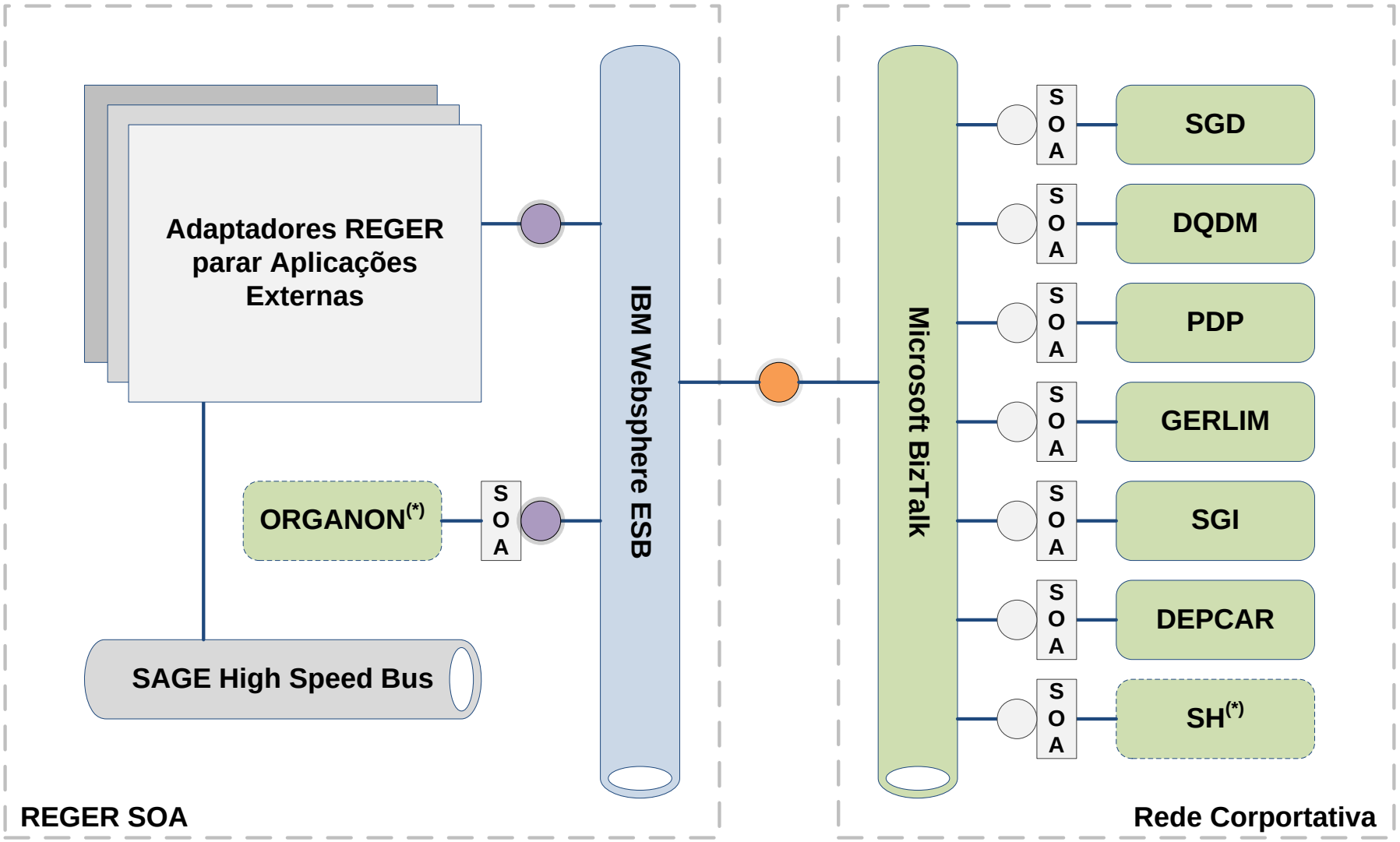
CIM-XML exporter interface



CIM-XML exporter interface



Future Developments – Integrations using SOA



REGER – Operative Network

Corporative Network

Future Developments – Integrations using SOA

Existing applications that will be integrated to REGER using SOA:

ORGANON – Real Time Voltage Stability Analisys (VSA) and Dynamic Stability Analisys (DSA);

PDP – Daily production Scheduler;

SGD – Documents Manager (Operative Instructions)

SGI – Outage Scheduler;

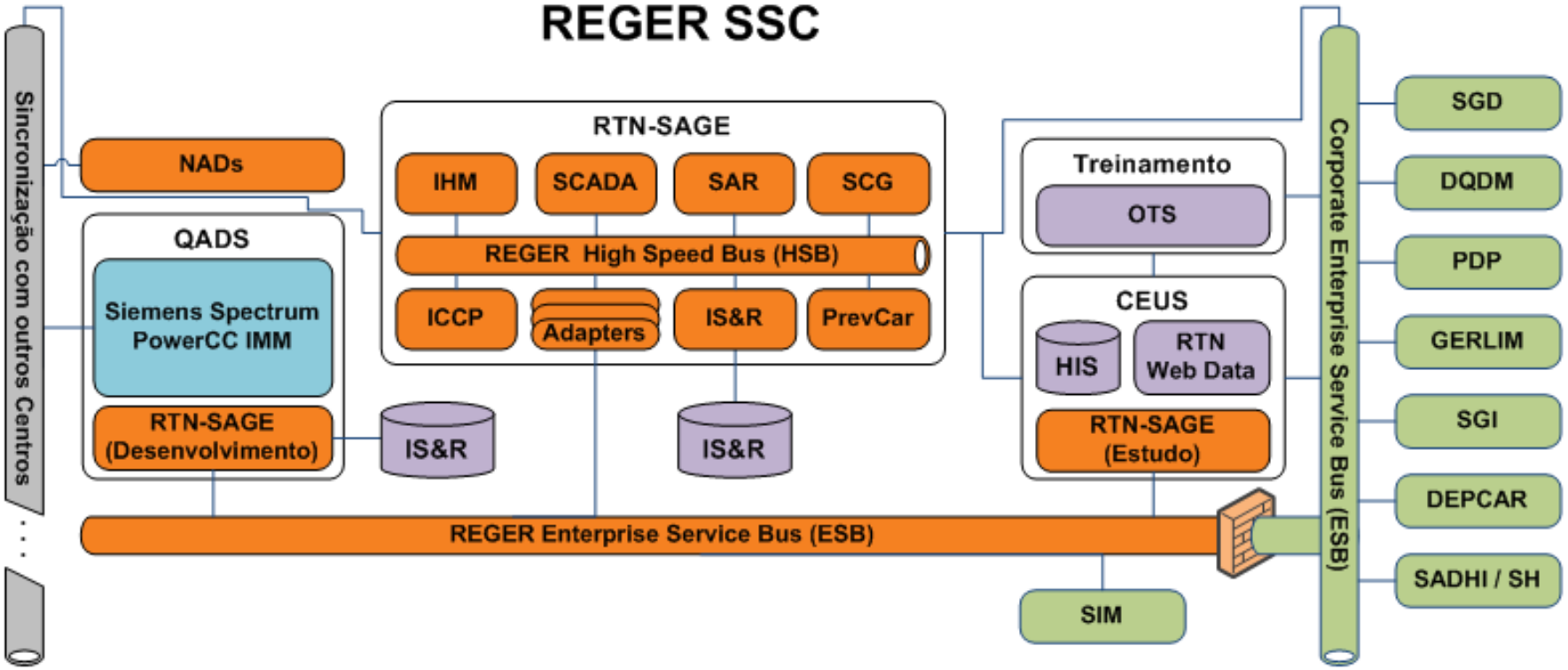
GERLIM – Limits manager;

DQDM – Report of Quality and availability of measurements;

SH – Hydro Simulator

DEPCAR - Data acquisition system for load forecasting.

REGER – Final Software Architecture



CEUS: Corporate/External User Support System
QADS: Quality Assurance and Development System
SAR: Sistema de Análise de Redes
SCG: Sistema de Controle e Geração
NADs: Nós de Aquisição de Dados
PrevCar: Previsor de Carga
IMM: Information Model Management

SIM: Simulador de Transitórios Eletromecânicos Tempo Real (Organon)
DEPCAR: Dados Externos para o PrevCar
SADHI/SH: Sistema de Aquisição de dados Hidrológicos/Simulador Hidráulico
SGI: Sistema de Gerenciamento de Intervenções
SGD: Sistema de Gerenciamento de Dados
PDP: Programa Diário de Produção
DQDM: Detecção de Queimadas, Descargas Atmosféricas e Dados Metereológicos
GERLIM: Gerência de Limites Operativos

Thank you !

Operador Nacional
do Sistema Elétrico

A energia que liga o país.

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Work Force of CIM translation

EMS provider Staff		2 People
ONS Staff	Core Business (Operational area)	1 Person
	TI area	4 People
External developer (Who wrote the code)		Unknown