



November 3, 2016

# CENACE: The Next Frontier in ISO Markets

## An Energy Market Intelligence Webcast

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# Introductions



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Broomfield, CO

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**David Kelly**

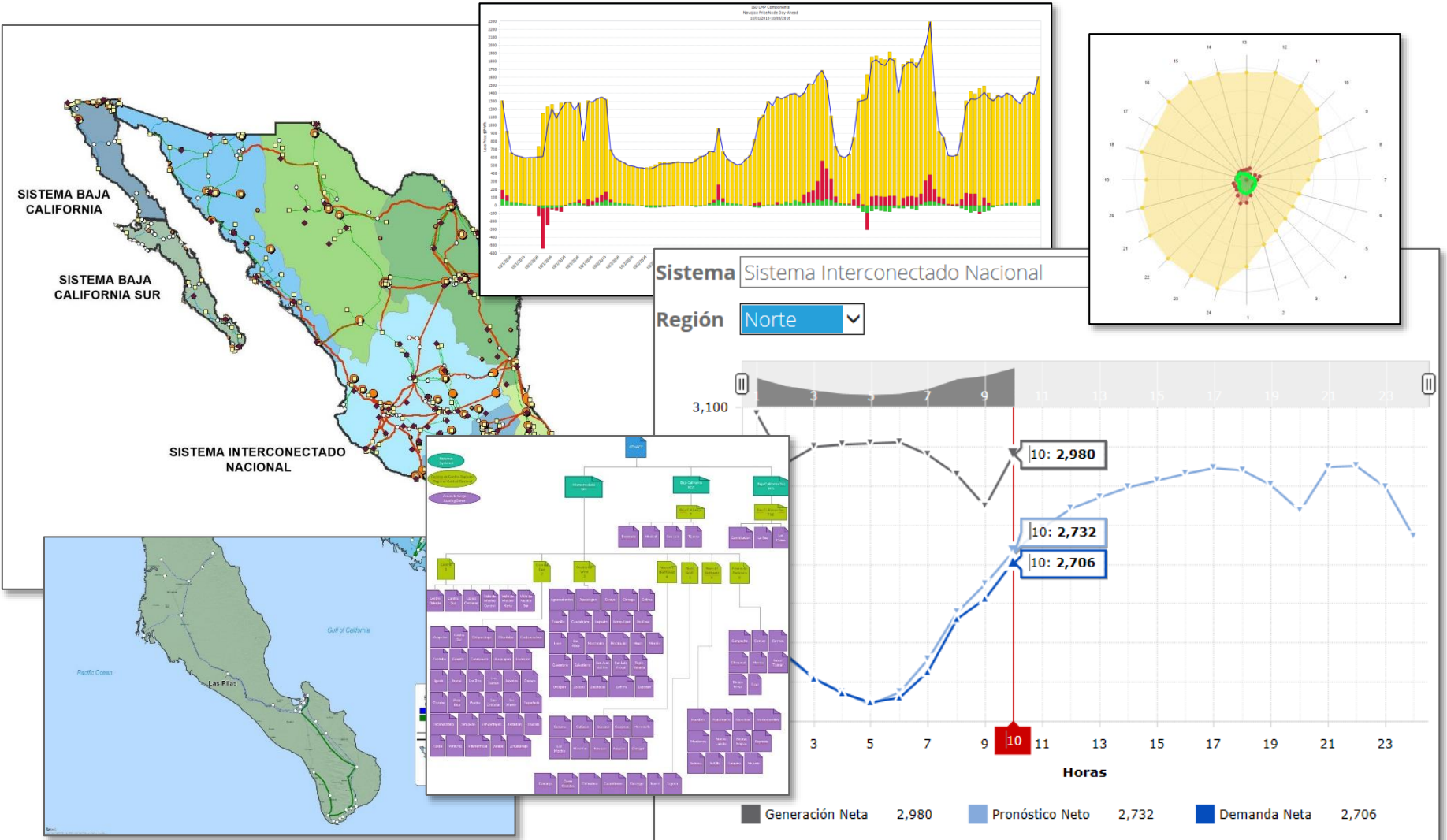
Power Markets Analyst – Velocity Suite Power

Broomfield, CO

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# CENACE ISO



# Agenda

- **CFE vs. CENACE**
  - What will be changing?
- **Available Data**
  - How is data being published?
  - LMP, Load, Generation, and More!
- **What Data is expected to be included in Velocity Suite?**
- **Sample Analysis**

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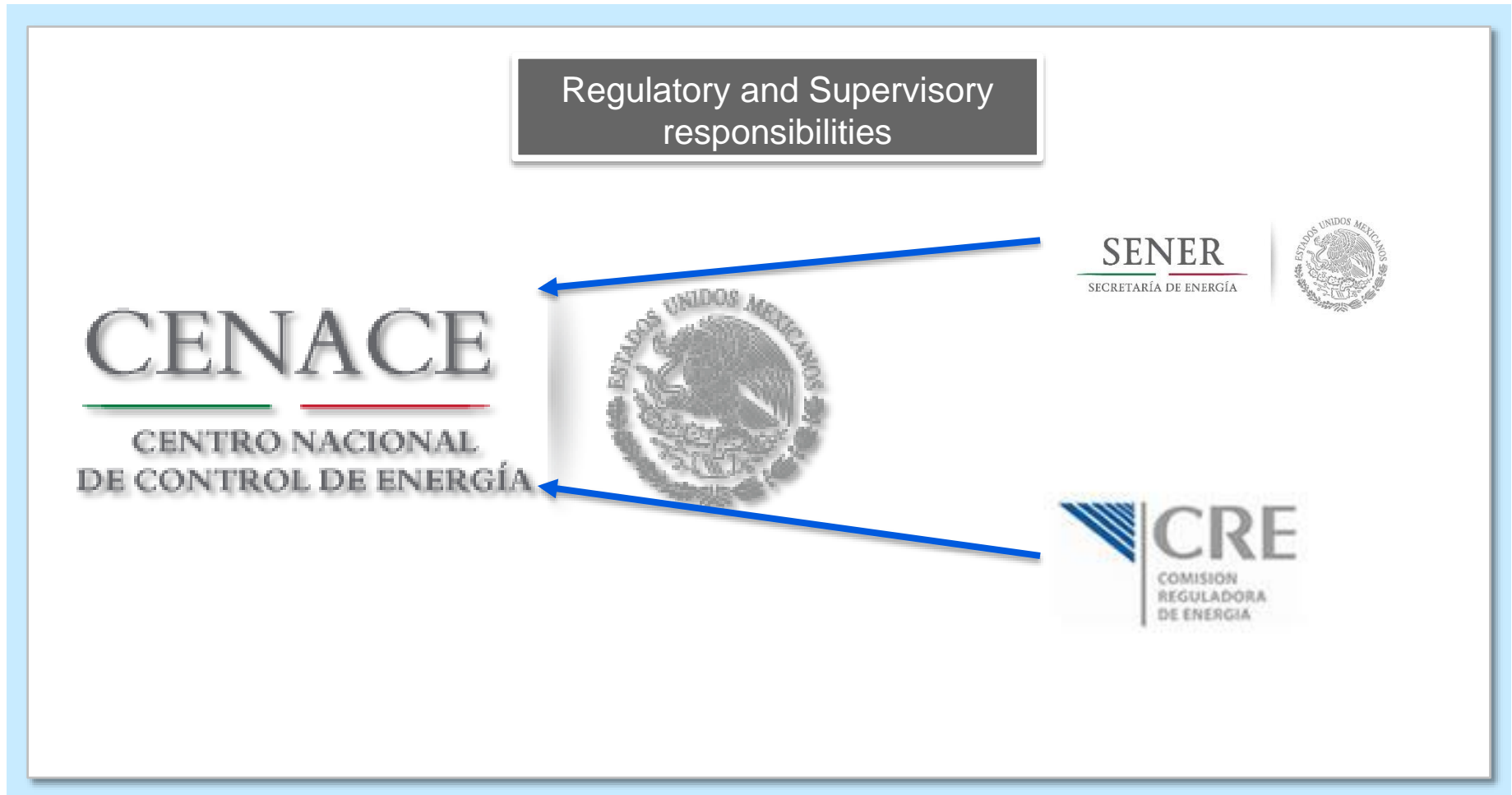
# CFE vs. CENACE

## Benefits of a Deregulated Wholesale Market



# CFE vs. CENACE

## Benefits of a Deregulated Wholesale Market





# CFE vs. CENACE

## Benefits of a Deregulated Wholesale Market

### Costs

- Reduced energy costs and increased price assurance

### Structure

- Designed based on other RTO structures but with emphasis on the regional needs
- Centralizes market structure and processes

### Stability

- More regional balance of supply and demand, with greater access to electricity
- Allows for integration of Renewable Resources more

# CFE vs. CENACE

## Challenges and Complexities

### New expertise needed

- New FTR product, increased LMP structure, transmission analysis, Ancillary Service products

### New processes

- FTR Auctions, Day-Ahead versus Real-Time market, Bid and Offer settlements, Operating Reserves

### More Complexity

- Over 2,000 entities, more detailed LMP reporting, increased regulation and control

### Changes in current patterns

- Different congestion pockets and Real-Time settlements

# CFE vs. CENACE

## What is a Deregulated Wholesale Market?

### What?

---

Nodal Pricing (2,000+)

Centralized congestion and pricing data

Improved market and operating efficiencies

Increased pricing and scheduling granularity

### How?

---

Better price signals

More efficient dispatch of electric generation

Improved ability to anticipate system conditions to reduce local congestion

Assign local congestion to the resource causing the congestion

# CFE vs. CENACE

## Current Zonal Market



- 1 Acapulco
- 2 Anahuac
- 3 Balsas
- 4 Bravo
- 5 Camargo
- 6 Campeche
- 7 Central
- 8 Champayan
- 9 Chetumal
- 10 Chihuahua
- 11 Coahuila
- 12 Colima
- 13 Cozumel
- 14 Durango
- 15 Huasteca
- 16 Juarez
- 17 La Mesa
- 18 La Paz
- 19 Laguna
- 20 Laguna Verde
- 21 Lajas Guemes
- 22 Los Mochis
- 23 Mazatlan I
- 24 Mexicali
- 25 Moctezuma
- 26 Monterrey
- 27 Occidente
- 28 Oriente
- 29 Petacalco
- 30 Puebla
- 31 Queretaro
- 32 Resumen Todos Los Nodos
- 33 Santa Lucia
- 34 Sinaloa
- 35 Sonora Norte
- 36 Sonora Sur
- 37 Sureste
- 38 Tamos
- 39 Tepic
- 40 Tuxpan
- 41 Valladolid
- 42 Veracruz
- 43 Yucatan

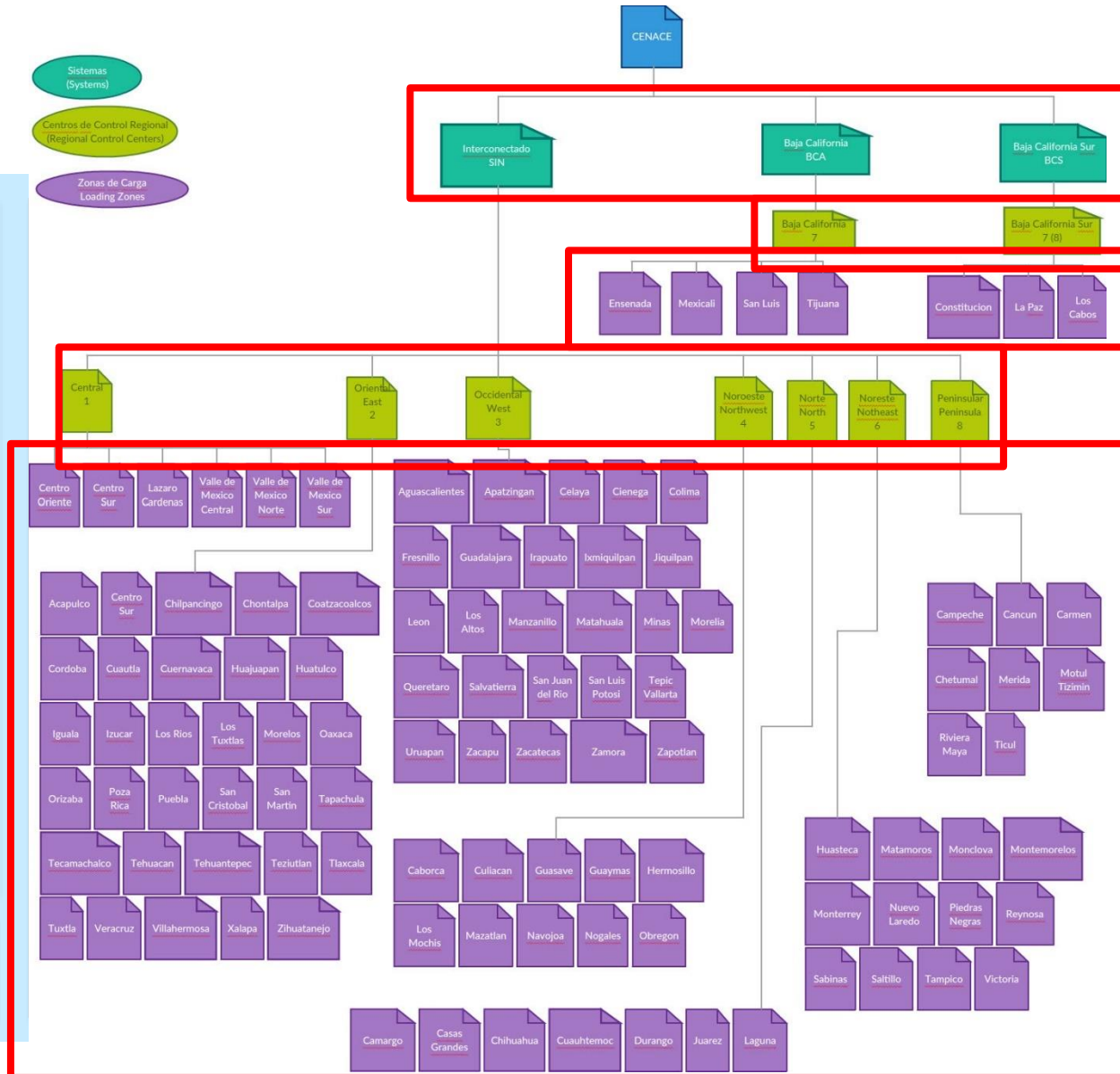
# CFE vs. CENACE

## New Entity Structure

### National Center of Energy Control (CENACE)

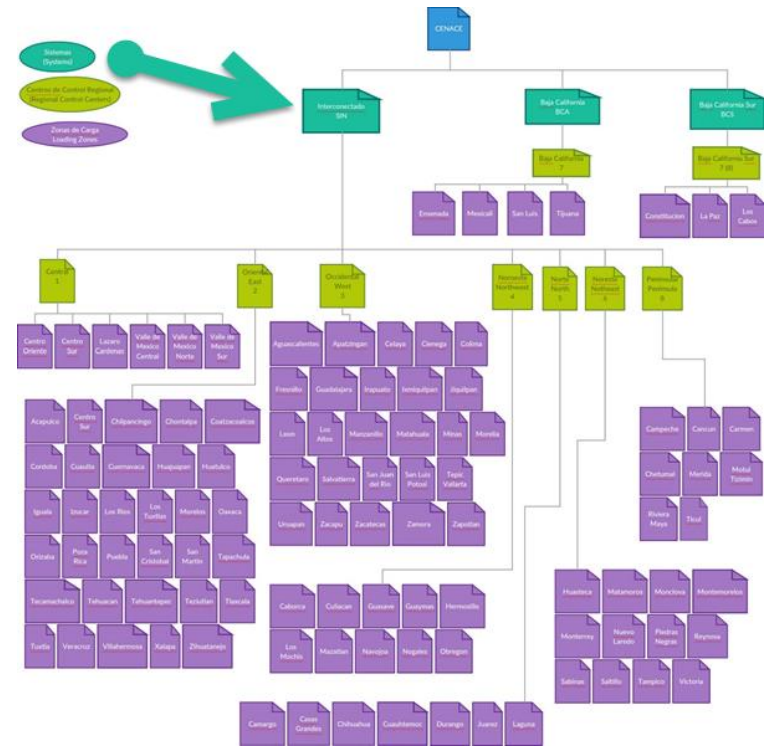
- 1 Independent System Operator
- 3 Independent Systems
- 9 Regional Control Centers
- 104 Loading Zones
- >2,300 nodes (not shown)

**Versus 42 Zonal points in CFE**



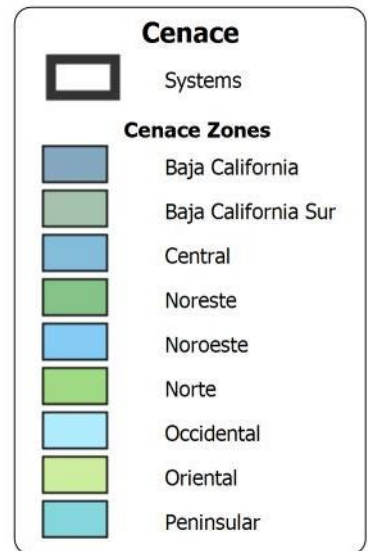
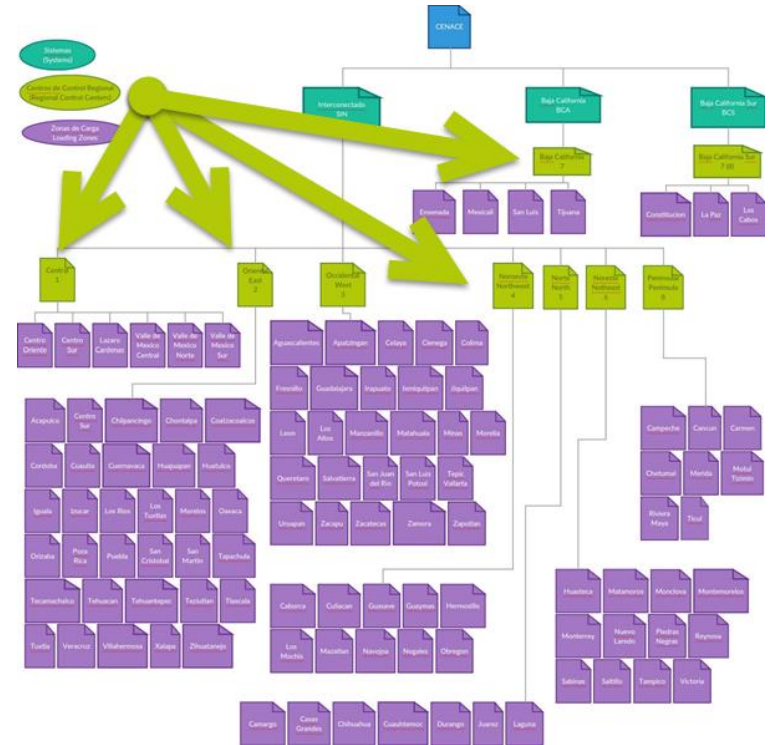
# CFE vs. CENACE

## What will be changing?



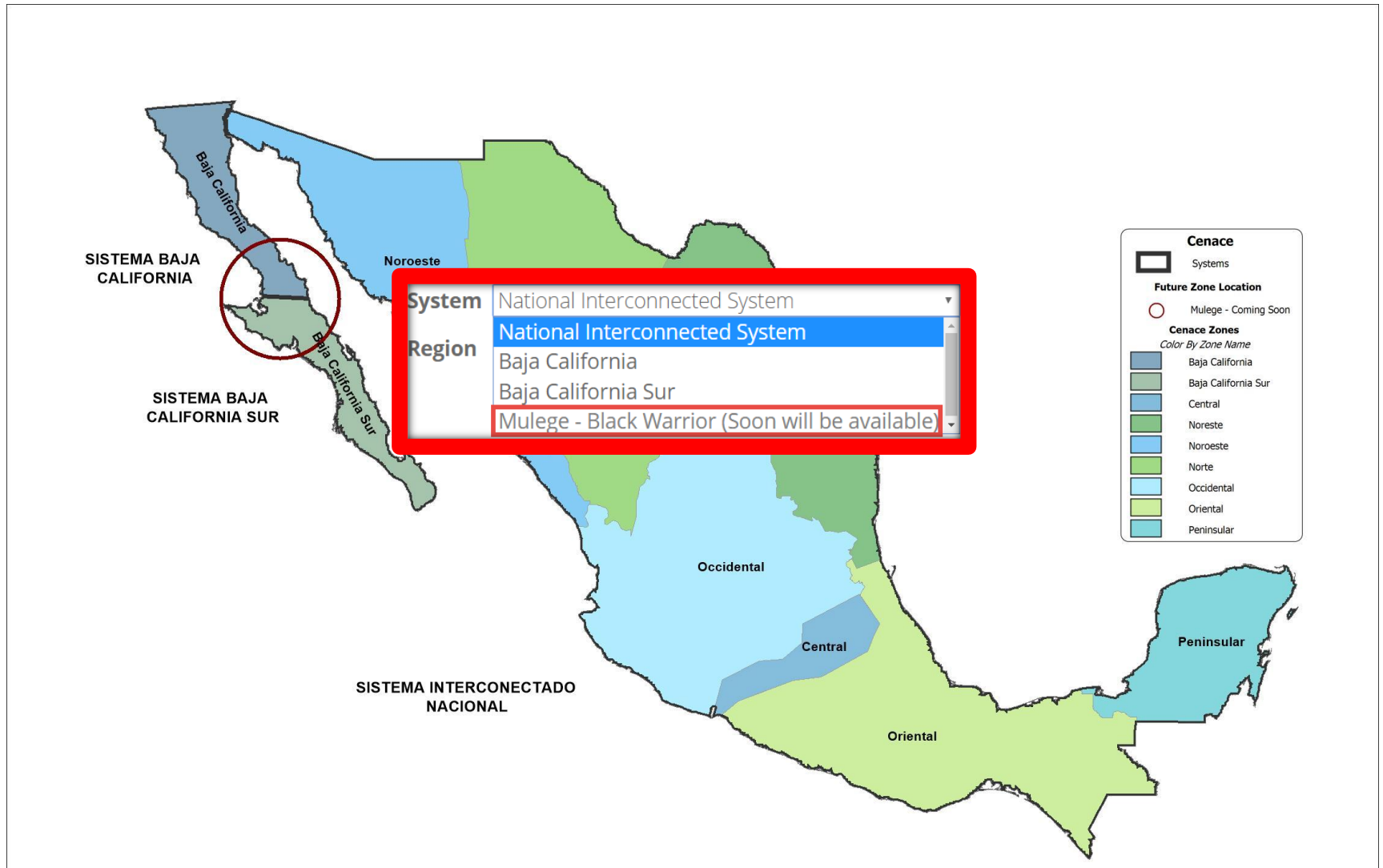
# CFE vs. CENACE

## What will be changing?



# CFE vs. CENACE

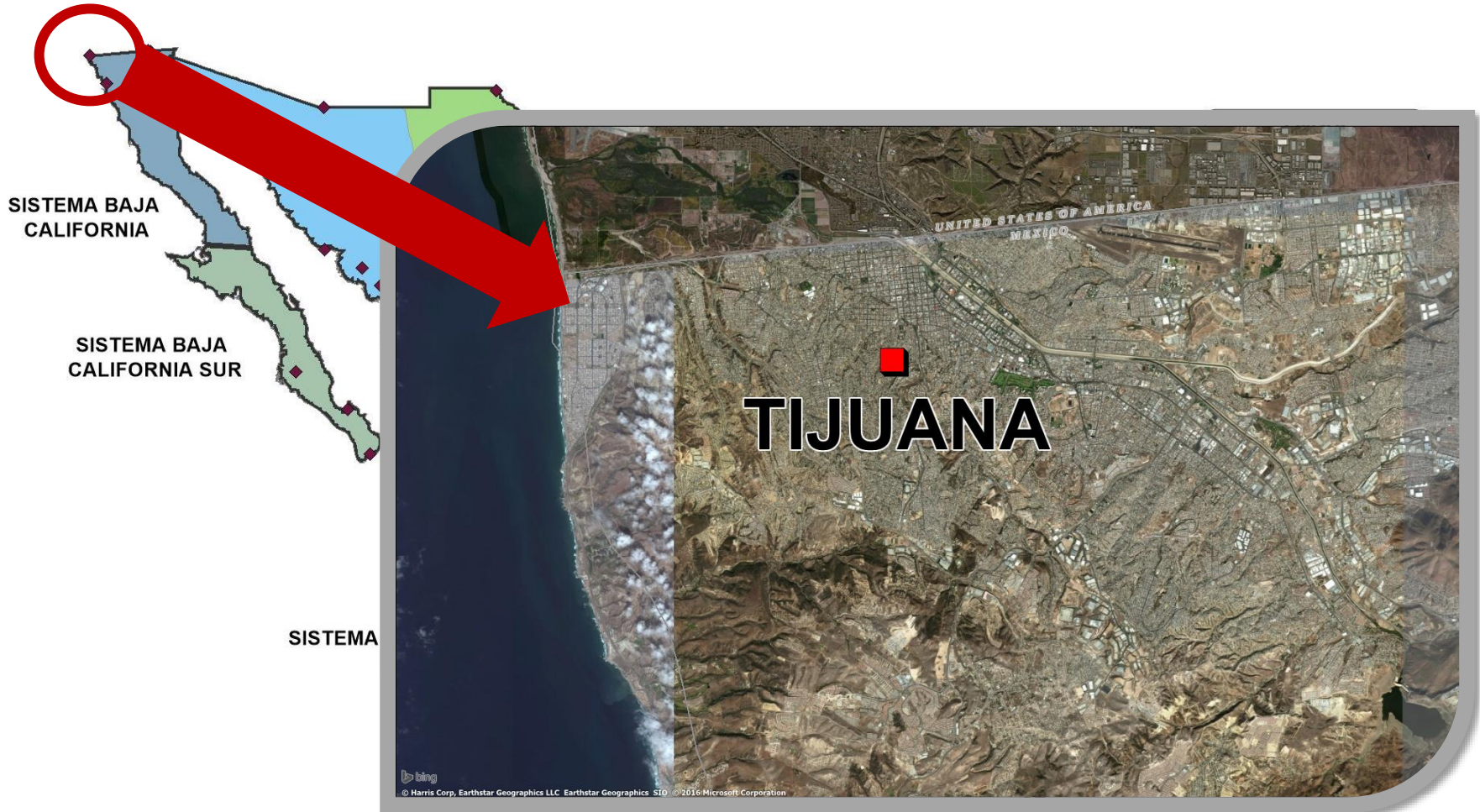
## What will be changing?





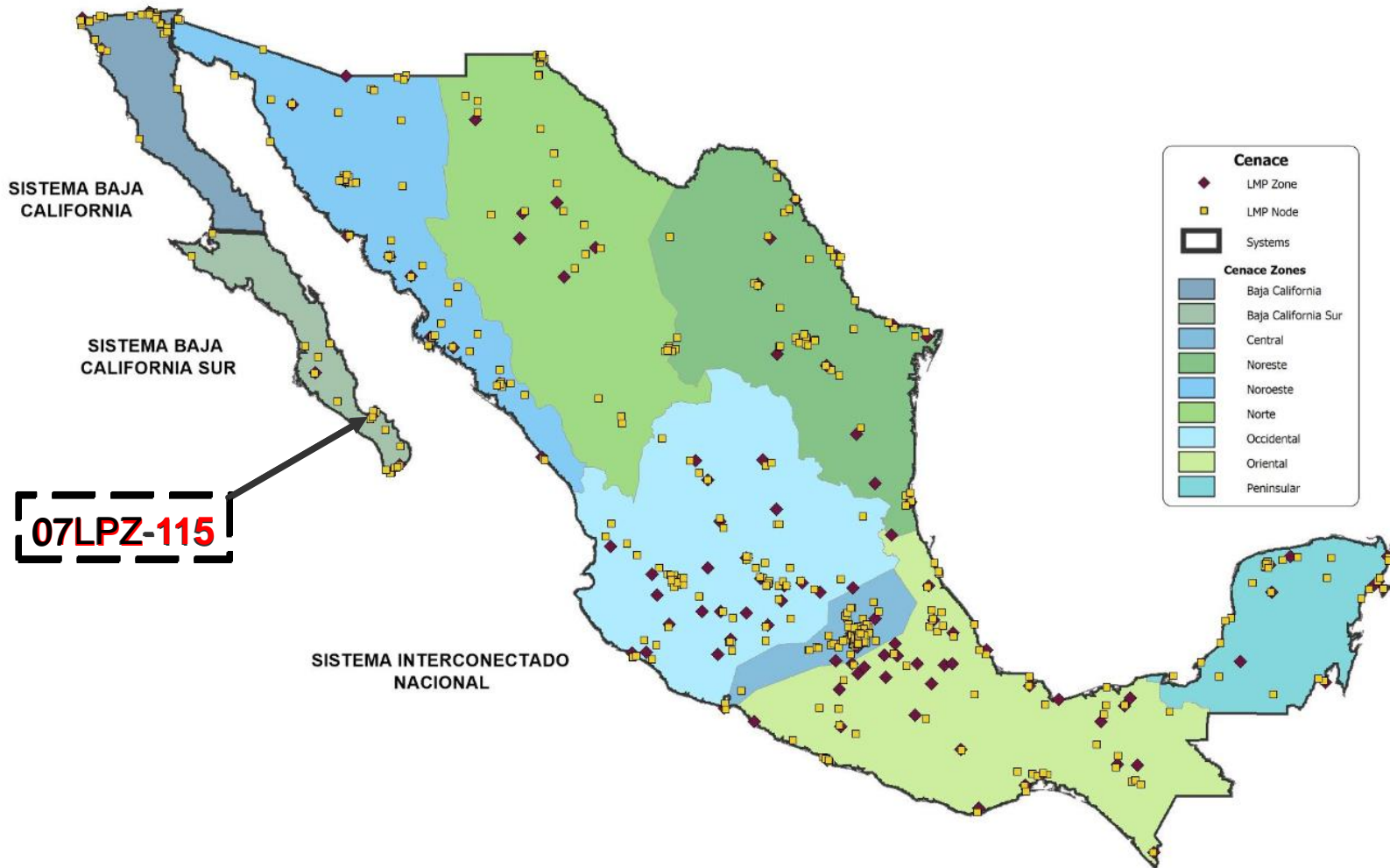
# CFE vs. CENACE

## What will be changing?



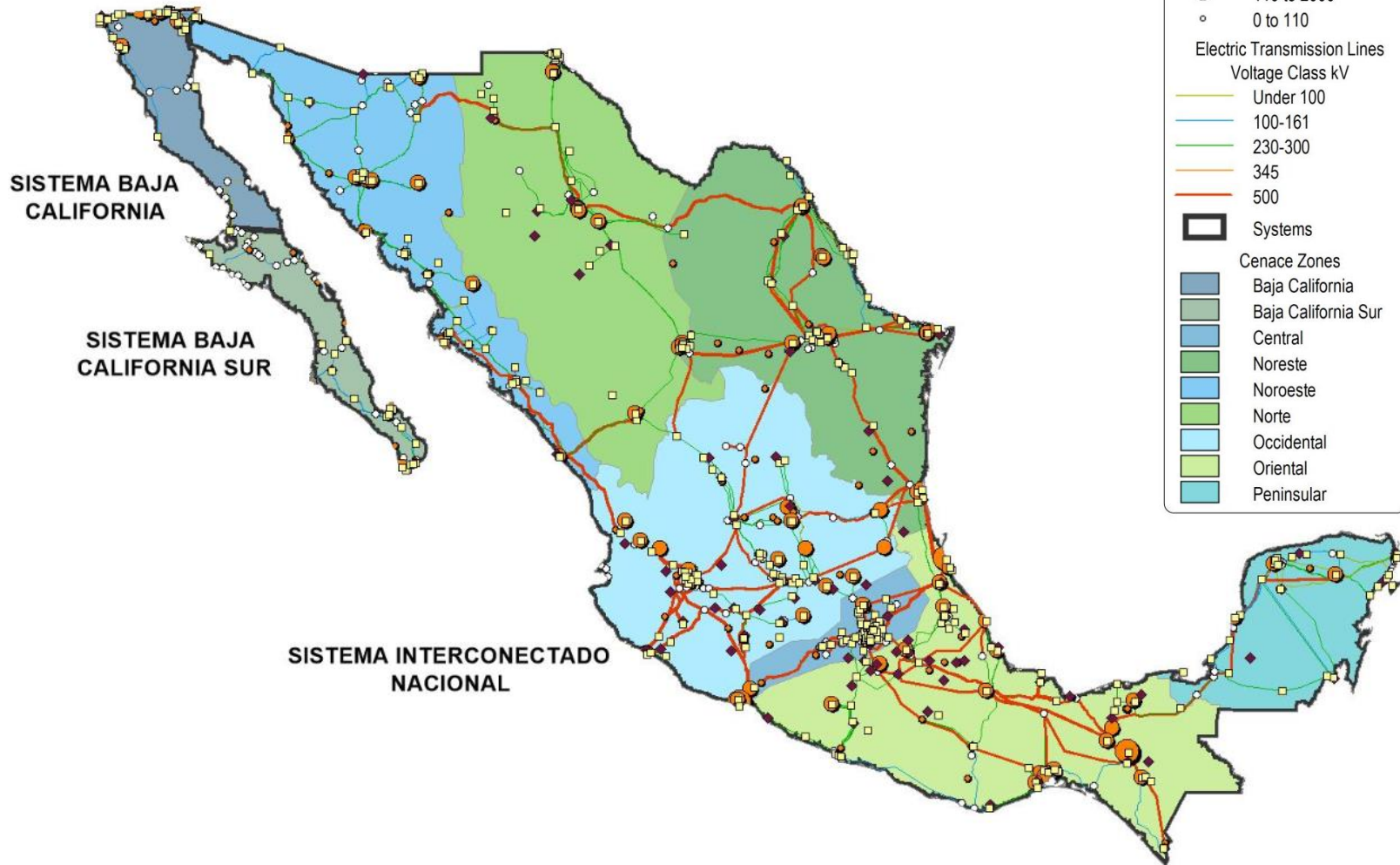
# CFE vs. CENACE

## What will be changing?



# CFE vs. CENACE

## How is this different?





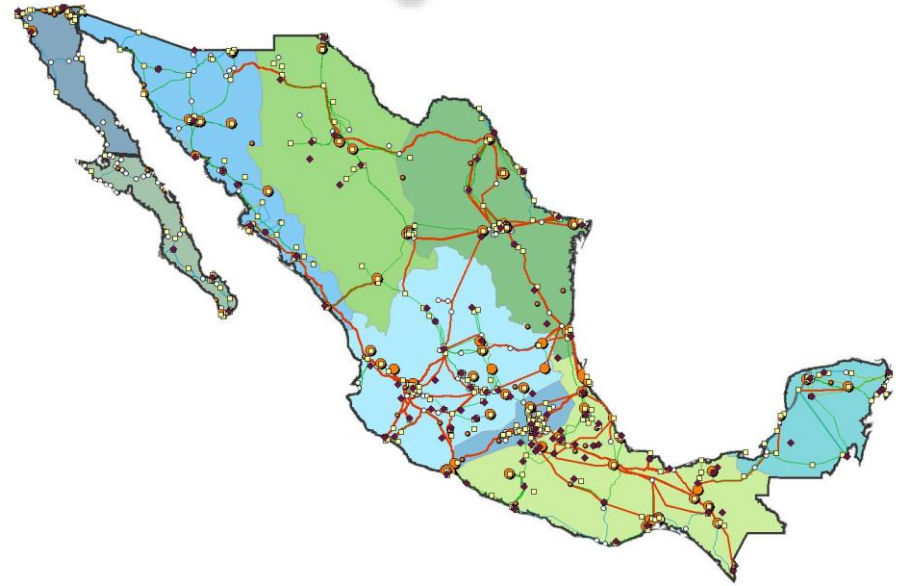
# CFE vs. CENACE

## How is this different?

CFE



CENACE

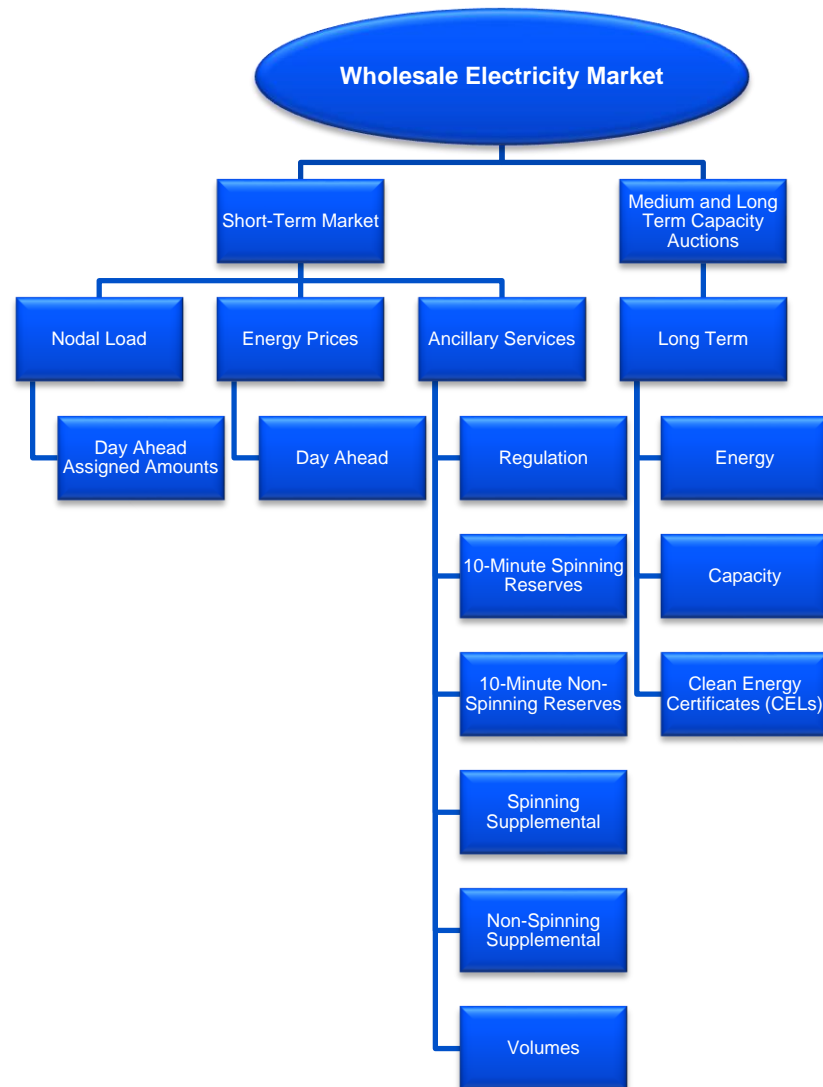


# Agenda

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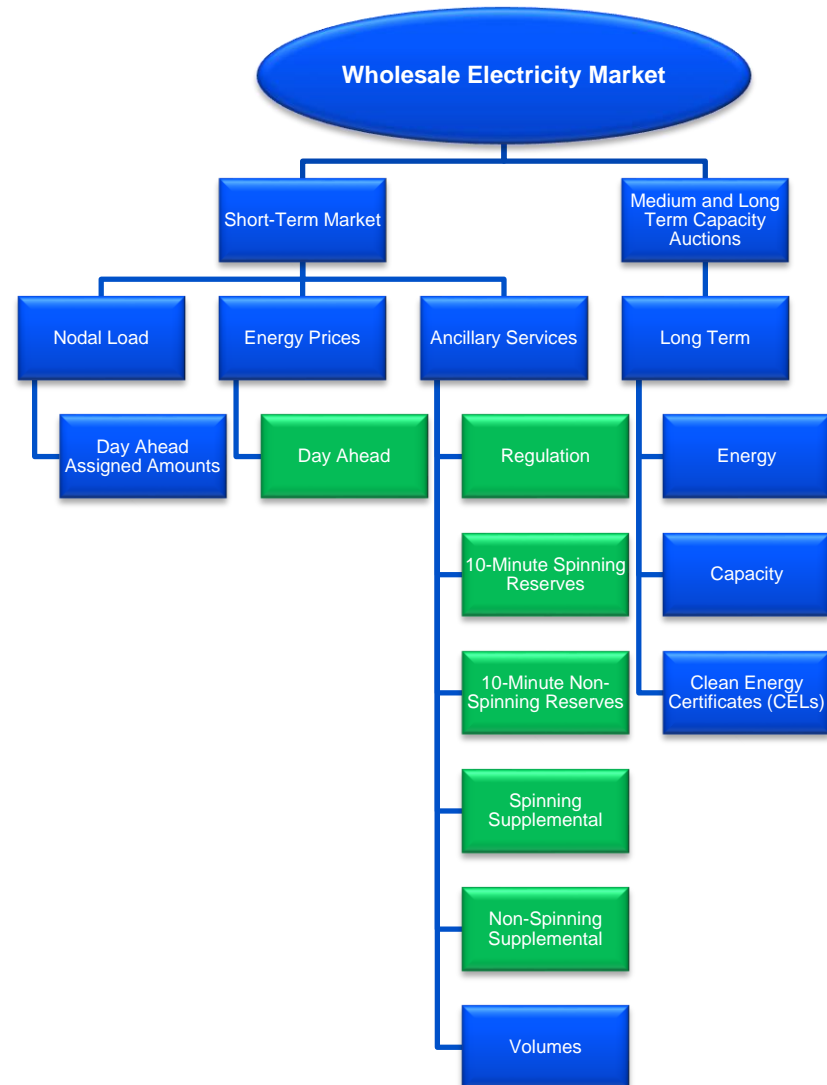
# What data is available?

## Markets and Operations (Mercado Y Operaciones)



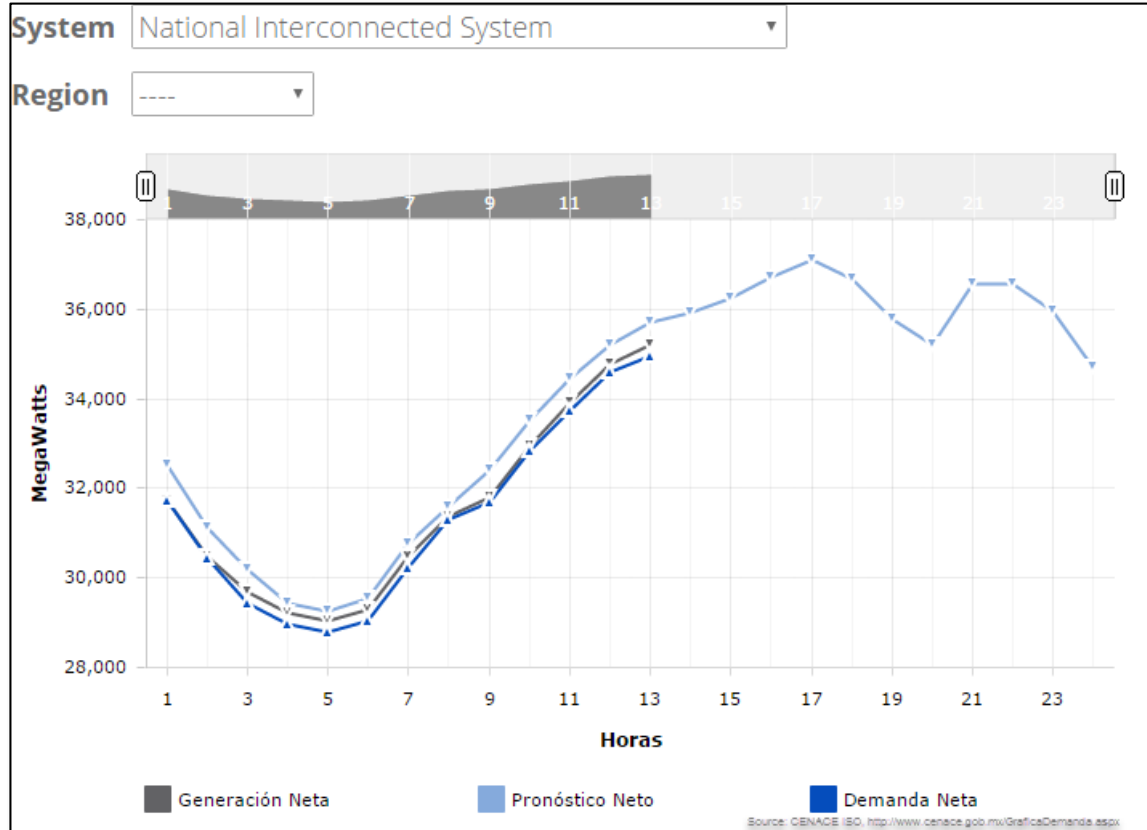
# What data is available?

## Markets and Operations (Mercado Y Operaciones)



# What data is available?

## Demand Graphic (Gráfica de Demanda)



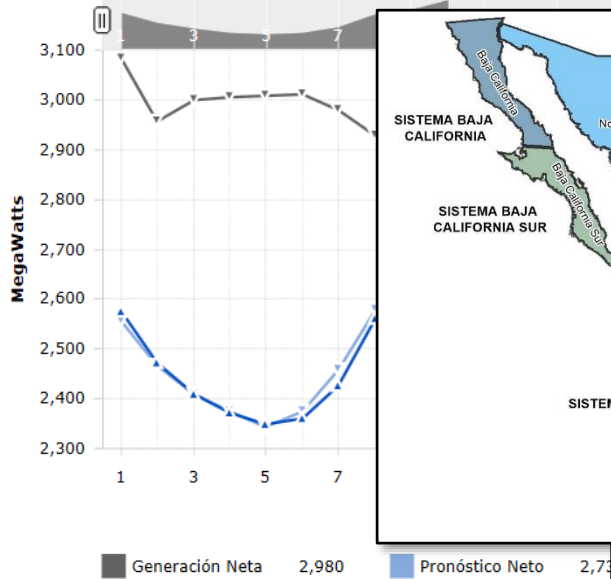


# What data is available?

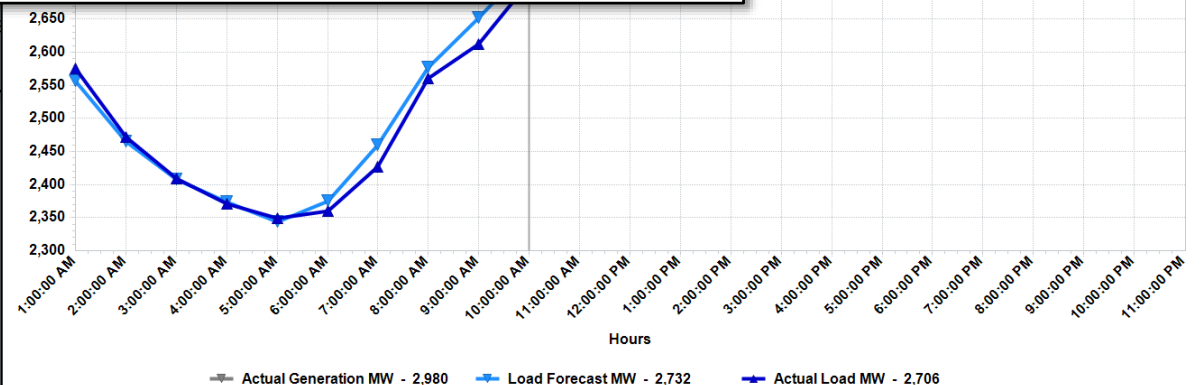
## Demand Graphic (Gráfica de Demanda)

Sistema Sistema Interconectado Nacional

Región Norte



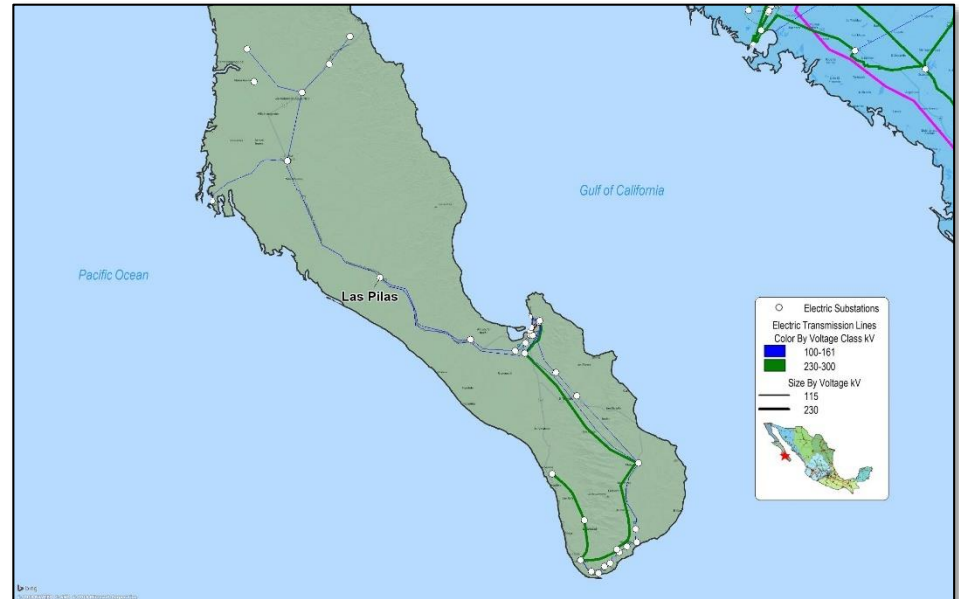
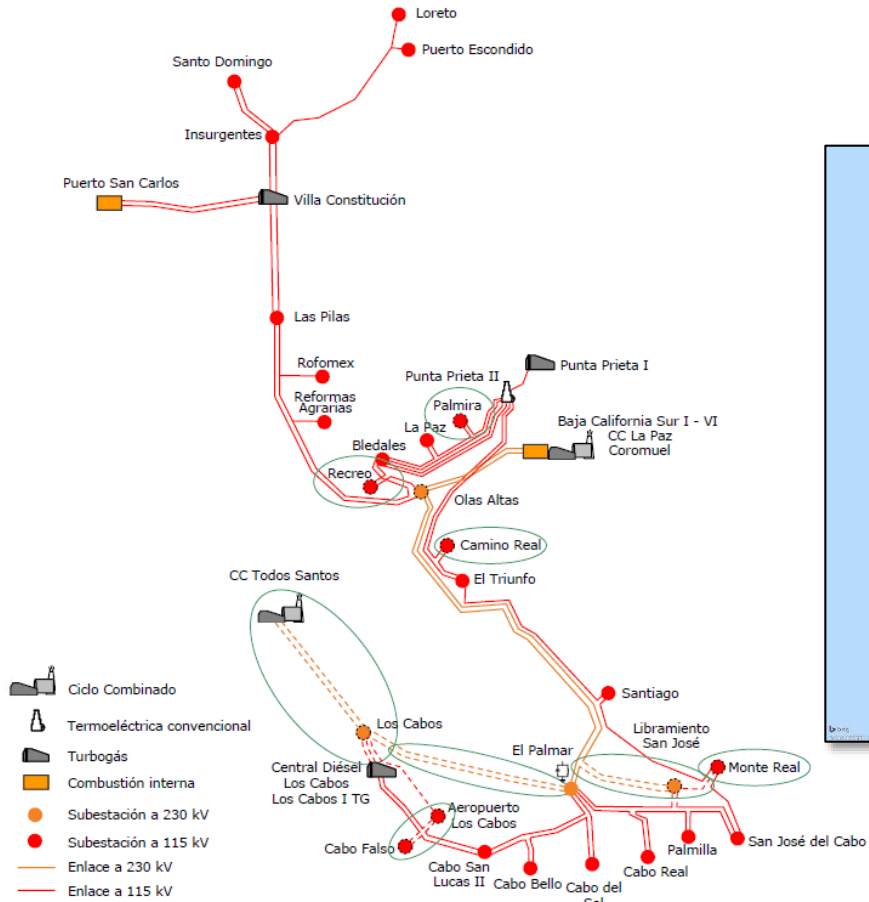
Source: CENACE ISO, <http://www.cenace.gob.mx/GraficaDemanda.aspx>



# What data is available?

## Pnode Catalog (Catálogo NodosP Sistema Eléctrico Nacional)

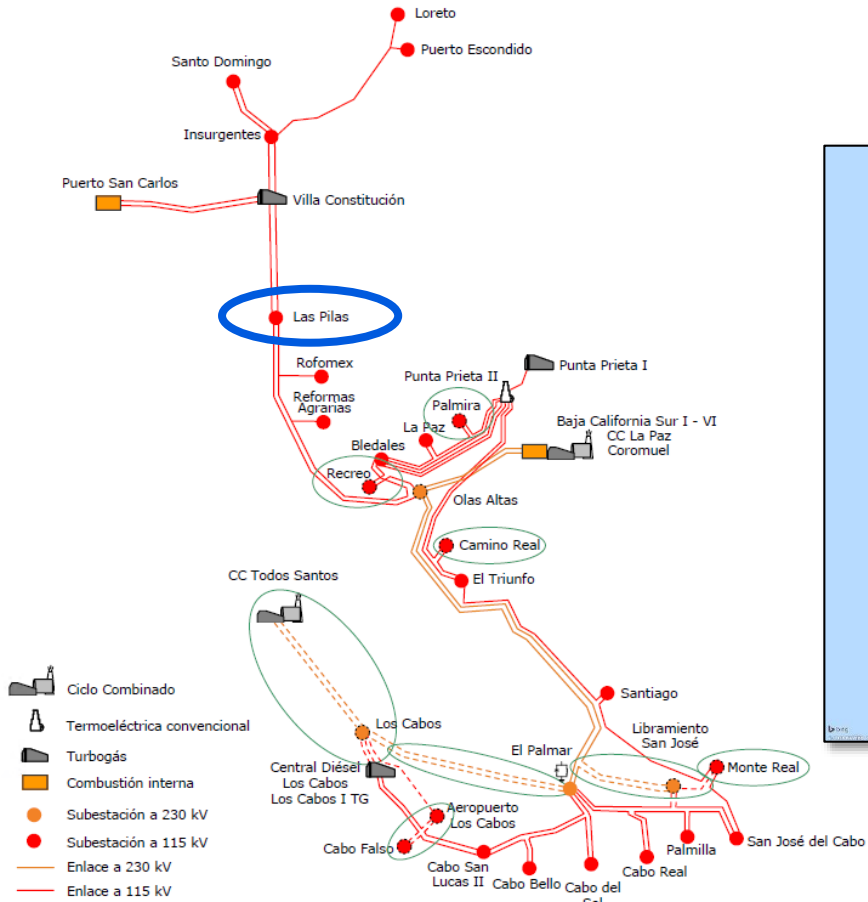
SISTEMA	CENTRO DE CONTROL REGIONAL	ZONA DE CARGA	CLAVE	NODOP		TIPO DE CARGA		TIPO DE GENERACION	
				NOMBRE	NIVEL DE TENSION (kV)	DIRECTAMENTE MODELADA	INDIRECTAMENTE MODELADA	DIRECTAMENTE MODELADA	INDIRECTAMENTE MODELADA
BCS	BAJA CALIFORNIA SUR	CONSTITUCION	07DOM-115	Santo Domingo	115	No Aplica	Indirectamente Modelada	No Aplica	No Aplica
BCS	BAJA CALIFORNIA SUR	CONSTITUCION	07GAO-115	Central Termica Gral. Agustín Olachea	115	No Aplica	Indirectamente Modelada	Directamente Modelada	No Aplica
BCS	BAJA CALIFORNIA SUR	CONSTITUCION	07INS-115	Insurgentes	115	No Aplica	Indirectamente Modelada	No Aplica	No Aplica
BCS	BAJA CALIFORNIA SUR	CONSTITUCION	07LAP-115	Las Pilas	115	No Aplica	Indirectamente Modelada	No Aplica	No Aplica
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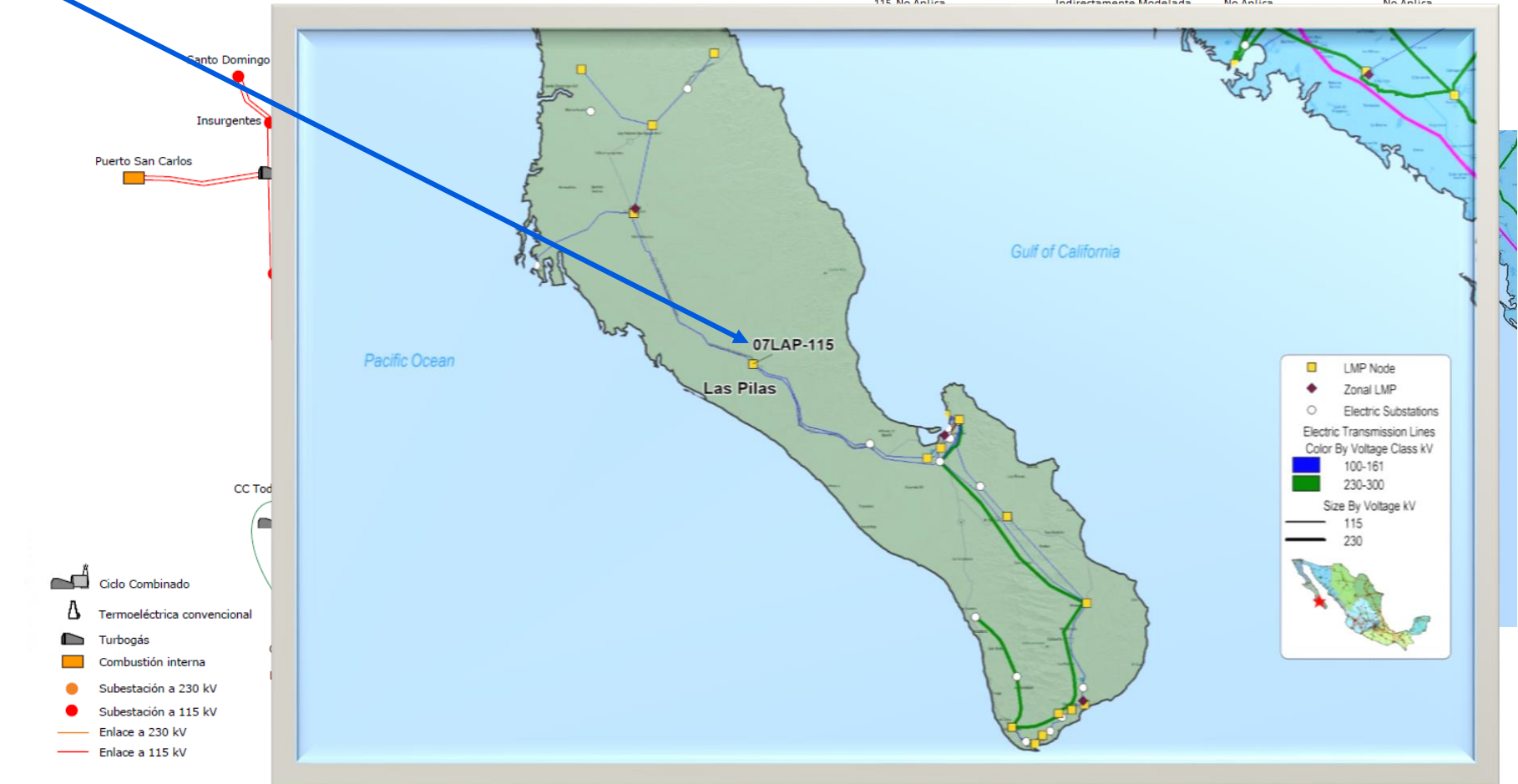
SISTEMA	CENTRO DE CONTROL REGIONAL	ZONA DE CARGA	CLAVE	NODOP	NOMBRE	NIVEL DE TENSION (kV)	TIPO DE CARGA		TIPO DE GENERACION	
							DIRECTAMENTE MODELADA	INDIRECTAMENTE MODELADA	DIRECTAMENTE MODELADA	INDIRECTAMENTE MODELADA
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BCS	BAJA CALIFORNIA SUR	CONSTITUCION	07INS-115	Insurgentes		115	No Aplica	Indirectamente Modelada	No Aplica	No Aplica
BCS	BAJA CALIFORNIA SUR	CONSTITUCION	07LAP-115	Las Pilas		115	No Aplica	Indirectamente Modelada	No Aplica	No Aplica
BCS	BAJA CALIFORNIA SUR	CONSTITUCION	07PO-115	Loreto		115	No Aplica	Indirectamente Modelada	No Aplica	No Aplica
BCS	BAJA CALIFORNIA SUR	CONSTITUCION	07PO-115	Puerto Escondido		115	No Aplica	Indirectamente Modelada	Directamente Modelada	No Aplica



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SISTEMA	CENTRO DE CONTROL REGIONAL	ZONA DE CARGA	CLAVE	NODOP		TIPO DE CARGA		TIPO DE GENERACION	
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BCS	BAJA CALIFORNIA SUR	CONSTITUCION	07PO-115	La Paz	115	No Aplica	Indirectamente Modelada	No Aplica	No Aplica



# What data is available?

## Nodal LMP & Component Breakdown

Precios marginales locales del MDA  
Sistema Interconectado Nacional  
Reporte diario  
Fecha: 10/Octubre/2016  
Archivo descargado desde el Sitio Web del Mercado Electrico Mayorista creado el 09/Octubre/2016 16:37:07 hrs.  
Nota: Los acentos de este reporte se omiten intencionalmente por sistema

Hora	Clave del nodo	Precio marginal local (\$/MWh)	Componente de energia (\$/MWh)	Componente de perdidas (\$/MWh)	Componente de congestion (\$/MWh)
1	01AAN-85	724.4	677.68	46.86	-0.14
2	01AAN-85	626.42	591.19	35.23	0
3	01AAN-85	591.62	559.46	32.16	0
4	01AAN-85	577.29	544.49	32.79	0
5	01AAN-85	583.79	550.78	33.01	0
6	01AAN-85	593.35	559.25	34.1	0
7	01AAN-85	652.76	608.82	43.94	0
8	01AAN-85	833.55	772.6	61.16	-0.2
9	01AAN-85	971.48	901.37	70.36	-0.26
10	01AAN-85	1251.4	1167.1	84.71	-0.41
11	01AAN-85	1364.31	1279.29	85.36	-0.34

Published Data

Intelligent Query Results - ISO LMP Components - Query1.evq

Column Header Legend: ● Calculated from Reported ● Modeled/Estimated ● Calculated from Modeled

Price Node Name	Price Node ID	Local Datetime (Hour Ending)	Market	LMP Price \$/MWh	Energy Price \$/MWh	Loss Price \$/MWh	Congestion Price \$/MWh	Record Count
01AAN-85	2376015	10/10/2016 01:00	DAH	724.40	677.68	46.86	-0.14	1
01AAN-85	2376015	10/10/2016 02:00	DAH	626.42	591.19	35.23	0.00	1
01AAN-85	2376015	10/10/2016 03:00	DAH	591.62	559.46	32.16	0.00	1
01AAN-85	2376015	10/10/2016 04:00	DAH	577.29	544.50	32.79	0.00	1
01AAN-85	2376015	10/10/2016 05:00	DAH	583.79	550.78	33.01	0.00	1
01AAN-85	2376015	10/10/2016 06:00	DAH	593.35	559.25	34.10	0.00	1
01AAN-85	2376015	10/10/2016 07:00	DAH	652.76	608.82	43.94	0.00	1
01AAN-85	2376015	10/10/2016 08:00	DAH	833.55	772.59	61.16	-0.20	1
01AAN-85	2376015	10/10/2016 09:00	DAH	971.48	901.38	70.36	-0.26	1
01AAN-85	2376015	10/10/2016 10:00	DAH	1,251.40	1,167.10	84.71	-0.41	1
01AAN-85	2376015	10/10/2016 11:00	DAH	1,364.31	1,279.29	85.36	-0.34	1

Velocity Suite Data

# What data is available?

## Ancillary Service Prices

Regulation

10-Minute Spinning

10-Minute non-Spinning

Spinning Supplemental

Non-Spinning Supplemental

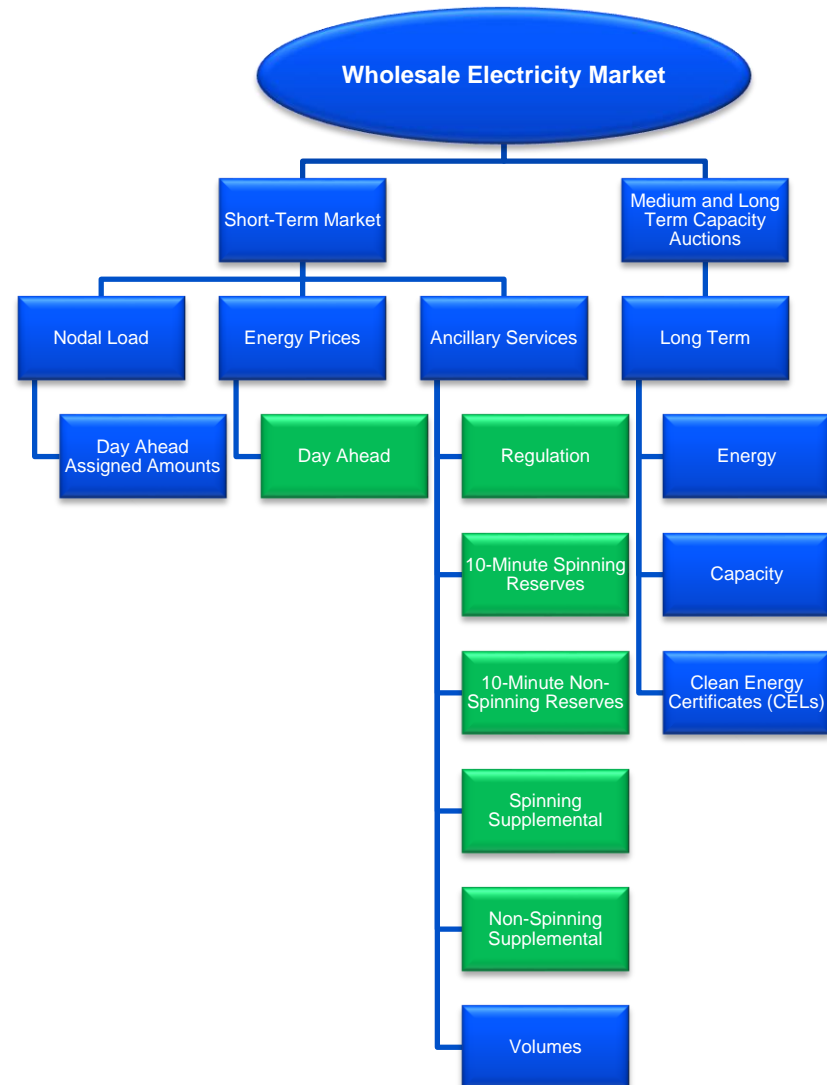


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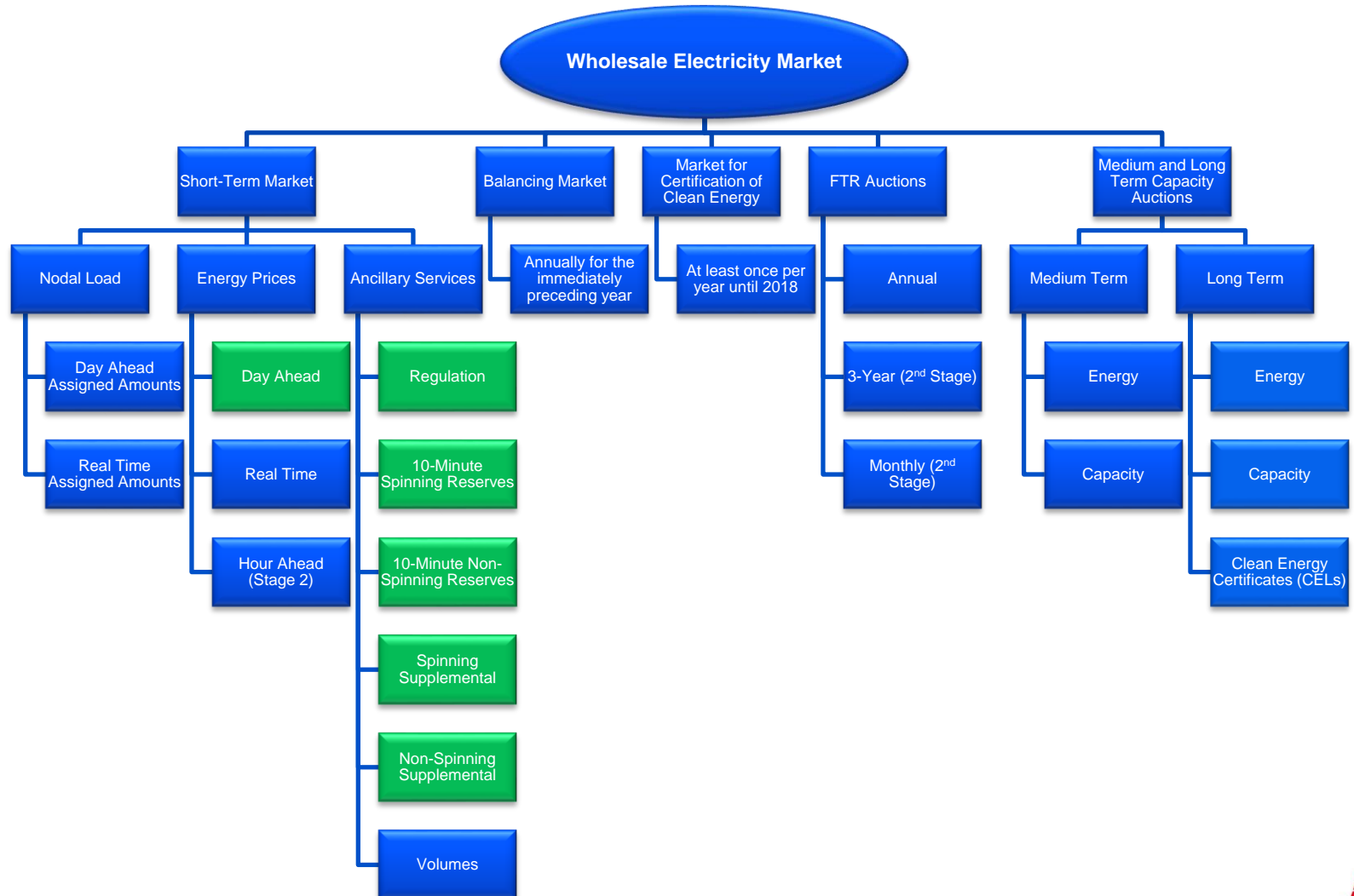
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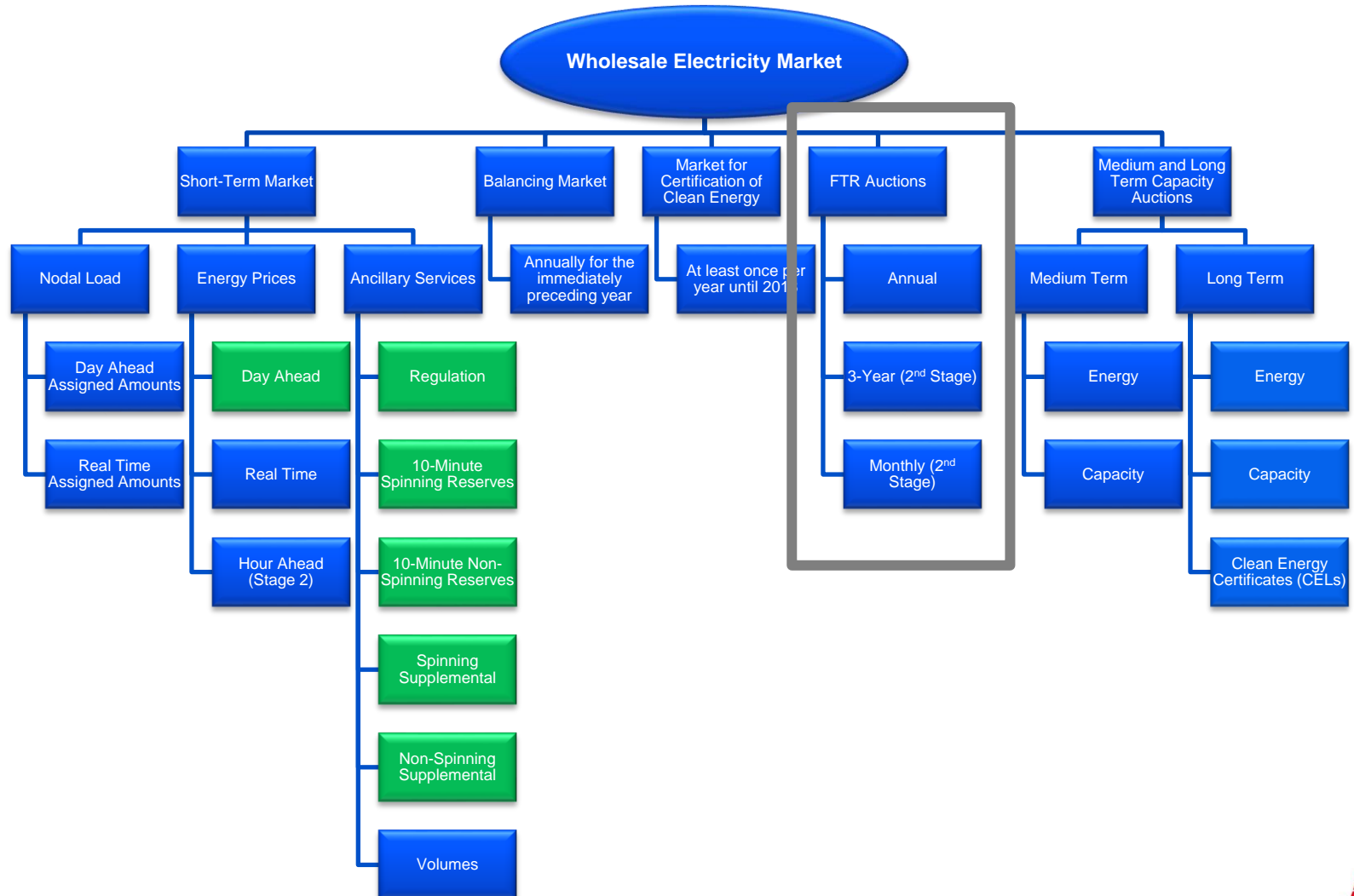




# What data is Expected?

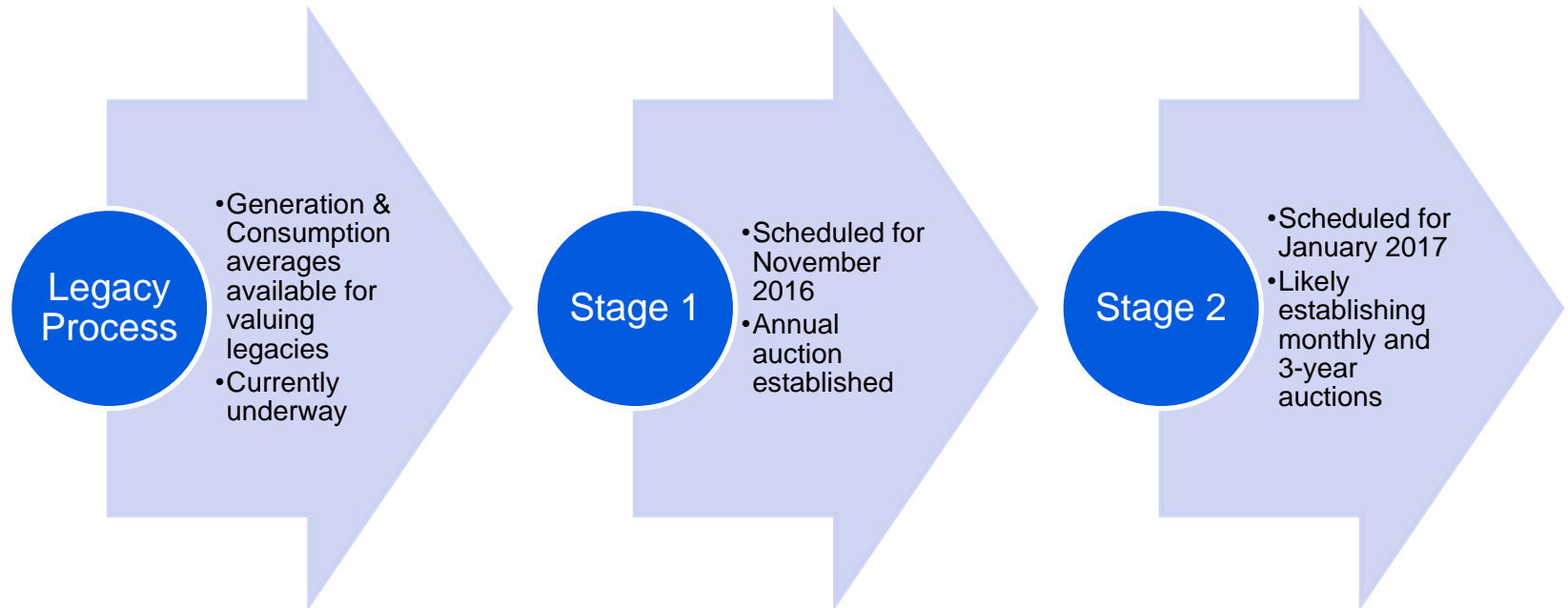


# What data is Expected?



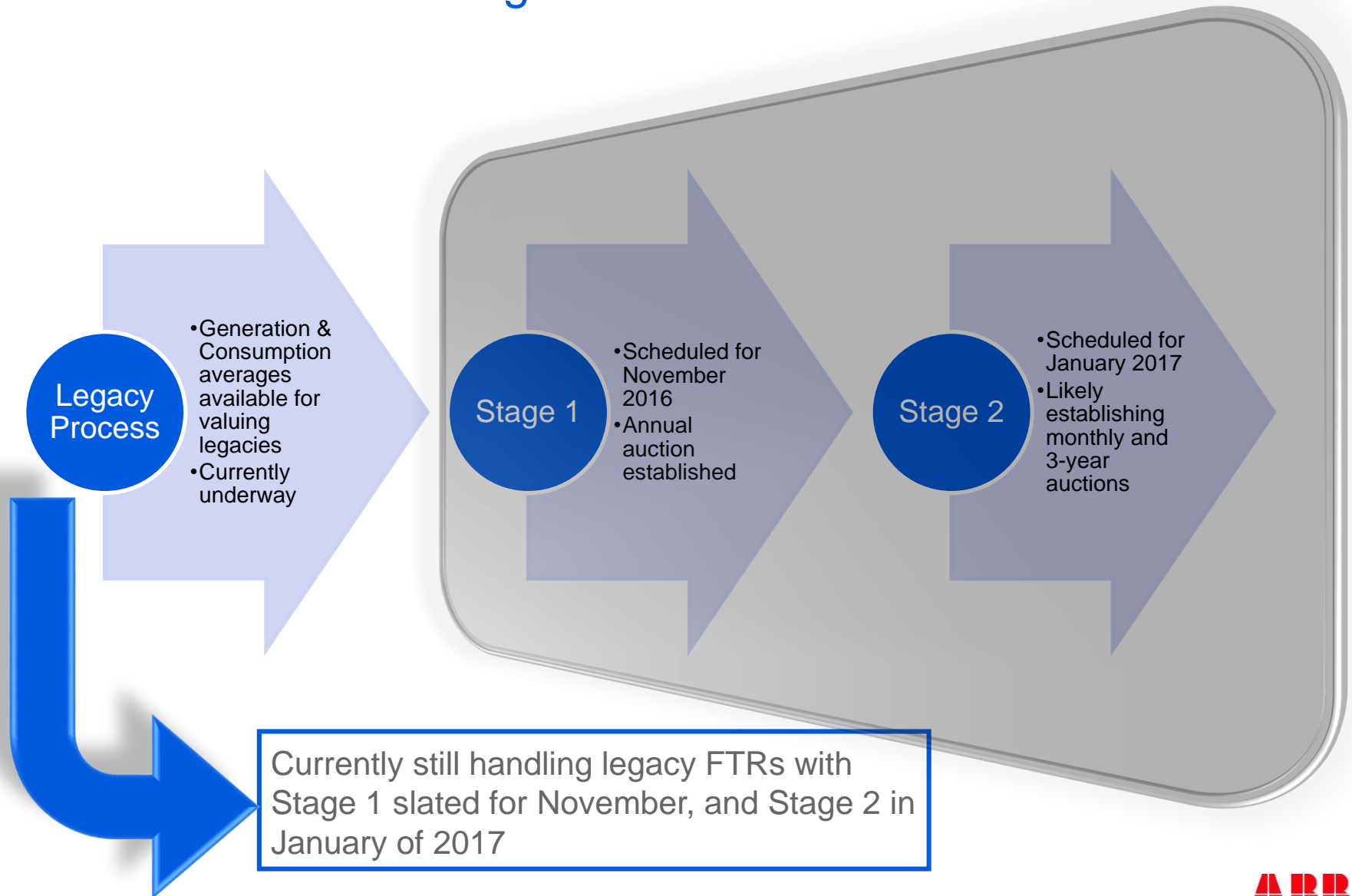
# What data is Expected?

## Financial Transmission Rights



# What data is Expected?

## Financial Transmission Rights



# What data is Expected?

## Reporting Issues

Not  
Reporting  
Hour 24

USE it or  
LOSE it

Real Time  
LMP data

Ancillary  
Volumes  
Formatting

MXN vs.  
USD

# Introductions



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**David Kelly**

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Broomfield, CO

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# Power Trends – Mexico's Energy Reform

## What were the results of CENACE's first Power Auction?

### THE WALL STREET JOURNAL.

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<http://www.wsj.com/articles/mexico-awards-contracts-to-secure-renewable-energy-1475086767>

#### BUSINESS

## Mexico Awards Contracts to Secure Renewable Energy

Electricity auctions drive fierce competition and push prices down

"Investors are starting to line up their horses"

"Mexico expects \$62.5bn of new foreign investment into its energy sector in the next three years."

"Out of a total 5.38 million megawatt-hours of energy that was awarded, PV won 74 percent and wind won the remaining 26 percent, with no contracts won by any of the other technologies."

#### SOLAR

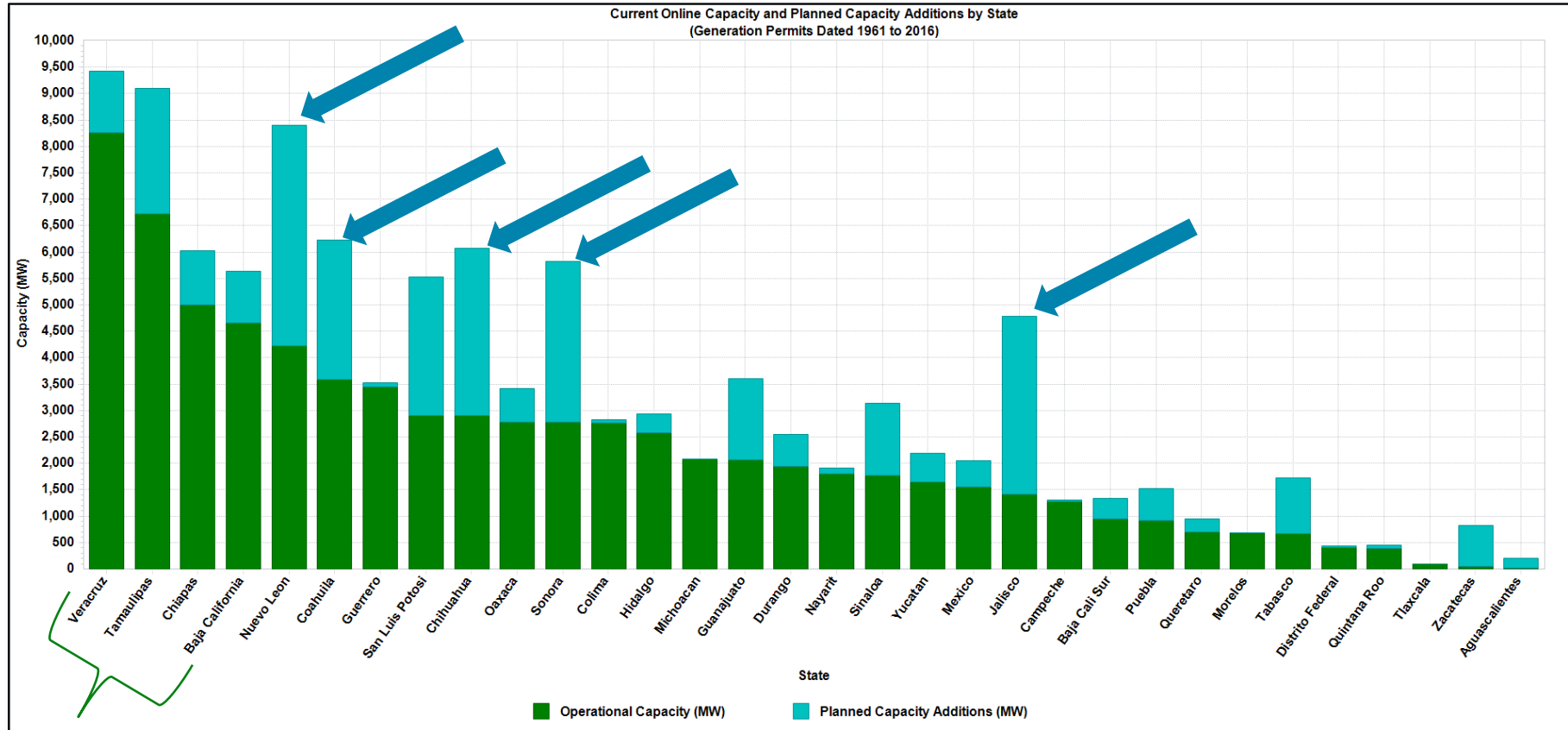
## Solar Stuns in Mexico's First Clean Energy Auction: 1,860MW Won at \$50.7 per MWh

Solar in Mexico will now grow by 521 percent in 2016.

## Mexico Planning \$46 Billion Coast-to-Coast Wind-Energy Push

# Power Trends – New Generation by State

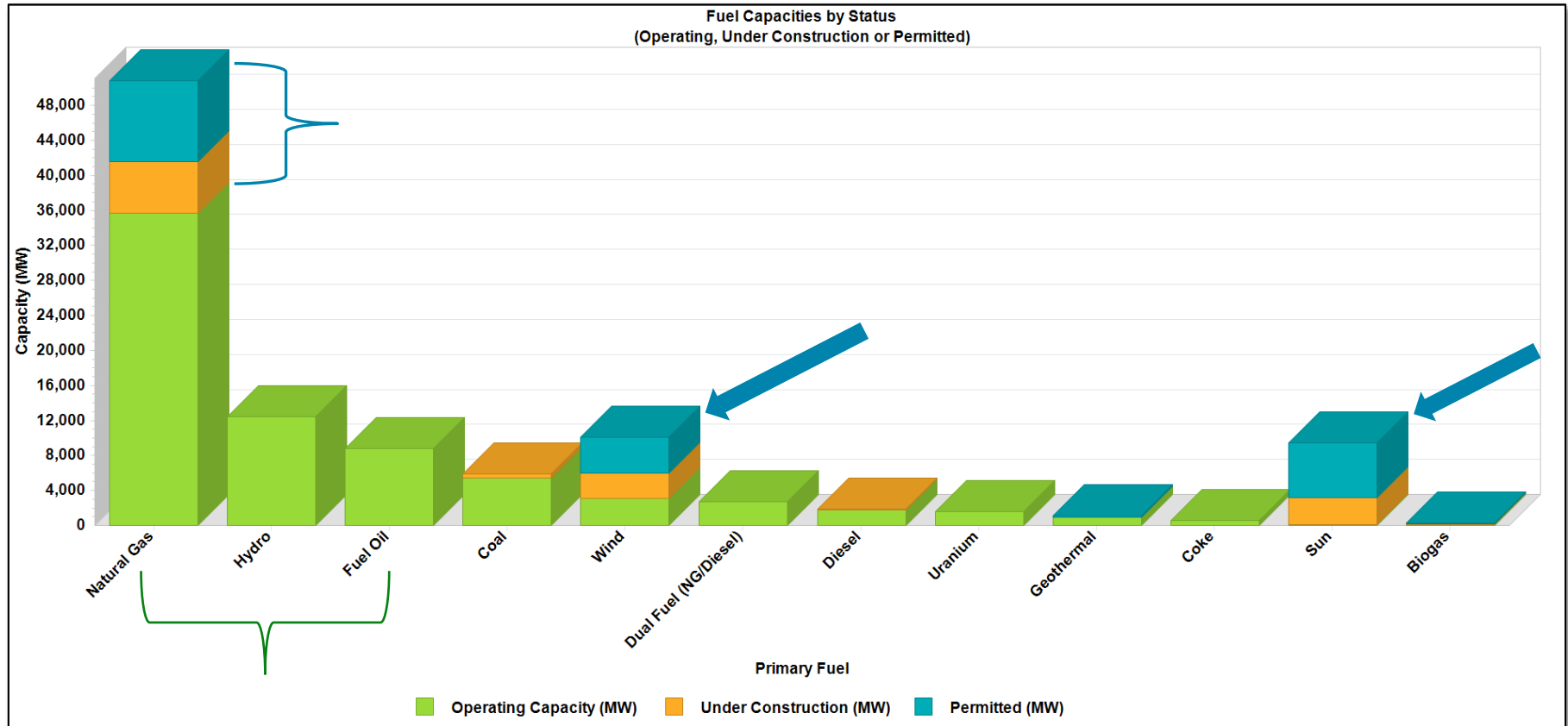
## Where is new power generation taking place?





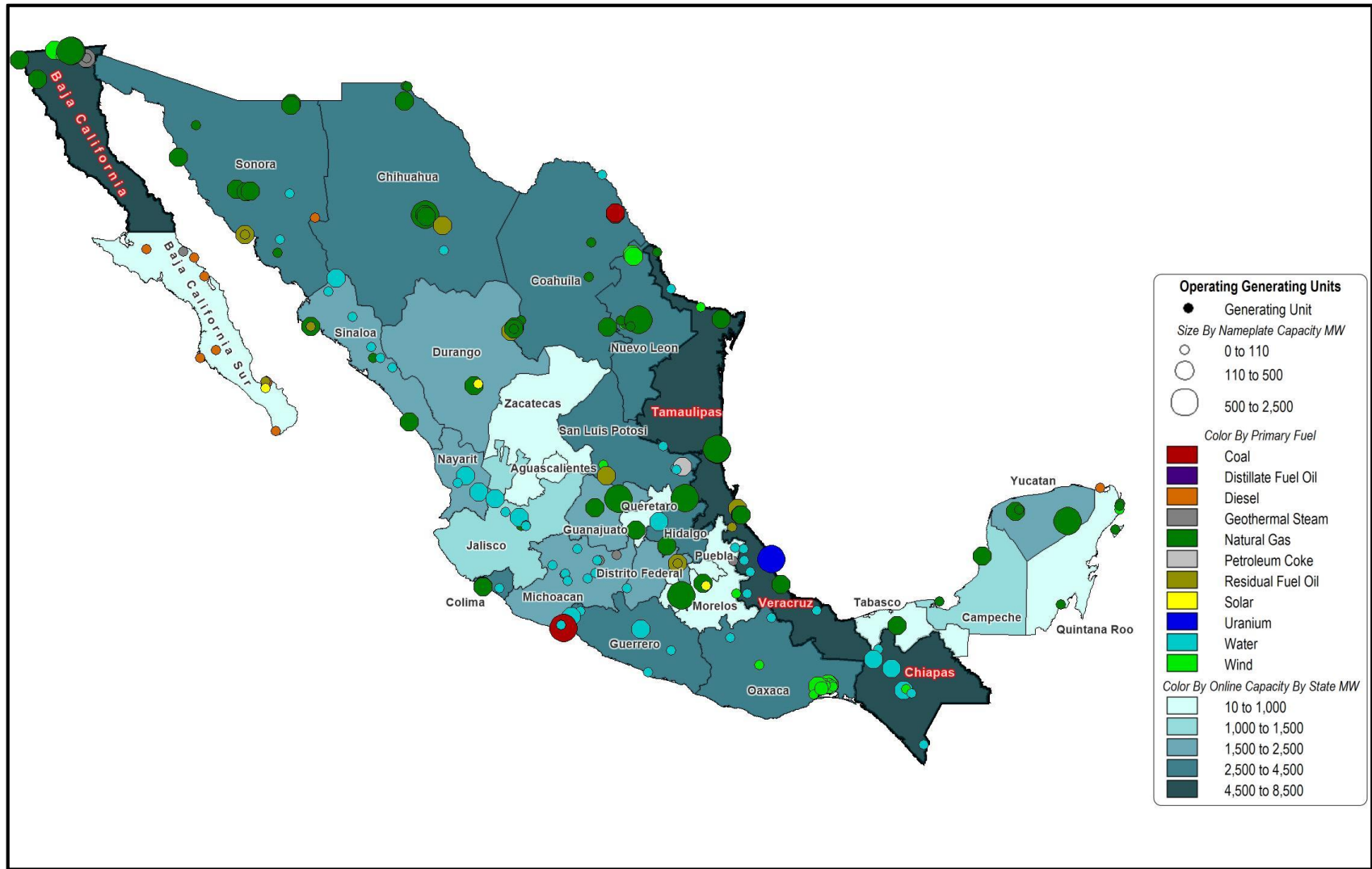
# Power Trends – Mexico's Current and Future Fuel Mix

## Which fuels?



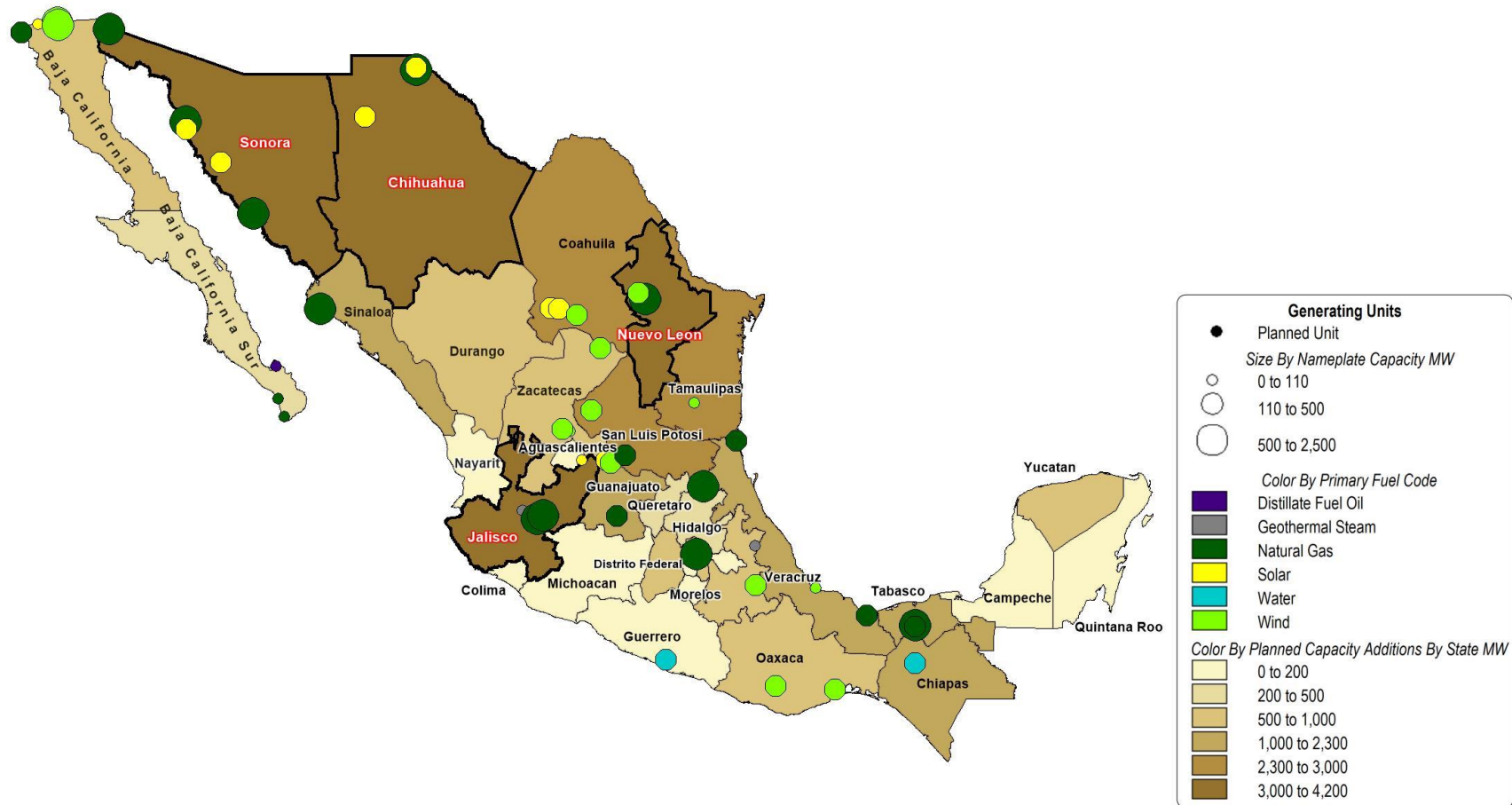
# Power Trends – Mexico's Current and Future Fuel Mix

## Where is current generation taking place?



# Power Trends – Mexico's Current and Future Fuel Mix

## Where is future generation planned?



# Power Trends – Mexico's Current and Future Fuel Mix

## What does data processing look like at Velocity Suite ?

**QUINTA. Descripción de las instalaciones.** El proyecto tiene por objeto la generación de energía eléctrica bajo la modalidad de autoabastecimiento, utilizando para ello una central de generación de energía eléctrica integrada por 90 aerogeneradores con una capacidad de generación eléctrica de 2.00 MW cada uno, para una capacidad total de producción anual estimada de 476.00 GWh, ubicada en los Ejidos San José de Tapias, El Orito y El Visor, Zacatecas.

Velocity Suite - [New Entrants Analyst - Plant Report : 1]

File Edit Tools Analysts Window Help

View Report For: La Bufo Wind Farm

Unit	Phase	Prime Mover Code	Unit Status Code	Primary Fuel Code	Commercial Online Date	Nameplate Capacity MW	Summer Capacity MW	Winter Capacity MW	Duct Fired Capacity MW	Fully Loaded Tested Heat Rate	Generator Manufacturer	Generator Model
WT1 90	1	WT	UC	WND	2/1/2017	180.000	180.000	180.000				

Combined Cycle Details:

Unit	Prime Mover	Status	Primary Fuel Code	Commercial Online Date	Nameplate Capacity MW	Summer Capacity MW	Winter Capacity MW	Generator Manufacturer	Generator Model
------	-------------	--------	-------------------	------------------------	-----------------------	--------------------	--------------------	------------------------	-----------------

Unit Ownership:

Unit	Owner Name	Holding Company Name
WT1 90	MPG La Bufo S A P I de CV	MPG La Bufo S A P I de CV

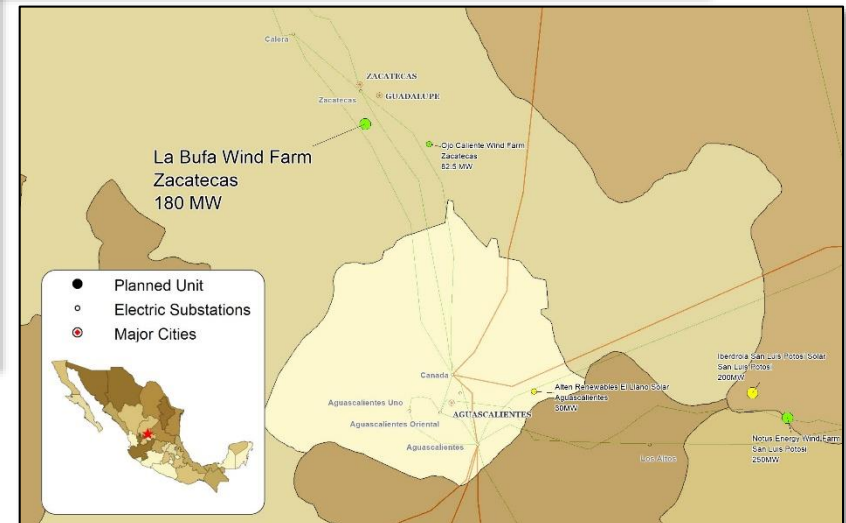
File Edit Tools Analysts Window Help

View Report For: La Bufo Wind Farm

Overview Phase Phase Timeline Units Regulatory Details Contracts & Connections Reference Notes

Reference Notes:

Category	Date	Source	Notes	Document Link
Timeline	12/03/2015	Windpowerengineering.com	The project is aiming to come online in early 2017.	<a href="http://www.windpowerengineering.com/construction/projects/volkswagen-to-buy-power-from-la-bufo-wind-farm/">http://www.windpowerengineering.com/construction/projects/volkswagen-to-buy-power-from-la-bufo-wind-farm/</a>
Project Status	12/03/2015	Windpowerengineering.com	MPG, an experienced player in the renewable energy industry, will construct the facility in partnership with Cannon Power Group and Gamesa, the turbine provider. Financing is being provided by Sumitomo Mitsui Banking Corporation, Korean Development Bank, Nacional Financiera, and Bancomext.	<a href="http://www.windpowerengineering.com/construction/projects/volkswagen-to-buy-power-from-la-bufo-wind-farm/">http://www.windpowerengineering.com/construction/projects/volkswagen-to-buy-power-from-la-bufo-wind-farm/</a>
Location	09/04/2014	Comisión Reguladora de Energía (CRE)	The plant will be located in the Ejidos San José de Tapias, El Orito and The Visitor, Guadalupe, Zacatecas.	<a href="https://crebveda.blob.core.windows.net/cre-documentos/642550e1-6f1d-41e4-9453-fb82728a4c">https://crebveda.blob.core.windows.net/cre-documentos/642550e1-6f1d-41e4-9453-fb82728a4c</a>
Regulatory	09/04/2014	Comisión Reguladora de Energía (CRE)	This permit authorizes MPG La Bufo, SAPI de CV, hereinafter referred to as the permit holder, to generate electrical energy in the form of self-sufficiency, in accordance with Resolution no. RES / 402/2014.	<a href="https://crebveda.blob.core.windows.net/cre-documentos/642550e1-6f1d-41e4-9453-fb82728a4c">https://crebveda.blob.core.windows.net/cre-documentos/642550e1-6f1d-41e4-9453-fb82728a4c</a>
Project Plans	09/04/2014	Comisión Reguladora de Energía (CRE)	The project aims to generate electricity in the form of self-supply, using an electric generation plant energy will comprise 90 wind turbines with a power generation capacity power of 2.00 MW each, for a total capacity of 180.00 MW and an estimated annual generation of 476.00 GWh production.	<a href="https://crebveda.blob.core.windows.net/cre-documentos/642550e1-6f1d-41e4-9453-fb82728a4c">https://crebveda.blob.core.windows.net/cre-documentos/642550e1-6f1d-41e4-9453-fb82728a4c</a>

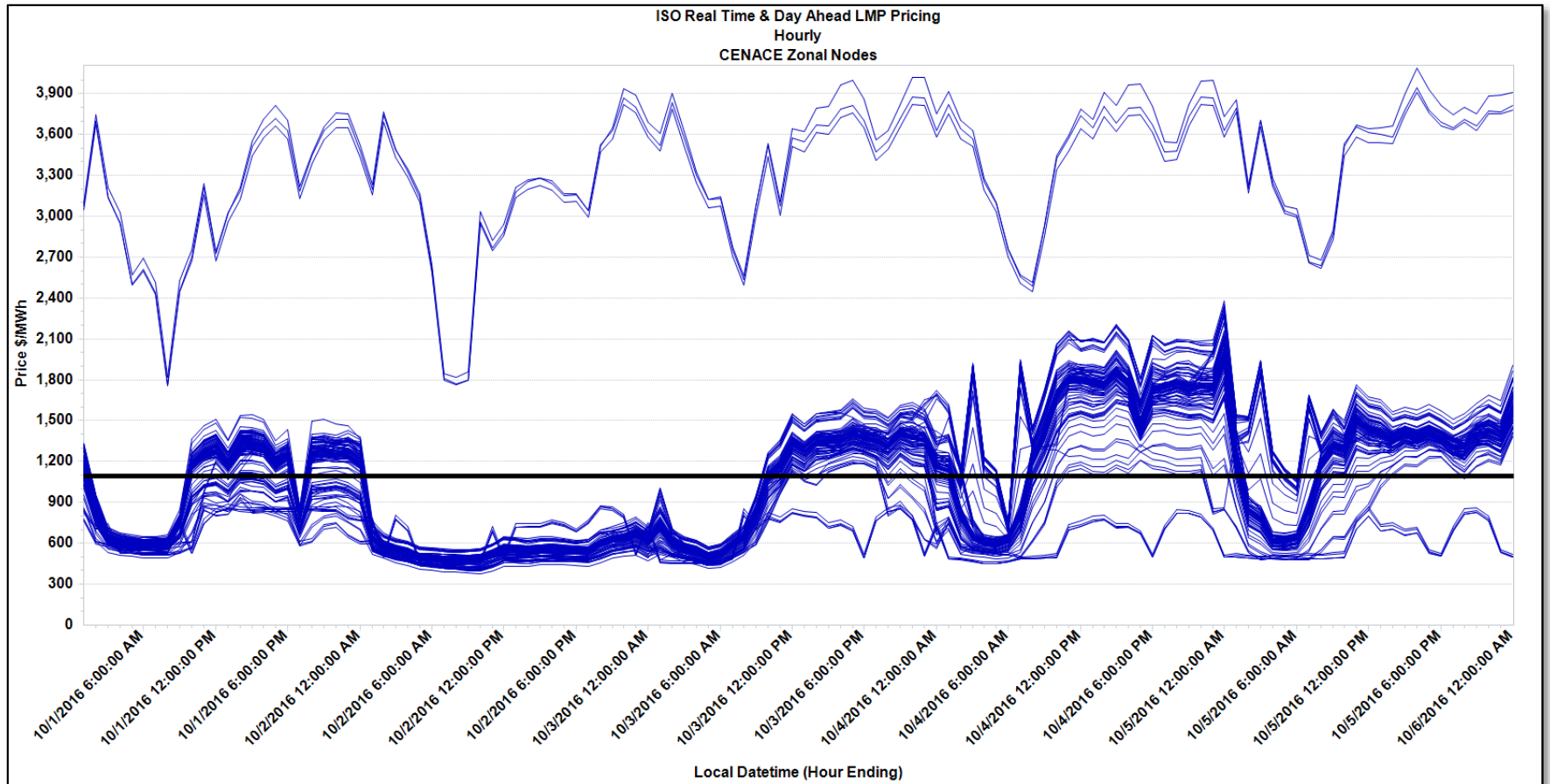


# Agenda

- **CFE vs. CENACE**
  - What will be changing?
- **Available Data**
  - How is data being published?
  - LMP, Load, Generation, and More!
- **What Data is expected to be included in Velocity Suite?**
- **Sample Analysis**

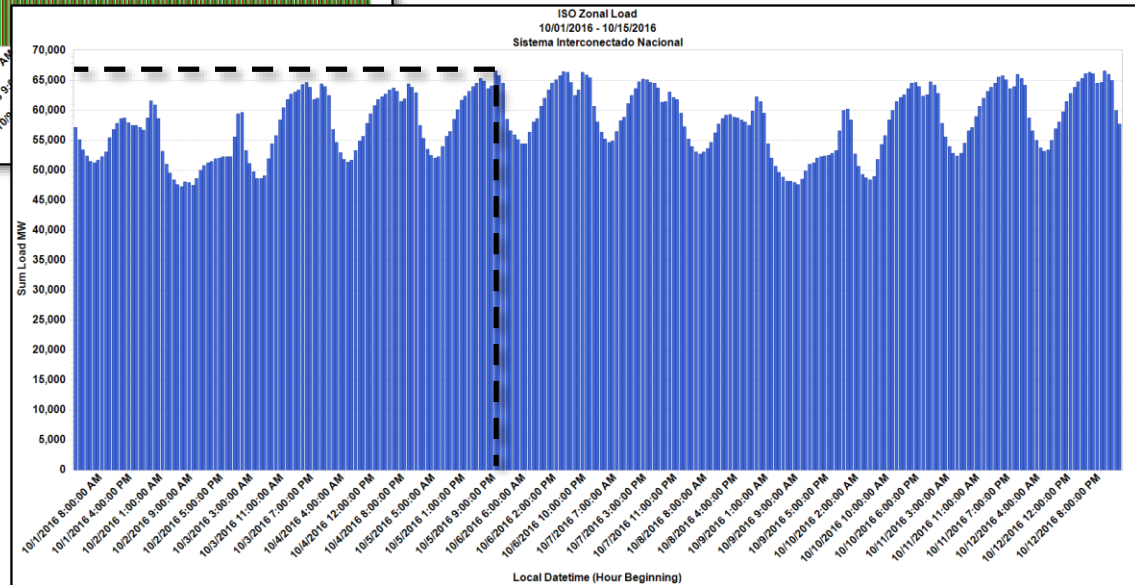
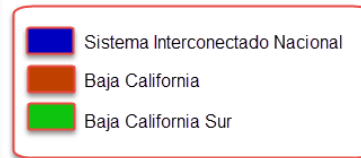
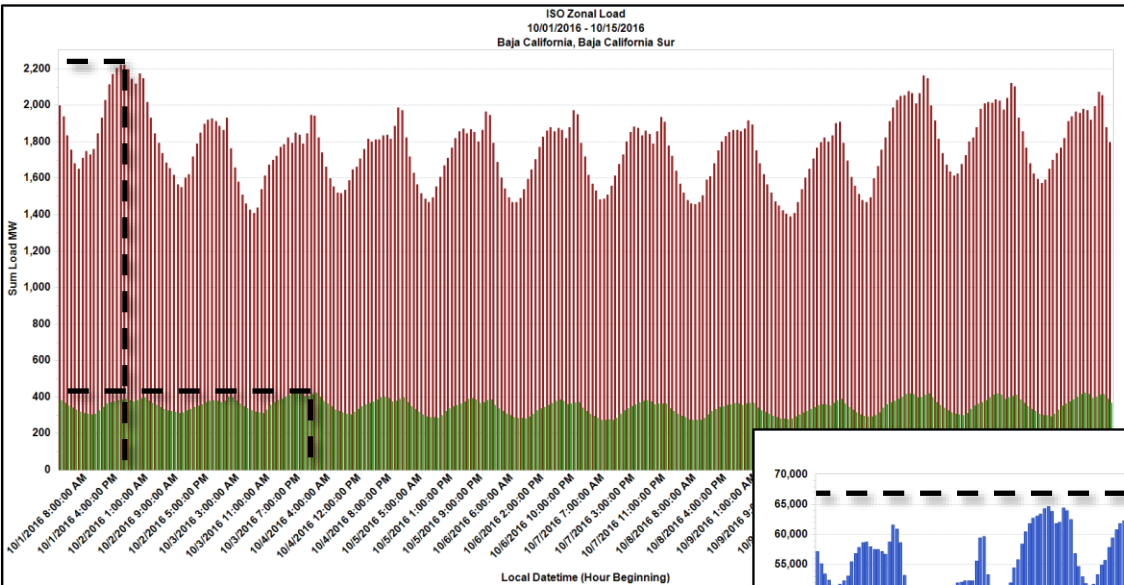
# Case Study

## Sample Analysis



# Case Study

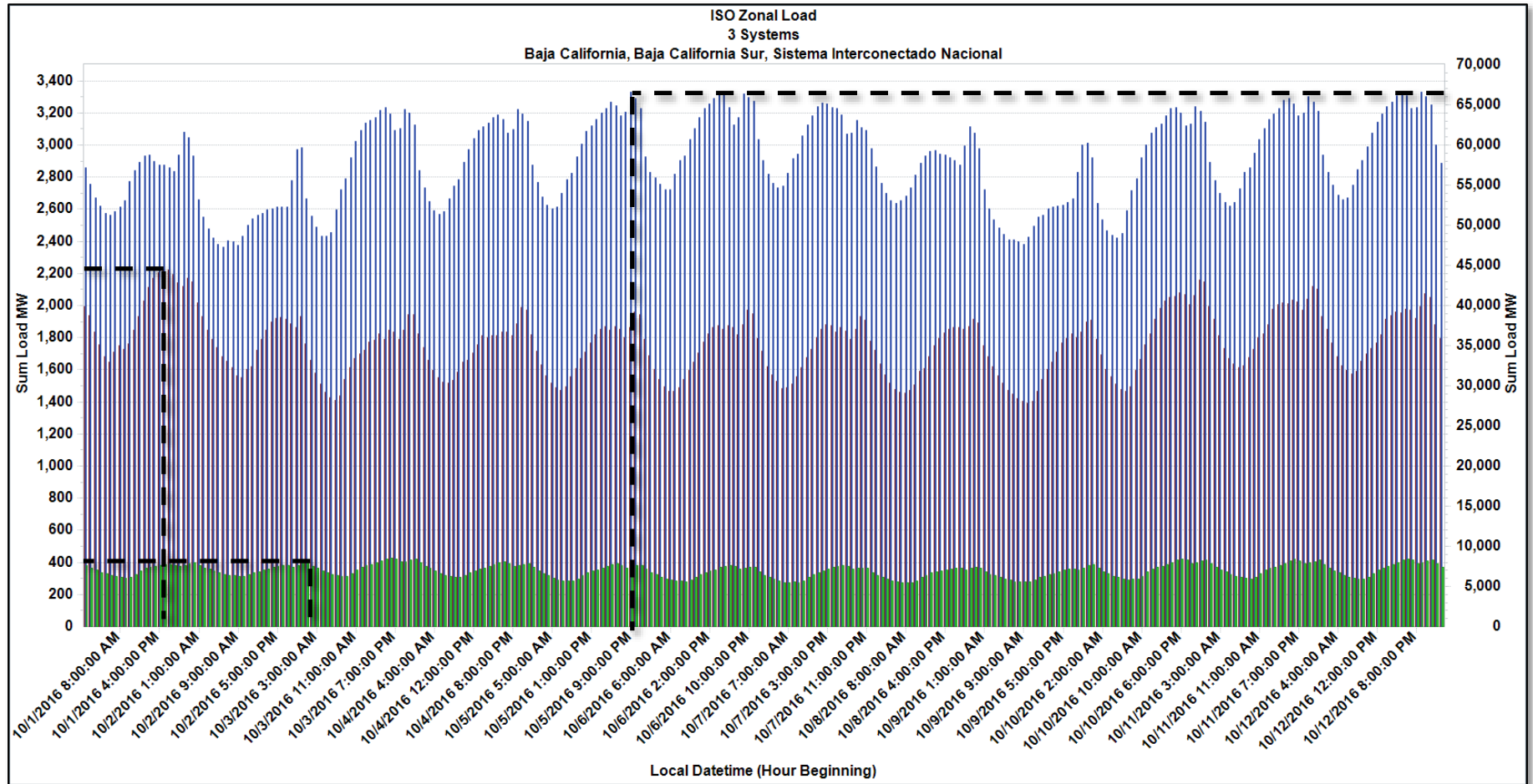
## Sample Analysis





# Case Study

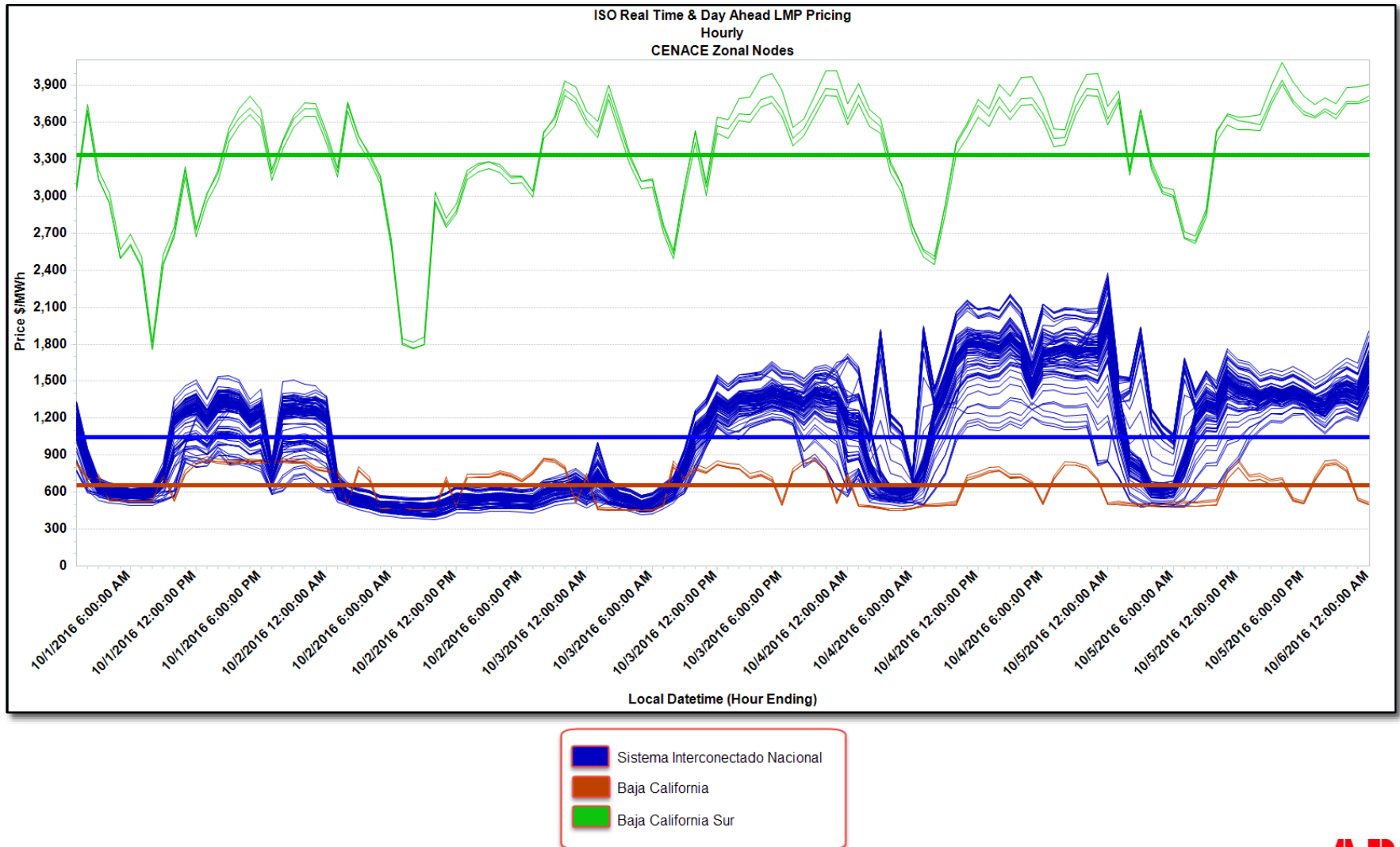
## Sample Analysis





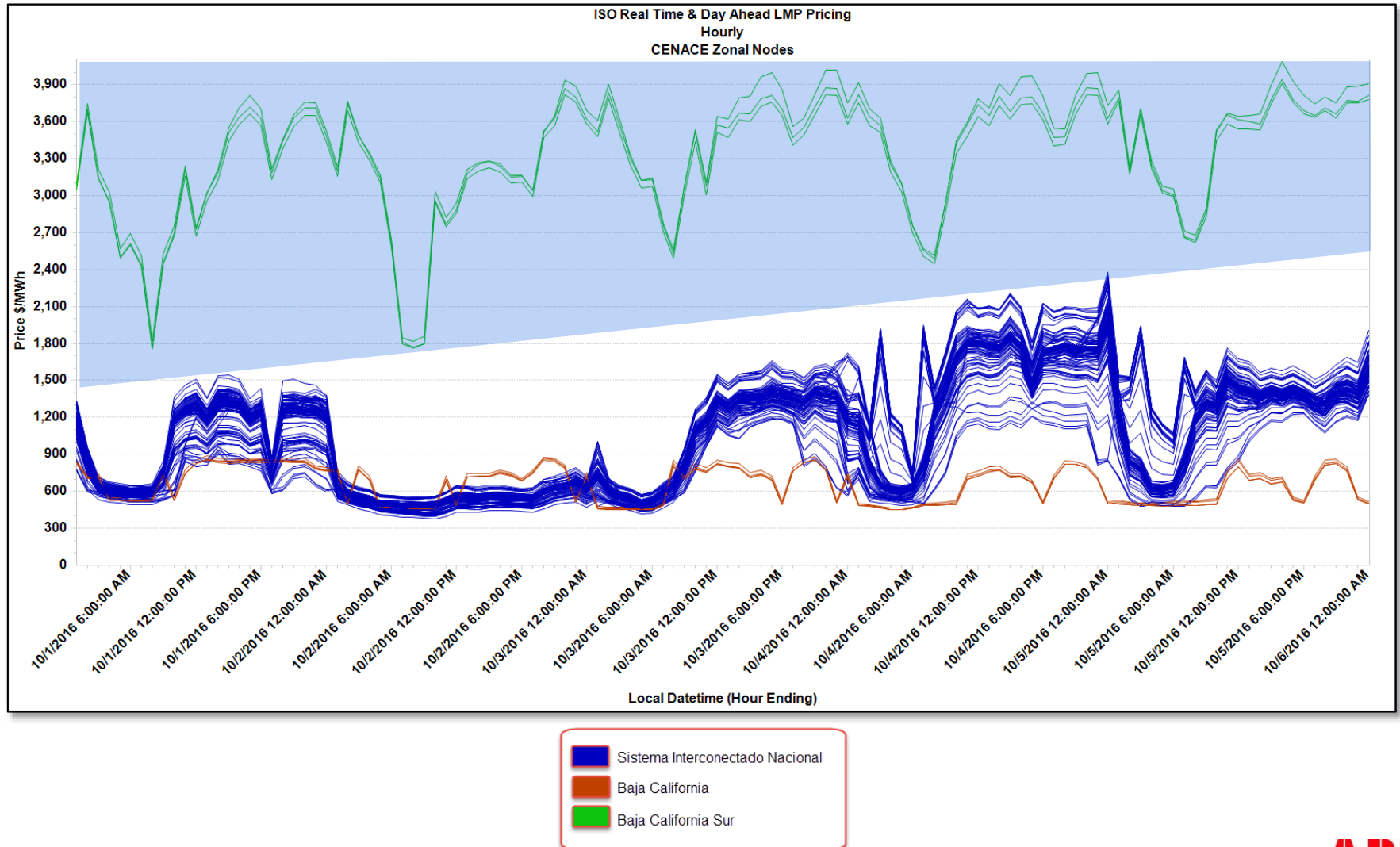
# Case Study

## Sample Analysis



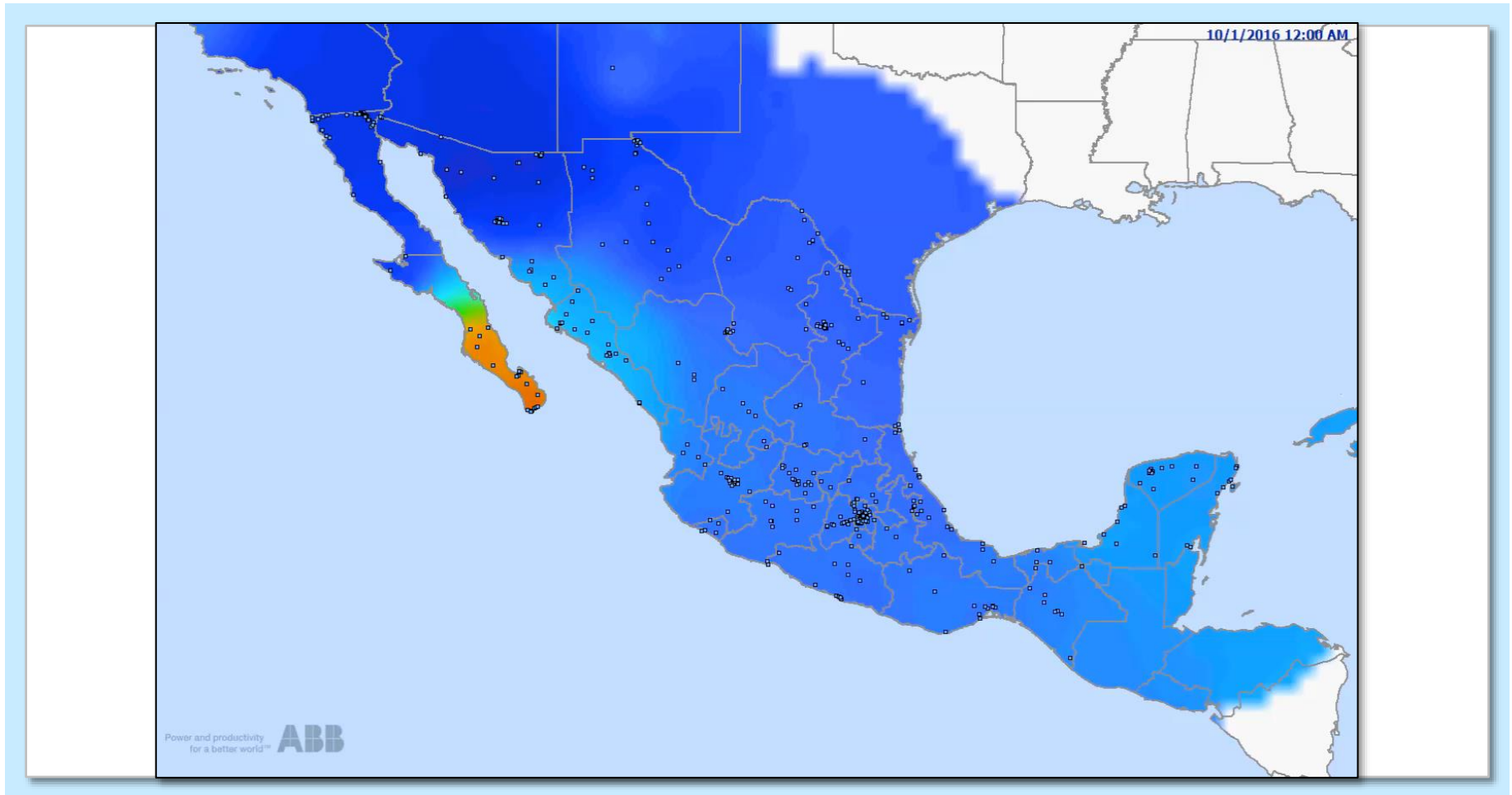
# Case Study

## Sample Analysis



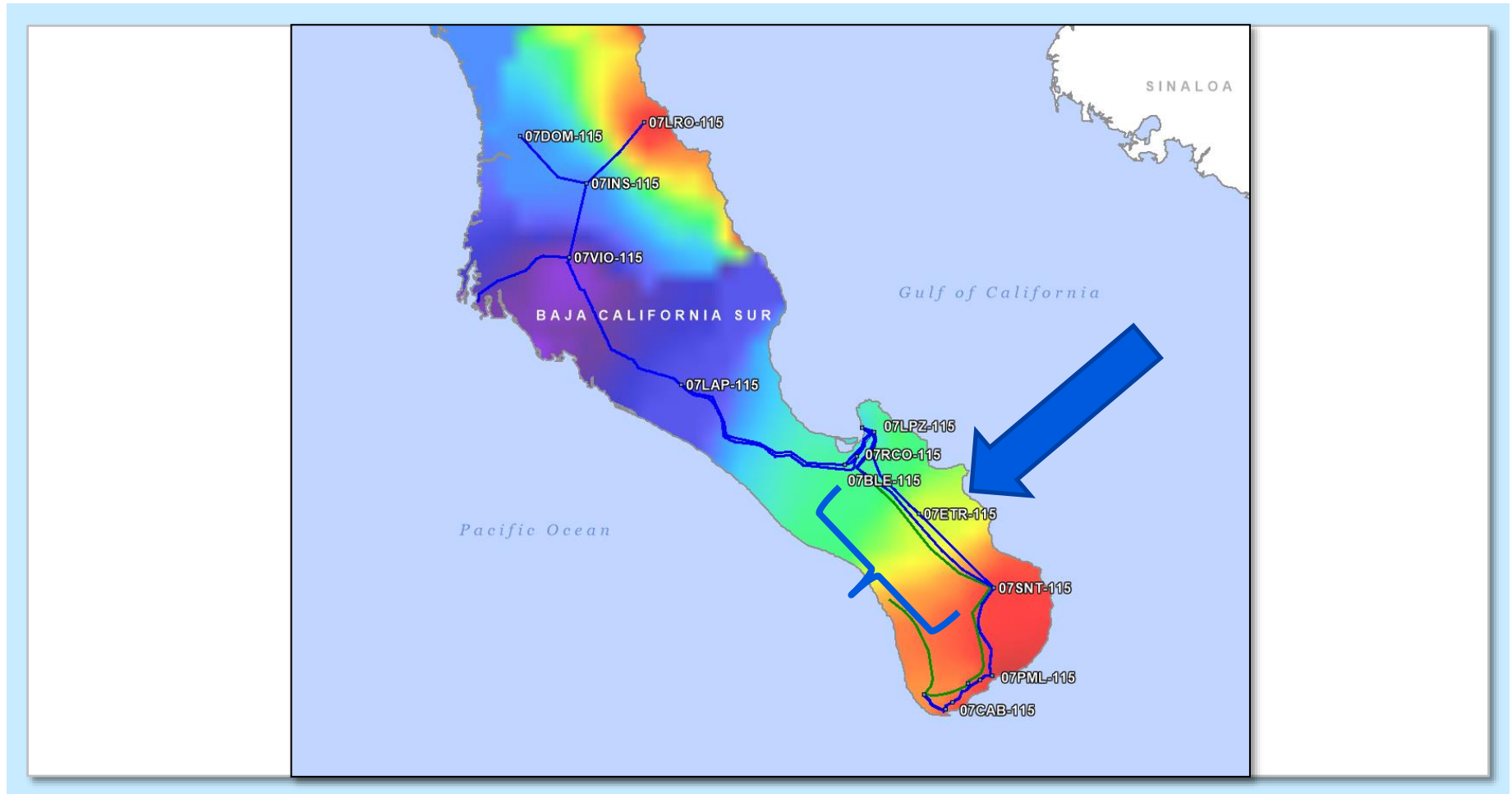
# Case Study

## Sample Analysis



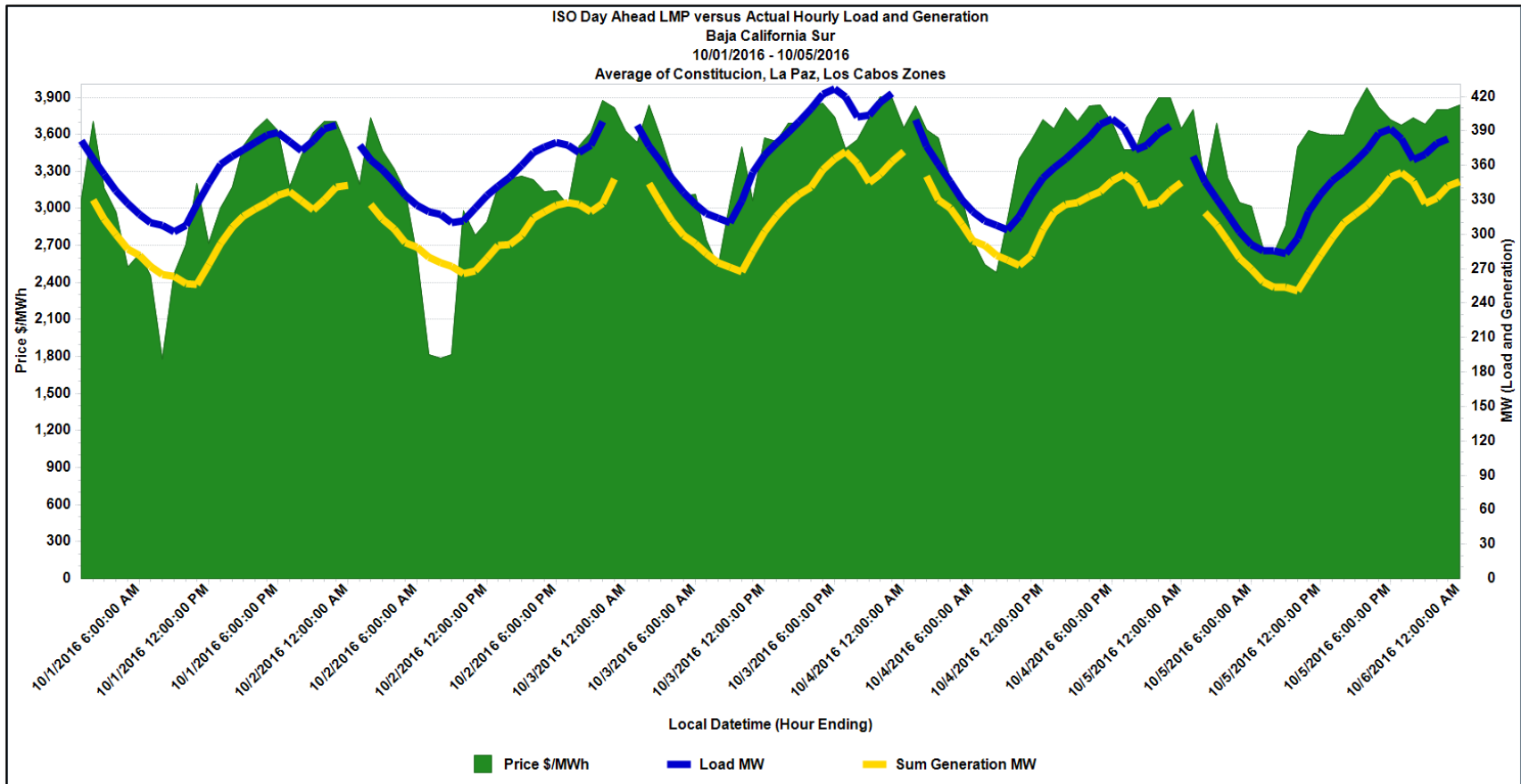
# Case Study

## Sample Analysis



# Case Study

## Sample Analysis



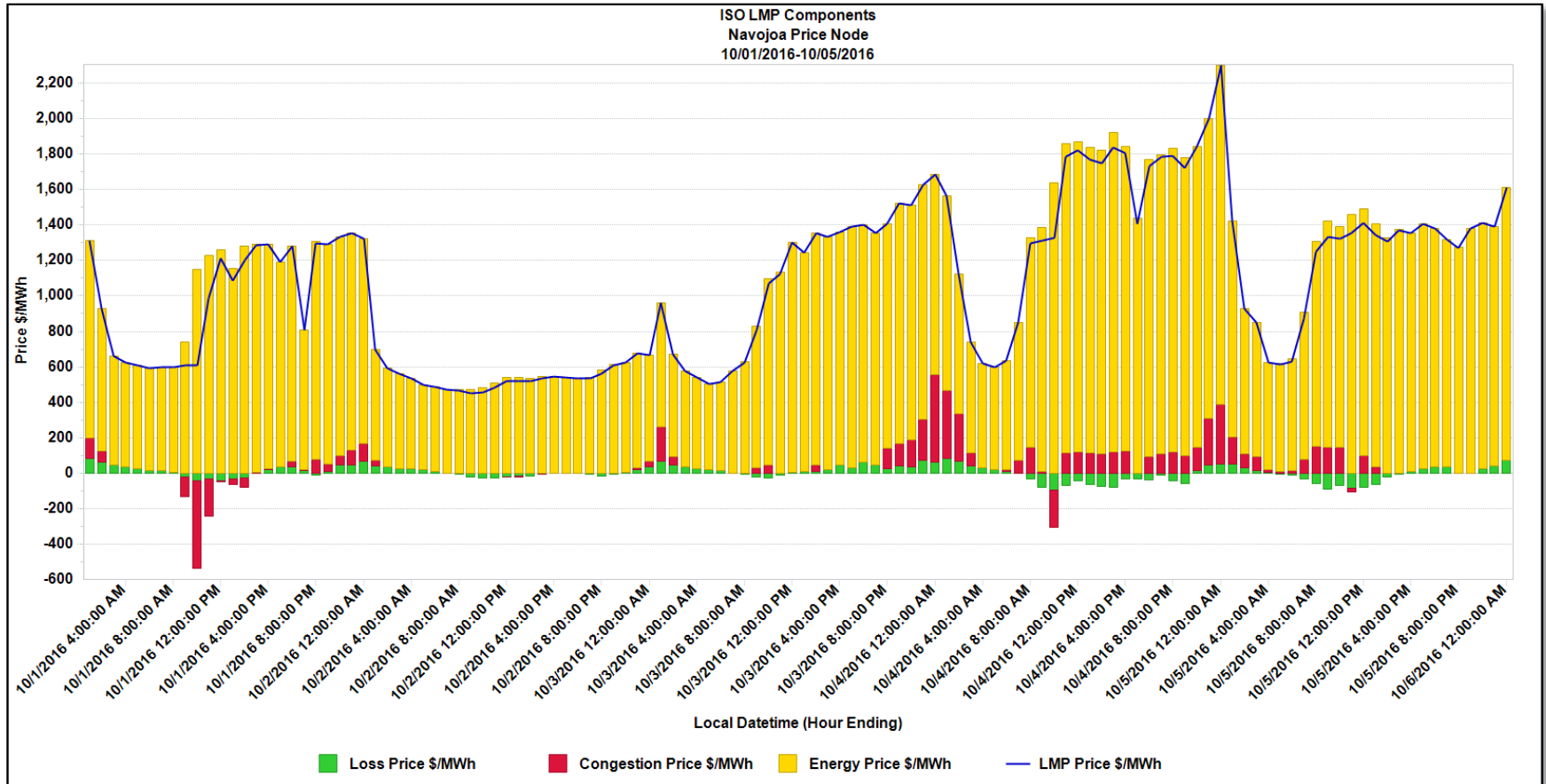
# Case Study

## Sample Analysis



# Case Study

## Sample Analysis

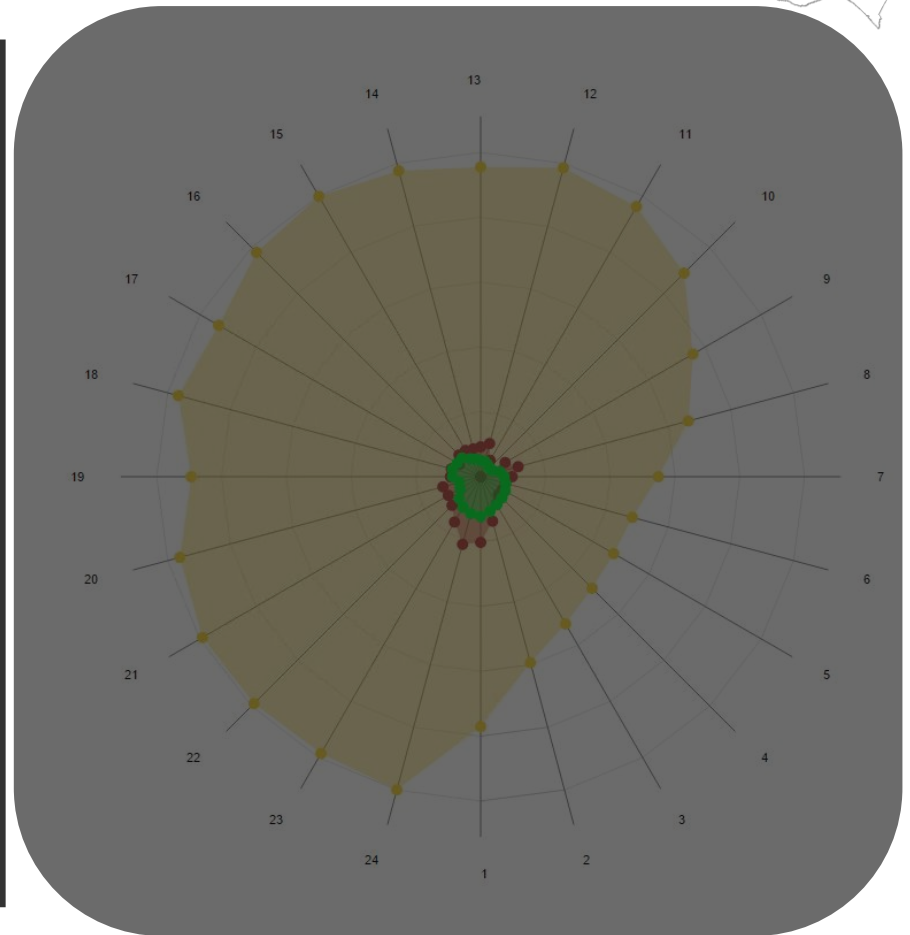
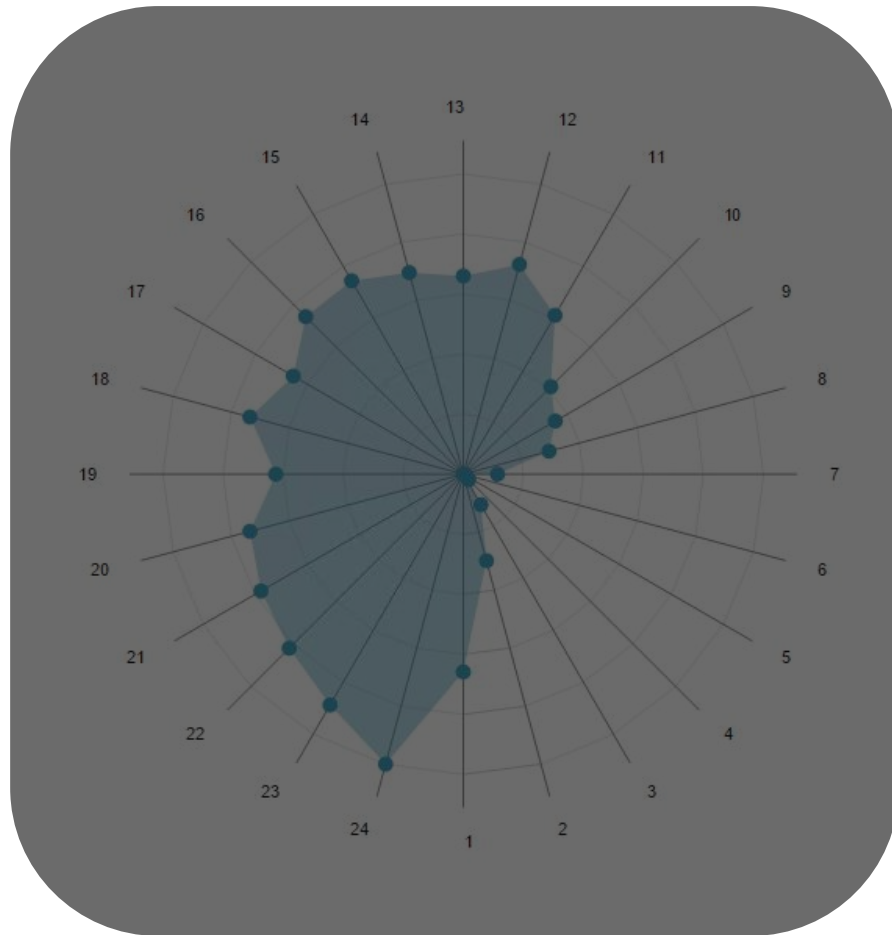




# Case Study

## Sample Analysis

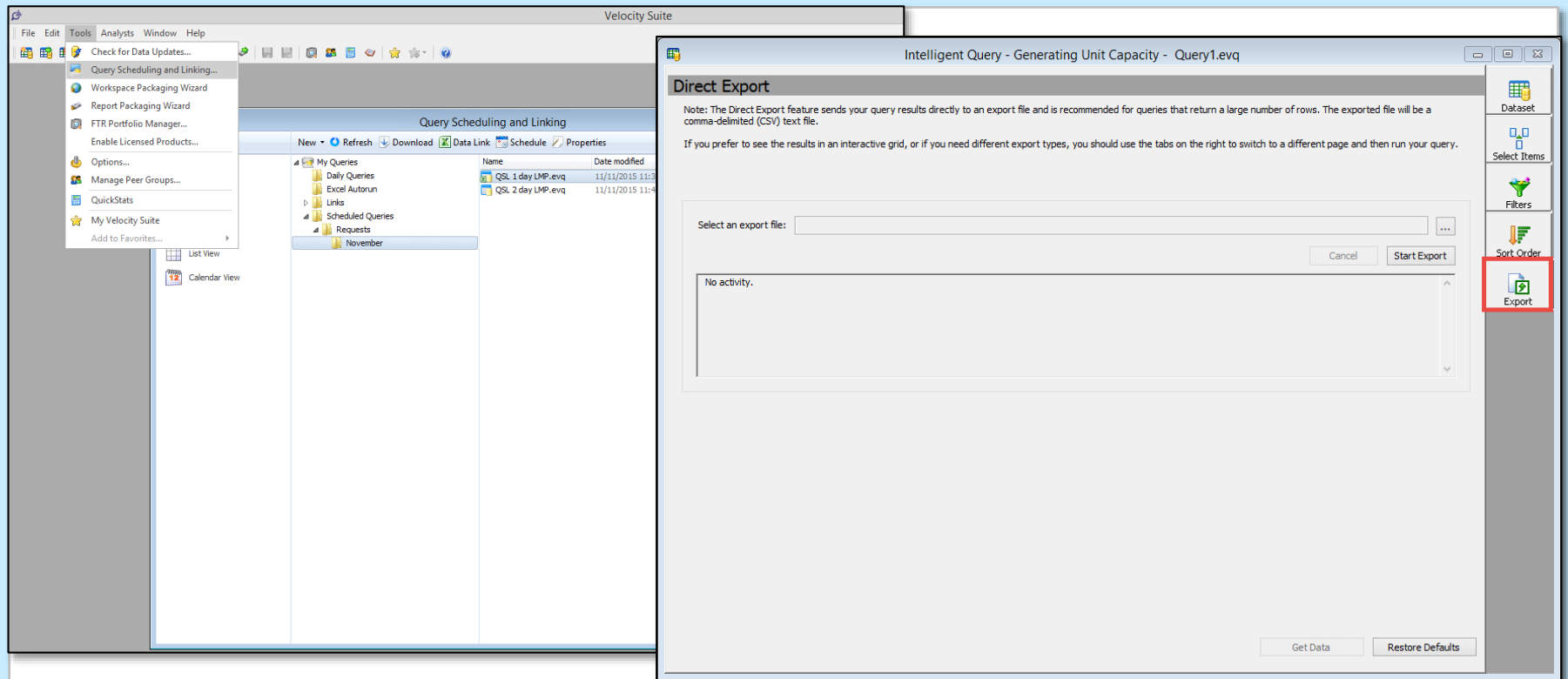
Navojoa Price Node LMP and components by Hour  
(10/01/2016 - 10/05/2016)



● Average of LMP Price \$/MWh ● Average of Energy Price \$/MWh ● Average of Congestion Price \$/MWh ● Average of Loss Price \$/MWh



# Other VS Tools



**For more information, please contact the Velocity Suite support department  
Velocity-Support.PGES@abb.com**

# ABB Advisors

## Mexico Offering

- **Advisory Services**
  - 25 Year Off-The-Shelf Price Forecasts
  - Custom 1-25 Year Price Forecasts
  - Asset Valuations
- **Standard and 25-Year Outlook Data**
  - PROMOD Format
  - 10 Regions\*
  - 53 Transmission Zones\*
  - Expansion Plan
  - Outlook Scenarios (Fuel, Renewables, etc.)
- **Coming in 2017...**
  - Full Reference Case Market Outlook

**\*Counts are expected as of go-live date of January 1, 2017**

# Summary

- **CFE vs. CENACE**

- What will be changing?



- **Available Data**

- How is data being published?
  - LMP, Load, Generation, and More!



- **What Data is expected to be included in Velocity Suite?**



- **Sample Analysis**



# Summary

Questions?

# Contact us

## **Velocity Suite Support**

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Phone: 1-888-968-8860

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for a better world™

