# ASSESSMENT OF ELECTRICITY MARKET TRANSPARENCY: MEXICO'S MERCADO ELÉCTRICO MAYORISTA

Final Report
November 21, 2018
Longwood Energy Group

Prepared for **Coalición por un Mercado de Electricidad Transparente:**
Asociación Mexicana de Energía Eólica (AMDEE)
Asociación Mexicana de Energía Solar Fotovoltaica (ASOLMEX)
Asociación de Comercializadores de Energía (ACE)
Asociación Mexicana de Energía (AME)
COGENERA México
Asociación Mexicana de Energía Hidroeléctrica (AMEXHIDRO)

# KEY MEMBERS OF THE TEAM

**Scott Englander**
President, Longwood Energy Group

**Diego Zermeño Valles**
Senior Consultant, Proalia

## Advisory Committee

**Jeff Pavlovic**
Power Market Expert, Bravos Energía

**Frank Wolak**
Professor of Economics
Director, Program on Energy and Sustainable Development
Stanford University

**Ellen Wolfe**
President, Resero Consulting

# CONTENTS

# GLOSSARY OF ACRONYMS

The acronyms used herein are in many cases those of the corresponding Spanish language terms.

API – *Application program interface*, a set of routines, protocols, and tools for building software applications that specifies how software components (e.g., the SIM and market participants' business software) should interact

BCA – The Baja California control area

BCS – The Baja California Sur control area

CCARM – *Comité Consultivo de Análisis de las Reglas del Mercado*, advisory committee for the analysis of market rules; there are currently four such committees

CENACE – *Centro Nacional de Control de Energía*, the system and wholesale market operator

CRE – *Comisión Reguladora de Energía*, the energy regulatory commission

CDT – *Capacidad de Transferencia Disponible*, the available transfer capacity

CTT – *Capacidad Total de Transferencia*, the total transfer capacity

DFT – *Derecho Financiero de Transmisión*, a financial transmission right

FERC – The US Federal Energy Regulatory Commission

GSI – *Garantía de Suficiencia de Ingresos,* revenue sufficiency guarantee (uplift payment to generator)

INAI – *Instituto Nacional de Acceso a la Información y Protección de Datos*, the national institute of information access and data protection

ISO – Independent system operator, equivalent to RTO in most practical senses

LFT – *Ley Federal de Transparencia y Acceso a la información Pública Gubernamental,* the 2002 federal law of transparency and access to public government information

LFTAIP – *Ley Federal de Transparencia y Acceso a la Información Pública*, the 2016 federal law of transparency and access to public information, replacing the LFT

LIE – *Ley de la Industria Eléctrica*, the electricity industry law

LORCME- *Ley de Órganos Reguladores Coordinados en Materia Energética*, the law of coordinated regulatory bodies on energy matters

MDA – *Mercado del Día en Adelanto*, the day-ahead energy and ancillary services market

MEM – *Mercado Eléctrico Mayorista*, the Mexican wholesale electricity market coordinated by CENACE

MIM – *Monitor Independiente del Mercado*, the independent market monitor

MBP – *Mercado para el Balance de Potencia*, capacity balancing market

MTR – *Mercado de Tiempo Real*, the real-time energy and ancillary services market

OOM – Out-of-merit, referring to operator actions that dispatch or commit units out of merit order

PML – *Precio Marginal Local*, locational marginal price of energy (day-ahead or real-time)

RLIE – *Reglamento de la Ley de la Industria Eléctrica*, the regulation associated with the LIE

RTO – Regional transmission organization, equivalent to ISO in most practical senses

SEN – *Sistema Eléctrico Nacional*, the entire system operated by CENACE, consisting of the SIN, BCA, and BCS

SENER – *Secretaría de Energía*, the Ministry of Energy

SIE – *Sistema de Información Energética*, the online system used by SENER to publish energy information

SIM – *Sistema de Información del Mercado*, the online system used by CENACE to release MEM data

SIN – *Sistema Interconectado Nacional*, the main control area of the SEN, consisting of everything but BCA and BCS.

# EXECUTIVE SUMMARY

The study documented in this report is an independent, qualitative assessment of transparency in the Mexican wholesale electricity market operated by CENACE (the MEM). The study, performed by a team led by Longwood Energy Group (Team) and commissioned by the *Coalición por un Mercado de Electricidad Transparente* (Coalition),[1] examined data release practices, operations, and price formation.

The assessment compared data release practice with policy in the MEM, and assessed the ways in which data release in the MEM might enhance or hinder transparency. The MEM's data release practices were compared with those used in advanced markets.

The assessment of operational transparency considered the degree to which market operations are performed as prescribed by relevant law and market rules. It sought to examine the manner and frequency that dispatch and pricing are determined by operator intervention rather than market mechanisms consistent with market rules. It also sought to investigate the principal causes of such actions, and potential impacts. The study looked at various other aspects of operational transparency in the MEM, relative to principles shared by markets with high levels of operational transparency. The Team's research was informed by interviews of agency staff, market participants, and other stakeholders.

## Transparency and the Role of Information in Markets and Efficient Outcomes

Transparency is essential for a well-functioning electricity market.[2] It prevents players with exclusive access to information from profiting unfairly at others' expense. Transparency levels the playing field by providing information equally to all, reducing barriers to entry. Market transparency reduces uncertainty, allowing better risk analysis and decision making, enabling participants and other stakeholders to more efficiently identify and respond to market needs. It increases competition, contributing to appropriate market outcomes, and by facilitating effective and reliable monitoring and regulation, it safeguards against market manipulation, building trust and market stability.

## Data Release Policy and Practice in the MEM

In electricity markets, it is essential that the market operator provide information in a way that facilitates efficient market outcomes. This requires that market participants and potential market participants have the information necessary to identify profitable business

[1] The Coalition, for the purposes of this effort, is comprised of Mexican trade organizations for wind and solar energy, hydroelectric, cogeration, independent power producers, and energy marketers: Asociación Mexicana de Energía Eólica (AMDEE), Asociación Mexicana de Energía Solar Fotovoltaica (ASOLMEX), Asociación de Comercializadores de Energía (ACE), Asociación Mexicana de Energía (AME), COGENERA México, and Asociación Mexicana de Energía Hidroeléctrica (AMEXHIDRO).

[2] "Transparency" as used in this report in connection with electricity markets is not transparency for its own sake, but relates specifically those aspects of visibility into the market that can lead to greater efficiency.

opportunities and that all stakeholders have equal access to this information. The role of information in promoting efficient market outcomes—as well as the inefficient market outcomes that can occur when some market participants possess significantly more information than other participants—has been addressed thoroughly in economics literature. Fully efficient market outcomes require that participants make efficient capital investment, operating, and pricing decisions. If one or more participants possesses superior information, they have a strong incentive to use it to increase their profits, potentially at the expense of market efficiency.

The public release of system and market data can help mitigate information asymmetries, where a dominant or incumbent participant with a large portfolio of assets has access internally to much more data than do smaller or newer participants. It is difficult to profitably compete against a market participant that holds more information, a problem which public information disclosure can mitigate. Other specific benefits of public information disclosure include:

- reducing supply uncertainty and risk, participant financial risk, and associated risk premia
- promoting market liquidity, which facilitates the hedging of risk by participants
- encouraging more cost-effective investment and operating decisions
- improving market monitoring
- decreasing barriers to entry
- strengthening confidence in the market operator and regulatory authorities

## Data Release Policy in the MEM

This report details the data release policy for the Mexican wholesale electricity market (MEM), as provided in the market rules and operating procedures. The data release policy and practice in MEM, operated by CENACE, is considered in the context of laws related more generally to transparency and to the regulation of the electricity industry, both historically and more recently as part of Mexico's energy industry reforms.

As detailed in this report, the regulatory basis of transparency and data release policy in the MEM has its foundation in a body of Mexican law including the Constitution itself. The general transparency laws classify information into three categories—Public, Reserved, and Confidential—and they establish criteria for classification.

The laws establish a set of open data rules—consistent with international standards—to simplify access, use, reuse and redistribution of public information generated by the Federal government and State Productive Enterprises, providing for it to be free, with non-discriminatory access, freely usable, machine-readable, self-explanatory, disaggregated as much as possible, timely, and permanent.

After 21 years without any substantial reform in the Mexican electricity industry, the Mexican Energy Reform enacted in December 2013, complemented by laws and regulations issued in late 2014, initiated the establishment of an institutional and industrial model of open access. Requirements for transparency applicable to CRE and CENACE

were established governing the operation and function of the MEM, which began operations in 2016. The transparency requirements have not yet been fully implemented.

With regard to data release, the most important laws, regulations, and market rules are contained in the *Ley de la Industria Eléctrica*, the Market Bases, the Market Manuals, and other documents. The relevant provisions contained in these documents are described in this report.

CENACE is charged with maintaining MEM data, making it available to market participants, and publishing it in the public domain through its Market Information System (SIM) and on the government website. Transmission and distribution companies are required to publish certain information online.

## Data Release Practice in the MEM

This report presents an assessment of the data release practices in the MEM. The assessment evaluates the actual data release practices in the context of the data release policy, and also compares the practices to those of several centrally-coordinated electricity markets around the world with high levels of transparency.

The assessment considers the degree to which the specific data release practices used in the MEM might enhance or hinder transparency, looking at various indicators. The focus of the assessment is on data that are published (i.e., released publicly), should be published (according to the policy), or are typically published in other markets.

To assess public data release practice in the MEM, the Team cataloged all data published by CENACE (as well as other related data) and compared the result to the data release policy, noting deviations where they exist.

This report includes a comparison, for several key categories of data, of the current MEM data posting practice to practices we documented as part of research on several comparison markets around the world. The key categories include those data elements and manners of posting where either the data could be considered to be foundational to market efficiency, the data are released publicly in the MEM and/or the comparison markets, the specific data are common to the MEM and the comparison markets, or the practice involves market participant-specific data.

## Findings—Data Release

Our analysis revealed that neither the data release policy for the MEM nor the actual practices are documented in one place; the detailed policy specifications are distributed among various manuals and regulatory issuances. CENACE does not publish a data dictionary; many of the specific pieces of information released or referred to in the market rules are not well-defined. Correcting these shortcomings would not be difficult, and doing so would put CENACE on a par, in these respects, with the most transparent markets examined in this study.

Our comparison of MEM data release policy to actual practice revealed that the data release implementation is incomplete, and a number of aspects of the implementation hamper transparency. The implementation was found to be so user-unfriendly that it limits

access significantly, hampering transparency. These shortcomings could be addressed without any rule changes, by:

- Publishing to the fullest extent the significant amount of data that should, according to policy, be published
- Eliminating any participant identity masking that is inconsistent with policy
- Quality checking published data files and correcting errors
- Using file naming conventions rather than idiosyncratic filenames that pose a barrier to automating file download
- Resolving issues with CENACE website malfunctions
- Ensuring that all data are machine readable (e.g., CSV), and all text is searchable
- Providing an online query tool for all hourly or daily data
- Implementing an API for client software to communicate with the SIM

Our work collecting stakeholder perspectives reinforced the findings of our comparison of MEM data release practice to MEM policy, in particular with regard to availability, accessibility, and machine readability of data. Stakeholder interviews revealed a strong consensus that CENACE provides stakeholders with insufficient price signals and other information needed to understand the dynamics of the market, manage risk, support operating and investment decisions, validate market settlement statements, and have confidence that the market and power system are being operated impartially and according to market rules. There was a broad stakeholder consensus for reclassifying Reserved information as Public. Many of the points raised by stakeholders were supported by the comparison of CENACE's data publication practices to those used in advanced markets. CENACE can reduce information asymmetry and increase the effectiveness of its data release by emulating other markets' practices such as:

**Provide transmission and distribution companies access to all Reserved data**. No justification was found for prohibiting access by transmission and distribution companies to certain Reserved data that other market participants may access.

**Reclassify Reserved information as Public**. Based on the criteria for classifying information as Reserved, it is not clear why many if not all of the Reserved MEM data are not released to the public as they are in other markets, but made available only to market participants, trusted external users, and transmission/distribution companies. Inasmuch as certain categories of Reserved information are not reclassified as Public, access by users with a legitimate interest should be streamlined, and access fees eliminated.

**Decrease obfuscation and increase timeliness of release.** CENACE aggregates, masks, and intentionally delays data more extensively than the comparison markets. Recommendations specific to each of several key categories of data follow:

- **Increase supply offer data and demand bid transparency**. CENACE could increase transparency of supply offer and demand bid data to the levels of the comparison markets by posting supply offers with plant or unit identities instead of masks,

including demand asset identities, and by reducing the 60-day time lag, and by releasing aggregate data with little or no delay.

- **Increase timeliness and disaggregation of load data**. The high level of aggregation and long delay for load data publication make CENACE least transparent relative to the comparison markets.
- **Increase generator data transparency**. By decreasing the level of aggregation, including plant or unit IDs, and making generator unit commitment and outage data available, CENACE could achieve comparability with the other markets examined. Generator outage data are valuable to the market monitor and other observers to detect whether suppliers are withholding output to drive prices up.
- **Increase transmission data transparency.** The provision of transmission data—valuable to generation unit owners in making location decisions, transmission planners in making planning decisions, and all market participants in managing congestion risk—could be enhanced by publishing the information that MEM market rules specify be available to entities certified for access to Reserved data and making power flow cases available. Extended transmission outage schedules, power flow cases and related data, and reports of binding constraints should be provided.

**Improve data release across the entire spectrum**. Although the major categories of data assessed above are perhaps the most important, our review noted areas for improvement in CENACE's release practices across the entire spectrum of data.

**Release complete models and comprehensive input data**. In several categories, as noted in Annex A, the rules provide for CENACE to release complete models and input assumptions. It was found that CENACE does not release the models or inputs comprehensively, however, in any of the categories.

**Publish data needed by market participants to validate allocated settlement charges.** The data currently provided to market participants with market settlement reports are insufficient to enable them to validate charges associated with the various socialized costs allocated pro rata.

**Increase the timeliness and frequency with which the CRE releases reports by the MIM.** The MEM rules provide for the independent market monitor (*Monitor Independiente del Mercado* or MIM) to monitor CENACE, and to report periodically and frequently on the efficient functioning of the MEM. The CRE has the responsibility of issuing reports that the MIM prepares. As of October 2018, however, only the MIM's annual 2016 report had been issued by the CRE.

A literature review and interviews with operators of markets elsewhere conducted as part of the Phase 1 study revealed widespread support for comprehensive data release, both generally and in the specific markets surveyed. Full and symmetric release (in high-quality format) of information is beneficial for participants to understand and predict market prices, to inform their operating and investment decisions, and for participants, potential participants, and neutral observers to assist in monitoring behavior. In the context of Mexico, which hopes to attract significant foreign investment in generating capacity

additions, the value of comprehensive and transparent data release cannot be overstated.

Discussions with staff at the CRE and CENACE regarding the challenges and opportunities with regard to MEM data release policy and practice were constructive, and staff members with whom we spoke expressed a sincere interest in finding ways to advance the MEM's development in this area.

CENACE staff indicated that the *implementation* of data release according to the requirements laid out in policy was still underway, and approximately 70 percent complete relative to the regulations.[3] Staff were well aware of the deficiencies in CENACE's data release systems, while at the same time recognizing that their ability to make improvements unilaterally is constrained by available resources, and in some respects by what is allowed or required under current policy. CRE electricity market staff, like CENACE, saw the need to improve public-facing data access capabilities—as well as those for use by market surveillance staff—as a high priority, and acknowledged current shortcomings.

## Operational Transparency in the MEM

For an electricity market to harness transparency so as to deliver all of the benefits described above requires more than making data accessible. This study examined the features of advanced markets with high levels of operational transparency and assessed operational transparency in the MEM, based on information gathered through discussions with stakeholders and with CENACE and CRE staff, as well as with a high-level review of market manuals and other documents published by CENACE. This information was reviewed against a rubric of ten principles, as summarized below.

- **Prices determined through market mechanisms, minimal use of out-of-market actions**
  Based solely upon what was reported to us by CENACE staff, it is fair to say that there is great need for improvements in CENACE's systems and in the market design that would allow greater reliance on market mechanisms.
- **Operating procedures documented comprehensively, publicly**
  A great deal of progress remains to be made for the MEM to be considered transparent with regard to the documentation of operating procedures.
- **Market mechanisms used in system/market operation are consistent with market rules**

  Ascertaining the degree to which MEM spot market operation is consistent with the market rules would require an effort more extensive than possible within the scope of this study. Given the current lack of detailed spot market operating procedures, however, many of the more specific aspects of market operation would be difficult to assess, except in a general sense.

[3] The exact meaning of this metric as expressed by staff is unclear; it was understood by the Team to mean 70 percent of the data categories and components within categories specified in the rules are currently being released.

- **Rules distinguish between acceptable / overreaching intervention by market operator**
  The MEM spot market rules for operator intervention as currently documented are rather general, and unlike those of other advanced markets, they do not contain provisions that sufficiently circumscribe their use.
- **Transparency around operator intervention and the causes of uplift**
  High uplift costs are a good indicator of a lack of operational transparency. Without public data on uplift costs, or documentation on the frequency, causes, and costs of operator intervention and uplift, it is impossible to develop consensus on a common understanding of these problems and develop solutions targeted appropriately.
- **Assessment of market operator performance by independent market monitor**
  The MEM rules provide for the MIM to monitor CENACE, and to report periodically on the efficient functioning of the MEM. As of October 2018, however, only the MIM's annual 2016 report had been issued by the CRE. The MIM is not yet being provided sufficient information to make a comprehensive analysis of market efficiency.
- **Price formation reflects all active constraints**
  Improvements to the market model to secure parts of the system that are not currently secured, or otherwise represent active constraints, are needed. Creating more granular reserve areas (currently the three control areas) may be necessary to properly model reserve constraints.
- **Transparency surrounding transmission outage scheduling and schedule changes**
  Outage schedule data, classified as Reserved data, are posted only seven days in advance and are aggregated by region. There is little information in the market rules regarding the procedures for changing transmission outage schedules and the policy for posting outage schedule changes.
- **Publicly accessible market committee meetings, meeting materials, and minutes**
  Although CENACE in 2018 began to publish terse committee minutes, the meeting schedules, agendas, and meeting materials do not appear to be published.
- **Robust and collaborative stakeholder engagement to improve transparency**
  To develop and continuously improve transparency will require a robust and collaborative stakeholder engagement effort. Managing the process successfully may require dedicating market operator staff with a mix of policy, operational, and legal expertise, as well as an iterative process that encourages collaboration of a technical nature to develop solutions.

As part of this study, the Team performed a limited analysis of MEM spot market pricing. The objective of the analysis was to assess qualitatively whether a subset of PMLs published by CENACE could be seen to reasonably reflect the underlying information that serves as the basis for their determination. The analysis was inconclusive, given that CENACE publishes insufficient information to help interpret PMLs or improve the estimation; lacking such additional information, it is impossible to identify specific problems that may exist in system

pricing. Nevertheless, the illustration provided by the price analysis underscores this finding, which was corroborated by other observations discussed elsewhere in the report.

The report contains examples describing efforts by several electricity markets to minimize market operator intervention by creating market mechanisms or improving existing ones, as well as efforts in those markets to keep market operators accountable regarding intervention and to provide the information needed by stakeholders to understand the resulting market outcomes. Recommendations for improving operational transparency in the MEM, based on the study's findings, are summarized below.

# Recommendations

The following table presents a succinct summary of 36 recommendations based on the study's findings. As the table shows, many of the recommendations can be implemented, at least in part, without any changes to the market rules.

| | Recommendation | Requires Rule Change? |
|---|---|---|
| Data Release Policy | | |
| 1 | Consolidate MEM data release policy | No |
| 2 | Publish a data dictionary for posted MEM data | No |
| 3 | Reclassify Reserved information as Public | Yes |
| 4 | For any Reserved information not reclassified as Public, modify policy to give transmission and distribution companies access | Yes |
| 5 | For any Reserved information not reclassified as Public, streamline access for users with legitimate interest, and eliminate access fees | Yes |
| Data Release Practice | | |
| 6 | Publish all data required by policy[a] | No |
| 7 | Eliminate masking of data (e.g., participant or asset ID) where not required by the rules | No |
| 8 | Quality check published data files and correct errors | No |
| 9 | When data are missing, publish "missing value" codes instead of nothing at all | No |
| 10 | Use file naming conventions rather than idiosyncratic filenames that can't be anticipated | No |
| 11 | Resolve issues with CENACE website malfunctions | No |

| | Recommendation | Requires Rule Change? |
|---|---|---|
| 12 | Ensure all data are machine readable (e.g., CSV), all text searchable | No |
| 13 | Provide online query tool for all hourly or daily data | No |
| 14 | Implement an API for client software to communicate with SIM | No |
| 15 | Decrease aggregation and masking of published data | In some cases[b] |
| 16 | Increase timeliness of data publication[c] | In some cases[d] |
| 17 | Publish unit commitment and generator outage data | In some cases |
| 18 | Post transmission outage schedules more than 7 days in advance | No |
| 19 | Publish power flow cases, list of contingencies, line and interface limits, and other data needed to simulate power system | No |
| 20 | Publish reports of binding constraints, along with associated congestion costs | No |
| 21 | Where rules require models to be posted, post models and complete input assumptions | No |
| 22 | Publish data needed by market participants to validate allocated settlement charges | No |
| 23 | Increase the timeliness and frequency with which the CRE releases reports by the MIM | No |
| | Operational Transparency | |
| 24 | Issue the Ancillary Services Manual | Yes |
| 25 | Commission the MIM to conduct a comprehensive assessment of market efficiency, to be made public[e] | No |
| 26 | Implement a system to give the MIM access to all of the information it needs to regularly assess market efficiency and CENACE performance | No |
| 27 | Develop comprehensive CENACE performance metrics and issue periodic performance reports | No |
| 28 | Develop and implement rules that distinguish more clearly the criteria allowing specific operator interventions | Yes |
| 29 | Make improvements to market design and CENACE's systems to allow greater reliance on market mechanisms in dispatch and pricing | In some cases |

| | Recommendation | Requires Rule Change? |
|---|---|---|
| 30 | Develop and implement reserve demand curves | Yes |
| 31 | Prior to development and implementation of reserve demand curves, clarify the procedures and penalty factors currently used by CENACE to relax reserve constraints | No |
| 32 | Explore the creation of more reserve areas, to properly model reserve constraints | No |
| 33 | Clarify the market rules for changing transmission outage schedules and posting outage schedule changes | Yes |
| 34 | Publish CCARM and CECMEM meeting schedules, agendas, and meeting materials; provide for attendance via web conference | No |
| 35 | Given current staffing constraints, CRE and CENACE should seek additional human resources to focus on the issues identified in this report | No |
| 36 | Establish a stakeholder process to address the issues and recommendations of this report | No |

[a] Specifically, the missing or incomplete one-third of Public data categories and two-thirds of Reserved data categories that should, according to policy be posted. See tables in Annex A for details.

[b] For some data categories, there is leeway to decrease aggregation within the rules. For others, the level of aggregation that the rules require is explicit.

[c] In cases where delays are not eliminated, consider posting more aggregated data sooner.

[d] For some data categories, there is leeway to decrease the delay, because the rules specify a maximum posting lag or none at all. For others, the required time lag is explicit.

[e] This work should include an assessment of the degree to which MEM spot market operation is consistent with the market rules, and an analysis of the frequency, causes, and costs of operator intervention and uplift. The MIM will need to be provided all of the information it needs to make such an assessment.

# I Introduction

The study documented in this report was performed by a team led by Longwood Energy Group (Team) and commissioned by the *Coalición por un Mercado de Electricidad Transparente* (Coalition).[4] The objective of the study was to perform an independent, qualitative assessment of transparency in the Mexican wholesale electricity market operated by CENACE (the MEM). The study examined data release practices, operations, and price formation. It focused primarily on the energy and ancillary services spot markets of the MEM.

This effort follows research commissioned in 2017 by the Coalition to study practices that create transparency into market operations and outcomes in some of the world's most advanced markets (the "Phase 1" study). The study of the MEM included an assessment of data release policy and practice and an assessment of operational transparency. Those assessments evaluated transparency in the context of the framework developed in Phase 1.

The assessments compared data release practice with policy in the MEM, and assessed the ways in which data release in the MEM might enhance or hinder transparency. The MEM's data release practices were compared with those used in advanced markets.

To assess operational transparency in the MEM, the Team examined the features of advanced markets with high levels of operational transparency and the impetus behind them, evaluated the degree to which MEM operations are consistent with the principles of operational transparency, analyzed MEM spot prices, and looked more specifically at examples of what the organizations running advanced markets have done to enhance operational transparency. The study was informed by interviews of agency staff, market participants, and other stakeholders.

The following sections begin with a discussion of transparency and the role of information in markets and efficient outcomes, followed by a review of data release policy in the MEM and its basis in Mexican law, an assessment of MEM data release practice including a comparison to policy, and a summary of stakeholder and agency staff perspectives on data release in the MEM. An assessment of operational transparency in the MEM follows, and the report concludes with a summary of recommendations based on our findings.

[4] The Coalition, for the purposes of this effort, is comprised of Mexican trade organizations for wind and solar energy, hydroelectric, cogeration, independent power producers, energy marketers: Asociación Mexicana de Energía Eólica (AMDEE), Asociación Mexicana de Energía Solar Fotovoltaica (ASOLMEX), Asociación de Comercializadores de Energía (ACE), Asociación Mexicana de Energía Hidroeléctrica (AMEXHIDRO), COGENERA México (CM), and Asociación Mexicana de Energía (AME).

# II Transparency and the Role of Information in Markets and Efficient Outcomes

Transparency is essential for a well-functioning electricity market.[5] It prevents players with exclusive access to information from profiting unfairly at others' expense. Transparency levels the playing field by providing information equally to all, reducing barriers to entry. Market transparency reduces uncertainty, allowing better risk analysis and decision making, enabling participants and other stakeholders to more efficiently identify and respond to market needs. It increases competition, contributing to appropriate market outcomes, and by facilitating effective and reliable monitoring and regulation, it safeguards against market manipulation, building trust and market stability.

While it is critical that wholesale electricity market prices respond to market conditions—it is also essential that the market operator provide prices and additional information in a way that facilitates efficient market outcomes. This requires that market participants and other stakeholders have the information necessary to identify profitable business opportunities and that all stakeholders have equal access to this information. The role of information in promoting efficient market outcomes has been addressed thoroughly in economics literature.[6,7,8] The literature also describes the inefficient market outcomes realized when some market participants possess significantly more information than other participants, noting increased markups of the short-term price over the marginal cost of production, decreased competition, increased likelihood of price spikes, and increased likelihood of regulatory intervention.[9]

Fully efficient outcomes require that market participants make efficient operating and pricing decisions, and they cannot do that without sufficient information. Market participants need market data to interpret past events and to project supply and demand, transmission constraints, congestion, and other variables.[10]

---

[5] "Transparency" as used in this report in connection with electricity markets is not transparency for its own sake, but relates specifically those aspects of visibility into the market that can lead to greater efficiency.

[6] Holmberg, P. and Wolak, F. A., 2018. Comparing auction designs where suppliers have uncertain costs and uncertain pivotal status, The RAND Journal of Economics. https://onlinelibrary.wiley.com/doi/abs/10.1111/1756-2171.12259.

[7] Hooper, L., Twomey, P., and Newbery, D., 2009. Transparency and Confidentiality in Competitive Electricity Markets. Sponsored by the U.S. Agency for International Development and the National Association of Regulatory Utility Commissioners. http://pdf.usaid.gov/pdf_docs/Pnadq695.pdf

[8] EU DGC, 2007. DG Competition Report on Energy Sector Inquiry, SEC (2006) 1724, 10 January 2007. Directorate-General for Competition, European Commission, Brussels. http://ec.europa.eu/competition/sectors/energy/2005_inquiry/full_report_part1.pdf

[9] Holmberg and Wolak, *ibid.*

[10] Baziliauskas, A., Sanderson, M., and Yatchew, A., 2011. Electricity Market Data Transparency. Prepared for Alberta Market Surveillance Administrator. https://albertamsa.ca/uploads/pdf/Archive/2011/Market%20Data%20Transparency/CRA%20Report%20for%20MSA%2011-22%202011.pdf

Market participants especially need sufficient market data to optimize capital investment and operating decisions.[11] Examples of capital investment decisions include:

- The technology, location and size of new plants
- Long-term commitments for fuel supply and transport capacity
- The location and type of transmission upgrades[12]
- Investments in demand response capability
- Investments in dual fuel capability, environmental retrofits, and plant repowering
- Timing exit from the market (e.g., retirement) appropriately

With sufficient market data, market participants are better able to optimize inter-temporal operating decisions, thereby increasing productive efficiency.[13] Examples of inter-temporal operating decisions include:

- Committing resources with startup/minimum-load costs whose recovery is not assured
- Deploying limited energy during one period vs. another
- Timing the charging and discharging of energy storage
- Optimizing import and export schedules
- Short-term fuel procurement and transport capacity nomination
- Outage scheduling
- Shifting load from one period to another

Such optimization requires the ability to project future prices and to simulate the impact of market participants' decisions on those prices. Although modeling electricity systems and markets to project prices has become a common practice, doing it well requires that the information used to develop input assumptions or models of the transmission system is available, of good quality, and timely.

If one or more participants has superior information, they have a strong incentive to use it to increase their profits, discouraging others from participating, potentially at the expense of market efficiency. Perhaps the most significant benefit of the public release of system and market data is that it can help mitigate information asymmetry, where a dominant or incumbent participant with a large portfolio of generation or transmission assets has access internally to much more market data, simply due to its size, than do smaller or newer participants, potential participants, and outside observers. It is difficult to profitably

---

[11] Baziliauskas *et al., ibid.*

[12] The discussion here is intended to be without reference to any particular market. That being said, the only types of transmission upgrade decisions in the MEM that are made by the private sector are for plant interconnections.

[13] Von der Fehr, N., 2013. "Transparency in Electricity Markets." University of Oslo, Department of Economics Research Memorandum No 13/2013, http://www.sv.uio.no/econ/english/research/memorandum/

compete against a market participant that holds more information, a problem which public information disclosure can mitigate.

In addition to reducing information asymmetry, other specific benefits of public information disclosure include:[14]

- reducing supply uncertainty and risk, participant financial risk, and associated risk premia
- promoting market liquidity, which facilitates the hedging of risk by participants
- encouraging more cost-effective investment and operating decisions
- improving market monitoring
- decreasing barriers to entry
- strengthening confidence in the market operator and regulatory authorities

These benefits can separately or collectively improve market outcomes in both the short and long term in a number of ways.[15] They can result in greater participation and increased competition, resulting in lower markups of the short-term price over the marginal cost of production and lower total costs serving system demand, and therefore lower wholesale electricity costs to consumers. Market participants and investors will have greater confidence that the markets will not require regulatory intervention. In turn, there will be greater confidence in using short-term wholesale prices as the basis for a liquid forward market for energy, which can lead to more efficient capital investment decisions. All of these conditions will encourage both the investment decisions needed to support resource adequacy, and operating decisions consistent with reliable system operation. Figure 1 summarizes these benefits.

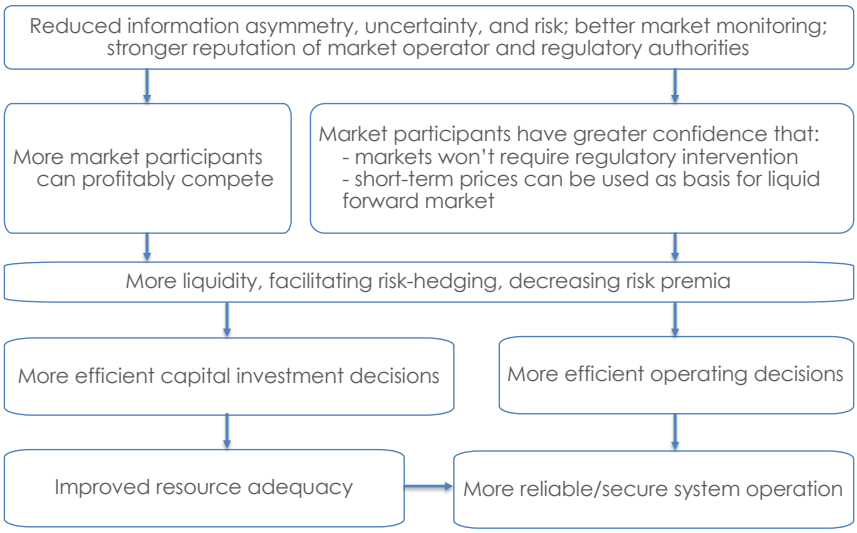



***Figure 1**. Benefits of transparency and information disclosure.*

[14] Hooper et al., *ibid.;* EU DGC *ibid.*; Von der Fehr, Holmberg & Wolak, *ibid*.

[15] Hooper et al., ibid.; Holmberg & Wolak, *ibid*.

# III Data Release Policy in the MEM

This section of the report details the data release policy for the MEM, operated by CENACE, as provided in the market rules and operating procedures. It is helpful to consider data release in the MEM first in the context of laws related more generally to transparency and regulation of the electricity industry, both historically and more recently as part of Mexico's energy industry reforms.

## Introduction

This section describes the general legal and regulatory framework serving as the foundation for transparency and information access in Mexico.

### 1. Background

In Mexico, the lack of sufficient and precise public information has been a concern articulated with regard to most industries. Although the government—through various departments and State-owned companies—publishes annual reports, evaluations, financial reports and development programs, information is generally relatively limited.

The foundation of the legal framework regarding transparency and data release policy lies in Article 6 of the Mexican Constitution. Under Article 6, the following principles govern how information access must be provided:[16]

i. All information in possession of any authority, entity, organ and federal, state and municipal body is public and may only be reserved temporarily for reasons of public interest. The principle of full disclosure must prevail in the interpretation of this right.

ii. Information relating to private life and personal data shall be protected under the terms and exceptions set out in the laws.

iii. Any person, without the need to prove any interest or justify their use, will have free access to public information, to their personal data or to the rectification of these.

iv. Mechanisms for access to information and expeditious review procedures will be established. These procedures shall be substantiated by specialized and impartial parties and with operational, management, and decision-making autonomy.

v. "Obligated subjects"[17] must preserve their documents in up-to-date administrative files and make them available through electronic media.

vi. The laws will establish the way that the obligated subjects must make their information public.

[16] Official Journal of the Federation, Friday 20 July 2007, available at: Http://inicio.ifai.org.mx/Articulo6/PublicacionDOF20Jul_2007.pdf

[17] Obligated subjects include any individual or entity that receives or makes use of public funds or resources or carries out acts for an authority, including agencies or dependencies, trusts, public funds, political parties and trade unions.

vii. Failure to abide by provisions for access to public information is punishable under the terms of the laws.

Until relatively recently, information published by the Mexican federal government was very opaque. This changed significantly in 2002, with the following two substantial changes:

- The *Instituto Nacional de Acceso a la Información y Protección de Datos* (INAI, formerly Instituto Federal de Acceso a la Información Pública, or IFAI)[18] was created to guarantee the right to access public government information
- The *Ley Federal de Transparencia y Acceso a la información Pública Gubernamental* (LFT), was published to regulate the procedure for citizens to assert the Right of Information.

Additionally, in 2010, the regulation regarding transparency and data protection was augmented by the *Ley Federal de Protección de Datos Personales en Posesión de los Particulares,* a law created to guarantee protections for personal data, as well to guarantee privacy and the right to informational self-determination.[19]

The government has in the past denied access to certain information—including information regarding State-owned companies—claiming it was confidential. To address this, two changes in law were made:

- **Constitutional amendments in 2013 and 2014**, enhancing the right to access information, consolidating a national information platform, strengthening the IFAI and expanding its authority. The agency, whose name was changed to *Instituto Nacional de Acceso a la Transparencia, Acceso a la Información y Protección de Datos Personales* (INAI),[20] was granted new responsibilities including:
  - Bring Supreme Court challenges against Mexican laws or international treaties that violate the right to access public information or the protection of personal data.
  - Review resolutions issued by local agencies, contributing to the standardization of transparency criteria across the three levels of government.
  - Standardize procedures for tracking and filing information, to improve compliance with the legislation.
- **The 2016 *Ley Federal de Transparencia y Acceso a la Información Pública*** (LFTAIP), a law replacing the LFT and expanding the scope of information subject to public access.[21] The LFTAIP required compliance with obligations regarding transparency.

[18] *See* http://inicio.inai.org.mx/SitePages/ifai.aspx
[19] See http://www.diputados.gob.mx/LeyesBiblio/pdf/LFPDPPP.pdf
[20] In accordance with articles 121 to 144 of the Ley Federal de Transparencia, any person may request information through the National Information Platform. Requests must be responded to within 20 days. In response to such requests, the relevant authority must deliver any information in an open format.
[21] See http://www.diputados.gob.mx/LeyesBiblio/pdf/LFTAIP_270117.pdf

The *LFTAIP*, the most important of the laws elaborating on Article 6, defines in detail the obligations of transparency for obligated subjects, requiring that their information be kept publicly available and up to date.

Regarding the justification for access to information, the law states that the burden of proof is on obligated subjects. This means that when an interested citizen asks for information, they need not prove why they should have access to it or what they intend to do with it. To deny access, however, the obligated subject must provide a justification. This creates incentives aimed at fostering greater citizen participation and transparency.

Both the *Ley Federal de Datos Personales en Posesión de los Particulares* and the *Ley Federal de Datos Personales en Posesión de los Sujetos Obligados* are laws that aim to establish the bases, principles and procedures to guarantee the right to the protection of personal data in possession of a citizen or obligated subjects. Every authority, the legislative and judicial branches, political parties, trusts, and public funds are subject to these laws at federal, state and municipal levels. The right to the protection of personal data is limited only for reasons of national security, public safety and health, or to protect the rights of third parties.

Finally, the purpose of the *Ley Federal de Archivos* (LFA) is to standardize the way in which information is published. Before the promulgation of the LFA, information storage was neither centralized nor standardized, which made consulting the original versions of historical documents housed in various archives a complicated task. Files were not organized correctly, and in some cases, information in the national archives was available only with names redacted. The LFA promotes the use of methods and techniques aimed to develop organized file systems, which guarantee the conservation, availability, integrity and expeditious localization of the files, contributing to the effectiveness of public administration, proper government management and institutional advancement.

## 2. Classification of information

According to the general transparency laws, any person can request information from the federal institutions without identifying themselves or justifying how the information will be used. The laws governing which information an agency may release, how the information is released, and to whom it may be released distinguish those practices by type of information. For this purpose, the laws classify information into three categories—Public, Reserved and Confidential—and they establish criteria for classification.

Administrative units within each agency holding information are responsible for classifying the information in accordance with those criteria, the guidelines issued by the INAI, and the given agency's own rules and procedures. The criteria for the classification and declassification of Reserved information are established by INAI.

**Public**. Public information may be stored, reproduced, and distributed freely by government agencies, and also by third parties without prior authorization.

**Reserved.** Information meeting the following criteria is considered Reserved:

- Putting national security, public security, or national defense at risk

- Discouraging negotiations of international relations
- Putting the country's financial, economic, or monetary stability at risk
- Endangering the life, safety, or health of the people

Information may be classified as Reserved for up to five years. As long as the criteria continue to be met, the Reserved classification may be extended.

Reserved information may be declassified as such if:

- The criteria causing it to be classified no longer apply
- The period of classification expires
- A relevant government believes that the public interest outweighs the classification
- The relevant agency's Transparency Committee believes it to be necessary
- The information involves the violation of human rights or crimes against humanity

**Confidential**. Information meeting the following criteria is considered confidential:

- Personal data concerning an individual
- Information of a banking, fiduciary, industrial, commercial, fiscal, stock market, or postal nature, whose ownership belongs to individuals, subjects of international law, or only involving private, rather than public expenditure
- Information required to be kept confidential in accordance with laws or international treaties

The Confidential classification does not expire, and only the titleholders, their representatives, and authorities empowered to do so may access Confidential information.

### 3. Open data

The laws described above regulate the way in which Public data generated by agencies and entities of the Federal Public Administration and by State Productive Enterprises are released and establish rules[22] for publishing information in order to simplify access, use, reuse and redistribution, in accordance with the legal framework. The regulation establishes the following minimum characteristics for open data:[23]

- **Free:** Available free of charge
- **Non-discriminatory:** Accessible without restrictions for all users
- **Free use:** May be used for any purpose, provided that the source is cited

[22] Mexico has adopted the Open Data Charter, a collaboration among governments and organizations working to share data based on a shared set of principles. https://opendatacharter.net/

[23] *Decreto por el que se establece la regulación en materia de Datos Abiertos*, Artículo Quinto, Diaro Oficial del la Federación, February 20, 2015. http://www.dof.gob.mx/nota_detalle.php?codigo=5382838&fecha=20/02/2015

- **Machine-readable:** Structured, totally or partially, to be processed and interpreted automatically by electronic equipment.
- **Self-explanatory:** Provided along with the highest level of description and the necessary metadata
- **Primary:** Provided in a form that is as disaggregated as possible.
- **Timely:** Updated periodically, as generated.
- **Permanent:** Historical versions (including information identifying them as such) must be kept available.

In addition to all of the general requirements described above, the release of data by the CRE and CENACE is governed by laws and regulations specific to those agencies and to the electricity industry more broadly, as described in the sections that follow.

## Data Release in the Mexican Electricity Industry

This section provides a review of the key legal instruments and public policies that have a bearing on accessibility of data specific to the Mexican electricity sector, with a focus on the wholesale market.

After 21 years without any substantial reform in the Mexican electricity industry, the Mexican Energy Reform enacted in December 2013, complemented by laws and regulations issued in late 2014, initiated the establishment of an institutional and industrial model of open access. As part of this new regulatory model, the *Ley del Servicio Público de Energía Eléctrica* was replaced with new laws, regulations and provisions.

Requirements for transparency applicable to CRE and CENACE were established as part of the regulatory framework governing the operation and function of the MEM, which began operations in 2016. The transparency requirements have not yet been fully implemented, as implementation is still underway.

Electricity sector data are available on various sites and government platforms. The availability, accessibility and quality vary across these platforms. CENACE is charged with maintaining MEM data, making it available to market participants, and publishing it in the public domain through its Market Information System (*Sistema de Información del Mercado*, or SIM) and on the government website datos.gob.mx. The Department of Energy (SENER) provides information online through the *Sistema de Información Energética* (SIE).[24] The CRE publishes regulatory information such as electricity tariffs. Transmission and distribution companies are required to publish certain information online.

With regard to data release, the most important laws, regulations, and market rules are contained in the following, listed in the order issued:

- *Ley de la Industria Eléctrica* (LIE)
- *Ley de Órganos Reguladores Coordinados en Materia Energética* (LORCME)

[24] http://sie.energia.gob.mx/

- *Reglamento de la Ley de la Industria Eléctrica* (RLIE)
- *Bases del Mercado Eléctrico* (Market Bases)
- *Estatuto Orgánico del Centro Nacional de Control de Energía*
- *Manuales del Mercado* (Market Manuals)
- Certain resolutions of the CRE (detailed below)

The relevant provisions contained in these documents are described in the following sections.

## 1. The LIE and the RLIE

Articles 157 to 161 of the LIE establish the roles and responsibilities of government agencies and industry participants with regard to information transparency and data release.[25] Those requirements are:

- Information related to the activities of state companies, subsidiaries and affiliates that operate in the electricity industry is subject to the principle of full disclosure.[26]
- Electricity industry participants must provide to SENER, CRE or CENACE all the information those entities need to fulfill their functions, including data for the evaluation of their operations.
- SENER and CRE will verify compliance with the transparency provisions of the LIE, its regulations, and associated permits.
- Market participants will allow auditors to access their facilities and must deliver sufficient documentation and allow verification, inspection or audits, and must comply with any other requirements specified in the market rules.
- The CRE, SENER, CENACE, and their contractors and external experts will protect Confidential or Reserved information that they receive from market participants.
- SENER, CRE and CENACE will promote the transparency of information in the MEM, and consider the public interest, the integrity and efficiency of the market, economic competition and consumer protection.
- The CRE will establish rules regarding how information should be made public, including the reports of the operation and development of the MEM that must be published by CENACE.
- The CRE and the Independent Market Monitor established by the CRE will issue their own reports on the operation and development of the MEM and may require any party to deliver the information necessary to monitor the market.

[25] LIE, Chapter 10, Information.

[26] The principle of full disclosure ("principio de máxima publicidad") is a concept in Mexican law. "Principio de máxima publicidad… La obligación de los sujetos obligados de poner a disposición de la sociedad toda la información relevante sobre su estructura, atribuciones, estrategias, evaluaciones y decisiones." http://laip.michoacan.gob.mx/botones/form_glosario.jsp

- In accordance with the terms defined by the CRE and within 60 days following operation, CENACE must publish bids and offers for supply and demand.
- The CRE will publish documentation of the calculations and adjustments used to determine regulated tariff rates, maximum rates of suppliers of last resort, and final Basic Supply rates.
- CENACE must publish the following pieces of information within seven days of their definition:[27]
  - The models used in the calculation of the MEM's prices, except for bids and offers for supply and demand.
  - The capacities and availability of the power plants, the National Transmission Network and the General Distribution Networks of the MEM.
  - The models used to plan the expansion of the National Transmission Network and the General Distribution Networks of the MEM.
  - The models and studies used to define the characteristics of the infrastructure required for the interconnection of a power plant or the connection of a load center.
- SENER will create a free online system to publish and update the following information regarding state owned enterprises, their subsidiaries and affiliates:
  - Contracts (including appendices) with market participants regarding any product in the MEM
  - Contracts related to the acquisition, sale, commercialization, transport, management or administration of fuels related to the electric industry
  - Contracts related to the construction, acquisition or operation of generation, transmission, distribution or electricity marketing assets
  - Any other information determined by SENER

Additionally, article 139 of the LIE establishes that the CRE will publish the spreadsheets used in the calculations and adjustments used to determine regulated tariff rates for transmission, distribution and CENACE operation, maximum rates for suppliers of last resort, and Basic Supply final rates.

The executive branch published a bylaw to the LIE: the RLIE, explaining in greater detail the regulation established by law. The regulatory provisions specific to transparency and access to data, however, are detailed not in the *Reglamento*, but in the Market Bases and Market Manuals established by the CRE and CENACE.

### 2. The Market Bases

The Electricity Market Bases are composed of general administrative provisions that contain the principles of design and operation of the MEM. Section 15 of the Bases covers data release.

[27] SENER, as part of the reform, developed the initial user control criteria and procedures for accessing this information, with the objectives of promoting transparency, competition and security.

The Bases establish the implementation of the SIM, which allows market participants, the authorities, and the public to have access to relevant information regarding market operation. According to the Bases, the SIM must consider the following:

- Three types of information: Public, Confidential, and Reserved
- Three channels of access: public, secure (registration required), and certified (digital certificate required). Only market participants, transmission providers, distribution providers, and the regulators will have access to the secure and certified areas.
- The capture and publication of information
- Under the principle of full disclosure, MEM data must be public and accessible, unless classified as Confidential or Reserved.
- Following the open data requirements, the SIM will allow all information to be downloaded into spreadsheets, except for text documents such as rules, schedules or meeting reports.
- An exception is provided for proprietary third-party modeling software; only the data used in such models must be released.
- The Market Bases classify certain data as Public, and also specify the timing of publication for some categories of Public data. Item-specific data release policy details specified in the Bases for Public data are listed in Annex A, Table A-1.
- The Market Bases classify certain data as Reserved, to be made accessible to all market participants, external trusted users, and in some cases transmission and distribution companies. Additionally, the Bases specify the timing of release for certain categories of Reserved data. Item-specific data release policy details specified in the Bases for Reserved data are listed in Annex A, Table A-2.
- The CRE'S Market Surveillance Unit and the Independent Market Monitor (*Monitor Independiente del Mercado*, MIM) will have access to market participant data.
- The CRE and SENER will have access to the information they need to carry out their responsibilities.
- The SIM also functions as a communication platform between CENACE and the market participants.

### 3. Estatuto Orgánico del CENACE

With the Energy Reform, CENACE (formerly a division of CFE, the state-owned utility) became the independent system operator, under oversight by SENER and the CRE. The *Estatuto Orgánico del CENACE* sets out the operational structure and the responsibilities of CENACE's Administrative Units, including the Directors Office ("*Direcciones*"), the Subdirectors Office ("*Subdirecciones*"), and General Offices ("*Jefaturas*"). Under the General Director, there is a General Office in charge of transparency (*Jefatura de Unidad de Transparencia*), which is responsible for ensuring that CENACE complies with its obligations under the *Ley General de Transparencia y Acceso a la Información* and other general laws (but not the transparency requirements established in the *Ley de la Industria*

*Eléctrica*, in the market rules or by industry regulatory authorities). The office is in charge of the following:

- Coordinating the distribution of information subject to the transparency regulation.
- The procedures regarding data requests, including:
  - Training and assisting the parties making data requests
  - Clarifying any ambiguity in a request, in coordination with the requesting party
  - Creating a registry of all requests, including answers, results, and reproduction and shipping costs
  - Promoting transparency inside CENACE by implementing proactive transparency policies

Additionally, other offices have certain responsibilities regarding transparency:

- The *Subdirección de Diseño del Mercado Eléctrico Mayorista* is the principal area responsible for publishing data related to the MEM, as it is responsible for the operation of the SIM for and the following functions:
  - Coordinating the development of reports that CENACE will send to the CFE and the Federal Economic Competition Commission, regarding possible attempts to manipulate the market or conditions that indicate a lack of competition
  - Designing, managing and authorizing the publication of reports that contain analysis, data and parameters of the MEM and the energy dispatch to keep interested parties informed
  - Making available the information required by article 160 of the *Ley de la Industria Eléctrica,* and implementing, maintaining and updating the SIM
  - Developing reports regarding the performance and development of the MEM
- The *Dirección de Estrategia, Normalización y Administración Financiera del Mercado* must publish the fees developed by the CRE for services provided by CENACE.

## 4. Detailed data release policy provisions

Most of the rules governing the MEM are contained in the Market Bases and the Market Manuals.[28] The latter specify the operating guidelines, and their purpose is to detail procedures, rules, instructions, calculation methodology, and directives regarding the planning and operation of the MEM. CENACE has so far issued over 27 Market Manuals.[29] The CENACE Board of Directors has the power to approve changes to the Market Manuals, with appropriate public consultation; CRE may review any proposed changes to the Manuals.

[28] The Market Manuals are referred to in the Market Bases as the *Manuales de Prácticas de Mercado* ("business practice manuals").

[29] The Market Manuals are available at: http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/ManualesMercado.aspx

Advanced electricity markets that strive for high levels of transparency have information release policies that are organized, structured, and published in one place. That is not the case for the MEM. While the details of MEM data release policy are contained primarily in the *Manual del Sistema de Información del Mercado,* which summarizes the data that the authorities and market participants need to release as well as the data release process, some important details not provided in this manual are scattered throughout other manuals and in resolutions issued by the CRE. Those additional sources include:

- *Manual de Vigilancia del Mercado* (Market Surveillance Manual)
- *Manual para el Desarrollo de las Reglas del Mercado* (Market Rules Development Manual)
- *Manual de Importaciones y Exportaciones* (Import and Export Manual)
- *Manual de Mercado de Energía de Corto Plazo* (Energy Spot Market Manual)
- *Manual de Programación de Salidas* (Outage Scheduling Manual)
- *Manual de Transacciones Bilaterales y Registro de Contratos de Cobertura Eléctrica* (Bilateral Transactions Manual)
- *Manual del Mercado para el Balance de Potencia* (Capacity Balancing Market Manual)
- *Manual de Pronósticos* (Forecasting Manual)
- CRE Resolution No. RES/948/2015
- CRE Resolution No. RES/1491/2016

Relevant provisions of each are described below. In addition to describing what data must be released and to whom, the provisions in many cases describe the frequency or schedule for releasing the information, and whether there is an intentional delay. In some cases, as noted, the provisions described in one source appear to contradict those in another.

### *Market Information System Manual*[30]

The kind of information that must be made available by the market participants and the authorities is defined in Section 15 of the Market Bases, from which the Market Information System Manual draws heavily. The information is itemized according to classification (Public, Secure or Certified). According to the Bases, CENACE must evaluate and itemize MEM data and make it available to interested parties.

The Market Bases establish a list of the information to be made available to each kind of user through its corresponding channel (Public, Secure and Certified) in the SIM. In accordance with the criteria of the general transparency laws, the Information System

[30] *Manual de Sistema Información del Mercado*, July 4, 2016.

Manual (SIM Manual) classifies the information as either Public, Confidential or Reserved. The authorities and the MIM must have access to all data.

**Public information**. Information that is considered public must be made publicly available through the SIM platform. Public information may be stored, reproduced and distributed freely by third parties, without requiring the authorization of CENACE or any authority. CENACE may arrange, with third parties, protocols or specialized formats for the submission of Public information. Item-specific data release policy details included in the SIM Manual for 63 types of data are listed in Annex A, Table A-1. The SIM Manual, significantly, does not provide any detail on the requirements for ease or quality of access to Public information. Given this gap in the data release policy, it would be possible for CENACE to publish Public information on its website in a way that technically satisfies the requirement, while making access so difficult or time consuming so as to not be truly publicly available from a practical standpoint. This aspect will be discussed further in the subsequent section on the assessment of data release practice in the MEM.

**Reserved information.** There are two sub-classifications of Reserved information: one available to all market participants, trusted external users, and transmission and distribution companies, and another available to all market participants and trusted external users but not transmission and distribution companies.[31] CENACE makes Reserved information available through the Secured Area or the SIM Certified Area. Aside from the information currently classified as Reserved in the Market Bases and SIM Manual, Reserved information can be classified as such by the Transparency Committee of CENACE on a case-by-case basis, considering the provisions set forth in the laws of transparency and access to public information.[32] The data release policy for Reserved information is detailed in Annex A, Table A-2.

**Confidential information.** Market participants and transmission and distribution companies have access to confidential information, made available by CENACE through the Secured Area and the SIM Certified Area. Except for the authorities and the MIM, users have access only to the specific Confidential information for which they have permission (i.e., their own). Users of Confidential information must ensure they will maintain its confidentiality. The Confidential information data release policy is detailed in Annex A, Table A-3.

### *Data release policy details contained in other sources*

**CRE Resolution No. RES/948/2015**, issued February 16, 2016, contains provisions for the release of data pertaining to open access and provision of services on the transmission and distribution networks. The resolution requires transmission and distribution companies to

[31] Technically speaking, the Market Bases and the SIM Manual also use the Reserved classification to refer to all information available to the authorities. In this report, we use the more limited connotation of the term, limiting access to specific groups of users other than the authorities.

[32] Although the LFTAIP includes criteria Transparency Committees must satisfy for declassifying Reserved information, we believe that the criteria are so stringent as to close this avenue for declassification for CENACE, instead requiring approval by the CRE.

make available online, to the general public, information that includes, at a minimum, the following:[33]

- General descriptions of the transmission and distribution networks
- Thermal operating limits of the networks in operation
- General conditions for the provision of transmission and distribution service (CGPS)
- Maximum rates approved by the CRE and model contracts for the provision of services
- The procedures, criteria, model contracts and formats of (generator) interconnection requests and (load) connection requests
- A statistical report of interconnection/connection requests that have been fulfilled, are in process, or are unfulfilled (with explanations)
- Notices regarding operational events that affect the provision of services

The resolution additionally requires CENACE to publish online information that includes the following:

- Information in real time regarding congestion, at the nodal level
- Daily volumes of electric energy, aggregated by node or transmission/distribution area (or other appropriate aggregation)
- Notices and information about transmission open seasons in progress or completed
- Transmission and distribution outage schedules
- Notices regarding operational events that affect the provision of services

There appear to be inconsistencies between these provisions of the resolution and provisions of the SIM Manual with regard to whether certain information is released to the general public or considered Reserved. For example, thermal transmission operating limits and transmission outage schedules should be made public, according to Resolution No. RES/948/2015, whereas the SIM Manual classifies them as Reserved. Although is not clear to the authors which provisions take precedence, it can be observed that the requirements as articulated in Resolution No. RES/948/2015 are too broad to be implemented. At minimum, the CRE would need to issue guidelines to establish the level of detail, frequency of publishing and procedures that CENACE should use in making the data available. As long as these guidelines are lacking, it is difficult to imagine how CENACE will attempt to comply with the rather general requirements of the resolution.

**CRE Resolution No. RES/1491/2016**, issued December 6, 2016, contains detailed provisions for the release of spot market energy and ancillary service bid data. In addition to reiterating the requirements for the release of bid data established in the Market Bases and the SIM Manual, the resolution includes the following provisions, the most significant of which is identity masking:

[33] CRE Resolution No. RES/948/2015, issued February 16, 2016, Article 4 Section 4.1, Article 16, and Article 17.

- In published spot market bid data, the identities of market participants and generators must be masked by assigning each one a unique identification code. The real identities corresponding to the codes will be known only to the CRE Market Surveillance Unit and CENACE, and the codes will change annually.
- In the Stage 1 market implementation, CENACE must publish bid data for the day-ahead market (MDA) and real-time market (MTR); once Stage 2 is implemented, CENACE must also publish hour-ahead market (MHA) bid data and controllable demand resource bids.
- The bid data will be made available on CENACE's website, grouped into the following categories: supply, demand, import and export, and supply or demand intermediaries.
- Dates and bid block quantities are included in all bid data; bid block prices are included only for those bid types that include prices: generator offers, import offers, and export bids. Demand and intermediary bid data include quantities only.

The ***Manual de Importaciones y Exportaciones*** (Import and Export Manual) contains provisions regarding publication of information about the operation of the external tie lines, as detailed in Annex A, Table A-1.

The ***Manual de Mercado de Energía de Corto Plazo*** (Energy Spot Market Manual) contains provisions regarding publication of the results of the MDA commitment and dispatch, as well as MDA energy and ancillary service prices.

The ***Manual de Programación de Salidas*** (Outage Scheduling Manual) contains provisions regarding publication of outage schedules, short-notice outages, and *ex post* evaluations of quarterly outage schedules.

The ***Manual de Transacciones Bilaterales y Registro de Contratos de Cobertura Eléctrica*** (Bilateral Transactions Manual) contains provisions regarding publication of certain information regarding bilateral contracts.

The ***Manual del Mercado para el Balance de Potencia*** (Capacity Balancing Market Manual, or MBP Manual) contains provisions regarding publication of a range of capacity market data.

The ***Manual de Pronósticos*** (Forecasting Manual) contains provisions regarding publication of the seven-day load forecast, forecast accuracy metrics,

The Market Surveillance Manual aims to establish the provisions, rules and procedures that describe the organization of the Market Surveillance Authority, as well as the processes and procedures to supervise, investigate, evaluate and inform on the operation and surveillance of the MEM. The manual covers the following topics:

- Surveillance of the MEM
- Collection of and access to market information
- Market performance and evolution
- Update of supply offer reference parameters

- Review of spot market supply offers
- Verification of opportunity costs
- Procedure to be followed by the surveillance entities in their investigations
- Price recalculation
- Revenue sufficiency guarantee
- Exemptions
- Other responsibilities of the surveillance entities

The manual establishes the following market surveillance entities:

**The Market Surveillance Authority** (*Autoridad de Vigilancia del Mercado*), responsible for overseeing the operation of the MEM and the actions of the entities subject to surveillance. This function resides within the CRE.

**The Market Surveillance Unit** (*Unidad de Vigilancia del Mercado*) is the administrative unit of the market surveillance authority. This function resides within the Electricity Unit of the CRE.

**The Independent Market Monitor (***Monitor Independiente del Mercado*, or MIM**)** is a group of independent experts commissioned by the CRE to perform market surveillance.

The entities subject to surveillance are:

- CENACE
- Market participants
- Transmission and distribution companies
- Holders of grandfathered financial transmission rights (*Derecho Financiero de Transmisión*, or DFTs)
- Holders of grandfathered interconnection contracts
- Generators holding independent energy production permits

Related to transparency and data release, the manual establishes the following:

- The entities subject to surveillance must provide, at the request of the market surveillance entities, any information needed for market monitoring purposes.
- The market surveillance entities have the power to obtain Confidential, Reserved, and Public information as needed to carry out their market surveillance functions.
- The market surveillance entities are responsible for all of the information sent to the authorities related to their activities.
- CENACE will help market surveillance entities by providing technical and administrative aid to fulfill their role
- CENACE will establish procedures to ensure that the surveillance entities have access to data related to the operations, market settlement, and reliability of the National Electricity System.

- CENACE must provide any data and information requested by the monitoring entities.
- CENACE must collaborate with the surveillance entities so that they have the technological infrastructure, tools, equipment, models, documentation and training needed to carry out their market surveillance functions.
- The entities subject to surveillance must implement procedures necessary for storing MEM data.

# IV MEM Data Release Practices

This section of the report presents an assessment of the data release practices in the MEM. The assessment evaluated the actual data release practices as implemented (as of June 2018), in the context of the data release policy. It also compared the practices to those of the markets examined in Phase 1. The assessment considered the degree to which the data release practices used in the MEM might enhance or hinder market efficiency, looking at various indicators including:

- Consistency of implementation with policy
- Breadth of data release
- Degree of granularity; identity masking
- Timeliness of release
- User-friendliness (ease of access, data acquisition, interpretation, machine readability, etc.)
- Degree of support for market participant business infrastructure

The assessment primarily focused on types of data that are published (i.e., released publicly), should according to MEM data release policy be published, or are published in the comparison markets.

## Approach

Research conducted by the Team on data release practice in the MEM and in other electricity markets internationally informed this assessment. As part of this effort, members of the Team cataloged data published by CENACE on its website (and related data), as of June 2018 except where noted, and posted in the secure area of the SIM as of October 2018. Additionally, members of the Team conducted interviews with MEM industry stakeholders, CENACE, CRE, and MIM staff, as well as operations and market monitoring staff in the comparison markets.[34]

## MEM Data Release Practice vs. Policy

The following comparison of MEM data release as implemented to the MEM data release policy is presented for Public data and Reserved data.

### 1. Public data

To assess public data release practice in the MEM, all data published by CENACE on its website (as well as other related data) were cataloged by the Team and then compared to the MEM data release policy. The outcome of this analysis is presented in Table A-1 of Annex A, which compares the MEM public data release practice to the public data release policy, noting deviations where they exist. We note the following general

[34] The research on other electricity markets referred to here was part of the 2017 Phase 1 study.

observations for the 63 categories of public data described in the various elements of data release policy:

**Availability of data that should be available, according to the policy**. As indicated in Table A-1, for approximately one-third of the data categories (20 out of 63 for which data should exist), all or part of the data were not found.

**Masking inconsistent with policy**. As noted in Table A-1, in two categories of data—assigned energy / ancillary service quantities and capacity obligations, the data are published using masked market participant identifiers, without any apparent regulatory basis for doing so. According to CENACE staff, CENACE intends to publish the names of market participants corresponding to the identifiers.[35] Additionally, for generator offer data, although policy provides for masked IDs that are changed annually, the Team found that in 2017, masked IDs were changed twice.[36]

**Accessibility**. There are 16 categories for which MDA and MTR hourly data were found. Of these, for eight categories, each file available for download contains data for only a single operating day, and files may only be downloaded one day at a time. For five data categories, daily files may be downloaded in bulk (single zip archive) for a user-specified date range (but then must still be concatenated by the user for analysis spanning more than a day). For one category, files contain data for approximately 15 days (in addition to daily files), but those files too must be downloaded individually. For another category, multiple files per operating day are posted, and must be downloaded individually. There is no feature that allows users to specify a date range, and then download a single file containing the data for that range. Giving users no choice but to download individual files and then aggregate them for multi-day analysis is extremely burdensome—infeasible for significant date ranges—and hampers transparency. Even if sophisticated users have the capability to develop scripts to automate the download of individual files, the file naming convention used by CENACE poses a barrier. Because the posting time and date is included in each filename, the filenames cannot be known in advance, and can only be read from the website once published. Standardizing the file-naming convention would eliminate this barrier.

**Machine readability.** In some cases, graphical information is provided, but not machine-readable data, as required by the market rules. In other cases, text documents (e.g., official issuances) are provided as scanned images, with no searchable text, and image quality too poor to permit users to create searchable text documents themselves using optical character recognition (OCR).

**Bugginess**. While testing the data download feature, selecting certain data would at times send the user to the CENACE contact form. In other cases, selecting a particular category in the data menu would consistently send the user to the wrong data page, due to an incorrect link.

**Errors.** Although the contents of only a small subset of published data were examined as part of this study, data errors were observed. In several cases, offer data files were found to

[35] Discussion with CENACE staff, August 21, 2018.

[36] We did check to see whether the same was true for load bids or import/export bids.

contain data for the wrong control area/system. In another case, offer data were found to contain conflicting information for the same assets. In others, assigned (MDA cleared) quantity data were simply missing. For missing data, no files including missing value codes were posted.[37]

In summary, the implementation of the MEM data publication policy provisions was found to be incomplete. For those aspects that have been implemented, the implementation is sufficiently user-unfriendly as to significantly limit access, hampering transparency.

### 2. Reserved data

To assess practice for the release of Reserved data in the MEM, the Team asked CENACE staff to report on the practice for posting to the restricted area of the SIM each of the categories of Reserved data. Additionally, one of the Team members with access to this part of the SIM provided their own observations regarding the availability in practice of each of the Reserved data categories described in the Market Bases and SIM Manual.

The outcome of this analysis is presented in Table A-2 of Annex A, noting deviations between practice and policy where they exist. We note the following general observations for the 19 categories of Reserved data.

**Availability of data that should be available, according to the policy**. There are 18 categories of Reserved data that should be available given the current status of market evolution.[38] Our Team member with access found that in two-thirds of the data categories (12 out of 18), none or only part of the data were available in the restricted area of the SIM. Of those 12 categories, CENACE acknowledges that it does not yet post data for three. For the remaining nine categories with missing data, the response by CENACE staff to our request appeared to indicate a belief that CENACE is in compliance with the policy.

**Failure to release models.** Of the nine categories where our observations and CENACE's report diverge, the most common area of discrepancy was with regard to five of the data categories where the policy requires CENACE to make models available—the MDA and MTR market models, the transmission system topology, the DFT allocation model, the capacity balancing market model, and the model used to determine capacity zones. In none of those cases does CENACE release models; instead it releases relatively limited data, which are insufficient to fulfil the intent of the policy.

## Stakeholder Perspectives on MEM Data Release Practice

To elicit stakeholder perspectives on MEM data release practice, members of the Team interviewed MEM industry stakeholders and CENACE staff. Private sector stakeholders

[37] It is not clear whether rules exist that specify how CENACE should indicate missing data in published or queried data. The value of such provisions is that they provide a standard and machine-readable way to indicate to users that data are missing and that the system operator is aware they are missing. Provisions like these are typically used when data reasonableness checks have failed; under such circumstances, posting indicators of missing values is much better than posting erroneous data or no data at all.

[38] DFT auction models are expected with the advent of the DFT auctions, not yet implemented.

interviewed included registered MEM market participants, firms whose applications for market participant status were being processed, non-participant firms contracting with third party market participants acting on their behalf, investors with interests in market participant entities, and prospective market participants. The group of industry respondents were diverse with respect to their degree of sophistication, involvement with, and understanding of the MEM, as well as with regard to their resources and capabilities.[39]

Many of the issues observed directly by the Team in its comparison of MEM data release practice to policy, as well as additional concerns, were raised by respondents. The additional concerns are listed below.

**Insufficient information.** The lack of sufficient information provided by CENACE about MEM operation and outcomes was a common refrain. Specifically, respondents reported that information provided by CENACE (whether by policy or practice) was insufficient to:[40]

- interpret movement or lack of movement in nodal prices (PMLs)
- understand frequent occurrences of divergence between day-ahead and real-time PMLs
- formulate inputs to market simulation models used internally
- replicate or approximate price formation
- understand the implications of terse operational status reports released by CENACE in real time
- estimate, in real time, the likelihood of reserve shortages or critical hours occurring later in the day
- know where natural gas pipeline constraints are occurring, how limited gas is being allocated, whether generator unavailability is due to pipeline constraints, gas allocation, or issues with the units themselves
- be aware of gas pipeline constraints known about day-ahead that will affect real-time operation or the following day's day-ahead market
- understand low levels of transmission congestion
- understand how certain cost-based generator offers could be as low as they have been
- know whether generators under legacy IPP contracts were being offered/dispatched appropriately
- validate market settlement charges based on allocations of spot market costs, such as those for losses and ancillary services
- know how operational issues identified by CENACE in previous weekly reports were resolved
- support long-term capital investment or contractual decisions

**Barriers to access.** Respondents reported that accessing MEM information through CENACE's facilities and processing it into a useful form to be so labor intensive that doing so has presented a barrier to doing business. This perspective was shared by respondents at

[39] The 14 industry stakeholder respondents represented 11 companies, none of whom were involved in commissioning the study on behalf of Coalition member organizations.

[40] The scope and time available for the interviews did not allow collecting detail on the specific types of information respondents would need for each of these purposes.

large and small firms alike. Respondents at large firms noted that despite their considerable information systems capabilities, accessing and processing data from CENACE was still largely a manual operation, because CENACE lacked the information infrastructure and staffing needed to support access by external systems.

Respondents at some smaller firms, in particular, perceived themselves to be at a disadvantage relative to their larger competitors, because they lacked the resources to overcome these barriers, either using internal capabilities or by making use of commercial providers of MEM data—which they saw as prohibitively expensive. Some respondents expected a persistent information asymmetry to lead to consolidation in the industry, with greater market concentration and potential for the exercise of market power as a result.

**Reserved information**. All respondents who were asked about whether Reserved information—currently made available to all market participants—should be made public responded that they would favor such a move; none reported objections or reasons for not publishing this information. Those doing business in electricity markets internationally saw no reason why the same types of information would be publicly accessible in those markets, yet not in the MEM.

**Timeliness of release**. Respondents report that the timeliness of data release, even when consistent with MEM policy, was often insufficient for business and operational purposes. Respondents with large industrial loads that are highly flexible with regard to when they operate, for example, reported that the release of information regarding reserve levels and real-time prices is not timely enough for them to be able to shift their loads accordingly.[41]

**Insufficient reporting on the Market Monitor's activities**. Respondents had expected that the Independent Market Monitor, as provided in the Market Surveillance Manual,[42] would be releasing periodic reports, including reports on any actions taken, more frequently. As of late November 2018, only the annual report on 2016 has been released.[43]

## MEM Data Release Practice from an International Perspective

As part of an investigation conducted during 2017, we selected and studied several electricity markets around the world to examine practices used in those markets that create high levels of transparency. The study included a survey of data release practices.

In selecting the markets for study, several characteristics were sought:

- Advanced in nature, with designs that have evolved over time

[41] For example, real-time prices are typically published by CENACE five days after operation, as allowed by MEM policy.

[42] The Market Surveillance Manual, Section 2.2.7(k), provides for the MIM to issue daily, weekly, monthly, quarterly, semiannual, and annual reports.

[43] It is our understanding that one or more subsequent reports have been provided to the CRE, but have not yet been approved for release.

- Oversight by a credible and effective regulatory process able to detect and correct market design flaws in a timely manner[44]
- Detailed, well-documented market rules developed with considerable stakeholder involvement
- Exemplary for their data release practices
- Initiatives to address issues involving market operator intervention
- Size and design similar to that of the MEM
- Some geographical diversity

Not all of these characteristics were shared by all of the markets selected. Of those selected for the study as a whole, ERCOT (Texas), PJM (eastern/midwestern US), AEMO (Australia), and CEN (Chile) were included in the survey of data release practices. In addition to these markets, the survey included an international multi-market information platform, ENTSO-E.[45]

Table 1 through Table 5 compare the current MEM data posting practice to those practices we observed in the comparison markets for several key categories of data. In order for the discussion to be meaningful and useful, the focus here is on those data elements and manners of posting where one or more of the following were true:

- the data can be considered to be foundational to market efficiency
- the data are released publicly in the MEM and/or the comparison markets
- the specific data were common to the MEM and the comparison markets
- the practice involved market participant-specific data

The tables indicate variation across markets in how market participant-specific data (e.g., supply offers, generator output, transmission rights bids and offers) are released. Beyond the question of whether these data are released at all in a given market, we found that the manner of release of such data varies primarily in three ways: (i) the time lag between when the data *could be* made available and when they *are* made available, (ii) the degree to which identities are obfuscated through aggregation or masking, and (iii) the granularity of the data (e.g., unit vs. portfolio level). The remainder of this section describes our findings in detail.

---

[44] Wolak, F.A., 2014. Regulating competition in wholesale electricity supply. In *Economic Regulation and Its Reform: What Have We Learned?* (pp. 195-289). University of Chicago Press.

[45] ENTSO-E, the European Network of Transmission System Operators, represents 43 electricity transmission system operators from 36 countries across Europe and its neighbors. ENTSO-E was established and given legal mandates by the EU in 2009. The ENTSO-E Transparency Platform centralizes the collection and publication of a common set of electricity generation, transportation and consumption information for the pan-European market. Many ENTSO-E members individually provide considerably more information than is included on the ENTSO-E Transparency Platform.


***Figure 2.*** *Markets included in data release survey.*

As illustrated in Figure 3, less time lag in posting, less masking, and greater granularity of data are considered to create greater transparency. The findings displayed in the following tables are arranged along axes making use of these qualitative scales.

The transparency of supply offer data release is illustrated in Table 1. CENACE's practices, which also apply to import offers, are less transparent than those of AEMO, CEN, and ERCOT, given the lengthy 60-day lag before data are released, as well as the fact that supplier identities are masked using pseudo-IDs that are changed annually.[46] CENACE could increase transparency to the levels of those markets by posting supply offers with plant or unit identities instead of masks, and by reducing the 60-day time lag to one or two days.[47]

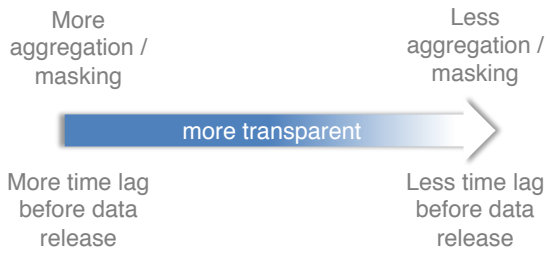



***Figure 3.*** *Transparency metrics used in the subsequent tables.*

Table 2 compares CENACE's practice with regard to demand bids.[48] In the MEM, demand bids are currently price-takers only, that is, load serving entities submit quantities for the amount of load they wish to serve in the MDA, at whatever the price turns out to be. Of the other markets, only ERCOT and PJM, like CENACE, have day-ahead bidding and settlement. CENACE, which posts relatively granular demand bid information, is considerably more transparent than PJM in this regard,

[46] CRE Resolution No. RES/1491/2016 requires that bid and offer data be masked using identifiers that change annually; it requires that the data be released *within* 60 days, but does not preclude release at any point sooner within that timeframe.

[47] The implications of firm-specific data disclosure for competition are discussed in Section 0 below.

[48] The term "bid" is used at times in this report to connote both demand bids and supply offers.

though not as much as ERCOT, which does not mask asset identities.

CENACE is comparable to ERCOT with regard to time lag for its granular data (60 days), although ERCOT does release aggregate demand bids after only two days. The benefit of CENACE's long time lag is unclear, especially since demand bids aren't priced, unlike those in ERCOT, and also because CENACE publishes aggregate load forecasts and actual load data shortly after operation. CENACE could increase transparency of its demand bid data by including plant or unit identities instead of masks, by reducing the 60-day time lag, and by releasing aggregate data with no or little delay.

As shown in Table 3, all other markets examined publish data on actual load either immediately or the day after operation, whereas CENACE delays publication for 14 days. CENACE publishes scheduled load data with no delay, although forecast data lag by four days and are aggregated to the control area level.[49] The high level of aggregation and long delay make CENACE least transparent relative to the other four markets and ENTSO-E with regard to the publications of load data; the remedy is straightforward.

**Table 1. Supply Offer Data Transparency**

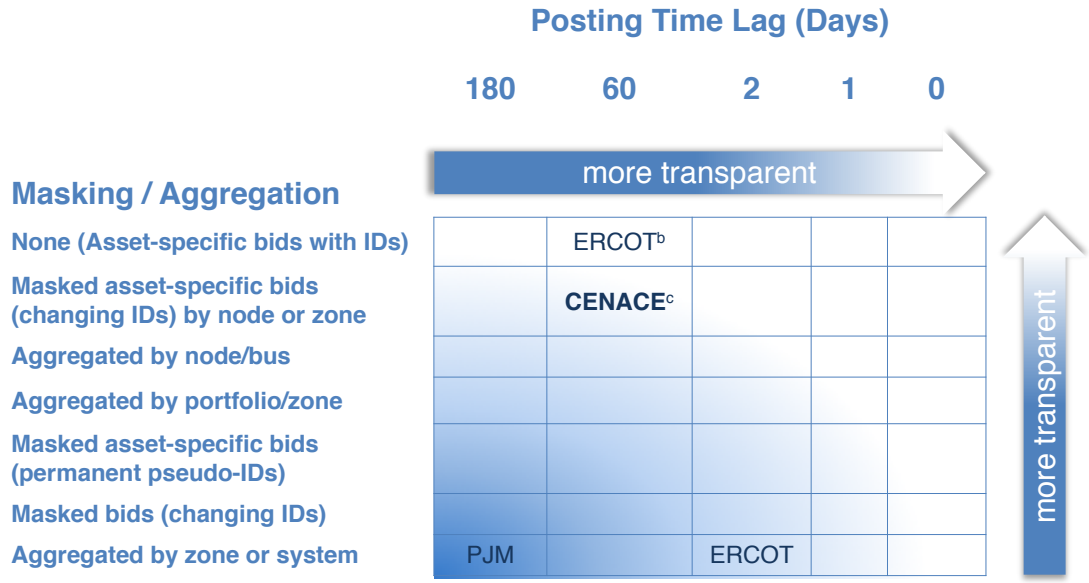
| Masking / Aggregation | Posting Time Lag (Days) 120 | 60 | 2 | 1 | 0 |
|---|---|---|---|---|---|
| | more transparent → | | | | |
| None (Unit-specific offers with IDs) | | ERCOT | | CEN* AEMO** | |
| Price-setting offers only, with IDs | | | ERCOT | | |
| Masked unit-specific offers (permanent pseudo-IDs) | | | | | |
| Masked unit-specific offers (pseudo-IDs changed periodically) | PJM | **CENACE** | | | |
| Aggregated by zone | | | ERCOT | | |

more transparent ↑

* CEN, with a cost-based dispatch, posts audited costs (fuel, VOM, startup) for the following 7 days, ~5-15 times per month.
** AEMO posts supply offers at 04:00 each day for the previous day.

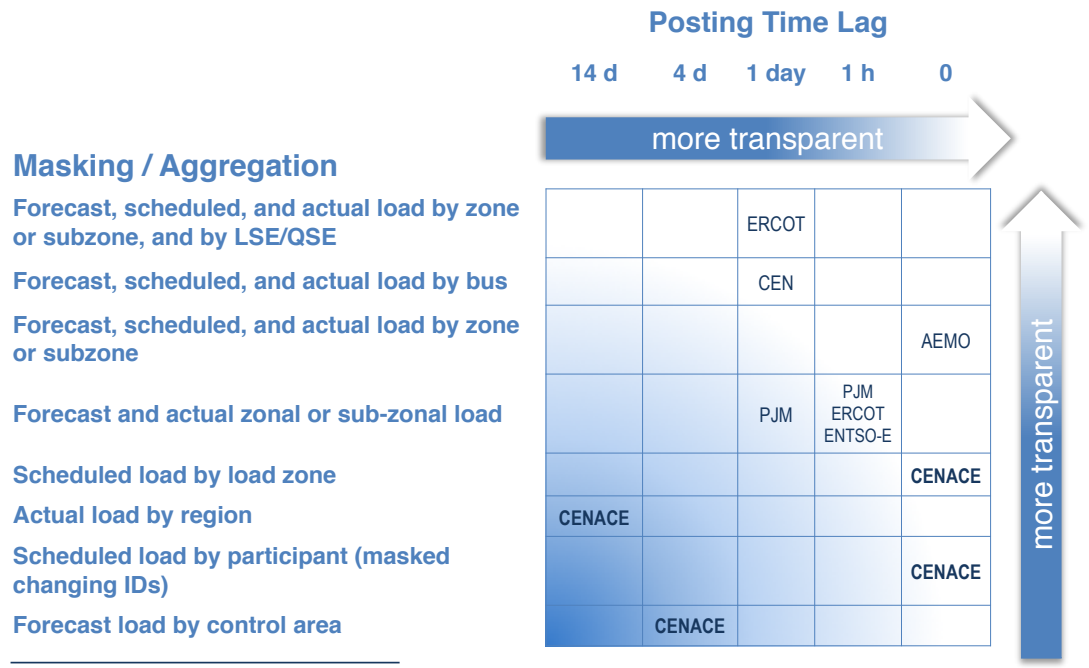
[49] There are two exceptions. As of June 2018, CENACE had yet to publish forecast load data for the two years prior to March 31, 2018; as of October 2018 the missing data had been published. CENACE does not yet appear to publish seven-day forecasts, as specified in the SIM Manual.

**Table 2. Demand Bids for Energy[a]**




[a] Demand bids are predominantly day-ahead. AEMO has no day-ahead market, and no load assets choose to bid into its real-time market. CEN has no day-ahead market. ENTSO-E does not post this information.
[b] By participant and bid location (node or zone)
[c] Demand bids in the market operated by CENACE are price-taking, with quantity only.

**Table 3. Load Data**




**Notes:**
CEN: Forecast and scheduled load available day- and week-ahead; actual load updated daily.
ERCOT: Forecast (current day and 6 days forward); actual (1 - 2 hours to process).
PJM: Forecast updated every 30 minutes; actual load updated daily.

As shown in Table 4, practices for the release of generator operational data can differ depending on the specific type of data. AEMO, CEN, ERCOT, PJM, and ENTSO-E all release some generation operational data identifying the specific plant or unit, and all of the markets but PJM release data in most categories with plant or unit IDs. CENACE, by contrast, (except for scheduled start and stop times) obfuscates considerably more with both aggregation and masking. In some of these other markets, as indicated in the table, data aggregated to the system or control area level are released relatively quickly, with more granular data released after a delay.

Missing entirely from the data published by CENACE are real-time dispatch instructions or output, generator outages, and reservoir levels. While the market rules provide for forced and scheduled outage data (classified as Reserved) to be accessible the day after operation by market participants, external trusted users, and transmission and distribution companies, they are not required to be published, and in our observation are not even accessible by the users for whom restricted access is intended.[50]

CENACE could increase its transparency with regard to the release of generator data in the same way that other markets do: by decreasing the level of aggregation, including plant or unit IDs, making generator outage data available to the public and not just market participants, and publishing machine-readable data on reservoir levels. One of the reasons electricity markets make outage data available is to facilitate market participants and outside observers playing a role in market monitoring by watching for instances of possible physical withholding, thereby decreasing the ability or temptation for a generator to engage in such behavior.[51] Publishing outage data is of particular value in cost-based markets where, because generator bids are capped at audited costs, a generator intent on unilaterally exercising market power may resort to physically withholding by declaring an outage; publishing outage data and naming poor performers provide strong deterrents for such behavior.

With regard to various types of transmission data, CENACE publishes far less information than the other four markets examined, as shown in Table 5. Among those data not published by CENACE are facility or interface operating limits, outage data, total transmission capacity, binding constraints and shadow prices, line or interface flows, congestion rent collected, and losses costs, revenues, and over-collection. Most of the other four markets examined publish comprehensive data for most of the categories listed. Except for line or interface flows, the MEM rules specify that all of this information be available to market participants and trusted external users. Failure to provide this kind of information in a nodal market is particularly harmful, because it makes it more difficult for market participants to manage congestion risk.

CENACE could increase its transmission transparency to the levels of the other markets examined by making power flow cases available and publishing the information that the market rules specify be available entities certified for access to Reserved data.

[50] See Annex A, Table A-2.

[51] Physical withholding is where a generator owner withholds the output of one of its units (e.g., by declaring an outage) in an attempt to increase the price it receives for the output of other units.

## Table 4. Generator Operational Data

| Nature of Data | Aggregation / Masking (Lag in Days): System / Control Area | Participant, Masked | Zone | Zone / Tech. | Plant or Unit, Masked | Plant/Unit, w/IDs |
|---|---|---|---|---|---|---|
| | more transparent | | | | | |
| Energy and/or A/S schedules | ERCOT (2) PJM (30) | **CENACE (0)** | | | | ERCOT (60), AEMO, CEN (0), **CENACE (7)**[b] |
| Dispatch instructions and/or output (real-time) | PJM (1 h) | | | ENTSO-E (1) | | AEMO (0), CEN (1), ENTSOE (1), ERCOT (60) |
| Scheduled & unscheduled outages | ERCOT (1 h) PJM (1 h) | | PJM (7) | | | CEN (1), ERCOT (60), AEMO (0), ENTSO-E (0) |
| Reserve MW | | **CENACE (0)** | ENTSO-E (0) | | | AEMO (0) |
| Reservoir levels,[c] fuel, energy stored | | | ENTSO-E (7) | | | CEN (1) |
| Operational parameters | | | | | **CENACE (0)**[d] | AEMO (1)[a], PJM (120), CEN (0), ERCOT (60) |
| Day-ahead wind & solar forecast | **CENACE (0)** | | ERCOT (0) | ENTSO-E (0) | | ERCOT (2), AEMO (0) |

[a] AEMO posts with supply offers at 04:00 each day for the previous day.
[b] The unit-specific schedules published by CENACE with a seven-day delay include start and stop times only, with no quantities.
[c] CENACE policy specifies publication of reservoir level data, but only graphs are published in practice.
[d] CENACE releases few unit-specific operating parameters compared to other markets.

## Table 5. Transmission Data

| Data Posted | AEMO | CEN | CENACE[a] | ENTSO-E | ERCOT | PJM |
|---|---|---|---|---|---|---|
| Operating or planning interface limits | ● | | ● | | ● | ● |
| Operating or planning facility ratings | ● | ● | ● | | | |
| Load flow model | ● | ● | | | ● | ● |
| Transmission outage data | ● | ● | | ● | ● | ● |
| Total or available transmission capacity, reservations | | | ● | ● | ● | ● |
| Binding transmission constraints / shadow prices | ● | | | | ● | ● |
| Interface flows (internal) | ● | ● | | | ● | ● |
| Line flows | | ● | | | | |
| Interface flows (boundary) | N/A | ● | | ● | ● | ● |
| Congestion rent collected | ● | | | | ● | ● |
| Losses costs, revenues, and over-collection | ● | ● | | | | ● |

[a] CENACE publishes planning limits but not operating limits, day-ahead available transmission capacity but not total capacity, reservations, or equivalent information for the real-time market.

In addition to the timely publication of comprehensive and granular market and system data, the practices of the other electricity markets we examined embody several additional features that create high levels of transparency: they are typically informed by stakeholder input, easily and publicly accessible, user-friendly, and supportive of market participant business infrastructure. Performance in these areas for the MEM is addressed below.

**Public access.** As discussed above, MEM data in a significant number of categories that are considered to be public information in highly transparent markets are classified as Reserved under the MEM market rules, and therefore not easily available to entities that are not market participants or transmission/distribution companies.[52] Some of the categories of Reserved data are inexplicably even inaccessible by transportation and distribution companies. All of the types of information classified in the MEM market rules as Reserved are, in the other electricity markets surveyed, easily available by the public or any entity with a legitimate interest.

**User-friendliness**. The highly transparent markets examined in this study embodied web interfaces with high levels of data organization, intuitive navigation, and sophisticated search capabilities. By comparison, the public data area of CENACE's website is not well-developed in these regards. As discussed above, CENACE's public data release is not well-documented, and CENACE does not publish a data dictionary.[53] While bulk download of daily files is provided for a minority of data categories, it is not available for most, and no custom query capabilities are provided. This makes download of data spanning significant periods of time unfeasible. For the few data categories providing bulk download of daily data, user aggregation of daily data is unnecessarily burdensome because the columnar data in the daily files are missing a date field.

**Support for market participant business infrastructure.** All other advanced markets make available APIs (application program interfaces) that allow user software to communicate with market systems to query databases or download data in bulk.[54] CENACE does not provide an API. Because, as noted above, CENACE data provision facilities are encumbered in various ways by poor design and implementation, the lack of an API means that even sophisticated users with sufficient information technology resources must devote considerable labor to obtaining and processing the information they need.[55]

## Discussion: Effectiveness of MEM Data Release

The material in the sections above described how information release can create efficient market outcomes, detailed the degree to which data release practice in the MEM is

[52] See Annex A, Table A-2.

[53] ERCOT provides a good example—see http://www.ercot.com/services/mdt

[54] A good example is the Interface Specification for OASIS, developed by the California ISO to provide structured public access to all of the data on the ISO website: http://www.caiso.com/Pages/documentsbygroup.aspx?GroupID=8BA357F4-2DC8-47FC-98B2-C063D6DF62EE

[55] Although providing an API should be considered essential, it should not be considered as a substitute for more bulk download capabilities accessible by anyone without special software, such as custom query capability through CENACE's web portal, or FTP.

consistent with the corresponding policy, as articulated in relevant law and regulation, and analyzed how that practice compares with the policy.

As discussed above, neither the data release policy for the MEM nor the actual practices are documented in one place; the detailed policy specifications are distributed among various manuals and regulatory issuances. CENACE does not publish a data dictionary; many of the specific pieces of information released or referred to in the market rules are not well-defined. Correcting these shortcomings would not be difficult, and doing so would put CENACE on a par, in these respects, with the most transparent markets examined in this study.

Our comparison of MEM data release practice to policy revealed that the implementation is incomplete, and a number of aspects hamper transparency. For those aspects that have been implemented, the implementation is user-unfriendly to such a great degree that it significantly limits access, hampering transparency.

These shortcomings could be addressed without any rule changes by:

- Implementing publication of the significant amount of data that should, according to policy, be published but is not
- Eliminating participant identity masking that is inconsistent with policy
- Quality checking published data files and correcting errors
- Using file naming conventions rather than idiosyncratic filenames that include timestamps
- Fixing malfunctioning CENACE web software
- Ensuring that all data are machine readable, and all text documents are searchable text rather than images
- Providing an online query tool for all hourly or daily data, to create CSV files containing data for a customizable date range
- Implementing an API for user software to communicate with the SIM to query databases or download data in bulk

Our work collecting stakeholder perspectives reinforced the findings of our comparison of MEM data release practice to policy, in particular with regard to availability, accessibility, and machine readability of data. Stakeholder interviews revealed a strong consensus that CENACE (whether by policy or practice) provides stakeholders with insufficient price signals and other information needed to understand the dynamics of the market, manage risk, support operating and investment decisions, validate market settlement statements, and have confidence that the market and power system are being operated impartially and according to market rules, as detailed above. There was a broad consensus for reclassifying Reserved information as Public, consistent with other advanced markets.

The comparison of CENACE's data publication practices for key data categories to those of the other markets surveyed as part of this research revealed a number of ways CENACE could increase the effectiveness of its data release.

One of the most significant of these would be to make Reserved information public, or at least make it available easily, quickly, and without charge to any person or entity with a legitimate interest. Practices in other advanced markets support stakeholders' calls to declassify Reserved information.

That an abundance of caution was used in the initial development of the market rules is understandable. At a minimum, now that there is a stakeholder advisory committee structure in place, with the benefit of knowledge that comes with nearly three years of market experience, it is worthwhile reconsidering whether each category of Reserved data (and all elements within each category) meets any of the INAI criteria for reservation, so as to avoid misuse of the classification.

It is our understanding that in the development of the market rules classifying certain information as Reserved, the only rationale—and INAI criterion—raised for not making this information Public was national and public security. Nevertheless, it strains credulity that publishing Reserved data such as dispatch non-compliance penalties, revenue sufficiency guarantee payments, and congestion revenue excesses and shortfalls would pose a risk to national or public security. On the contrary, these data are key indicators of market performance, vital for market participants (including potential participants) in making investment decisions, and valuable for all observers in assessing market health, the potential benefits of potential market rule changes, and the impact of certain changes once implemented. Given the significant public benefits and absence of any downside, there should be little argument for declassifying this information entirely.

As indicated in Table A-2 of Annex A, 10 or 11 out of the 19 categories of Reserved information are not accessible by transmission and distribution companies. Certainly, none of the INAI criteria justify release of the data to market participants and external trusted users but not to transmission and distribution companies. This distinction should be reexamined as well.[56]

With regard to categories of Reserved data that involve certain transmission system information, the case for maintaining restrictions to access is more open to debate. The concern is that the information could be misused in a way that would pose a risk to the security of the infrastructure (e.g., through terrorism). The Team members are not aware of any instances in which technical and engineering data related to a transmission system have facilitated acts that have harmed national or public security. Powerful tools showing the nature and precise coordinates of aboveground transmission and generation facilities are widely available on the internet (e.g., Google Maps), and remote sensing makes it possible to estimate line flows from a distance in real time. These realities beg the question of whether any of the rest of the Reserved data categories materially increase the risk to the security of the infrastructure.

Practices regarding sensitive transmission system data vary across the other markets examined in this study. In Chile, full power flow cases containing the transmission system topology are available for public download on the web. In US markets, so-called critical

[56] Whether the number is 10 or 11 depends on whether transmission and distribution companies have access to the topology of the National Electric System; the Market Bases and the SIM Manual are at odds on this point.

energy infrastructure information (CEII) is protected, but anyone with a legitimate interest can apply for access free of charge by completing a simple application form and non-disclosure agreement, and expect to be granted access in typically one to two weeks or less. A number of market operators, including those in New Zealand, Chile, and Colombia, publish simplified network models.[57]

Respondents in our stakeholder interviews reported that the CENACE process for certification as an external trusted user was difficult, expensive, and could take up to four months. Inasmuch as essential MEM data continue to be classified as Reserved, improving the process to make it simpler, quicker, and less costly or free would help to reduce information asymmetry.

Other ways CENACE could increase the effectiveness of its data release, based on our comparison of CENACE's data publication practices for key data categories to those of the other markets included the following:

- **Decrease obfuscation.** In the comparison markets it is the exception, rather than the rule, for data to be aggregated, masked, released with a delay, or subject to non-disclosure conditions, with the exact measures depending on the specific market and conditions. CENACE's practice in this regard is more highly aggregated and masked than the comparison markets.
- **Increase supply offer data transparency**. CENACE could increase transparency of supply offer data to the levels of the comparison markets by posting supply offers with plant or unit identities instead of masks, and by reducing the 60-day time lag to one or two days.
- **Increase demand bid data transparency**. CENACE could increase transparency of its demand bid data to the levels of the comparison markets by including plant or unit identities instead of masks, by reducing the 60-day time lag, and by releasing aggregate data with no or little delay.
- **Increase timeliness and disaggregation of load data**. The high level of aggregation and long delay for load data publication make CENACE least transparent relative to the other four markets and ENTSO-E. The observed masking of scheduled/assigned load quantity data and capacity obligation data does not appear to be required by policy. Reducing the degree of aggregation and posting delay could put CENACE on a par with its much more transparent peers.
- **Increase generator data transparency**. The observed masking of scheduled/assigned generation quantity data and capacity obligation data does not appear to be required by policy. By decreasing the level of aggregation, including plant or unit IDs, and making generator unit commitment and outage data available to the public and not just entities certified for access to Reserved data, CENACE could achieve comparability with the other markets examined.

[57] The simplified models allow market participants to enter bids and approximate actual market outcomes, including prices and dispatch levels.

Generator outage data are valuable to the market monitor and other observers to detect whether suppliers are withholding output to drive prices up.

- **Increase transmission data transparency.** CENACE could increase its transparency of transmission data by publishing the information that MEM market rules specify be available to entities certified for access to Reserved data. Additionally, allowing the inclusion of plant or unit IDs with the data would raise the level of transmission data transparency to those of the other markets examined. Transmission data are valuable to generation unit owners and investors in making location decisions and transmission planners making planning decisions.

Although the five major categories of data assessed above are perhaps the most important, our review noted areas for improvement in CENACE's release practices across the entire spectrum of data.

The literature review and interviews with operators of markets elsewhere conducted as part of this study revealed widespread support for comprehensive data release, both generally and in the specific markets surveyed. Full and symmetric release (in high-quality format) of information is beneficial for participants to understand and predict market prices, to inform their operating and investment decisions, and for participants to assist in monitoring behavior. In the context of Mexico, which hopes to attract significant foreign investment in generating capacity additions, the value of comprehensive data release cannot be overstated.

The 60-day time lag used by CENACE with bid and offer data has its basis in Art. 159 of the LIE, Market Bases section 15.2.1, and CRE Resolution No. RES/1491/2016. Both the law and the resolution, however, specify that the data be released *within* 60 days, not precisely 60 days after operation.[58] In the Market Bases and the SIM Manual, on the other hand, the time lag is specified as 60 days. Depending on which of these authorities has precedence, it is possible that CENACE has the flexibility to publish the data any time between operation of the market and 60 days thereafter, and doing so might only require a change to the SIM Manual.

Unlike the 60-day maximum posting delay, the masking of plant or unit identities in bid data is not required by law, but by CRE Resolution No. RES/1491/2016. Changing this policy would require action by the CRE. The resolution does not explain the reasoning behind the masking requirement. It is our understanding that 60-day delay as implemented by CENACE and the identity masking as required by the resolution were intended to hamper anti-competitive behavior such as collusion among different firms, or a single firm taking advantage of the knowledge of when it was on the margin to increase prices. Whatever the rationale behind the MEM's masking requirement, masking makes it impossible for stakeholders to "name and shame" bad performers, whose disincentives to perform badly are less without the threat of public scrutiny. Changing the masked IDs annually, as the

[58] "Los términos generales respecto a las ofertas presentadas en el Mercado Eléctrico Mayorista (MEM) que debe publicar el Centro Nacional de Control de Energía (Cenace) *dentro de los 60 días* naturales siguientes al día de que se trate…, son aplicables a todas las ofertas de compra y de venta de energía y servicios conexos; así como a las ofertas de compra de importaciones y ofertas de venta de exportaciones…" (emphasis added). CRE Resolution No. RES/1491/2016.

resolution requires, is likely to exacerbate information asymmetry, because larger firms, which can bring more resources and internal information to bear, can more easily map masked IDs from one year to the next through analysis of their bid activity.

The question of whether the disclosure of plant or unit identities increase the potential for coordinated or uncompetitive behavior—in a way that is effective and sustainable—is worthy of discussion. It is well-understood that for such behavior to be effective and sustainable, it requires conditions that include high market concentration, barriers to entry, and inelastic demand. The potential for uncompetitive behavior can also depend upon market design features (e.g., uniform price vs. discriminatory, number of bid curve steps allowed), as well as conditions such as forward market liquidity, resource mix, and the degree of reliance on the spot market. Little, if any, empirical research on this topic exists regarding electricity markets; most is theoretical or model-based.

Detecting and mitigating uncompetitive behavior, in any case, does not require limiting information disclosure, and limiting information disclosure will not prevent uncompetitive behavior if the conditions that allow it to occur are present.

Data disclosure can have cost, efficiency, and competitiveness benefits that offset concerns or potential impacts of uncompetitive behavior. Wide dissemination of market data can deter uncompetitive behavior through easier detection and can increase efficiency and reduce costs. Some new research indicates that under certain circumstances, fast access to individual bid curves may improve competitiveness of the market, especially during periods of high demand.[59]

All of the comparison markets studied release plant-specific operational data and supply offer/cost data, and most do it quickly. No market monitors' studies reviewed as part of Phase 1 of this investigation revealed related uncompetitive behavior, and market operator staff reported none when asked during interviews. Of the comparison markets, AEMO has had perhaps the most aggressive practice for releasing firm-specific information; in that market, comprehensive daily unit-specific offer curves and operating parameters are released four hours after the end of the operating day. AEMO market monitors report no ill effects.

Markets with many suppliers and many demanders function most efficiently with complete information. In a market with fewer suppliers or demanders will less information improve market outcomes? As explained in previous sections of this report, less public information increases the likelihood that informational asymmetries arise, which can increase the likelihood of inefficient market outcomes.

Economic theory cannot determine with specificity the amount of information or the timeliness of release (i.e., lag) that may be considered appropriate in a given market. To the extent that other markets have taken a more aggressive approach to information disclosure and have thus far not suffered competitive harm, this may be evidence that

[59] Lazarczyk, E., and Le Coq, C., 2017. Information Disclosure in Electricity Markets, Presented at: 15th IAEE European Conference 2017, *Heading Towards Sustainable Energy Systems: Evolution or Revolution?* Vienna, Austria. International Association for Energy Economics.

CENACE could also adopt more aggressive information releases with limited risk of harming competition.

The appropriate level of information release in any given market should consider specific market and conditions (design, concentration, asymmetry), as well as the capabilities and available resources of its market monitoring authority. While a review of good practices in well-functioning and efficient markets cannot attribute beneficial market outcomes to data release practices, it can point to the right balance. Further independent analysis may be necessary, however, to establish whether the lessons from other markets can reasonably be expected to apply to the MEM.

## CRE and CENACE Staff Perspectives on Data Release

As part of this study, members of the Team met with staff at the CRE and CENACE to discuss, in part, some of the challenges and opportunities with regard to data release policy and practice in the MEM. Both of these discussions were very constructive, and staff of both organizations expressed a sincere interest in finding ways to address the shortcomings on which this investigation was shedding light, as well as others of which they were aware. Highlights of those discussions are included here.

CENACE staff indicated that the *implementation* of data release according to the requirements laid out in policy was still underway, and estimated that as of late August 2018, approximately 70 percent of the required information was being released in accordance with the regulations.[60] Staff were well aware that their systems for data release do not meet users' needs. There were also quite candid that their ability to unilaterally improve or expand the capabilities of the current systems is constrained by budget and staffing limitations, internal capabilities, and in some respects by what is allowed or required under current policy.

CENACE staff favor outsourcing the next generation of their information access systems, given the budget and authority to do so. Whether such systems developed for use in other electricity markets could be adapted for use by CENACE is worth exploring.

When asked about the rationale for classifying items currently considered to be Reserved information, they were unable to elaborate beyond what is currently stated in the regulations, but expressed interest in any recommendations arising from this study for rule changes that would reclassify specific categories of information as Public. With regard to the lack of a publicly accessible data dictionary or even a simple catalog of available data, CENACE staff expressed interest in learning about practices used in advanced markets. Ultimately, CENACE would look to the CRE for direction on any changes to their current practice.

[60] The exact meaning of this metric as expressed by staff is unclear; it was understood by the Team to mean 70 percent of the data categories and components within categories specified in the rules are currently being released. This would be consistent with our finding that approximately one-third of Public data required to be posted was missing or incomplete.

CRE electricity market staff, like CENACE, saw the need to improve the systems through which market participants and others are given access to MEM data—as well as those for use by market surveillance staff—as a high priority, and acknowledged the possibility that the current data release requirements were not sufficiently comprehensive. To this end, they pointed to an initiative to create a working group that would propose revisions to the SIM Manual.[61] CRE staff also saw creation of a data dictionary as high priority; they indicated that this was currently in progress, but had no firm timeline for completion.

With current budget constraints and only 60 staff people in the electricity unit—most of whom are devoted to activities such as permitting and tariff administration—the Commission's capacity to develop and execute initiatives in this area, however, is limited.

[61] As of late September 2018, CENACE's website, in its section on development and modification of market practice manuals, does not yet list such an effort. https://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/ManualesPracM.aspx

# V Operational Transparency in the MEM

In the preceding sections, we have detailed the importance and benefits of centrally-coordinated electricity markets providing information in a way that facilitates interpretation of prices, projections of supply and demand, transmission constraints, congestion, and other variables so as to enable market participants to manage risk and optimize capital investment and operating decisions. We have discussed the importance of making comprehensive market information broadly available, so as to mitigate the impacts of information asymmetry, reduce barriers to entry, increase liquidity and competition, and enable participants and observers more broadly to assist in market monitoring.

This section of the report focuses on operational transparency. For an electricity market to harness transparency so as to deliver all of the benefits described in the preceding sections requires going beyond simply making data accessible. Here we examine the features of advanced markets with high levels of operational transparency and the impetus behind them, assess the degree to which MEM operations are consistent with the principles of operational transparency, present an analysis of MEM spot prices, and look more specifically at examples of what the organizations running advanced markets are doing to enhance operational transparency.

Electricity markets that are operationally transparent share the following principles, among others:[62]

- Prices are determined through market mechanisms, and they reflect market and system conditions; use of manual or out-of-market actions by the system/market operator is minimized
- The procedures for employing the market rules in operation are documented comprehensively in publicly available operating guidelines
- The market mechanisms as implemented in unit commitment, dispatch, and price-setting, as well as manual actions taken by operators, are consistent with market rules
- There are rules that distinguish between acceptable intervention by the market operator and intervention that is overreaching
- There is heightened transparency around operator intervention and the causes of uplift, focusing attention on the issues and facilitating more efficient market activity
- Detailed operating logs maintained by the system operator contain sufficient information regarding inputs, outputs, and operator actions to allow the unit commitment, dispatch and pricing to be replicated and to be scrutinized by market monitors
- Price formation reflects all active constraints, including those requiring operator intervention; energy and ancillary service pricing are tightly aligned with system dispatch

[62] It should be noted that most markets, even relatively mature ones, are continually evolving, and even ones regarded as having a high degree of operational transparency may still be considered "works in progress" in some of these areas. Unless a given market has in place procedures that capture, document, and make visible the occurrence and causes of operator intervention, it is likely that the full extent to which it occurs will not be apparent.

- There is transparency surrounding the scheduling of transmission outages, as well changes to transmission outage schedules
- The market operator engages extensively with stakeholders on policy and technical issues, through an organized and representative committee structure, with publicly noticed and accessible meetings, meeting materials, and minutes

Additionally, operationally transparent electricity markets take advantage of built-in mechanisms that enhance their ability to evolve so as to correct shortcomings in design or implementation, and increase transparency:

- A regulatory process able to detect and correct market design flaws in a timely manner
- Market participants are given the ability to drive transparency improvements
- Successful initiatives to address known issues involving market operator intervention

The following sections elaborate on the themes of operator intervention, price formation, and transmission outage scheduling transparency.

## Operator Intervention

Many of these principles relate to intervention by market operators during the course of market operation—specifically, action taken by a market operator that is outside of the market-clearing mechanism or market operation rules. If a market operator intervenes, it is typically because the market rules and mechanisms have failed to produce a feasible operating solution, or because the system cannot be secured by the market mechanisms under the given conditions, or both. Nevertheless, operator intervention has also been known to occur due to unnecessary operator discretion, e.g., in seeking levels of reserves above those provided for by system requirements, or in seeking lower prices.

Operator intervention can be of a form that is provided for in the market rules, or something that is more *ad hoc*. Market rules typically provide for interventions such as out-of-merit (OOM) commitment or dispatch and supplemental reliability unit commitments to be used under circumstances where reliability would not otherwise be maintained. Another example is the ability for market operators to relax transmission or reserve constraints when market mechanisms are not able to achieve a feasible operating solution.

Such market rule provisions are usually put in place with the expectation that they will be invoked rarely. That is because operator intervention, which is usually not incorporated in the pricing model, can distort market outcomes, and when used frequently can reduce market transparency, create incentive problems, make market oversight more difficult, increase production costs, and generally compromise many of the benefits of efficient markets.[63] Moreover, when operators intervene for reliability reasons that market mechanisms don't address, doing so tends to hide the underlying physical causes, subsidize the status quo, and dampen price signals that might otherwise attract investments to address them.

[63] Hogan, W. W. (2014). Electricity Market Design and Efficient Pricing: Applications for New England and Beyond. The Electricity Journal, 27(7), 23–49.

There are cost consequences that significantly weaken the rationale for OOM commitment. The costs created by OOM commitments must be allocated to market participants as uplift, and imposing such charges in a way that is inconsistent with cost causation can cause further distortions in outcomes, resulting in unjust and unreasonable rates.[64]

Advanced markets aiming to increase transparency and reduce incidence of operator intervention do so in several ways:

- Clarify and codify the criteria and procedures for operator intervention
- Enhance the sophistication or granularity of market models used in unit commitment and dispatch such that they can better secure the system, reducing the need for OOM actions
- Enhance the market models, inputs, or constraints used in unit commitments such that they better anticipate real-time conditions and thereby reduce the need for supplemental reliability commitments or OOM dispatch.

## Price Formation

As discussed in earlier sections of this report, prices must reflect the reliability needs of the system in the short and long run for there to be sufficient confidence in the competitive market and in spot market price signals to support investment and operational decisions needed to ensure the reliability of the system. Price and volatility suppression and elevated levels of uplift are some of the most common manifestations of poor price formation, and their potential adverse impacts are numerous, as described here by an authority on the topic:[65]

> *When uplift occurs due to rules that keep prices too low or suppress volatility, there will be too little incentive for load management, efficient imports, participation by storage technologies, investment in fast response generation, efficient use of energy limited resources, and installation of dual fuel capability. Moreover, providers of lower-cost alternatives will not be able to profitably invest to displace resources receiving uplift, such as through investments to raise ramp rates or decrease minimum load.*

Improvements in price formation can be achieved in various ways, depending on the specific nature of the problem. Examples include the following:[66]

- Including all active constraints in price formation, especially those leading to operator actions
- Enabling intra-day offer changes when fuel costs or availability are changing during the operating day

---

[64] Notice of Proposed Rulemaking, Uplift Cost Allocation and Transparency in Markets Operated by Regional Transmission Organizations and Independent System Operators. Docket No. RM17-2, US FERC, January 19, 2017.

[65] Pope, S.L., 2014. Price formation in ISOs and RTOs. FTI Consulting, i-ii. As the author notes, even with an overall understatement of prices across a broad region, prices may be suppressed in some locations and increased in others.

[66] Pope, S.L., *ibid*., ii-v.

- Allowing block-loaded fast-start resources to set prices when they are needed to serve load
- Basing supplier settlements on quantity-weighted hourly averages of interval prices, or interval prices and quantities rather than simple hourly averages
- Implementing or improving shortage (scarcity) pricing, to improve price signals for load response and performance incentives for suppliers when reserve or regulation requirements cannot be met

## Transparency around Operator Intervention and Uplift

Without public documentation on the frequency, causes, and costs of operator intervention and uplift, it is more difficult to develop consensus on a common understanding of these problems and develop solutions targeted appropriately. For that reason, making high-quality information available is often a first step in attacking such challenges. Unlike with price signals, simply publishing information on operator intervention and uplift will neither change market participants' incentives nor enable them to directly impact these sorts of problems, although such information will raise awareness that is likely to cause market participants to demand improvements. Ultimately, changes in market rules or systems will be required. Examples of how some markets have increased the breadth and granularity of information surrounding operator intervention and uplift are included at the end of Section V.

## Transparency Surrounding Transmission Outage Scheduling

Transmission outages can have significant impacts on prices and transmission rights values. Nevertheless, in most markets, schedules and schedule changes are typically determined using approaches that do not necessarily consider all market impacts. This is of concern for several reasons. For example, changing outage schedules after a transmission rights auction can result in rights values that are considerably different from market participants' expectations. Moreover, in many markets, transmission outages are typically scheduled by transmission owners, who themselves are market participants, creating potential conflicts of interest.

Communications among market participants around transmission outage schedules are also of concern. Conversations between a transmission owner and affected generators regarding transmission outage schedules, for example, may be necessary from a practical and reliability perspective, but such conversations, if private, are inconsistent with the spirit and intent of fair and open access.

The considerations that drive transmission outage scheduling decisions typically do not include market impacts directly. For example, with regard to transmission outage schedule changes, it is not difficult to imagine the tension between efficient utilization of transmission crews and the financial impact on market participants. The mechanisms required to

produce efficient outcomes can only be implemented, however, when the costs and benefits of transmission outage schedules are widely understood.[67]

Unquestionably, better transparency regarding transmission outage schedules and changes benefits all market participants.

## Assessment of Operational Transparency in the MEM

To assess operational transparency in the MEM, the Team relied on information gathered through discussions with stakeholders and with CENACE and CRE staff, as well as with a high-level review of market manuals and other documents published by CENACE. This information was reviewed against a rubric of the following ten principles. In some respects, as noted, it was not possible within the scope of this study or given the information available to make an assessment.

1. Prices are determined through market mechanisms, minimal use of out-of-market actions
2. Operating procedures documented comprehensively, publicly
3. Market mechanisms used in system/market operation are consistent with market rules
4. Rules distinguish between acceptable and overreaching intervention by market operator
5. Transparency around operator intervention and the causes of uplift
6. Continuous scrutiny and assessment of market operator performance by an independent market monitor
7. Price formation reflects all active constraints
8. Transparency surrounding transmission outage scheduling and schedule changes
9. Publicly accessible market committee meetings, meeting materials, and minutes
10. Robust and collaborative stakeholder engagement to improve transparency

While the policy and practice regarding information release more generally can play a significant role in a given market's operational transparency, the focus here is on those elements not already covered in Sections III and IV.

### 1. Prices are determined through market mechanisms

According to CENACE staff, operator intervention in the operation of the day-ahead MDA and real-time MTR is common—more so in real time, and more so in some control areas than others. Operator use of OOM commitment or dispatch for reliability purposes is, according to CENACE staff, very common. Also common (but less so than OOM commitment or dispatch) is the relaxation of constraints in order to achieve a feasible operating solution. According to CENACE staff, operators at times relax either operating reserve constraints or transmission constraints or both for this purpose.

Staff reported that operator intervention is used only for reliability reasons or because of difficulty getting the market model to solve; judgment based on prices or other factors

[67] An example of such a mechanism would be an allowance for additional cost recovery through transmission rates when maintenance schedules are adjusted in order to reduce generation costs.

never enters into a decision to intervene. Staff pointed to several causes driving the need for operator intervention. In particular, they highlighted the high number of generator outages in real time that are not foreseen in the day-ahead timeframe, as well as uncertainty in line flows due to poor-quality SCADA systems and state estimation.[68]

Given the lack of published data or analysis on the nature, causes, frequency, or impact of operator intervention in the MEM spot markets, we were not able to quantify or independently investigate this issue further. Based solely upon what was reported to us by CENACE staff, it is fair to say that there is great need for improvements in CENACE's systems and in the market design that would allow greater reliance on market mechanisms. Indeed, the high number of generator outages and frequent reserve shortages reported underscore the need for new investment by the private sector, but if price signals fail to reflect the extent of reserve shortages or indicate to the market where new capacity is needed and likely to be profitable, the required investments may not occur quickly enough.

The CRE could address the lack of information by commissioning the MIM to assess the frequency, causes, and costs of operator intervention and uplift in the operation of the MEM to date.[69] The MIM will need to be provided all of the information it needs to make such an assessment, and its findings should be made public.

### 2. Operating procedures documented comprehensively, publicly

The Market Bases require CENACE to issue Operating Guidelines and Operating Criteria and Procedures,[70] but to date, only two such documents have been issued, unrelated to the topics of this study.[71] There is no dedicated ancillary services manual, and apparently no documentation explaining how reserve requirements are determined.[72] Detailed rules for constructing the inputs to the models used in the day-ahead and real-time unit commitment and dispatch do not appear to be published. In short, a great deal of progress remains to be made for the MEM to be considered transparent with regard to the documentation of operating procedures.

[68] It is the Team's understanding that a project to upgrade SCADA systems was commissioned by CENACE in mid-2018.

[69] Explicit uplift costs in the MEM take the form of revenue sufficiency guarantees (*Garantías de Suficiencia de Ingresos*).

[70] Bases del Mercado Eléctrico, SENER, Diaro Oficial, September 8, 2015, Section 1.5.

[71] The two documents issued relate to auction contract compensation and the system within the SIM that market participants use to make payments.

[72] Although the *Código de Red* (grid code) establishes some very general reserve requirements (e.g., *Criterio OP- 35*), they are too general and vague for use in operations, and reportedly the actual reserves assigned by CENACE on an hourly basis appear not to follow any particular guideline.

### 3. Market mechanisms and operator intervention consistent with market rules

Aside from a high-level report done the same year the MEM began operation,[73] the Team is not aware of any publicly-available independent audit ascertaining that operation of the day-ahead and real-time markets (either under market mechanisms or manual intervention) is consistent with market rules.

The three principal types of operator intervention reported to be in use by CENACE staff are OOM unit commitment or dispatch for reliability, relaxation of transmission limits, and relaxation of operating reserve constraints. OOM commitment or dispatch is provided for in both the Market Bases[74] and the Energy Spot Market Manual.[75] The Market Bases provide, in economic dispatch, for the relaxation of transmission limits, as well as generator and demand resource maximum, minimum, and ramping limits.[76] The Energy Spot Market Manual provides for relaxation of transmission limits in the day-ahead unit commitment, supplemental unit commitment, real-time unit commitment, and economic dispatch, when necessary to avoid loss of load in order to obtain a feasible operating solution. A transmission facility's limit may be relaxed by up to 5 percent, using a penalty cost of 90 percent of the difference between the value of energy not served and the highest marginal cost of generation in the system.[77]

Relaxation of operating reserve constraints using reserve demand curves is provided for in the Market Bases and the Energy Spot Market Manual. The Market Bases require this functionality in economic dispatch for the Stage 2 market, with application in the Stage 1 market optional.[78] The Energy Spot Market Manual provides for the use of reserve demand curves in day-ahead unit commitment, supplementary reliability commitment, and real-time commitment and dispatch.[79] According to the manual, the reserve constraints may be relaxed using reserve demand curves either to avoid loss of load, when insufficient reserves have been offered into the market, or when reserves would otherwise be too costly.[80]

Ascertaining the degree to which MEM spot market operation is consistent with the market rules would require an effort more extensive than possible within the scope of this study.

---

[73] *Technical Support for Electricity Market Assessment and Regulation Development in Mexico: Report on Current Market Status*, Prepared for the Office of Energy Programs, Bureau of Energy Resources, U.S. Department of State by Deloitte Financial Advisory Services, LLP, December 1, 2016.

[74] *Bases del Mercado Eléctrico*, Sections 2.1.58, 6.2.2, 6.3.2, 9.2.3, 9.9.3, and 10.2.3.

[75] *Manual de Mercado de Energía de Corto Plazo*, SENER, Diaro Oficial, June 17, 2016, Sections 2.4.1, 3.3.1, 3.6.2, 3.6.6, 3.6.16, 4.3.3, and 5.2.4.

[76] *Bases del Mercado Eléctrico*, Section 9.1.8.

[77] *Manual de Mercado de Energía de Corto Plazo*, Sections 3.6.11-12, 3.7.6, 4.3.6-7, 4.4.6, 5.2.7-8, 5.3.5, 6.6.8, 6.7.5, 6.8.9, 6.9.5,

[78] *Bases del Mercado Eléctrico*, Sections 1.4.2, 9.1.8, and 10.4.5.

[79] *Manual de Mercado de Energía de Corto Plazo*, Sections 1.3.7, 3.7.6, 4.4.6, 5.3.5, 6.7.5, 6.9.5.

[80] "Curvas que establecen los requerimientos de reservas operativas para cada zona de reserva del Sistema Eléctrico Nacional y sus costos de penalización asociados, que se utilizarán para relajar las restricciones de reservas en los modelos de asignación y despacho de generación en los casos en que no se cuente con suficiente oferta de estos servicios o cuyos costos resulten inconvenientes económicamente." *Manual de Mercado de Energía de Corto Plazo, ibid*.

Some major concepts, such as the use of a penalty cost to allow relaxation of restrictions (as opposed to simply substituting limits with higher values), would be straightforward to verify. Given the current lack of detailed spot market operating procedures as discussed above, however, many of the more specific aspects of market operation would be difficult to assess, except in a general sense.

### 4. Rules distinguish between acceptable and overreaching intervention by market operator

In the discussion above, we have described the market rules providing for several types of operator intervention. The MEM spot market rules for operator intervention as currently documented are rather general, and unlike those of other advanced markets, they do not contain provisions that sufficiently circumscribe their use.

A case in point is the above-referenced provision for relaxing reserve requirements. The measure provides for this to be done using demand curves—once implemented—but does not offer detail on the procedure to be used until demand curves are implemented, or a methodology to be used to establish reserve penalty prices that appropriately value the tradeoff between meeting the reserve requirement or involuntarily disconnecting load under scarcity conditions.

### 5. Transparency around operator intervention and causes of uplift

Because uplift costs represent the total of all out-of-market costs in a market, high uplift costs are a good indicator of a lack of operational transparency. As discussed above, without public documentation on the frequency, causes, and costs of operator intervention and uplift, it is impossible to develop consensus on a common understanding of these problems and develop solutions targeted appropriately. Such information and comprehensive analysis have yet to be made available along these lines for the MEM.

### 6. Assessment of market operator performance by independent market monitor

The MEM rules provide for the MIM to monitor CENACE, and to report periodically on the efficient functioning of the MEM. As of late November 2018, however, only the MIM's annual 2016 report had been issued by the CRE. The MIM is not yet being provided sufficient information to make a comprehensive analysis of market efficiency. It is the Team's understanding, for example, that CENACE is not equipped to make available to market monitors detailed operating logs containing sufficient information regarding inputs, outputs, and operator actions to allow the MEM day-ahead and real-time unit commitment, dispatch and pricing to be replicated and scrutinized.

The operators of advanced markets are typically required to self-report on their own performance, using a standard set of performance metrics that allow tracking of progress from month to month or year to year. Good examples of such metrics have been developed by FERC staff in the US.[81] No system for tracking CENACE performance has been put in place by CENACE or the CRE.

[81] RTO/ISO Performance Metrics, US Federal Energy Regulatory Commission, https://www.ferc.gov/industries/electric/indus-act/rto/rto-iso-performance.asp.

### 7. Price formation

According to CENACE staff, neither the dispatch nor the *ex post* price formation procedure are able to reflect all active constraints, in particular those that lead to OOM dispatch. Improvements to the market model to secure parts of the system that are not currently secured, or otherwise represent active constraints are needed to address this issue. Given the frequent real-time reserve shortages, creating more granular reserve areas (currently the three control areas) may be necessary to properly model reserve constraints.

Intra-day offer price changes are not currently allowed by the rules, even when fuel costs or availability are changing during the operating day. This is of particular concern with regard to natural gas pipeline constraints, which generators have no control over. Even if generators are equipped with dual-fuel capability, an offer based on natural gas fuel prices would be insufficient to cover the cost of fuel oil burned in the event gas is unavailable.

The Market Bases provide for block-loaded generators to be considered as dispatchable between zero and their upper limits in both the dispatch and pricing passes, as part of the Stage 2 market implementation.[82] It is our understanding that this capability is not currently available in the current (Stage 1) market model.

In the current Stage 1 market implementation, real-time supplier settlements are based on simple hourly averages rather than quantity-weighted hourly averages of interval prices. The Stage 2 market implementation as designed will be an improvement, with settlements calculated using quantities and prices for each dispatch interval.[83]

The Stage 2 market implementation will include a form of shortage (scarcity) pricing, based on reserve demand curves. Additionally, it will include provisions for demand response resources. Together, these two provisions will improve price signals and performance incentives when reserve or regulation requirements cannot be met.

### 8. Transparency surrounding transmission outage scheduling and schedule changes

There is currently very limited transparency around transmission outage scheduling in the MEM. The market rules require that transmission outage schedules, classified as Reserved information, be posted in the Reserved area of the SIM. The transmission outage schedule data are only posted, seven days in advance, however, and are aggregated by region. There is little information in the market rules regarding the procedures for changing transmission outage schedules and the policy for posting outage schedule changes, even in the Reserved area.

### 9. Publicly accessible market committee meetings, meeting materials, and minutes

Advanced markets typically exercise considerable openness and stakeholder engagement efforts to address market performance issues and the development of market design improvements, as doing so is foundational to market transparency. The

[82] *Bases del Mercado Eléctrico*, Section 9.1.9.

[83] *Bases del Mercado Eléctrico*, Section 17.4.2. Implementing this would require real-time telemetry at generators and at step-down transmission and sub-transmission substations.

organizational structure and process to facilitate these activities is specific to each market, and typically detailed in market rules.

The technical and policy committees and working groups that make up the organizational structure in advanced markets are typically open to anyone who registers to attend, free of charge, though voting rights are usually limited to members and defined by governance rules. It is common for there to be provisions for participation via web and phone conference facilities. Committee meeting schedules, agendas, presentations and other documents are published online in advance, along with minutes from previous meetings, documenting discussion and actions taken. Materials are typically kept available online for a period of several years before being archived.

While the market rules and implementation of the MEM have unquestionably incorporated stakeholder input, the MEM does not have a well-developed governance infrastructure such as exists in highly transparent electricity markets elsewhere. Nevertheless, in early 2018, pursuant to the market rules, four stakeholder advisory committees (CCARMs) were formed to propose, analyze, and evaluate changes to the market rules, focused on the wholesale market (CCARM-MEM), grandfathered external generators and interconnection contracts (CCARM-Legados), transmission system operations (CCARM-OSEN), and grid planning and expansion (CCARM-PER). The committees include voting representatives of CENACE and each of the market participant sectors,[84] and non-voting representatives of SENER and the CRE. Additionally, the *Comité de Evaluación del CENACE y del Mercado Eléctrico Mayorista* (CECMEM, committee to evaluate CENACE and the MEM), consisting of representatives of CRE, CENACE, SENER, and the private sector, was formed in late August 2017.

Given the newness of the MEM governance structure, it remains to be seen how effective it will be in bringing about greater levels of transparency. This will require considerably more openness to the process. Although very terse CCARM minutes are published by CENACE, the meeting schedules, agendas, and meeting materials do not appear to be. Likewise, the Team was not able to find any published information regarding the CECMEM other than its formation.

### 10. Robust and collaborative stakeholder engagement to improve transparency

In addition to simply considering information that gets posted or reported upon, to develop and continuously improve transparency typically requires special stakeholder process considerations, given the complexity and sensitivity of the issues involved. Managing the process successfully may require market operator staff with a mix of policy, operational, and legal expertise, depending on the circumstances—rather than those typically assigned to manage purely policy issues or purely technical issues. Moreover, these types of issues, owing to their nature, may be difficult to resolve with the typical stakeholder process involving formal comments or presentations by the committee members. Instead, a process involving collaborative, face-to-face, whiteboard-quality discussions, with more iterations of a technical nature, may be more successful in developing solutions.

[84] Transmission and distribution companies' representatives have voting rights on the OSEN and PER committees, but not on the MEM or Legados committees.

## Analysis of MEM Nodal Prices

As part of this study, the Team performed a limited analysis of MEM spot market pricing. The objective of the analysis was to assess qualitatively whether a subset of PMLs published by CENACE could be seen to reasonably reflect the underlying information that serves as the basis for their determination—cost-based generator offers and bid demand.

Performing a very sophisticated analysis was outside the scope of this study. As the data release assessment revealed, CENACE does not publish the information needed for a pricing analysis to accurately reflect system conditions. For those reasons, the scope of the analysis was limited to the day-ahead market (MDA) for the BCS interconnection—which has less than 30 market nodes, 21 thermal units, no imports, exports or hydro generation, and relatively little congestion.[85] A relatively simplistic dispatch was used to construct unconstrained market clearing prices for use in comparison to published PMLs. Despite the relative simplicity and limited scope of the analysis, which covered the 26-month period from March 2016 to April 2018, to perform it required downloading nearly 3,000 daily files (not including additional data needed for validation) from the CENACE website and aggregating them into a usable database.[86]

The analysis sought to calculate, for each hour, an unconstrained day-ahead clearing price (UCP) for BCS, and compare the relationship of UCP and demand to that of median nodal PML and demand. The UCP for each hour was determined independently (i.e., without multi-period optimization or intertemporal constraints) by constructing a supply curve and finding the price at which demand would be satisfied. Scheduled/cleared BCS load (*cantidades asignadas*) was taken as demand; offer curves submitted by generators—consisting of prices and quantities for 11 blocks—were used to rank offers in merit order. Units tagged in offer data as non-dispatchable (*no programable*), as well as minimum generation (min-gen, or minimum load) blocks of self-scheduled (*operacion obligada*), generation were considered to be must-run. Above this must-run generation was stacked all other thermal capacity, with units modeled as single blocks, in merit order at the average offer price of their dispatchable blocks. UCP was determined as the price of the marginal block needed to serve demand.

The results are shown in Figure 5, with the median of hourly nodal PMLs and the UCP both plotted against demand, for each of the 26 months in the period. Figure 5 illustrates in greater detail the same data for just one month (December 2017) as shown in Figure 5 for all of the months. Prices (both UCP and PML) generally fall in distinct clusters likely associated with plant type (steam turbine vs. reciprocating engine) and fuel (diesel vs. residual oil). Within each cluster, price rises gradually with demand, whereas a shift from a less expensive cluster to a more expensive one results in a much larger increase.

As the figures show, the relationship of PML to demand is quite similar to that of UCP to demand. UCP is much more tightly stratified within these clusters than PML, which is likely an artifact of using a single average price/block for each unit, rather than the full convex offer curves submitted by suppliers and used by CENACE in the MDA dispatch. Additionally,

[85] Congestion was observed in less than 0.5 percent of PMLs in BCS over the period examined here.

[86] Fortunately, CENACE generously offered their help with some of the acquisition and aggregation.

given that the BCS thermal units' min-gen blocks account for approximately 80 percent of their capacity, as indicated by offer data, it is likely that in the simplistic approach used here, marginal units would have been dispatched within their min-gen capacity, whereas in reality (to enforce min-gen constraints) more expensive units would have been dispatched instead.[87] A variety of other factors are likely responsible for remaining deviations.

The results presented here are for a small control area with no imports, exports, or hydro generation, relatively few thermal generators, and hardly any congestion. It is nevertheless impossible to say, even for such a simple system, whether or not the published PMLs examined appropriately reflect the cost-based generator offers, bid demand, system conditions, and various constraints on which they are based, because CENACE publishes insufficient information to help interpret PMLs or improve the estimation—e.g., transmission and reserve constraints (and rules for relaxation), bid load by zone or node, generator operational characteristics, designations of generation as must-run for reliability, power flow cases, and lists of contingencies.

Without additional information, even the best modelers in the world can only reach general conclusions about pricing accuracy, making it impossible to identify specific problems that may exist in system pricing. The illustration provided by the price analysis done here underscores this finding, which was corroborated by other observations discussed elsewhere in this report.

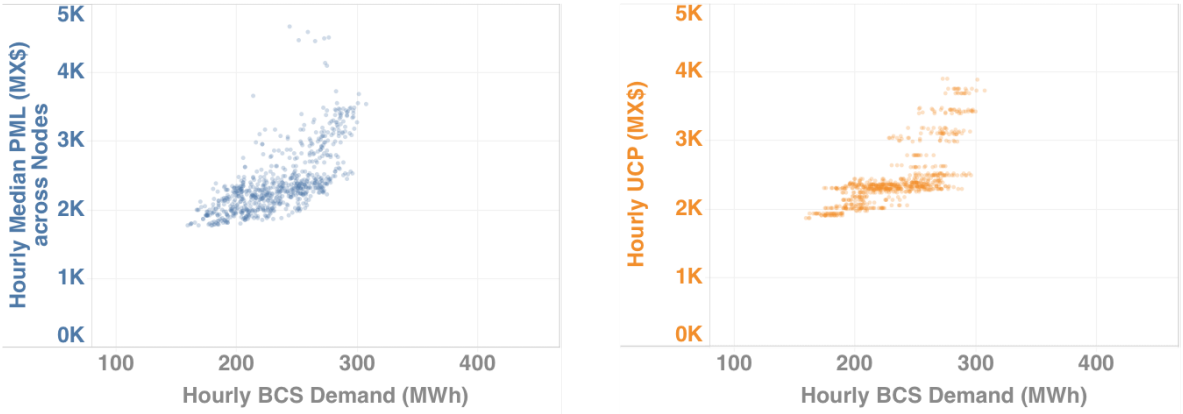



***Figure 4**. Calculated hourly day-ahead BCS unconstrained clearing price and median of published nodal PML vs. hourly BCS energy demand, for December 2017.*

[87] Simplistically speaking, in CENACE's MDA unit commitment, if in an hour the amount of energy required of the marginal generator were less than the next available generator's min-gen level, that generator would not be selected as the marginal generator, because to run at less than its min-gen would violate an operational constraint. Therefore, the next most expensive generator would be selected, assuming the amount of energy required fell within its dispatchable range. Of course, the unit commitment optimization is more complicated than this simplistic illustration indicates, because it considers many constraints and optimizes over a multi-hour period to achieve a least-cost solution.

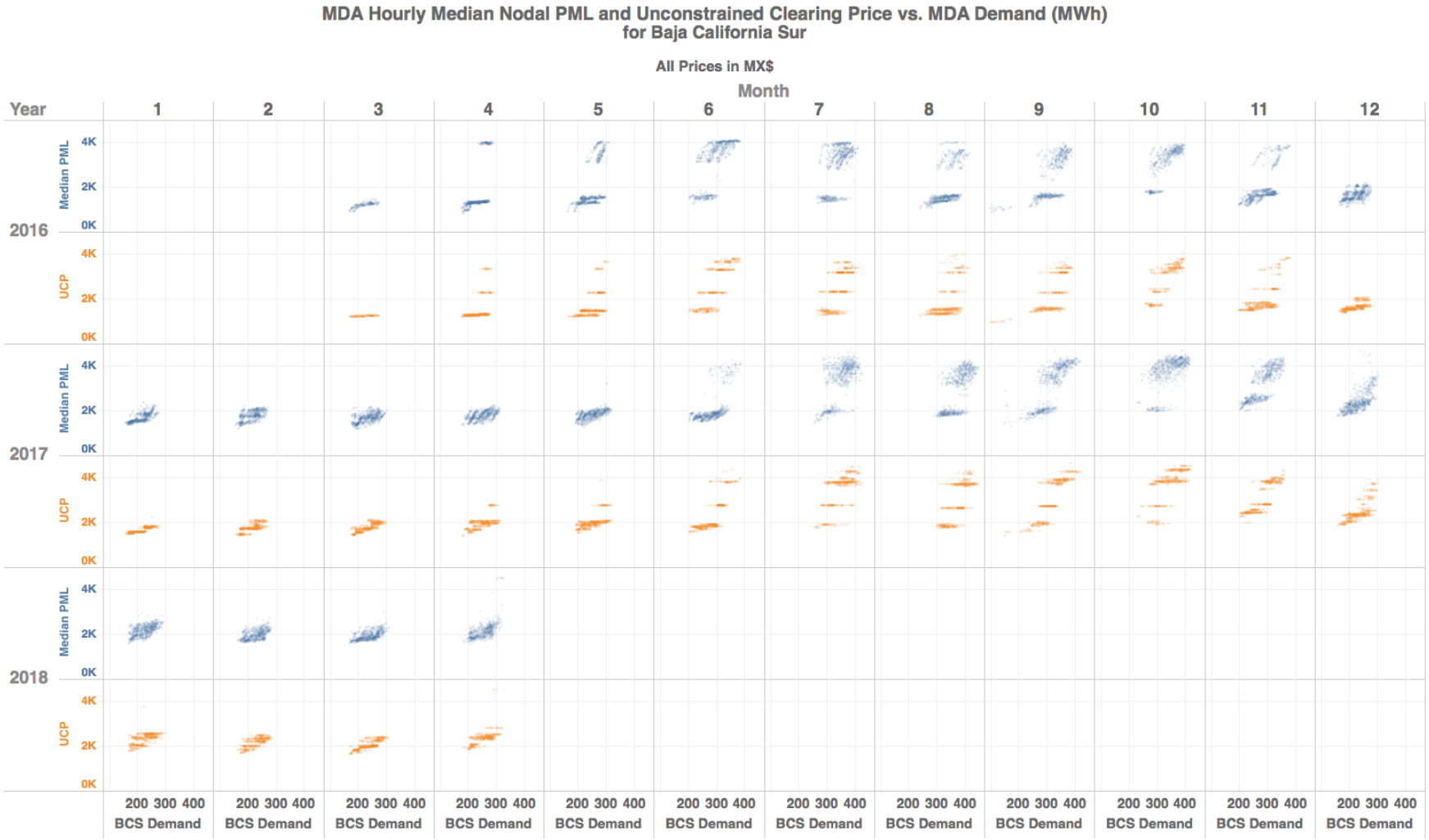



***Figure 5**. Calculated hourly day-ahead BCS unconstrained clearing price and median of published nodal PML vs. hourly BCS energy demand, for entire analysis period.*

## Examples: How Advanced Markets Create Operational Transparency

As part of the research conducted by the Team on markets internationally in Phase 1 of this study in 2017, we documented efforts by several electricity markets to minimize market operator intervention by creating market mechanisms or improving existing ones. We also documented efforts in those markets to keep market operators accountable regarding intervention and to provide the information needed by stakeholders to understand the resulting market outcomes.

The examples described below illustrate several such efforts to reduce intervention, as well as the stakeholder initiatives and deliberation leading to their creation and evolution. The examples included are from NYISO (New York), CAISO (California), ERCOT (Texas), PJM (mid-Atlantic/Midwest), and AEMO (Australia). Although transmission outage scheduling is typically performed by a transmission owner/operator rather than the market/system operator, it is included with these examples because of the similarities to system operator actions. Just as with system operator intervention, transmission outage scheduling is not subject to market mechanisms, yet can affect prices significantly.

### 1. Operator intervention

Electricity markets are evolving to increasingly employ market-based mechanisms to replace operator intervention. Examples include innovations by CAISO and ERCOT in their approach to OOM dispatch and commitments, as well as CAISO's so-called load adjustments and adjustment relaxation. Considered together, these efforts represent a continued movement to contain or minimize intervention. Aimed at improving price formation, manual intervention is being replaced by the inclusion of additional constraints in market models.

CAISO accomplished this through the creation of new "minimum on-line" and generation contingency constraints within its pricing model. ERCOT employed changes to its market design to reduce the reliance on the reliability unit commitment.

Our research found that markets successful in reducing operator intervention have also been providing greater transparency around intervention when still required to operate the system. Examples include the following:

**NYISO operational and uplift reports**. NYISO provides daily announcements and quarterly reports that include analysis of the causes and impacts of uplift. Daily operational announcements with data on operator actions, including dispatcher notices, generation committed for reliability, and market monitor notices, provide a degree of transparency. Quarterly Market Monitor reports on energy market outcomes offer insight into the prevalence, causes, and impacts of operator actions, covering real-time pricing events, supplemental commitments, OOM dispatch, and uplift charges.

**CAISO OOM commitment notices and reports**. CAISO provides immediate notice of commitments, daily dispatch reports, and monthly reports to the regulator regarding OOM operator actions, to better inform participants' market activities. Daily operational

announcements/reports include daily exceptional dispatch reports, and immediate notice if resources must be committed or dispatched by operators for system or local reliability needs under the CAISO's Capacity Procurement Mechanism. Monthly reports include an exceptional dispatch report (filed at the US FERC), a unit commitment report distinguishing between non-market commitments and market commitments, and a report on minimum on-line constraints.

**PJM closed-loop interface changes**. PJM created closed-loop interfaces so that operator actions such as sub-zonal dispatch of demand response are captured in energy prices rather than uplift, because its modeling software can only set prices for thermal constraints, which don't represent voltage problems. In response to stakeholder advocacy, PJM agreed not to implement closed-loop interfaces without advance notice five days prior to close of each financial transmission rights auction. The rule makes an exception for short-duration outages. Putting this rule in place did not require a tariff change (i.e., approval by the US FERC).

**PJM Market Operations Price Transparency Initiative**. PJM in late 2016 began a stakeholder process to develop transparency solutions, resulting in subsequent changes to the PJM Operating Agreement. According to PJM,

> *Data and information that provide transparency into system conditions and operator actions that result in prices and other settlement results such as uplift can aid market participants in understanding the conditions driving those results and build confidence in the market.*[88]

The conditions and actions covered by the initiative included transmission constraints, the Reliability Assessment Commitment process, and associated conservative operations, both in day-ahead and real-time operations.

**AEMO Intervention Pricing**. When AEMO operators encounter a situation requiring intervention, they institute what they refer to as Intervention Pricing, intended to minimize the effect (e.g., suppression), of the intervention on pricing, using two dispatch passes.[89] Pass 1 is the actual dispatch, recognizing the out-of-merit operation and actual system state; Pass 2 is the pricing dispatch, assuming the counterfactual operation as if the intervention had not taken place. As of mid-2017, the process could be used for short periods of time (a few hours), but not longer, because after that, the actual and counterfactual dispatch tended to diverge. For this reason, AEMO initiated the development of Intervention Pricing capable of running for days, for use during natural disasters.

One of the drivers many of the various efforts described above is regulatory. The US FERC for example, in its recent Order No. 844, required market operators to report information

[88] PJM, Market Operations Price Transparency Issue Details. https://www.pjm.com/committees-and-groups/issue-tracking/issue-tracking-details.aspx?Issue=%7B87AF17D1-0031-4251-A019-767FACCD80FF%7D

[89] "Intervention Pricing Methodology," Australian Energy Market Operator, October, 2014.

about uplift payments and operator-initiated commitments.[90] It its remarks upon issuance of the order, FERC staff noted that:[91]

> *A lack of transparency regarding uplift payments and operator-initiated commitments can mask system conditions, particularly in times of system stress. The result is that market participants may not fully understand the needs of the system or recognize the resource attributes that are required to meet those needs. …[I]nformation currently reported by RTOs and ISOs… lacks detail regarding the locations and causes of uplift and operator-initiated commitments [and] may not provide sufficient transparency for market participants to plan for and respond to system needs in a cost-effective manner, resulting in rates that are unjust and unreasonable.*

The order required market operators to publish monthly reports of:

- all uplift payments categorized by transmission zone, day, and uplift category
- the total amount of uplift paid to each resource
- the commitment size, transmission zone, reason, and start time of each operator-initiated commitment

Under the order, each market operator must also include in its tariff the transmission constraint penalty factors used in its market software, as well as any circumstances under which those penalty factors can set locational marginal prices, and any process by which the penalty factors can be temporarily changed.

### 2. Transmission outage scheduling

In CAISO, a stakeholder-driven effort in 2015-2016 greatly improved transparency related to the posting of transmission outages. Two principal deficiencies were addressed by the reforms—data posting and timing. Data posting problems included a lack of machine readability and API, inconsistent equipment naming conventions across outage scheduling, market and FTR systems, and reports that were not issued frequently enough to capture schedule changes. Moreover, CAISO (like CENACE currently) was not posting outages more than seven days in advance, and was reluctant to change outages once the transmission rights model was "frozen."

The significant improvements included adding data naming conventions and machine readability, and publishing all outages when received, except for during a "quiet period" between the release of the transmission rights auction model and the completion of the auction itself.

---

[90] Uplift Cost Allocation and Transparency in Markets Operated by Regional Transmission Organizations and Independent System Operators, US Federal Energy Regulatory Commission Order No. 844, issued April 19, 2018, 163 FERC ¶ 61,041.

[91] Federal Energy Regulatory Commission, Open Commission Meeting, April 19, 2018, Staff Presentation Item E-1.

# VI Conclusions and Recommendations

This final section presents conclusions based on the findings of the study, as well as the Team's recommendations for the CRE and CENACE to address the issues that the study revealed. The section concludes with a succinct summary, in Table 6, of the 36 specific recommendations.

Transparency is essential for a well-functioning electricity market. It prevents players with exclusive access to information from profiting unfairly at others' expense. Transparency levels the playing field by providing information equally to all, reducing barriers to entry. Market transparency reduces uncertainty, allowing better risk analysis and decision making, enabling participants and other stakeholders to more efficiently identify and respond to market needs. It increases competition, contributing to appropriate market outcomes, and by facilitating effective and reliable monitoring and regulation, it safeguards against market manipulation, building trust and market stability.

In electricity markets, it is essential that existing and potential market participants have the information necessary to identify profitable business opportunities and that all stakeholders have equal access to this information. Fully efficient market outcomes require that participants make efficient capital investment, operating, and pricing decisions. If one or more participants possesses superior information, they have a strong incentive to use it to increase their profits, potentially at the expense of market efficiency. The public release of system and market data can help mitigate such information asymmetries and the threat they pose to competition.

Public information disclosure can also benefit electricity markets by reducing supply uncertainty and risk, participant financial risk, and associated risk premia, promoting market liquidity, encouraging more cost-effective investment and operating decisions, improving market monitoring, decreasing barriers to entry, and strengthening confidence in the market operator and regulatory authorities.

The study documented in this report is an independent, qualitative assessment of transparency in the MEM, focusing on data release and operational transparency. The assessment compared data release practice with policy in the MEM, assessed how MEM data release practices might enhance or hinder transparency, considered the extent to which market operations are performed as prescribed by the market rules, and sought to examine the degree to which dispatch and pricing are determined by operator intervention rather than market mechanisms. It also sought to investigate the principal causes of such actions, and potential impacts.

## Conclusions and Recommendations—Data Release

A literature review and interviews with operators of markets elsewhere conducted as part of the Phase 1 study revealed widespread support for comprehensive data release, both generally and in the specific markets surveyed. Full and symmetric release (in high-quality format) of information is beneficial for participants to understand and predict market prices, to inform their operating and investment decisions, and for participants, potential participants, and neutral observers to assist in monitoring behavior. In the context of

Mexico, which hopes to attract significant foreign investment in generating capacity additions, the value of comprehensive and transparent data release cannot be overstated.

Neither the data release policy for the MEM nor the actual practices were found to be documented in one place; the detailed policy specifications are distributed among various manuals and regulatory issuances. CENACE does not publish a data dictionary; many of the specific pieces of information released or referred to in the market rules are not well-defined. Consolidating the data release policy for the MEM, as well as publishing a data dictionary would bring CENACE more in line with industry standard practices.

This study revealed that the data release implementation is incomplete and user-unfriendly to such a great degree that it limits access significantly, hampering transparency. These shortcomings could be addressed without any rule changes, as follows:

- Publishing to the fullest extent the significant amount of data that should, according to policy, be published[92]
- Eliminating any participant identity masking that is inconsistent with policy
- Quality checking published data files and correcting errors
- Using file naming conventions rather than idiosyncratic filenames that pose a barrier to automating file download
- Resolving issues with CENACE website malfunctions
- Ensuring that all data are machine readable (e.g., CSV), and all text is searchable
- Providing an online query tool for all hourly or daily data
- Implementing an API for client software to communicate with the SIM

Stakeholder interviews revealed a strong consensus that CENACE provides stakeholders with insufficient price signals and other information needed to understand the dynamics of the market, manage risk, support operating and investment decisions, validate market settlement statements, and have confidence that the market and power system are being operated impartially and according to market rules. There was a broad stakeholder consensus for reclassifying Reserved information as Public. Many of the points raised by stakeholders were supported by the comparison of CENACE's data publication practices to those used in advanced markets. CENACE can reduce information asymmetry and increase the effectiveness of its data release by emulating other markets' practices such as:

**Provide transmission and distribution companies access to all Reserved data**. No justification was found for prohibiting access by transmission and distribution companies to certain Reserved data that other market participants may access.

**Reclassify Reserved information as Public**. Based on the criteria for classifying information as Reserved, it is not clear why many if not all of the Reserved MEM data are not released to the public as they are in other markets, but made available only to market participants,

[92] See details listed in Annex A.

trusted external users, and transmission/distribution companies. Inasmuch as certain categories of Reserved information are not reclassified as Public, access by users with a legitimate interest should be streamlined, and access fees eliminated.

**Decrease obfuscation and increase timeliness of release.** CENACE aggregates, masks, and intentionally delays data more extensively than the comparison markets. Recommendations specific to each of several key categories of data follow:

- **Increase supply offer data and demand bid transparency**. CENACE could increase transparency of supply offer and demand bid data to the levels of the comparison markets by posting supply offers with plant or unit identities instead of masks, including demand asset identities, and by reducing the 60-day time lag, and by releasing aggregate data with little or no delay.
- **Increase timeliness and disaggregation of load data**. The high level of aggregation and long delay for load data publication make CENACE least transparent relative to the comparison markets.
- **Increase generator data transparency**. By decreasing the level of aggregation, including plant or unit IDs, and making generator unit commitment and outage data available, CENACE could achieve comparability with the other markets examined. Generator outage data are valuable to the market monitor and other observers to detect whether suppliers are withholding output to drive prices up.
- **Increase transmission data transparency.** The provision of transmission data—valuable to generation unit owners in making location decisions, transmission planners in making planning decisions, and all market participants in managing congestion risk—could be enhanced by publishing the information that MEM market rules specify be available to entities certified for access to Reserved data and making power flow cases available. Extended transmission outage schedules, power flow cases and related data, and reports of binding constraints should be provided.
- **Improve data release across the entire spectrum**. Although the major categories of data assessed above are perhaps the most important, our review noted areas for improvement in CENACE's release practices across the entire spectrum of data.
- **Release complete models and comprehensive input data**. In several categories, as noted in Annex A, the rules provide for CENACE to release complete models and input assumptions. It was found that CENACE does not release the models or inputs comprehensively, however, in any of the categories.
- **Publish data needed by market participants to validate allocated settlement charges**. The data currently provided to market participants with market settlement reports are insufficient to enable them to validate charges associated with the various socialized costs allocated pro rata.
- **Increase the timeliness and frequency with which the CRE releases reports by the MIM.** The MEM rules provide for the MIM to monitor CENACE, and to report periodically and frequently on the efficient functioning of the MEM. The CRE has the

responsibility of issuing reports that the MIM prepares. As of October 2018, however, only the MIM's annual 2016 report had been issued by the CRE.

Discussions with staff at the CRE and CENACE regarding the challenges and opportunities with regard to MEM data release policy and practice were constructive, and staff members with whom we spoke expressed a sincere interest in finding ways to advance the MEM's development in this area.

CENACE staff indicated that the *implementation* of data release according to the requirements laid out in policy was still underway, and approximately 70 percent complete relative to the regulations.[93] Staff were well aware of the deficiencies in CENACE's data release systems, while at the same time recognizing that their ability to make improvements unilaterally is constrained by available resources, and in some respects by what is allowed or required under current policy. CRE electricity market staff, like CENACE, saw the need to improve public-facing data access capabilities—as well as those for use by market surveillance staff—as a high priority, and acknowledged current shortcomings.

## Conclusions and Recommendations—Operational Transparency

This study examined the features of advanced markets with high levels of operational transparency, and assessed operational transparency in the MEM, based on information gathered through discussions with stakeholders and with CENACE and CRE staff, as well as with a high-level review of market manuals and other documents published by CENACE. This information was reviewed against a rubric of operational transparency principles; the Team's recommendations in this area stem from that comparison.

- **Commission the MIM to assess operator intervention and uplift.** Without public data on uplift costs, or documentation on the frequency, causes, and costs of operator intervention and uplift, it is impossible to develop consensus on a common understanding of these problems and develop solutions targeted appropriately. We recommend that the CRE commission the MIM to assess the frequency, causes, and costs of operator intervention and uplift in the operation of the MEM to date. The MIM will need to be provided all of the information it needs to make such an assessment. The MIM's findings should be made public.
- **Make improvements to market design and CENACE's systems to allow greater reliance on market mechanisms.** Based solely upon what was reported to us by CENACE staff, there is great need for improvements in CENACE's systems and in the market design that would allow greater reliance on market mechanisms.
- **Issue the ancillary services manual.** A great deal of progress remains to be made for the MEM to be considered transparent with regard to the documentation of operating procedures.
- **Develop and implement reserve demand curves**, and prior to development and implementation of reserve demand curves, clarify the procedures and penalty

[93] The exact meaning of this metric as expressed by staff is unclear; it was understood by the Team to mean 70 percent of the data categories and components within categories specified in the rules are currently being released.

factors currently used by CENACE to relax reserve constraints. CENACE staff report the need to relax reserve constraints frequently. The market rules provide for the use of reserve demand curves to manage operating reserve shortages independently from the implementation of the Stage 2 market, so their development needn't be delayed until other features of the Stage 2 market are ready.

- **Develop and implement rules that distinguish more clearly the criteria allowing specific operator interventions.** The MEM spot market rules for operator intervention as currently documented are rather general, and unlike those of other advanced markets, they do not contain provisions that sufficiently circumscribe their use.
- **Explore the creation of more reserve areas, to properly model reserve constraints.**
- **Clarify the market rules for changing transmission outage schedules and posting outage schedule changes.** Transmission outage schedule data, classified as Reserved data, are posted only seven days in advance and with a high degree of aggregation. There is little information in the market rules regarding the procedures for changing transmission outage schedules and the policy for posting outage schedule changes.
- **Develop comprehensive CENACE performance metrics and issue periodic performance reports.**
- **Publish CCARM meeting schedules, agendas, and meeting materials.** Although CENACE in 2018 began to publish terse committee minutes, the meeting schedules, agendas, and meeting materials do not appear to be published.

## Summary of Recommendations

The following table presents a succinct summary of 36 recommendations based on the study's findings. As the table shows, many of the recommendations can be implemented, at least in part, without any changes to the market rules.

**Table 6. Summary of Recommendations**

| | Recommendation | Requires Rule Change? |
|---|---|---|
| Data Release Policy | | |
| 1 | Consolidate MEM data release policy | No |
| 2 | Publish a data dictionary for posted MEM data | No |
| 3 | Reclassify Reserved information as Public | Yes |
| 4 | For any Reserved information not reclassified as Public, modify policy to give transmission and distribution companies access | Yes |

| | Recommendation | Requires Rule Change? |
|---|---|---|
| 5 | For any Reserved information not reclassified as Public, streamline access for users with legitimate interest, and eliminate access fees | Yes |
| | Data Release Practice | |
| 6 | Publish all data required by policy[a] | No |
| 7 | Eliminate masking of data (e.g., participant or asset ID) where not required by the rules | No |
| 8 | Quality check published data files and correct errors | No |
| 9 | When data are missing, publish "missing value" codes instead of nothing at all | No |
| 10 | Use file naming conventions rather than idiosyncratic filenames that can't be anticipated | No |
| 11 | Resolve issues with CENACE website malfunctions | No |
| 12 | Ensure all data are machine readable (e.g., CSV), all text searchable | No |
| 13 | Provide online query tool for all hourly or daily data | No |
| 14 | Implement an API for client software to communicate with SIM | No |
| 15 | Decrease aggregation and masking of published data | In some cases[b] |
| 16 | Increase timeliness of data publication[c] | In some cases[d] |
| 17 | Publish unit commitment and generator outage data | In some cases |
| 18 | Post transmission outage schedules more than 7 days in advance | No |
| 19 | Publish power flow cases, list of contingencies, line and interface limits, and other data needed to simulate power system | No |
| 20 | Publish reports of binding constraints, along with associated congestion costs | No |
| 21 | Where rules require models to be posted, post models and complete input assumptions | No |
| 22 | Publish data needed by market participants to validate allocated settlement charges | No |
| 23 | Increase the timeliness and frequency with which the CRE releases reports by the MIM | No |

| | Recommendation | Requires Rule Change? |
|---|---|---|
| | Operational Transparency | |
| 24 | Issue the Ancillary Services Manual | Yes |
| 25 | Commission the MIM to conduct a comprehensive assessment of market efficiency, to be made public[e] | No |
| 26 | Implement a system to give the MIM access to all of the information it needs to regularly assess market efficiency and CENACE performance | No |
| 27 | Develop comprehensive CENACE performance metrics and issue periodic performance reports | No |
| 28 | Develop and implement rules that distinguish more clearly the criteria allowing specific operator interventions | Yes |
| 29 | Make improvements to market design and CENACE's systems to allow greater reliance on market mechanisms in dispatch and pricing | In some cases |
| 30 | Develop and implement reserve demand curves | Yes |
| 31 | Prior to development and implementation of reserve demand curves, clarify the procedures and penalty factors currently used by CENACE to relax reserve constraints | No |
| 32 | Explore the creation of more reserve areas, to properly model reserve constraints | No |
| 33 | Clarify the market rules for changing transmission outage schedules and posting outage schedule changes | Yes |
| 34 | Publish CCARM and CECMEM meeting schedules, agendas, and meeting materials; provide for attendance via web conference | No |
| 35 | Given current staffing constraints, CRE and CENACE should seek additional human resources to focus on the issues identified in this report | No |
| 36 | Establish a stakeholder process to address the issues and recommendations of this report | No |

[a] Specifically, the missing or incomplete one-third of Public data categories and two-thirds of Reserved data categories that should, according to policy be posted. See tables in Annex A for details.

[b] For some data categories, there is leeway to decrease aggregation within the rules. For others, the level of aggregation that the rules require is explicit.

[c] In cases where delays are not eliminated, consider posting more aggregated data sooner.

[d] For some data categories, there is leeway to decrease the delay, because the rules specify a maximum posting lag or none at all. For others, the required time lag is explicit.

[e] This work should include an assessment of the degree to which MEM spot market operation is consistent with the market rules, and an analysis of the frequency, causes, and costs of operator intervention and uplift. The MIM will need to be provided all of the information it needs to make such an assessment.

# Annex A. MEM Data Release Policy and Practice by Data Type

**Table A-1. MEM Public Information Release Policy and Practice**

| PUBLIC INFORMATION POLICY | | | | PUBLIC INFORMATION PRACTICE | | | |
|---|---|---|---|---|---|---|---|
| **Information** | **Timing of Release** | **Format** | **Policy Source** | **Comments** | **Observed Timing** | **Observed Format** | **Link** |
| Transmission System Data | | | | | | | |
| Pricing nodes catalog | Within 24 hours of an update of the physical network, aggregated nodes or distribution nodes | Online consultation or downloadable in CSV, PDF, or HTML format | SIM Manual | | Updated about every month | Downloadable in XLSX format | http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/NodosP.aspx |
| Thermal operating limits of transmission facilities | Not specified | RES/948/2015: Transmission or distribution co. online platform (format unspecified) | CRE Resolution No. RES/948/2015 | Not found.<br>Note: Classified as Reserved information in SIM Manual. The secure area of the SIM notes this information "will be available soon." | | | |
| Transmission and distribution outage schedules | RES/948/2015: Not specified<br>Outage Scheduling Manual: Annually by July 31, quarterly 65 days in advance, and (short notice outages) no later than 5 days in advance of month | RES/948/2015: CENACE online platform (format unspecified)<br>Outage Scheduling Manual: SIM (format unspecified) | CRE Resolution No. RES/948/2015<br>Outage Scheduling Manual | Not found.<br>Note: Classified as Reserved information in SIM Manual. Outage schedules posted in secure area of SIM extend no further than 7 days. | | | |
| Evaluation of prior quarter's outage schedule | Up to 10 days after end of quarter | Unspecified | Outage Scheduling Manual | Not found. | | | |

| PUBLIC INFORMATION POLICY | | | | PUBLIC INFORMATION PRACTICE | | | |
|---|---|---|---|---|---|---|---|
| **Information** | **Timing of Release** | **Format** | **Policy Source** | **Comments** | **Observed Timing** | **Observed Format** | **Link** |
| Absolute Available Transfer Capacity on external ties | No later than 09:00 the day before operation | Not specified | Manual of Imports and Exports | Information available only for the MDA | No later than 09:00 the day before operation | Downloadable in CSV, PDF or HTML format[a] | http://www.cenace.gob.mx/SIM/VISTA/REPORTES/CapacidadTransfer.aspx |
| Available Transfer Capacity (CTD) for 7-day time horizon | Daily | Not specified | Manual of Imports and Exports | Not found | | | |
| Notices and information about transmission Open Seasons in progress or completed | Not specified | CENACE online platform (format unspecified) | CRE Resolution No. RES/948/2015 | No Open Seasons have been conducted. | | | |
| Energy and Ancillary Services Requirements | | | | | | | |
| Load forecast | Hourly MDA load forecast (MWh): daily and immediately after calculation.<br>MTR load forecast (MWh): updated hourly<br>7-day load forecast: Not specified | Online graph, with hourly values. Downloadable file in CSV, PDF or HTML format. | SIM Manual<br>Forecast Manual | Aggregated to control area level.<br>7-day load forecast: Not found.<br>Prior to September 2018, data for before March 31, 2018 were not posted. Missing data have since been published | As of October 2018, lag has been reduced to 4 days | Downloadable in CSV, PDF or HTML format[a] | http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/DemandaPronosticada.aspx |

| PUBLIC INFORMATION POLICY | | | | PUBLIC INFORMATION PRACTICE | | | |
|---|---|---|---|---|---|---|---|
| **Information** | **Timing of Release** | **Format** | **Policy Source** | **Comments** | **Observed Timing** | **Observed Format** | **Link** |
| Ancillary services requirements | Total system requirements: Immediately after use in the MDA and MTR<br>Specific requirements by market participant: 7 days after use<br>Methodology for calculating requirements: immediately after the methodology is modified | Requirements: Downloadable file in CSV format<br>Methodology: Downloadable file in PDF format | SIM Manual | | Requirements: Every day for both MDA and MTR<br>Methodology: Only one version has been published, in 2016 | Requirements: Downloadable in CSV format[c]<br>Methodology: Downloadable in PDF format | http://www.cenace.gob.mx/SIM/VISTA/REPORTES/ServConexosSisMEM.aspx |
| Energy and Ancillary Services Schedules, Operation, and Pricing | | | | | | | |
| Evaluation of prior quarter's outage schedule | Up to 10 days after end of quarter | Unspecified | Outage Scheduling Manual | Not found. | | | |
| Times and locations where scheduled outages will not be authorized | As needed | Not specified | Outage Scheduling Manual | Not found.<br>Access to Outage Administration System (SIASAM) is restricted. Existence of data in SIASAM verified. | | | |
| Bids for the purchase and sale of energy and ancillary services in the MDA and MTR[e] | 60 days after the day of operation | Downloadable file in CSV format | SIM Manual; CRE Resolution No. RES/1491/2016 | | 60 days after the day of operation | Downloadable in CSV and HTML format[a] | http://www.cenace.gob.mx/SIM/VISTA/REPORTES/OfertasComVentSisMEM.aspx |

| PUBLIC INFORMATION POLICY | | | | PUBLIC INFORMATION PRACTICE | | | |
|---|---|---|---|---|---|---|---|
| **Information** | **Timing of Release** | **Format** | **Policy Source** | **Comments** | **Observed Timing** | **Observed Format** | **Link** |
| Statistics and forecasts of intermittent and firm generation aggregated by technology | Ongoing updates | Downloadable in CSV, PDF or HTML format | SIM Manual | Forecasts: Published only for intermittent generation<br>Statistics: Not found | Intermittent generation forecasts: Daily<br>Other: None | Intermittent generation forecasts: Downloadable in CSV or HTML format[a] | http://www.cenace.gob.mx/SIM/VISTA/REPORTES/PronosticosGen.aspx |
| Energy and ancillary services assigned quantities | MDA: Immediately, once MDA results are calculated (daily at 17:00 according to Energy Spot Market Manual)<br>MTR: Immediately, following calculation for each 15-minute interval | Downloadable in CSV, PDF, or HTML format | SIM Manual<br>Energy Spot Market Manual | MDA: Data are aggregated by market participant, with masked IDs<br>MTR: Not found | MDA: Daily | Downloadable in CSV format[a] | http://www.cenace.gob.mx/SIM/VISTA/REPORTES/CantidadesAsignadas.aspx |
| Nodal load distribution factors | Daily, immediately after calculation | Downloadable in CSV, PDF, or HTML format | SIM Manual | Not found<br>Note: Classified as Reserved information in SIM Manual. These are available in the secure area of the SIM | | | |
| Aggregated import and export quantities | Immediately after calculation | Downloadable file in CSV, PDF or HTML | SIM Manual | Not found | | | |
| Start-up and shut-down instructions for generation units | 7 days after each day of operation | Downloadable file in CSV, PDF or HTML format | SIM Manual | Includes times only, not dispatch levels | 7 days after each day of operation | Downloadable in CSV format[a] | http://www.cenace.gob.mx/SIM/VISTA/REPORTES/InstArrParo.aspx |

| PUBLIC INFORMATION POLICY | | | | PUBLIC INFORMATION PRACTICE | | | |
|---|---|---|---|---|---|---|---|
| **Information** | **Timing of Release** | **Format** | **Policy Source** | **Comments** | **Observed Timing** | **Observed Format** | **Link** |
| Transmission and distribution losses, technical and non-technical | 7 days after calculation | Downloadable file in CSV, PDF or HTML format | SIM Manual | Calculated using energy balance | 14 days after calculation | Downloadable in CSV, PDF or HTML format[b] | http://www.cenace.gob.mx/SIM/VISTA/REPORTES/PerdidasReales.aspx |
| Opportunity cost models for hydroelectric power | 7 days after use in the MDA and MTR | Downloadable in CSV, PDF, or HTML format | SIM Manual | Models and data: Not found<br>A weekly graph of hydro opportunity costs is included in weekly reports. | Graph of costs released the week after operation. | Weekly graph of opportunity costs, with no machine-readable values. | http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/SeguimientoSemanal.aspx |
| Actual demand (by energy balance) | Immediately after calculation, hourly | Online graph, with hourly values. Downloadable file in CSV, PDF, or HTML format | SIM Manual | Aggregated to the regional level | The information is lagging by about two weeks | Downloadable in CSV, PDF or HTML format[b] | http://www.cenace.gob.mx/SIM/VISTA/REPORTES/DemandaRealSist.aspx |
| Actual demand (by withdrawals) | Immediately after calculation, hourly | Online graph, with hourly values. Downloadable file in CSV, PDF, or HTML format | SIM Manual | Aggregated to the regional level | The information is lagging by about two weeks | Downloadable in CSV, PDF or HTML format[a] | http://www.cenace.gob.mx/SIM/VISTA/REPORTES/DemandaRealSist.aspx |
| Reservoir levels | Every Monday for previous week. | Downloadable in CSV, PDF, or HTML format | SIM Manual | No machine-readable values are published | Each Monday for previous week | Graph in PDF file | http://www.cenace.gob.mx/Docs/MercadoOperacion/EvolucionHidraulica/OperacionDePresas/2017/AGM_20171218.pdf |
| Expected reliability import and export quantities | No later than 09:00 the day before operation | Not specified | Manual of Imports and Exports | Needed for BCA only | Daily, generally 2 days before operation | Downloadable in CSV, PDF or HTML format[b] | http://www.cenace.gob.mx/SIM/VISTA/REPORTES/EstimDeficExcEnergBCA.aspx |
| Expected reliability import and export quantities for 7-day time horizon | Daily | Not specified | Manual of Imports and Exports | Not found | | | |

| PUBLIC INFORMATION POLICY | | | | PUBLIC INFORMATION PRACTICE | | | |
|---|---|---|---|---|---|---|---|
| **Information** | **Timing of Release** | **Format** | **Policy Source** | **Comments** | **Observed Timing** | **Observed Format** | **Link** |
| Notices regarding operational events that affect the provision of services | Not specified | CENACE and transmission or distribution co. electronic bulletins (format unspecified) | CRE Resolution No. RES/948/2015 | | As needed, sometimes several per day | Downloadable in PDF format; one file per event[d] | http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/NotasOperativas.aspx |
| Information in real time regarding congestion, at the nodal level | Not specified | CENACE online platform (format unspecified) | CRE Resolution No. RES/948/2015 | Not found. | | | |
| Daily volumes of electric energy, aggregated (by node, transmission / distribution area, or other) | Not specified | CENACE online platform (format unspecified) | CRE Resolution No. RES/948/2015 | | Daily | Downloadable in CSV format[a] | http://www.cenace.gob.mx/SIM/VISTA/REPORTES/CantidadesAsignadas.aspx |
| Energy and ancillary services prices for the MDA and the MTR; volumes allocated in the market | MDA: Immediately, once calculated (17:00, according to Energy Spot Market Manual)<br>MTR: Immediately, following calculation for each 15-minute interval | Downloadable file in CSV, PDF or HTML format | SIM Manual<br>Energy Spot Market Manual | | MDA: Published daily, typically between 15:00 and 20:00 for the SIN<br>MTR: Published daily but information lags by five days | Downloadable in CSV, PDF or HTML format[b] | http://www.cenace.gob.mx/SIM/VISTA/REPORTES/PreEnergiaSisMEM.aspx<br>http://www.cenace.gob.mx/SIM/VISTA/REPORTES/ServConexosSisMEM.aspx |
| Financial Transmission Rights Market | | | | | | | |
| DFT auctions and results | Immediately after calculation | Online consultation or downloadable file in CSV, PDF or HTML | SIM Manual | There haven't been any DFT auctions as of June 2018 | | | |

| PUBLIC INFORMATION POLICY | | | | PUBLIC INFORMATION PRACTICE | | | |
|---|---|---|---|---|---|---|---|
| **Information** | **Timing of Release** | **Format** | **Policy Source** | **Comments** | **Observed Timing** | **Observed Format** | **Link** |
| Registry of DFTs and grandfathered DFTs | Monthly | Downloadable file in CSV, PDF or HTML format | SIM Manual | | November of each year | Downloadable in CSV format per control area | http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/DTFLegados.aspx |
| Capacity Balancing Market | | | | | | | |
| Capacity obligations for each zone and market participant | According to SIM Manual: During first 4 weeks of year<br>According to Capacity Balancing Market Manual: 3 working days after calculation | Online consultation or downloadable file in CSV, PDF or HTML | SIM Manual<br>MBP Manual | Information is masked using pseudo-IDs that change periodically | During the first 4 weeks after the end of each year | Downloadable in CSV format | http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/ResultadosMercadoBalancePotencia.aspx |
| Capacity zone definitions for future year(s) | According to SIM Manual: 30 days before the beginning of year<br>According to Capacity Balancing Market Manual: By April 30 of year Y for capacity year Y+3 | Online consultation or downloadable file in CSV, PDF or HTML | SIM Manual<br>MBP Manual | Not found. Capacity zone definitions link in SIM is incorrect | | | |
| Net capacity price | During first 2 months of each year | Online consultation or downloadable file in CSV, PDF or HTML | SIM Manual | | During the first 2 months of each year | Downloadable in PDF format | http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/PrecioNetoPotencia.aspx |

| PUBLIC INFORMATION POLICY | | | | PUBLIC INFORMATION PRACTICE | | | |
|---|---|---|---|---|---|---|---|
| Information | Timing of Release | Format | Policy Source | Comments | Observed Timing | Observed Format | Link |
| Estimated capacity clearing price and capacity clearing price for each zone | 3 working days after calculation | Not specified | MBP Manual | Part of Executive Report | Yearly (Feb. 28, 2018 for 2017) | Downloadable in PDF format | http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/ResultadosMercadoBalancePotencia.aspx |
| Maximum capacity price for each zone | 3 working days after calculation | Not specified | MBP Manual | Also included in Executive Report | 2017 Results: Preliminary, Dec. 14, 2017 Final: Feb. 2, 2018 | Downloadable in PDF format | http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/PrecioNetoPotencia.aspx |
| Net capacity price for each zone | 3 working days after calculation | Not specified | MBP Manual | Also included in Executive Report | 2017 Results: Final: Feb. 28, 2018 | Downloadable in PDF format | http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/PrecioNetoPotencia.aspx |
| Information used to calculate maximum and net capacity prices | 3 working days after calculation | Not specified | MBP Manual | Part of Executive Report | Yearly (Feb. 28, 2018 for 2017) | Downloadable in PDF format | http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/ResultadosMercadoBalancePotencia.aspx |
| Quantity of efficient capacity acquired in each zone | 3 working days after calculation | Not specified | MBP Manual | Part of Executive Report | Yearly (Feb. 28, 2018 for 2017) | Downloadable in PDF format | http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/ResultadosMercadoBalancePotencia.aspx |
| Charge for capacity assurance (unit price) | 3 working days after calculation | Not specified | MBP Manual | Part of Executive Report | Yearly (Feb. 28, 2018 for 2017) | Downloadable in PDF format | http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/ResultadosMercadoBalancePotencia.aspx |
| Information used to calculate charge for capacity assurance | 3 working days after calculation | Not specified | MBP Manual | Part of Executive Report | Yearly (Feb. 28, 2018 for 2017) | Downloadable in PDF format | http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/ResultadosMercadoBalancePotencia.aspx |

| PUBLIC INFORMATION POLICY | | | | PUBLIC INFORMATION PRACTICE | | | |
|---|---|---|---|---|---|---|---|
| **Information** | **Timing of Release** | **Format** | **Policy Source** | **Comments** | **Observed Timing** | **Observed Format** | **Link** |
| Maximum Loss of Load Probability (PENS), Value of Lost Load (VENS), and Efficient PENS | Not specified | Not specified | MBP Manual | Part of Executive Report | Yearly (Feb. 28, 2018 for 2017) | Downloadable in PDF format | http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/ResultadosMercadoBalancePotencia.aspx |
| Forecasts and calculations of reserve margins | Reserve margin calculation: 30 days after end of year<br>Reserve margin forecast: 30 days (SIM Manual) or 3 months (CBM Manual) prior to beginning of forecast year | Online consultation or downloadable file in CSV, PDF or HTML | SIM Manual<br>MBP Manual | Published by SENER in 2017; by CENACE in 2018 | Yearly (Feb. 28, 2018 for 2017) | Downloadable in PDF format | http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/AcreditacionReqPotencia.aspx<br>http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/ResultadosMercadoBalancePotencia.aspx |
| Zonal percentage of capacity requirement delivered | Immediately after determined | Not specified | MBP Manual | Part of Executive Report | | | |
| Reference generation technologies, costs, and technical characteristics | Every 3 years, at least 4 months before operation of the capacity balancing market | Not specified | MBP Manual | | 2017 preliminary: Oct. 25, 2017; final: Jan. 11, 2018 | Downloadable in XLSX and PDF formats | http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/TecnologiaGeneracionReferencia.aspx |
| Report containing updates of reference generation costs | No later than 25 days before operation of the capacity market | Not specified | MBP Manual | No updates yet | | | |
| Information on system operating status | Immediately after calculation | Downloadable file in PDF or HTML format | SIM Manual | No machine-readable data. | Several times per day | Downloadable in PDF format[d] | http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/NotasOperativas.aspx |

| PUBLIC INFORMATION POLICY | | | | PUBLIC INFORMATION PRACTICE | | | |
|---|---|---|---|---|---|---|---|
| **Information** | **Timing of Release** | **Format** | **Policy Source** | **Comments** | **Observed Timing** | **Observed Format** | **Link** |
| Long- and Medium-Term Auctions | | | | | | | |
| Medium- and long-term auction results | Immediately after calculation | Downloadable file in CSV, PDF or HTML format | SIM Manual | | After calculation | Varies depending on type of document | http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/SubastasMP.aspx<br>http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/SubastasLP.aspx |
| Clean Energy Certificate Market | | | | | | | |
| CEL market results | Immediately after calculation | Downloadable file in CSV, PDF or HTML format | SIM Manual | CENACE CEL market not yet in operation; all non-auction transactions are bilateral | | | |
| Forecasting and Planning | | | | | | | |
| CENACE's forecasting methodologies and reports | Ongoing updates | Downloadable file in PDF format | SIM Manual | | Last publication was on April 23rd, 2018 | Downloadable in PDF format | http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/MetodologiasPronostico.aspx |
| Interconnection queues | Every 2 months | Downloadable in CSV or XLS format | SIM Manual | | Published every month | Downloadable in XLSX format | http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/ColasInterconexion.aspx |
| Forecast of aggregate generating capacity | Monthly | Downloadable file in CSV, PDF or HTML format. | SIM Manual | There is some information regarding the forecast of generating capacity, but it is only for a one-day period (not 7 as it is stated) | Daily | Downloadable in CSV format[a] | http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/DemandaPronosticada.aspx<br>http://www.cenace.gob.mx/SIM/VISTA/REPORTES/PronosticosGen.aspx |

| PUBLIC INFORMATION POLICY | | | | PUBLIC INFORMATION PRACTICE | | | |
|---|---|---|---|---|---|---|---|
| **Information** | **Timing of Release** | **Format** | **Policy Source** | **Comments** | **Observed Timing** | **Observed Format** | **Link** |
| Forecast error metrics | SIM Manual: Monthly<br>Forecasting Manual: Monthly, on the 25th day of the month | Downloadable file in PDF or HTML format | SIM Manual<br>Forecasting Manual | Not found | | | http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/MetricasErroresPron.aspx |
| General planning models | 7 days after a plan has been published | Downloadable in PDF format | SIM Manual | Data only, not models, are published | Annually; publication dates not listed | Downloadable in PDF and XLSX format | https://www.gob.mx/sener/acciones-y-programas/programa-de-desarrollo-del-sistema-electrico-nacional-33462<br>http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/ModeloGeneralPlaneacion.aspx |
| Other | | | | | | | |
| Reports on market performance required by the CRE | To be determined by the CRE | Downloadable in PDF format | SIM Manual | Weekly: high-level reports on the MEM are released.<br>Annual: As of June 2018, in-depth analysis by the MIM has been released only for 2016. | Weekly: weekly reports are published every Sunday with a two-week lag.<br>Annual: MIM report for 2016 released October 2017 | Downloadable in PDF format | http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/SeguimientoSemanal.aspx<br>http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/ReporteAnual.aspx |

| PUBLIC INFORMATION POLICY | | | | PUBLIC INFORMATION PRACTICE | | | |
|---|---|---|---|---|---|---|---|
| **Information** | **Timing of Release** | **Format** | **Policy Source** | **Comments** | **Observed Timing** | **Observed Format** | **Link** |
| Requests to modify Market Rules | Ongoing updates | Downloadable file in PDF format | SIM Manual | Activities of the Market Rules Analysis Advisory Committee (CCARM-MEM) posted on CENACE website.<br>There is no portal for requests to be submitted, and no requests have been published; unable to verify if any requests exist. | N/A | N/A | http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/CCARM_MEM.aspx |
| Training course catalog | Updated as needed | Online consultation | SIM Manual | Training materials not included | N/A | Online consultation | http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/Capacitacion.aspx |
| General conditions for the provision of transmission and distribution service (CGPS) | Not specified | Transmission or distribution co. online platform (format unspecified) | CRE Resolution No. RES/948/2015 | Note: CRE is the one in charge of publishing these. They are part of the DACG of open access and provision of service of the RNT and distribution networks | Published in February 16th, 2016 | Downloadable in PDF format | http://www.cenace.gob.mx/Docs/MarcoRegulatorio/AcuerdosCRE/Resoluci%C3%B3n%20948%202015%20Disposiciones%20Acceso%20Abierto%20y%20Prest.%20Serv.%20RNT%20y%20RGDs%20DOF%202016%2002%2016.pdf |
| CRE-approved maximum tariff rates and model contracts for provision of services | Not specified | Transmission or distribution co. online platform (format unspecified) | CRE Resolution No. RES/948/2015 | | | Downloadable in PDF format<br>Detail on components in XLSX format | http://cfe.gob.mx<br>https://www.gob.mx/cre/documentos/memoria-de-calculo-de-las-tarifas-finales-que-aplicaran-a-la-eps-cfe-suministrador-de-servicios-basicos-durante-diciembre-de-2017 |

| PUBLIC INFORMATION POLICY | | | | PUBLIC INFORMATION PRACTICE | | | |
|---|---|---|---|---|---|---|---|
| **Information** | **Timing of Release** | **Format** | **Policy Source** | **Comments** | **Observed Timing** | **Observed Format** | **Link** |
| Procedures, criteria, model contracts, and formats for interconnection and connection requests | Not specified | Transmission or distribution co. online platform (format unspecified) | CRE Resolution No. RES/948/2015 | | Published once (June 2, 2015) | Downloadable in PDF format | http://www.cenace.gob.mx/Docs/MarcoRegulatorio/Criterios%20de%20Interconexi%C3%B3n%20de%20Centrales%20El%C3%A9ctricas%20y%20Conexi%C3%B3n%20de%20Centros%20de%20Carga%20DOF%202015%2006%2002.pdf |
| Register of interconnection / connection requests that have been fulfilled, are being processed, or have not been approved | Not specified | Transmission or distribution co. online platform (format unspecified) | CRE Resolution No. RES/948/2015 | Available on the SIM | Published every month or two, between several days and 2 months after effective month | Downloadable in XLSX format | http://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/ColasInterconexion.aspx |
| Information on bilateral contracts | Not specified | Not specified | Manual of Bilateral Transactions | Not found | | | |
| Agendas of the market rules advisory committees | Not specified | Not specified | Market Bases | Not found. (A schedule of meetings did not appear to be available either). | | | |

| PUBLIC INFORMATION POLICY | | | | PUBLIC INFORMATION PRACTICE | | | |
|---|---|---|---|---|---|---|---|
| **Information** | **Timing of Release** | **Format** | **Policy Source** | **Comments** | **Observed Timing** | **Observed Format** | **Link** |
| Minutes from CENACE's board of directors and from market rules advisory committees | Not specified | Not specified | Market Bases | During the course of this assessment, CENACE began posting the committees' minutes. Without a schedule of meetings, it is impossible to determine whether all minutes have been published. | Monthly or less frequently, depending on the committee | Non-searchable image PDF | https://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/CCARM_MEM.aspx<br>https://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/CCARMLegados.aspx<br>https://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/CCARM_OSEN.aspx<br>https://www.cenace.gob.mx/Paginas/Publicas/MercadoOperacion/CCARM_per.aspx |

[a] Files available for download contain data for a single operating day; files may only be downloaded one file at a time.
[b] Files available for download contain data for a single operating day; daily files may only be downloaded in bulk (single zip archive) for user-specified date range.
[c] Files available for download contain data for either a single operating day or about two weeks; files may only be downloaded one file at a time.
[d] Files available for download contain data for a single event; files may only be downloaded one file at a time.
[e] The terms for the release of bid data are further detailed in CRE Resolution No. RES/1491/2016, issued December 6, 2016, and discussed in the body of this report.

### Table A-2. MEM Reserved Information Release Policy

| RESERVED INFORMATION POLICY | | | | RESERVED INFORMATION PRACTICE | |
|---|---|---|---|---|---|
| **Information** | **Timing of Release** | **Format** | **Policy Source** | **Reported by CENACE** | **Observed** |
| Accessible by market participants and external trusted users | | | | | |
| Complete models of the MDA and MTR, including the components used to calculate MEM prices, including power flow files, transmission constraints, distribution factors by bus for each interval, and mapping of nodes to physical assets | 7 days after calculation | Downloadable in CSV, XLS or RAW format | Market Bases<br>SIM Manual | MDA model posted as specified in SIM Manual | The posted "commercial models" contain lists of nodes and the distribution factors for load zones, but there is nothing close to a complete model available (e.g., power flow files are not included).<br>Nothing for the MTR is posted. |
| Complete models to calculate start-up and shut-down instructions (unit commitment model) | 7 days after calculation | Downloadable in CSV or XLS format | Market Bases<br>SIM Manual | Not released. | Not released. |
| Complete models for DFT allocation (including grandfathered DFTs and DFTs for network expansion) | Immediately after completion | Downloadable in CSV or XLS format | Market Bases<br>SIM Manual | The network and commercial models used for the initial DFT allocation are published. | CENACE publishes lists of nodes and branches used in the models. CENACE has not published the inputs to the calculation (assignable DFTs) or the structure of the optimization problem as implemented. |
| Complete models used in the DFT auctions | 7 days after operation | Downloadable in CSV or XLS format | Market Bases<br>SIM Manual | Waiting for the first auction to take place | |
| Complete models used in the capacity balancing market | 7 days after operation | Downloadable in CSV or XLS format | Market Bases<br>SIM Manual | All of the inputs for the models of the capacity balancing market model are published in the public area of the SIM | The complete models are not posted; the result of the capacity market can be replicated by third party observers with considerable effort. |
| Complete models used in the determination of capacity zones | 7 days after definition | Downloadable in CSV or XLS format | Market Bases<br>SIM Manual | The capacity zones are defined as [each of the three] interconnected systems | Models not found.<br>Capacity zone definitions link in SIM is incorrect |
| Penalties for non-compliance with real-time dispatch instructions | Daily | Downloadable in CSV, PDF or HTML format | SIM Manual | Posted daily in accordance with the settlement processes. | |

| RESERVED INFORMATION POLICY | | | | RESERVED INFORMATION PRACTICE | |
|---|---|---|---|---|---|
| **Information** | **Timing of Release** | **Format** | **Policy Source** | **Reported by CENACE** | **Observed** |
| Revenue sufficiency guarantee payments to generators | Daily | Downloadable in CSV, PDF or HTML format | SIM Manual | Posted daily in accordance with the settlement processes. | No information provided on the causes of the RSG cost. |
| Congestion and marginal losses revenue excesses and shortfalls | Daily | Downloadable in CSV, PDF or HTML format | SIM Manual | Posted daily in accordance with the settlement processes. | |
| Topology of the National Electric System (Model of the Physical Network)[a] | Each time the physical network model is updated | Downloadable file in a database format compatible with common simulation software for power systems | SIM Manual | 7 days after each operational day, the MDA network model is posted. | The posted "commercial models" contain lists of nodes and the distribution factors for load zones, but there is nothing close to a complete model available (e.g., power flow files are not included).<br>Nothing on the MTR is posted. |
| Detailed planning models | Bases: 7 days after filing of the relevant programs | Downloadable in PDF format | Market Bases<br>SIM Manual | Planning information with a 15-year timeframe is published annually. | |
| Accessible by market participants, external trusted users, transmission and distribution companies | | | | | |
| Topology of the National Electric System (Model of the Physical Network)[a] | Each time the physical network model is updated | Downloadable file in a database format compatible with common simulation software for power systems | Market Bases | 7 days after each operational day, the MDA network model is published. | The posted "commercial models" contain lists of nodes and the distribution factors for load zones, but there is nothing close to a complete model available (e.g., power flow files are not included).<br>Nothing on the MTR is posted. |
| Capacity and availability of the power plants, transmission facilities, and distribution facilities modeled in the MEM | 7 days after calculation | Downloadable in CSV, PDF or HTML format | SIM Manual | Still under development. Expecting to release it October 2018. | Not available. |
| Methodology to determine transmission operating limits | Ongoing update | Downloadable in PDF format | Market Bases<br>SIM Manual | The methodology to calculate the transmission constraints has not yet been published. | Not available. |

| RESERVED INFORMATION POLICY | | | | RESERVED INFORMATION PRACTICE | |
|---|---|---|---|---|---|
| Information | Timing of Release | Format | Policy Source | Reported by CENACE | Observed |
| Reports of transmission limits used in the spot markets | 7 days after calculation | Downloadable in PDF format | Market Bases<br>SIM Manual | Posted daily as part of the physical network model. | CENACE publishes a list of flowgate limits. Permanent limits contain a general description of the cause of the limits, but in very general terms. Temporary limits usually have no explanation whatsoever. |
| Resources designated for transmission system support | Daily | Downloadable in CSV, PDF or HTML format | SIM Manual | Still under development. Expecting to release it December 2018. | Not available. |
| List of contingencies considered in the transmission reliability evaluation | 7 days after calculation | Downloadable in CSV, PDF or HTML format | Market Bases<br>SIM Manual | Posted daily as specified in SIM Manual. | Although flowgate limits are posted, a list of monitored contingencies does not appear to be included. |
| Regions and periods not authorized for schedule of generation or transmission outages | Immediately after calculation | Downloadable in CSV, PDF or HTML format | SIM Manual | Yearly and triennial schedules are published. | |
| Scheduled generation and transmission outages, disaggregated by technology and region | Daily update, after the respective day of operation | Downloadable in CSV, PDF or HTML format | Market Bases | Posted daily as per SIM Manual, at close of MDA | Scheduled outages more than 7 days in the future are not included |
| Forced generation and transmission outages, disaggregated by technology and region | Daily update, after the day of operation | Downloadable in CSV, PDF or HTML format | SIM Manual | Published daily as specified in SIM Manual. | |

[a] The MEM rules are inconsistent regarding access to this information. According to the Market Bases (15.2.2), the topology of the National Electric System will be made available to market participants, external trusted users, and transmission and distribution companies; according to the SIM Manual (5.3.1), the information will be made available only to will be made available to market participants and external trusted users.

### Table A-3. MEM Confidential Information Release Policy

| Information | Timing of Release | Format |
|---|---|---|
| Accessible by information owner | | |
| Bids for the purchase and sale of energy and ancillary services | Ongoing update | Online consultation or downloadable in CSV, PDF or HTML format |
| Bids for the purchase and sale in the capacity balancing market | Ongoing update | Online consultation or downloadable in CSV, PDF or HTML format |
| Bids for the purchase and sale of CELs. | Ongoing update | Online consultation or downloadable in CSV, PDF or HTML format |
| Bids for purchase and sale in the medium- and long-term auctions | Ongoing update | Online consultation or downloadable in CSV, PDF or HTML format |
| Bids for the purchase of DFTs | Immediately after update by Market Participant | Online consultation or downloadable in CSV, PDF or HTML format |
| Unit commitments of power plant units and demand response in the MDA | Immediately after closing of the MDA | Online consultation or downloadable in CSV, PDF or HTML format |
| Scheduled MDA imports/exports | Immediately after closing of the MDA | Online consultation or downloadable in CSV, PDF or HTML format |
| Base points for economic dispatch and instructions for the dispatch of reservoirs | Immediately after calculation in each MTR interval | Spreadsheets, online consultation or downloadable daily |
| Ancillary service obligation | Immediately after running the MDA. | Online consultation or downloadable in CSV, PDF or HTML format |
| Designation as a system support resource | Before the day of operation | Online consultation or downloadable in CSV, PDF or HTML format |
| Estimated consumption of natural gas by generation | Immediately after natural gas administrators are notified | Online consultation or downloadable in CSV, PDF or HTML format |
| Interconnection request status | Ongoing update | Online consultation or downloadable in CSV, PDF or HTML format |
| Completed connection and interconnection studies | 7 days after calculation. | Online consultation or downloadable in CSV, PDF or HTML format |
| Market settlement calculations and invoices | Immediately after confirmation | Online consultation or downloadable in CSV, PDF HTML or XML format |

| Information | Timing of Release | Format |
|---|---|---|
| Processing status for accreditation of market participants | Immediately after update | Online consultation |
| Fixed asset reports | Immediately after update | Online consultation or downloadable in CSV, PDF or HTML format |
| Accessible by transmission and distribution companies | | |
| Assets registered by transmission and distribution companies | Immediately after update in the SIM | Online consultation or downloadable file in CSV format |
| Transmission and distribution outage requests | Ongoing updates | Online text file |