



New Technologies: Blockchain

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Comisionado
Comisión Reguladora de Energía

Leveraging digitalization – Blockchain meets Energy

November 11, 2018. Mexico City



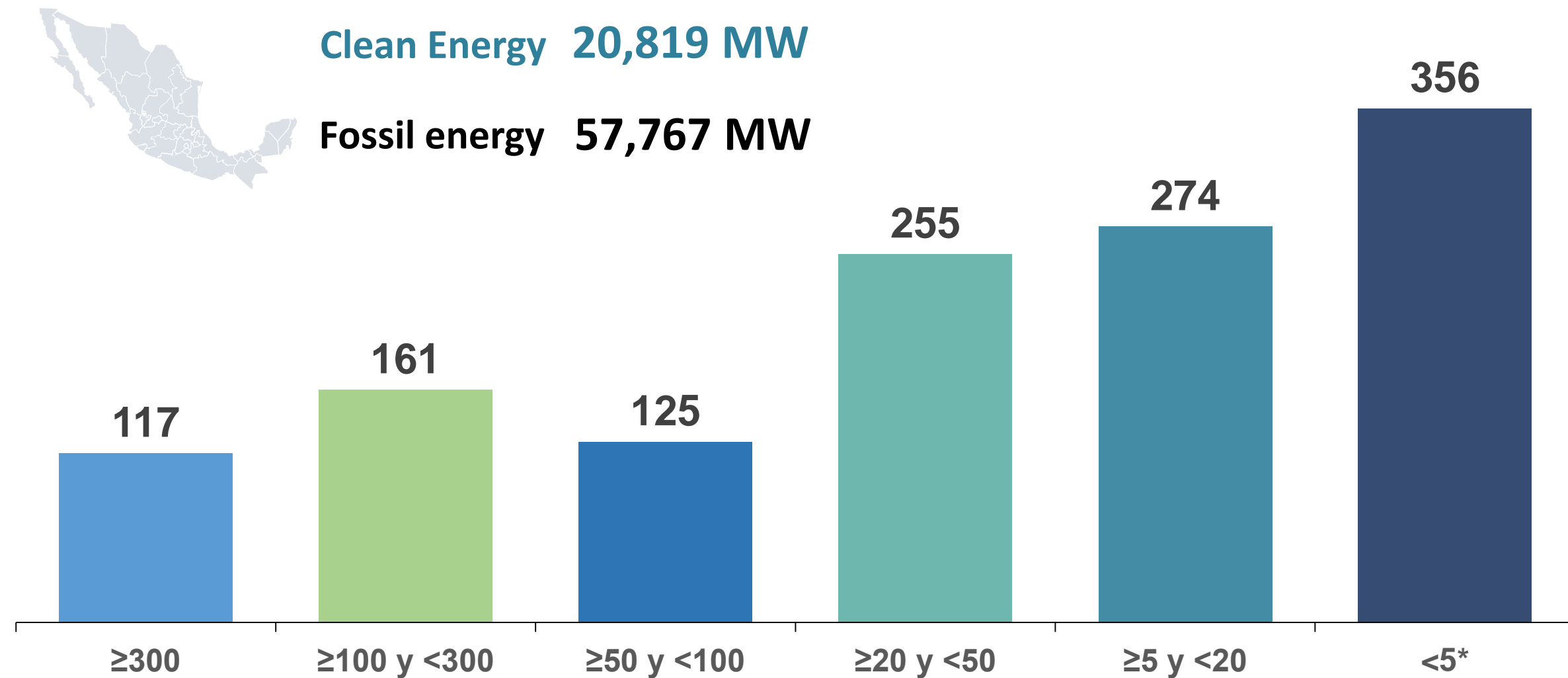
**Las opiniones vertidas son a título personal y pueden no representar la posición de la Comisión Reguladora de Energía y su Órgano de Gobierno*

Update

Resumen Corto de Resultados Hasta el Momento

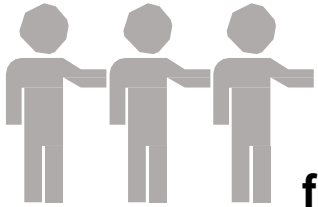
Power Generation

Generation plants operating with permit, by range(MW)

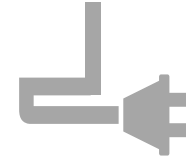


Access to Networks & New Regulatory and Contractual Scheme for Transmission Expansions

Access, Pricing, and Expansion Rules Enabling Clean Growth



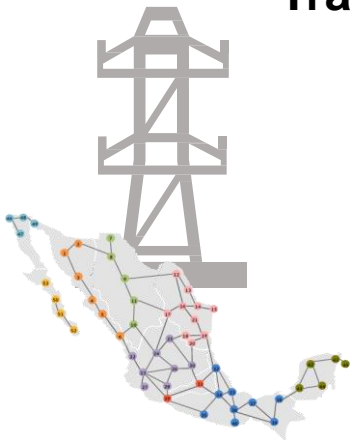
**Open Access and Service Terms
for Transmission and Distribution¹**



**Rules & Characteristics for
Interconnection Process²**

Transmission Rates³

Income required
2,369 MUSD



Distribution Rates⁴

Income required
5,129 MUSD



**System Operator
Charges: Cenace⁵**

Income required
140 MUSD



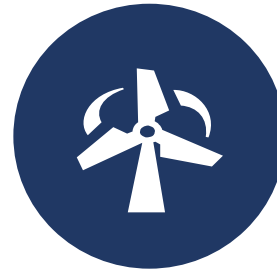
Grid Code: Includes Modern Interconnection Requirement for Variable Renewables



Operation



Planning



Generation



Load Center

Wholesale Markets

Market Design: Different Markets and Products



 I. Short Term Energy & Reserve Markets

 II. Short Term Capacity Market

 III. Medium Term Energy Markets

 IV. Clean Energy Certificates Market

 V. Long-term markets

Short-term Market

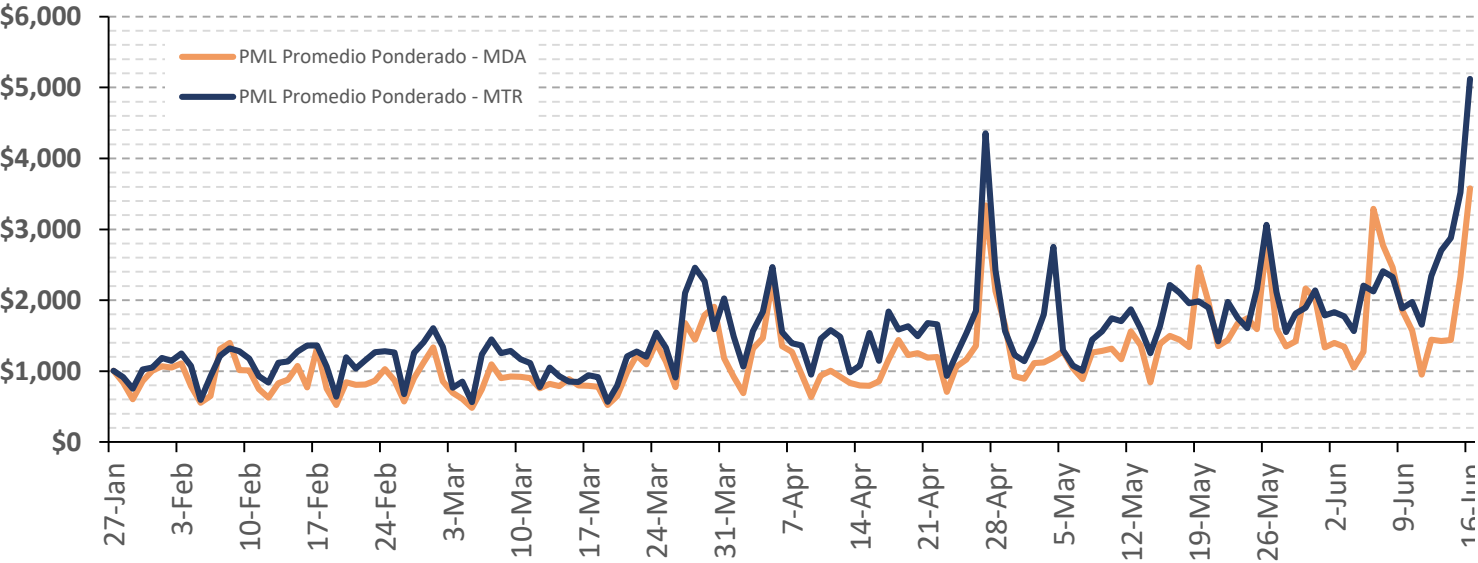
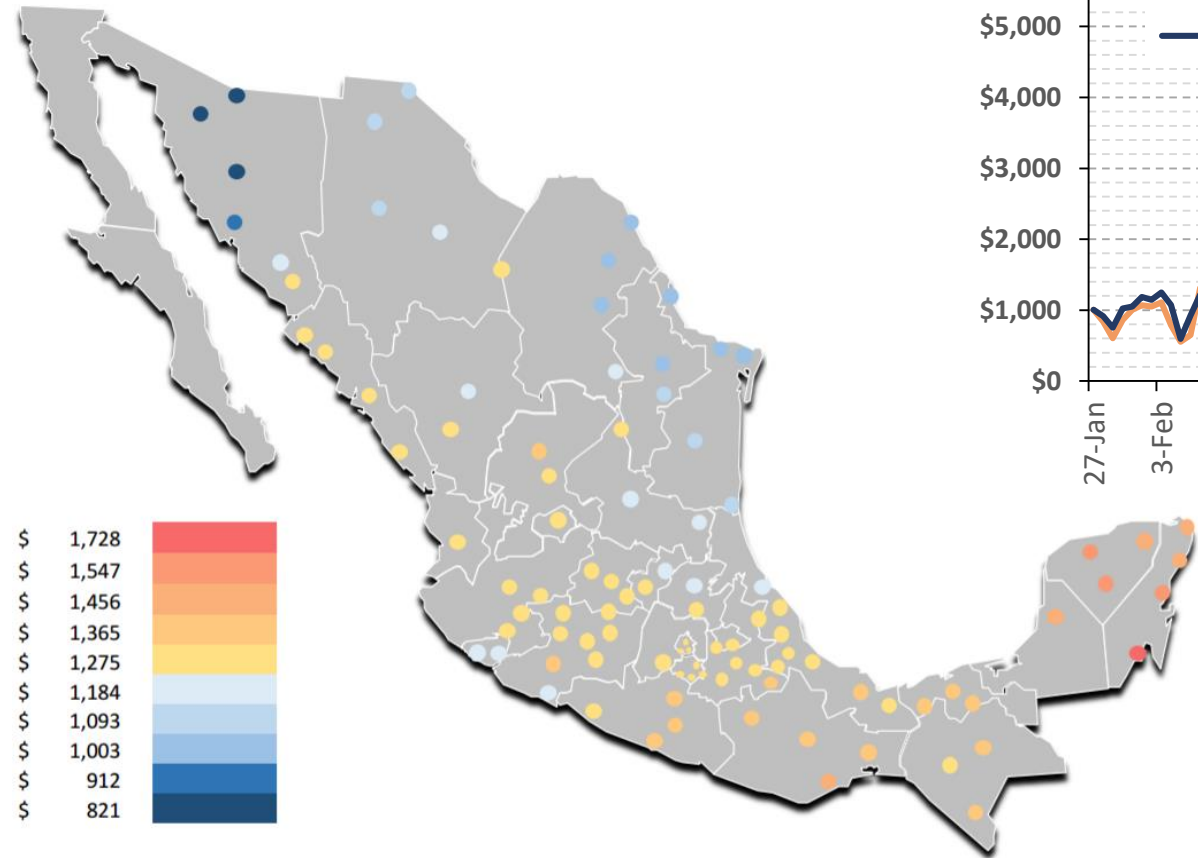
Power and Capacity

Market Nodal Prices



Local Marginal Price Day Ahead Market Vs Real Time Market, National Interconnected System

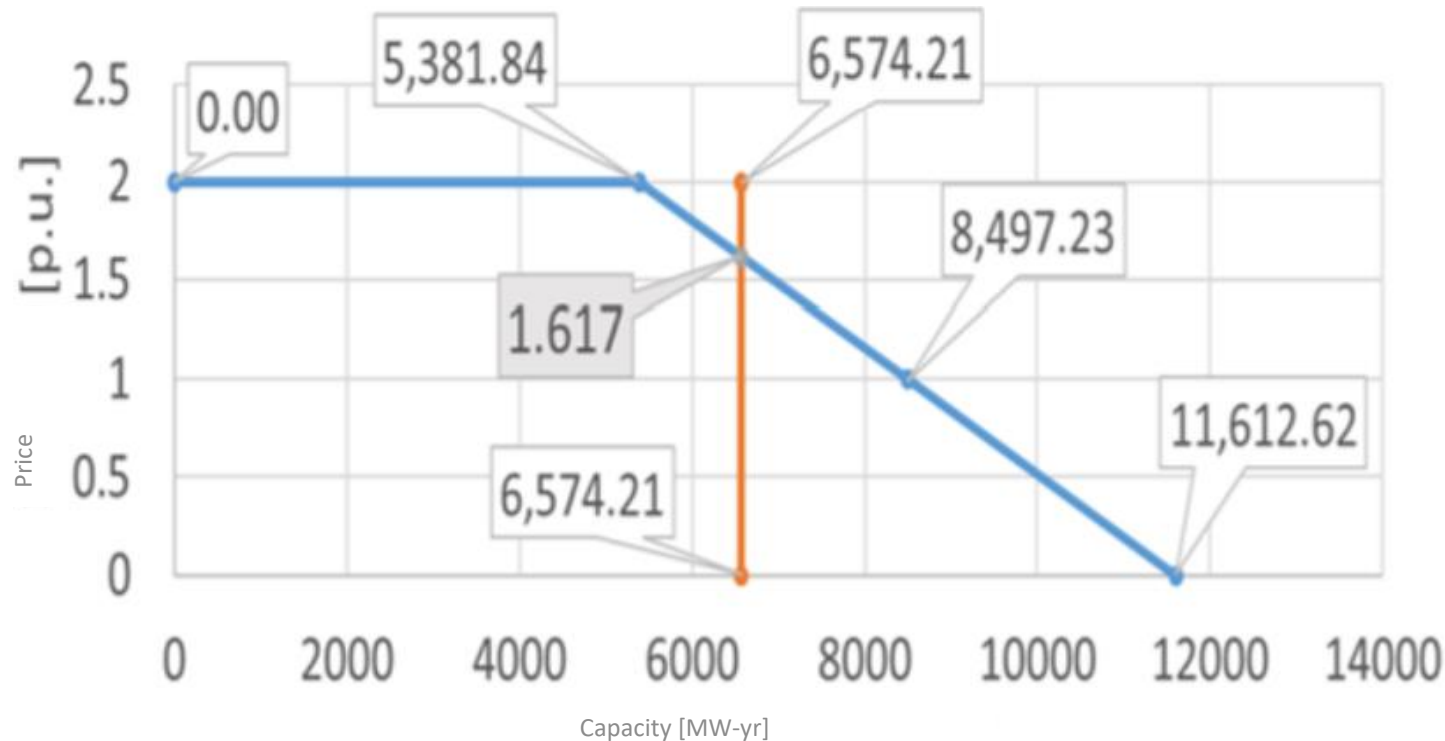
Average weekly nodal price by node



Capacity Prices: Short-Term Ex-Post “Potencia” Market , 2017



Capacity demand curve of National Interconnected System (SIN)



Contracted Capacity
6,574 MW

Price
38.1 kUSD/MW-yr

Participation in the Short-term Markets



Generators

 **32**



Energía Azteca X,
S.A. de C.V.

Grupo Energético
Elan, S.A.P.I. de
C.V.



Qualified Retailer

 **15**



Basic service retailer

 **1**



Non-retailer marketer

 **7**



Qualified user



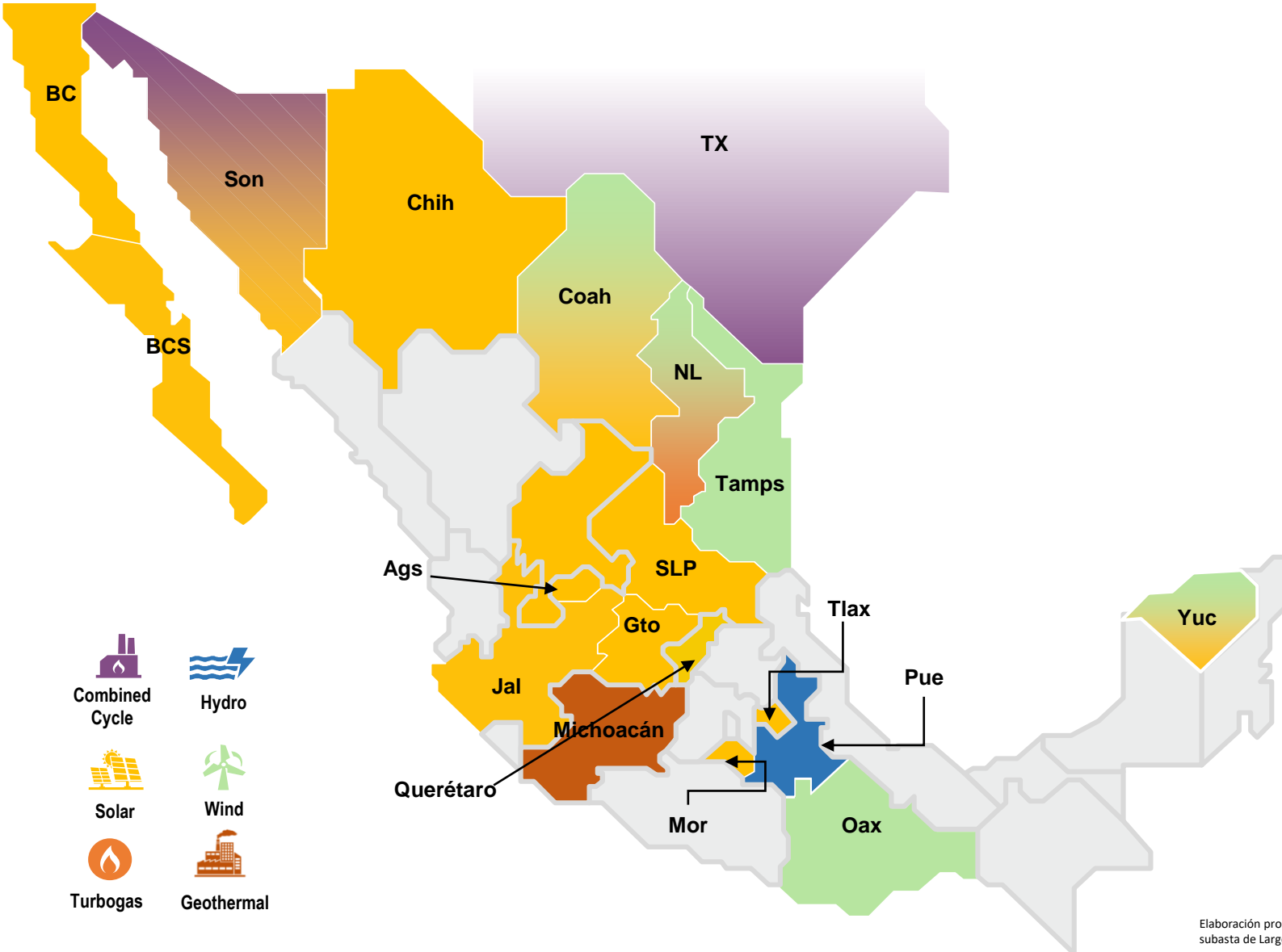
- 12 qualified users representing 74 load centers.

Potential of **4,274** load centers with demand equal or greater than 1 MW.

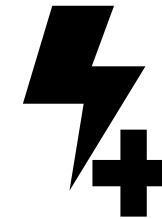
Long-Term Auctions

Accelerating Clean Energy Deployment

Long Term Auctions are Accelerating Clean Energy Integration at World Record Low Prices



8.9 BUSD
of investment



Increase of
7.6 GW

**Last
Price**
(USD/MWh+CEL*)

Solar \$21.34

Wind \$18.48

Elaboración propia. *Promedio ponderado de ofertas de paquetes que únicamente ofrecieron Energía y CELs. ** El dato de geotérmica corresponde a "3ª subasta de Largo Plazo", PwC, 2016. Tipo de cambio (MX/USD) utilizado por SLP: 1ra 17.3192, 2da 20.17, 3ra 19.185

... with a Whole New Ecosystem of Clean Energy Companies Deploying Projects



1st Auction / 11 companies



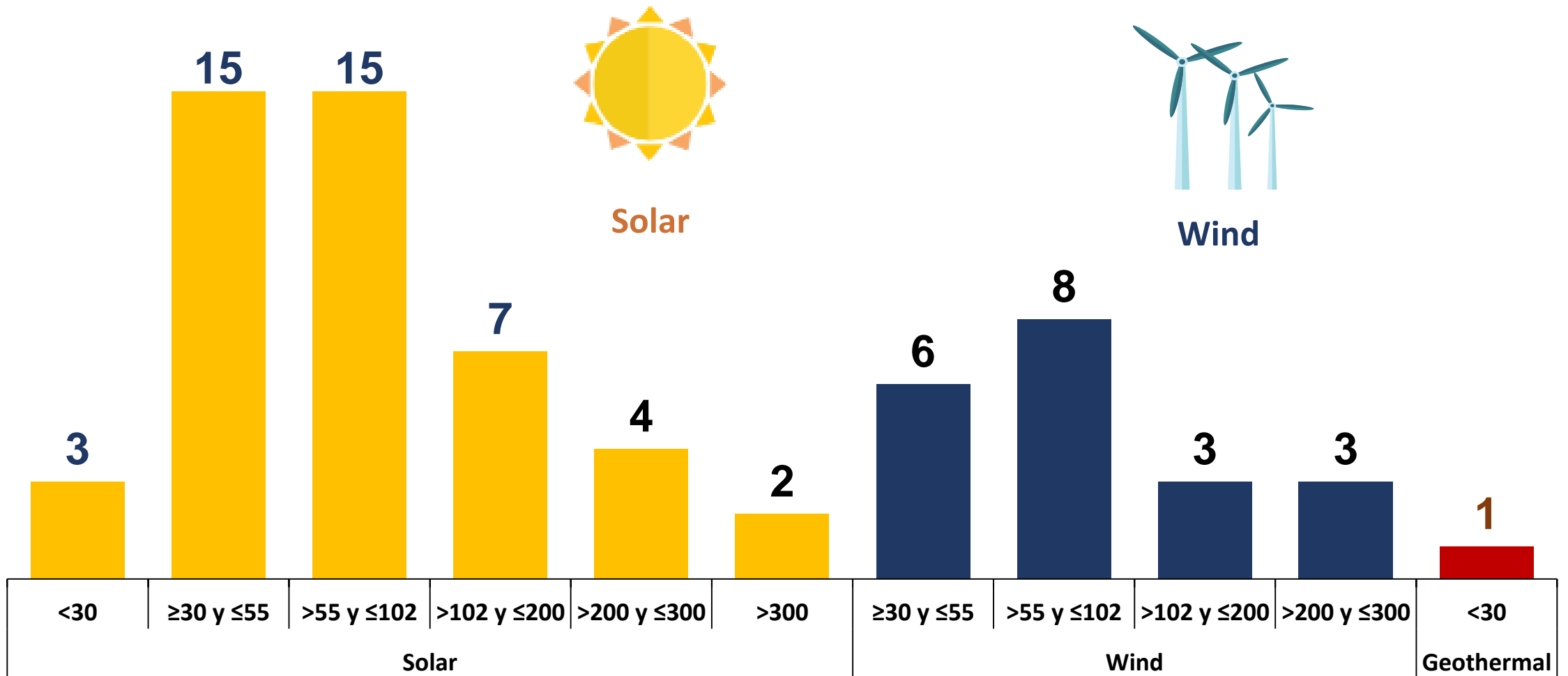
2nd Auction / 24 companies



3rd Auction / 8 companies



... at project scales that are decentralizing generation at the wholesale level



... creating already 25k+ jobs in the solar and wind industry and with stronger projections



206k Additional New Jobs by 2032

Capacity increase by 2032

Wind  11.4 GW

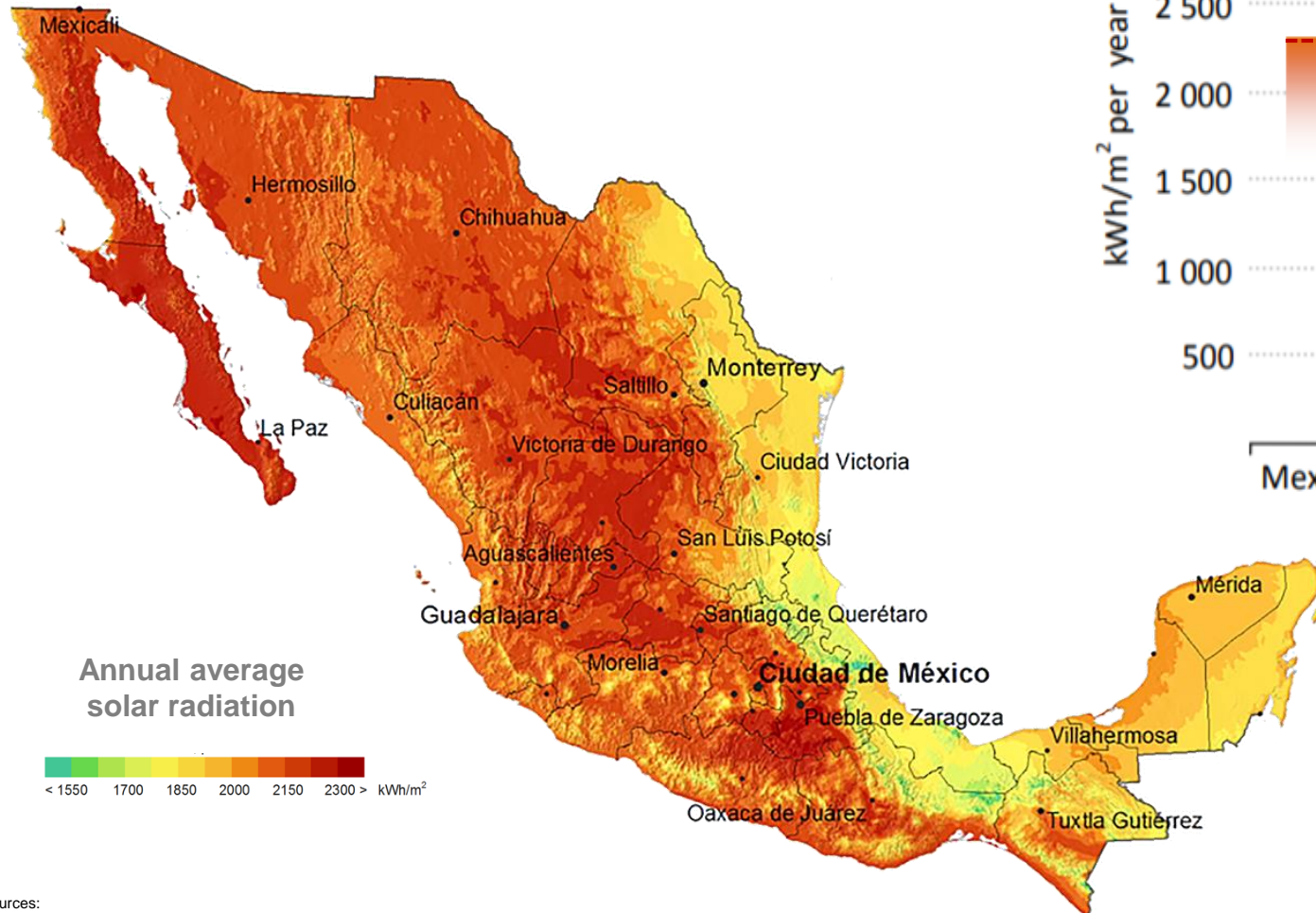
Solar  14.8 GW

Others clean energy 10.8 GW

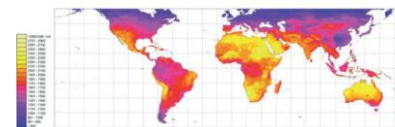
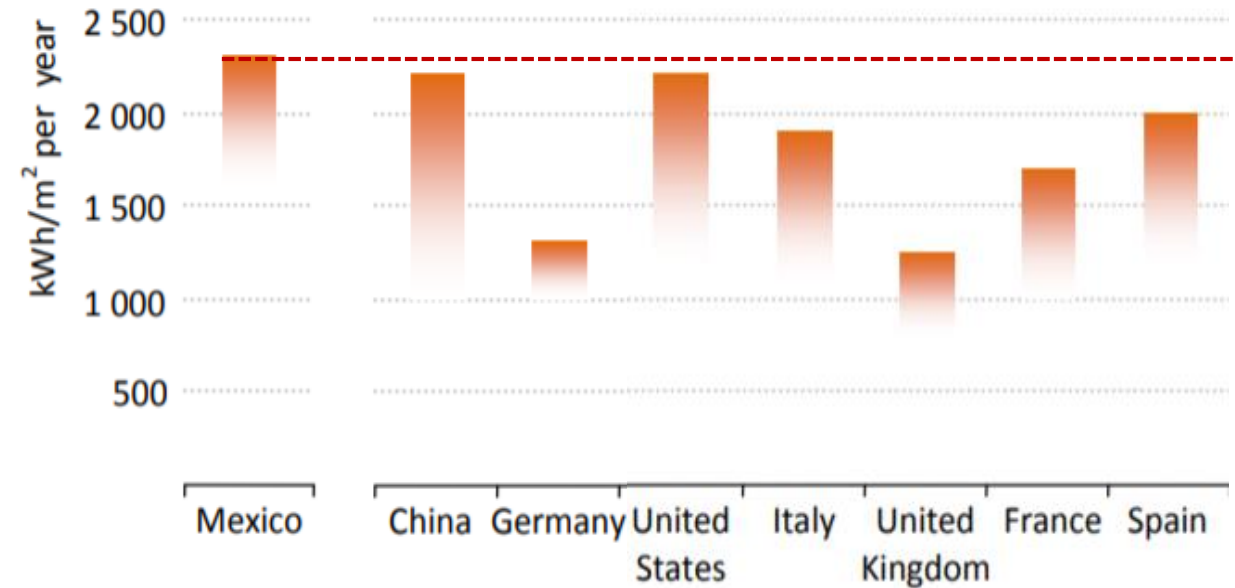


Distributed Generation

Great Solar Radiation Leads Great Solar Prices



Average solar irradiance range in selected countries

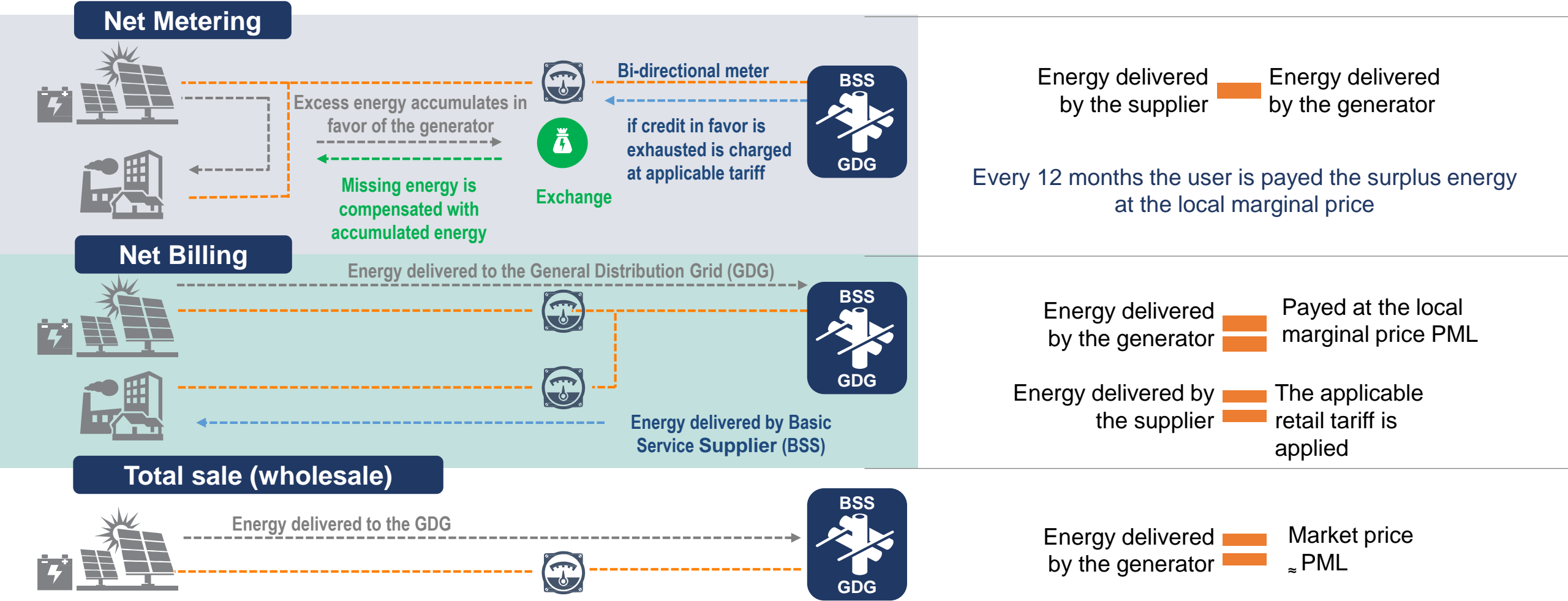


Distributed Generation Regulation in Mexico: Removing Barriers to Consumer Choice With Adequate & Easy to Use Instruments



Three different schemes

Billing



*Users can choose the scheme
The suggested recruitment period is one year

E-platform to follow consumers request for DG interconnection



Consulta la integración de la generación distribuida cerca de tu domicilio

Consulta por domicilio

Consultar

Consulta el estatus de una solicitud

Número de solicitud

Consultar

Integración de la generación distribuida a los circuitos de media tensión de las Redes Generales de Distribución

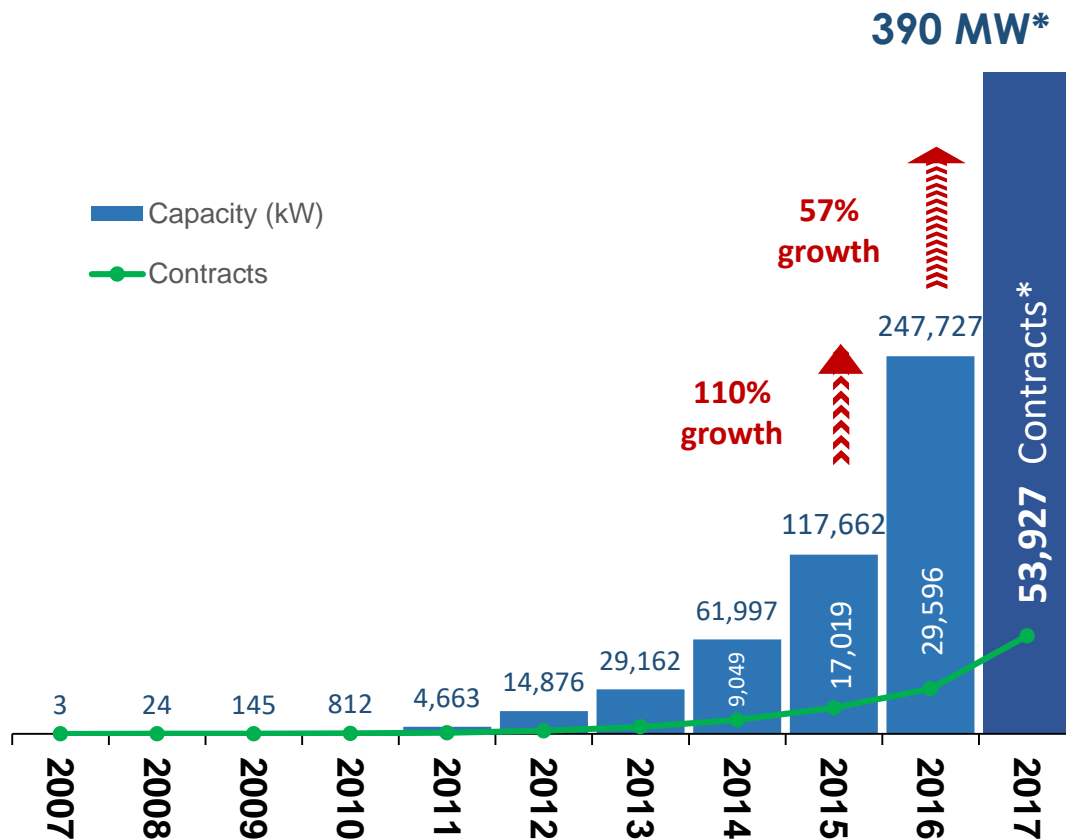
En esta sección podrás consultar que circuitos de distribución de media tensión se encuentran cerca de tu domicilio y conocer su capacidad de integración de Centrales Eléctricas de Generación Distribuida. Con base en la evaluación de las características operativas actuales de los circuitos de distribución se recomienda un límite para la capacidad de integración sin afectar los parámetros de eficiencia, Calidad, Confiabilidad, Continuidad, Seguridad y sustentabilidad del Sistema Eléctrico Nacional, dicha capacidad no está garantizada y puede variar con el tiempo, dependiendo de las características operativas del circuito, el crecimiento de la demanda y el incremento de centrales eléctricas interconectadas al mismo. Por lo que toda solicitud de interconexión requiere de una revisión de la infraestructura existente.



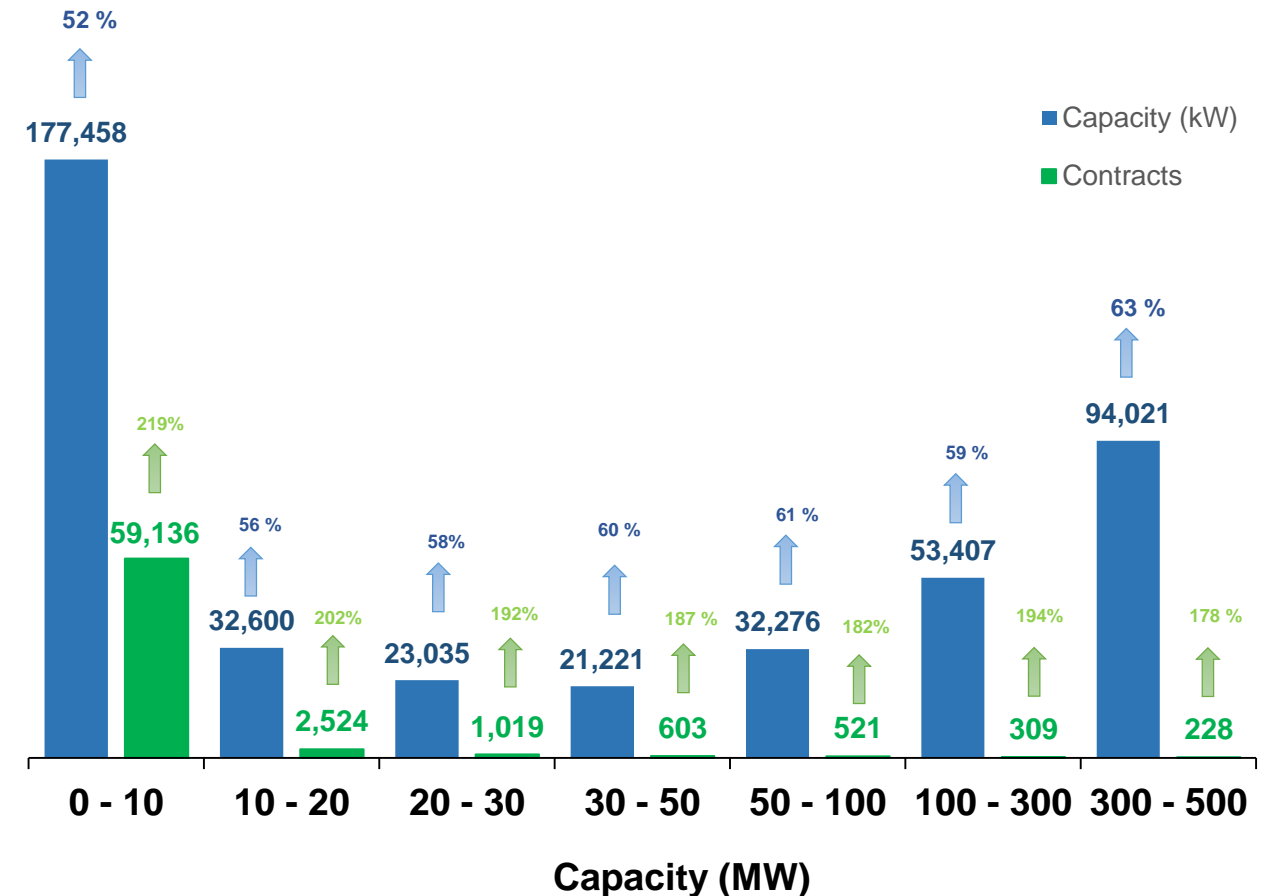
DG installations growing exponentially, yet a small share in overall mix (0.57% of installed capacity 2017)



Installed Capacity & Number of Installations



Number of Contracts by capacity range

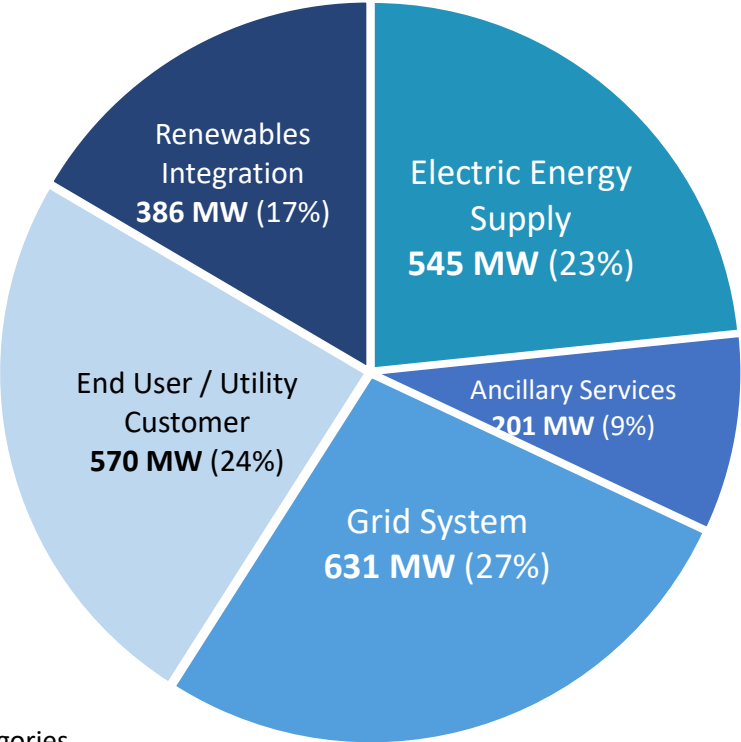


Perspectives

Economic Viability of Large Scale Storage in Mexico

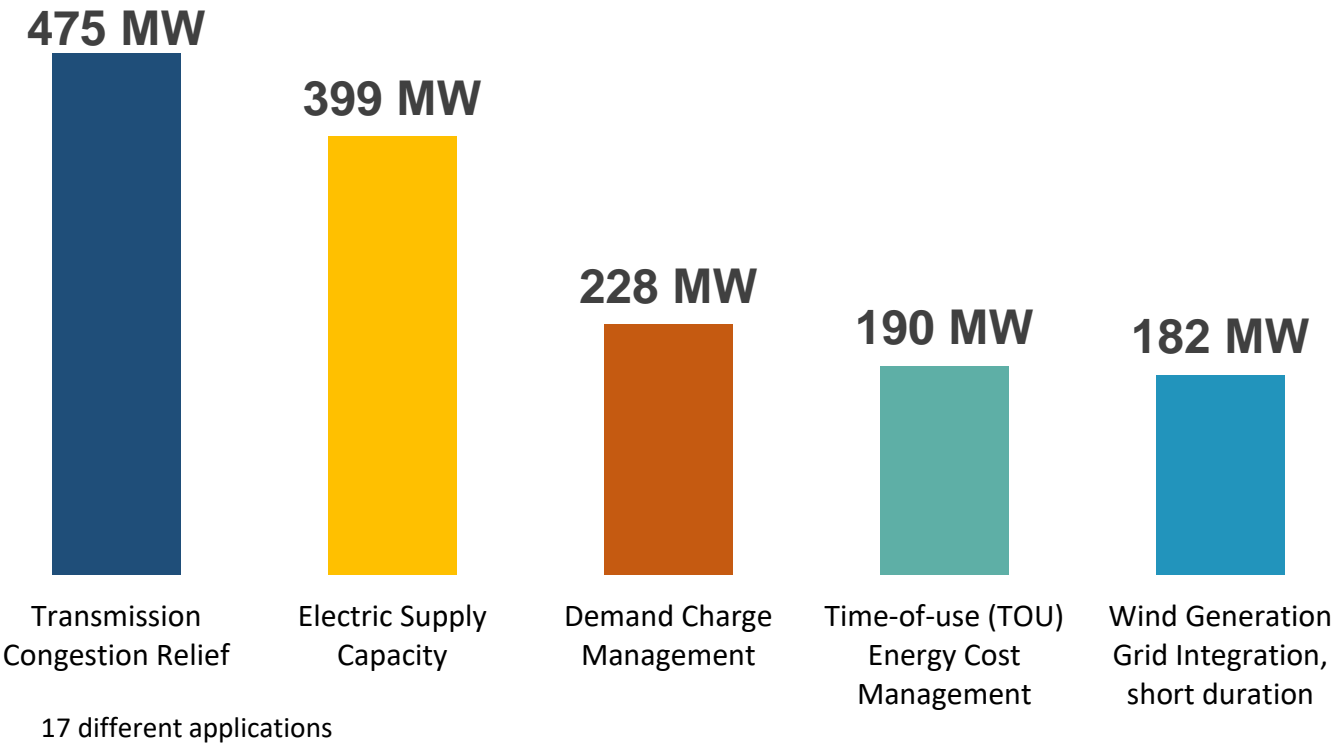


Market potential



5 categories

Applications with best potential



10 years ahead market size:



2,333 MW



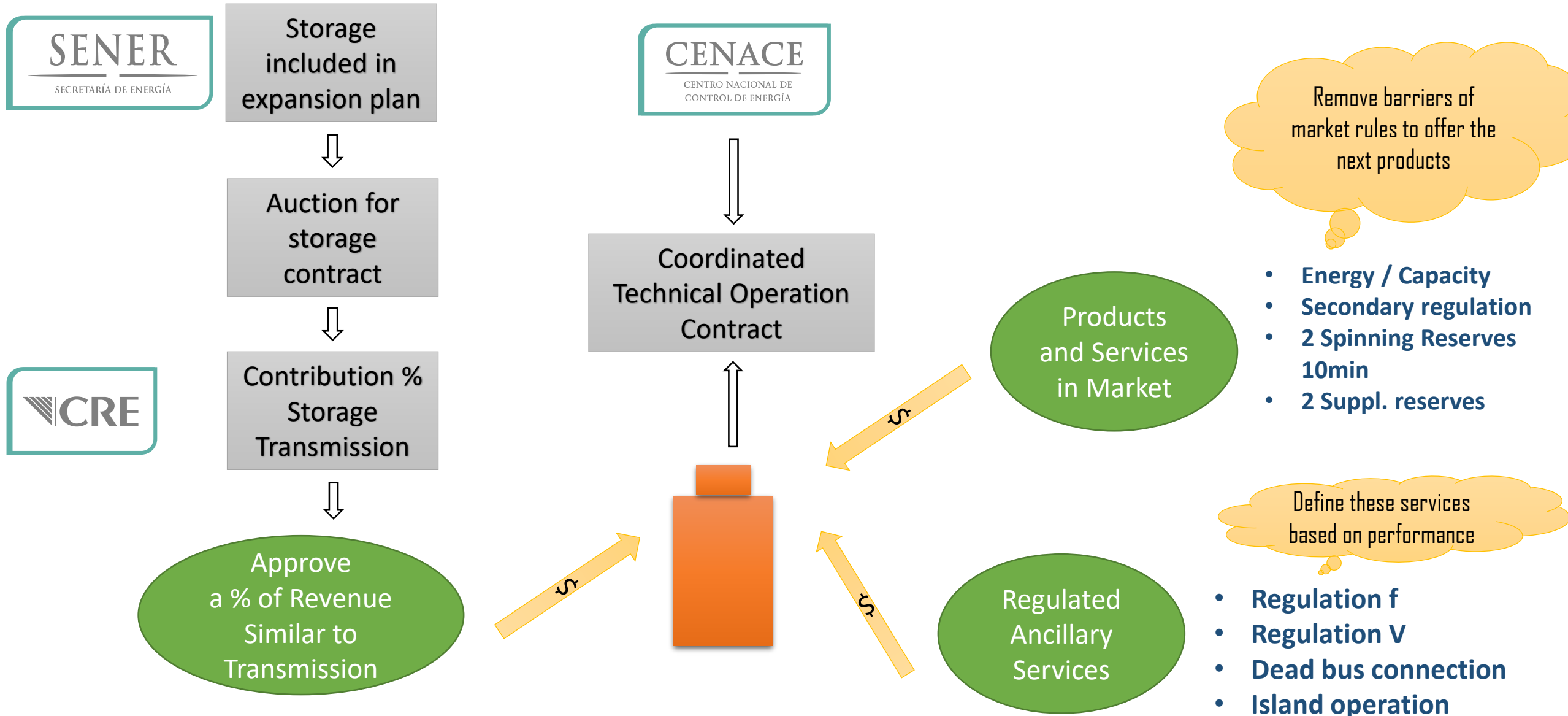
3,841 MWh



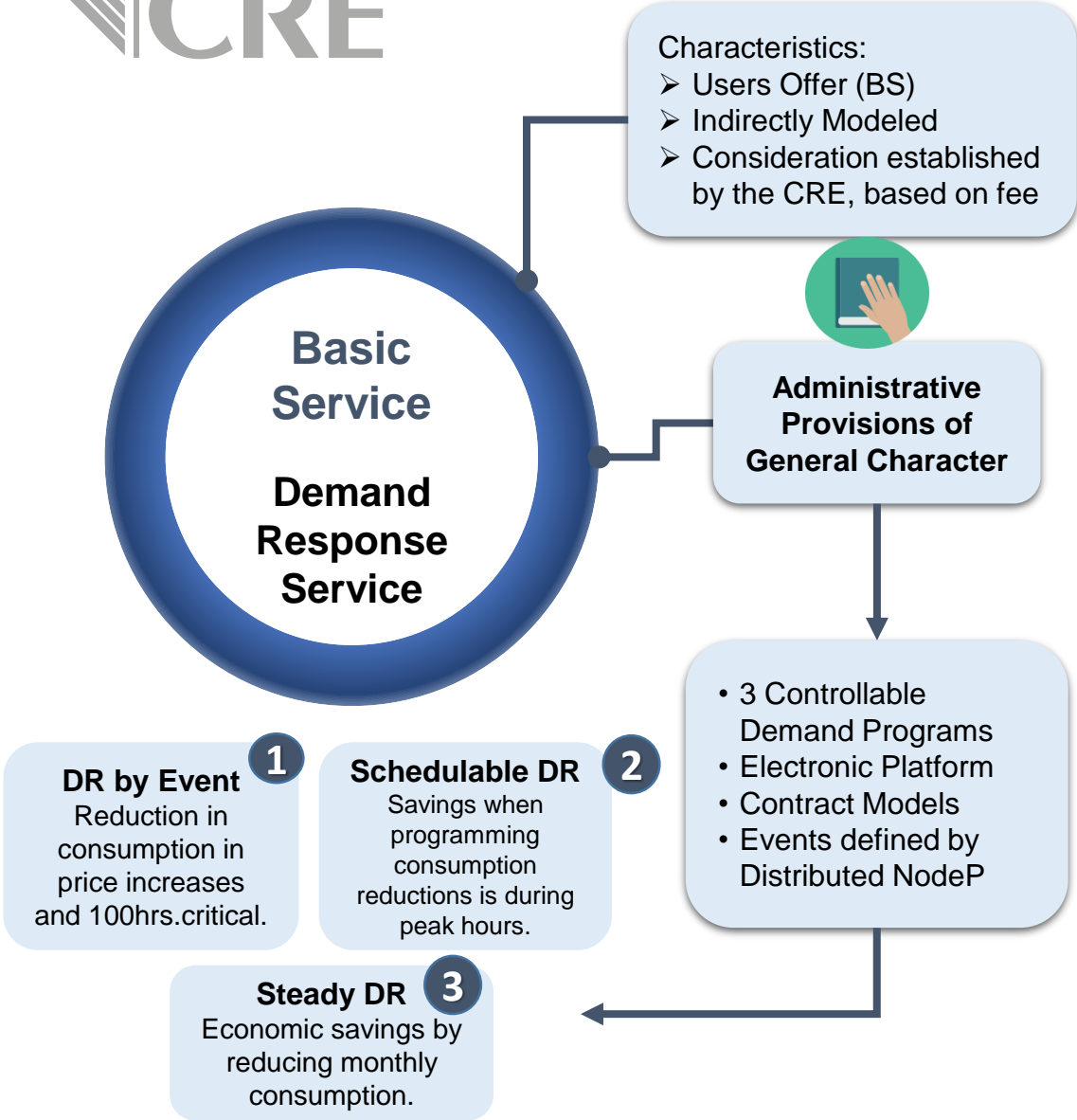
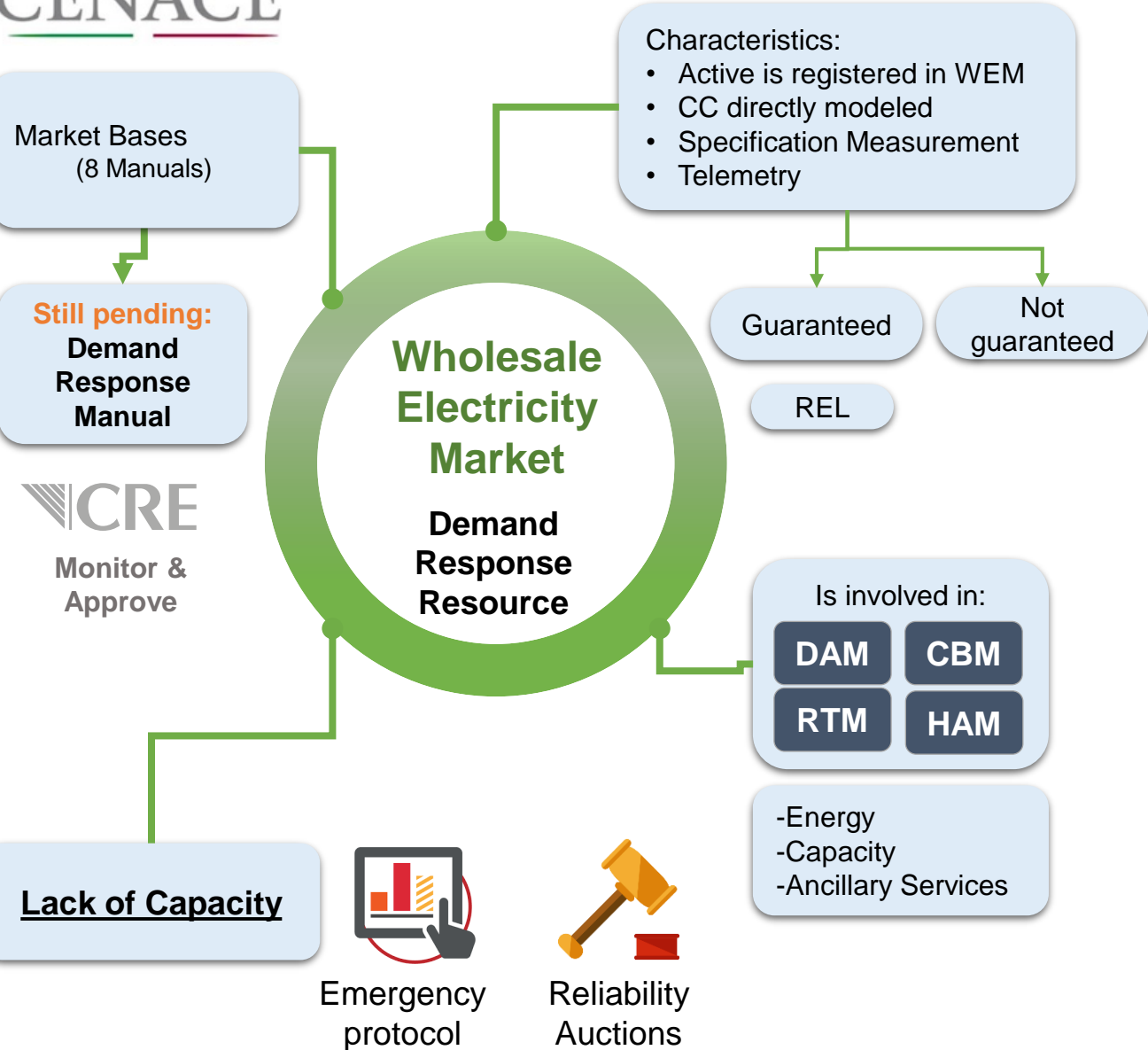
1,419 millions of USD

Source: Feasibility Study for Large Scale Energy Storage Systems in Brazil, Colombia and Mexico. Project done by Quanta Technology for ISA, under USTDA support

Representation: Model for a Transmission Plan Driven Storage Asset



General Schemes Proposed for Demand Response



CRE develops a new regulation for Collective Distributed Generation Contract



One Contract for different users who share the same power plant with capacity below 0.5 MW in distributed generation, removing the limits of property

1 owner
(individual or corporate)



0

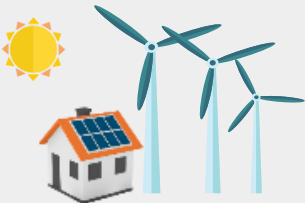
Different users



Different owners



1 power plant

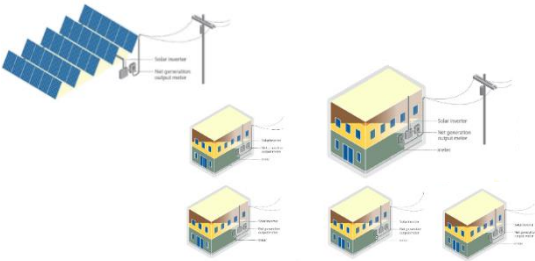
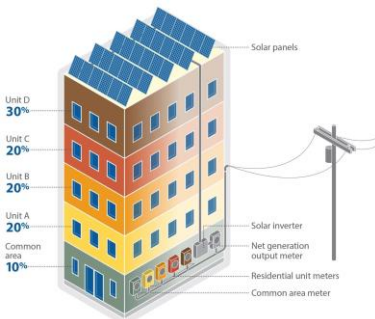


Some possible schemes



Different users in different locations and a power plant in location of one user into the same system

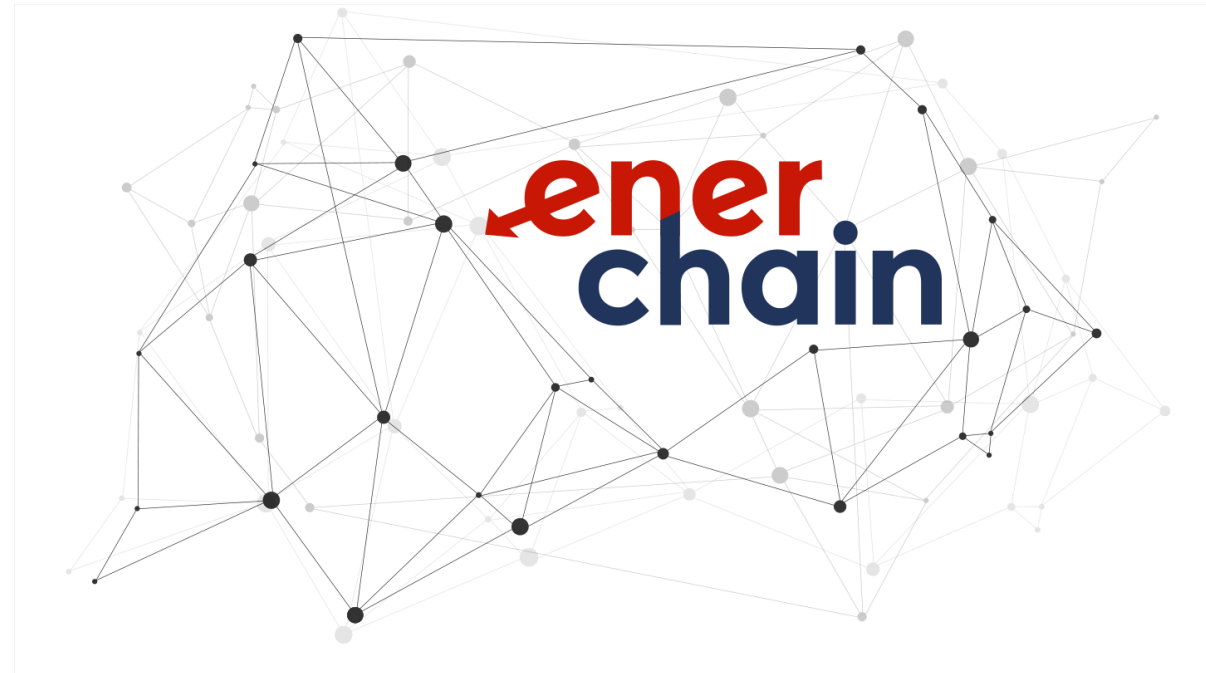
Different users and a power plant in same location



Different users in different locations and the power plant in a different location regard of the users but in the same system

Some Blockchain solutions in the energy sector

Wholesale peer-to-peer trading / Enerchain wholesale trading Project



**Is an application being
developed by big European
gas and power companies**



Prosumer power: P2P transact actions



Port of Rotterdam



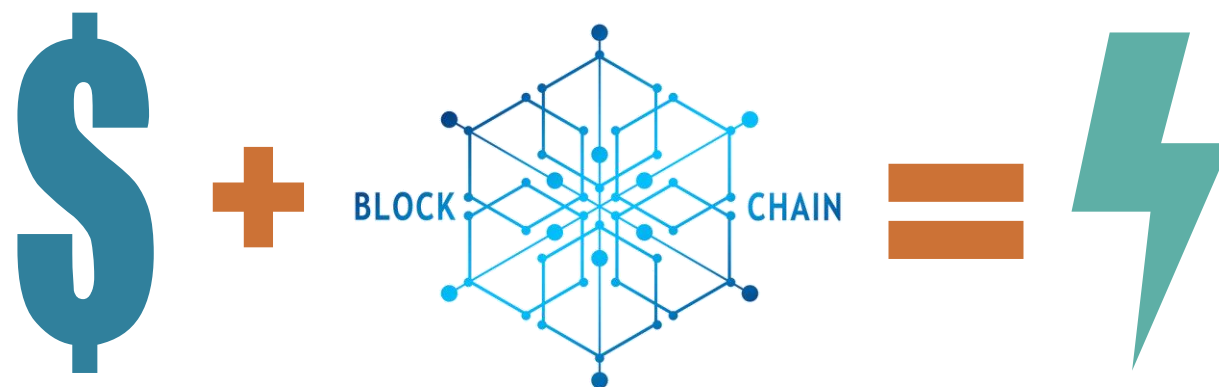
Exergy Micro Hedging, Texas



Clean Energy Certificates (Tracking systems)



Blockchain for raise capital for energy solutions



Potential Blockchain applications for CRE

The CRE already begins the process to evaluate potential applications in the short term



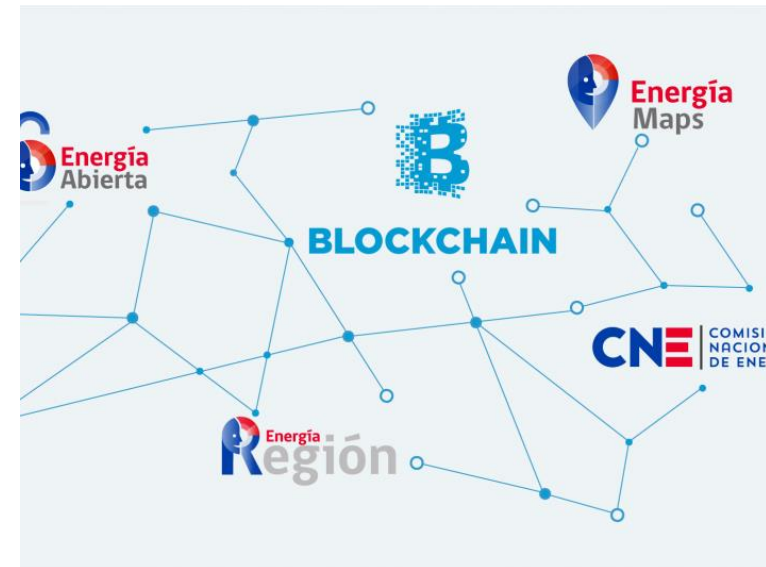
Collaboration with WEC & EWF:



- Diagnosis of Priority Areas
- Identify one or two pilot areas
- Deploy a solution in the very short term

Objective: Improve the quality of service to our regulated and the market in general with more reliable and safe information

The Chilean Regulator use Blockchain



- Digital Notary
- Electric Market Price Information
- Timely information of facilities in operation

Some potential Blockchain applications



Functions in-house

More reliable management of price information

Increase in the reliability of the exchange of documentation

Timely and reliable statistics

Clean Energy Certificates System

Quality electric service monitoring

Other Markets

Market Price Information

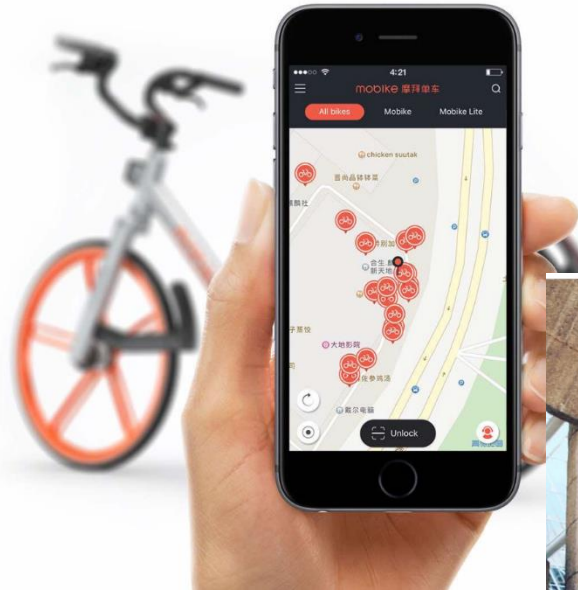
Recording of measured data

Smart Collective Generation Contracts

Bidding process, transparent two ways information, information that is provided to the participants and information about the offers.

The DDD it's also happening in
Mexico

Digital platforms facilitate the efficient and collective use of assets..



What comes next?



...ecarbonization



...escentralization



...igitalization

Thanks!



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@CRE_Mexico