



# SUPPORTING ENERGY EFFICIENCY AND CLEAN ENERGY PARTNERSHIPS BETWEEN CALIFORNIA AND MEXICO

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**I. OVERVIEW OF THE ENERGY SECTOR**

**II. MEXICO'S ENERGY REFORM**

**III. INVESTMENT OPPORTUNITIES**

**IV. FINAL COMMENTS: CURRENT COLLABORATION**

# OVERVIEW OF THE ENERGY SECTOR

**2014**

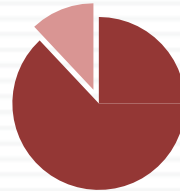
119 million  
inhabitants



406 cities



75% of the total  
population is located in  
cities



30.7 million vehicles using  
petrol and diesel



**2029**

137 million  
inhabitants

503 cities

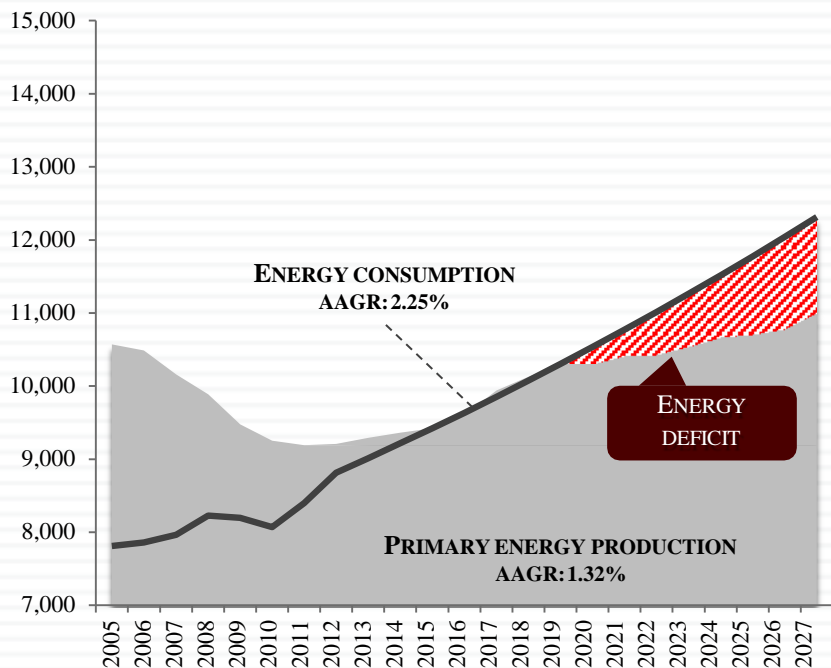
90 % of the total  
population will be  
located in cities

39.8 million vehicles will  
use petrol and diesel

# OVERVIEW OF THE ENERGY SECTOR

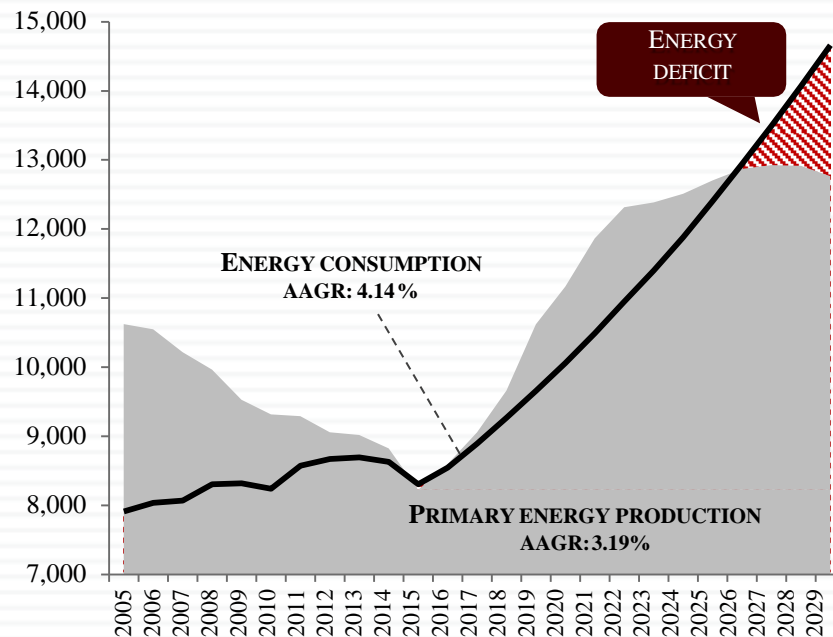
## MEXICO: ENERGY PRODUCTION, CONSUMPTION AND ECONOMIC GROWTH (PETAJOULES)

### 2013: BEFORE ENERGY REFORM



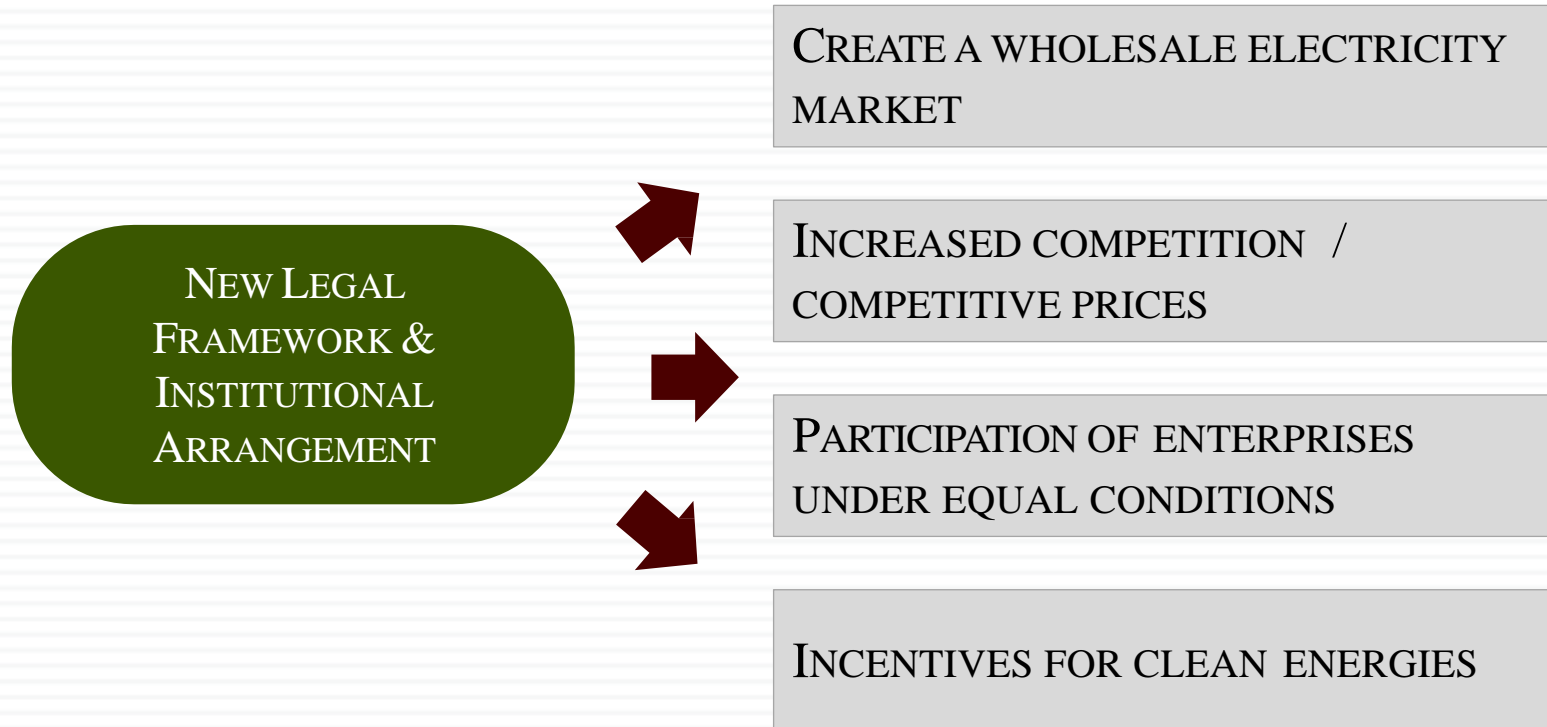
AAGR: ANNUAL AVERAGE GROWTH RATE 2015 -2027

### 2015: AFTER ENERGY REFORM



AAGR: ANNUAL AVERAGE GROWTH RATE 2015 -2029

# MEXICO'S ENERGY REFORM ELECTRICITY SECTOR



## MAIN MANDATES

- TRANSITION TOWARDS THE SUSTAINABLE USE OF ENERGY
- GRADUAL INCREASE OF CLEAN ENERGY IN THE NATIONAL ENERGY GRID,
- REDUCTION IN THE CARBON FOOTPRINT OF THE ENERGY SECTOR
- ALIGNING THE MANDATE ON CLIMATE CHANGE AND THE ELECTRICAL INDUSTRY

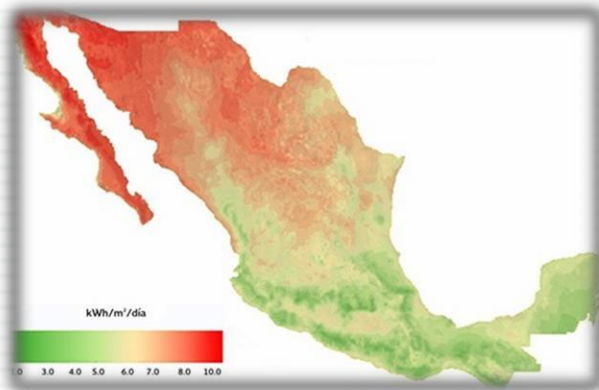
## PLANNING INSTRUMENTS (ADVISORY COUNCIL)

- TRANSITION STRATEGY TO PROMOTE THE USE OF CLEANER TECHNOLOGIES AND FUELS
- SPECIAL PROGRAM FOR THE ENERGY TRANSITION
- NATIONAL PROGRAM FOR SUSTAINABLE USE OF ENERGY.

### MAPS OF RENEWABLE RESOURCES

#### DIRECT IRRADIATION

DURING JUNE\*



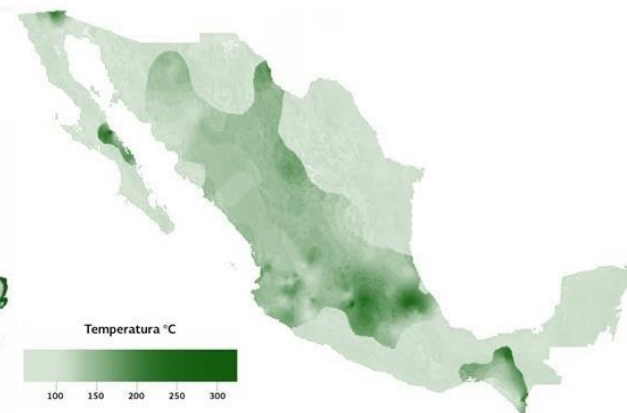
#### POWER DENSITY

80MTS DURING APR. (W/M<sup>2</sup>)\*\*



#### GEOHERMAL RESOURCES

(°C)\*\*\*

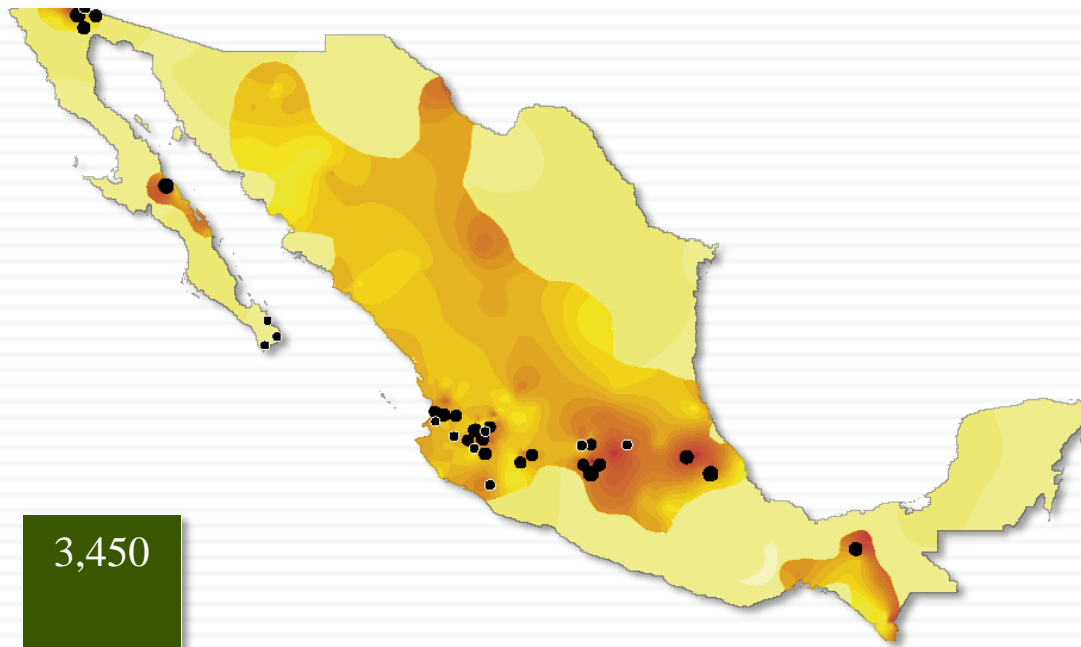


\* AVERAGE DAILY IRRADIATION IN MEXICO IS ABOUT 5.5 KWH/M<sup>2</sup>/D, AND CAN REACH VALUES HIGHER THAN 8.5KWH/M<sup>2</sup>.

\*\* STUDIES TO CHARACTERIZE THE WIND RESOURCE IN REGIONS OF THE ISTHMUS OF TEHUANTEPEC, THE PENINSULAS OF YUCATAN AND BAJA CALIFORNIA, AND THE NORTHERN REGION OF THE GULF OF MEXICO.

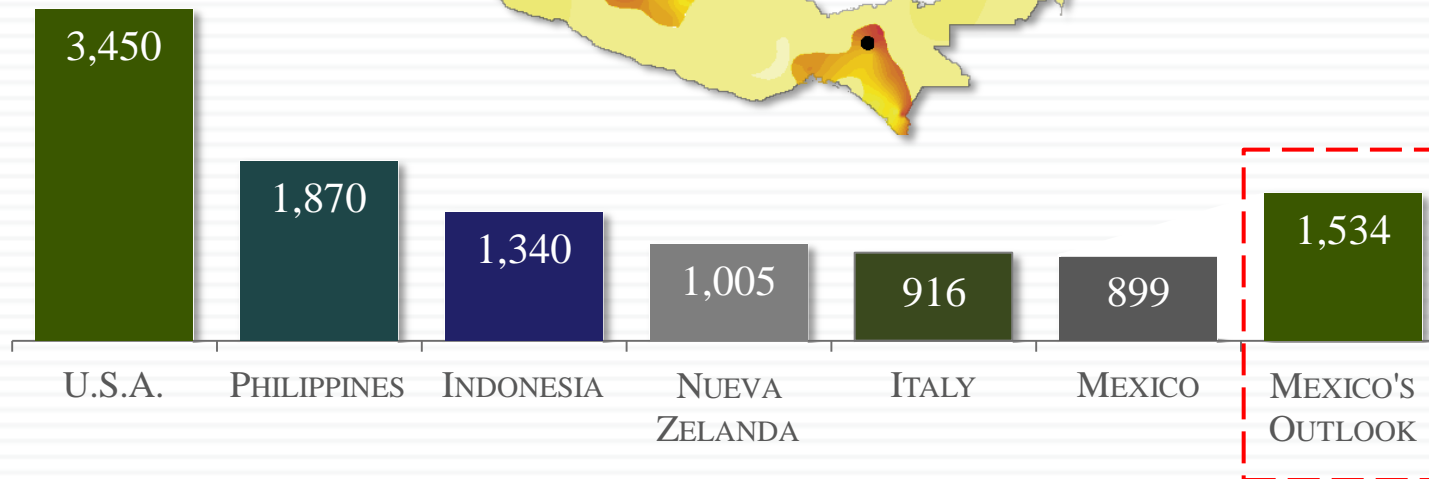
\*\*\* GEOHERMAL POTENTIAL BASED ON THE CENSUS OF MORE THAN 1,300 HOT SPOTS ESTIMATED BY THE FEDERAL ELECTRICITY COMMISSION.

### CLEAN POWER GENERATION: GEOTHERMAL



PROVEN	286 MW
PROBABLE	5,730 MW
POSSIBLE	7,422 MW

**TOTAL: 13.4 GW**



- 15 EXPLORATION'S PERMITS (508 MW)
- 2 EXPLORATION'S CONCESSIONS (50 MW)
- 77 MW IN ADDITION TO THE 4 CFE'S FIELD
- 11 APPLICATIONS IN PROCESS



### CLEAN POWER GENERATION: GEOTHERMAL

#### PROCESS FOR INVESTING



**RECOGNITION**  
REGISTRATION FOR 8 MONTHS (SENER)



**EXPLORATION**  
3 YEAR RENEWABLE PERMIT FOR AREAS  
OF UP TO 150 KM<sup>2</sup>



**EXPLOITATION**  
30 YEAR RENEWABLE CONCESSIONS FOR  
AREAS OF UP TO 150 KM<sup>2</sup>

#### DRIVERS

- NEW LEGAL FRAMEWORK (GEOTHERMAL ENERGY ACT)
- WHOLESALE ELECTRICITY MARKET
- FINANCIAL RISK MITIGATION MECHANISM
- CLEAN ENERGY CERTIFICATES

# INVESTMENT OPPORTUNITIES

## ELECTRICITY SECTOR: 116 BILLION DOLLARS

GENERATION ADDITIONAL  
CAPACITY  
60 GW (2015-2029)

NEW TRANSMISSION LINES:  
24,600 KM (2015-2029)

WHOLESALE ELECTRICITY MARKET

ELECTRICITY AUCTIONS  
(CLEAN ENERGY CERTIFICATES: 2018: 5 %; 2019: 5.8%)

ELECTRIC INTERCONNECTIONS WITH  
NORTH AMERICA AND CENTRAL AMERICA

INTERCONNECTION OF BAJA CALIFORNIA  
SYSTEM-NATIONAL SYSTEM

SMART GRIDS AND DISTRIBUTED GENERATION

## THE FOLLOWING SYSTEMS BEGAN OPERATIONS

- BAJA CALIFORNIA: JANUARY 27TH
- SISTEMA NACIONAL: JANUARY 29TH
- BAJA CALIFORNIA SUR: MARCH 23RD

## PARTICIPATION (397 AVERAGE OF DAILY OFFERS)

- CFE / 183 PERMIT HOLDERS REPRESENTED BY CFE
- FENIX GROUP
- FISTERRA

## TRANSPARENCY AND ADMINISTRATIVE FLEXIBILITY

- GREATER TRANSPARENCY IN GENERATION COSTS
- ESTABLISHMENT OF REFERENCE PRICES
- SIMPLIFICATION AND ADMINISTRATIVE FLEXIBILITY

### **1<sup>ST</sup> LTEA**

#### **RESULTS (MAR 29<sup>TH</sup>, 2016)**

- 11 WINNING COMPANIES WILL ADD 2,085 MW OF GENERATING CAPACITY (81% SOLAR AND 19% WIND)
- CLEAN GENERATION WILL INCREASE 1.9%
- ESTIMATED INVESTMENT: 2.6 BILLION USD OVER THE NEXT 3 YEARS
- 7 STATES BENEFIT FROM INVESTMENT (AGS, BCS, COAH, GTO, JAL, TAMP, & YUC.)
- AVERAGE PRICE: 47.78 USD FOR A PACKAGE OF 1 MWH AND 1 CLEAN ENERGY CERTIFICATE:
  - WIND: 55.39 USD
  - SOLAR: 45.15 USD

### **2<sup>ND</sup> LTEA**

- TRANSPARENCY THROUGHOUT ALL PROCESS ([HTTP://WWW.CENACE.GOB.MX](http://www.cenace.gob.mx))
- PROMOTE NEW INVESTMENTS IN CLEAN ENERGY GENERATION
- BEST PRACTICES FROM 1<sup>ST</sup> ELECTRICITY AUCTION
- CALL FOR TENDER: APRIL 29<sup>TH</sup>, 2016
- AWARDING: SEP. 30<sup>TH</sup>, 2016

### **1<sup>ST</sup> BID**

WITH PRIVATE INVESTMENT

- ISTMO DE TEHUANTEPEC TO THE CENTER OF THE COUNTRY
- INVESTMENT: 1.2 BILLION USD
- HIGH-VOLTAGE DIRECT-CURRENT 600 LINEAR KM
- PRIVATE INVESTORS CAN COMPETE

### **2<sup>ND</sup> BID**

INTERCONNECTION OF BAJA CALIFORNIA SYSTEM-  
NATIONAL SYSTEM

- INCLUSION OF THE PROJECT: PRODESEN 2016-2030
- ESTIMATED INVESTMENT: 1.2 BILLION OF USD
- CALL FOR TENDER AND AWARDING: 2017
- STARTING OF OPERATIONS: APRIL 2021



THE SENER AND THE STATE OF CALIFORNIA OF U.S.A. SIGNED A MOU FOR COOPERATION IN CLEAN ENERGIES (JULY 29TH, 2014)



UNIVERSITY OF CALIFORNIA AND SENER SIGNED A MOU (OCT. 30, 2014)

### MAIN RESULTS

#### VISITS AND WORKSHOPS

- RENEWABLE ENERGY SYMPOSIUM
- CONFERENCES SERIES THE FUTURE OF ENERGY
- TECHNICAL WORKSHOPS

#### ACADEMIC EXCHANGE & GRADUATE PROGRAMS

- VISITS OF PROFESSORS, SCIENTISTS AND ADMINISTRATORS
- ACADEMIC EXCHANGES: AMERICAS INSTITUTE UCSD
- MOU: STANFORD UNIVERSITY & LBNL-BERKELEY
- CCUS POSTGRADUATE PROGRAM (LBNL-BERKELEY)

#### POWER SECTOR TRANSFORMATION

- CARBON MARKET
- TECHNICAL WORKSHOPS:
  - RENEWABLE ENERGY TECHNOLOGIES AND GRID INTEGRATION
  - GEOTHERMAL ENERGY AND GRID INTEGRATION.
- COMMERCIAL MISSIONS