



Mexico Cooling Initiative

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“2ndo. Taller de la Aceleradora de Eficiencia Energética en Edificaciones”

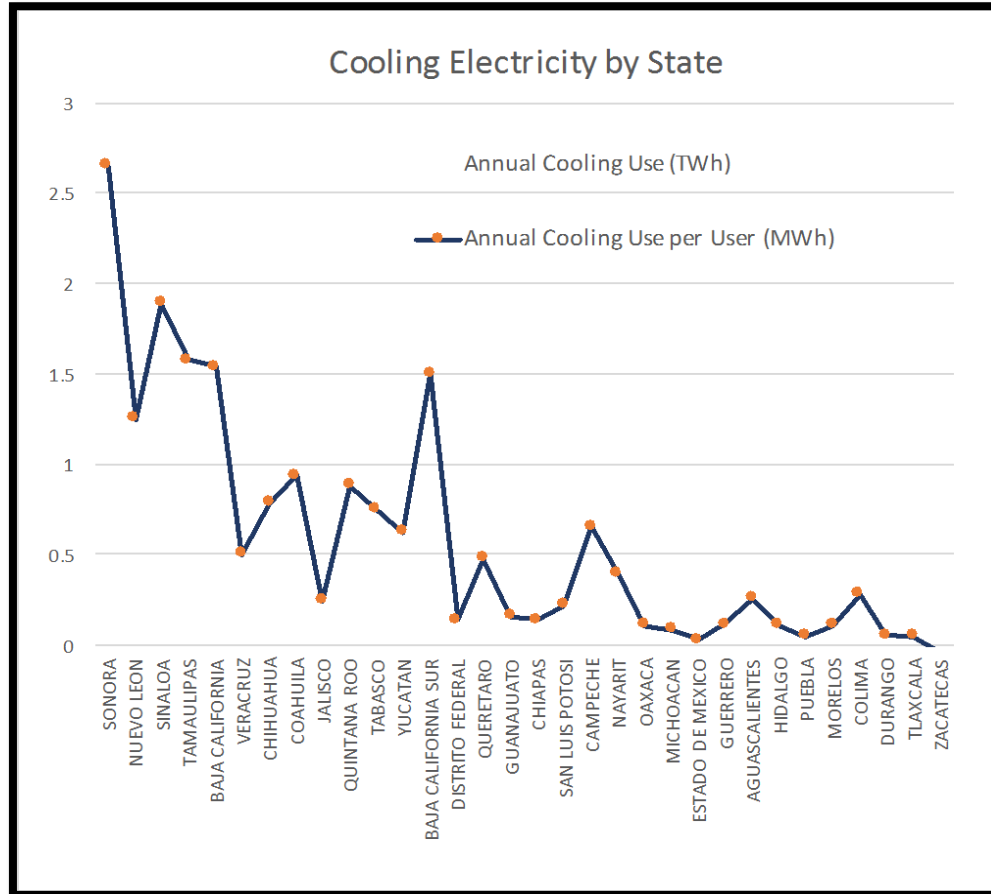
Martes 26 de Febrero de 2019, 9:00 – 12:00 hrs.

Sede: Sala Audiovisual, Centro Ecológico, Hermosillo, Sonora

Why A Cooling Initiative Now?

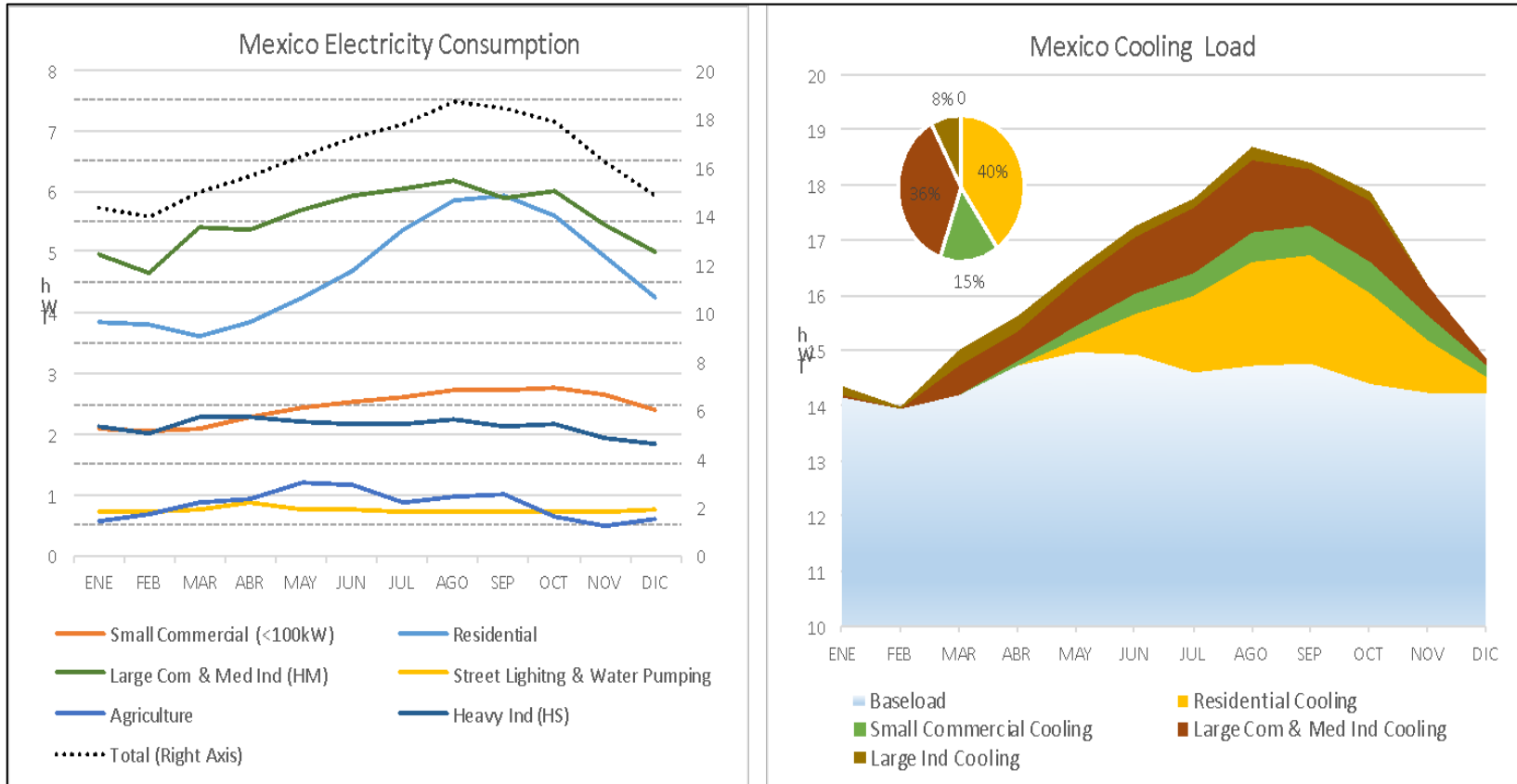
- ◆ Cooling is most important enduse – AC use is growing rapidly around the world and is particularly impactful on growing, greening grids.
- ◆ Two recent insights:
 - Residential AC even more important than we thought and that it happens at a critical time (1 AM).
 - Commercial building electricity may be much higher than we thought and largely cooling driven
- ◆ *Global efforts like Kigali Cooling Efficiency Program* bringing attention and resources to AC
Goal is integrated strategy toward deep cuts

Geographical Variation



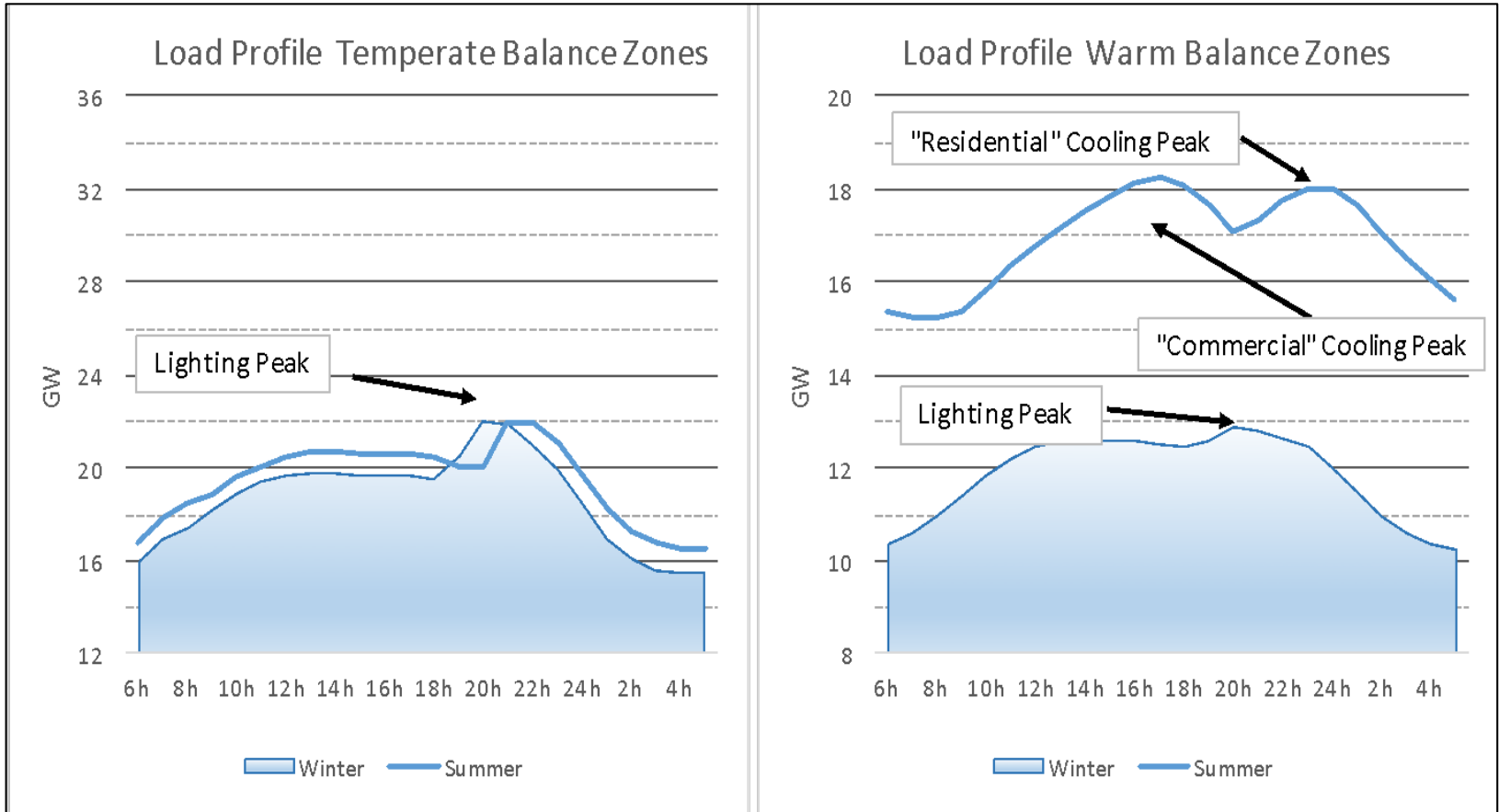
- ◆ Overall and per user cooling both highest in Sonora
- ◆ Top 5 states use half of the total cooling
- ◆ Maximum cooling is nearly 10 times the median

Cooling Electricity



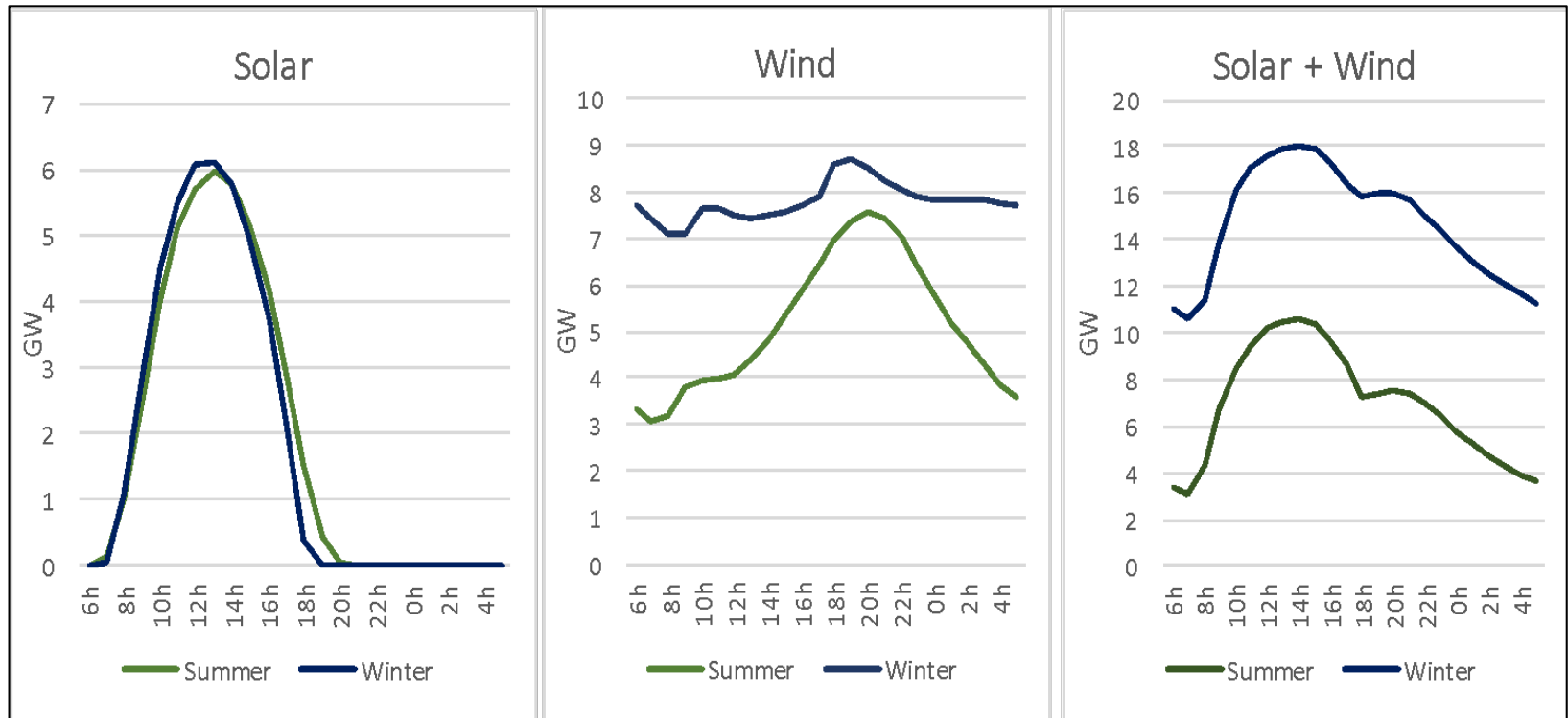
- ◆ Cooling Electricity about 5 TWh in August
- ◆ Residential Load is Sharpest
- ◆ Large Commercial and Medium Industry (Hourly > 1 kW) Broad and High

Cooling Load Profile



- ◆ Winter and Summer load curve very similar in temperate balance zones
- ◆ Lighting peak around 20-22h
- ◆ Strong effect from cooling in warm load zones. Two distinct peaks at 5 PM and 1 AM
- ◆ Peak Cooling Load is about 7.5 GW

Correlation with Renewables



- ◆ Residential cooling peak not covered by solar
- ◆ Wind variable but on average least available at night in summer
- ◆ Much of the generation expansion program won't cover much of the growth in cooling without storage

Growth in Air Conditioner Stock

Urbanization	Climate	Fraction of Households			Ownership of Air Conditioners		
		2014	2030	2050	2014	2030	2050
Urban	Hot	33%	41%	50%	35%	50%	80%
	Temperate	46%	44%	41%	4%	6%	10%
Rural	Hot	9%	7%	6%	10%	15%	25%
	Temperate	12%	8%	5%	1%	1%	2%
Total / Weighted Average		100%	100%	100%	14%	24%	45%

- In 2014, 33% of Urban households in warm climates have AC, and 14% of all household had AC
- Urbanization could rise from about 80% to 90% by 2050
- Trend from Temperate to Hot climates continues with % hot rising to 55% by 2050
- Ownership raises in all categories, but especially in hot urban areas
- Net result of these factors is three-fold increase in AC ownership from 14 to 45%

Fact Book Findings (Numbers)

COOLING CONTRIBUTION TO ELECTRICITY DEMAND

Cooling Electricity in 2015	22.6 TWh
Cooling % of All Electricity in 2015	8.9%
Cooling Electricity per User - CDMX	140 kWh
Cooling Electricity per User - Sonora	2650 kWh
National Cooling Peak Load	7.5 GW
Time of Peak Load	5 PM and 1 AM
GHG Emissions	10 mt CO ₂
Costs	31 billion (mil millones) \$MX
Subsidies	42 billion (mil millones) \$MX

Elements of a Cooling Strategy

- ◆ Equipment Efficiency Standards - Rapidly adopt the best available air conditioning technologies on the market through regulations like Mexico's NOM's.
- ◆ Voluntary Programs - Develop and disseminate ultra-low energy alternatives to current technologies through voluntary programs such as labeling, rebates, early replacement programs and public information campaigns.
- ◆ Technology R&D - Develop alternative cooling technologies such as evaporative cooling and solar-assisted cooling for the Mexican market and deploy them through industry partnerships.
- ◆ Building Envelope Best Practices - Lower cooling load with improved construction and retrofits through mandatory building codes and private sector initiatives.
- ◆ Cool Solar Reflective Coatings - Lower cooling load by reducing solar heat gain through cool roofs and other reflective coatings.
- ◆ Smart Design and Operation - Employ advanced construction, integrated design, user behavior and smart controls to reduce or eliminate cooling loads and respond to peak loads and electricity prices.

Cooling Initiative Activities

1. **In Progress** - Improved national standards for fixed-speed mini-splits
2. **Launching** - Promotion of market shift toward variable speed mini-splits
3. **Launching** – MEPS for Commercial AC
4. **Launching** - Residential AC Testing in Sonora
5. **Launching** – Cooling Community of Practice Online Platform
6. **In Discussion** - Building Codes in CDMX

Equipment Efficiency under K-CEP

Berkeley Lab MEI leads Kigali Cooling Efficiency Program Mexico efforts to increase efficiency of cooling (AC+ refrigerators) while eliminating HFCs. Partners: Iniciativa Climática de México (ICM) and INEEL

Minisplit Air Conditioner Standards

- ◆ Optimize fixed-speed norm (NOM-023) level with new seasonal metric
- ◆ Preliminary consideration of merging fixed- and variable-speed norm

Promotion of Inverter Minisplit Market

- ◆ Current market for inverter ministplits ~25%
- ◆ Consideration of non-regulatory programs (incentives, bulk procurement)

Commercial Air Conditioning Standards

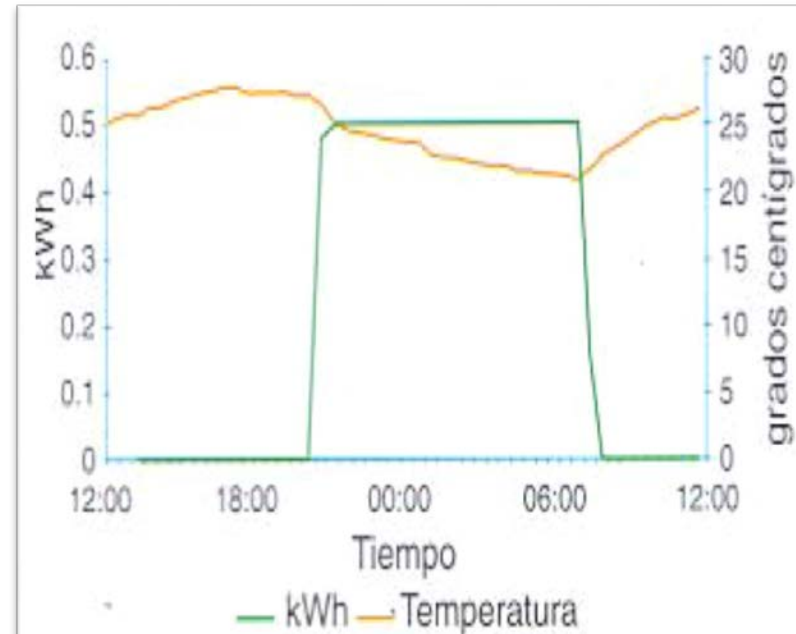
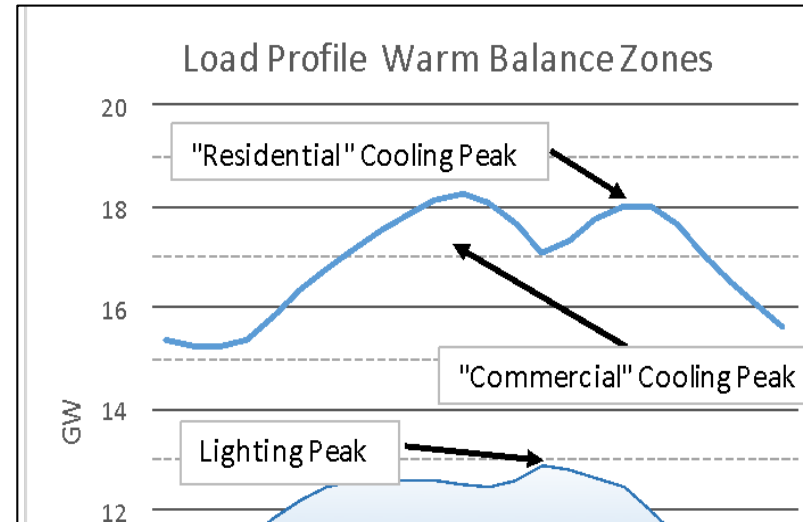
- ◆ Develop Mexico's first standard for AC > 5 tons (rooftop)

Residential AC Testing in Sonora

Project: Measure electricity use of ACs in households with good time resolution (~15 min) for entire cooling season (May-Oct)

Goals:

- ◆ Understand whether residential AC explains late night peak
- ◆ Estimate of total residential summer use
- ◆ Understand coincidence with solar and other renewables
- ◆ Next Steps – Energy Savings and cost-benefit analysis of high-efficiency AC in Hot-Dry environment



Cooling Communities of Practice

Mexico Cooling CoP Platform Functions

- **Create** a mechanism of interaction and collaboration fully supported by CONUEE
- **Build** on the momentum created by the Summit to address the cooling challenge in Mexico
- **Leverage** the network of industry representatives, government officials, researchers and international cooperation officials that participated in the Summit and recommended the establishment of a CoP for cooling.
- **Allow** for participation of an expanded set of stakeholders from different sectors
- **Provide** a forum to industry, academia and government to present their views on technical, regulatory and policy issues to a wide range of stakeholders
- **Facilitate** interaction and collaboration among members on specific topics and supports potential partnerships between industry and top academia/research institutions throughout the country.
- **Serve** as a gateway to engage institutions and communities in the U.S., Latin America and the world working on the cooling space
- **Connect** experts and actors to programs, resources and events in real time
- **Convene** in-person meetings, webinars and other events on specific topics
- **Disseminate** relevant information including reports, proceedings and news items
- **Integrate** social media element (blogs, tweets, newsletter) to provide timely information to the membership
- **Links** to CONUEE, MEI and other partners' websites to increase coverage and participation

Berkeley Lab Energy Technologies Area

MEXICO COOLING INITIATIVE
A COMMUNITY OF PRACTICE

CONUEE
CONSEJO NACIONAL DE ENERGIA

Contact Us

About Topics Discussion News

Mexico City faces a crisis with air-conditioner overuse.

In collaboration with Mexico's Department of Energy, we hope to save \$100 billion dollars of electricity costs and subsidies by 2050.

Alternative Cooling Technologies

Building Codes

Cool Solar Reflective Coatings

Equipment Standards and Regulations

Smart Building Design and Operation

Voluntary Equipment Efficiency Programs

ENERGY TECHNOLOGIES AREA

USAID
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

Mexico Cooling Initiative Retweeted
Global Cooling Prize @CoolingPrize - 22 Feb

Disclaimers

Thank You

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