Universidad Nacional Autónoma de México
Instituto de Energías Renovables
IER-UNAM

Research in Solar Concentrating Systems and capabilities related to STAGE-STE Project

2016

Universidad Nacional Autónoma de México (UNAM)

- The largest University in Mexico
- Founded in 1910
- Has its origins in the Real y Pontificia Universidad de México (1551)

Teaching

- 346,730 students enrolled in 2015 at all levels
- 28,630 graduate level students
- 41 graduate programs
- 37 specialty programs
- 117 undergraduate programs

Research

- Scientific research subsystem
  - 22 Institutes, 8 centers and 5 programs
- Humanities subsystem
  - 11 Institutes, 6 centers y 6 programs

Academic personnel 39,500 (12,172 full time)

Instituto de Energías Renovables (IER-UNAM, Renewable Energy Institute)

UNAM
CAMPUS MORELOS

Director: Dr. Antonio del Río

Academic Staff: 71

- 44 Researchers
- 22 Academic technicians
- 2 UNAM Commissioned researchers
- 3 CONACYT Commissioned researchers (Cátedras)

Postdoctoral researchers: 15

Students: 297

- 206 graduate, 91 undergraduate

- Participates in three graduate programs:
  - Engineering
  - Material Sciences
  - Physical Sciences

Mission and vision

- The Mission of IER-UNAM is to carry out basic and applied research in energy, with emphasis in renewables, for supporting the development of sustainable energy technologies; to carry out studies, consultancy and training for the different sectors of society; to develop specialized human resources, and to disseminate knowledge, for the benefit of Mexican Society.

- Our vision is to be a research institute with international academic leadership in renewable energy and related areas, which fosters scientific and technological development and facilitates its application to the solution of problems for the sustainable development of Mexico.

History

- 1979. Creation of the Solar Energy Department of the Materials Research Institute (IIM-UNAM), Mexico City.
- 1985. Creation of the Solar Energy Laboratory (LES) of IIM-UNAM in Temixco, Morelos.
- 1996. Transformation into Energy Research Center (CIE-UNAM), as an entity independent from IIM-UNAM.
- 2014. Transformation into UNAM's Renewable Energy Institute (IER-UNAM).

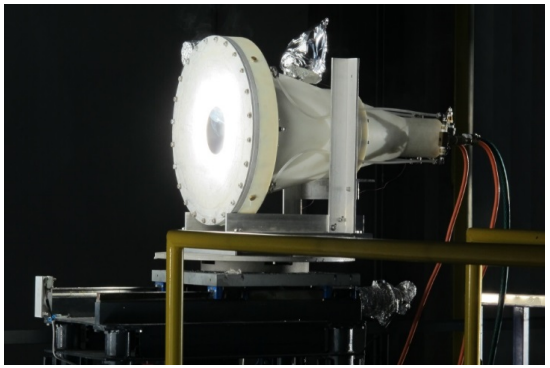
Location

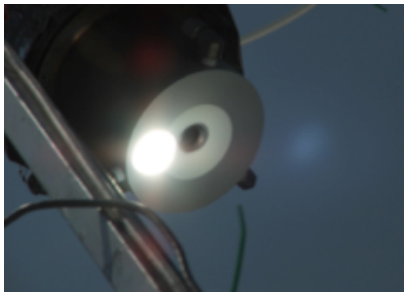
Temixco, Morelos, 60 km to the south of Mexico City.

Solar concentrating systems

Research lines:

- Optical design and evaluation of solar concentrating systems
- Thermal modeling of receivers and processes
- Solar chemical processes and reactors
- Instrumentation for high flux and high temperature solar concentrating systems
- Solar concentrating systems control
- Solar systems integration and hybridization
- Solar resource assessment





Relevant projects in Solar Concentration

National Laboratory of Solar Concentrating Systems

Financing: CONACYT /UNAM /UNISON
Budget: first stage (2007-2010) 42 million pesos
second stage (2012-2014) 24 million pesos

Project coordinator: Dr. Claudio Estrada (IER-UNAM)

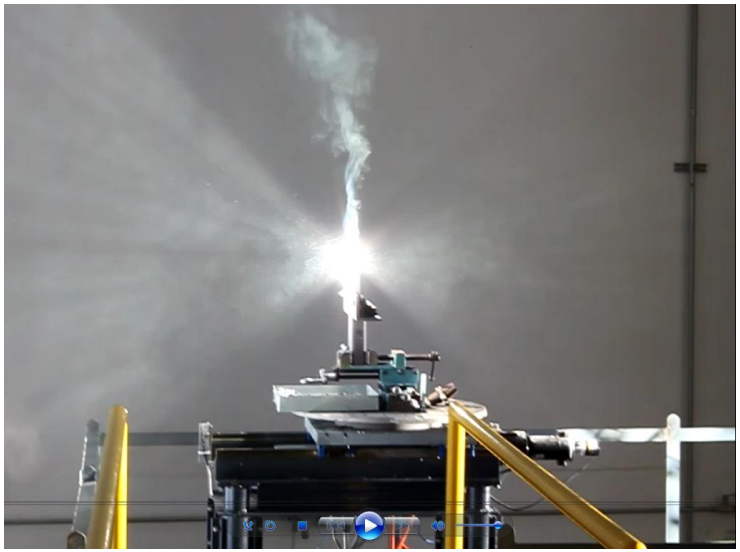
General objectives:

- Constitution of a network of research groups
- Advancement of concentrating technologies, generating new knowledge
- Generation of high level human resources in the area
- Design and construction of three solar facilities:
  - High radiative flux solar furnace (solar thermochemistry laboratory)
  - Solar photocatalytic water treatment pilot plant
  - Heliostat test field (central receiver experimental field)

LACYQS
Laboratorio Nacional de Sistemas
de Concentración Solar y Química Solar

High radiative flux solar furnace (Temixco)

- 9 m × 9 m heliostat area
- 6.70 m × 6.40 m concentrator area
- 3.64 m focal distance
- 409 mirror facets
- 24 kW_t power
- 18,000 suns peak concentration
- Temperature above 3400 ºC (Tungsten melting)
- Solar spot diameter 10 cm (90%)



Laboratorio Nacional de Sistemas de Concentración Solar y Química Solar

Solar tower experimental field (Hermosillo, Sonora)

Jointly developed and operated with Universidad de Sonora

Features:

- 32 m high tower
- 7x8 m^2 Lambertian target
- 4x4 m^2 aperture receiver
- 1x1 m^2 thermal test receiver plate
- Solarimetric station
- 30 heliostats 6x6 m^2
- 82 heliostats final design, for 1 MWt)

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LACYQS Laboratorio Nacional de Sistemas de Concentración Solar y Química Solar

Solar photocatalytic wastewater treatment plant (Temixco)

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MINISTERIO DE EDUCACIÓN Y CIENCIA

Ciemat
Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas

LACYQS
Laboratorio Nacional de Sistemas de Concentración Solar y Química Solar

Centro Mexicano de Innovación en Energía Solar (CeMIE Sol)

Financing: CONACYT /UNAM /UNISON
Duration: 2014-2018
Budget: (first stage) 320 million Mexican pesos

Project coordinator: Dr. Antonio del Río Portilla (IER-UNAM)

- The Mexican Center for Innovation in Solar Energy (CeMIE-Sol), is a collaboration effort of 57 institutions to generate innovation in solar energy.
- 22 approved Strategic Projects.
- These projects involve research and innovation in different aspects of PV cells, solar thermal, bioclimatic aspects, solar resource assessment and solar energy prospective
- IER-UNAM participates in 12 projects, where the budget distributed for the first two stages totaled 90 million Mexican pesos.

CeMIE Sol
Centro Mexicano de Innovación en Energía Solar

CoSolPi

- Project title: **Combustibles Solares y Procesos Industriales** (Solar fuels and industrial processes)
- Strategic Project No. 10 of CeMIE Sol.
- Objective: To carry out research and technology development on the realization of high temperature thermochemical processes by using concentrated solar radiation as a source of thermal energy. The aim is the development of future sustainable industrial processes, for the production of clean fuels like Hydrogen, synthesis gas, biofuels, and the valorization of materials employed by the national industry.
- Coordinator: Dr. Hernando Romero Paredes Rubio (UAM-I)
- Participating institutions: UAM-I, IER-UNAM, UACH, CINVESTAV.
- Duration: 2014-2018.
- Total budget: 40 million Mexican Pesos

Casa abierta al tiempo

Cinvestav UNIDAD MERIDA

IER Instituto de Energías Renovables

CeMIE Sol Centro Mexicano de Innovación en Energía Solar