KIC – MASTER RENE

Y2 Presentation

Barcelona, February 2015

master renewable energy

Science & Technology Excellence

program goals

To provide students with the necessary conceptual, theoretical, and experimental foundations in renewable energies to start a career in **academia** or **industry**:

- With a PhD thesis in a state-of-the-art research team
- As a researcher or project manager in an industry research laboratory, in energy agencies or companies
- As Project Manager, Business Unit Manager, etc in industry in either the technical or business spheres
- As specialist in energy strategies for large companies or SMEs in the field of renewable energies

Current position after the REST Master

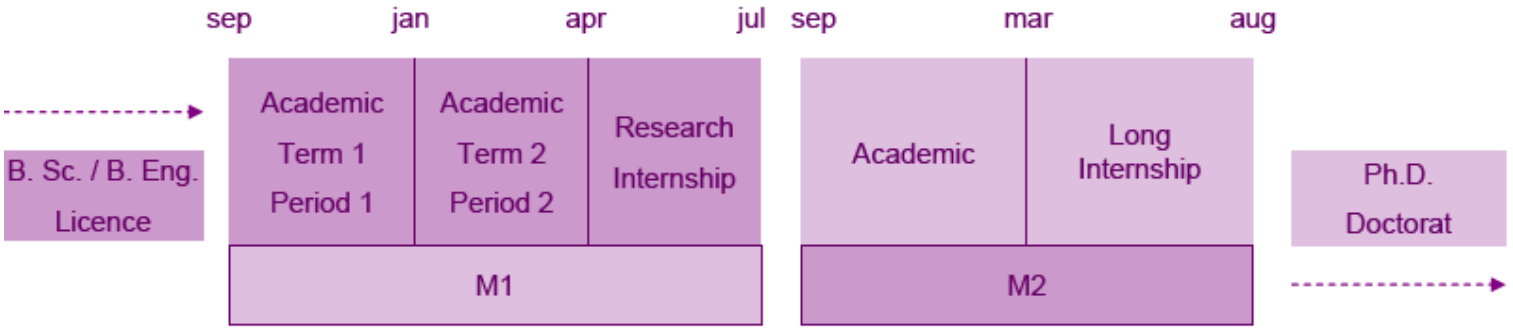
3 academic years: 2011-2012, 2012-2013 and 2013-2014

- PhD : 30
Mostly in France (Plateau de Saclay)
First choice: Photovoltaics
Second choice: Smart grids

- Job in industry or services : 36
- From start-ups to big companies (TOTAL, EDF, GDF Suez…)
- France – Abroad (about 50-50)

- **2013-2014** : only 4 students still looking for a job three month after end of Master(10%)

program at Ecole Polytechnique



M1 - Ecole Polytechnique

Energies of the 21st Century

Core courses: mainly Physics and Mechanics

Overview of the energy domain (resource, climate, nuclear technology, photovoltaics, fusion…)

M2 - Ecole Polytechnique & ParisTech

Renewable Energy Science and Technology

Opened: September 2011

- Energy-focused courses in the following domains: Photovoltaics / Energy Vectors and Storage / Energy Distribution Networks / Wind and Hydro Power
- General courses : Socioeconomic Issues / Topical Seminar Series / Project Management, Innovation and Entrepreneurship

Full curriculum taught in English

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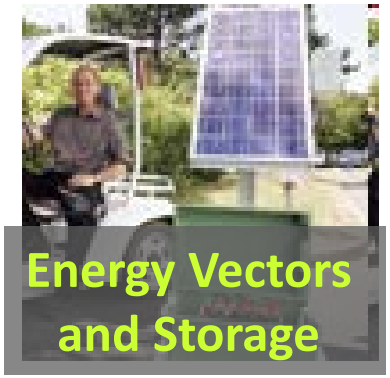
“REST” program overview

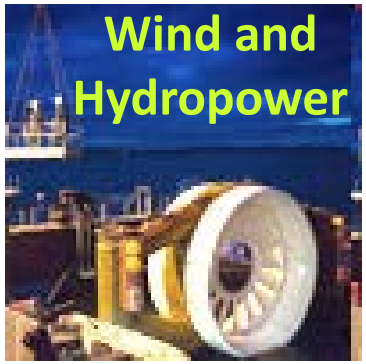
Core Scientific Courses

- Physics of Solar Cells
- Thin-Film Photovoltaics
-Photovoltaic Technologies in Industry
-Polymers for Photovoltaics



-Renewable Generation of Electricity using the Thermal Cycle
-Hydrogen and Energy
-Batteries and Energy Storage

-Introduction to Power Systems
-Stochastic and Dynamic Optimization: Adaptive Storage and Delivery of Renewable Energies



-Wind Power
-Fluvial and Maritime Resources for Ren. Energy
-Fluide-structure couplings in offshore wind and marine energy

Transversal Content

- Introduction to Biomass and Bioenergy
- Specialization Course in Biomass and Bioenergy

New Energies and New Markets

- General Interest Seminars
- Language Courses

Project Management, Innovation and Entrepreneurship

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course selection

Goal: allow flexibility, while keeping consistency

Each student is required to take **eight** courses, with some guidelines:

⊙ Choice of two specialties among:

- Photovoltaics
- Energy Vectors and Storage
- Energy Distribution Networks
- Wind and Hydro Power

- Within each specialty the student has to take two courses (**four total**)

⊙ **Project Management, Innovation, and Entrepreneurship** is obligatory (includes case study project)

⊙ **Three electives** among remaining courses

In addition:

- Topical Seminars
- Language Course

program organization

- All courses given in English
- Language courses provided (French for non-francophones)
  - Students obliged to achieve French level to pass M2 year
- All lecture courses take place at Ecole Polytechnique (20 min south of Paris)
- Student housing available on campus

- Some laboratory sessions given in research labs around Paris

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Industrial support

- **Industrial grants for life expenses of the students (10 k€ / year)**
  ≈ 15 in total

  Provided by the leading French companies in the energy domain (worldwide market) :

  Total, EDF, Air Liquide, Schneider Electric, Saint Gobain, PSA, Alstom, Cogenpower, GDF-Suez

- **Other scholarships :** University Paris-Saclay, French Foreign Ministry programs…

- **Internship (6 month) : extra support available (research laboratories or industry)**

strong research base

- Laboratory of Physics of Interfaces and Thin Films (LPICM, Ecole Polytechnique)
- Hydrodynamics Laboratory (LADHYX, Ecole Polytechnique)
- Solid Mechanics Laboratory (LMS, Ecole Polytechnique)
- Dynamic Meteorology Laboratory (LMD, Ecole Polytechnique)
- Applied Mathematics Center (CMAP, Ecole Polytechnique)
- Centre for Energy and Processes (CEP, Mines ParisTech)
- Institute for Photovoltaic Energy Research and Development (IRDEP, CNRS / EDF / Chimie ParisTech)
- Laboratory of Fluid Mechanics (Arts & Métiers ParisTech)
- Laboratory of Chemistry and Processes (ENSTA ParisTech)
- Laboratory of Information Processing and Communication (TELECOM ParisTech)
- Laboratory of Environment and Arable Crops (AgroParisTech / INRA)

Never far from research: PV Industry Lab leads to scientific publication:
J. W. Choi, C.H. Kim, **Jonathan Pison, Akinola Oyedele,** D. Tondelier, A. Leliege, E. Kirchner, P. Blanchard, J. Roncalib, and B. Geffroy , RSC Adv. 2014, 4, 5236

ROYAL SOCIETY OF CHEMISTRY

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TOTAL EDF SAINT-GOBAIN Schneider Electric PSA PEUGEOT CITROËN AIR LIQUIDE

IPVF (Institut Photovoltaïque d'Ile de France)

French National Project (Institute for Energy Transition)

Location : Ecole polytechnique campus

2016-2017

INSTITUT PHOTOVOLTAÏQUE D'ILE-DE-FRANCE

ÉCOLE POLYTECHNIQUE UNIVERSITÉ PARIS-SACLAY

cnrs dépasser les frontières

TOTAL

eDF

HORIBA JOBIN YVON

AIR LIQUIDE

RIBER

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Chimie Paris ParisTech

ARTS ET MÉTIERS ParisTech

ESPCI ParisTech

École des Ponts ParisTech

HEC PARIS

ENSTA ParisTech

MINES ParisTech

AgroParisTech

TOTAL

eDF

SAINT-GOBAIN

Schneider Electric

PSA PEUGEOT CITROËN

AIR LIQUIDE

What is IPVF ?

Our Ambition

To become one of the major global centers for research, innovation and training in photovoltaics

An Industrial-Academic Partnership

Uniting the research efforts of industrialists active in the market and academics bringing world-class expertise

Positioning

Upstream research for future generations of devices
Strong industrial foothold

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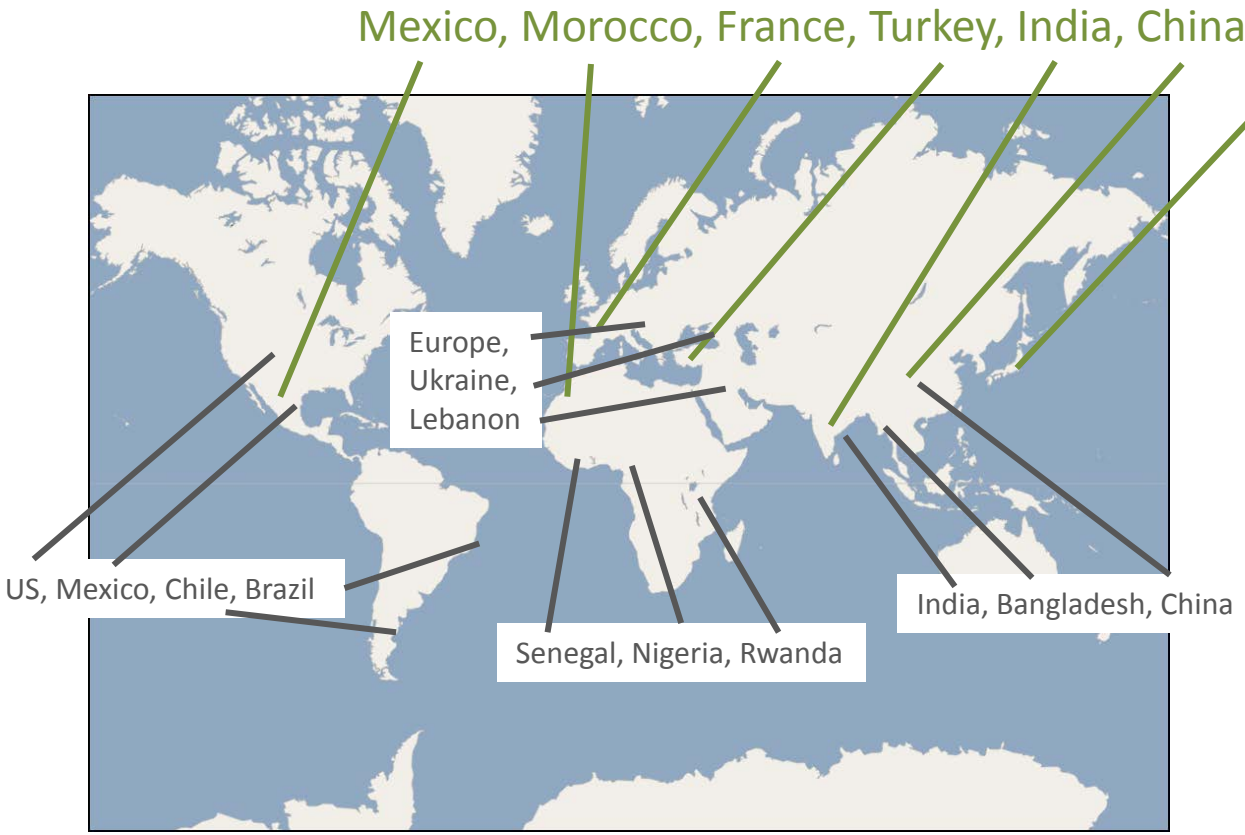
student body – diversity and growth

Year 1, **2011**: 12 students



Year 2, **2012**:
46 students

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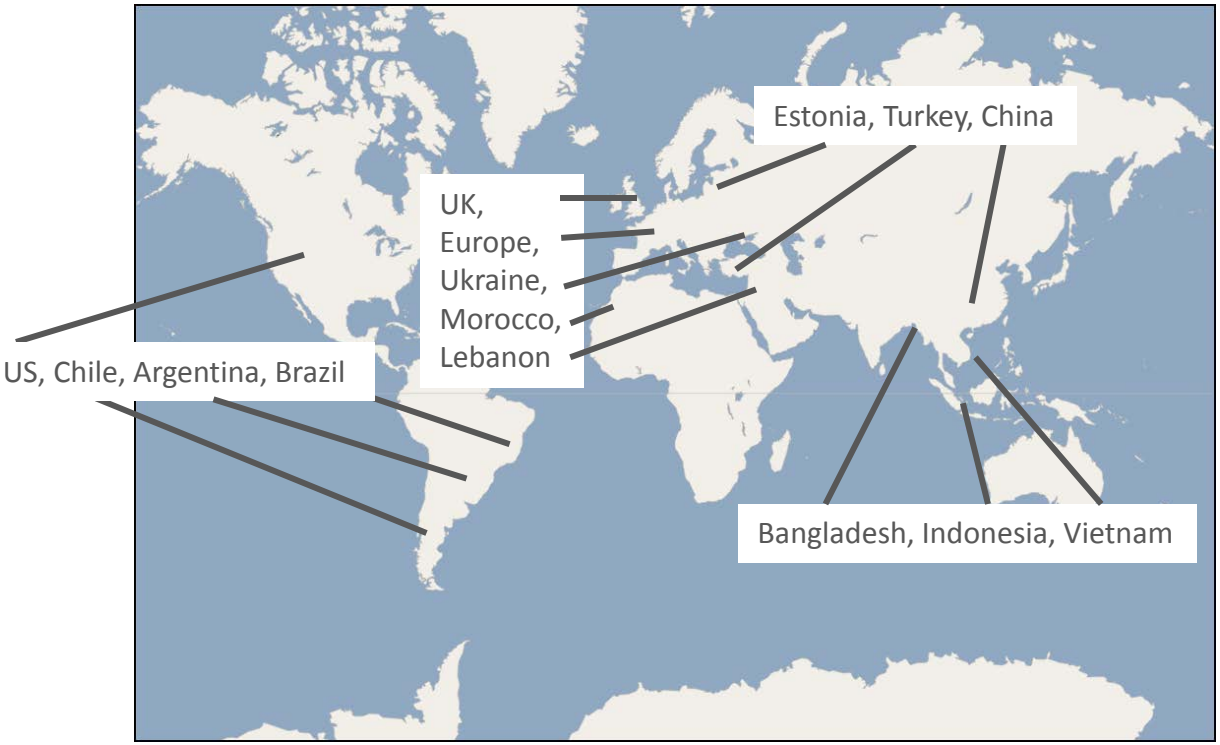
student body – diversity and growth

Year 3, **2013**: 37 students (from 161 applicants)



student body – diversity and growth

Year 4, **2014**: 52 students

Eight Industrial Partners provide a total of 15 bursaries (10k€ each)

Goal of 25 bursaries for 2015-2016

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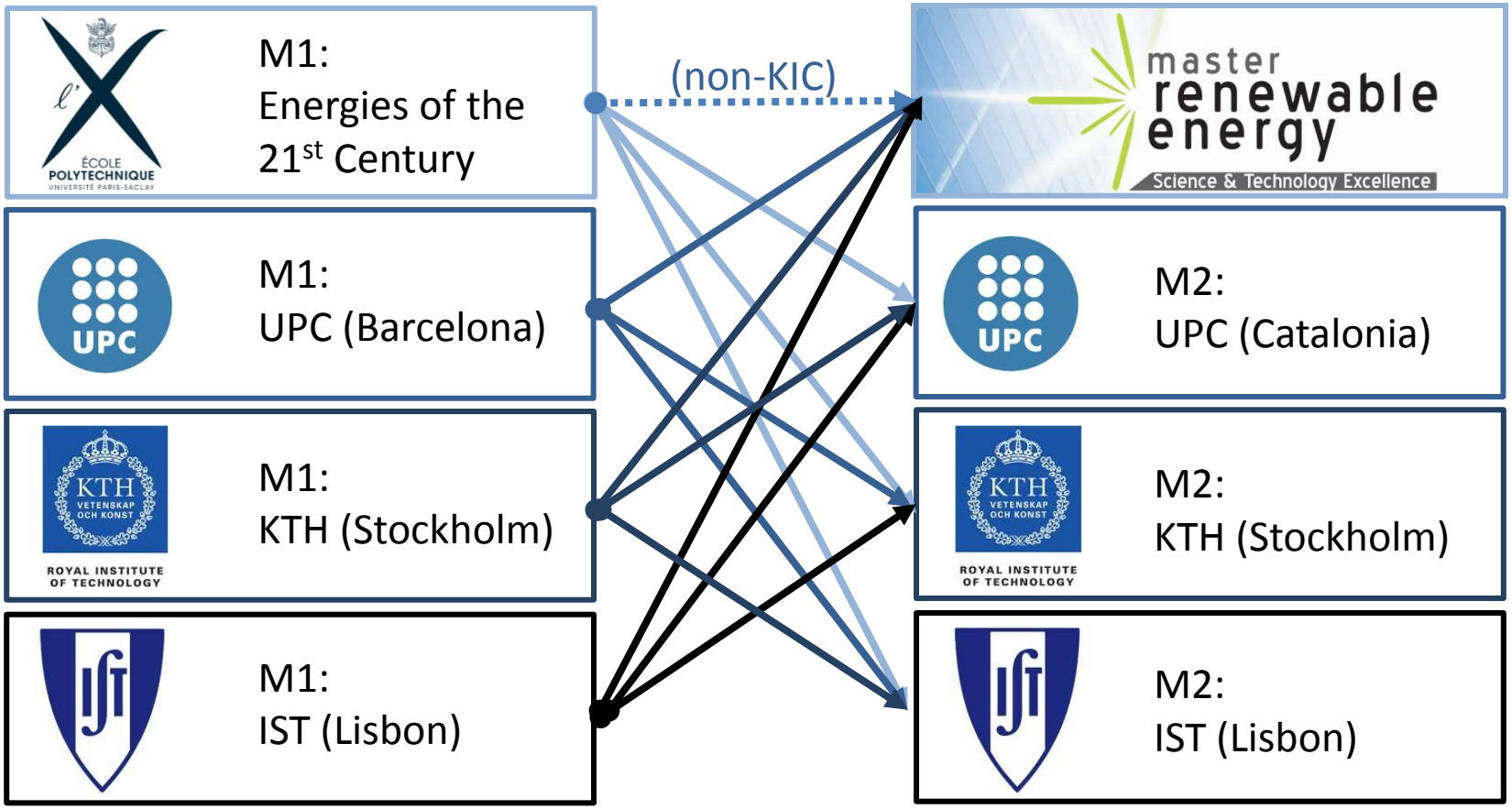
international links: RENE program

European exchange program funded by KIC Innoenergy Initiative



ESADE business school (Barcelona) provides entrepreneurship training

ICARE program (Wuhan – China) : 2012

EUROPEAN COMMISSION

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HUAZHONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

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ESPCI ParisTech

École des Ponts ParisTech

HEC PARIS

ENSTA ParisTech

MINES ParisTech

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TOTAL

EDF

SAINT-GOBAIN

Schneider Electric

PSA PEUGEOT CITROËN

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MOOC creation

MOOC : **M**assive **O**pen **O**nline **C**ourse

Coursera Platform (**French or English language**)

- 2014 : « Physique des cellules solaires au silicium » (B. Drévillon, J. Nassar)

  2 800 « students » (28 % from Africa). English version in progress (2015)

- 2015 : « Thin film solar cells » (P. Roca…), « polymers for photovoltaics » (G. Horowitz)

  « Fluvial and maritime resources for renewable energies » (A. Stegner)

- Possible extension to other Master REST courses

MOOC : flexible platform.

- Course + exercices + tutorial
- Executive formation (partnership Ecole polytechnique / HEC)

THANK YOU !

WWW.POLYTECHNIQUE.EDU