Who is TEAM?

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Erin Baker	Umass Amherst
Valentina Bosetti	FEEM/CMCC
Gabe Chan	Harvard
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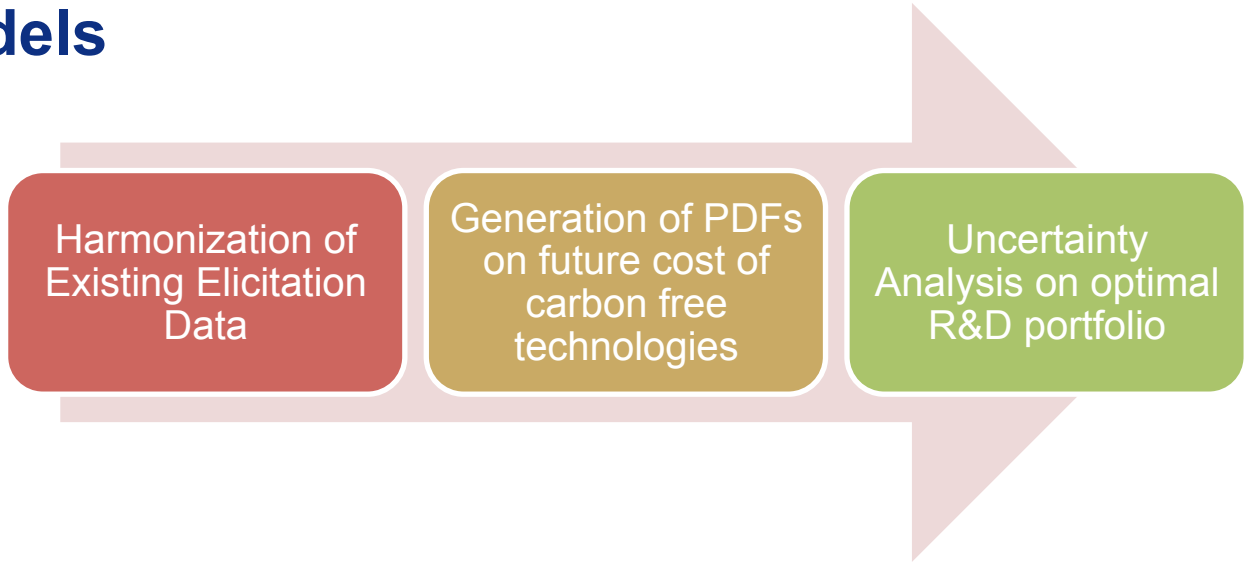
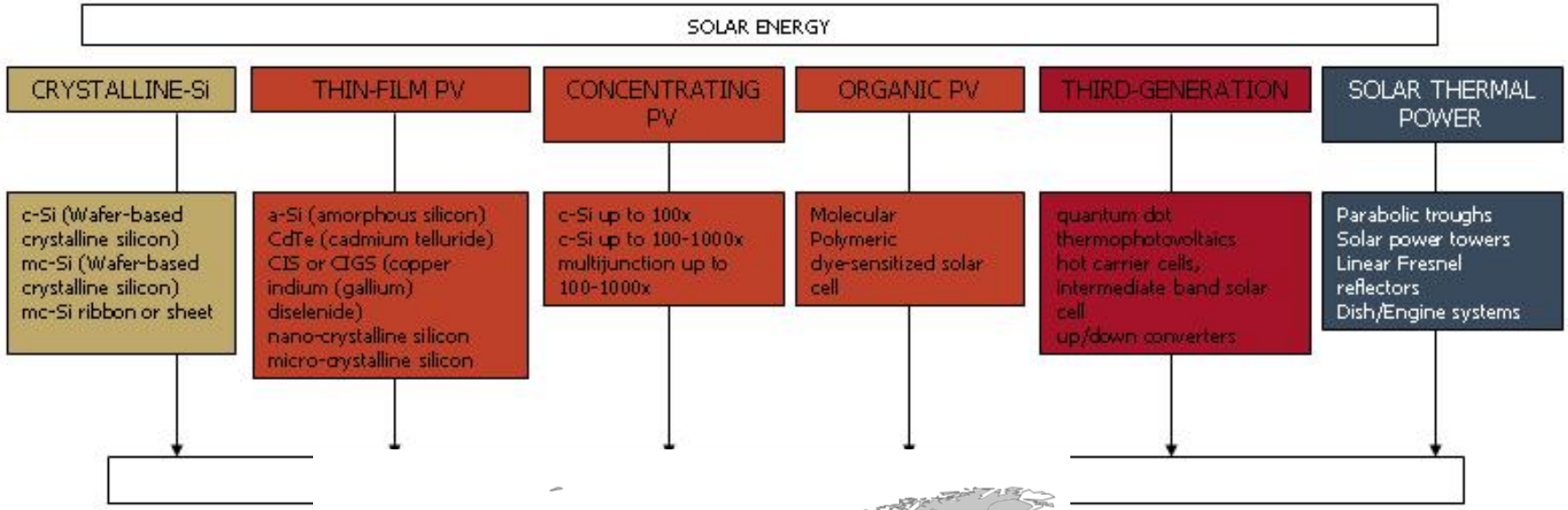
What is TEAM about?

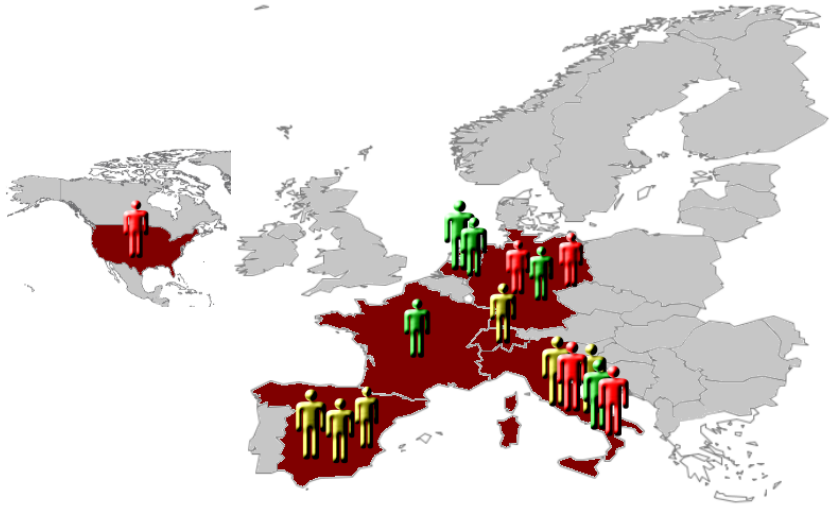
The purpose of this project is to develop a framework for:

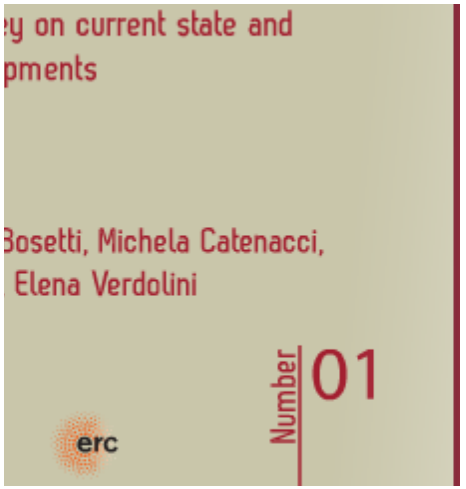
1. **Integrating the large and growing data sources on technology supply derived from expert elicitations**
2. **Communicating the integrated data in a way that is useful to policymakers and IAM modelers.**
3. **Study the effect of uncertain technical change in IA models**



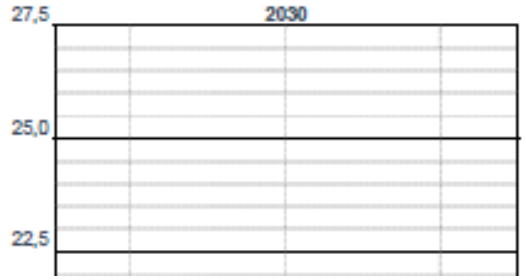
An example: A solar survey







Questions on 2030 Costs:



We are interested in analysing the **evolution of the expected cost of electr**
under different RD&D funding scenarios. The aim is then to assess whe
eventually become competitive with fossil fuel generated electricity (with

	Probability			
Cost of solar electricity	Scenario 1	Scenario 2	Scenario 3	Scenario 4
≤ 11.27 c$/kWh				
≤ 5.55 c$/kWh				
≤ 3 c$/kWh				

A number of groups have performed elicitations of future energy technology costs

Technology:	CCS	Solar	Nuclear	Biofuels	Electricity from biomass	Battery/ Elec vehicles	Utility scale storage	Wind, geothermal, hydrogn	Building energy eff	IGCC
UMass	X	X	X	X	X	X				
Harvard	X	X	X	X	X	X	X		X	
FEEM	X	X	X	X	X					
DOE EERE	X	X		X	X	X		X	X	
CMU	X	X	X							
NAS	X									X
Chung et al	X									

Challenges

- Metric
- R&D Levels
- Time horizon/Region
- Technology type
- Assumptions
- Type of Survey
- Aggregation over experts
- Aggregation over surveys
- Incorporation past data (e.g. on learning)

Impacts

- Comparisons might help better understanding of:
  - expert elicitation process
  - elicitated data
  - where key holes in the data are (Technologies, Timing, Funding scenarios, Regions)

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The TEAM Data

- Moving beyond individual studies on future costs
- Less broad than SREN, costs and R&D effect are the focus
- Megajoule

TEAM, Potential Impacts on the Modeling Community

- The Integrated Modeling Community is extensively working in order to:
  1. Reality-check technology costs and penetration rates values (e.g. SRREN)
  2. Check the effect of the availability of specific technological options (e.g. EMF 27)
  3. Understand drivers of costs in IAMs/diagnostics (e.g. AMPERE, PIMDDI)
- TEAM aims at providing new data and frameworks to develop this research, also through a small scale modeling comparison example

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3. **Study the effect of uncertain technical change in IA models: what is the optimal short term decision?**

Current Pilot Project: Harmonization and Aggregation

- Research Question: What is the optimal/robust energy R&D portfolio?
- Elicitation teams: FEEM, Harvard, Umass
- Five Technologies:
  - Solar PV
  - Nuclear
  - CCS
  - Liquid fuels from biomass
  - Electricity from biomass
- Database
- Meta-analysis
- Harmonization
- Aggregation

Current Pilot Project: Model Comparison

- Research Question: What is the optimal/robust energy R&D portfolio?
- Modelling tools: Gcam, Markal US, WITCH
- Type of Analysis MonteCarlo analysis with post-processing to generate pdfs
- Scenarios: unconstrained , 450, 550

- Frameworks
  - Why do uncertainty analysis?
  - What are the interesting questions?
  - Examples of applications

Current Pilot Decision Framework

- We now have 1000 model run for each scenario covering the technology space; then what?
- Through simple decision theory framework evaluate «best» R&D portfolio according to competing rules
  - Minimize energy security concerns
  - Maximize welfare (whose??)
  - …

Open Questions: Aggregating the Data

- Up to this point we were cutting through complexities,
- Now we can actually see what really matters and we should really get it right
- What did we learn that can help us designing better surveys

Open Questions: Regional versus Global Analysis

- Should the value of R&D investments include benefits to the rest of the world?
- Should we account for the fact that breakthroughs will be regionals ?
- How to model spillovers of knowledge from other countries?
- What are the best modeling tools to mimic the innovation process?

Open Questions: Diffusion of technologies

- Historical evolution of:
  - penetration of technologies,
  - consumer response,
  - institutional and infrastructure barriers,
  - technology policy (two ways relationship with technology evolution)
  - innovation: where, who, drivers (patent data)

- Using an historical perspective (e.g. see the work by Charlie Wilson. Tyndall)
- Asking experts?

Nuclear Projections EMF 22 Study: Global Capacity Installed (average across 12 EU/US models), different Policy scenarios