From a promise to a problem

Making photovoltaic markets happen

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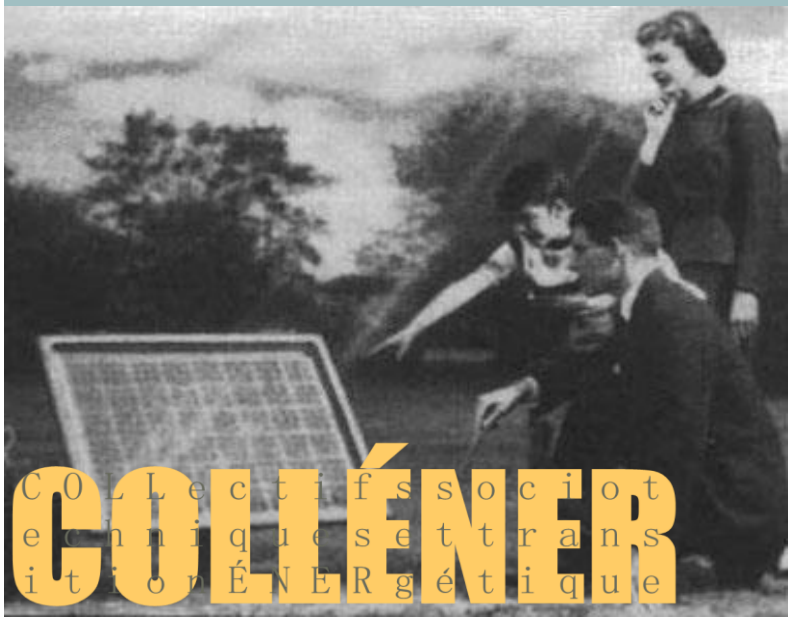

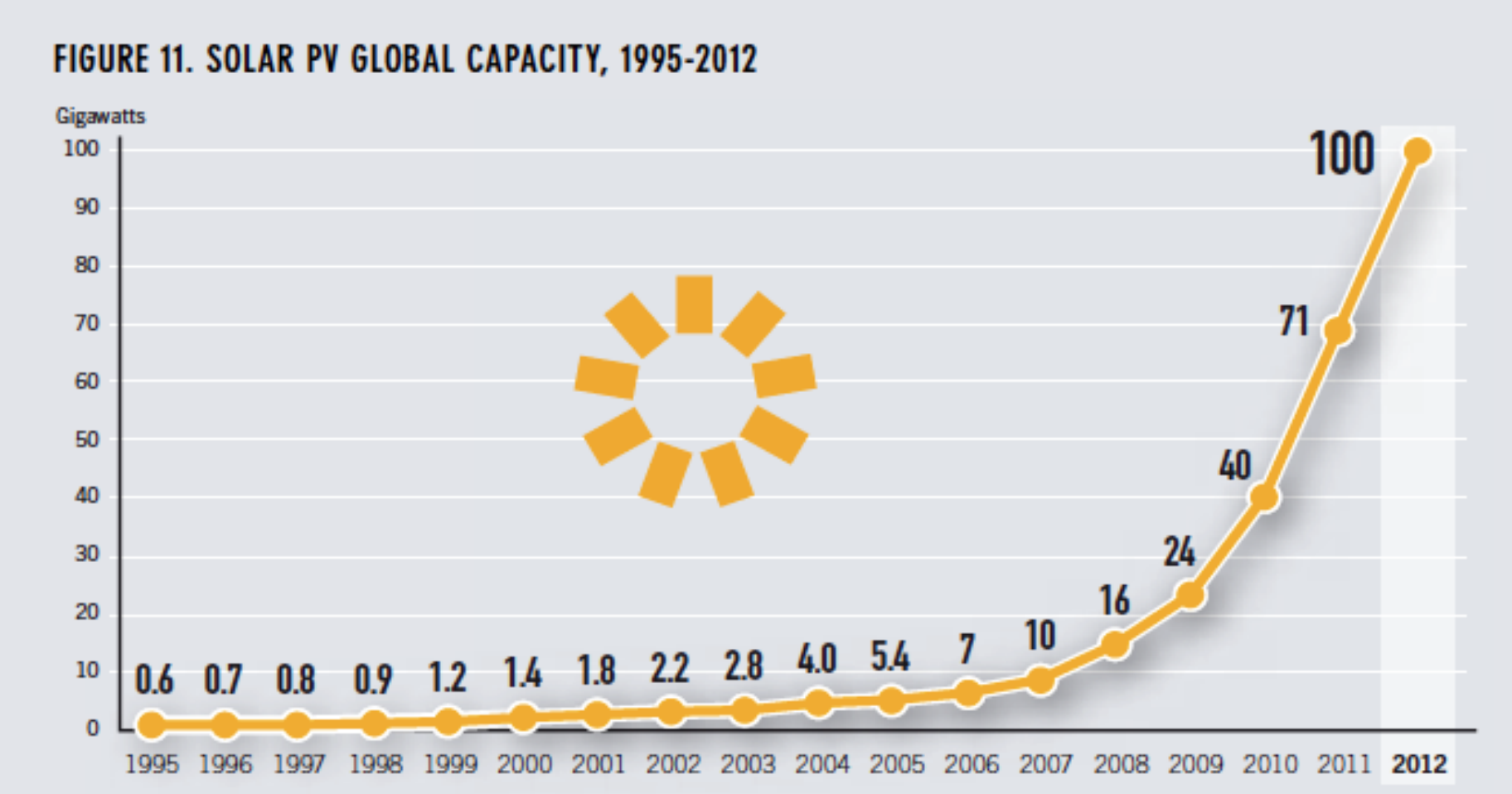

REN21 (2013). Renewables Global Status Report 2013, p. 45.

Introduction

- Photovoltaic (PV)
  - early 2000s: promising but utopian
  - late 2000s: booming, next big thing
  - … and today: problematic, chaotic, uncertain

- What can explain the brutal and to an extent dramatic changes in the status of PV markets?
  - PV markets, especially in Europe, have been driven by policy support.
    If the fate of PV is tied to that of support instruments, what can the study of feed-in tariffs teach us about PV?

What is a Feed-in tariff?

Emerging technology

Grid connexion

Purchase agreement
Electric utilities *have* to buy power generated from PV installations

Fixed price

Fixed period of time
15 to 20 years

Paid for by electricity users

"The difficulty was that we thought of it as an **extremely simple problem of economic theory** with an **extremely limited number of solutions**, and then we kept on refining it by turning a few screws so as to get something that **combined too many objectives.** […]

It took place in **a great mess** because we were in the thick of problems that were, on the one hand, that in some countries it was **too expensive**, and on the other hand, that we had **trouble developing several sectors in a regular manner**, as many governments wanted to. "

– Interview, utility, 2012.

A history of FITs

Emergence (1978-1999)

- **1978:** PURPA – US
- **1980s:** Denmark and Germany
  - voluntary agreements for wind electricity
  - Wind power purchased at a percentage of retail price
- **1990:** German Feed-in Law
  - FITs as regulatory instruments
- **1996:** Internal Market Directive and Green Paper on Renewable Energy Sources

A history of FITs (2)

Generalisation and stabilisation (2000-2008)

- **2000:** German EEG (Eneuerbare Energien Gesetz)
- **2001:** *PreussenElektra v. Schleswag*
  - European Court rules that FITs do not constitute State Aid
- Development of EU renewable energy policy
  - DIR 2001/77/CE
  - EU Energy-Climate Package (2008)
  - DIR 2009/28/CE
- The 'Feed-in tariff v. Tradable Green Certificate' debate

A history of FITs (3)

Sophistication (2008 onwards)

- EEG evolutions to channel growth in PV installations
  - Dynamic degression of FITs depending on the rate of development, growth corridor
- Reforms of FITs throughout Europe
  - Spain (2008), Czech Republic (2010), France (2010-11),UK (2011)…
- Sophistication and hybridisation of instruments

FITs as market devices and political instruments

- Socio-technical agencements (Callon, 2006, 2013)

- FITs rely on:
  - *institutional arrangements:* administrative procedures, purchase obligations, mechanisms to compensate for cost, RE targets…
  - *theories of the economy:* innovation studies, learning-by-doing, experience curves, effectiveness, static and dynamic efficiency, (investment) risk evaluation and perception, modelling…
  - *things valued:* renewable electricity and its characteristics, grid connection, RE technologies, RE resources and potentials…

PV market

Incentives

None

Low FIT
Planned decrease

Marginal

High
Static
BIPV

Promising

Political push

Overflowing
Speculative
Unreliable

Stop & go, regulatory proliferation

Negotiated

Indentified but damaged and insecure

Designed to control growth
Contested

French PV policy

Eole 2005 – Tendering scheme for RE	1995
Loi du 10 février 2000 sur la modernisation du service public de l'électricité	2000
Establishement of the first feed-in tariffs for PV	2002
Modification of feed-in tariffs; introduction of a BIPV premium	2006
Energy-Climate Package – Binding RE targets for EU member states French PV capacity objective: 5.4 GW by 2020 PV module prices divided by 2	2008
PPI 2009-2015 – Confirmation of the 5.4 GW PV by 2020 (about 500 MW/year) **Rapport Poignant** – Warnings from the Spanish experience	2009
January – Revision of FIT categories and decrease of FIT levels **July** – Creation of the Comité d'Evaluation de l'Intégré au Bâti (CEIAB) **August** – Rapport Charpin; second revision and decrease of FITs **November** – Auditions on PV held at the Assemblée Nationale **December** – Moratorium on FITs for PV installations (except on individual households)	2010
January-March – Consultation of PV **04 March** – New support system: yearly cap, self-adjusting FIT, calls for tenders	2011
Etats Généraux du Solaire Photovoltaïque organised by PV representatives **Fall** – Emergency measures for PV announced	2012
January – Punctual revision and increase of tariffs, premium for systems produced in the EU	2013

2002 v. 2006 designs

2002	2006

• Maximum level: 15.25 eurocents/kWh (~ 1 FF)
• Categories:
  ▫ mainland/overseas
  ▫ installation capacity and type of ownership
• Stepped: -5% each year
	• 30 eurocents/kWh
	  + BIPV Premium (25 c/kWh)
	• One-size-fits-all
	• Indexed to inflation

Effects ➢Does not guarantee profitability ➢No real increase in installed capacity	**Effects** ➢Discrepancy between FITs levels and installation costs ➢ Rapid increase in projects ➢Difficult control over “BIPV” ➢ PV investors and developers are a very heterogeneous group

2006-2010 FITs

2006-2009

2010

						12 January 2010 *Arrêté*, 16 March 2010 *Arrêtés*		**31 August 2010 *Arrêté***	
Standard	30	30.520	31.193	31.502	*BIPV ≤ 250 kWc*	Residential	58	< 3kWc	58
								>3 kWc	51
						Educational and Medical	58	51	
						Other buildings	50	44	
						Simplified	42	37	
BIPV premium (25c€/kWh)	55	55.964	57.187	**60.176**	*Other*	≤ 250 kWc	31.4	27.6	
						≥ 250 kWc	31.4 x C	27.6 x C	

The post-moratorium scheme

"Self-adjusting" FITs

Type d'installation (Critères techniques)		Tarif en €/MWh		
Installations sur bâtiments		Bâtiments à usage d'habitation	Bâtiments à usage d'enseignement et de santé	Autres bâtiments
Intégration complète	P ≤ 3 kWc	460	406	352
	3 kWc < P ≤ 9 kWc	460	406	352
	9 kWc < P ≤ 36 kWc	403	406	120
	36 kWc < P	120		
Intégration simplifiée	P ≤ 36 kWc	303,5		
	36 kWc < P ≤ 100 kWc	288,3		
	100 kWc < P	120		
Surimposition		120		
Installations au sol		120		

Commission de Régulation de l'Energie (2011)

Calls for tenders

- "Simplified" for PV installations between 100 and 250 kWc
- Classic for PV projects larger than 250 kWc, with 7 distinct lots aiming at promoting emerging technologies

Re-framing strategies

- Categorisations and refinements to channel innovation and shape technologies
  - Support is increasingly differentiated by installation types and size
- Sophistication of mechanisms to enable FITs to take into account more and more information
  - Regional coefficients
  - Automatic decrease
  - Bonus for EU-manufactured PV systems…
- Political management
  - Consultation in 2010-2011
  - “Emergency measures” in January 2013

Conclusions

- FITs were elaborated, stabilised and then transformed through the **interactions** of **energy policies** and **policy process, economic theories,** and **technology developments**.

- PV markets **depend** on FITs, but they also **disrupt** FITs.

- Various **re-framing** strategies have been used to deal with PV markets overflowings. Most have relied on modifications of support instruments design, also affecting the theories they relied upon.

Thank you for your attention!