Tradable Green Certificates as a Means of Environmental Policy? Theoretical Consideration and Evidence from Poland and Romania

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Motivation & Outline

Twofold purpose:

- Theoretical justification for TGC-based quota obligation schemes?
- Case studies of the new TGC schemes in Poland and Romania

Outline:

(1) Outline of the functioning of a TGC scheme

(2) Theoretical justification of TGC schemes

(3) TGC schemes in Poland and Rumania: design, current state, prospects; conditions for wind-power investments

1 TGC-Based Quota Obligation Schemes

- Retailers must prove a certain quota of electricity sold is generated from renewable energy sources (RES) by submitting TGC to an authority
  $\longrightarrow$ quota instrument, similar cap-and-trade system
- Regulatory authority issues and distributes TGC to RES generators
- One certificate refers to 1 MWh RES electricity, has indefinite maturity, vanishes after submission
- RES generators may sell certificates either on the TGC market or via long-term contracts with retailers
- Quota non-fulfillment by a retailer induces a fine for missing TGC amount
  $\longrightarrow$ introduces upper price limit (buy-out price) on TGC market

2 Theoretical Justification of TGC Schemes

- First discussed in U.S. power industry restructuring debates in 1990s, scientifically: Rader and Norgaard (1996, The Electricity Journal)

- **Arguments for TGC schemes** (R&N'96, Menanteau et al. 2003):
  - Public-good character of RES use due to reduced power price volatility and reduced risk of regulatory changes
  - Potential to 'correct market failures and overcome market barriers'
  - Inducement of technological progress, learning-curve argument

- **Refutations ...**

  Typically (e.g. Frondel et al. 2008, Bläsi 2006):

  no additional emissions reductions, excessive power prices, over-investment, negatively biased carbon price

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3a The TGC Schemes in Poland and Romania

- **Poland:**
  - 38m pop. (EU#6), €308bn GDP (EU#7), 210 Mt CO_2 (EU#4)
  - power mix: 3% RES, 60% hard coal, 35% brown coal, 2% gas
  - RES quotas (%):

2006	2007	2008	2009	2010–2014
3.6	5.1	7.0	8.7	10.4

  - no upper or lower TGC price limit, penalty currently at €71
  - in 2006 only 77% of necessary TGC issued, in 2007 doubling of RES power generation necessary to fulfill quota, TGC price at buy-out

    $\longrightarrow$ expection of TGC price near buy-out level until 2014

3a The TGC Schemes in Poland and Romania

- **Romania:**
  - 21.5m pop. (EU#7), €121bn GDP (EU#17), 70 Mt CO_2 (EU#10)
  - power mix: 28% big hydro, 40% coal, 17% gas, 13% nuclear, 2% oil
  - RES quotas (%):

2005	2006	2007	2008	2009	2010–2012
0.7	2.22	3.74	5.2	6.78	8.3

  - upper TGC price limit of €42, lower of €24, penalty at €84
  - in 2007 only 2.1% of necessary TGC issued, regulator adapted quota to 0.01%, no adaption possible anymore after 2007

    $\longrightarrow$ expection of TGC price near upper price limit until 2012

3b Conditions for Wind-Power Investments

- Analysis of two investor strategies: market sale of TGC and power (option 1), bilateral contract with fixed prices (option 2)
- Calculation of internal rates of return (IRR) based on cash-flow model, comparison with CAPM reward-to-risk ratio of alternative financial investment:

	Poland	**Romania**
IRR option 1	9.49	13.26
IRR option 2	14.07	25.47
R-t-r ratio	*9.84*	*12.0*

3c Discussion

- Both schemes set clear incentives for wind-power investments, but quota fulfillment not likely soon
- Bilateral contracts more attractive, moving schemes close to feed-in-tariff systems
- Design issues Romania: RES expansion requirement surprising, as are spread between upper price limit and penalty as well as high quotas
- As both countries with liberalized energy markets and subject to EU ETS, all above-described distortionary effects can be expected

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Conclusions & Outlook

(1) No justification for policies supporting RES deployment, if energy markets are liberalized and ETS is in place

(2) New systems in Poland and Romania provide clear promotion, but exhibit all described distortionary features, in particular massive investment bubble expected in Romania

(3) Extension of analysis for Australia planned

(4) Analysis of learning curves in PV and solar industry with a focus on Australia, judgment whether Pigou subsidy may be appropriate there

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