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Analysis of the Commodification and Financialisation Aspects of the Green Certificate Schemes in Flanders and Norway

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Analytical framework

» Support to renewable energy (RE)
  » Price based approach: feed-in tariffs, feed-in premiums, ...
  » Quantity based approach: *certificate schemes*, tendering, auctioning, ...

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**Commodification**

- Operational data (MWh produced)
- Green certificates (GC)

**Financialisation**

- Redeem obligation
- Green certificates OR Fine/penalty

**Producer of renewable energy**

- Green certificates

**Obligated party**

- Money
Analytical framework

- Support to renewable energy (RE)
  - Quantity based approach: *certificate schemes*
    - A process of renewable energy *commodification* and *financialisation*

A process by which distinct goods with different attributes and values are transformed into simple fungible commodities within undifferentiated price competition

A process that aims to reduce any produced good or service into an exchangeable financial instrument which can be easily traded
Analytical framework

Analysis of design and performance of 2 tradable green certificates schemes:
• Flanders (Belgium)
• Sweden-Norway

By focussing on:
• Commodification
• Financialisation
Aspects

In order to get a better understanding of:
• Effectiveness
• Cost-efficiency
• Distribution of risks
Swedish-Norwegian Green Certificate Scheme

- Renewable energy objectives
  - Norway: 67.5% Renewable Electricity (RE) by 2020
  - Since 2003: a Green Certificate Scheme (GCS) in Sweden
  - In 2012: a GCS for Norway – linked with Swedish scheme
  - Common market for GC Norway-Sweden

Operational data (MWh produced) → Green certificates (GC) → Electricity providers

- Green certificates OR Fine/penalty
- Redeem obligation

Money

Producer of renewable energy

Auto producers
Swedish-Norwegian Green Certificate Scheme

» **Commodification** aspects
  » 1 GC = 1 MWh renewable electricity
  » Technology neutral
  » Eligible technologies: biomass, geothermal, solar, hydro, wind and wave energy
    » In Sweden: peat for CHP plants
  » New plants or expansion of existing plants
  » For 15 years – no longer than 2035
Swedish-Norwegian Green Certificate Scheme

» **Financialisation** aspects
  » Redeem quota designed in such a way that each country will generate an equal capacity in RE (13,2 TWh/year) by 2035
  » Revision of target every 4 years possible
  » Penalty for non-delivery (150% of average GC-price of previous year)
Swedish-Norwegian Green Certificate Scheme

Resulting renewable production

- Norway
- Sweden
- Target

» Effectiveness
  » On schedule
  » But: asymmetry in investments:
    Sweden >> Norway
Swedish-Norwegian Green Certificate Scheme

» Reasons for asymmetry in investments
  » Differences in depreciation rules (faster in Sweden)
  » Differences in tax regime (lower income tax in Sweden, additional tax for hydropower in Norway)
    » 5.6 TWh of mainly wind power in Norway may be crowded out by more expensive Swedish projects
  » Difference in commodification aspects of both schemes
    » Swedish projects, in operation after 2020, will be part of the scheme – Norwegian ones not
    » Less appetite to invest in Norway

» Conclusion:
  » Swedish-Norwegian scheme is effective in achieving the results
  » BUT not in the most cost-efficient way
Swedish-Norwegian Green Certificate Scheme

- Distribution of risks
  - Mainly for the investors
    - No limit to number of certificates \(\Rightarrow\) risk of oversupply \(\Rightarrow\) risk of decline in certificate price
    - Investors might postpone investment decision: more likely in Norway than in Sweden
  - For the government: little or no risk
    - 398 TWh guaranteed
    - Overinvestments: target will be met
    - Under investments: further incentives may be given (increase of redeem quota)
Flemish Green Certificate Scheme

» Renewable energy objectives
  » In 1999: 0.03% in 1999 → 3% by 2004
  » At this time: an EU-wide GCS expected
    ⇒ GSC selected as policy instrument in Flanders
  » GSC scheme operational since 2002; since then: amended

Operational data (MWh produced) → Green certificates (GC)
Green certificates OR Fine/penalty → Redeem obligation
Green certificates → Electricity providers

Money

Producer of renewable energy
Flemish Green Certificate Scheme

» **Commodification** in the original design
  » 1 GS = 1 MWh renewable electricity
  » Technology neutral
  » Eligible technologies: wind on-shore; hydro; tidal energy; geothermal; biogas; landfill gas; biomass

» **Financialisation** in the original design
  » Redeem quota
  » Penalty for non-delivery
    » Set at 125€/lacking GC
    » Sets ceiling price in GCS
Flemish Green Certificate Scheme

- Amendments
  - In 2003 already
  - RE did not develop as anticipated
  - Amendments in financialisation aspect
    - New redeem quota
    - Amended penalty
      - 2002: 75€
      - 2003: 100€
      - 2004:-...: 125€

![Graph showing redeem quota changes over years](Graph)
Flemish Green Certificate Scheme

- Amendments: in *financialisation* aspect
  - 2004: introduction of minimum allowances: sets floor price for GC

Diagram:
- **Producer of renewable energy**
  - Operational data (MWh produced)
  - Green certificates (GC)
- **Electricity providers**
  - Market price
  - Green certificates
- **Distribution grid operators**
  - Minimum allowance
  - Green certificates (GC)
  - Market price

Flowchart:
- Green certificates ➔ Redeem obligation ➔ Fine/penalty
- Green certificates ➔ Market price
- Operational data ➔ Green certificates (GC)
- Green certificates (GC) ➔ Green certificates

Diagram elements:
- Producer of renewable energy
- Electricity providers
- Distribution grid operators
- VREG
- Market price
- Green certificates
- Redeem obligation
- Minimum allowance

Note:
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Flemish Green Certificate Scheme

» Amendments: in financialisation aspect

» 2006: minimum allowances for PV above market price
Flemish Green Certificate Scheme

- Amendments of 2004-2006
  - Resulted in a boom in PV-investments
  - Cost went out of hand
- Amended minimum allowances in 2009 and redeem quota in 2011

Minimum allowances

- GGC price (€/GSC)
- PV
- PV < 1MWp
- PV > 1 MWp
- Wind energy
- Biogas

Redeem quota

- Original
- Amended 2003
- Amended 2011
Flemish Green Certificate Scheme

- New amendments: in *commodification* aspect
  - Introduction of banding in 2009
    - Co-firing biomass: 1 GSC / 1 MWh ⇒ 0.5 GSC / 1 MWh
  - 2011: thorough evaluation of GSC
    - Generalisation of banding factor for all technologies
      - Technology specific
      - Revised annually
      - Can vary between 0 and 1.25 GSC/MWh (in practice: 0 - 1)
      - Price band between fine and minimum allowance: narrowed to 93-100€ / GC
  - Redeem quota: increased
# Flemish Green Certificate Scheme

<table>
<thead>
<tr>
<th>Banding factor or the number of FGC issued per MWh renewable electricity produced</th>
<th>New in 2013</th>
<th>New in 2014</th>
<th>New in 2015(°)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photovoltaic</td>
<td>Transformer capacity &lt; 10kW</td>
<td>0.23</td>
<td>0.268</td>
</tr>
<tr>
<td></td>
<td>Transformer capacity 10kW - 250kW</td>
<td>0.63</td>
<td>0.522</td>
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<tr>
<td></td>
<td>Transformer capacity 250kW - 750kW</td>
<td>0.49</td>
<td>0.436</td>
</tr>
<tr>
<td>Wind on-shore</td>
<td>Maximum turbine capacity ≤ 4MWe</td>
<td>0.80</td>
<td>0.777</td>
</tr>
<tr>
<td>Biogas; electrical capacity ≤ 5 MWe</td>
<td>For digestion of manure and agricultural products</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>For digestion of gardening and kitchen waste</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>For heat recovery of landfill gas</td>
<td>0.196</td>
<td>0.241</td>
</tr>
<tr>
<td></td>
<td>For digestion of sewage sludge</td>
<td>0.208</td>
<td>0.329</td>
</tr>
<tr>
<td></td>
<td>Other digesters</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Biogas; electrical capacity 5 – 20 MWe</td>
<td>For digestion of manure and agricultural products</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>For digestion of gardening and kitchen waste</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>For heat recovery of landfill gas</td>
<td>0.001</td>
<td>0.0409</td>
</tr>
<tr>
<td>Biomass; electrical capacity ≤ 20 MWe</td>
<td>For the combustion of straw</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>For the combustion of wood</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>For the combustion of municipal or industrial waste</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
Flemish Green Certificate Scheme

- Effects of Flemish Green Certificate Scheme:
  - In 2010: 3.1 TWh RE energy produced = 6% target ⇒ Effective
  - Due to boost in PV investments ⇒ not cost-efficient
Flemish Green Certificate Scheme

- Reform of scheme in 2012:
  - Quantity based approach → price base approach
  - Stand-still in investments (temporary ?)
    ⇒ cost-efficient, but risks not to be effective

![RE capacity added (MW)](chart)

- PV
- Wind
- Biogas
- Biomass
- Hydro
Flemish Green Certificate Scheme

» Distribution of risk

Electricity providers: risk of fine (not enough certificates)
   Within limits: due to fixed fine
   ⇒ Other redeem quota path

Investors: decline in certificate price
   ⇒ Minimum allowances

Distribution grid operators: extra costs
   ⇒ Socialisation of costs between each other

Investors in 2012: uncertainty on how the amended scheme will function;
   banding factor that varies in time
   ⇒ Decline in investments

Government: will the target be met?
Conclusion

» Both schemes: effective but not cost-efficient however for different reasons
  » Norway-Sweden: due to differences in taxes, depreciation rules
    ⇒ Be careful with creating common markets for commodities
  » Flanders: caused by design aspect: minimum allowances above market price

» Certificate scheme design: determine how risks are distributed among the participants
  » Most apparent in Flemish scheme in view of its numerous amendments

» Take care when designing certificate schemes
  » Analysis of commodification and financialisation aspects helps to understand the impacts of its design
11/09/2014

Thank you for your attention

Any questions?