



# Subsidization of renewable energy

## Green certificates

### An introduction

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# Agenda

- Purpose
- Different types of subsidies
- Green Certificates
  - How do they work
  - Why do we need them
  - Future opportunities

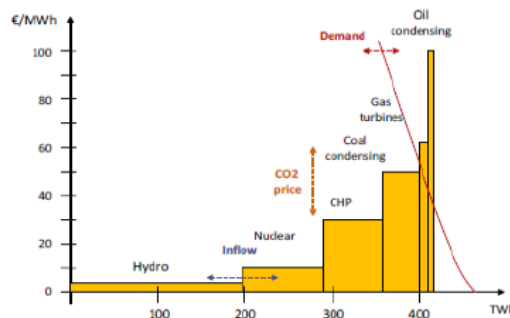
# Purpose & background

## ■ Fossil energy sources

- Coal = 40 EUR / MWh
- Gas = 49 EUR / MWh
- Oil = 90 EUR / MWh
- Nuclear = 35 EUR / MWh

## ■ Renewable energy sources

- Hydro = 5 EUR / MWh
- Wind = 75 EUR / MWh
- OS Wind = 200 EUR / MWh
- Solar = 125 EUR / MWh
- Bio = 125 EUR / MWh
- Wave = ++++++
- Tidal = ++++++



# Purpose & background

- Why do we subsidize?



# How do we subsidize?

- Direct or indirect subsidies?
- What's beneficial for society?
- What's fair with respect to competition?
- **Discussion: How do you think energy should be subsidized??**



# How do we subsidize?

- Feed in tariffs
  - Contribution per MWh
  - Technology specific
  - Difficult to set the right tariff
  - Can allow expensive technologies to produce
  - Efficient way to subsidize, used in over 60 countries
- Green certificates
  - Market based subsidy system
  - Can be compulsory or voluntary
  - Market decides the price
  - Most efficient technology will produce first

# How do we subsidize?

- R&D support
- Strategic public procurement
- Taxes that increases the price of fossil energy
- Tax cuts for green energy
- Public relation campaigns (free marketing)
- Guarantees of origin

# Experience from other countries



## •2008 Study from ECON

- SWE
- DEN
- GER
- UK
- AUT
- FIN
- ITA
- FRA
- NED
- ESP

- Main driver: environmental concerns & climate change
- A combination is most common
- SWE, UK and ITA use certificates
- No production support in FIN, but fiscal support
- Conclusion = feed in tariffs is most effective, but differences between countries
- Investments in renewable energy is way more risky and will rely on public support schemes for years



# Green Certificates

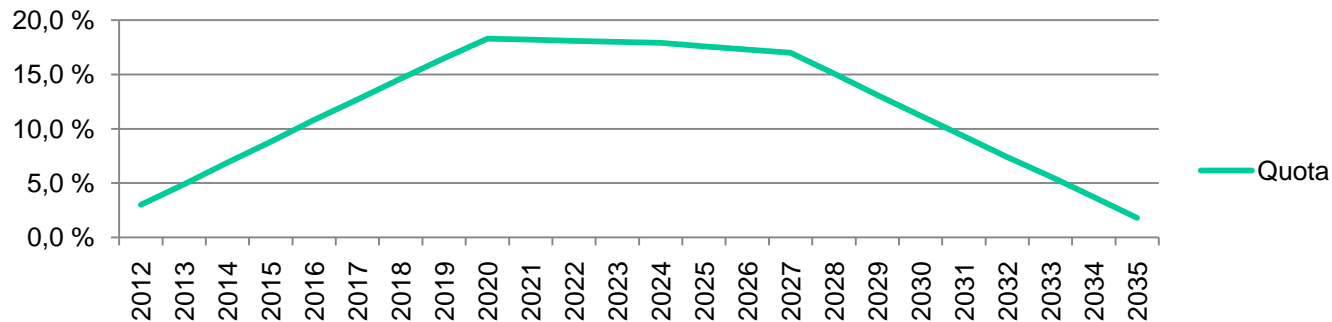
- Norway will enter a common market with Sweden in 2012.
- Objective: As a support scheme, contribute to more renewable energy in the market through promoting the most efficient projects, independent of technology.
- The size of the support will be decided by the market (supply and demand)
- Each certificate is valid for 15 years and the support scheme will issue certificates until 2020.
- Objective: 26,4 TWh of new renewable energy within 2020.

# GC's – How do they work??

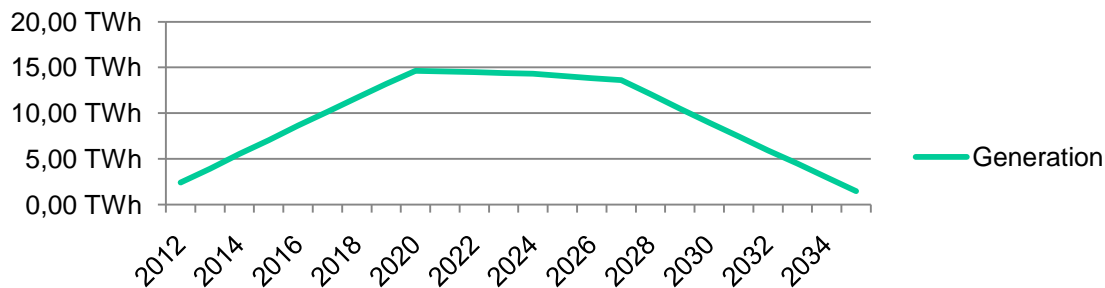
- Producers of new renewable energy will receive a GC per MWh delivered to the market.
- The government will decide a specific share of GC's, which all suppliers of energy have to buy each year within a specific date.
- The share is a percentage of total sales.
- If the suppliers fails to comply with the procurement of certificates – they will be fined. Average certificate price \* 150 %

# GC's – The quota

## Proposed quota



## Generation

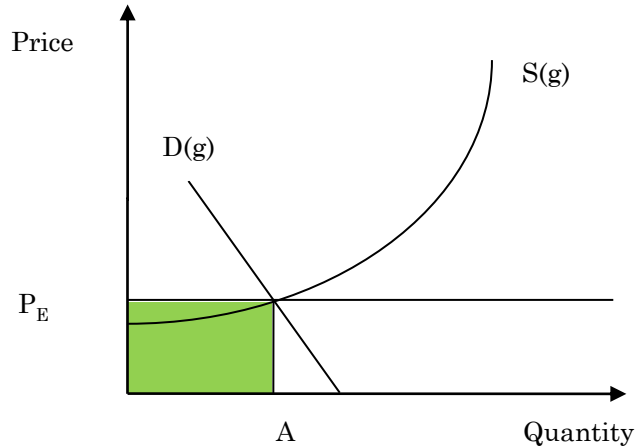


# GC's – How do we do this practically?

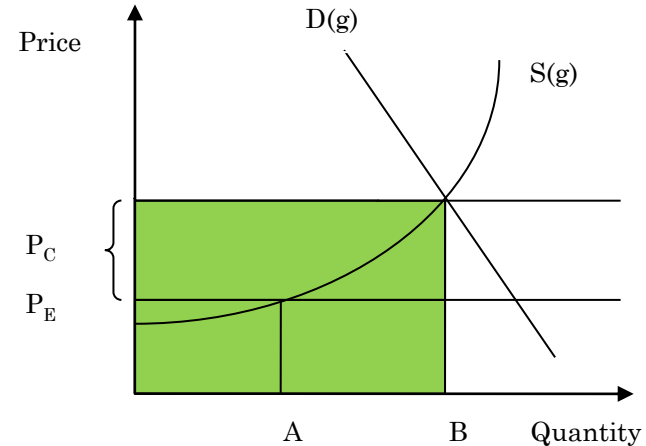
1. The government decides the quota
2. The government issues certificates
3. The suppliers have to buy certificates
4. Price is decided in the market
5. The supplier bills the customer
6. Increased quota and on again.....

# GC's – price formation

## Without GC



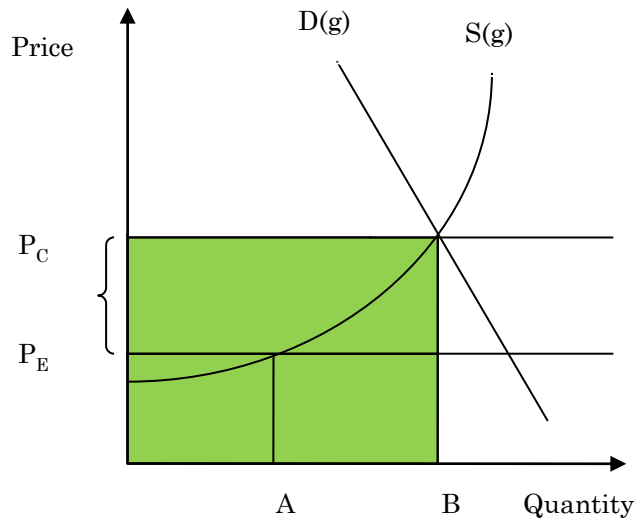
## With GC



Price el + Price GC = Prod.cost

# GC's - Price formation

## Price formation



## Events

1. The government decides a quota ( $B$ )
2. Producers enters the market
3. Price is decided in intersection quota-supply-demand

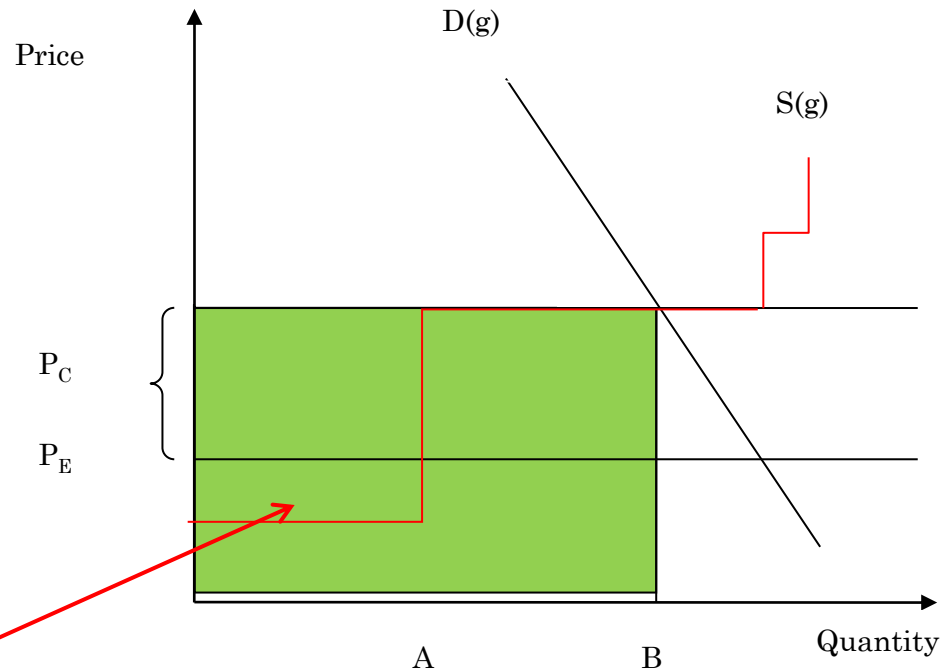
# Who decides the price??

In theory: SIMPLE

- Production cost to the last producer

Complications:

- Competition between producers within same technology
- Financial behavior



Windfall profits

# Erfaringer fra Sverige

- Brukte noe tid på å tilpasse seg
- For lav kvoteplikt innledningsvis = lav pris
  - Mange hadde ventet på sertifikatene
  - Varmekraftverk begynte på biobrensel
- Stigende priser mot 2008
  - Billigste teknologi utbygget
- Finanskrisen – redusert forbruk
  - Absolutt andel redusert – for mange sertifikater



# Konklusjon

- Systemet fremmer effektivitet
  - Grønn energi produseres der den gir mest per input
- Samarbeid = et mer solid marked og bedre forutsigbarhet
- Teknologier vil modnes
- Suksessfaktorer:
  - Forutsigbarhet og tillit
  - Tålmodighet
  - Huske på hva som faktisk er målsetningen!