f3 – Policy instruments directed at renewable transportation fuels

An international comparison

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Project & Presentation

- Aim/Context
- PART I
  - ‘Smakprov’:
    Brazil, US & Germany
  - Findings
- PART II
  - Status Sweden
  - Conclusions

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Aim & ‘point of departure’

Insights for more efficient policy instruments in Sweden that account for dynamic issues:

- feedstock and climate,
- Technology, industrial development and infrastructure,
- regulations, and longer-term political intent.

Point of departure:

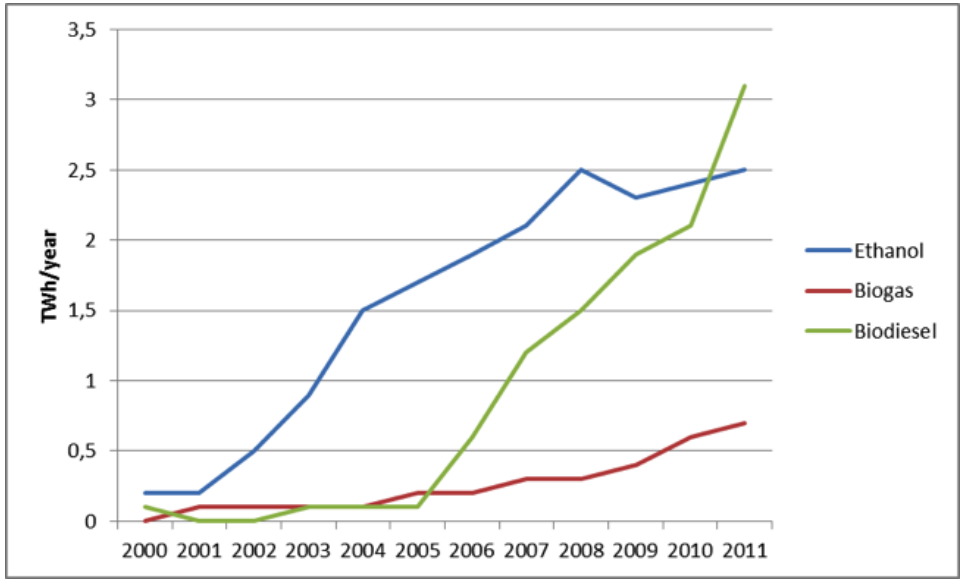
- While production, infrastructure, and markets for biofuels in Sweden are of significant scale, they are still in an early stage of their development potential;
- biofuels policy must reflect this.

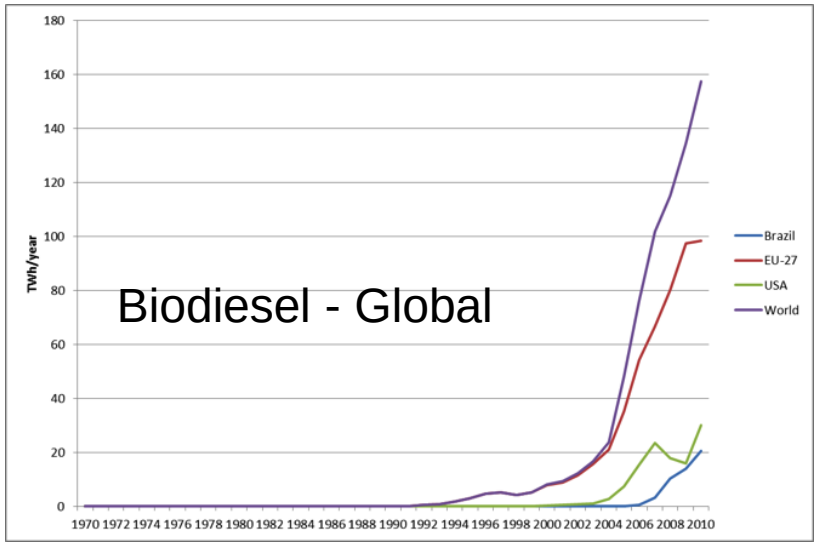
Key focii

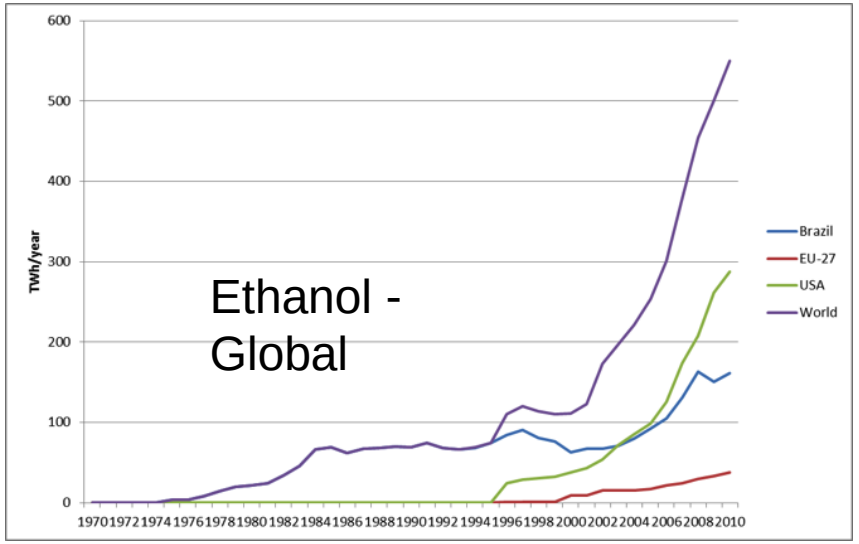
Emphasis on key points of change or major market inflection; in particular:

- Underlying motivations for policy interventions
  - *Formulation process?*
  - *Alignment of outcomes align with initial objectives*
- Support for biofuels in the short and longer terms;
- Lessons for Swedish biofuels.

Sweden & the World







Brazil

US

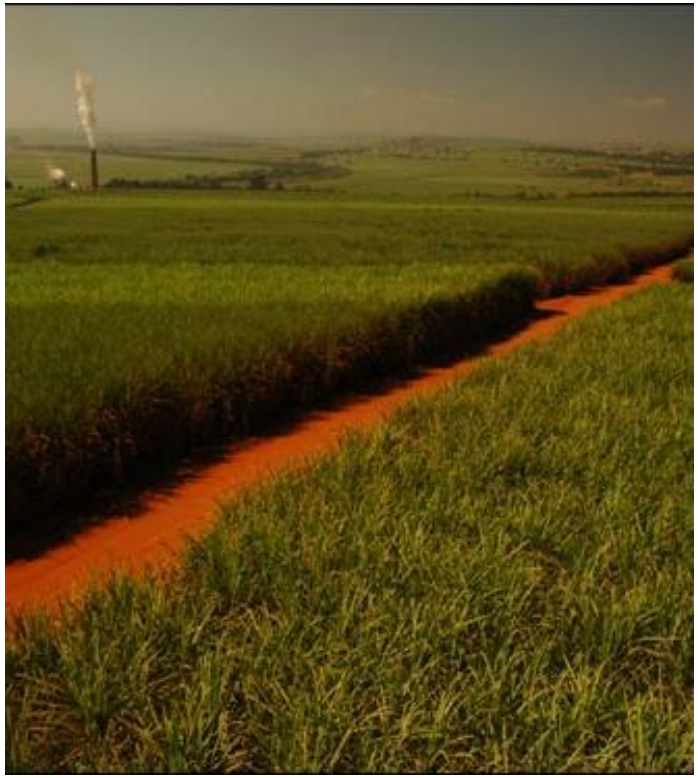
Germany

CASE STUDY FINDINGS

Brazil -
Reduce oil dependency; strengthen agriculture

<u>Proalcohol achievements</u>

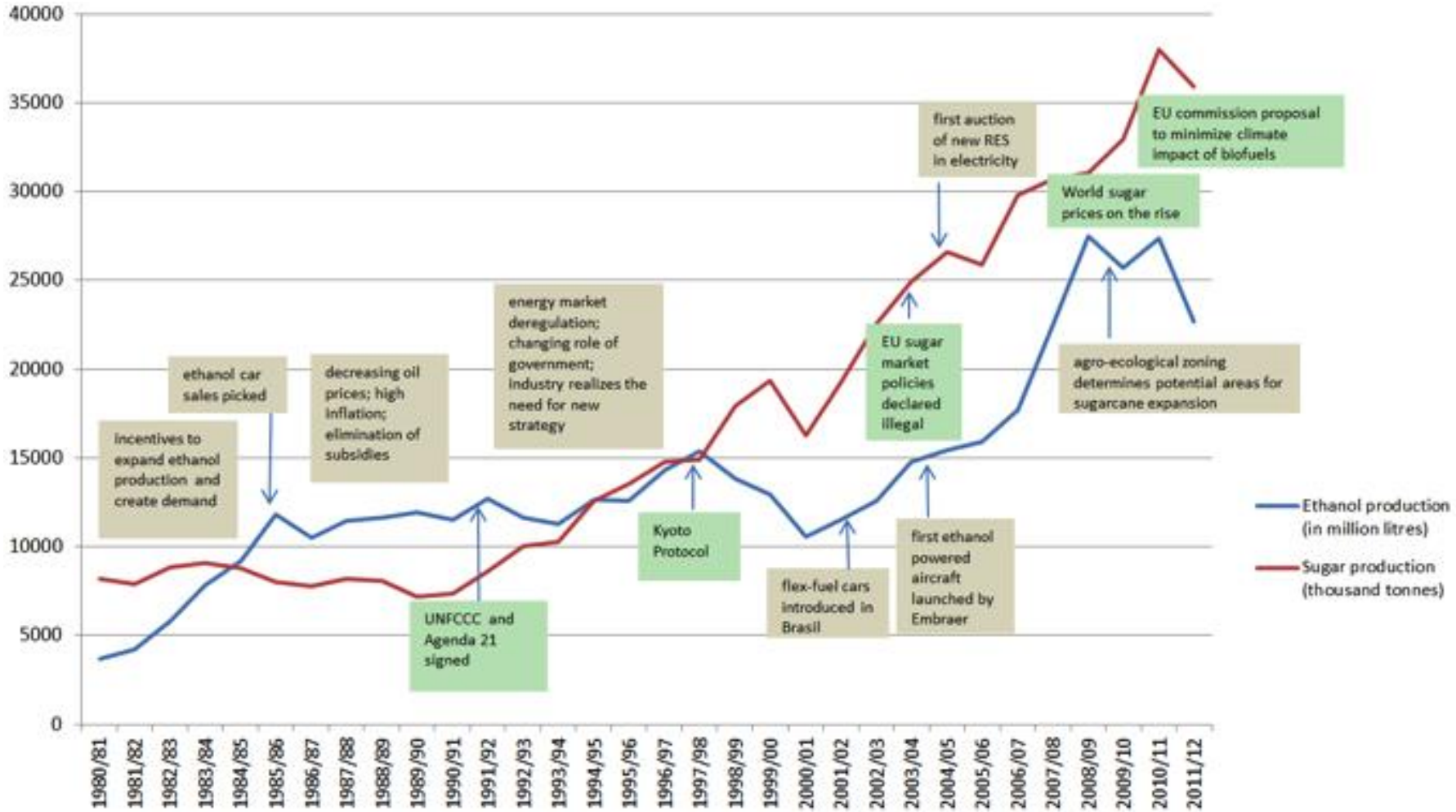
- Infrastructure (production + distribution)
- Agri-Modernisation
  - +30% yields sugar
  - (+) food/fuel production
  - (-) deforestation
- +35% GDP attributed to reduced oil dependence (EtOh contribution)
- Energy diversification
  - +6% electricity
  - (-)14/22% business cycle volatility
  - Systemic efficiency improvements



Brazil – policy portfolio

- Expansion incentives
- Mandatory targets for EtOH mix
  - High blends guaranteeing market/avoiding blend wall issues
- Negotiated agreements with cars manufacturers
- Public procurement of car fleets
- R&D financing of agriculture
- Investment grants

Brazil –
emerging economy adaptation & evolution



Brazil – biodiesel

- 1980s pro-oleo programme failed
- 2005 – 2% v/v biodiesel authorized
  - Later made mandatory and lifted to 5%
  - Rapid expansion 5% goal reached in 5 years
- Installed capacity is now above this by 100%
  - Blend wall issues
  - Lobbying for increases to 7% then 20%
- Socio-economic elements
  - Favouring small farmers (modest success)
  - Significant international capital involvement

United States – (EtOH) air quality, rural support, energy security; a ‘path dependent’ development

Fuel programme achievements

-Cleaner air & reduced water resource risks

-Significant part of agricultural fabric

-Sizeable flex fuel fleet

-Massive logistics infrastructure

-Import dependence reduction

10% of gasoline

-Technology ‘threshold’ for 2nd generation fuel production

But – currently in limbo

-Blend walls

-Receding energy security concerns

-Vehicle sector ambivalence

United States – policy portfolio

Clean Air Act 1977 10% EtOH approved

-Oxygenate competing with fossils
-Long term tax exemptions
-Steady significant growth
-Strengthening of oxygenate mandates

Mandates for flex fuel vehicles
MTBE bans 2003+

-Market space created & Explosive growth

Energy policy act 2005

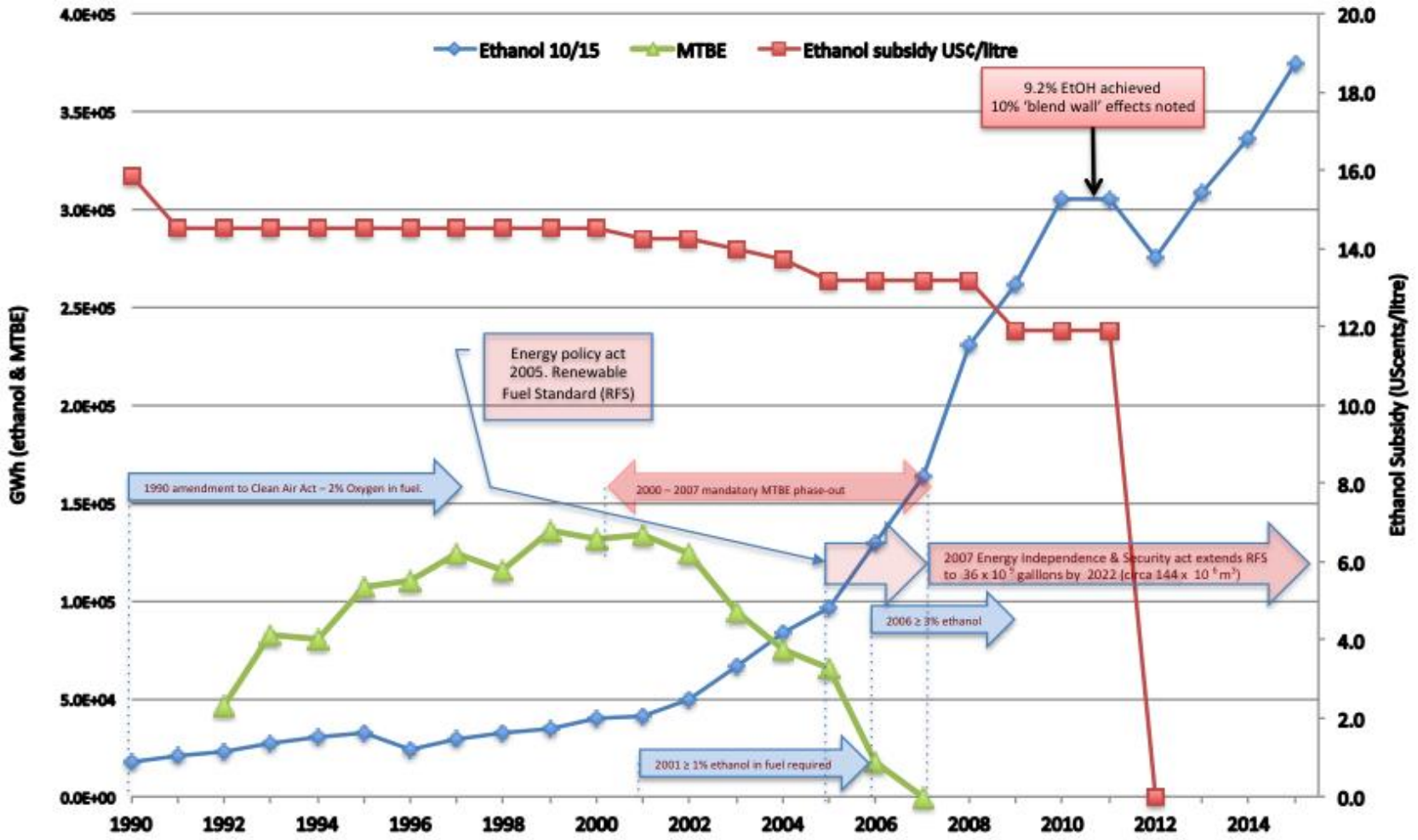
-Infrastructure grant programmes
-Demonstration, testing

2006-8 RFS programmes/Energy security /Economic Stabilization Acts

-Mandated consumption requirements
-Delineation of fuel types/generations
-Upper limit for 1st gen & guaranteed market space for advanced fuels

US –

2001 inflection (market space); 2012 support shift



Germany –
(biodiesel) shifting aims & political expediency

Original focus: Rural development, energy security, climate ---

Evolved focus: Climate, energy security, rural development

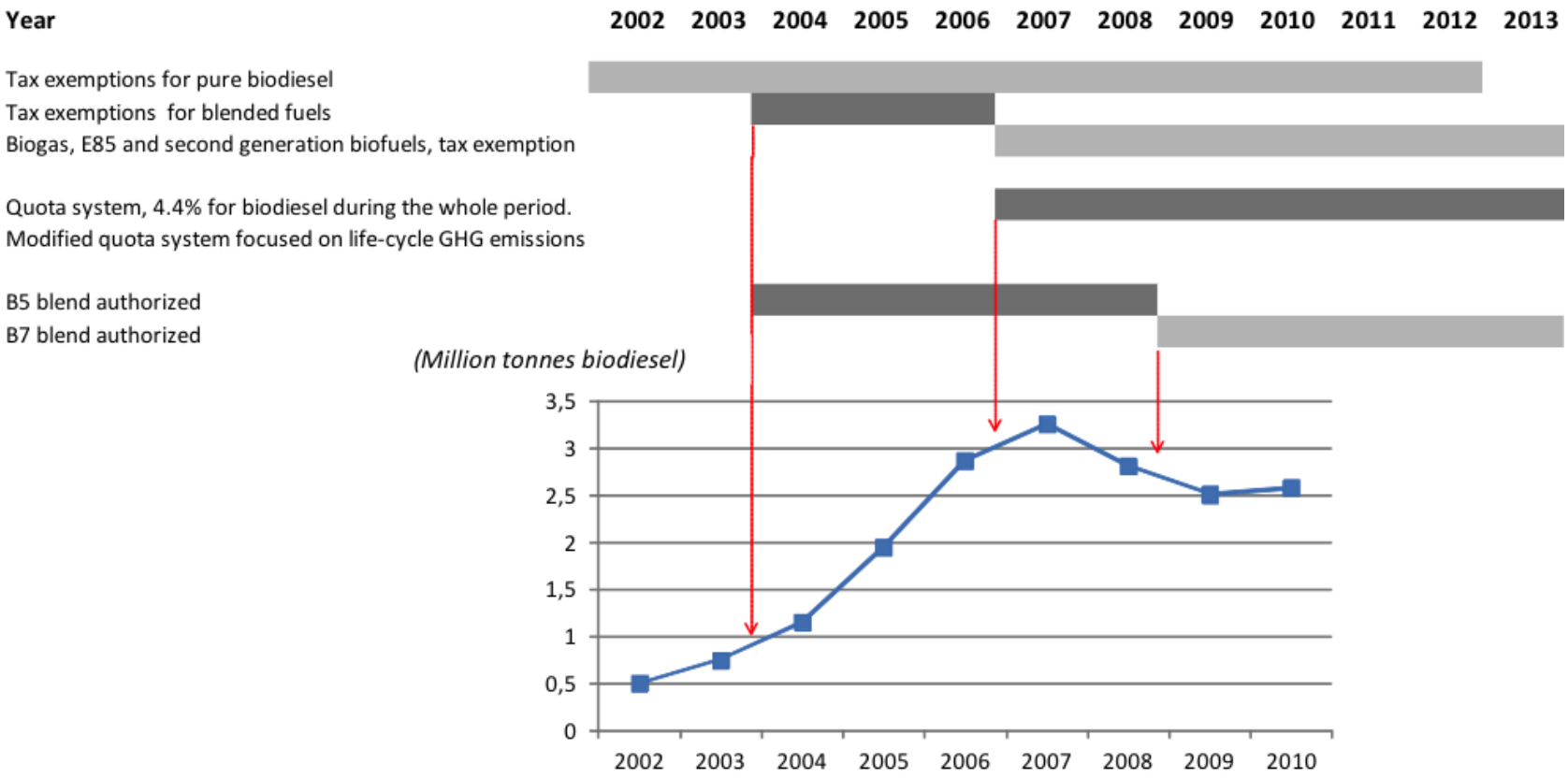
Original format

- High blend & pure biodiesel focus, smaller market actors and generous tax exemptions (2 billion €/2007)

Refocus and outcomes

- Quota system 2007 (4%)
- Collapse of high blend market (66% market→11%)
- Dominance of large actors
- Cost effective
- Market development within 5-7% approved blend range
- Rise of EtOH market

Germany – 2007 regime change



Synergies by design & multisectoral benefits

Multifaceted policy support and longer-term stability

Tradeoffs between quota systems for low-blends & policy instruments that support high level blends

ANALYSIS FINDINGS

3 Key themes from cases

- Synergies by design and serendipity
- Policy support stability &‘flexibility’ over relatively long market development periods
- Trade-offs between policies for low contra high level blends.

Synergies by design & multi-sectoral benefits

Synergistic effects stimulate biofuels

- increased overall benefit accrues if several sectors gain from the development.

Cases highlight areas where

- biofuels developments strengthen and diversify incumbent sectors and deliver socio-economic benefits
  - fiscal deficit and fuel dependence reduction,
  - agricultural, energy & transport sector stimulation,
  - environmental benefits.

Multifaceted policy support and longer-term stability

Cases highlight the benefits of policy mixes that provide relative stability in support.

Key stability parameters observed included:

- multiple support mechanisms,
- lengthy time horizons for change,
- guaranteed market spaces,
- Deliver of other ‘public goods’

Long versus short(er) stories

Ongoing support matched by steady sector growth was mapped for Brazil and the US over more than 30-years.

-Helped develop industry confidence, legitimacy, and private sector investment

-System flexibility in Brazil

Low blends result in ‘blend wall constraints’ – **short term** issue if easily reached. **Medium-term** issue if high enough to be difficult to reach or if total consumption growing rapidly.

German experiences with generous policy support then rapid policy shifts

-Overall markets contracted

-High-blend systems with high subsidy dependence shrank rapidly and drastically

-Market shares replaced with low-blends

-New market dominated by large ‘incumbents’

Tradeoffs & quota systems

Contrasting experiences with policies supporting high or low level blends point to a number of policy trade-offs

- Brazil, mid-high level blends supported by other initiatives (e.g. flexi-fuel vehicles) and have large market shares, but:
  - But logistics bottlenecks and blend wall issues in biodiesel

- US, mechanisms have built a huge sector, but:
  - Not conducive to the development of markets and infrastructure for high-blend biofuels
  - US now faces ‘blend wall’ challenges
  - Grappling with technology issues, political economy & car lobby

Tradeoffs & quota systems

Quota based systems dominating in the EU

- can apparently deliver low-share targets for biofuels in total fuel mix
- may not set up the system that is required to deliver much higher penetration of fossil free fuels.

High (mix) penetration requires considerable time and massive investment to develop and gain market acceptance.

PART II:
A hybrid quota system

STATUS SWEDEN

New hybrid quota system for biofuels in Sweden (budget proposition 2014)

Hybrid because mandatory blending standards for low-level blended biofuels while tax exemptions are kept for pure and high-level blended biofuels.

- only applicable to sustainable biofuels (according to RED).
- from May 2014: - 4.8% (v/v) biofuels in petrol
- 9.5% (v/v) biofuels in diesel of which 3.5% with additional advantages
- From May 2015: 7% (v/v) biofuels in petrol
- High tolls for ethanol in low-level blends are removed.

Hybrid quota system for biofuels in Sweden – Side effects

- Toll removal places extra burden on domestic ethanol production
  - May be compensated to some extent by increased demand and stricter GHG demands from 2017 (RED)
- Further? Demand for tall oil (limited resource)
  - Exacerbation of challenges for chemical industries that use it as feedstock.

CONCLUSIONS

Synergies & period of opportunity

As production, transportation, and distribution must be involved for a full biofuel chain – other opportunities for synergies

- vital component is the well-developed infrastructure for district heating
- systemic advantages for integrated 1st and 2nd generation biofuel production processes with significant waste heat.

Currently, there may also be a relatively positive business climate for integration of 2nd generation biofuel production with the Nordic forest industry

- diversification opportunities to ameliorate decreased profitability

Swedish hybrid quota system

Sweden seems to have noted fallout from events such as the rapid change from tax exemptions to a quota-based system in Germany.

- Promising 2nd generation pathways in Sweden, (e.g. DME and 2nd generation biogas) still granted full tax exemptions.
- Instrumental for the continued development of these options & an example of stable policy support
- Recognition of trade-off between a quota system that secures low-level blends and a continued support for the pursuit of the high-level blends
- Necessary to achieve the high ambitions for biofuels in the Swedish transport sector.

Clouds on the horizon?

However, these ambitions, together with the activities most likely required to fulfil the targets with 2nd generation fuels will lead to a situation where:

- capital costs are expected to become a more significant part of the total production cost.
- Logical that a hybrid quota system will be insufficient.

A resulting need for increased support for both R&D and for capital investment programmes.

Target-specific policy instruments more effective than quota systems and tax exemptions for:

- energy self-sufficiency and
- rural development.

THANK YOU!