

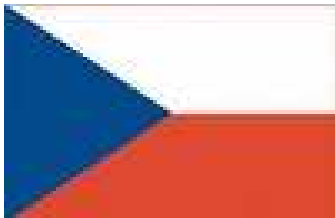
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# THE CZECH FIRST CCS DEMONSTRATION PROJECT: HOW TO MANAGE THE COST?

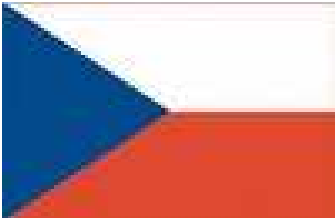
Vladimír Budinsky, MBA

SD – Severočeské doly Company,  
Member of the CEZ GROUP



# CONTENT

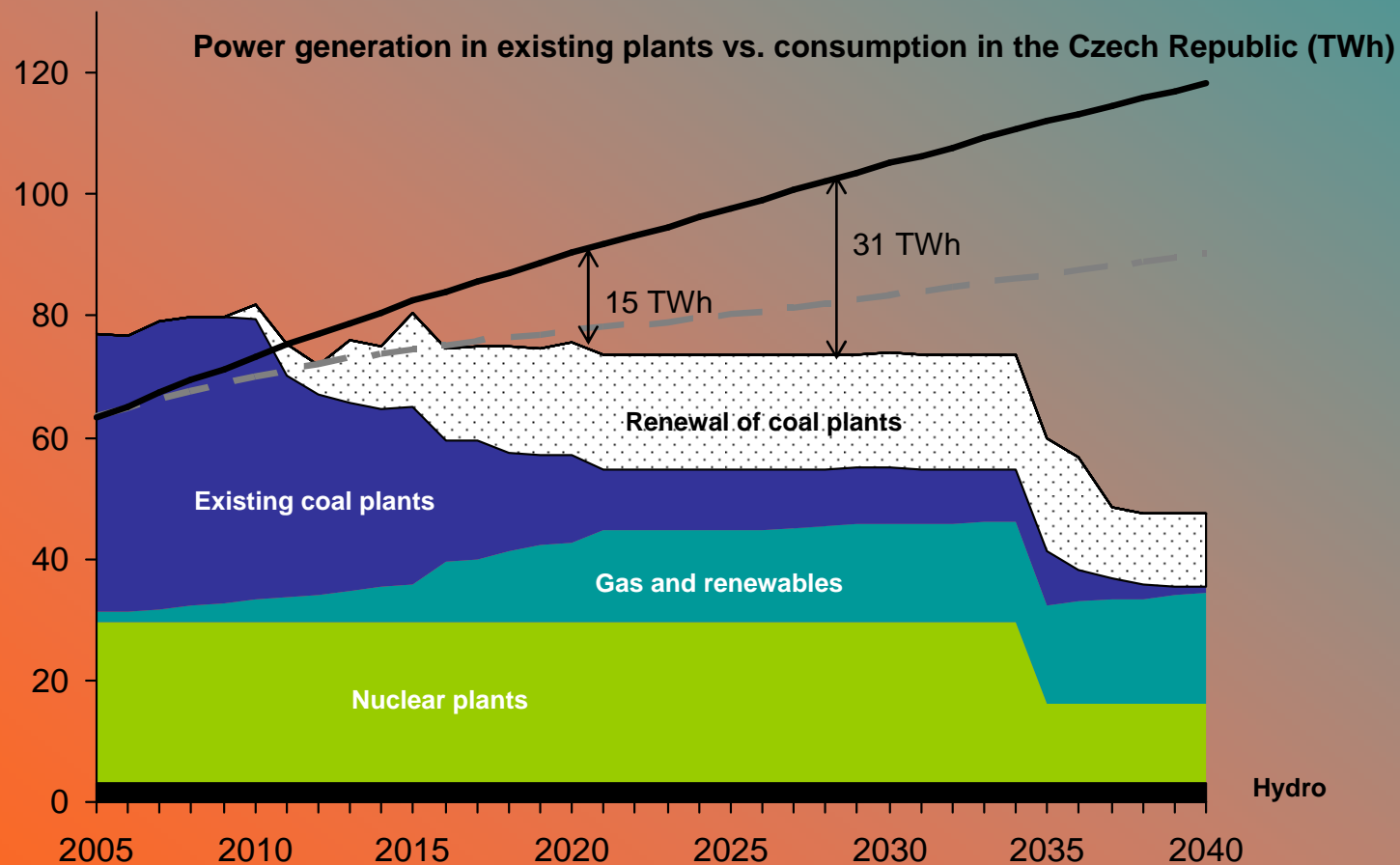
- 1. CEZ Group: Production Portfolio and Strategy**
- 2. Demonstration Programme of Post-Combustion CCS**
- 3. Financing the Demonstration Unit**
- 4. Emissions Limit for New Power Stations: European Commission, European Parliament and EU Council Debate**
- 5. Conclusions**



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## EXISTING SOURCES IN THE CZECH REPUBLIC WILL COVER THE DEMAND ONLY UNTIL 2015; NEW POWER PLANTS ARE NEEDED





## CEZ GROUP

- A strong vertically integrated energy company (brown coal mining – generation – distribution – supply)
- # 8 in the TOP 10 European Power Utilities by number of customers and #6 by market capitalization
- Leader in Central European power markets, 2nd biggest exporter of electricity in Europe

Installed capacity .....14,392 MW

Electricity generated.....65,532 GWh

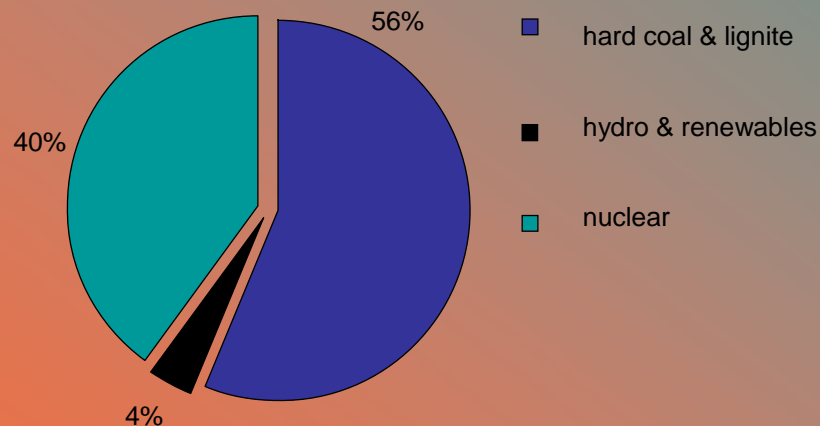
Electricity sold..... 85,674 GWh

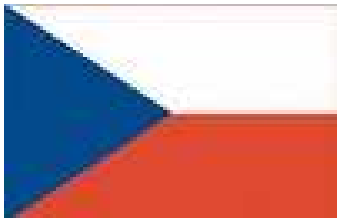
Market capitalization.....€ 27.3 billion

Number of customers.....6.7 million

## CEZ PRODUCTION PORTFOLIO

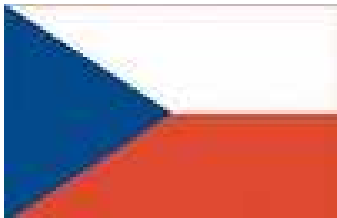
Production of electricity, gross (GWh)





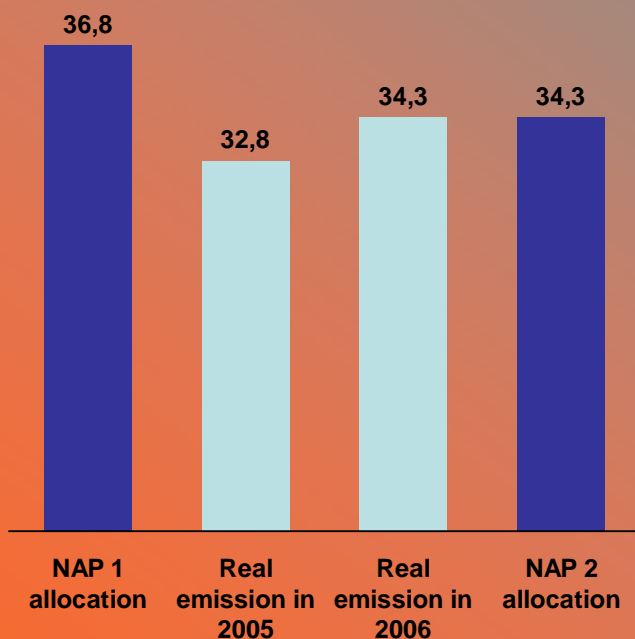
## CEZ GROUP COMPLIANCE WITHIN EU ETS

<b>Allocation 2005 – 2007</b>	<b>46.7 Mt/y</b>
<b>Allocation 2008 – 2012 (anticipated)</b>	<b>42.0 Mt/y</b>
<b>Number of installations</b>	<b>13/4 (brown coal/hard coal)</b>
<b>Installed capacity covered by EU ETS</b>	<b>8,691 MW</b>
<b>ERU/CER import limit 2008 - 2012</b>	<b>10% of annual allocation</b>



## NAP 2 ALLOCATION SUFFICIENT TO COVER THE CEZ GROUP GENERATION NEEDS

**CO<sub>2</sub> Emissions of the CEZ Group (Czech Republic)** mil. tons



### Trading

- Priority dispatch of units with low CO<sub>2</sub> emissions
- Reduction of export

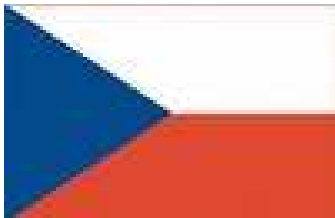
### Plant maintenance

- Increased availability of nuclear plants
- Increased focus on plant efficiency

### Measuring Management

- Implementation of more accurate measurement systems
- Opportunity cost of CO<sub>2</sub> emission considered in all decisions

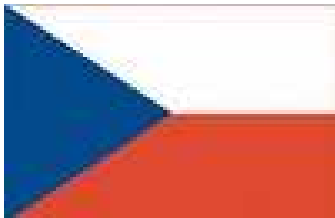
- Polish power plants Elcho and Skawina got allocated 3.6 m in NAP 2, a reduction of 21% compared to NAP 1. Their average emissions were 4.2m in 2005-07.
- Bulgarian allocation plan has not been approved yet.



## CEZ GROUP

### New generation strategy (until 2020)

- Diversify into gas (in the Czech Republic projects 1200-2000MWe; another projects in Bulgaria and Poland; JV in Hungary; tender in Romania...)
- Develop nuclear projects where possible
- Create portfolio of renewables
- Within hard and brown coal focus on projects with significant cost advantage (3 brown coal projects contracted/in construction: total 2200 MW in the Czech Republic; 600 MW in Bosnia&Hercegovina in preparation)
- Invest into JI/CDM projects
- Invest into fossil fuel plants in the non-EU growing markets

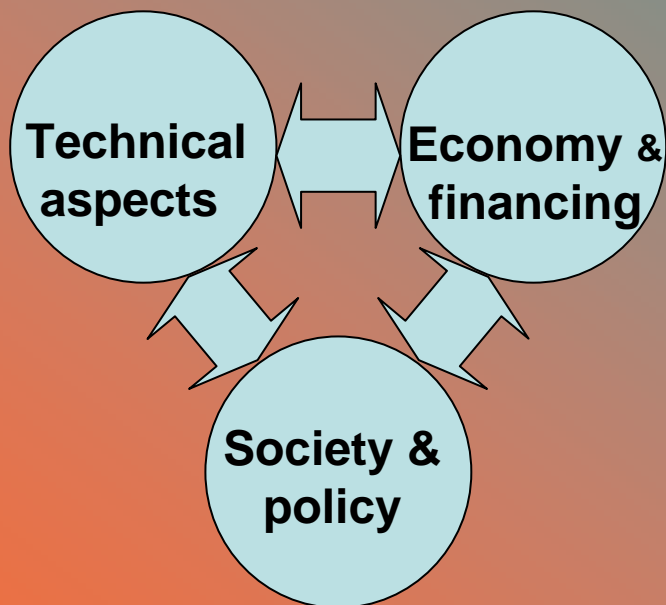


# CCS DEVELOPMENT – A COMPLEX ISSUE

DEMONSTRATION → EARLY DEPLOYMENT → ROLLOUT

- Technology validation (optimization and upscale of CO<sub>2</sub> separation technology, CCS integration)
- Improvement of economy
- Available CO<sub>2</sub> storage capacities (+ transport)
- Legislative, regulatory and business uncertainties

- Selection of separation technology
- Energy optimization
- Optimization of operation (capture – transport – storage)



- Economy of CCS system
- Financial support of demo CCS !!!
- Risk management

- CCS acceptability
- Political consent



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## CCS RESEARCH AND INTERNATIONAL COOPERATION: CEZ GROUP PARTICIPATION

### INTL

- ▶ Zero Emission Platform (ZEP),  
IEA Greenhouse Gas R&D Programme,  
WGs in VGB, Eurelectric, IETA...

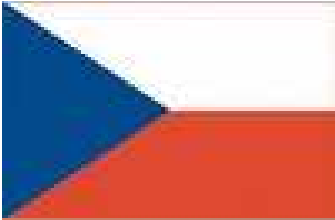
### EC

- ▶ Participation in EU research (7<sup>th</sup> Framework  
Programme, Geocapacity...)

### Czech Republic

- ▶ Support and co-financing of projects in  
the Czech Republic

- **Ministry of Environment: geological research**
- **Ministry of Industry and Trade: industrial R&D**



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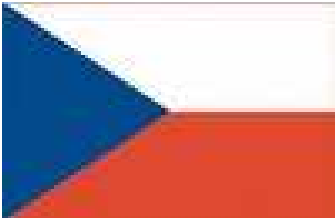
## **CEZ GROUP to built the Czech first CCS demonstration plant**

### **Considering:**

- **Support of the Czech government to host one EU CCS demonstration unit in the country**
- **Preliminary criteria for EU CCS demo programme (X00 MWe, full chain, operational by 2015, advanced engineering...)**
- **European Industrial Initiative for CCS**

### **Two options:**

- **North Bohemia Clean Coal Project (Brown coal fired power station Ledvice)**
- **Hodonín CO<sub>2</sub> Separation Project**



# NORTH BOHEMIA CLEAN COAL PROJECT (DEMO OPTION)



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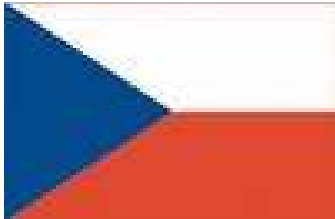
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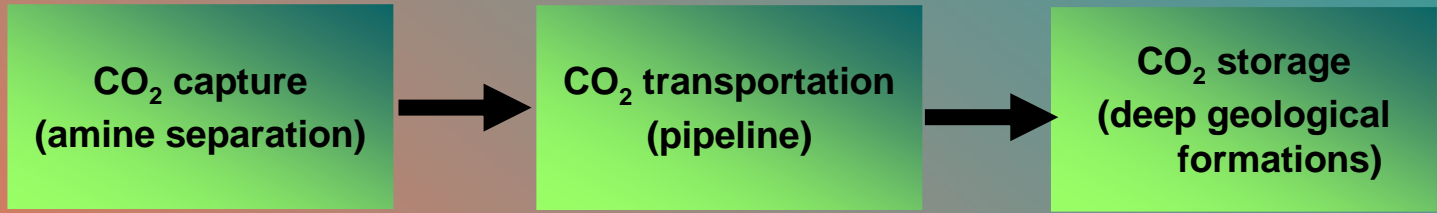
- 660 MWe & supercritical steam parameters (600/610°C)
- lignite fuel
- condensation turbine - heat reserve for a local heating system
- cooling - cooling tower
- minimum environmental impacts - flue gas better than required by EU LCP Directive; waste water, noise,...



Ad Hoc Group of Experts on Clean Electricity Production from Coal and Other Fossil Fuels  
2nd Session  
Geneva, 17-18 November 2008



# INVESTMENT COSTS ESTIMATION: THE NEED OF SUPPORT

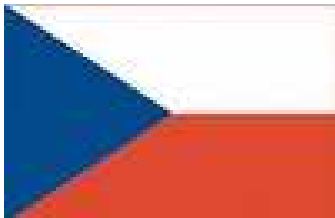


**North Bohemia  
Clean Coal  
Project**

- |   |  |   |
|---|--|---|
| <ul style="list-style-type: none"> <li>▪ Capacity – 2 x 5000 t/day (3000 t/day)</li> <li>▪ 740 mil USD (370 mil USD)</li> </ul> | <ul style="list-style-type: none"> <li>• Length = X0 km</li> <li>• 85 mil USD</li> </ul> | <ul style="list-style-type: none"> <li>• Deep sedimentary aquifers (Central Bohemian Permocarboneous basin)</li> <li>• 20 + 30 mil USD</li> </ul> |
|---|--|---|

**Hodonín CO<sub>2</sub>  
Separation  
Project**

- |   |  |  |
|---|--|--|
| <ul style="list-style-type: none"> <li>▪ Capacity – app. 1000 t/day</li> <li>▪ 200 mil USD</li> </ul> | <ul style="list-style-type: none"> <li>• Length = X – X0 km (possible use of local oil company lines)</li> <li>• 28 mil USD</li> </ul> | <ul style="list-style-type: none"> <li>• Depleted oil structures or deep sedimentary aquifers</li> <li>• 8.5 + 14 mil USD</li> </ul> |
|---|--|--|

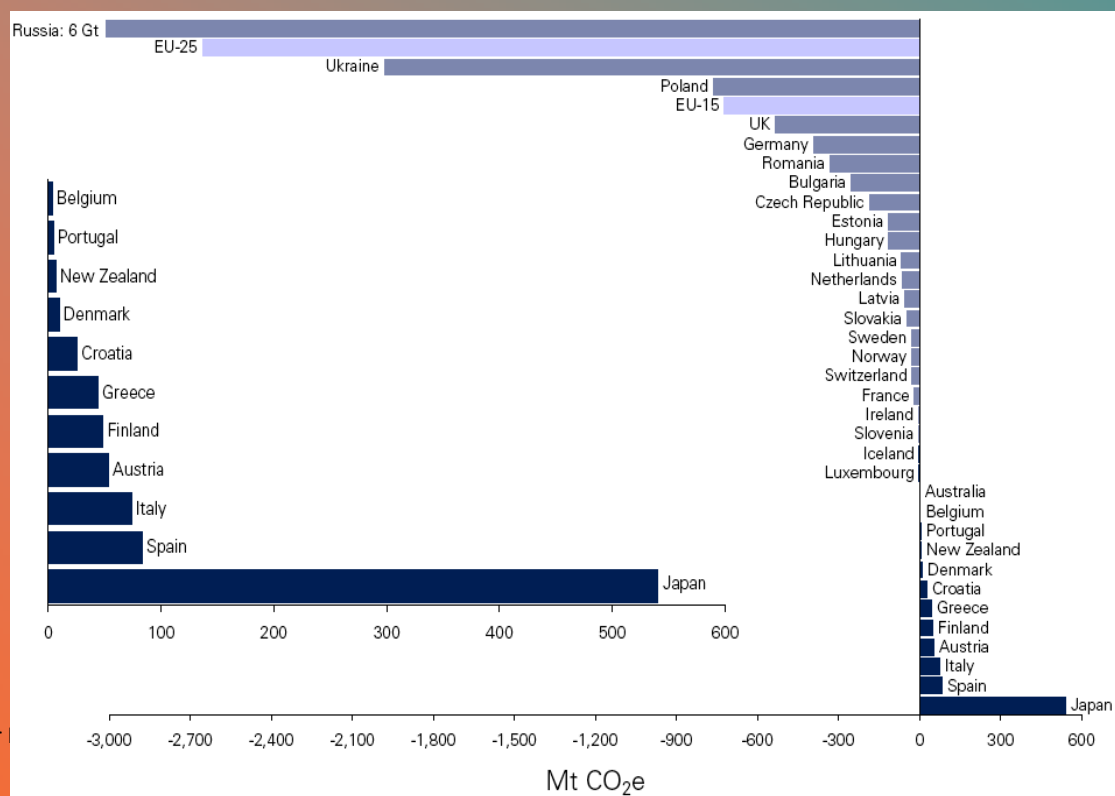


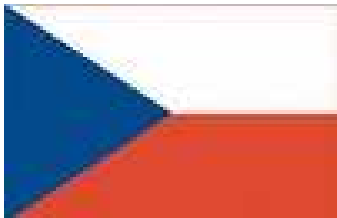
# KYOTO PROTOKOL BALANCES

**AAU** – units assigned to countries with quantified reduction target under the Kyoto Protocol (Annex B = OECD + Central Europe + FSU countries, 5.2% reduction relative to 1990)

- Represent the „right to emit“ one ton of CO<sub>2</sub> equivalent
- Six greenhouse gases + all sectors (compliance period = 2008 – 2012)
- Can be transferred among countries (Article 17 of the Kyoto Protocol)

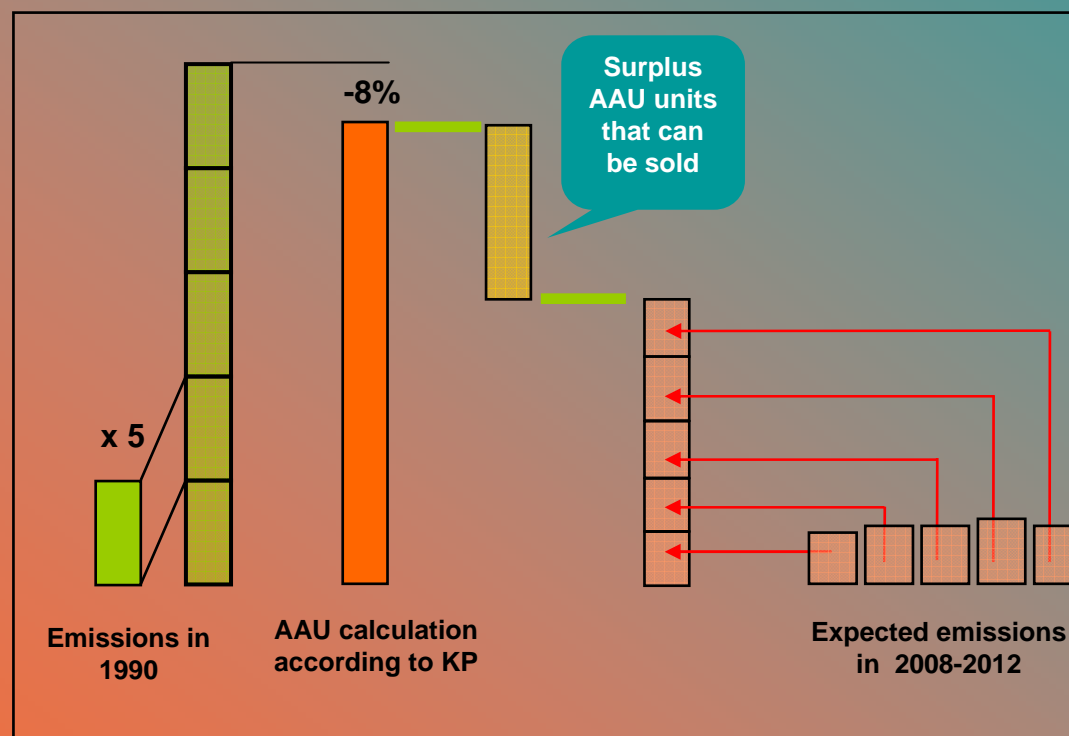
- AAUs – state property
- Countries with emissions under the Kyoto target are allowed to sell „unused“ AAUs to countries in opposite situation (asset to be monetized)
- Buyers require „greening“ – clear link between AAU credits to be purchased and projects reducing GHG emissions
- AAUs are bankable to the next period (provided that a new post-2012 agreement is reached)





## SALE OF AAUs SURPLUS AS FINANCIAL SOURCE FOR CO<sub>2</sub> REDUCTION STEPS

- Czech Republic is a seller (up to 150 million AAUs for 2008-2012)
- Transactions of AAUs should generate (financial) resources for energy savings measures, efficiency,....., CCS demo (PROPOSAL)
- Necessary regulatory and administrative measures for transactions have to be established





## CCS AS IDEAL CANDIDATE FOR GREENING AAUs

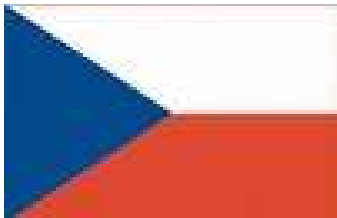
### CCS as a form of greening has a number of advantages:

- Clear and quantifiable environmental effect
- Bulk of AAUs transferred within one transaction
- Clearly defined project boundaries
- Strong partner as implementing body



- Low transaction costs
- Credibility
- Support of an emerging and promising technology

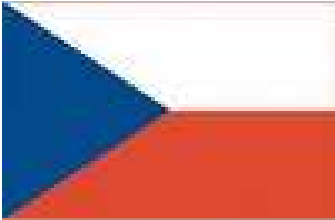
### Form of public support not burdening governmental resources



## THE EUROPEAN COMMISSION'S DRAFT FOR EU LAW ON CCS

### Discussion:

- **McKinsey Report 2008:**  
Full scale commercial coal-fired plant using CCS could be competitive with other forms of power generation in the EU by 2030. The costs could be down to €30-45/mt CO<sub>2</sub> abated by 2030.  
**BUT:**  
Developing early demonstration projects would be more expensive: about € 60-90/mt CO<sub>2</sub> abated  
That means there is a € 0.5 – 1.1 billion gap over the life of each project.
- **EP Rapporteur on the draft CCS law:**  
So far no demonstration projects have been identified.  
There is no financing mechanism.  
EU's 12 CCS demo projects would need about € 10 billion in public support in total over next 7-8 years.  
The money from selling the allowances only for the actual sequestration, not to develop the technology.  
A limit of 350 g CO<sub>2</sub>/kWh proposal in changes to the EC draft.
- **EU Council:**  
Still discussing several financial options for CCS, including revenues from auctioning ETS allowances, national budgets, EIB resources as well as EP ideas.
- **Industry:**  
Public financial support needed.  
Subsidies to bridge the gap until costs come down and investments become viable.  
Joint efforts in building public acceptance of CCS.  
Technology-forcing legislation is needed.

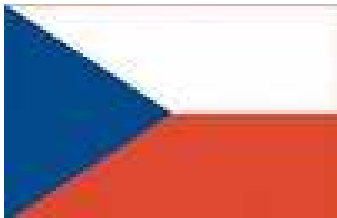


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## CONCLUSIONS

- ▶ **CCS demo projects → necessary step before deployment**
- ▶ **Construction and operation of CCS demo without financial support not probable**
- ▶ **Using AAUs credits → suitable, unique and time limited opportunity for support of low-carbon technologies and GHG reduction measures**



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**THANK YOU FOR YOUR ATTENTION!**

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