



# **The IEA EMB-ETP modelling framework: preliminary results with emphasis on the Chinese industry**

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## **Topics**

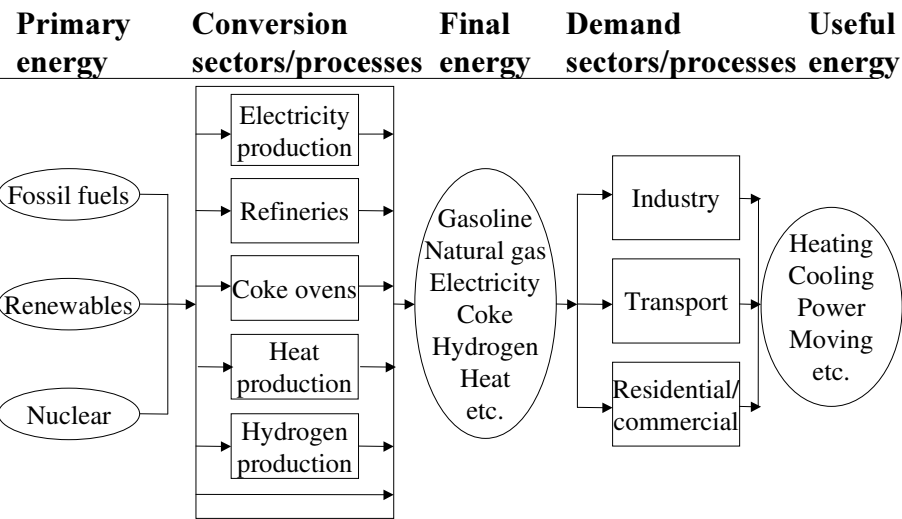
- **Modeling approach**
- **China modelling issues**
- **Preliminary results for China**
- **Need for improvements**

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## Reference Energy System (RES)



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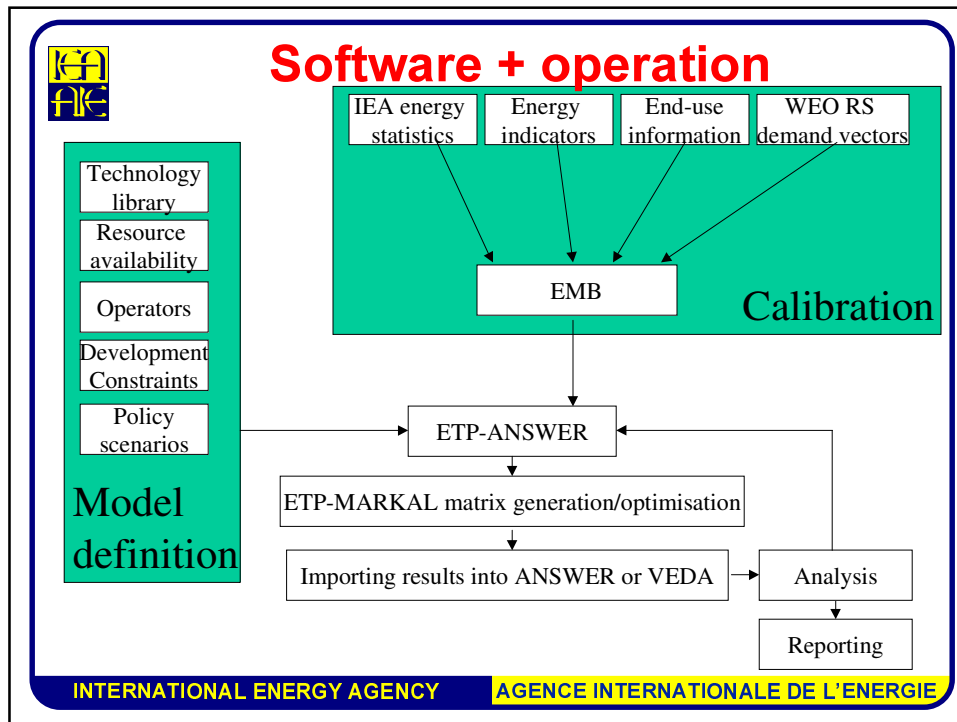


## ETP technology database

- *70% of model development time is for data collection*
- One global technology database
- Region-specific constraints
- Region-specific cost index
- Region and sector specific discount rate

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- Some key assumptions for China**
- **GDP growth**
  - **Decoupling factors physical production/demand and GDP growth**
  - **Region-specific cost multipliers (USA GC=100)**
    - ◆ Investments 90
    - ◆ Fixed/variable cost 90
    - ◆ Constant labor cost share in time
  - **Discount/hurdle rates:**
    - ◆ Electricity sector 6.2%
    - ◆ Industry 10.7%
    - ◆ Residential/commercial 25.2%
    - ◆ Transport 15.2%
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## Step 1: Understand the IEA energy statistics ! Example steel

[EJ/yr]	Total	
<b>Transformation Sector</b>	<b>95</b>	
<i>Of which:</i>		
Coke Ovens		1.7
Blast Furnaces		4.8
<b>Energy Sector</b>	<b>25</b>	
<i>Of which:</i>		
Coke Ovens		0.8
Blast Furnaces		0.1
<b>Distribution Losses</b>	<b>7</b>	
<b>Total Final Consumption</b>	<b>289</b>	
<i>Of which:</i>		
Industry Sector		91.5
<i>Iron and Steel</i>		11.6
Transport Sector		74.7
Other End-use Sectors		122.6
<b>Total</b>	<b>416</b>	<b>19.1</b>

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## But what do the Chinese statistical figures mean? (Price et al., 2002)

- Chinese iron&steel industry 4.0 EJ in 1996 (final energy, official statistics)

*But:*

- Double counting -0.6 EJ
- Resource production -0.7 EJ
- Omitted small producers +0.4 EJ

*Therefore:*

- True value 3.1 EJ: **22% less**

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## Physical materials demand projections: is sustained growth really possible?

	2000	2020	2050
GDP	100	276	687
Aluminium	100	221	440
Ammonia	100	162	236
BTX	100	225	468
Cement	100	177	282
Chlorine	100	177	282
Ethylene/propylene	100	177	282
Paper	100	177	282
Steel	100	162	236

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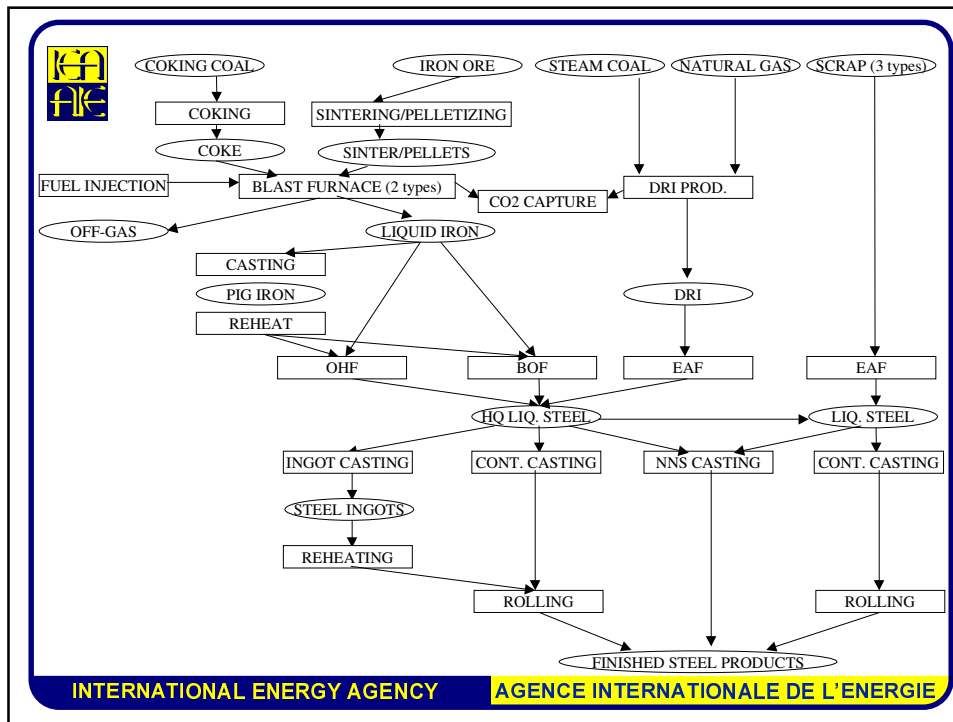


## Industry in ETP

- Physical materials flows modelled
- Energy use for materials calculated by the model
- Other industrial energy use allocated to energy services (steam, process heat etc.)

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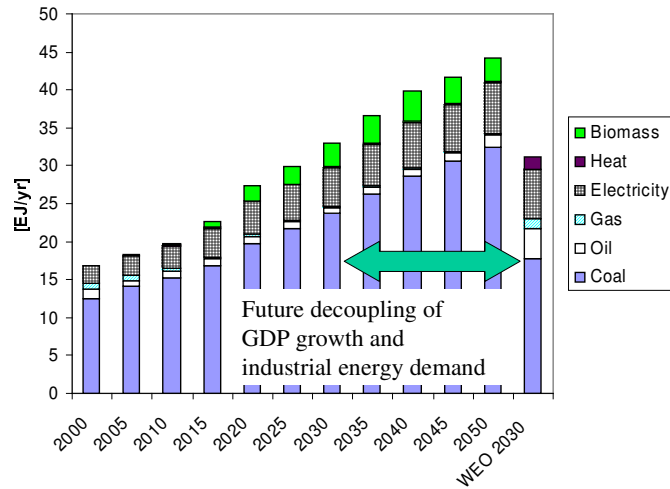
## The explanatory power of the ETP industry model

	Other [PJ/yr]	Materials [PJ/yr]	Total [PJ/yr]
Chemicals	1800	1752	3552
Ferrous metals	2150	2382	4532
Food, beverage & tobacco	629	0	629
Machinery	698	0	698
Non-ferrous metals	349	204	553
Non-metallic minerals	528	1983	2511
Paper & pulp	76	303	379
Textiles & leather	542	0	542
Other	1346	0	1346
<b>Total</b>	<b>6772</b>	<b>6624</b>	<b>13396</b>

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## ETP: Chinese industrial energy use projection

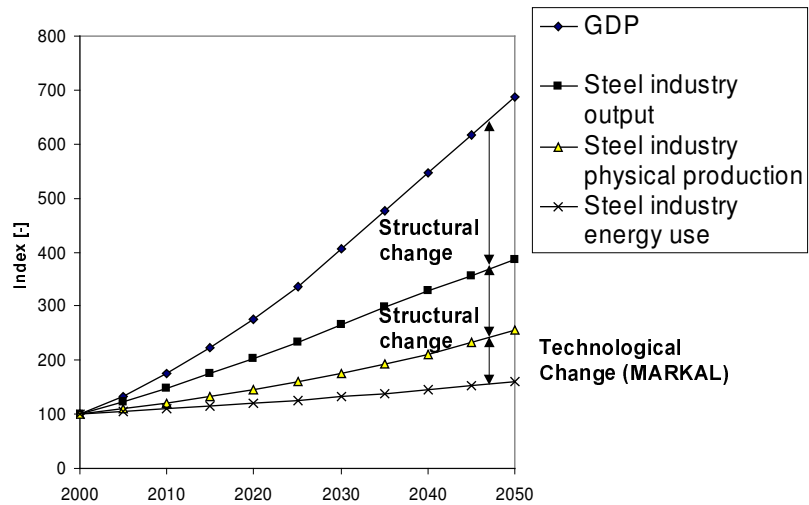


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## Future economic growth and decoupling are key uncertainties



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## The need for detailed studies

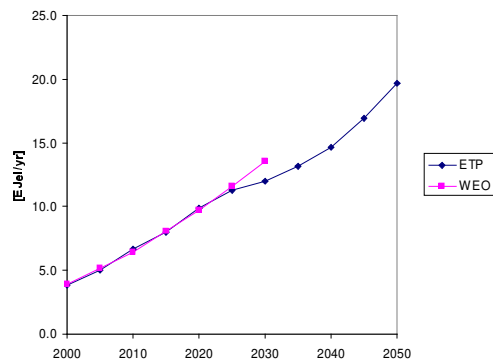
- Climatic differences (relevant for electricity load curve & cost residential/commercial energy-efficiency options)
- Efficiency gap old industry centres and new industries
- Matching gas/renewables supply in the West and demand in the East
- Coal trade issues

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## Electricity demand projections



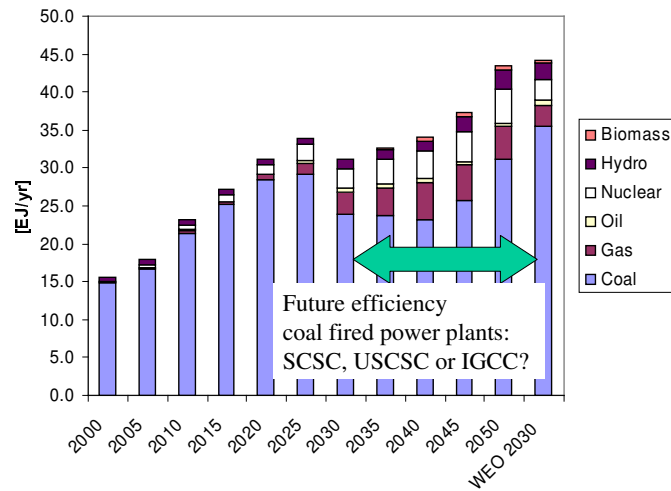
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## Electricity sector fuel supply



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## Conclusions

- Understand Chinese energy statistics
- Understand/collect Chinese energy efficiency data
- Improved economic forecasts
- The need for models on several aggregation levels

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