

Agenda



1. Current situation & objectives

2. Energy market analysis

3. Global automotive trends

4. Hot forming process Bopfingen

5. Cold forming process Albersdorf

6. Global landscape - Cold/Hot forming

7. Energy cost saving measures

8. Key findings

Current situation

- Same production processes are implemented worldwide
- Rising energy prices increase the interest in energy cost saving measures
- No detailed data of process specific energy consumption are available

Objectives

- Energetic market analysis of Magna`s most important production regions: USA, China, Europe & Brazil
- Inquiry of the energy consumption of two Magna production processes
- Create a global landscape for production energy cost overview
- Identify Magna`s cost saving leverages

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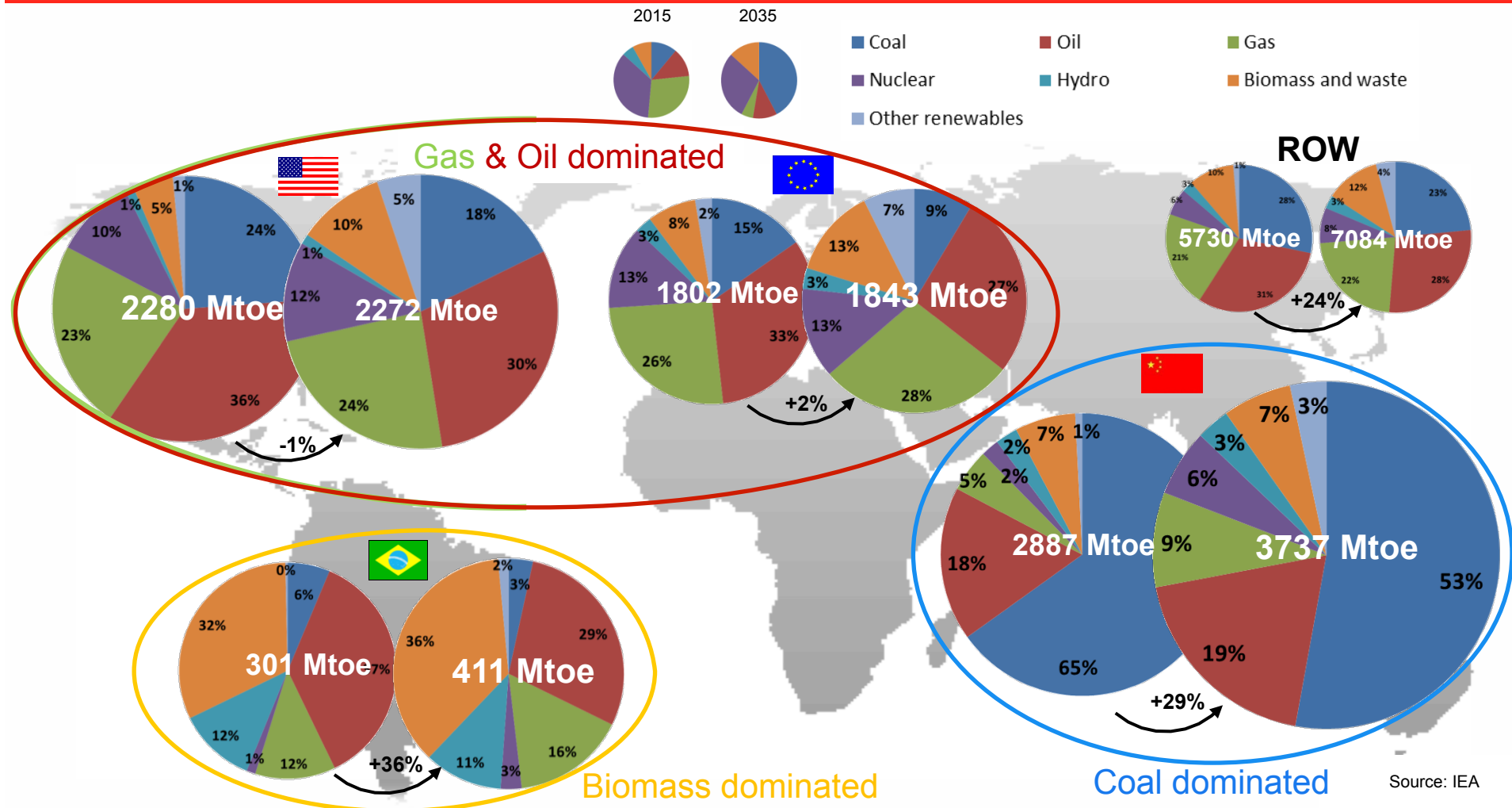
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Global primary energy demand 2015-2035



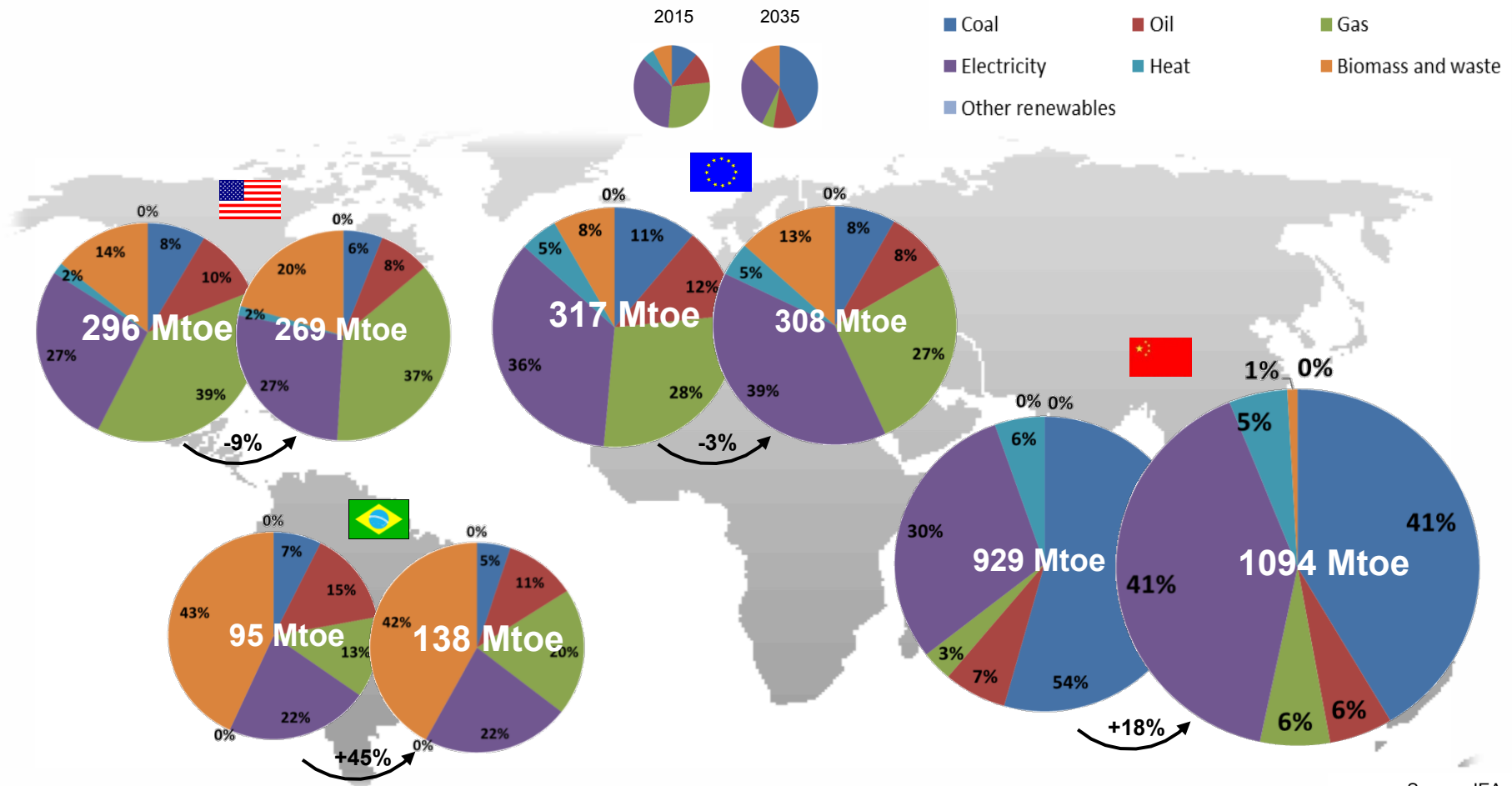
Source: IEA

ROW...Rest of the World

1 Million tons of oil equivalent (Mtoe) = 11 630 Gigawatt hours

- Energy demand of top 4 automotive markets will increase about 13% (ROW: +24%)
- The regions have different primary energy focus
- Largest energy increase in Brazil (+36%) and China (+29%)

Global energy demand – Industrial sector

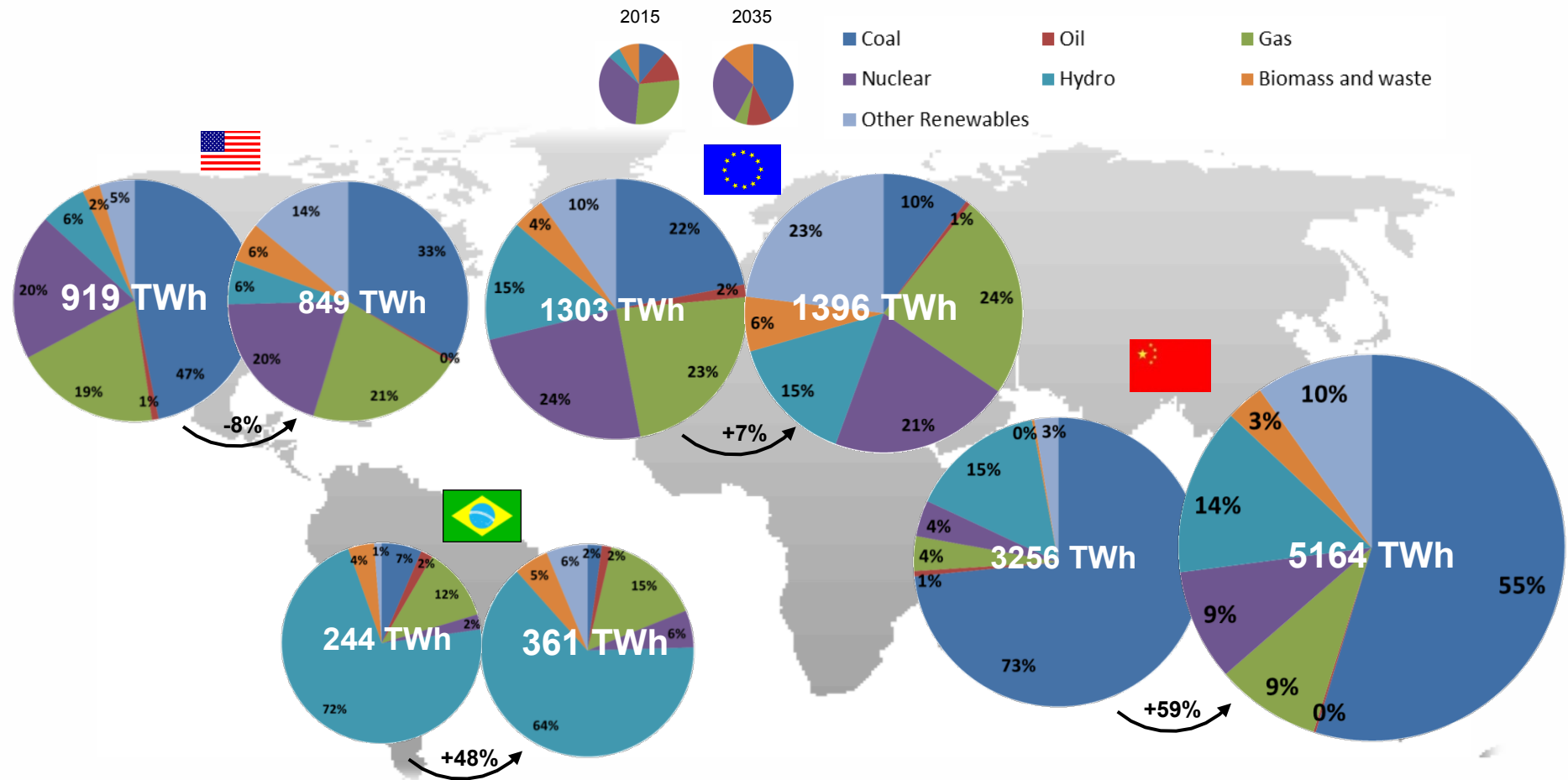


Source: IEA

1 Million tons of oil equivalent (Mtoe) = 11 630 Gigawatt hours

- Largest demand growth will be expected in China (+18%) and Brazil (+45%)
- Electricity will command largest growth in consumption globally

Global electricity demand – Industrial sector



Source: IEA

1 Terawatt hour (TWh) = 10³ Gigawatt hours

- Global electricity demand will rise ~50% by 2035
- Coal will still dominate as main source for electricity generation
- Largest energy increase in Brazil (+48%) and China (+59%)
- Coal will be replaced by Hydro, Gas, and other Renewables as electricity generation sources

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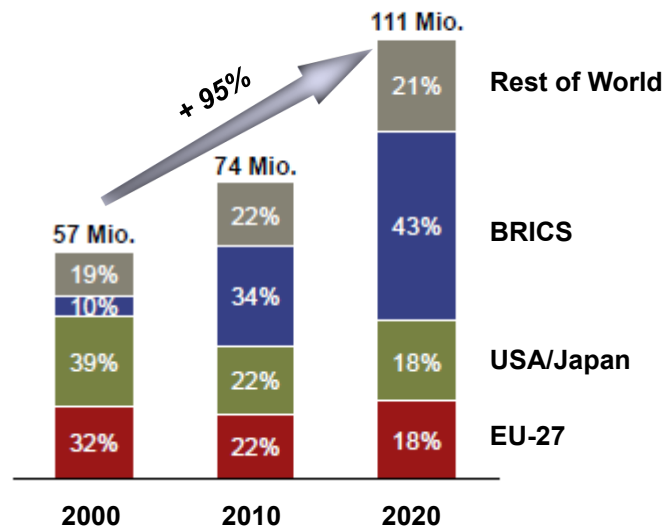
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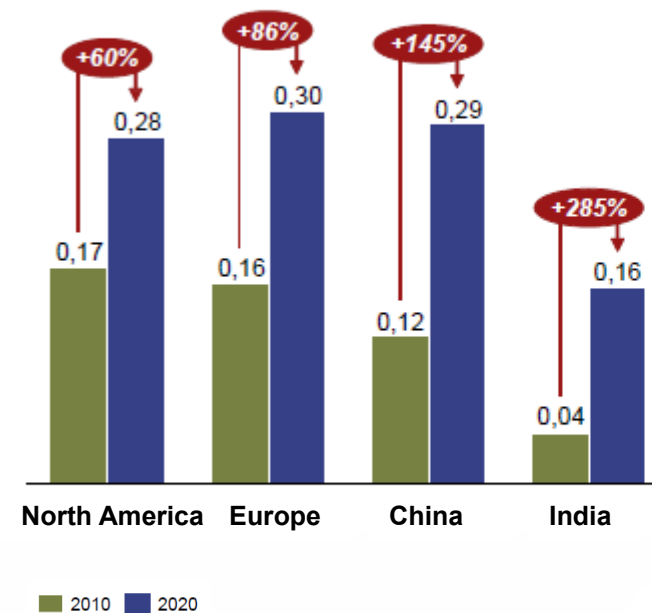
How will OEM platforms develop in the future?

Production trends – automotive industry



Platform strategy development

(Production volume in Mio. cars per platform, 2010 vs. 2020)



BRICS...Brazil,Russia,India,China,SouthAfrica

Quelle: A.T.Kearney,JDPower,Frost&Sullivan

- Average automotive market growth rate p.a.: China (7%), Brazil (4,6%), EU (2,7%), NAFTA (4,1%)
- OEM focus on platform strategy to cover production volumes and to reduce costs
- 10 basic platforms will cover 30% of global car production in 2020

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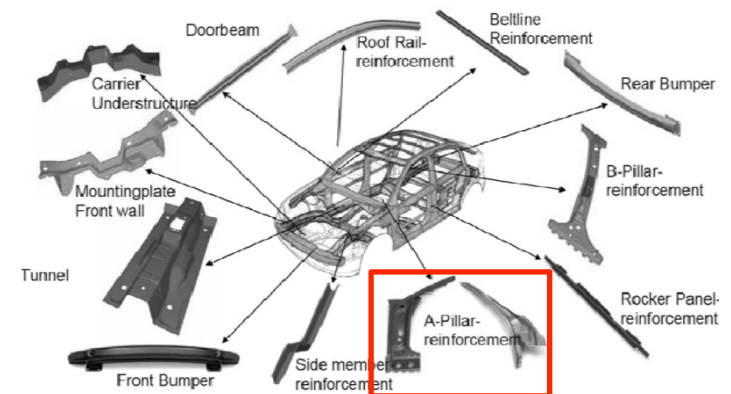
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Parameters hot forming process Bopfingen

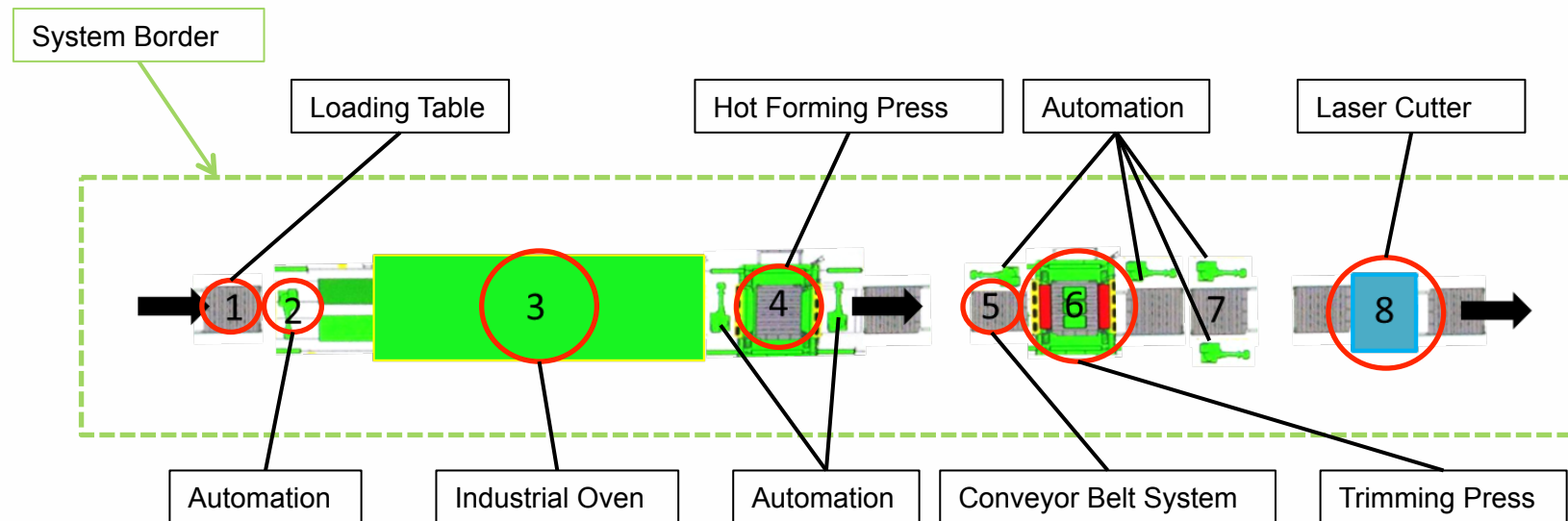


- Product: Ford Fokus A-Pillar
- Cycle Time: 376 sec.
- Total production volume: 824.550 Cycles/a
- All results referred to one cycle for regional transparency
- Regional average energy prices are adopted
- Breakdown and set-up times are included
- German process parameters are the basis for regional comparison



Process overview - Hot forming

How is the hot forming process built up in Bopfingen?



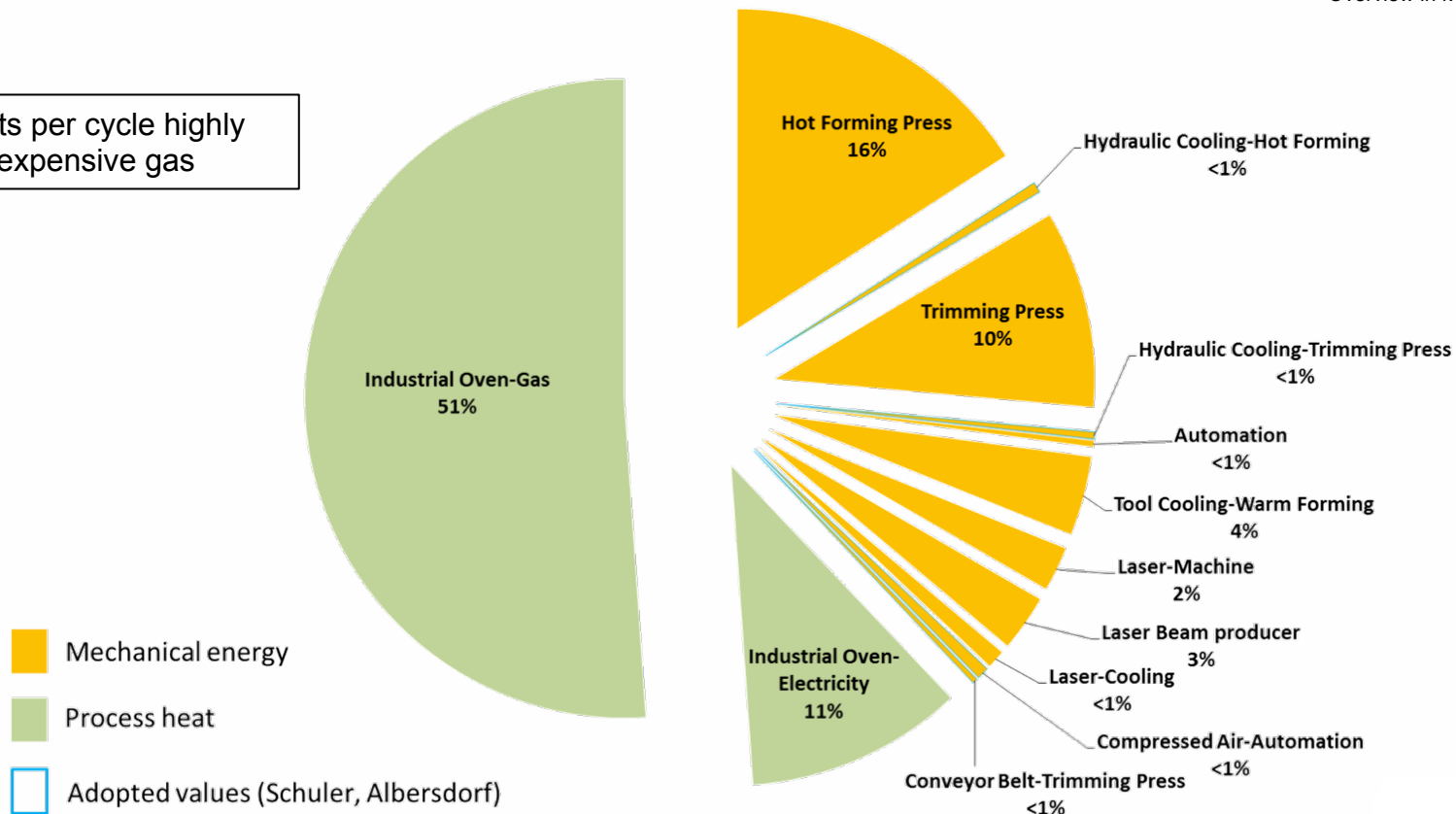
- Roller hearth oven: 12 heating zones
- Hydraulic press with 12.000 kN press capacity

Energy consumption break down

How do components affect the cold forming process per cycle?

Overview in kWh per Cycle

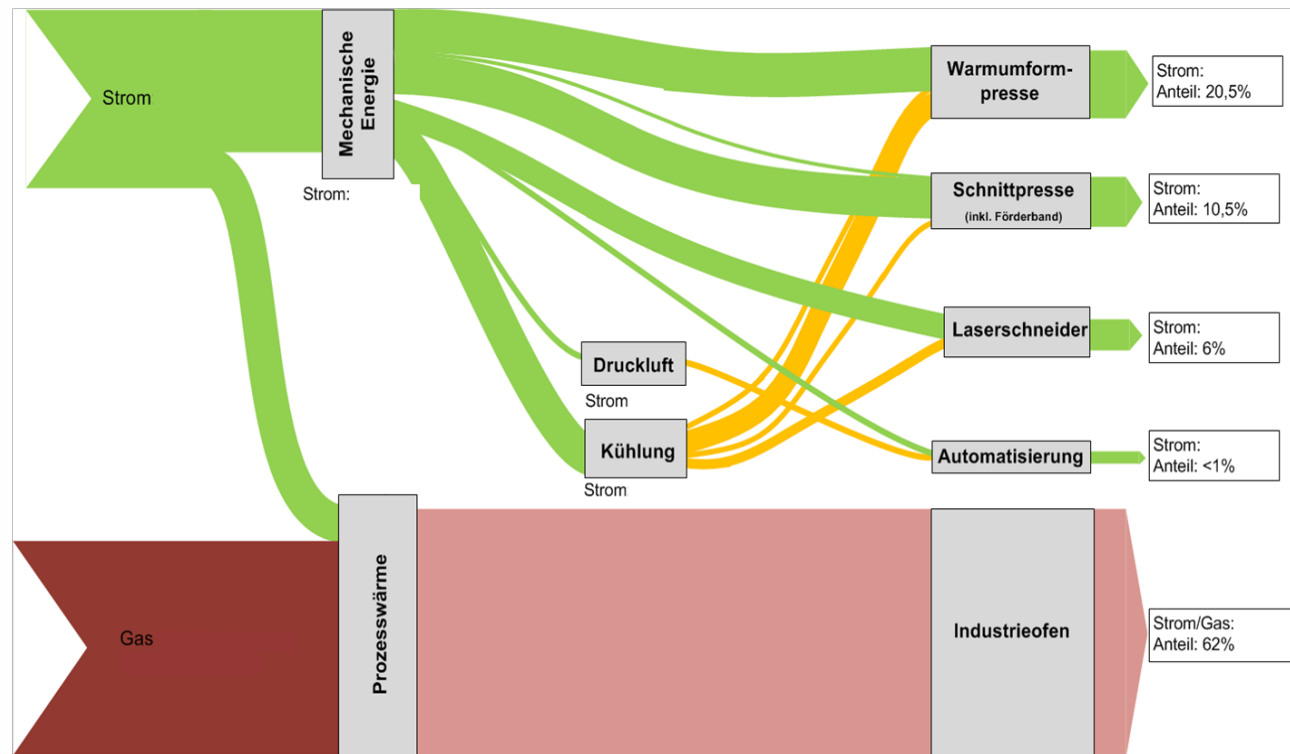
Energy Costs per cycle highly
reliant on inexpensive gas



- Industrial oven consumes about 62% of the complete energy demand
- Compressed air and cooling units are not influential on the total energy consumption

Energy flow chart - Hot forming process

Sankey-Diagramme for the production line



Energy demand per cycle

11,2 kWh/m³ natural gas

- Process heat is responsible for >60% of the process energy demand

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Parameters cold forming process Albersdorf

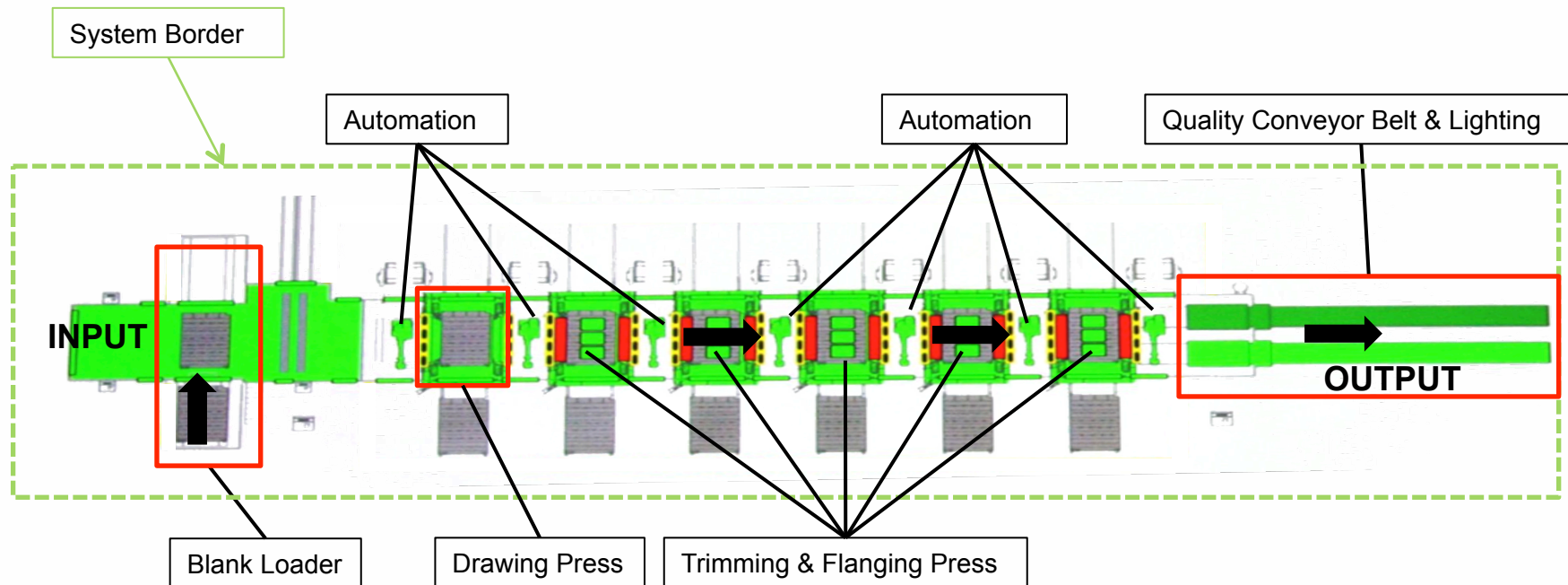


- Product: Porsche Cayenne Aluminium Hood
- Cycle Time: 61sec.
- Total Press Cycles: 2.400.000 Cycles/a
- All results referred to one cycle for regional transparency
- Regional average energy prices are adopted
- Austrian process parameters are the basis for regional comparison



Process overview - Cold forming

How is the cold forming process built up in Albersdorf?

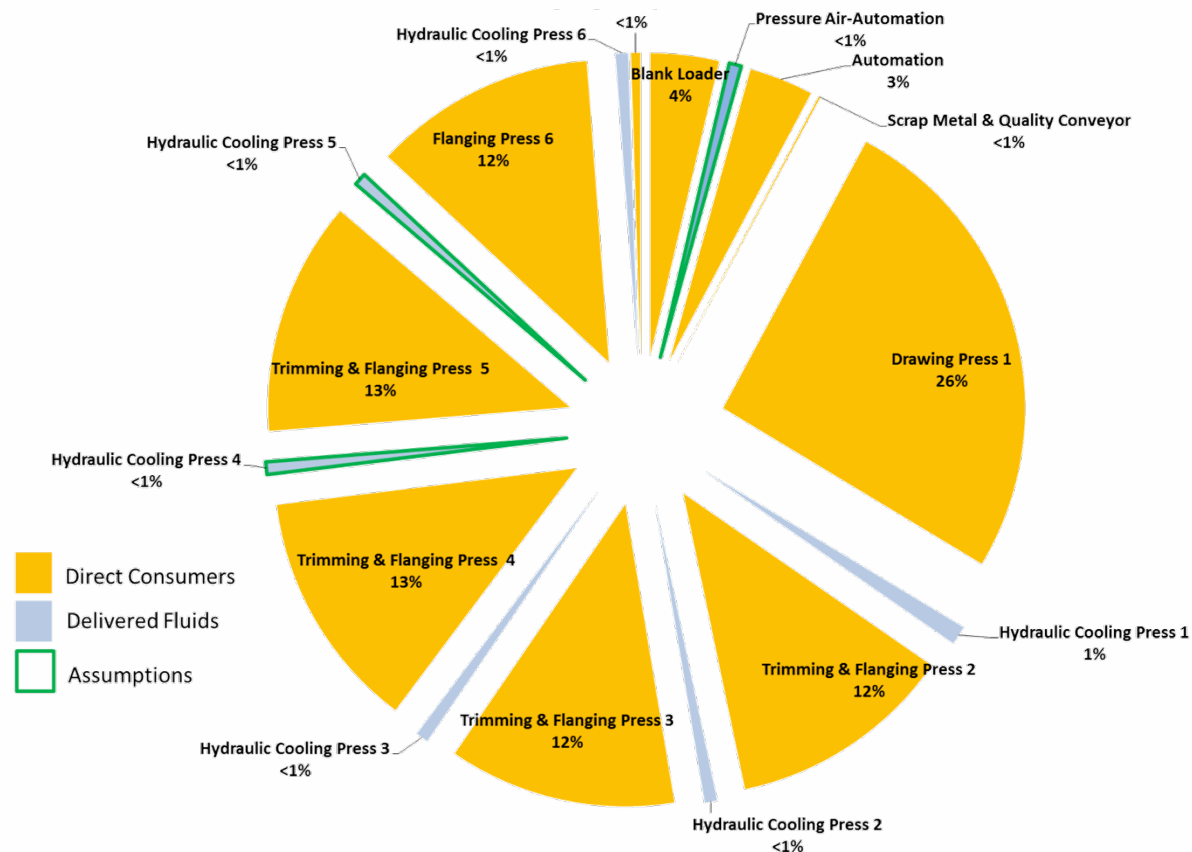


- SCHULER press line: 6 presses in operation
- Drawing press with 16.000 kN press capacity
- Trimming & flanging presses with 10.000 kN press capacity

Energy consumption break down



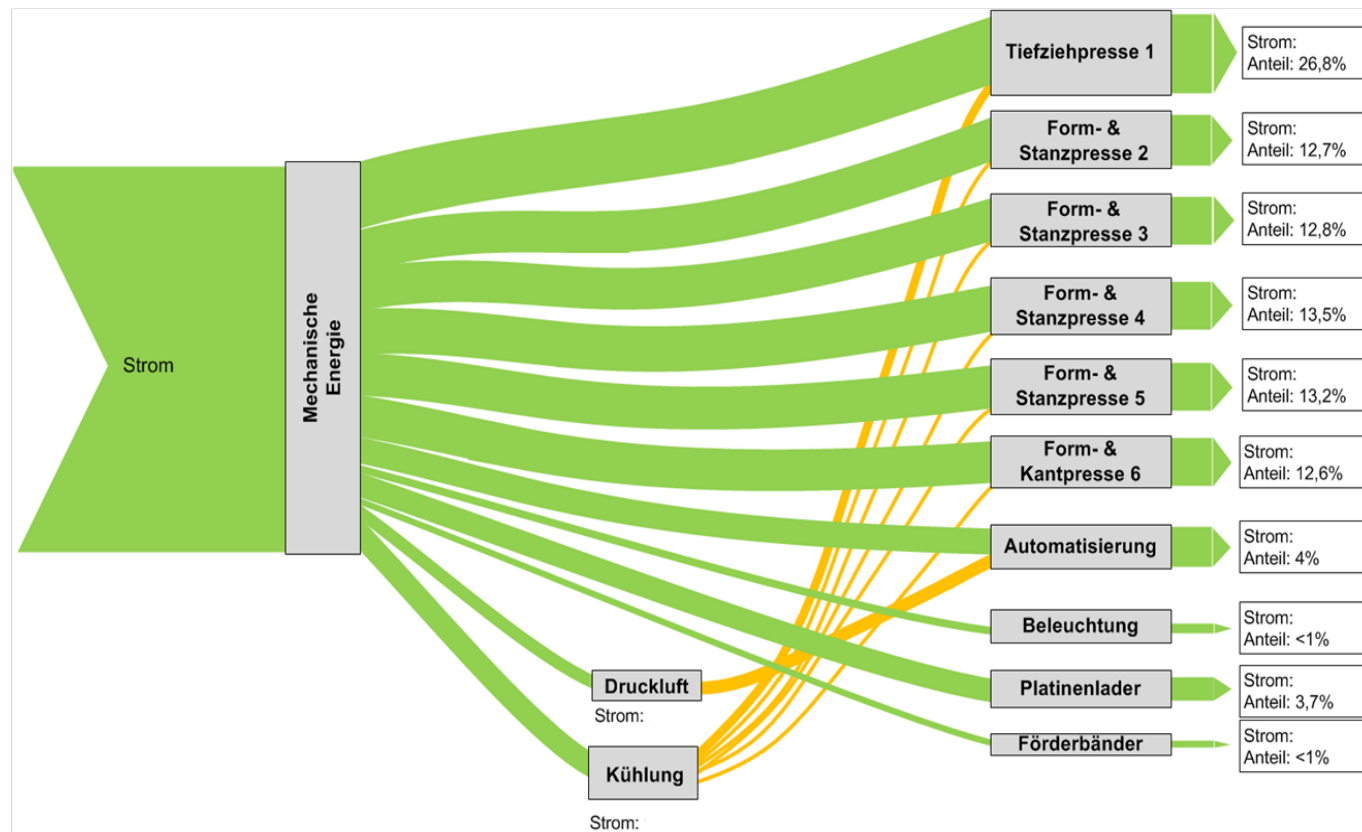
How do components affect the cold forming process per cycle?



- Presses consume 1/3 of their energy demand in stand-by mode
- Cooling, air pressure & automation units are very cost efficient and cause no high affect
- Energy demand depends on required press work for forming the blank

Energy flow chart - Cold forming process

Sankey-Diagramme for the production line



Energy demand per Cycle

- 100% electricity consumption transformed to mechanical energy
- Drawing press consumes double the energy compared to trimming and flanging presses
- Trimming and flanging presses have similar energy consumptions

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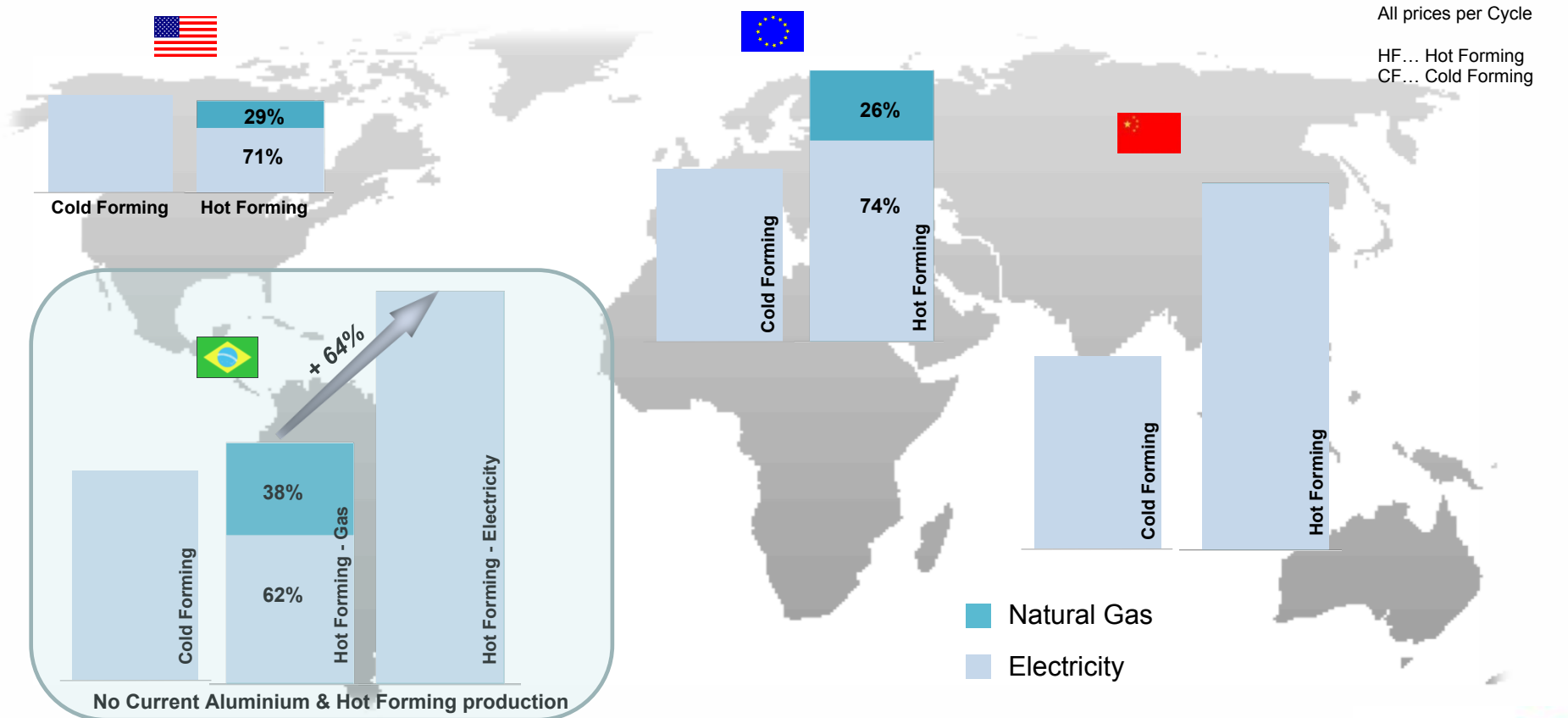
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Global landscape - Cold/Hot forming



How are electricity and gas prices affecting Magna processes globally?



- USA has global cost advantage due to access to inexpensive NG, similar energy costs for CF/HF
- US HF production is cheaper than EU CF production (Factor 2)
- No gas infrastructure in China and Brazil, no energy cost efficient production
- China HF has factor 4 price (CF factor 2) disadvantage over USA due to their high energy costs

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Energy cost saving measures

Tremendous cost saving opportunities due to missing energy efficient measures

➤ Hot Forming

- Preheat the blank
- Heat Up Fluids
- More concepts:
 - Natural gas usage for oven system
 - Heat up production building
 - Material inquiry
 - Oven temperature optimization

Energy Savings

563 MWh/a
108.000 m³/a

350 MWh/a

➤ Cold Forming

smart engine control management systems

- Engine management – Product data set
- Engine management – Intellegent stand by
- Engine management – Special situations
- Engine management – Machine set up optimization

216 MWh/a
369 MWh/a
181 MWh/a
253 MWh/a

- Tremendous cost saving potential especially for new oven system in China and Brazil

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Energy Market

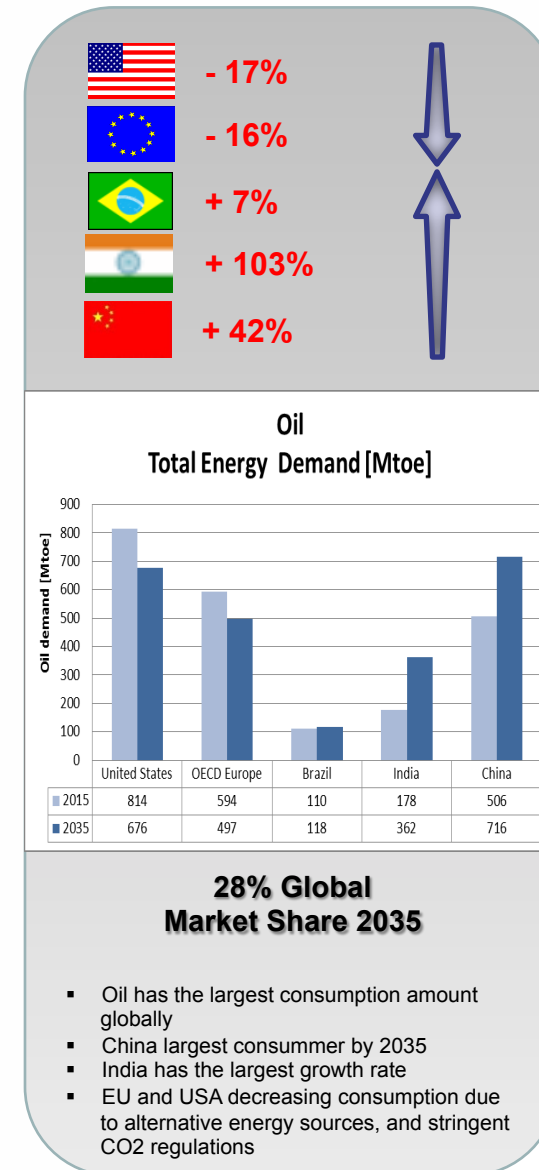
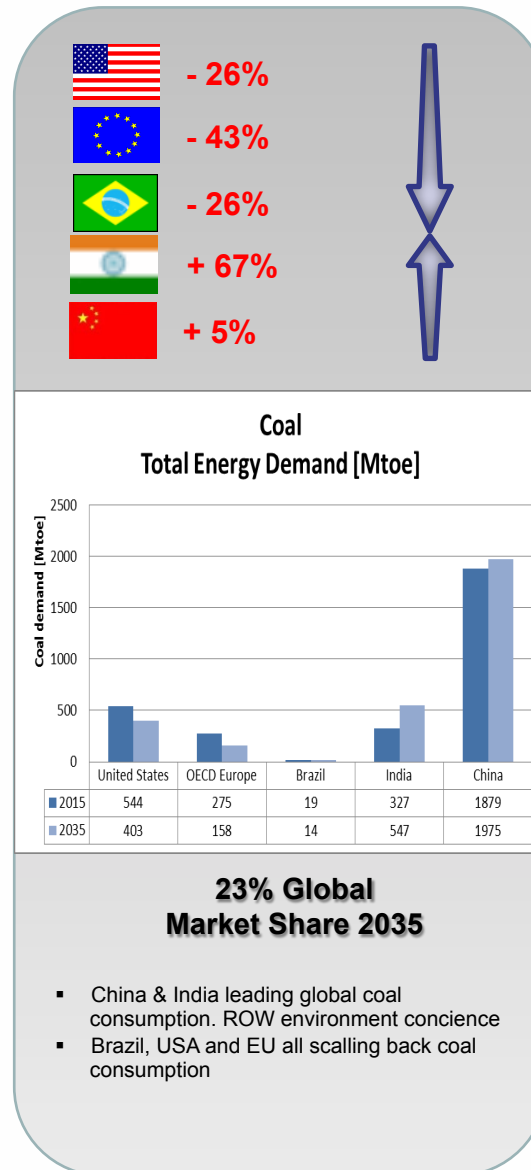
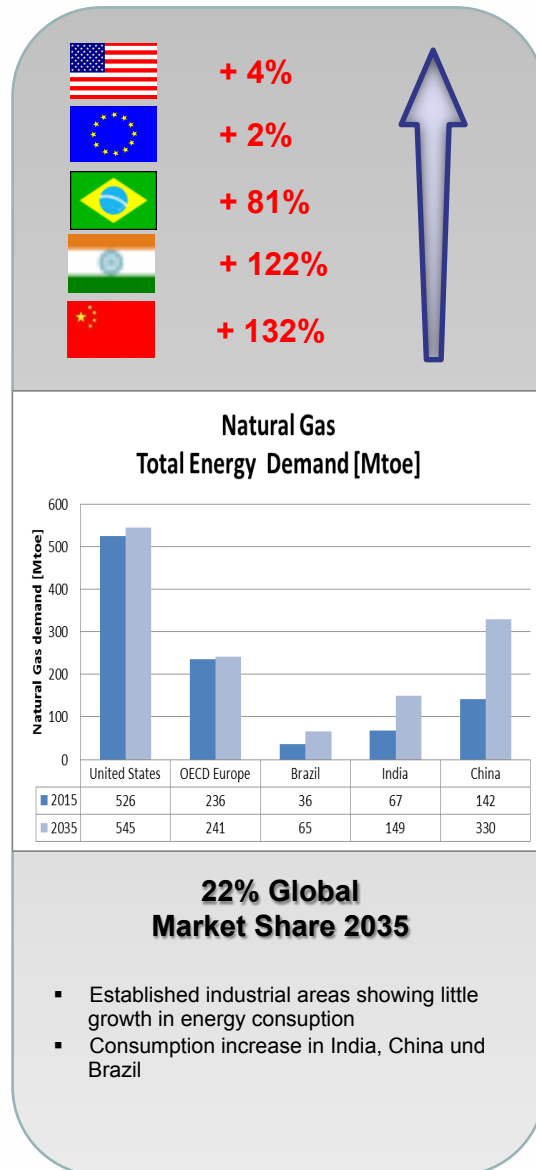
- Global GDP in correlation with energy demand & oil price
- Oil price as a key driver for gas & electricity market prices
- Constantly growing import dependencies (especially in EU & China)
- **Rising energy & electricity demand in China & Brazil until 2035**

Production Process

- USA has similar energy costs for hot and cold forming
- USA hot forming energy costs are **half** of the energy costs of cold forming in EU
- Expensive energy costs in China & Brazil due to missing natural gas infrastructure
 - decrease up to **65%** per cycle possible due to gas usage
- China **4-times** higher energy costs than USA for hot forming
- **To keep constant energy cost level → investments in energy efficient measures are necessary**

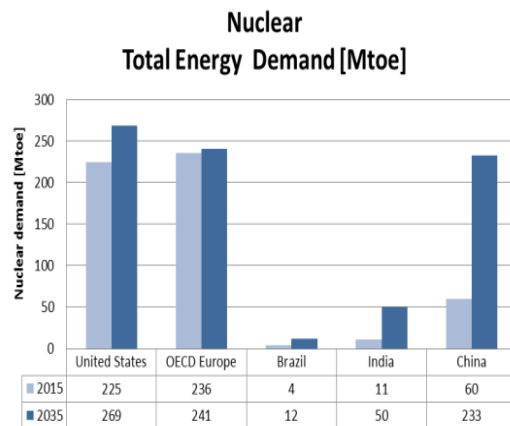
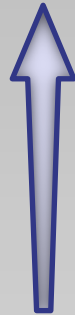
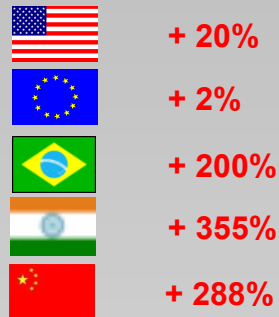
Thank you for your attention

Global Energy Growth – Forecast 2015/2035



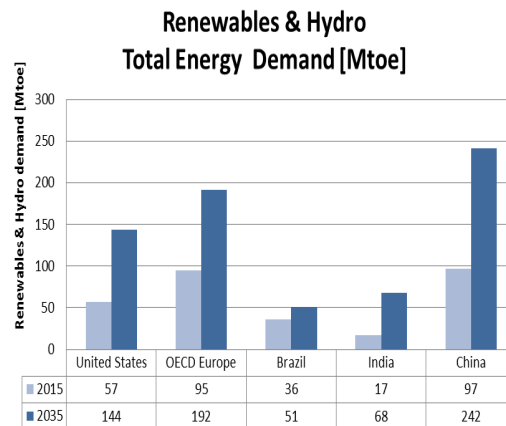
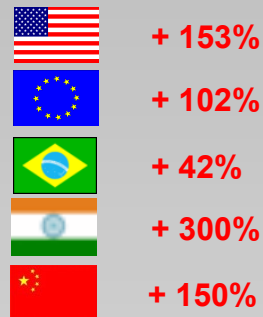
Source: IEA

Global Energy Growth – Forecast 2015/2035



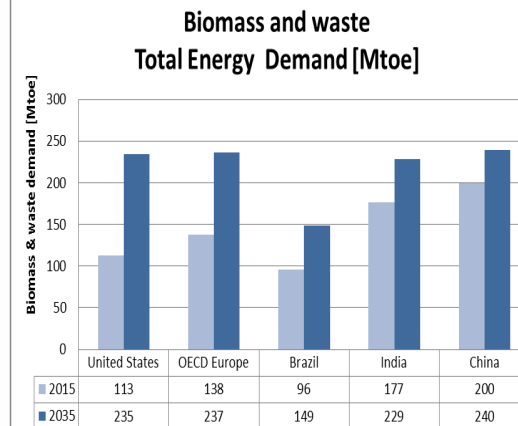
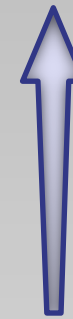
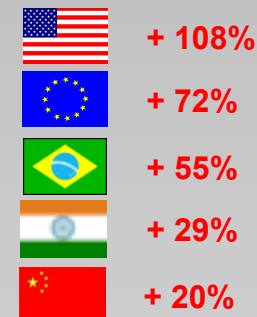
**8% Global
Market Share 2035**

- China requires Nuclear plants to reach domestic demand
- Europe ceasing to build additional plants



**7% Global
Market Share 2035**

- Every region will growth in Renewables
- EU and China largest growth potential 2035
- US Market growing but still low vs total energy consumption

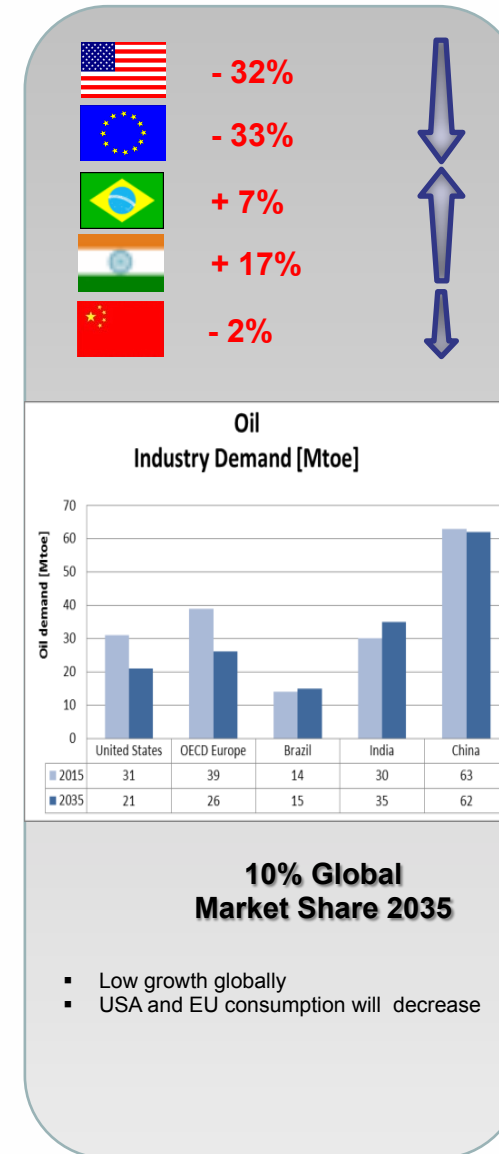
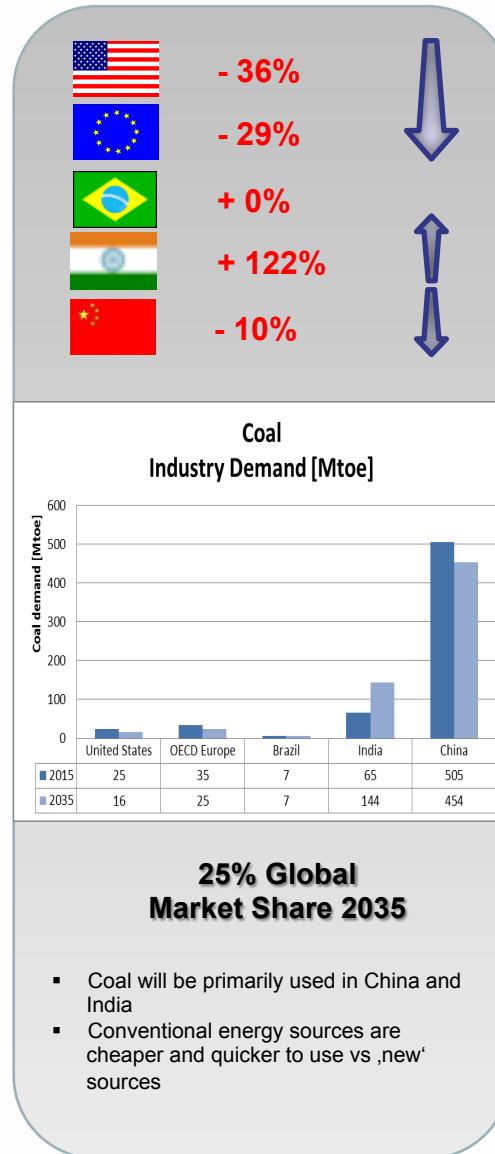
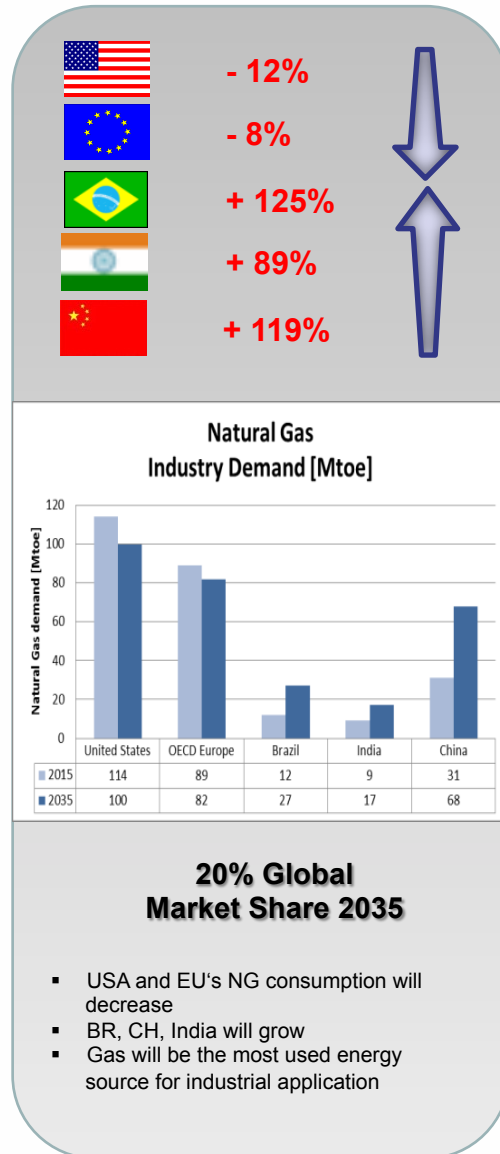


**12% Global
Market Share 2035**

- 2035 even consumption distribution through all regions
- USA largest growth rate

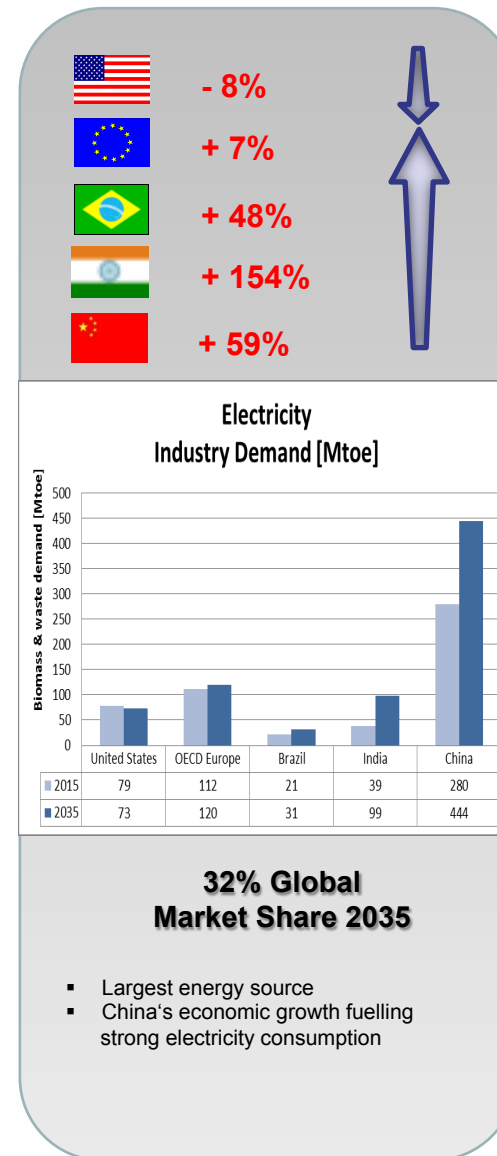
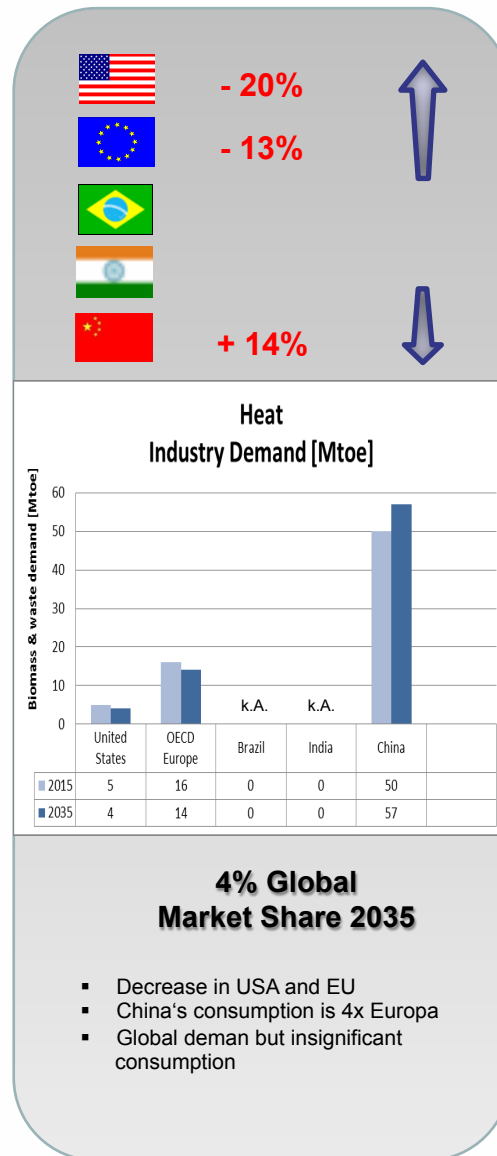
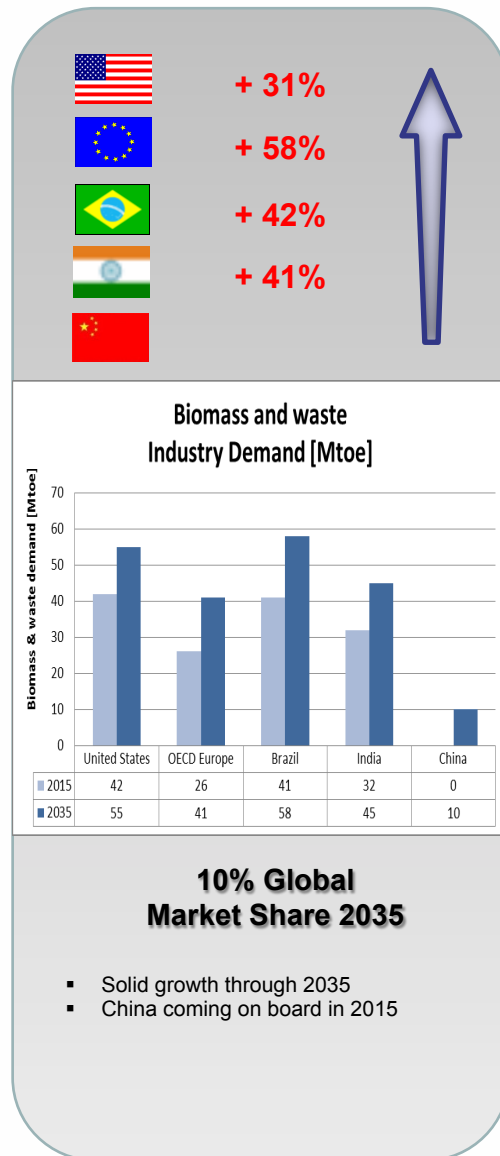
Source: IEA

Global Industry Energy Growth – Forecast 2015/2035



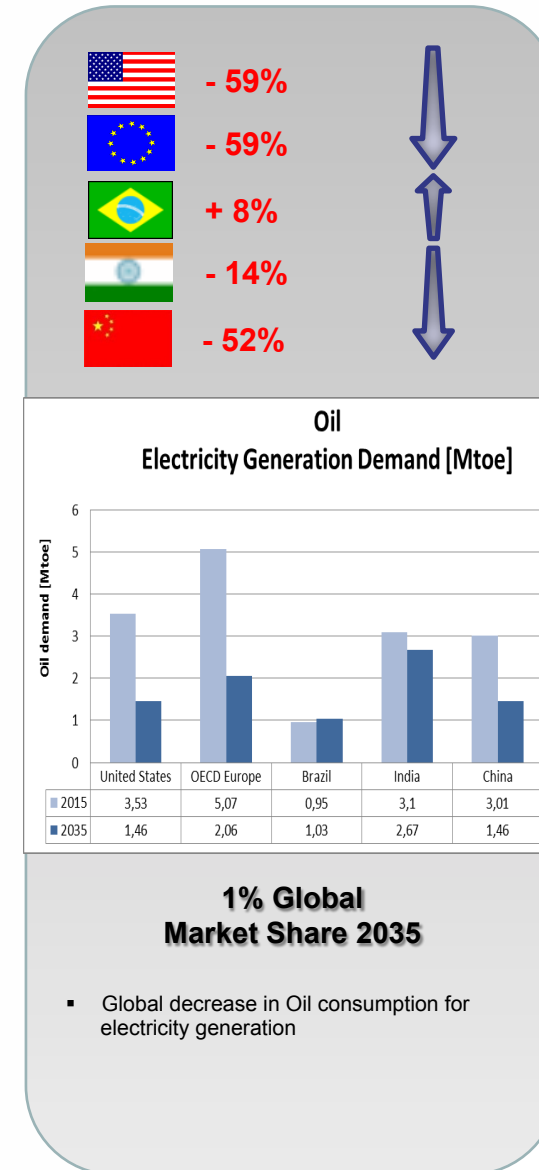
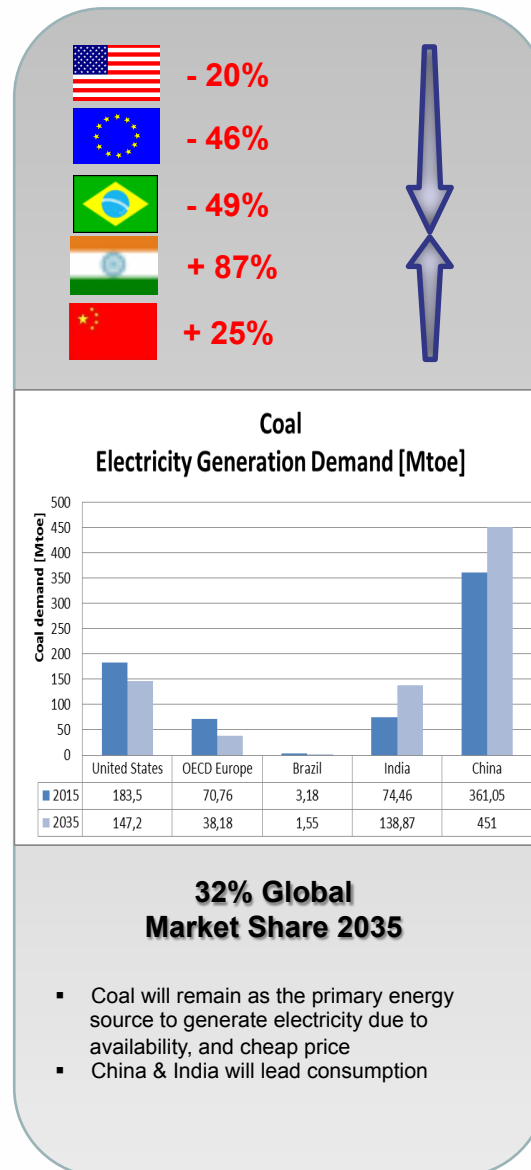
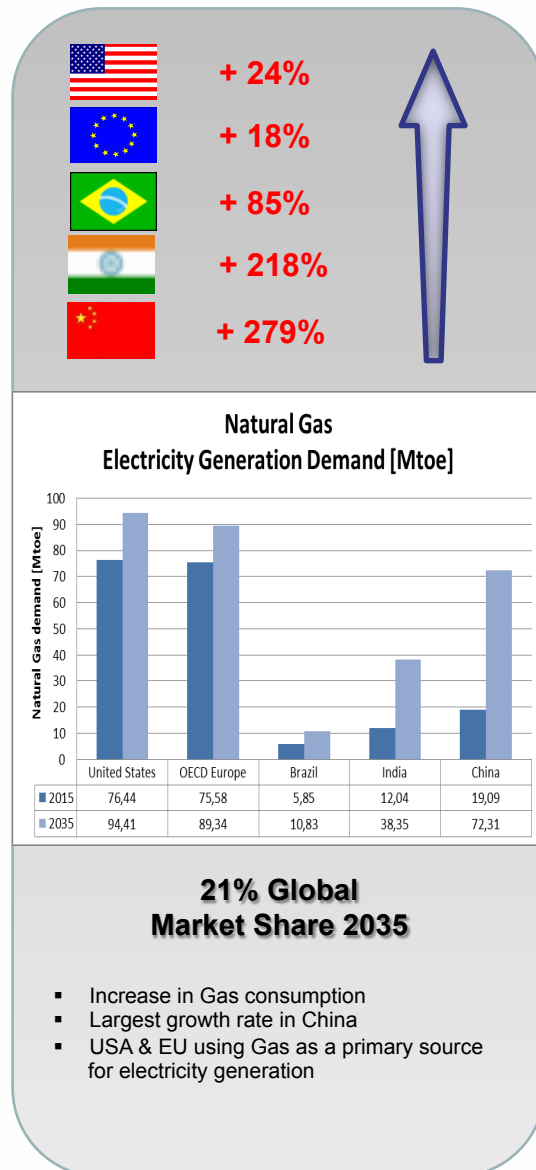
Source: IEA

Global Industry Energy Growth – Forecast 2015/2035



Source: IEA

Global Electricity Growth – Industrial Sectors Forecast 2015/2035

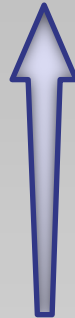


Source: IEA

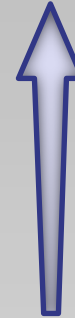
Global Electricity Growth – Industrial Sectors Forecast 2015/2035



+ 20%
+ 2%
+ 235%
+ 355%
+ 286%



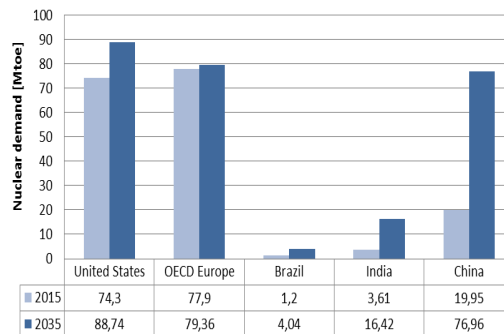
+ 109%
+ 79%
+ 39%
+ 267%
+ 126%



+ 159%
+ 83%
+ 83%
+ 1867%
+ 1940%



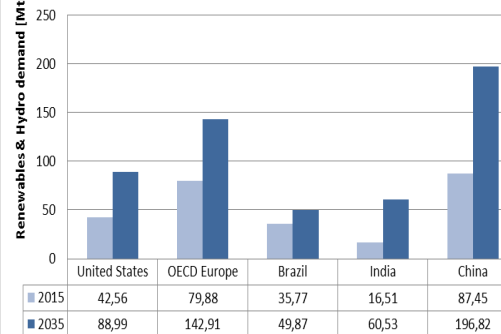
Nuclear
Electricity Generation Demand [Mtoe]



**14% Global
Market Share 2035**

- Nuclear power will remain an important energy source
- China requires Nuclear to meet large energy demand
- China reaches same demand level as USA & EU

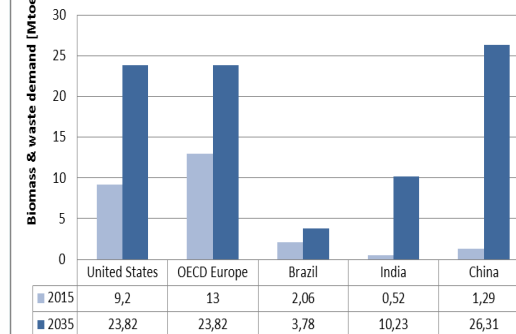
Renewables & Hydro
Electricity Generation Demand [Mtoe]



**28% Global
Market Share 2035**

- Renewable and Hydro becoming increasingly important in to global energy landscape
- China investing heavily in Renewable and Hydro

Biomass and waste
Electricity Generation Demand [Mtoe]



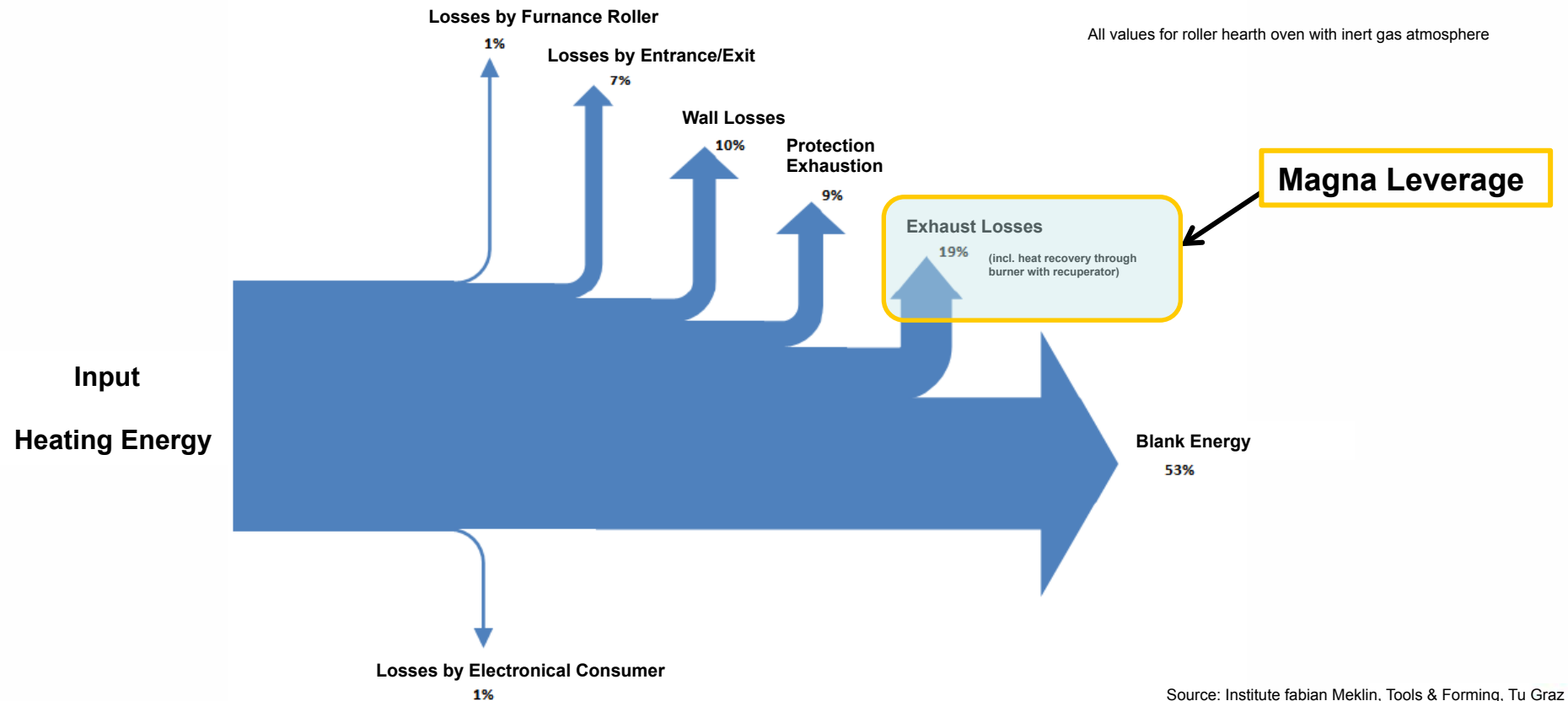
**4% Global
Market Share 2035**

- Dramatic increase in India and China
- China demand surpassing US & EU in 2035

Source: IEA

Oven Energy Flow-Overview

How are the energy flow shares of an industrial oven separated?



- Energy losses through oven wall approx. 10% → investment in oven isolation not economically viable
- Utilize the exhaust gas that has 19% energy loss and re-use the 500-600°C exhaust gas for other applications