How will freight services provide Sweden with goods in the future?

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A question

Do you think there will be an electrified road somewhere in Europe within 5-10 years?
What is the problem?

Many people want to define the problem in order to promote their solutions.
Congestion in cities ...
Distribution in cities ...
Dysfunctional or inadequate public transport...
Low capacity in the rail system ...
High energy use in the current system ...
Wrong fuel in today's system ...
Wrong pricing of transport...

One problem is that there is no really good solution to reduce long-range and heavy truck transport's emissions of carbon dioxide.
Freight transports on Railway

The State railway network is about one-tenth as long as the State road network.
11% of the total tonnage on land goes by rail (2012)
44% of the railway tonnage is ore on Malmbanan (iron ore).
35% of the land-based annual performance (Tonnekm) goes by rail (cf. EU average 17%)

Conclusions.
Rail is good for very heavy transports.
Rail is good at long distances (over 400-500 km)
Freight transports on Roads

The state road network is 10 times as long as the railway network
86% of the total tonnage is on Roads
About 65% of the land-based annual performance (Tonnekm) goes on Roads.
2/3 of this freight is concentrated on some few big Roads.
an average transport on roads is about 100 kilometers.
Only 3% of road transports are longer than 500 kilometers.

Conclusions:
The roads reaches all the way.
The Roads are good for short and medium transports.
By 2030, we'll need a fleet that is independent of fossil fuels.

We need to free the heavy road transport from its dependence on fossil fuels!
Development up to 2030

Both rail and road traffic has grown by more than one percent a year in recent decades.

By 2030 it is expected that transport performance is increased by 1.9% per year on average:

- Road to 1.99%/year resulting in an increase of 59% by 2030.
- Rail with 1.33% per annum, giving an increase of 37% by 2030.
- Waterways with 1.99%/year resulting in an increase of 61% by 2030.
Some interesting questions:

Will the traffic modes be able to meet the projected growth rate?
Where will there be capacity?
What can we afford to?
How do we keep up?

Some possible answers:

To extend the railway is very expensive and takes a very long time. Coastal shipping might be able to relieve the pressure on the railways.
The railways need to focus on to meet the forecasted increase of traffic.
Any significant shift from road to rail is less likely to 2030.
Freight forecasts by 2030, according to strategic plans (billion tonkm)

<table>
<thead>
<tr>
<th></th>
<th>Today 2010</th>
<th>BAU</th>
<th>Nr 1. a wear fee + fuel tax</th>
<th>Nr 2. Heavy Railroad Investments</th>
<th>Nr 3. Nr 1 and 2 combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail</td>
<td>22,3</td>
<td>30,6 (+37%)</td>
<td>31,0</td>
<td>33,4</td>
<td>33,6 (+51%)</td>
</tr>
<tr>
<td>Mairitime</td>
<td>36,9</td>
<td>59,2</td>
<td>60,2</td>
<td>57,6</td>
<td>58,6</td>
</tr>
<tr>
<td>Road</td>
<td>39,9</td>
<td>63,6 (+59%)</td>
<td>62,3</td>
<td>62,7</td>
<td>61,4 (+54%)</td>
</tr>
</tbody>
</table>

The railway is increased to a maximum from 30.6 to 33.6 billion tonkm
Road is reduced to a maximum from 63.6 to 61.4 billion tonkm
A possible conclusion

To free the roads from dependence on fossil fuels must largely be through action in the road transport system.

Bio-fuels ...
Electro fuels...
Electrification...
increased efficiency...

All the tricks will be needed...
Why electrical Roads?

Electrical Roads reduces energy use.
Electrical Roads reduces CO2 emissions.
Electrical Roads leverages existing infrastructure.
Electrical Roads creates a new national field of knowledge and a new industrial branch.
Electrical Roads is great field for cooperating between the political, administrative and industrial entities.
Demonstrations challenge the Industry!

A knowledge basis for future decisions in politics, administration, industry and academia.

- The technologies for continuous transfer of power are available?
- How do they work?
- How mature (market close) are they?
- Do they have a price?
- What interest have industry for electrical Roads?
- What and who are driving the development?
A pre-commercial innovation procurement

The Transport Administration conducts, in co-operation with Vinnova and the Energy Agency, a pre-commercial procurement of Electrical Road Demonstrations in four steps:

1. Prequalification of participants (July-Oct 2013) 11 participants
2. An idea study of solution. (dec 2013-april 2014) 10 participants
3. Design of the demonstrator. (June 2014-april 2015) 4 participants
4. Implementation of the demonstrations. Starting June 2015. 2 participants

The pre-commercial procurement refers to TRL levels 5-7
Nr 1 in construction – eHighway E 16

Conductive transfer with hanging threads and pantographs on the roof
nr 2 in construction
Elways Arlanda v 893

Conductive transfer with rail and pantograph under the vehicle
What answers will the demonstrations give us?

- Do such transfer techniques work in real traffic?
- Are they safe and reliable?
- How they need to be improved – what needs to be done?

And answer we would not get?

- What are the sociatal achievements made?
- What are the business achievements made?
- What road network is suitable for electrification?
- How should an extension be financed?
- Effects on the power grid?
- Environmental effects?
- Etc ...
New knowledge is needed - a new research program!

1. **Power supply.** How to supply system be designed and dimensioned?

2. **Design, operation and maintenance** of electrical Roads. Operation and maintenance methods and machinery developed for various system

3. **The environmental impact** from general assessments to case studies.

4. **Socio-economic effects** advanced studies that can examine the shipments along possible routes.

5. **Economic Impact.** Studies of actual use cases where both operators and shippers involved.
New knowledge is needed - a new research program!!

6. **Financing and strategies for utilization.** Which system solutions fits where? How should the implementation be financed?

7. **Business models, access and payment system.** How will the costs, risks and profits generated be shared?

8. **Legal, regulatory and standardization questions.** Which barriers exist for a broad implementation and what new regulatory framework needs to be developed?

9. **Coordination and dissemination.** An international knowledge center with Swedish participation need to be explored.
Where are we and where are we going?

1. Implement and evaluate the demonstrations
2. Start and implement the FoI application (FFI/TRV)
3. Next steps - Plan for a semi-commercial pilot

- Selection of stretch - High traffic density.
- Strong interest among shippers and carrier
- Strong industrial part-financing.
- Choice of procurement technology/business form
- A robust transfer technology.
- Political acceptance
- Financial solution

A stand-alone-system; Industrial Shuttle, industry, Mine, Terminal, Port
Conclusion - summary

Yet, it is time to test and develop.
Meet each technique based on its current maturity.
Develop knowledge of the "soft" issues and general conditions for electrical Roads.
Broaden knowledge and "mature" decision-making process through demonstrations.
Plan for a semi-commercial pilot.
Create international alliances.
Outline of a strategy for a fossil free transport system

Use of energy in the transport system 2014 (85 TWh)
(Energimyndigheten)

72 TWh fossil fuels (85 %)

13 TWh (15 %) Fuels of other sources

Effects
Less use and driving

Higher efficiency
Fossil Fuels
Other Fuels

Instruments / stimulation / R&I

Physical Measures
Shift / Avoid

Instruments / stimulation / R&I
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