

Markeder og muligheter for ny norsk næringsutvikling

Rammebetingelser og grep for norsk næringsliv

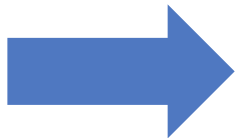
Energilagringseminar

September 2016

The global environmental challenges

- 80 % of today's global energy production is based on fossil fuel
- We need to reduce emissions by 50-80 % by 2050 and then go carbon negative

- Global energy demand is increasing
- 2/3 of today's global population need to increase their standard of living
- The global population will grow with 2 billion more people within 2050



The more we disrupt our climate, the more we risk severe, pervasive and irreversible impacts

Strong market growth expected for energy storage and electro-mobility

The combination of increasing renewable energy production and storage capacity at rapidly falling costs with ever smarter and competitive electric mobility solutions opens tremendous market potential



According to Bloomberg New Energy Finance 2016 onshore wind costs will fall 41% by 2040...



... and solar by 60%. These will be the cheapest ways of producing electricity in many countries during the 2020s and in most of the world in the 2030s



Energy storage market to grow to USD250 billion by 2040. 25 GW of storage devices expected deployed over the next 12 years up from less than 1 GW today



Electric vehicles will make up 25% of the global car fleet by 2040, representing 8% of world power demand



From today until 2040, \$11.4tn will be invested in power generation of which an astonishing \$7.8tn will be invested in renewable energy

Transmission & distribution

Distributed

System scale



90% 70% 90%



70% 70% 70%



20%



70%



>50%



90%

Technology		Commercial status	Application		
			Generation & system-level	Transmission & distribution	End-User
Pumped Hydro		Commercial	√		
Compressed Air		Early commercial	√	√	
Power to Gas (CAES)		R&D Early commercial	√		
Flywheel		Commercial		√	√
Supercapacitor		R&D	√	√	√
Battery	Li-Ion	Commercial Early deployment	√	√	√
	Flow	Early commercial	√	√	√

Utilizing Norwegian advantages: A proven early market for green technology and with favorable public funding opportunities

Norway is a frontrunner in electrification

- Norway has a long history of producing green power
- Ranks no1 on energy availability and security
- Norway's electric vehicle penetration is 40x the global average.
- The first electric ferry, service and fisher boats have been taken into service recently, initiating the next electric transport revolution from Norway

Green energy abundance

- Norway is abundantly endowed with clean hydropower and is facing an increasing electricity surplus the next years
- Virtually 100% of power production is from hydropower, both green and reliable
- Ideal for both electric application in the consumer market, business and energy intensive industrial production

Industrial competence

- Norway has strong industrial and engineering competence
- Particularly in maritime industries, e.g. specialized ship building, offshore technology, e.g. deep water oil& gas extraction, wind power) and process industry, e.g. metals and) other materials such as magnesium, silicon, plastics and composite materials

Public funding opportunities

- Broad political agreement to push for the "green shift" to change Norway from an oil and gas economy towards a green industries economy leading to unique green funding opportunities
- **Enova?**
- **Fornybar AS**
- **Innovation Norway**
- **GIEK**

Over the next 15 years a combination of ***market-driven technological development*** and ***political/regulatory processes*** will lead to ***a major disruption of the energy and transportation sector.***



“The winning technologies”

1. Solar
2. Electrical propulsion
3. Energy Storage/batteries
4. Autonomous cars
5. Hydrogen
6. Sustainable biomass