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# **Sustainable Transition towards Hydrogen**

## **An analysis of the challenges**

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# Agenda of presentation

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- **Energy context**
- **Challenges facing introduction of hydrogen in the energy market**
- **Government role in overcoming the challenges**



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# Energy context: hydrocarbons

- **Security concerns**
  - Growing import dependence
  - Concentration of reserves (e.g., unstable regions)
  - Restricted access to development
  - Increasing demand (e.g., emerging economies)
- **Environmental problems**
  - Notably climate change
- **Lack of alternatives in transport**
  - Growing oil demand



# Energy context: non-hydrocarbons

## Range of concerns

- **Renewables: significant growth but not a major contributor yet**
- **Nuclear: outlook improving but uncertain**
- **Coal: prospects dependent on clean coal technologies/zero emission technologies**



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# Energy context: summary

- Range of problems; transportation and stationary use of energy
- Natural gas & hydrogen part of solution
- Natural gas a bridge to hydrogen use
- Hydrogen versatile energy carrier
  - Produced from wide variety of sources
  - Clean
- But number of challenges have to be overcome



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# Challenges facing the introduction of hydrogen in the energy market



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# Hydrogen introduction challenges

- 50 millions tonnes/year currently produced
- But cost-effective production techniques needed
- Small-scale decentralized facilities could be first step to build up infrastructure
- In long run, centralized hydrogen production plants needed



# Government role in overcoming the challenges



T H I R T Y Y E A R S

# IEA Analysis: Prospects for Hydrogen and Fuel Cells

- **Current energy trends not sustainable**
- **Credible long-term environmental and energy security policies and targets necessary**
- **Combination of environmental and energy-security policies makes hydrogen a significant player in market of transport fuels**



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# IEA Analysis: Prospects for Hydrogen and Fuel Cells

- **Governments should:**
  - foster international standards
  - promote infrastructure investment
  - provide incentives for consumers to adopt new technologies



# Stern Review: The Economics of Climate Change

- **Generated considerable media attention**
- **Stimulated renewed reflection on consequences of climate change**
  - **Cost of inaction could be high**
- **Post Kyoto framework necessary**





# Conclusion

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- **Uncertainty on how to meet challenges of:**
  - Energy security
  - Environment, notably climate change
- **Hydrogen part of solution as an energy carrier**
  - Notably in transport sector

