

# Energeetika stsenaariumitest ning tulevikuperspektiividest

31.10.2019

Priit Mändmaa

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# Ülevaade

- Mis ja kes on World Energy Council?
- World Energy Scenarios 2060
- European Energy Scenarios 2040

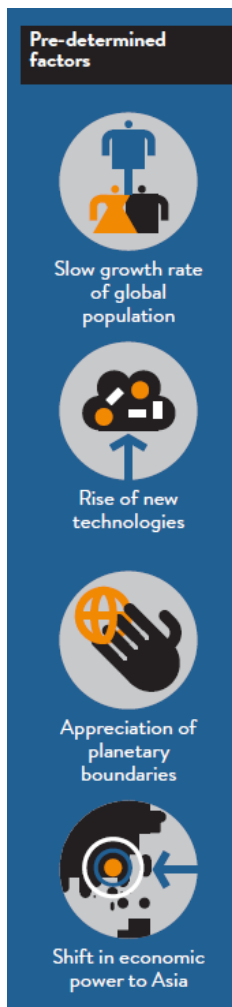
# World Energy Council

- Asutati 1923. aastal;
- Üle 3000 liikme 96-s liikmesriigis;
- Peakontor Londonis;
- Missioon: To promote the sustainable supply and use of energy for the greatest benefit of all people;
- Eesti liitus WEC-ga 1937. aastal, liikmelisus taastati 1998. aastal.

# World Energy Scenarios

Key Messages

# Global scenarios framework recap

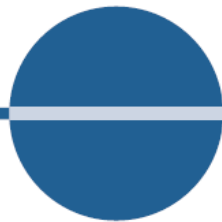


## Scenarios

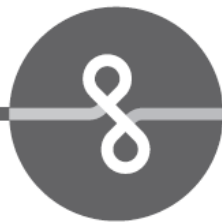
**Modern Jazz**  
Highly digitally disruptive, innovative and agile world. Dominant market mechanisms. Energy plus services. Data dominance.



**Unfinished Symphony**  
Strong policy, long-term planning, united action for climate and broadening agendas. Co-benefits and synergies.



**Hard Rock**  
Fragmented world and low global cooperation. National and energy security focus. Globally connected challenges.



## Critical Uncertainties



Pace of innovation and productivity gains



International governance and geopolitical changes



Priority given to climate change and connected issues

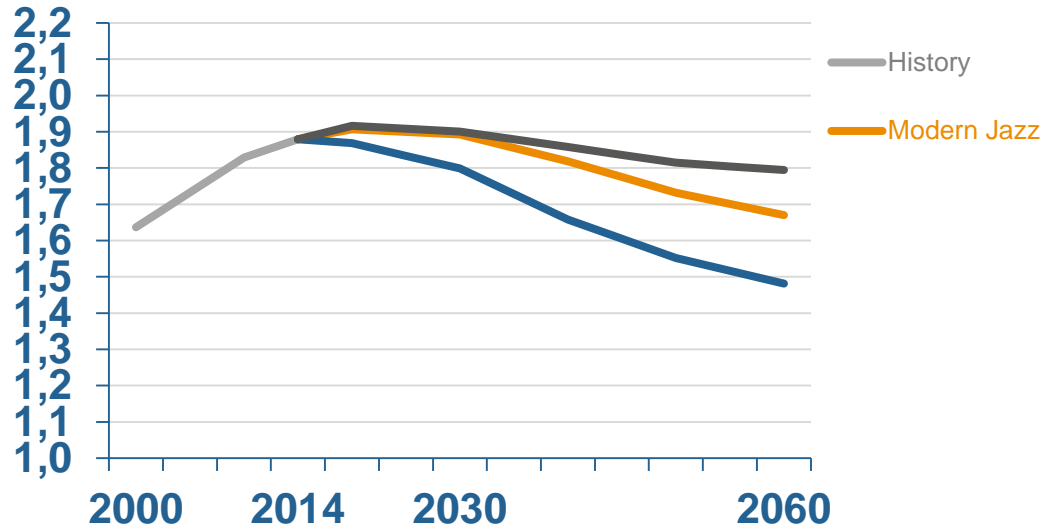


Policy tools in action

# 1 THE WORLD'S PRIMARY ENERGY DEMAND GROWTH...

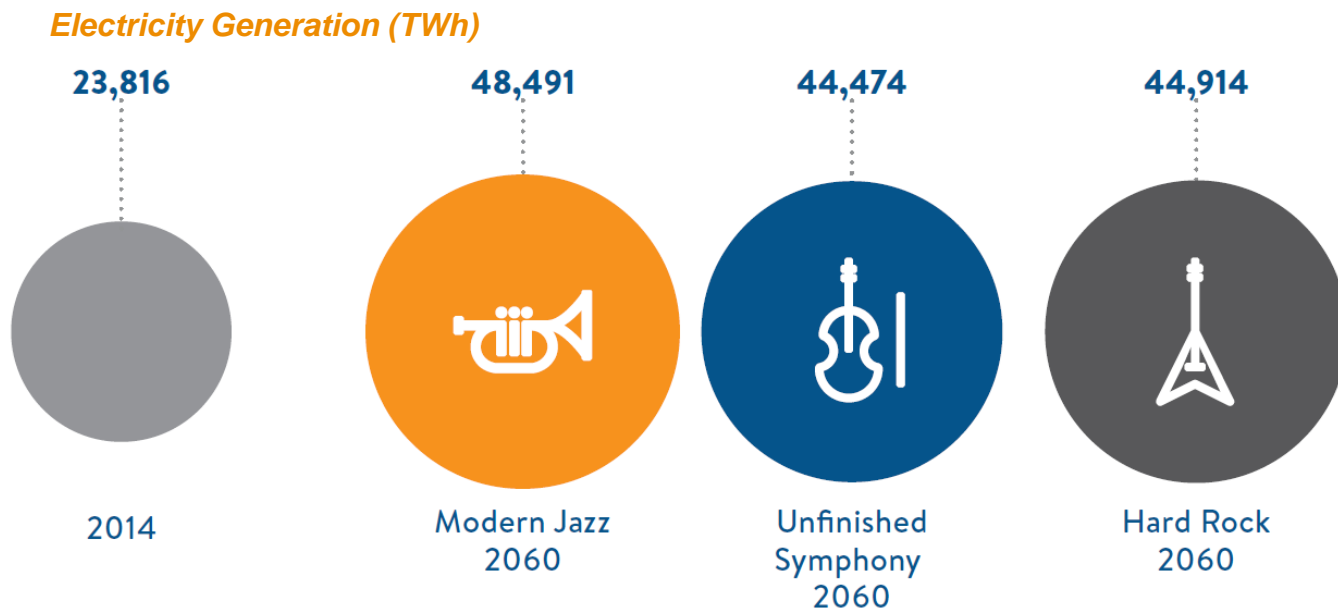
...will slow and per capita energy demand will peak before 2030 due to unprecedented efficiencies created by new technologies and more stringent energy policies.

*Final Energy Growth Rate (p.a.)*



## 2 DEMAND FOR ELECTRICITY...

...will double to 2060. Meeting this demand with cleaner energy sources will require substantial infrastructure investments and systems integration to deliver benefits to all consumers..

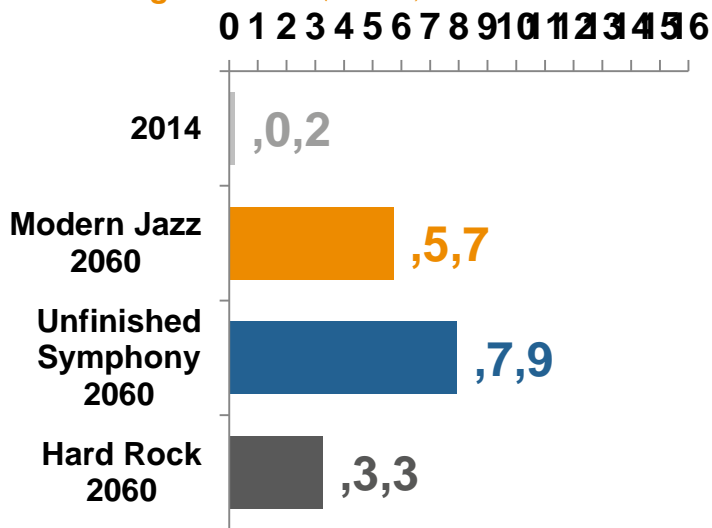


# 3 THE PHENOMENAL RISE OF SOLAR AND WIND ENERGY...

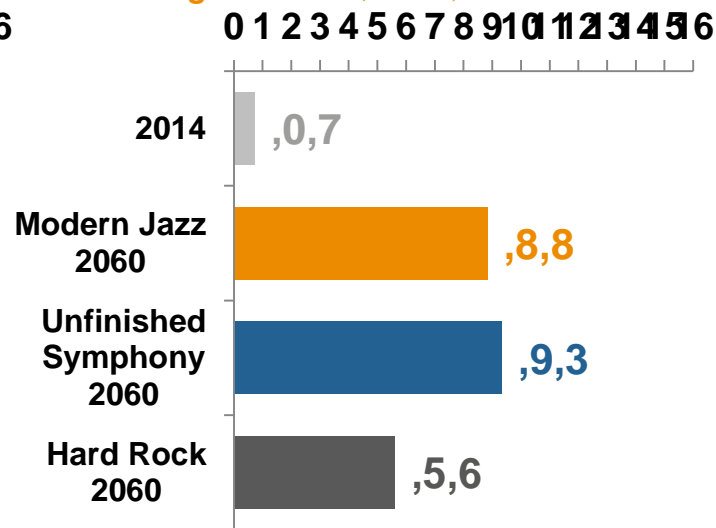
...will continue at an unprecedented rate and create both new opportunities and challenges for energy systems.

## Electricity Generation by Source

### Solar generation ('000 TWh)

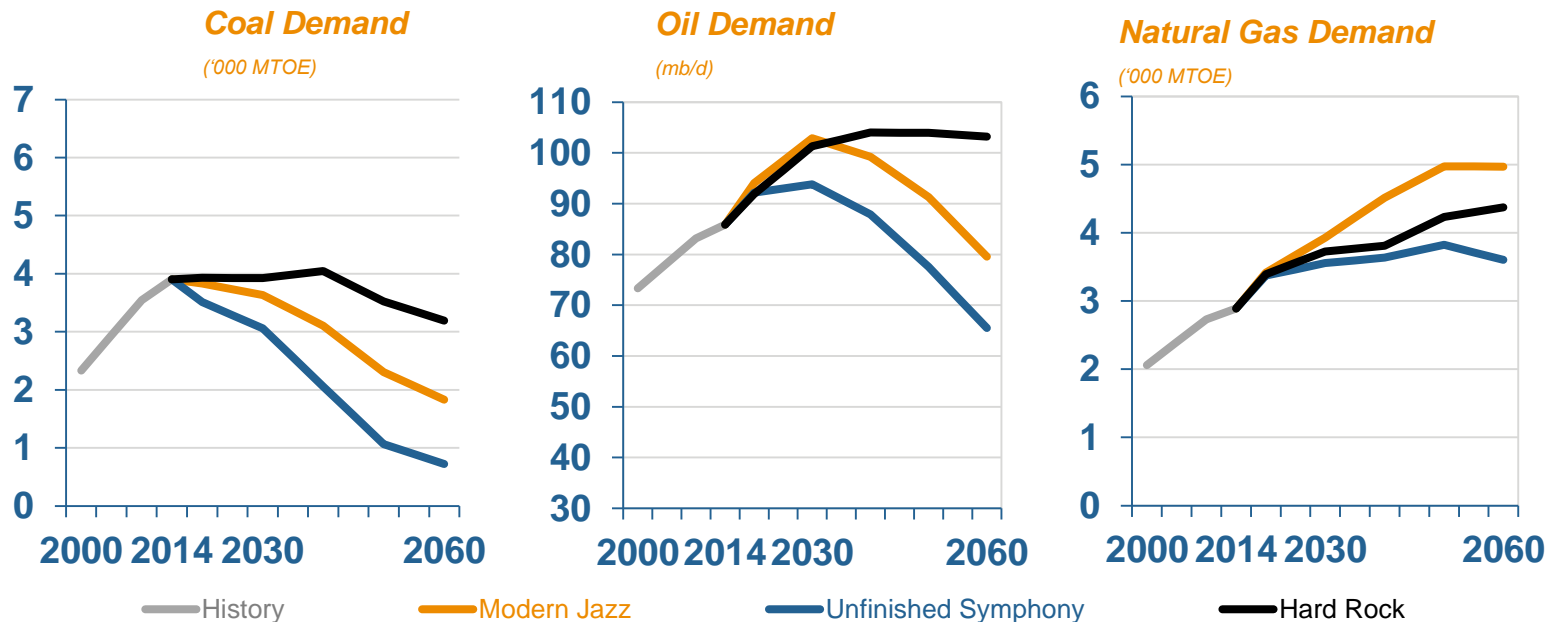


### Wind generation ('000 TWh)



# 4 DEMAND PEAKS FOR COAL AND OIL...

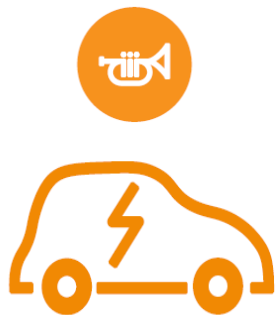
...have the potential to take the world from “Stranded Assets” to “Stranded Resources”.



# 5 TRANSITIONING GLOBAL TRANSPORT...

...forms one of the hardest obstacles to overcome in an effort to decarbonise future energy systems.

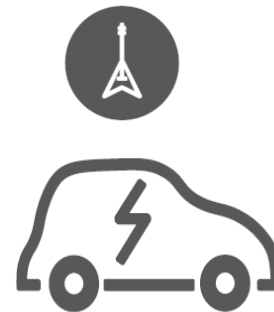
## *Electric Vehicles of Light-duty Vehicle Fleets*



26% of 3.0 billion



32% of 2.8 billion

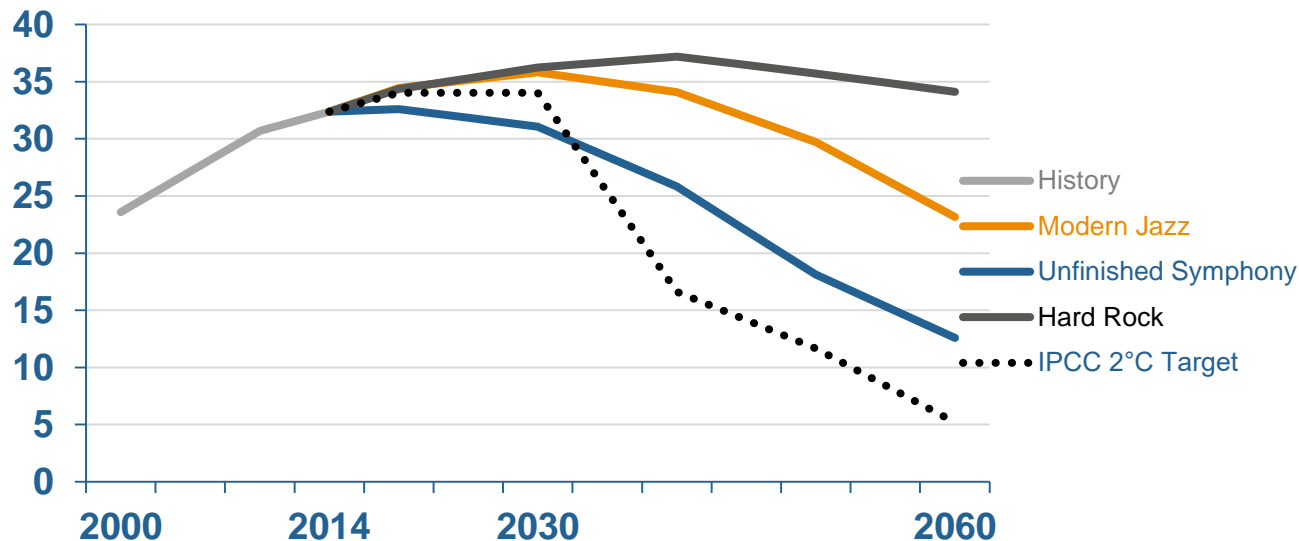


9% of 2.9 billion

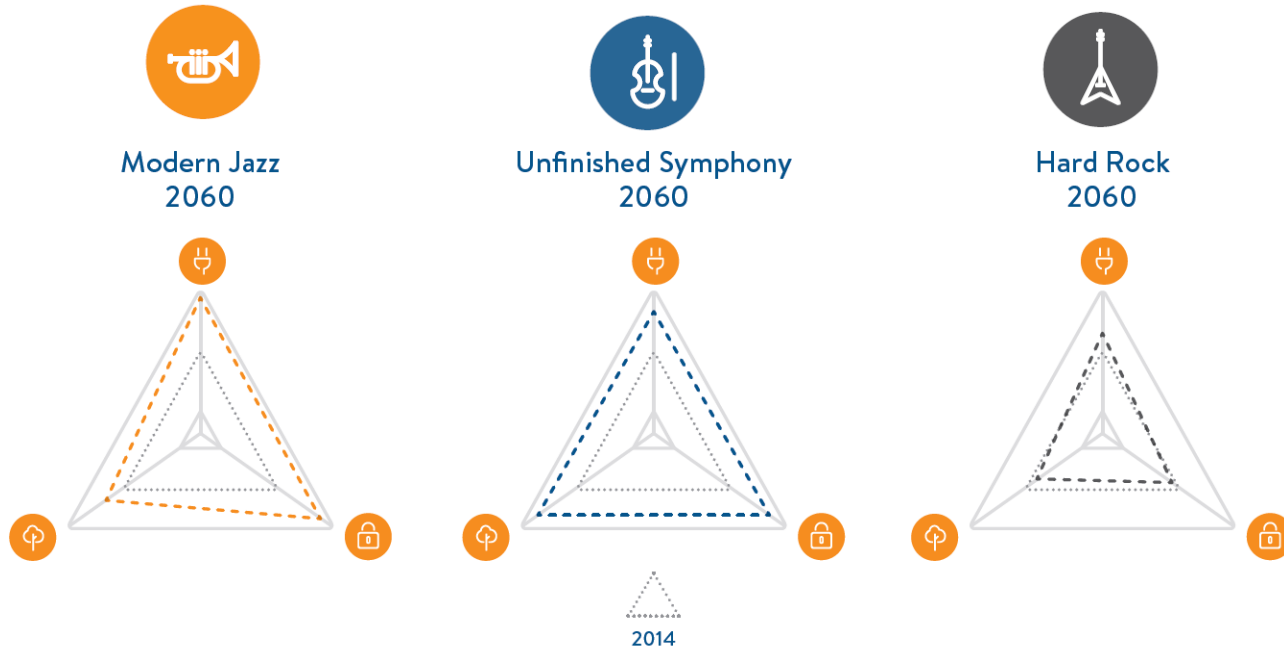
# 6 LIMITING GLOBAL WARMING...

...to no more than a 2°C increase will require an exceptional and enduring effort, far beyond already pledged commitments, and with very high carbon prices.

*Annual Carbon Emissions (GtCO<sub>2</sub>)*



# 7 TRILEMMA INDEX IN 2060



**WORLD ENERGY SCENARIOS | 2019**  
**European Regional Perspective 2040**

# Regional coverage

- The EU-31 (incl. EU-28, Switzerland, Norway, Iceland)
- The Eastern Europe
- Russia



INCREASING,  
BUT UNEVENLY  
DISTRIBUTED  
INNOVATION

DATA-  
EMPOWERED  
CUSTOMERS

TECHNOLOGY  
COST  
REDUCTIONS

CITIZENS RELY  
ON  
BUSINESSES,  
EVEN ON  
SOCIAL ISSUES

## EUROPEAN MODERN JAZZ

ENERGY  
SECURITY IS  
OUTSOURCED  
TO  
CUSTOMERS

STRONG  
INNOVATION IN  
TRANSPORT  
SECTOR

DIGITALISATION  
STRONG, BUT  
VERY UNEVEN

“ETHICAL  
INTERNALITIES”  
ARE PRICED  
INTO SERVICES



EUROPEAN  
UNION  
SUBSIDIARITY  
PRINCIPLES  
ARE RE-  
VISITED

CLIMATE  
TARGETS AND  
BUILDING  
CODES ARE  
INNOVATION  
DRIVERS

ENERGY  
POLICY IS  
INTEGRATED  
WITH OTHER  
POLICIES

REFORM OF  
ELECTRICITY  
MARKET  
DESIGN FOR  
SECURITY

## EUROPEAN UNFINISHED SYMPHONY



SECTOR  
COUPLING IS  
SEIZED

COOPERATION  
VIA DEDICATED  
NETWORKS

IMPACT OF  
TRANSITION TO  
POOR PEOPLE  
IS CLEARLY  
ADDRESSED

CC(U)S AND  
LARGE SCALE  
BATTERIES  
LIKELY TO  
PROGRESS

DECREASING  
POWER OF  
EUROPEAN  
UNION

INEQUALITY  
OF WEALTH  
BETWEEN  
COUNTRIES  
INCREASES

BILATERAL  
COOPERATION,  
ALSO  
BETWEEN US,  
RUSSIA, CHINA

BARRIERS TO  
DATA SHARING,  
NO  
EMPOWERED  
CUSTOMERS

## EUROPEAN HARD ROCK

LOCAL  
SECURITY IS  
PRIORITISED

TALENT MOVES  
TO RICHER  
AREAS

POLICIES  
TOWARDS  
CLIMATE  
CHANGE  
MITIGATION

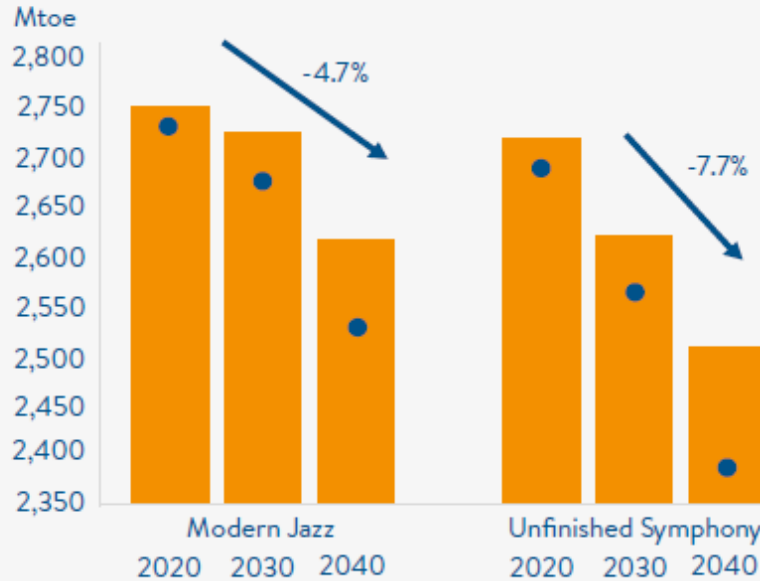
TRANSPORT  
INNOVATION IS  
UN-EVEN



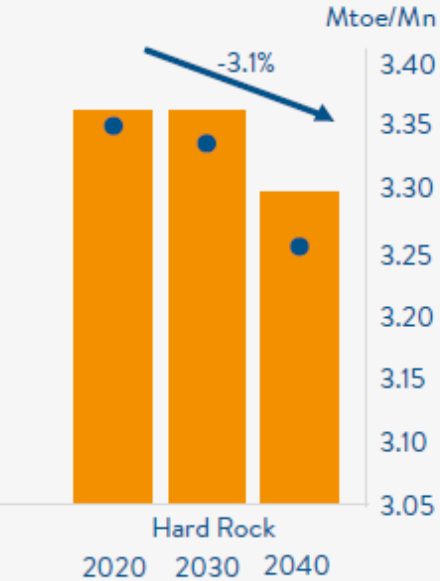
# ENERGY IMPLICATIONS

# Total annual primary energy supply and primary energy per capita

## TOTAL PRIMARY ENERGY SUPPLY

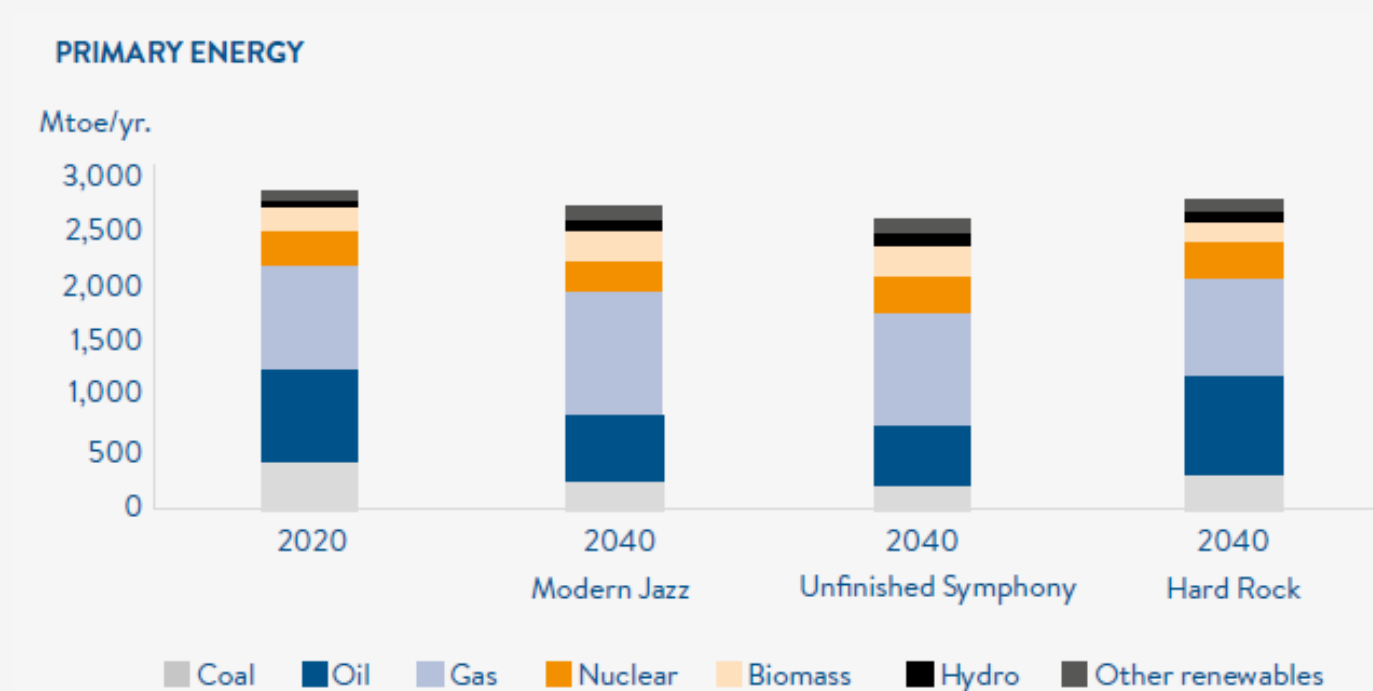


## PRIMARY ENERGY PER CAPITA



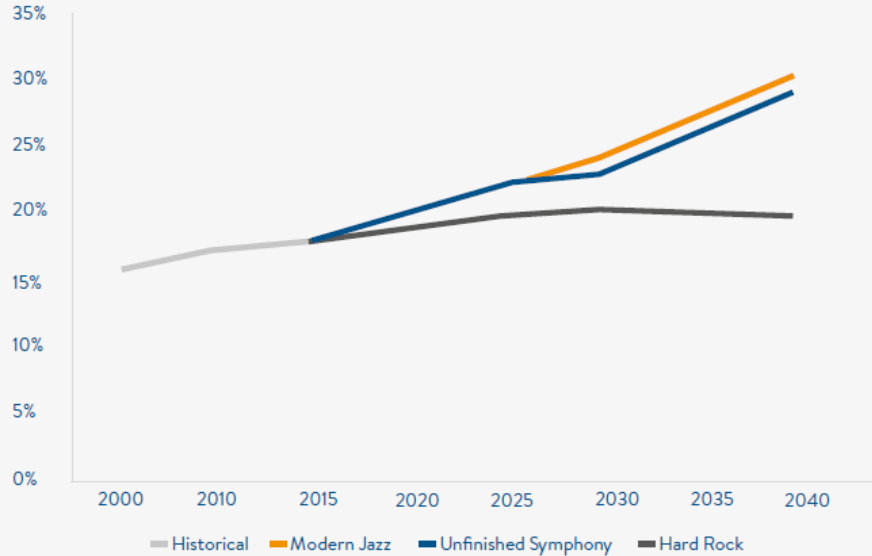
■ Primary Energy ● Primary Energy per capita → Growth 2020-2040

# Annual primary energy by sources

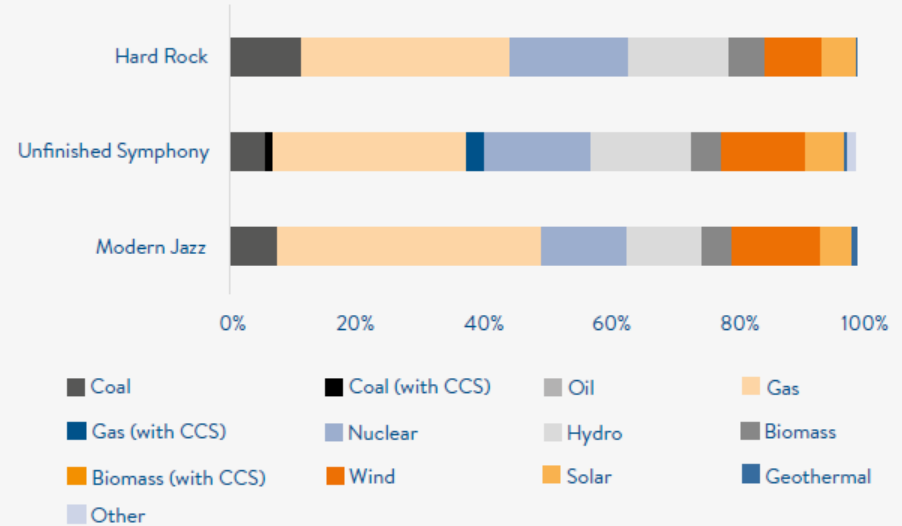


# Electrification

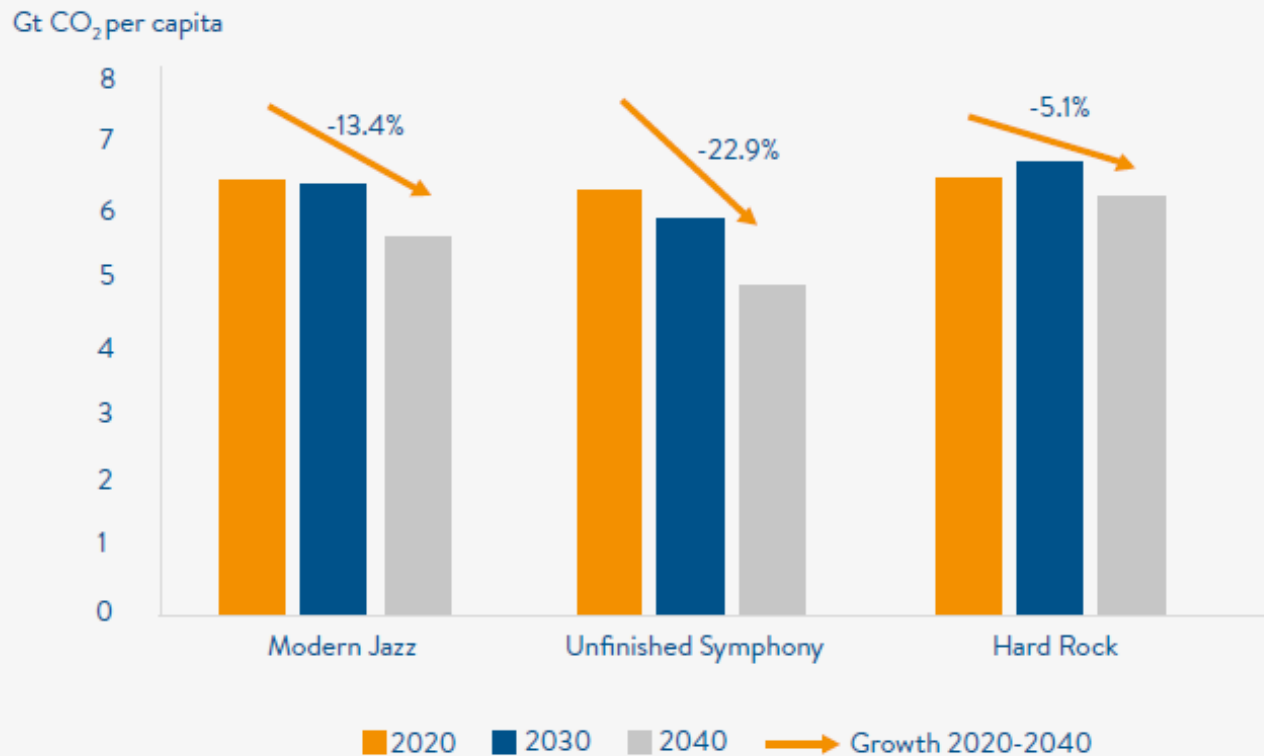
## Electrification rate (% of total final energy)



## Sources of electricity generation (%)



## Europe carbon emission per capita



# Recommendations for European leaders

## POLICY MAKERS

- Engage citizens in honest discussions of whole energy transition costs and re-localisation of new market designs
- Promote sector-coupling strategies to achieve socially affordable and deeper decarbonisation
- Promote integrated policy pathfinding in relation to energy-industrial development
- Develop proactive energy infrastructure action planning, including repurposing of pipelines to progress hydrogen

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## ENERGY BUSINESS LEADER

- Leverage digitalisation to help identify and secure new co-benefits and synergies, e.g., smart systems integration, switching supply and storage

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## INVESTMENT COMMUNITY

- Promote technology neutrality in financing net-zero carbon pathways

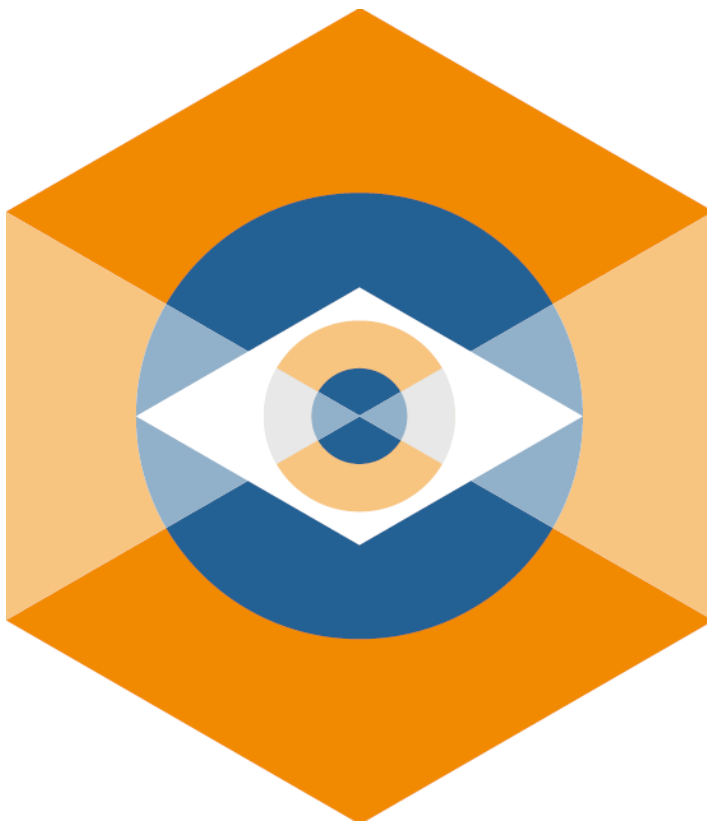
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## MACRO MANAGEMENT

- Seek/encourage investment
- Focus on regional integration of pipelines and grid to enhance dynamic resilience

3. detsembril toimub WEC Eesti aastakonverents. Olete  
oodatud!

Täna tähelepanu eest!



## World Energy Scenarios video