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# Modernising Infrastructure - *Transition of the Energy Sector*

Pathways to Sustainable Energy

13 November 2018, Kyiv



# Central issues

## Framework for analyzing the transition



### ENERGY

#### **Resolving the legacy:**

- Infrastructure, assets = sunk capital
- Social structures: People, jobs, education, social life
- Regional, subregional
- Centers of innovation – centers of regeneration

#### **Technology is changing**

- Pace of technological change in energy
- Uncertainty of rate of penetration of new technologies
- Integrating resource efficiency into the planning
- Resiliency of new infrastructure over planning period

#### **Finance under uncertainty**

- Restricted funding for fossil technologies
- Incentivize winners and compensate losers
- How big? How long-term the planning period?

#### **Innovative Policies**

- Importance of innovative, flexible, holistic policy frameworks
- Sustainable approach: quality of life, energy security, impact

# Pathways to Sustainable Energy

## Defining “Sustainable Energy”



### ENERGY

#### **ENERGY SECURITY**

**“Secure the energy needed for economic development”**

- Energy Efficiency (energy intensity of economy, rate of improvement of energy intensity, conversion efficiency)
- Resource management
- Circular economy
- Fuel mix
- Net energy trade
- Investment requirements
- Intellectual property
- SMEs, business models
- Innovation, proactive solutions

#### **ENERGY AND ENVIRONMENT**

**“Minimize adverse energy system impacts on climate, ecosystems & human health”**

- GHG emissions from the energy system
- Energy-related air pollution, water use & water stress
- Cities

Energy for Sustainable Development

#### **ENERGY FOR QUALITY OF LIFE**

**“Provide affordable energy that is available for all at all times”**

- Access to energy services
- Energy affordability
- Work force in population centers, jobs
- Food security (biomass use, agriculture)

# Pathways to Sustainable Energy

Identifying choices, tracking progress

ENERGY

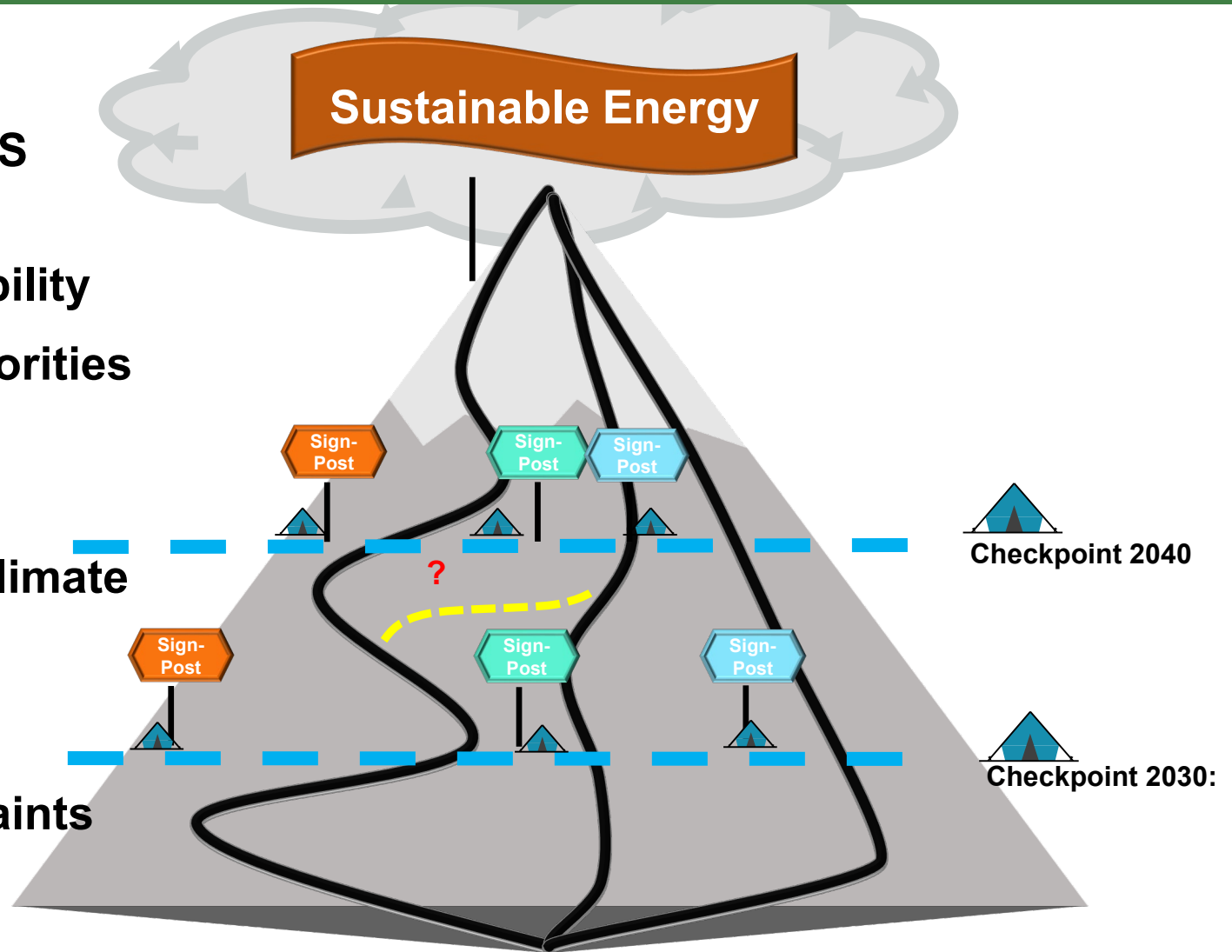


Sustainable Energy

## MULTIPLE OPTIONS

depend on

- Resource availability
- Development priorities
- Environmental constraints
- (Geo-) Political climate
- Industrialization
- Social aspects
- Financial constraints
- ...



Same starting point – choice of pathways via different policy options

# How Pathways helps develop options for countries on how to achieve Sustainable Energy UNECE Region Project Approach



## ENERGY

- **Country-owned scenario development**
  - Modelling of sustainable energy scenarios to 2050 for countries
  - Updated energy system data; new sub-regional analysis possible
  - Policy and updated technology options for UNECE region
  - Understand what makes economical sense to fix
  
- **Informed policy dialogue**
  - Adaptive policy pathways build on importance of large industrial complexes: true impact of energy transition
  - Innovation policy agenda
  - Position energy as fundamental enabler for economic development
  - Sub-regional focus via workshops
  
- **Planning process: Early-warning system**
  - Signposts
  - Choice of Sustainable Energy Targets & Key Performance Indicators

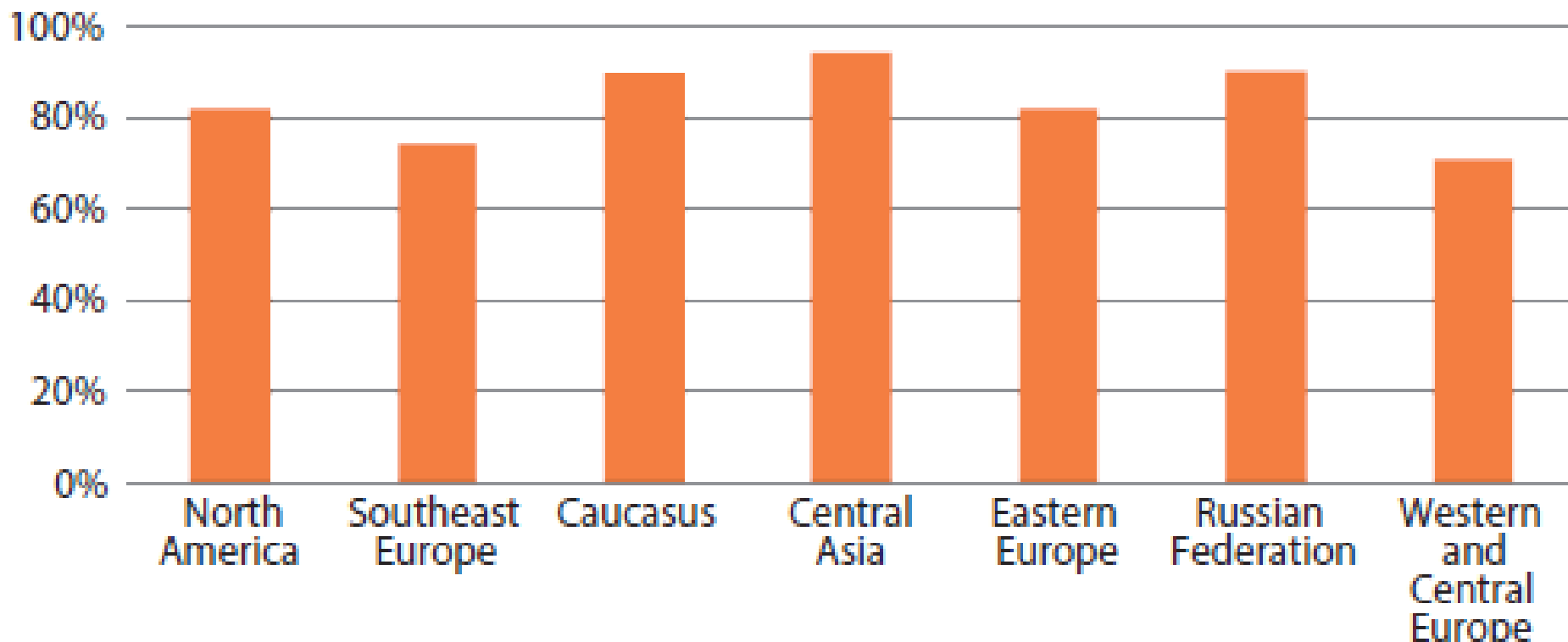
# Some modelling examples - UNECE Region

High Fossil Fuel Dependency

ENERGY



## Share of fossil fuels in energy mix (TPES)



*Data source: IEA World Energy Balances.*

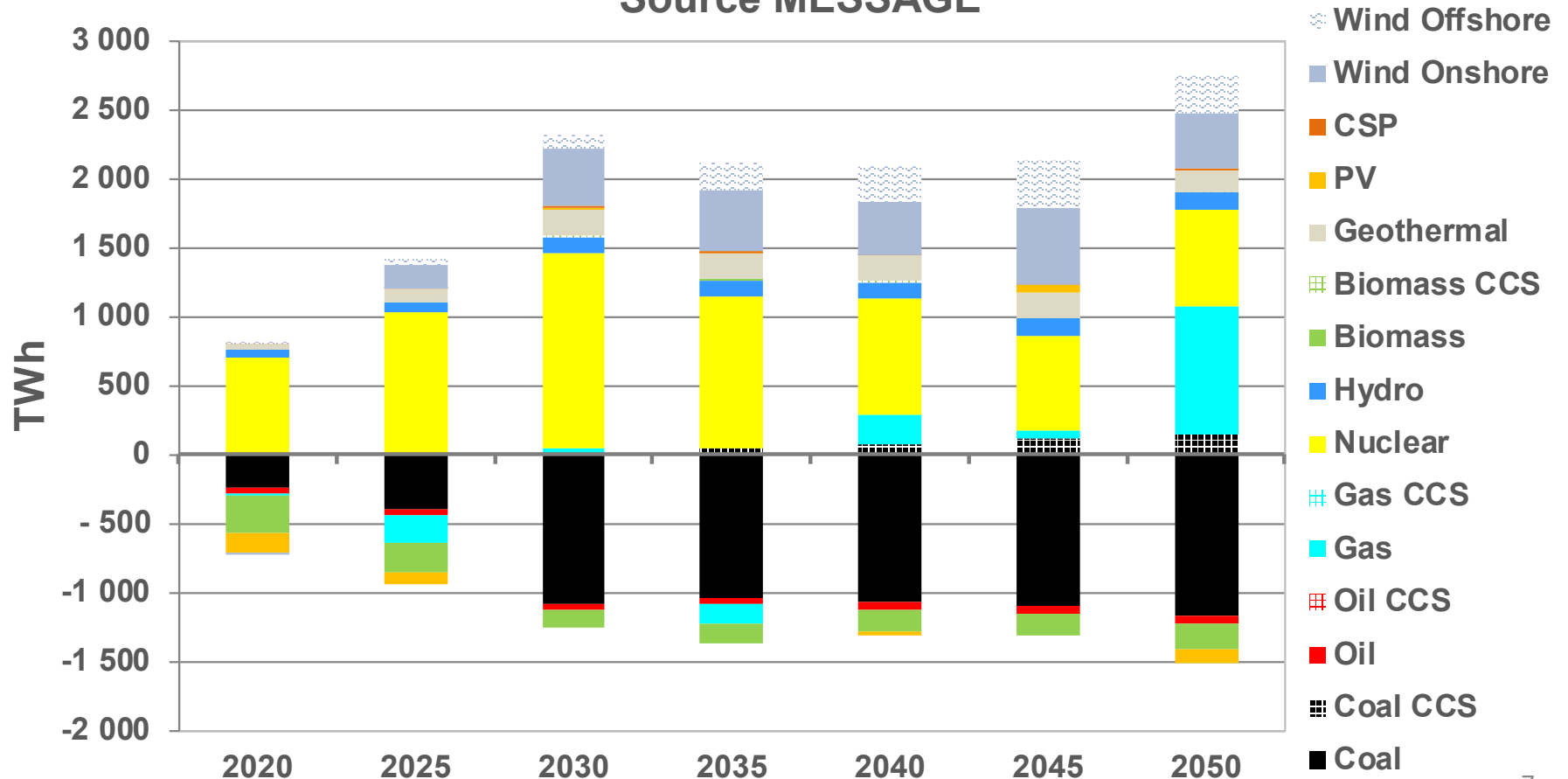
***How to move from a fossil fuel based to an economy fueled by clean energy is one of the major challenges for the UNECE region and most of its sub-regions?***

# Example Modeling Results – change versus base case scenario – Electricity Generation

ENERGY

## Difference in electricity generation, UNECE NDC versus Reference Scenario

Source MESSAGE



# Energy Efficiency

## UNECE Group of Experts on Energy Efficiency



### ENERGY

- Optimization of resources (financial and natural)
- No modernization of energy systems without energy efficiency: link between supply and demand side
- Increasing energy efficiency influences renewable energy share
- Need new business models targeting energy efficiency
- “Hook” to financing
  - How to put a price on saved energy
  - Formulate value added for countries
- Task Force on Industrial Energy Efficiency



Pathways can help countries in developing innovative policies

ENERGY



## Approach

- It is coming - proactivity
- Innovative *Integrated* Planning
  - E.g. renewable energy, storage, energy efficiency in combination
- Technical solutions are not the only answer
  - *Local* ownership involving education systems
  - Enhanced understanding of technical change and innovation policy
- Issue of large complexes dependent on energy
  - Centers of “regional regeneration”
- In partnership: Lusatia, Kazakhstan, others



# Thank you!

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# Example Modeling Results Cumulative Energy Sector Investments "Business As Usual"

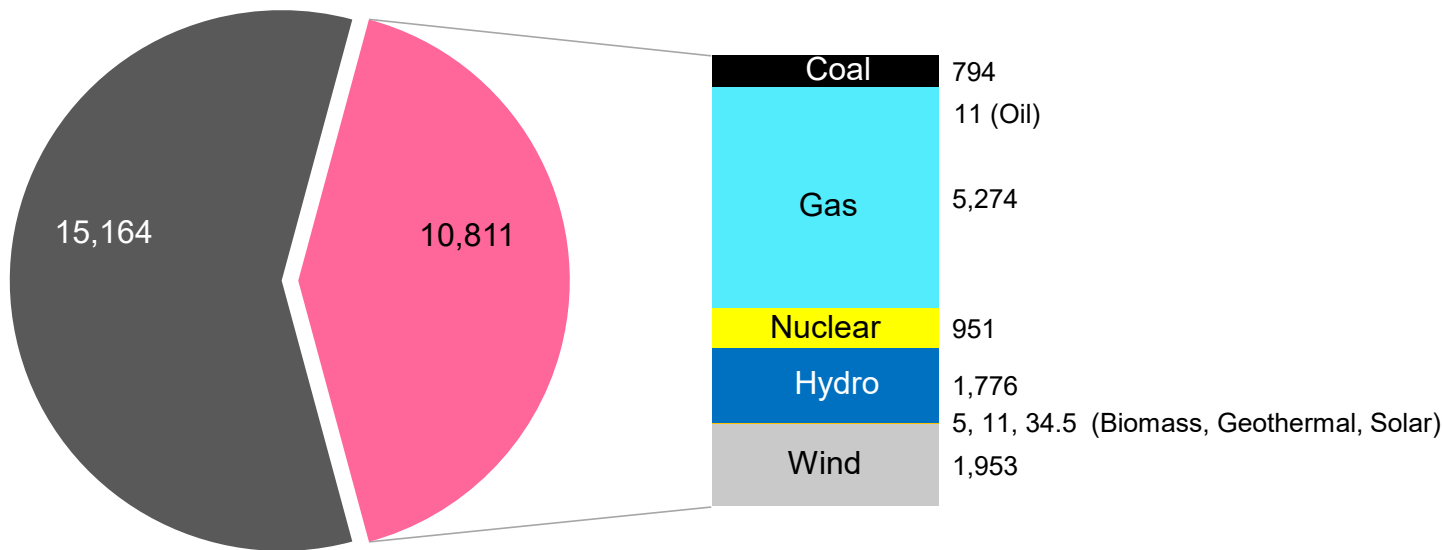
ENERGY



## UNECE Region - Reference Scenario 2020 – 2050 in billion US\$<sub>2010</sub> = \$25,975 billion

Source MESSAGE

Extraction fossil fuel Electricity Supply (including T&D)



- Extraction fossil fuel
- Coal
- ▨ Coal CCS
- Oil
- ▨ Oil CCS
- Gas
- ▨ Gas CCS
- Nuclear
- Hydro
- Biomass
- ▨ Biomass CCS
- Geothermal
- Solar
- Wind

# Example Modeling Results Cumulative Energy Sector Investments “NDC Scenario”

ENERGY



## UNECE Region – NDC Scenario

2020 – 2050 in billion US\$<sub>2010</sub> = \$26,672 billion

Extraction fossil fuel    Electricity Supply (including T&D)

