



# Pathways to Sustainable Energy

3<sup>rd</sup> Workshop

Geneva, 19-20 April 2016

3/5



UNECE

# SCENARIO BUILDING

19 April	20 April
AM	AM
PM	PM

## **Focal Question**

**How can the UNECE Region  
attain Sustainable Energy in the  
Future (2050)?**

# What is Sustainable Energy in 2050?

- Energy that meets the **Sustainable Development Goals**, in particular the targets of
  - **Goal 7:** Affordable, reliable, sustainable, and modern energy
    - Universal Access, renewables, energy efficiency, international cooperation, infrastructure and technology
  - **Goal 13:** Combat Climate Change
    - Climate finance, capacity building, climate policies, climate resilience
  - **Goal 9:** Industry, Innovation and Infrastructure
- Energy that meets **Climate Objectives** (Paris Agreement and beyond)
  - Keep global warming under 2-degree-celsius
  - Fully implement INDCs (existing, and more ambitious ones)
- No limitations on energy technologies
- National net zero carbon energy policies in place
- Towards **net zero emissions** before 2080

# Sustainable Development Goals (SDGs)



# Uncertainties: Working with Descriptors

## Key Uncertainties

- Factors that have a high importance for the focal question, and for which future development is rather uncertain.
- The key uncertainties were selected during the first two workshops in 2015.

## Further Uncertainties

- Factors with comparatively high importance for the focal question.
- In order to develop a more complete picture of the four scenarios, more descriptors are included to describe the scenarios.

# Uncertainties

	Key Uncertainties	Further Uncertainties
<b>SOCIETY</b>		<ol style="list-style-type: none"> <li>1. Society Change</li> <li>2. Civil Society</li> <li>3. Consumer awareness about energy conservation &amp; energy efficiency</li> <li>4. Urbanisation</li> </ol>
<b>TECHNOLOGY</b>	<ol style="list-style-type: none"> <li>5. Information &amp; communication technology (ICT)</li> <li>6. Grid Development &amp; Infrastructure</li> <li>7. Energy storage</li> <li>8. Low carbon technologies</li> <li>9. Carbon Capture &amp; Storage (CCS)</li> </ol>	<ol style="list-style-type: none"> <li>10. Transport</li> </ol>

# Uncertainties

	Key Uncertainties	Further Uncertainties
<b>ECONOMY</b>	<ul style="list-style-type: none"> <li>11. Cost and availability of energy (Energy Supply)</li> <li>12. Carbon pricing</li> <li>13. Energy market design</li> <li>14. Business Models</li> </ul>	<ul style="list-style-type: none"> <li>15. Global Economic Growth</li> <li>16. Population Growth</li> <li>17. Energy Demand Growth</li> <li>18. Private Sector Initiatives and Investment</li> <li>19. Energy Resource Uncertainty</li> <li>20. Producer responses to changes in the value of energy at source</li> </ul>
<b>ENVIRONMENT</b>	<ul style="list-style-type: none"> <li>21. Land, water, energy nexus</li> </ul>	<ul style="list-style-type: none"> <li>22. Water availability</li> <li>23. Environmental Crisis</li> </ul>



# Uncertainties

	Key Uncertainties	Further Uncertainties
<b>POLICY &amp; REGULATION</b>	<ul style="list-style-type: none"><li>24. Cooperation on Sustainable Development Goals (SDGs) &amp; Paris Agreement (COP 21)</li><li>25. Country leadership</li><li>26. Taxes/subsidies for energy</li><li>27. Policy support of energy efficiency and energy conservation</li></ul>	<ul style="list-style-type: none"><li>28. Sanctions</li><li>29. Energy Security</li></ul>

# SCENARIOS AXES

## **X-AXIS: Degree of global cooperation in implementing the Sustainable Development Goals (SDGs) and the Paris Agreement**

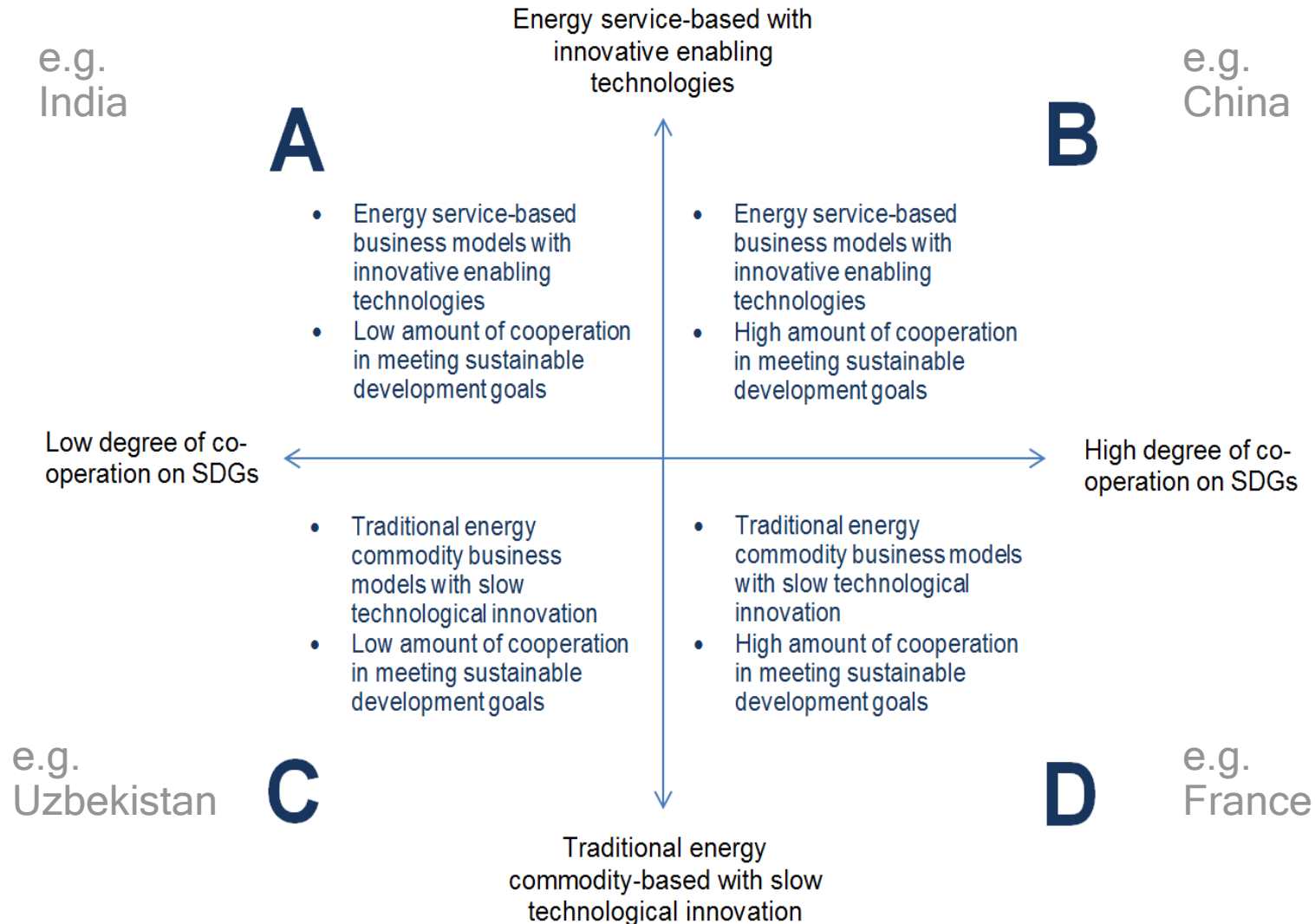
- Successful implementation of SDGs (in particular SDG7, SDG13, but also SDG17), and the Paris Agreement depends on the cooperation among different countries and regions (North-South, South-South, etc.) as every country has a role to play.
- Ends:
  - Low cooperation with inefficient implementation (Scenarios A, C)
  - High cooperation with efficient implementation (Scenarios B, D)

# SCENARIOS AXES

## Y-AXIS: Degree of energy system innovation

- Innovation in the energy system includes developments in business models, low carbon technologies, set up of players in the energy system, scientific and technological “discoveries”, and public sector measures. The lower end of the axis would describe the traditional model which is based on a centralized energy system with a few large utilities “controlling” the market, applying conservative technologies. The higher end of the axis would see a shift to an energy system that moves towards service-based business models including decentralized supply, micro-grids, application of ICT, new players such Google, Yahoo, etc. entering the market, the introduction of innovative technologies such as low-carbon power generation, expansion of smart meters, etc.
- Ends:
  - Energy service-based system with innovative enabling technologies (Scenarios A, B)
  - Traditional energy commodity based system with slow (technological) innovation (Scenarios C, D)

# Scenario Matrix



# PLOTTING THE 4 SCENARIOS

- Equally plausible
- Equally likely
- All achieve sustainable energy in 2050 but on different pathways
- No scenario presents „business as usual“
- Development of global scenarios (not only UNECE)

# PLOTTING THE 4 SCENARIOS – CURRENT STATUS & NEXT STEPS

## I. Finalize axes

**PRESENT NEW FINAL FINE-TUNED SCENARIO MATRIX AT WS**

- Finetuning before breakout team work beings

## II. Finalize list of descriptors (Uncertainties)

**PRESENT NEW FINAL LIST AT THE WS**

- Providing a more comprehensive list in order to allow a more complete description of scenarios before work an assumptions beings

## III. Develop input parameters for the modelling **HOMEWORK BEFORE THE WS!!!**

- Discuss proposed list of input parameters during the workshop to inform the work on assumptions building in the breakout groups

## IV. Develop assumptions for each uncertainty („descriptor list“) **within each breakout-teams** **HOMEWORK BEFORE & AT THE WS!!!**

- Define 1-2 or more assumptions for each descriptor

# Scenario Teams – 3rd Workshop

## **A** EAGLES

Low degree of cooperation  
High degree of innovation with  
new business models

### **Bartosz Wojszczyk**

- Denis Hicks
- Aleksandar Dukovski
- Henri Waisman
- Torstein Indrebo
- David Healey
- Anna Sikharulidze
- Murthy Balijepalli
- Hannes MacNulty
- Martin Hagberg

David Elzinga

## **B** FLAMINGOS

High degree of cooperation  
High degree of innovation with  
new business models

### **Christian Doetsch**

- Sergey Katyshev
- Jürgen Keinhorst
- Stephanie Waldhoff
- David Hone
- Anna Galkina
- Maxim Chepelev
- Timothy Cayford
- Barry Worthington
- Michail Savva

Lisa Tinschert

## **C** OSTRICHES

Low degree of cooperation  
Low degree of innovation with  
traditional business models

### **Anita Pirc Velkavrh**

- Pieter Boot
- Holger Rogner
- Alexander Titov
- Yury Baron
- Sergiu Robu
- Igor Litvinyuk
- Pedro Crespo Del Granado
- Ramazan Zhampiisov

Michal Drabik

## **D** HUMMINGBIRDS

High degree of cooperation  
Low degree of innovation with  
traditional business models

### **Sigurd Heiberg**

- Tatiana Mitrova
- Beatrice Otto
- Roman Podolets
- Vicki Duscha
- Miriam Gutzke
- Adam Koniuszewski
- Lucia Mora Ruiloba

Stefanie Held

# Rooms for Breakout Groups

- **Scenario Team A:** Saale IX (same room)
- **Scenario Team B:** Saale VI
- **Scenario Team C:** Scott Foster's Office (S-382)
- **Scenario Team D:** Stefanie Held's Office (S-380)



# HOW TO DEVELOP ASSUMPTIONS

- For all 29 descriptors, 1 or 2 assumption(s) shall be developed.
- An assumption should be
  - short and precise (one sentence)
  - describe the expected outcome of the scenario in 2050, or a milestone towards it. For example:
    - „*By 2050 eighty percent of fossil fuel subsidies are removed.*“
    - “*By 2035 an effective carbon pricing system will be in operation connecting a wider region.*“
- Assumptions should be plausible based on what we now today
- The assumptions will then be used to form the narrative storylines for each scenario. This will be done after the workshop.
- The outcomes for each description across all four scenarios should ideally cover the range of plausible outcomes.

# **DEVELOPING ASSUMPTIONS :** **HOMEWORK**

## **SCENARIO XY**

# DEVELOPMENT OF ASSUMPTIONS



## - Society

No	Descriptors	Assumptions
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### KEY UNCERTAINTIES

-	None defined	
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### FURTHER UNCERTAINTIES

1	Society change	To be filled out!!
2	Civil Society	To be filled out!!
3	Consumer awareness about energy conservation and energy efficiency	To be filled out!!
4	Urbanisation	To be filled out!!

# DEVELOPMENT OF ASSUMPTIONS



## - Technology

No	Descriptors	Assumptions
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### KEY UNCERTAINTIES

5	Information and communication technology (ICT)	To be filled out!!
6	Grid development and energy infrastructure	To be filled out!!
7	Energy storage	To be filled out!!
8	Low carbon technologies	To be filled out!!
9	Carbon Capture and Storage (CCS)	To be filled out!!

# DEVELOPMENT OF ASSUMPTIONS



UNECE  
- Technology

No	Descriptors	Assumptions
<b>FURTHER UNCERTAINTIES</b>		
10	Transport	To be filled out!!

# DEVELOPMENT OF ASSUMPTIONS



## - Economy

No	Descriptors	Assumptions
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### KEY UNCERTAINTIES

11	Cost and availability of energy (Energy Supply)	To be filled out!!
12	Carbon pricing	To be filled out!!
13	Energy market design	To be filled out!!
14	Business Models	To be filled out!!

# DEVELOPMENT OF ASSUMPTIONS



## - Economy

No	Descriptors	Assumptions
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### FURTHER UNCERTAINTIES I/II

15	Global Economic Growth	To be filled out!!
16	Population Growth	To be filled out!!
17	Energy Demand Growth	To be filled out!!
18	Private Sector Initiatives and Investment	To be filled out!!

# DEVELOPMENT OF ASSUMPTIONS



## - Economy

No	Descriptors	Assumptions
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### FURTHER UNCERTAINTIES II/II

19	Energy Resource Uncertainty	To be filled out!!
20	Producer responses to changes in the value of energy at source	To be filled out!!



# DEVELOPMENT OF ASSUMPTIONS



UNEP  
- Environment

No	Descriptors	Assumptions
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## KEY UNCERTAINTIES

21	Land, water, energy nexus	
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## FURTHER UNCERTAINTIES

22	Water availability	To be filled out!!
23	Environmental Crisis	To be filled out!!

# DEVELOPMENT OF ASSUMPTIONS UNECE

## - Policy and Regulation

No	Descriptors	Assumptions
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### KEY UNCERTAINTIES

24	Cooperation on Sustainable Development Goals (SDGs) & Paris Agreement (COP 21)	To be filled out!!
25	Country leadership	To be filled out!!
26	Taxes/subsidies for energy	To be filled out!!
27	Policy support of energy efficiency and energy conservation	To be filled out!!

# DEVELOPMENT OF ASSUMPTIONS UNECE

## - Policy and Regulation

No	Descriptors	Assumptions
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FURTHER UNCERTAINTIES		
28	Sanctions	To be filled out!!
29	Energy Security	To be filled out!!