Dutch CO2 targets
and the
business case of new build and
XLTO Borssele NPP

- Nijenrode university MSc
- Certified Public Auditor RA
- Army intelligence experience in war zone
- Mergers and acquisition background

- Over 20 years nuclear experience
- Within EPZ serving: HR – Strategy – Business development – Finance – Procurement – Fuel – Facilities - ICT

- Lives triple G life
  Geven-Groeien-Genieten (give – grow – enjoy)
- Loves: running – books – hang out on the couch in the garden

Bram-Paul Jobse CFO N.V. EPZ – www.epz.nl – a.jobse@epz.nl – +31 6 507 45 184

First 1 question to help us forward

What is the biggest challenge for expanding nuclear in NL?

a. Political stability
b. Capacity of the regulator
c. Technical requirements
d. Capacity factor renewables, supply and demand
e. Availability of workforce
f. Grid capacity
g. Financing and cost price
h. Other

N.V. EPZ Electricity without CO2

- Safe
- Available
- Affordable

Finding the optimum

Follow us on our journey to the future

This afternoon

- Dutch targets ….. challenges
- EPZ strategy ….. from unpretending to proud
- Realistic ….. facts or fairy tales?

Energy in the Netherlands

Energy in the Netherlands

Primary energy consumption

	PJ	TWh	%
Renewables	300	84	10%
Nuclear	40	11	1%
Natural gas	1.307	366	44%
Oil	1.078	302	37%
Coal	173	48	6%
Other	47	13	2%
	2.945	824	100%

Excluding international transport by plane and ship (170 TWh)

https://www.ebn.nl/nieuws/infographic-2022-energie-in-cijfers/

Energy in the Netherlands

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	2.945	824	100%

Final energy demand

	PJ	TWh	%
Electricity	389	108	17%
Heat	219	61	10%
Direct use of gas	570	160	25%
Transport	566	159	25%
Product and feedstock	536	150	24%
Energy loss	665	186	
	2.945	824	100%

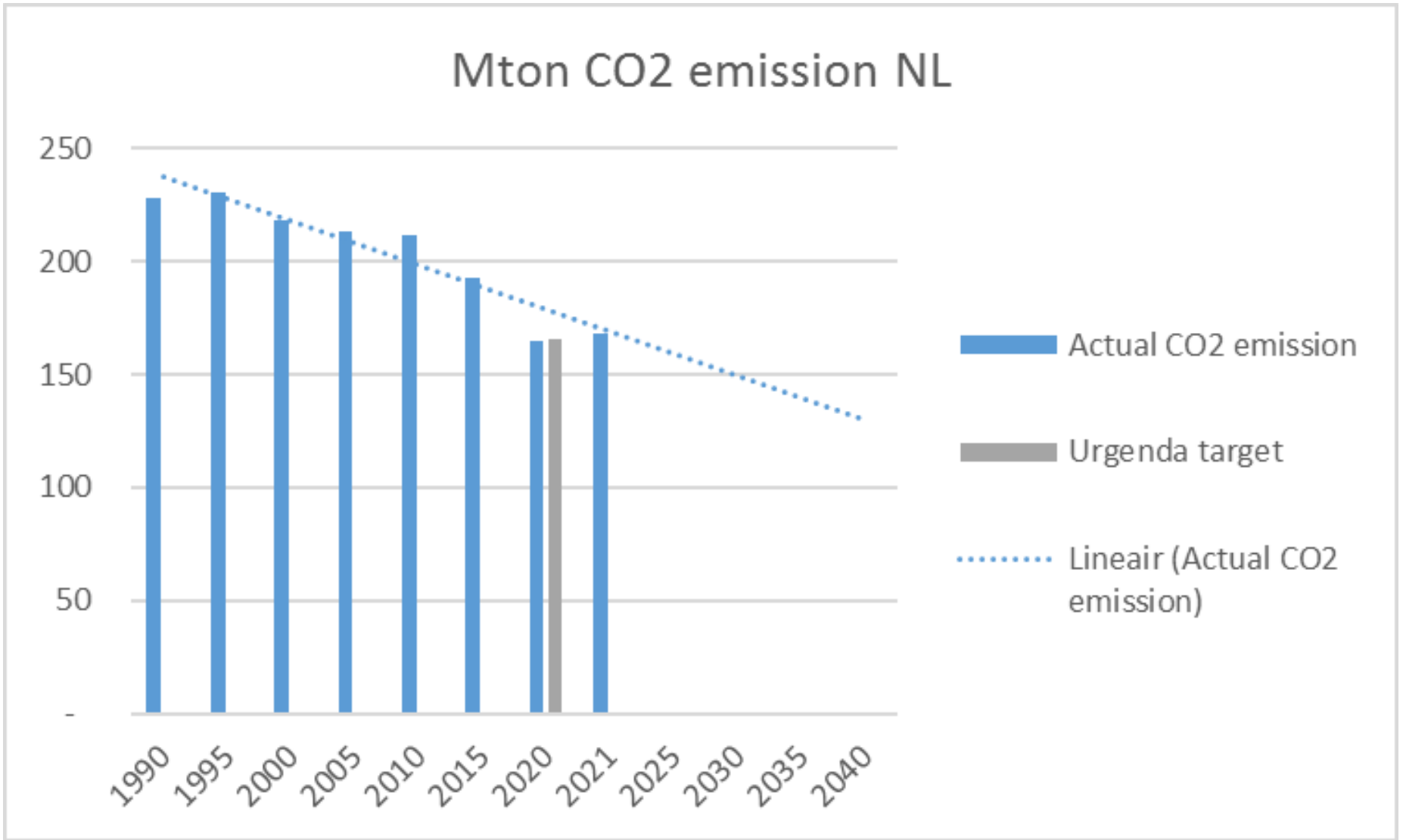
Excluding international transport by plane and ship (170 TWh)

1 EPR 1.600 MW = 13 TWh

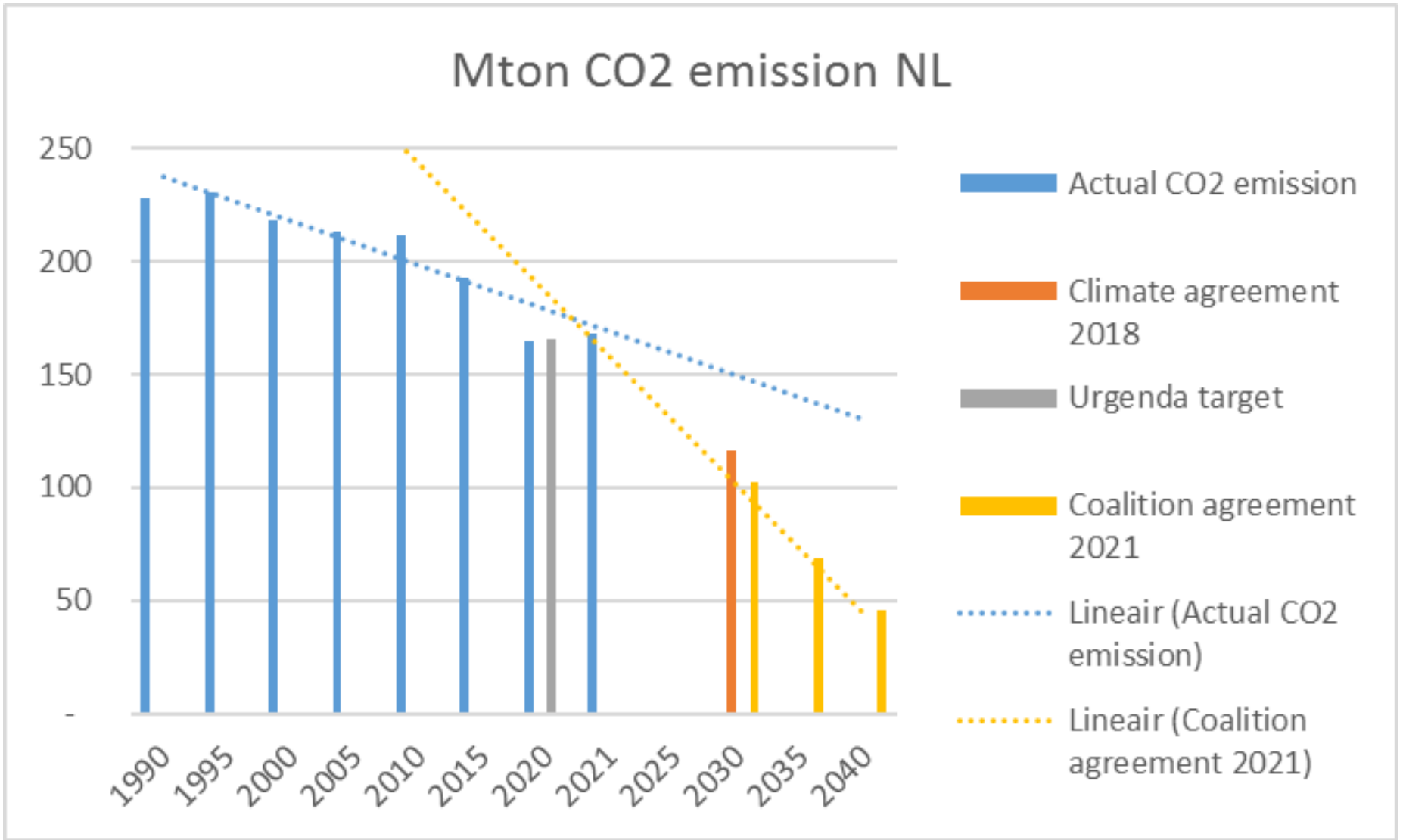
https://www.ebn.nl/nieuws/infographic-2022-energie-in-cijfers/

Challenges

- Dutch CO2 targets
- Space
- Electricity need

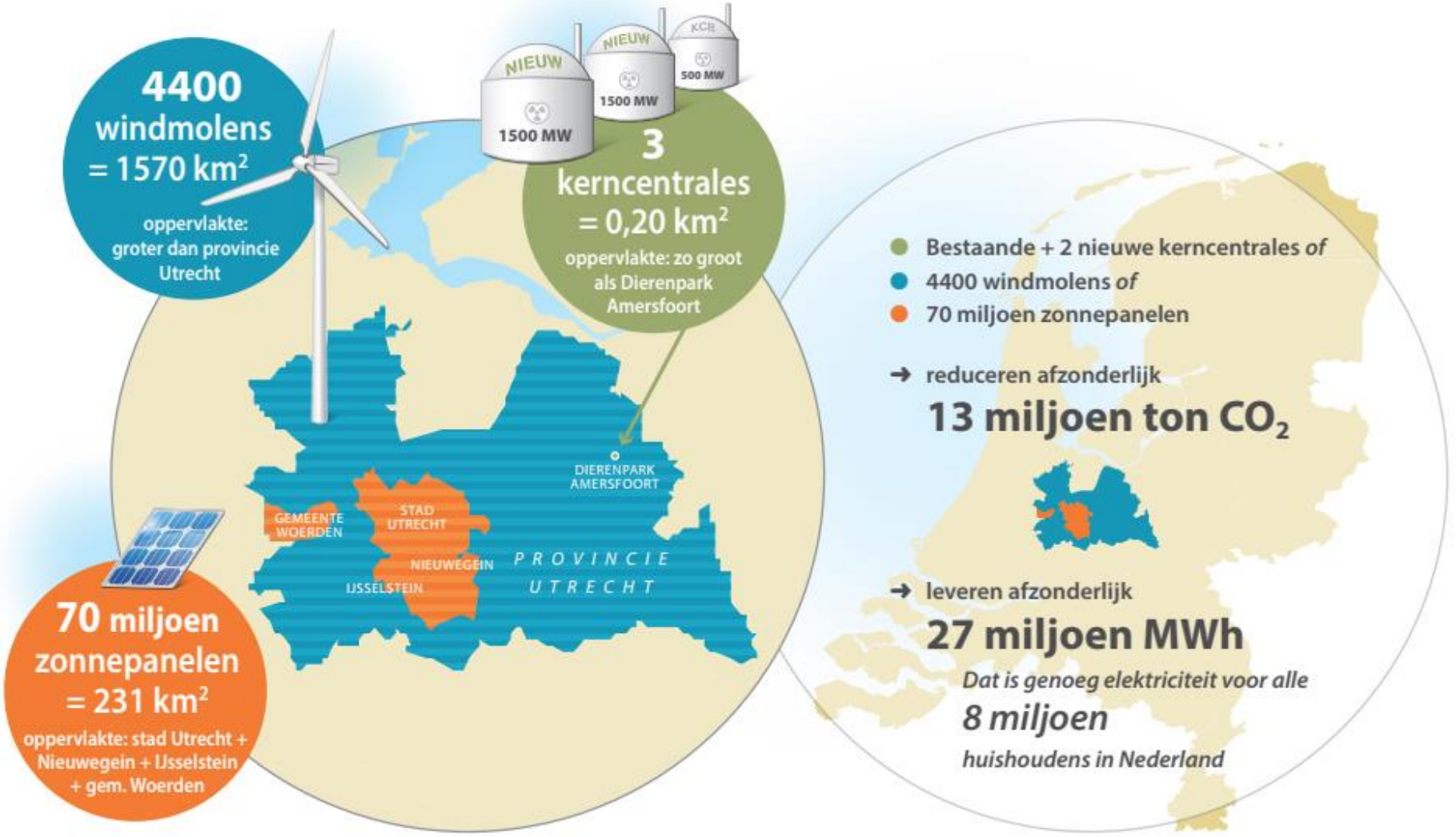


Source CBS RIVM emission registration



Source CBS RIVM emission registration

Used space nuclear compared to solar and wind



2050 Indicative electricity need

Production	2021 TWh	2050 TWh	Factor
Electricity consumption	108	300	3
Heat and hydrogen solutions	61	200	3
Conversion, energy storage	-	150	
	169	650	4

Source CBS Tennet

2050 Indicative electricity need

Production	2021 TWh	2050 TWh	Factor
Electricity consumption	108	300	3
Heat and hydrogen solutions	61	200	3
Conversion, energy storage	-	150	
	169	650	4

Max theoretical Capacity	2021 MW	2050 MW	2050 TWh	Factor
Wind on shore	5.000	6.000	20	1
Wind of shore	3.000	75.000	330	25
Solar	14.000	125.000	100	9
	22.000	206.000	450	9
Current transport volume				10
	MW	MW		
Necessary peak power capacity	21.000	52.000		2

Source CBS Tennet

The big puzzle How to solve?

The big puzzle

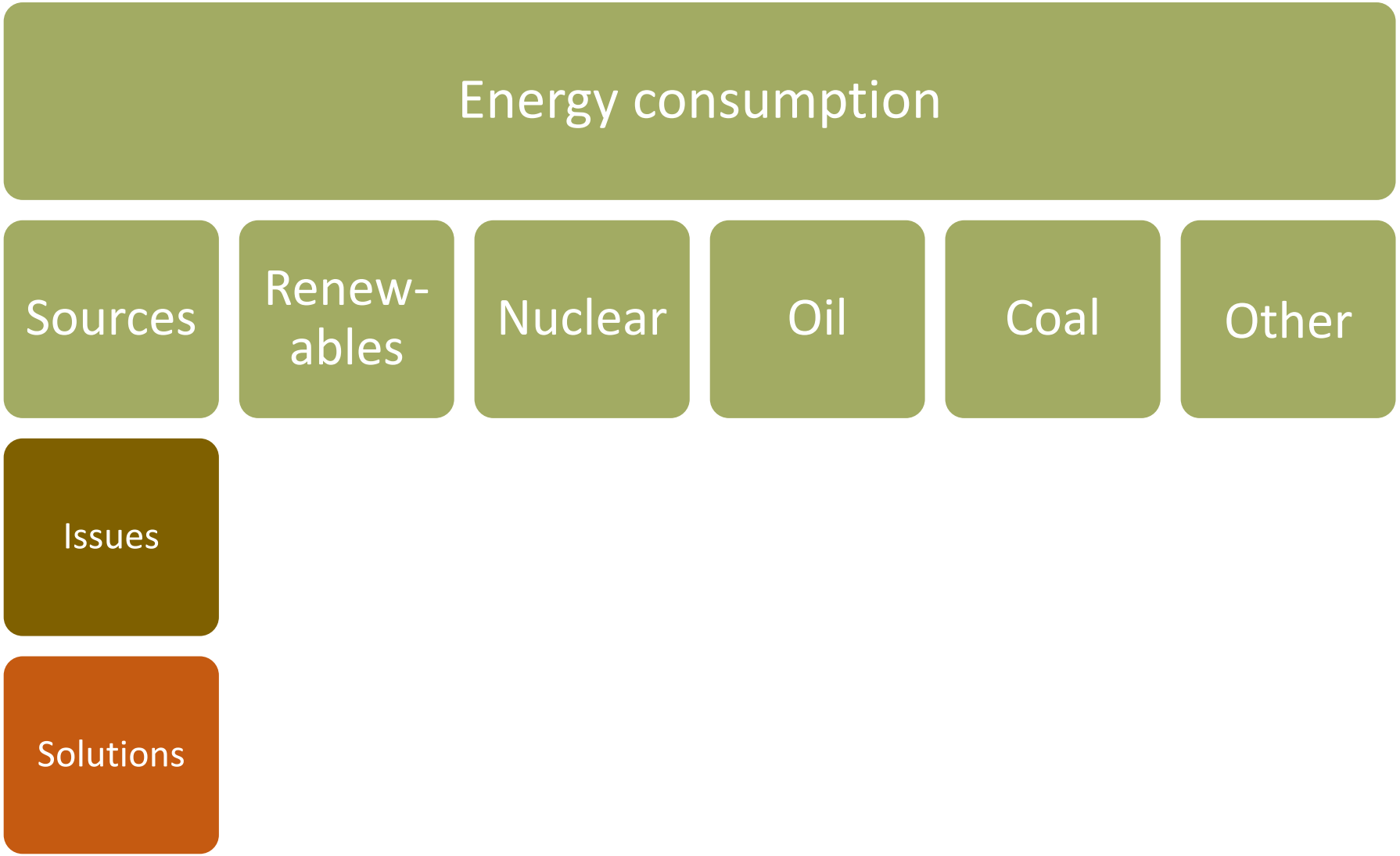
Energy consumption

Sources

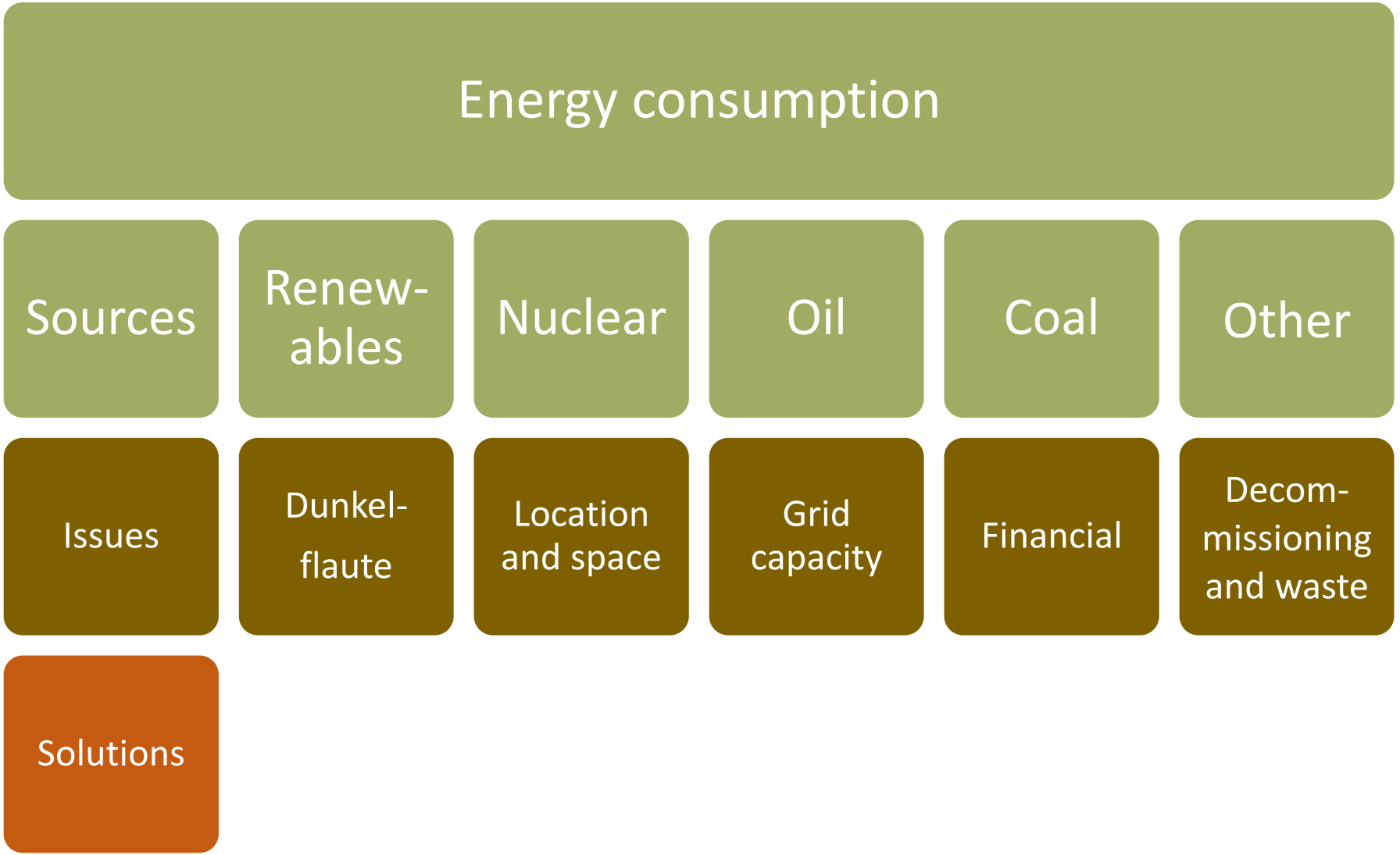
Issues

Solutions

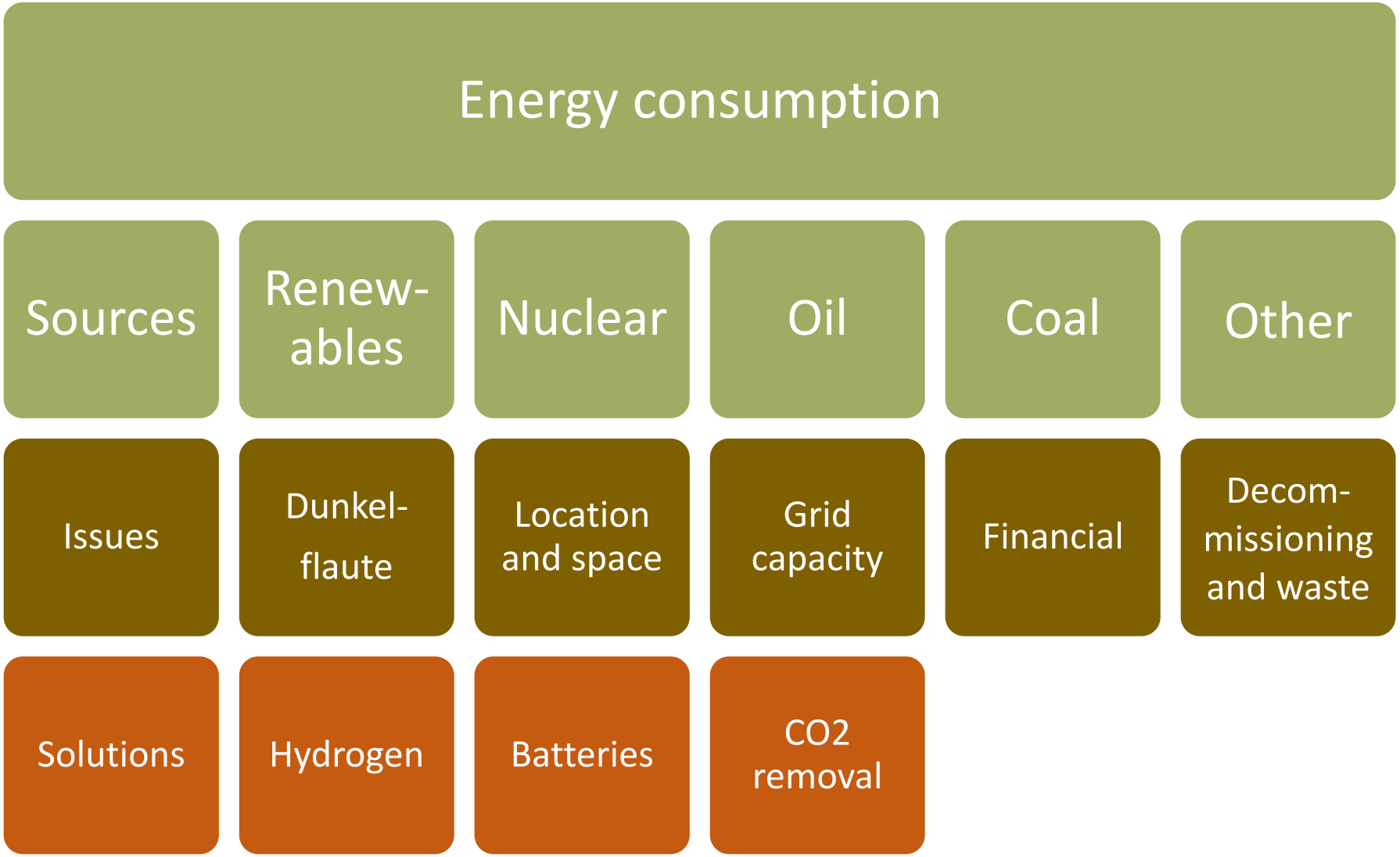
The big puzzle



The big puzzle



The big puzzle
‘We need an integral energy policy’



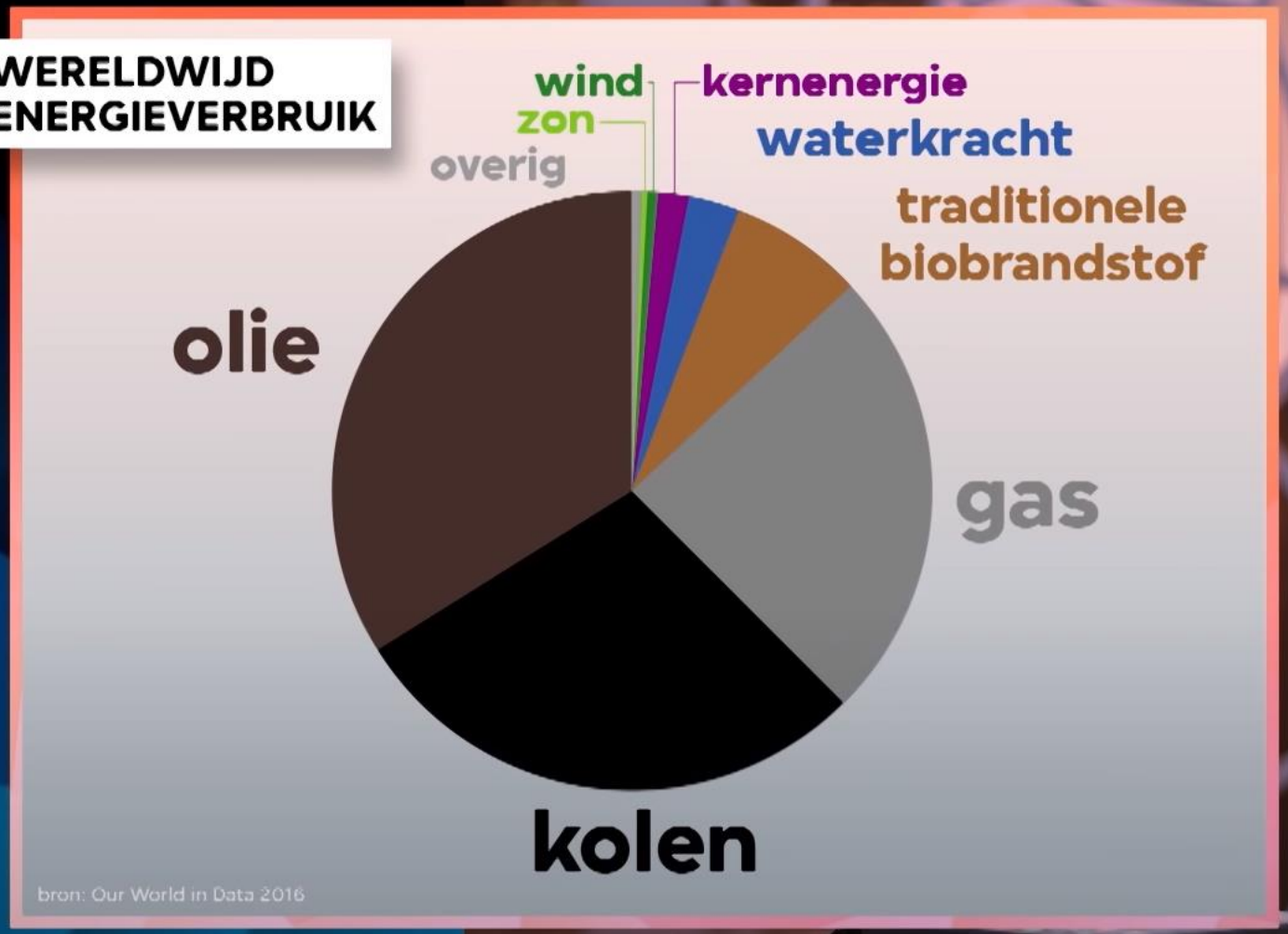
The EPZ journey
‘from unpretending to proud in 16 months’

Our journey
‘from unpretending to proud in 16 months’

- 11.2018 Arjen Lubach: (satirical tv show)

  ‘Nuclear is a realistic alternative’

Nuclear Energy - Zondag met Lubach (S09)



By far the most is taken up by oil, coal and gas,

16:13 / 19:15

Scroll for details

Nuclear Energy - Zondag met Lubach (S09)

but that is going too slowly. Luckily, there is another way to produce energy without producing CO2, namely:

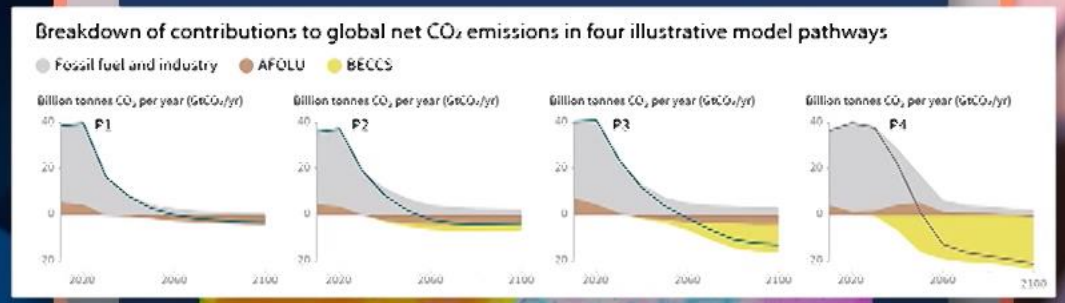
0:40 / 19:15

Scroll for details

ipcc
INTERGOVERNMENTAL PANEL ON Climate change

Global Warming of 1.5°C

An IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty.



and in the 4 most important scenarios there is a need for more nuclear energy.

Our journey

- 11.2018 Arjen Lubach: ‘Nuclear is a realistic alternative’
- 03.2019 Global Environmental Outlook GEO6: ‘With current policies targets are not feasible’

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- 11.2019 NL EAA (PBL) stresses: ‘Without exra measuers not feasible’

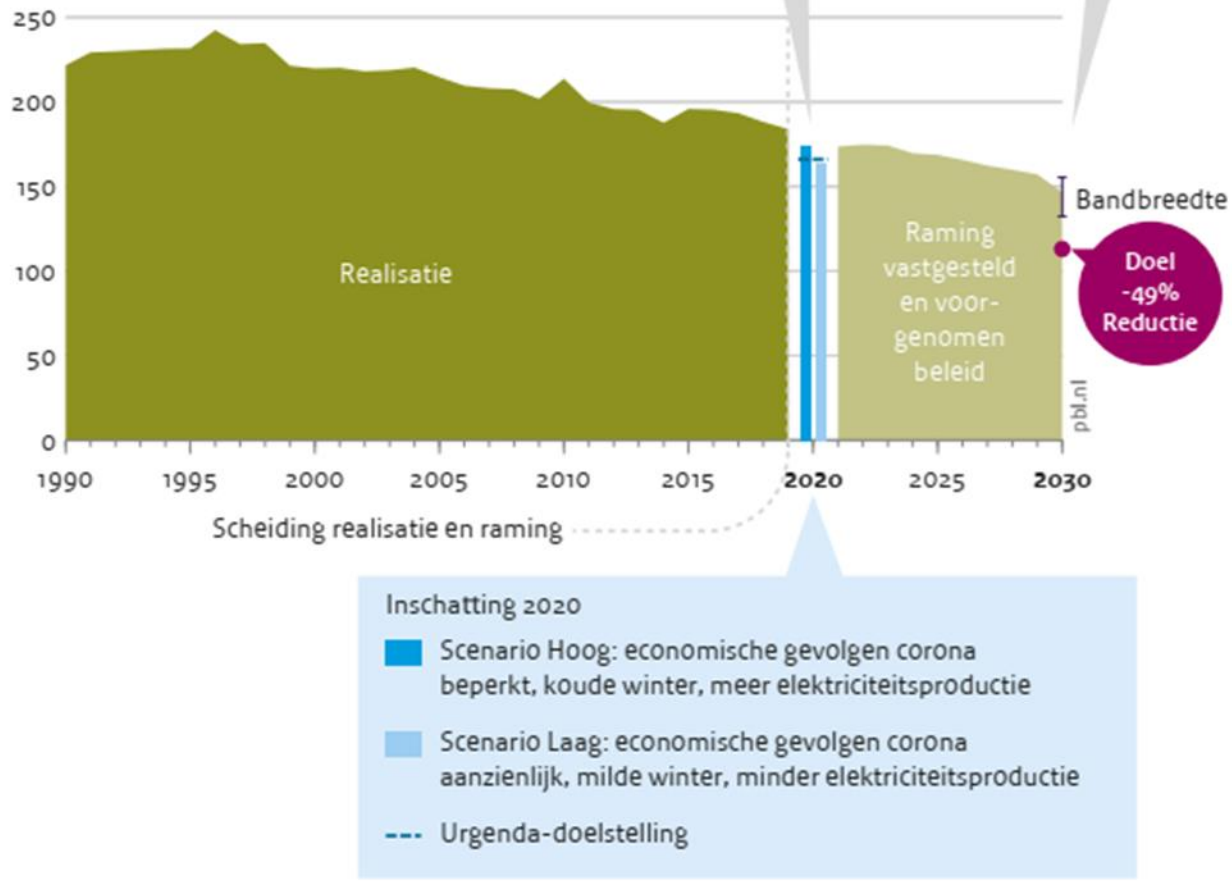
En, worden de doelen voor 2020 en 2030 gehaald?

Doelen voor 2020
- Vermindering uitstoot broeikasgassen met 25% t.o.v. 1990
- Hernieuwbare energie maakt 14% uit van het totaal
- 482 petajoule energiebesparing voor de periode 2014-2020

Doelen voor 2030
- Vermindering uitstoot broeikasgassen met 49% t.o.v. 1990
- Hernieuwbare energie maakt 27% uit van het totaal
- 924 petajoule energiebesparing voor de periode 2021-2030

Emissie broeikasgassen exclusief landgebruik in megaton CO_2-equivalenten

Bron: Emissieregistratie (realisatie); KEV-raming 2020



Aanvullende info

De KEV is een studie van PBL, CBS, TNO EnergieTransitie en RIVM, met bijdragen van RVO.nl
Voor meer informatie over de KEV: www.pbl.nl/kev

Hoofdconclusies:

Uitstoot broeikasgassen:
- 2020: MOGELIJK: Maar ook met strenge corona-maatregelen is kans op halen Urgenda-doel klein
- 2030: NEE: Forse extra inspanning nodig om 49% reductie te bereiken

Hernieuwbare energie:
- 2020: MOGELIJK: Administratieve verrekening met Denemarken mogelijk onvoldoende
- 2030: NEE: Vanwege te laag groeitempo wordt aandeel van 25% voorzien

Energiebesparing:
- 2020: JA: Nederland heeft tot en met 2018 al 593 petajoule bespaard
- 2030: NEE: Besparingstempo moet omhoog om het doel te bereiken

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- 06.2020 Minister of Economic affairs and Climate asks EPZ to investigate life time extension

Ministerie van Economische Zaken en Klimaat

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de directeur EPZ
T.a.v. de heer C. Wolters
Postbus 130
4380 AC VLISSINGEN

gescand

2 JUN 2020

Directoraat-generaal Klimaat en Energie
Directie Elektriciteit

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Bezuidenhoutseweg 73
2594 AC Den Haag

Postadres
Postbus 20401
2500 EK Den Haag

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T 070 379 8911 (algemeen)
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www.rijksoverheid.nl/ezk

Behandeld door
A.G.J. Sedee

T 070 379 6067
A.G.J.Sedee@minezk.nl

Ons kenmerk
DGKE-E / 20141901

Uw kenmerk

Bijlage(n)
0

Datum 29 MEI 2020
Betreft levensduurverlenging kerncentrale

Geachte heer Wolters,

De Provincie Zeeland heeft in haar Regionale Energie Strategie aangegeven dat kernenergie een rol speelt in de Zeeuwse CO_2-vrije energiemix. De minister van Economische Zaken en Klimaat heeft vervolgens in antwoord op Kamervragen voor het Schriftelijk Overleg Klimaat en Energie op 23 april 2020 aangegeven, dat hij bij de vergunninghouder na zal gaan of hij het technisch en bedrijfseconomisch mogelijk acht, met inachtneming van daarvoor benodigde investeringen, dat de levensduur van de kerncentrale op een veilige manier wordt verlengd, en zo ja voor welke periode.

Het gaat in deze fase niet om een compleet overzicht van de benodigde investeringen, maar om een inschatting uwerzijds of gelet op de bij u bekende informatie;

- levensduurverlenging technisch haalbaar zou kunnen zijn
- de daarvoor benodigde investeringen - gelet op de huidige marktinzichten - bedrijfseconomisch verantwoord lijken
- de levensduur met 10 of 20 jaar verlengd zou kunnen worden waarbij de installatie blijft voldoen aan de geldende veiligheidseisen.

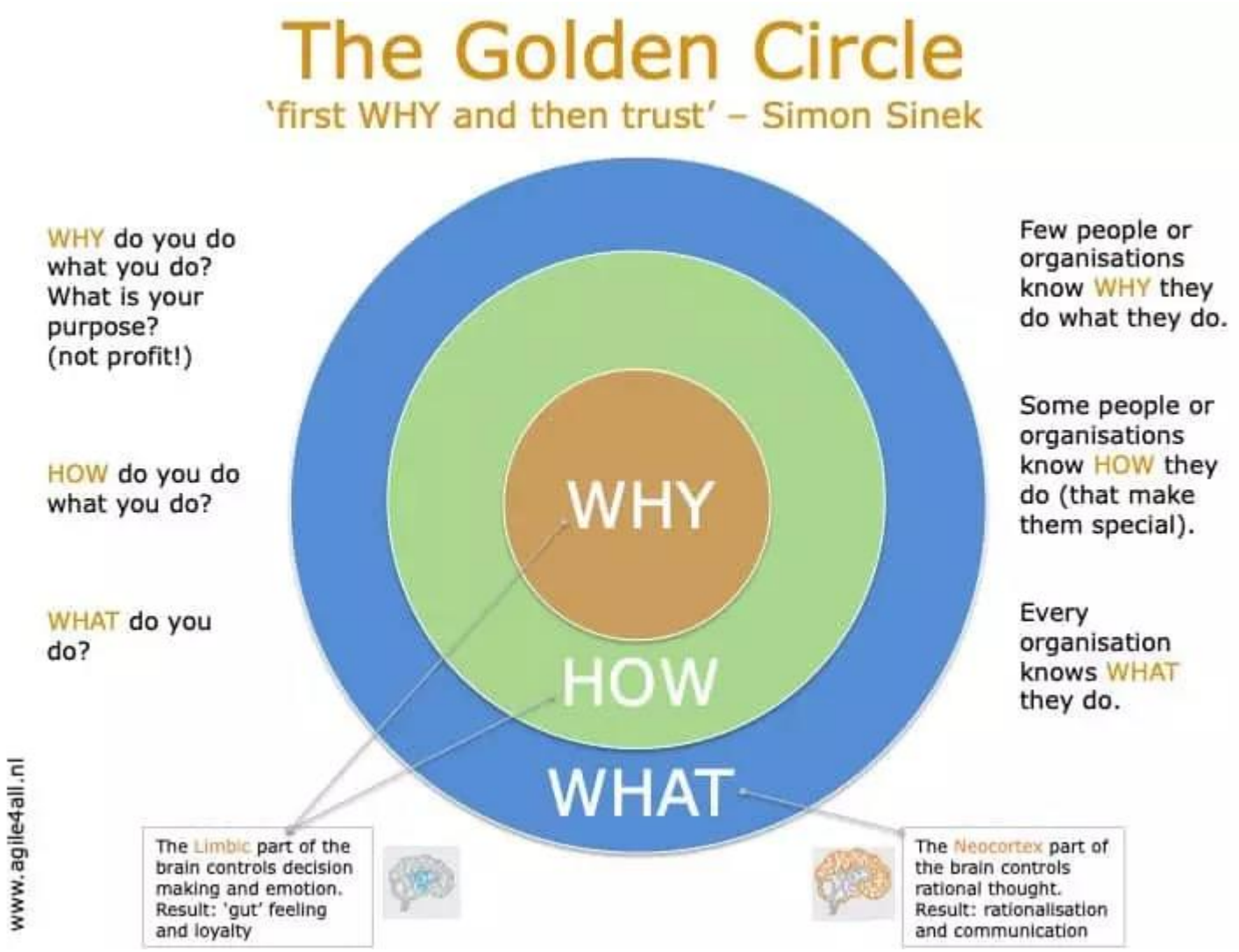
Voor de beantwoording van deze vragen, kunt u in deze fase uitgaan van de reeds bekende technische eisen, voorwaarden en standaarden voor een bestaande kerncentrale van het type dat in Borssele staat.

Mocht (een deel van) de informatie die u gaat verstrekken bedrijfsvertrouwelijk zijn, dan verzoek ik u dat aan te geven, zodat daar op gepaste wijze rekening mee kan worden gehouden.

This afternoon

- Dutch targets
- EPZ strategy
- Realistic?

Why?


The Golden Circle
'first WHY and then trust' – Simon Sinek
WHY do you do what you do? What is your purpose? (not profit!)
HOW do you do what you do?
WHAT do you do?
WHY
HOW
WHAT
Few people or organisations know WHY they do what they do.
Some people or organisations know HOW they do (that make them special).
Every organisation knows WHAT they do.
www.agile4all.nl
The Limbic part of the brain controls decision making and emotion. Result: 'gut' feeling and loyalty
The Neocortex part of the brain controls rational thought. Result: rationalisation and communication

Why (new) nuclear in Borssele?

Why (new) nuclear in Borssele?

We solve issues

- Environmental
- Only sun and wind is not enough
- Availability
- Space requirements
- Affordable

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We can do it

- (Nuclear) Safety
- Knowledge and experience
- Infrastructure and waste policy
- Location

Our journey towards……

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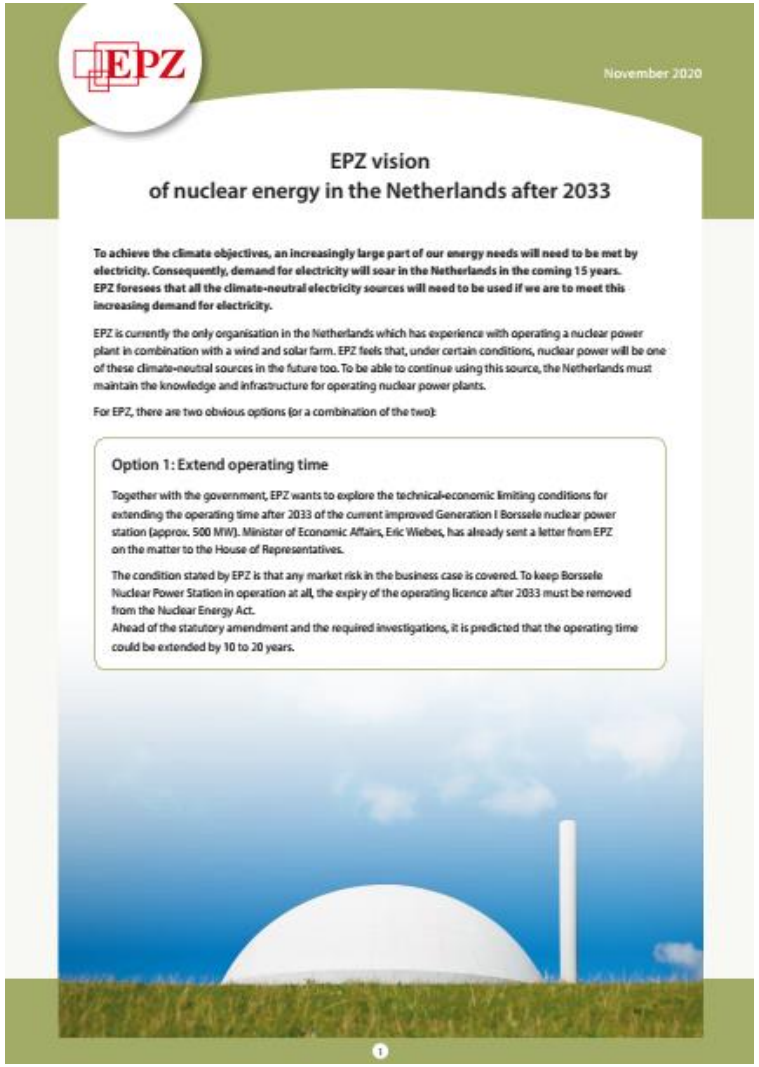
- 06.2020 Minister of Economic affairs and Climate asks EPZ to investigate life time extension
- 11.2020 Strategy paper EPZ



EPZ

November 2020

EPZ vision
of nuclear energy in the Netherlands after 2033

To achieve the climate objectives, an increasingly large part of our energy needs will need to be met by electricity. Consequently, demand for electricity will soar in the Netherlands in the coming 15 years. EPZ foresees that all the climate-neutral electricity sources will need to be used if we are to meet this increasing demand for electricity.

EPZ is currently the only organisation in the Netherlands which has experience with operating a nuclear power plant in combination with a wind and solar farm. EPZ feels that, under certain conditions, nuclear power will be one of these climate-neutral sources in the future too. To be able to continue using this source, the Netherlands must maintain the knowledge and infrastructure for operating nuclear power plants.

For EPZ, there are two obvious options (or a combination of the two):

Option 1: Extend operating time

Together with the government, EPZ wants to explore the technical-economic limiting conditions for extending the operating time after 2033 of the current improved Generation I Borssele nuclear power station (approx. 500 MW). Minister of Economic Affairs, Eric Wiebes, has already sent a letter from EPZ on the matter to the House of Representatives.

The condition stated by EPZ is that any market risk in the business case is covered. To keep Borssele Nuclear Power Station in operation at all, the expiry of the operating licence after 2033 must be removed from the Nuclear Energy Act.
Ahead of the statutory amendment and the required investigations, it is predicted that the operating time could be extended by 10 to 20 years.

Strategy EPZ

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of nuclear energy in the Netherlands after 2033

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Our journey towards……

November 2020

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Strategy paper

- Extend operating life time
- New Build

Our journey towards……

Strategy paper

Extend operating life time

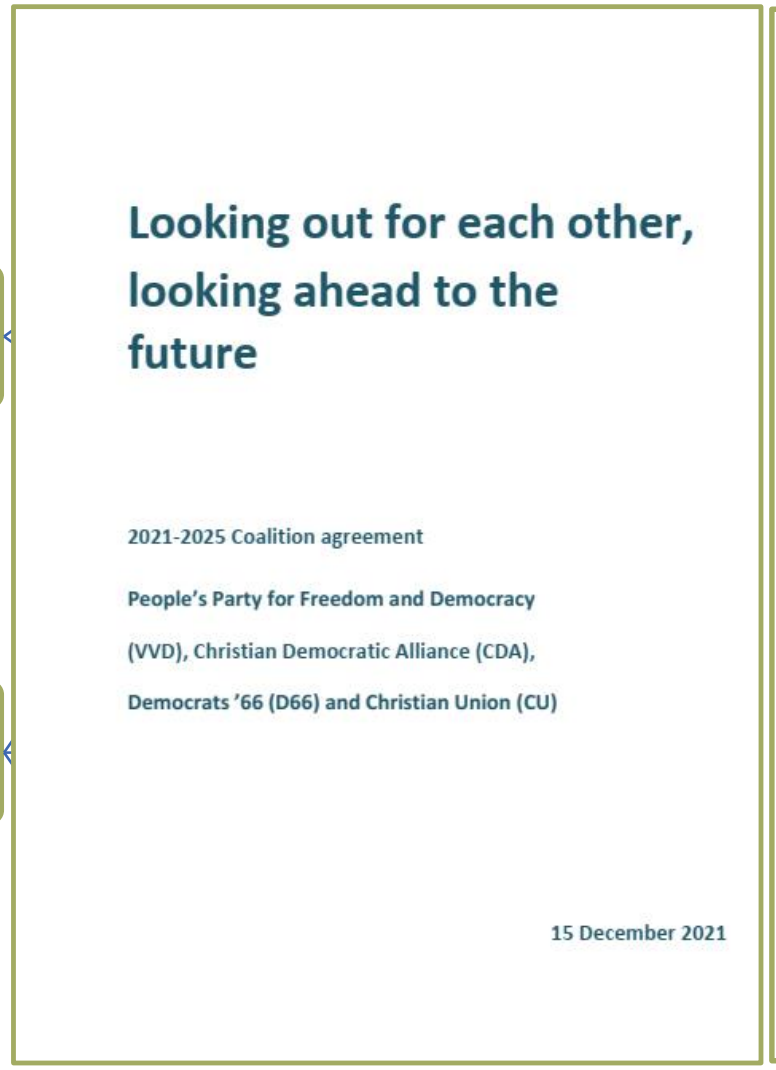
New Build

Our journey towards……

Strategy paper

Extend operating life time

New Build



Nuclear paragraph in 2021-2025 Coalition Agreement :

Nuclear energy can complement solar, wind and geothermal energy in the energy mix, and can be used to produce hydrogen. It also makes us less dependent on imported gas. The Borssele nuclear power plant will therefore be kept operational for longer, with all due consideration naturally given to safety. The government will also take the necessary steps for the construction of two new nuclear power plants. This means that, among other things, we will assist commercial operators in their exploratory studies, support innovation, carry out tender procedures, consider the contribution (financial or otherwise) to be provided by public authorities, and prepare legislation where necessary.

Our journey towards……

Strategy paper

- Extend operating life time
  - Covenant – Market risk coverage – Technical feasible
  - Nuclear energy act adjustment
- New Build
  - Proven licensed design
  - 2 Identical - phased commissioning and training
    - Gen III PWR
    - SMR
  - Covenant – Financing - Market risk coverage

This afternoon

- Dutch targets
- EPZ strategy
- Realistic?

Financial operating experience

comparing recent and future EPZ capex

Financial operating experience

	Invest-ment year	Invest-ment in € mln	Capacity in MW	Invest-ment per MW in € mln	Full load hours per year	Capacity factor	MWh per year	Operating years	Invest-ment in € per MWh
Wind on shore EPZ II	2012	22	12	1,8	2.775	32%	34.133	20	32
Wind on shore EPZ III	2021	15	17	0,9	2.865	33%	48.700	20	15
Solar EPZ I	2019	13	18	0,7	1.135	13%	20.425	20	32

Source N.V. EPZ : Indicative figures for illustration purposes only

comparing recent and future EPZ capex

Financial operating experience

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XLTO nuclear EPZ I	2034	500	481	1,0	7.796	89%	3.750.068	20	7

Source N.V. EPZ : Indicative figures for illustration purposes only

comparing recent and future EPZ capex

Financial operating experience

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XLTO nuclear EPZ I	2034	500	481	1,0	7.796	89%	3.750.068	20	7
New nuclear EPZ II	2034	8.000	1.600	5,0	8.059	92%	12.894.720	60	10

Source N.V. EPZ : Indicative figures for illustration purposes only

comparing recent and future EPZ capex

Thanks for your attention