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COAL TRANSITIONS

www.coaltransitions.org

Climate Strategies

A project supported by the KR Foundation

Coal Transitions: insights from an international research project on the future of coal

COP24 - 06/12/2018

oliver.sartor@iddri.org

SciencesPo

Coal Transitions: an international research project

Six leading research teams from 6 major coal using economies: China, India, South Africa, Australia, Germany, Poland.

Exploring feasible and just pathways to coal transitions, compatible with <2°C goal of Paris Agreement

SciencesPo

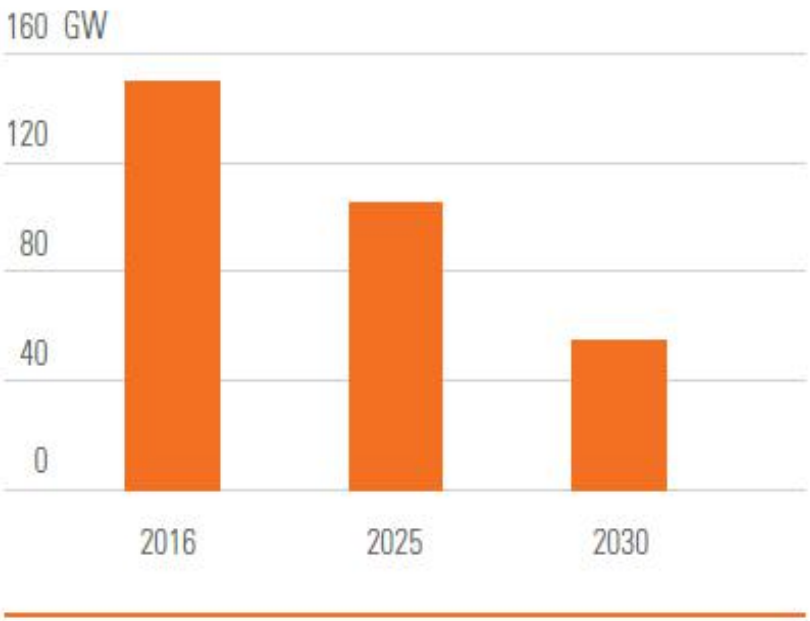
Key elements of a coherent strategy

1. (Paris-compatible) transformation of the energy system
2. Avoiding stranded assets
3. Avoiding stranded workers
4. Regional economic transition
5. International dimension (esp. for major exporters/importers)

.

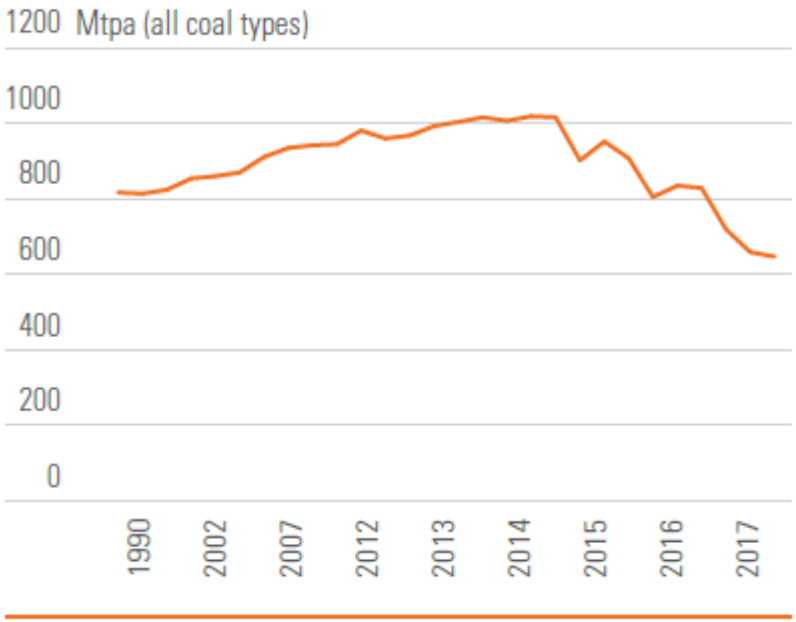
Coal transitions are happening

Figure 12. EU JRC's Forecast of Total Coal-fired power capacity in Europe to 2030



Source: IDDRI, based data from JRC, 2018.

Figure 16. US Coal Consumption is declining rapidly



Source: Enerdata.

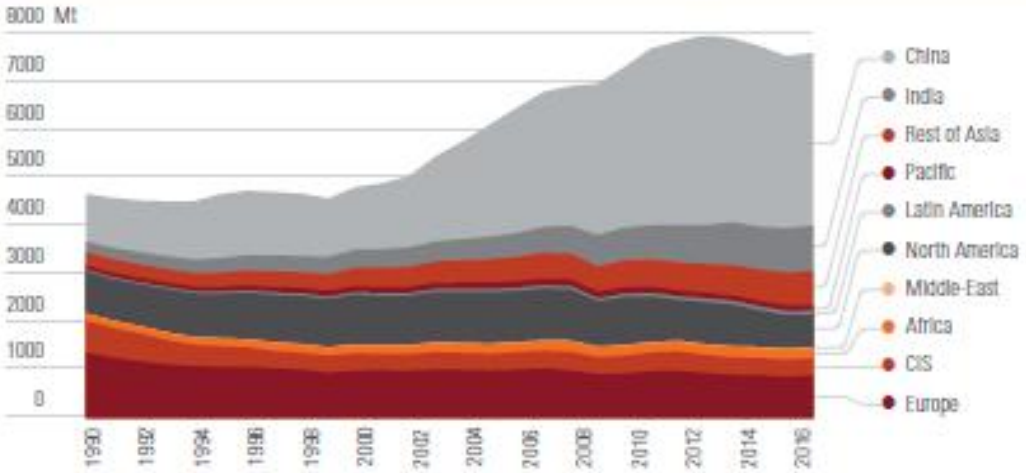
36 governments have pledged to phase out coal before 2030

Other large coal using countries, including Germany, South Africa, Spain, are exploring strategies to phase out coal.

Others, such as China, EU, are serious about reducing coal use

But more effort is needed to keep well below 2°C

Figure 1. Global coal and lignite consumption (includes thermal and metallurgical coal)



Source: Enerdata

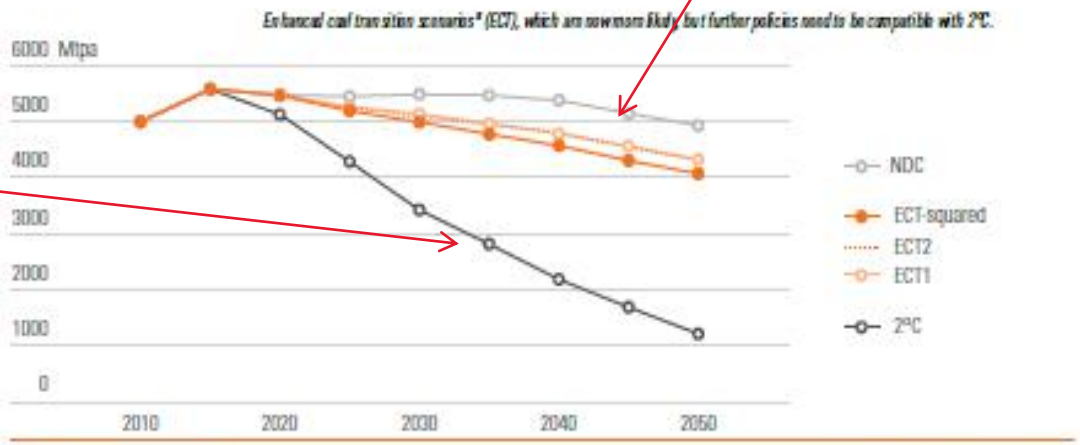
Globally, demand growth has essentially levelled out since 2013, despite big differences in trends across countries.

Several factors at play.

Global demand will probably go into secular decline from 2020s,..

« Well below 2°C » requires bringing demand down more quickly…

Figure 10. Global coal consumption 2010-2050 in various scenarios in Mtpa

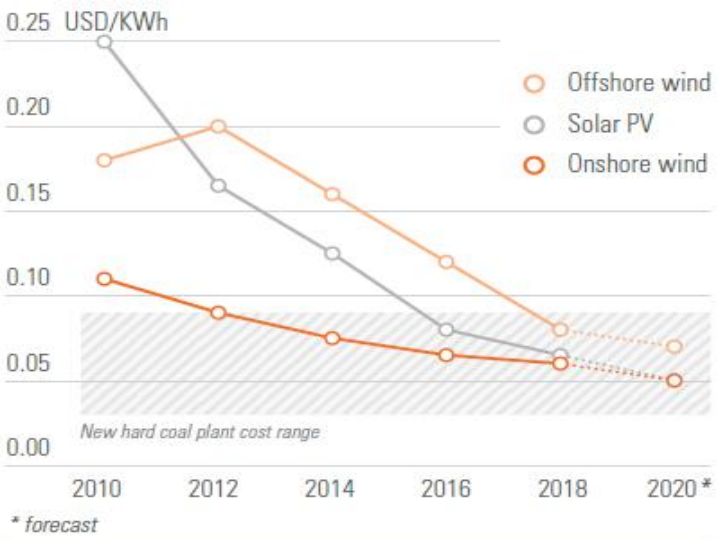


Source: Coal Transitions project

Note: Figures for thermal coal only

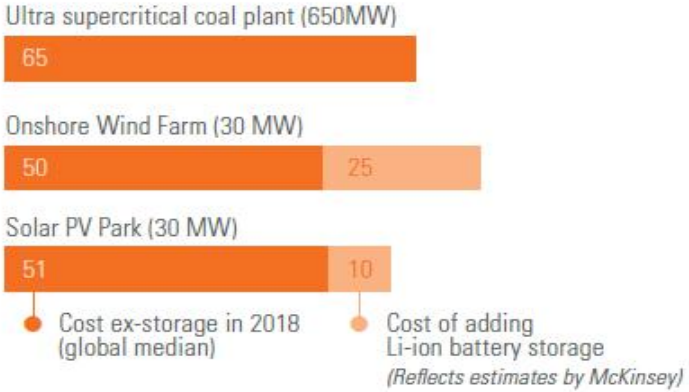
Alternatives to coal power becoming more affordable and reliable

Figure 7. The increasing competitiveness of renewable energy with hard coal technologies (global median auction results)



Source: IDDRI, based on data from IRENA, World Coal Association.

Figure 8. Current cost estimates of supercritical coal *vs* cost of onshore wind and solar PV with Li-ion battery use as capacity firming



NB. Figures reflect global averages for auctions for different installation sizes and not necessarily represent local costs in all locations, which can be significantly lower (or higher).

Source: IDDRI based on data from IRENA, 2018; McKinsey, 2018.

Mini-grid and off –grid solutions in India or Africa can be cheaper and more reliable than new coal plant

Solutions to variability of renewables are numerous and advancing.

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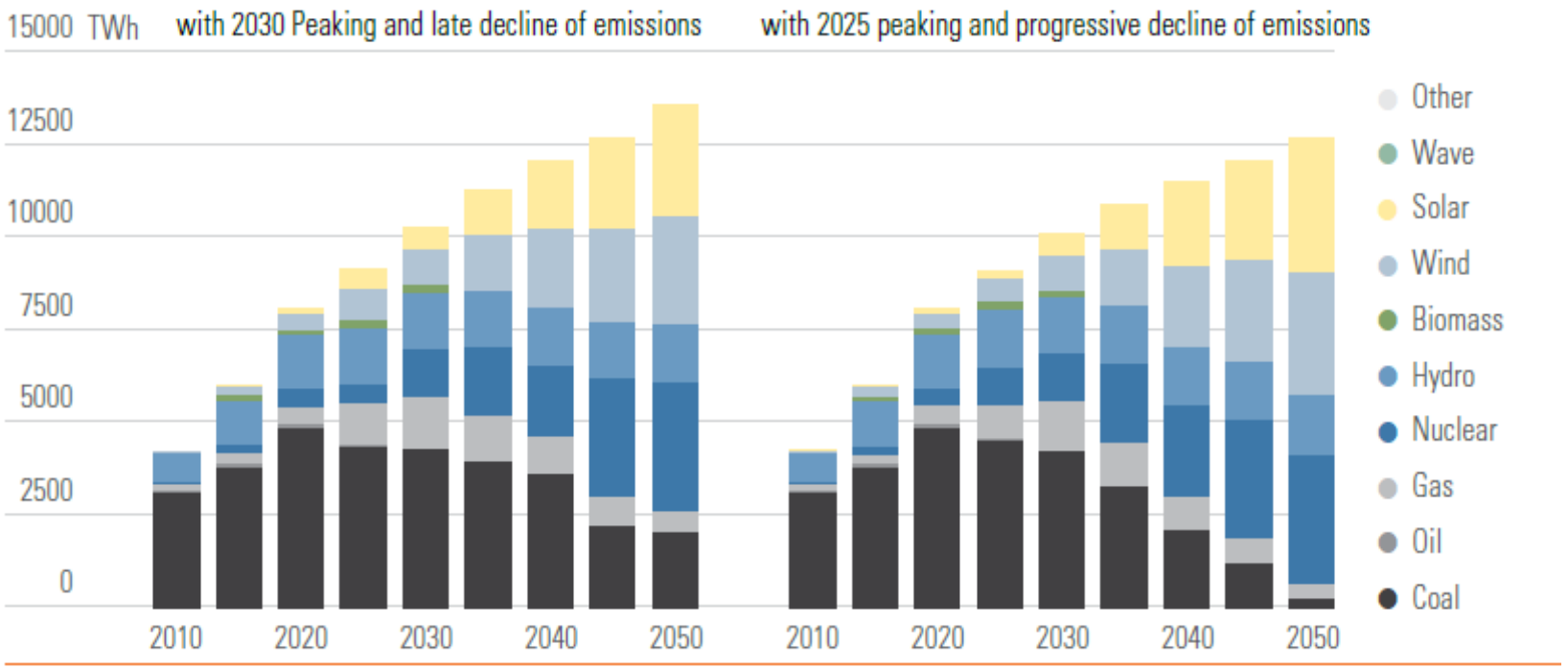
For major economies, technically and economically possible to phase out coal from power and heating

E.g. Electricity mix pathways for China..;



Source: Tsinghua University, China

A key is issue is planning phase down of existing assets (avoiding stranded assets faciliting integration of decarbonised power):

If you avoid newbuild today, and apply a manadatory 25-year asset lifetime, many countries could largely avoid stranded assets and be consistent with <2°C goal

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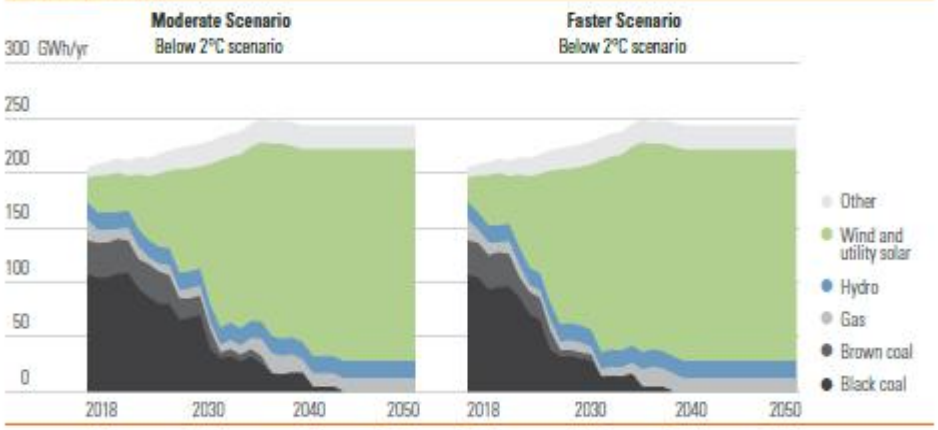
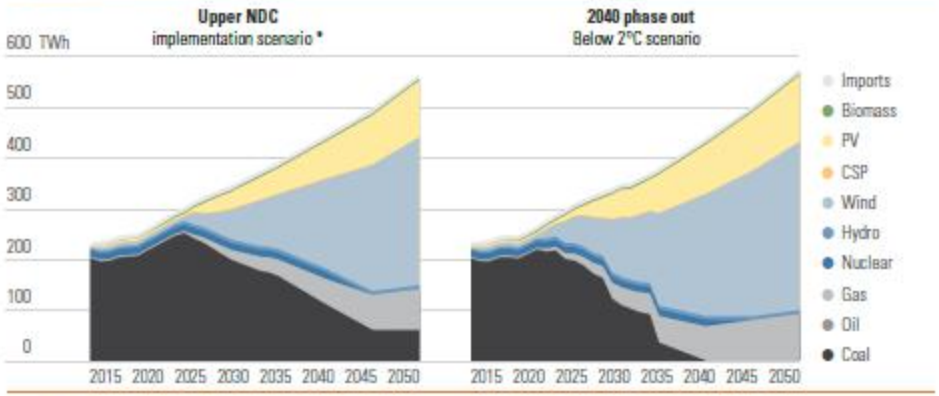
Coal phase outs can be economically affordable with the right policy framework

Figure 17e. Australia



Source: Crawford School of Public Policy, ANU.

Figure 17c. South Africa



Source: UCT, South Africa * South Africa has a range for its NDC scenario. However experts note that the upper range is more consistent with business as usual or reference case

Some countries face virtually zero or *negative incremental cost* to coal power phase out

South Africa and Australia for example could exploit and abundant natural RES and aging fleets to phase out by ca. 2040

But key conditions:

- Infrastructure development/planning
- Broaden portfolio of renewables
- Improve power market design
- Develop residual dispatchable resources (e.g. storage, hydro, biomass, or other solutions) for remaining load

Just transition for workers, citizens is possible

Coal extraction regions often suffer from significant problems (predating climate mitiagation).

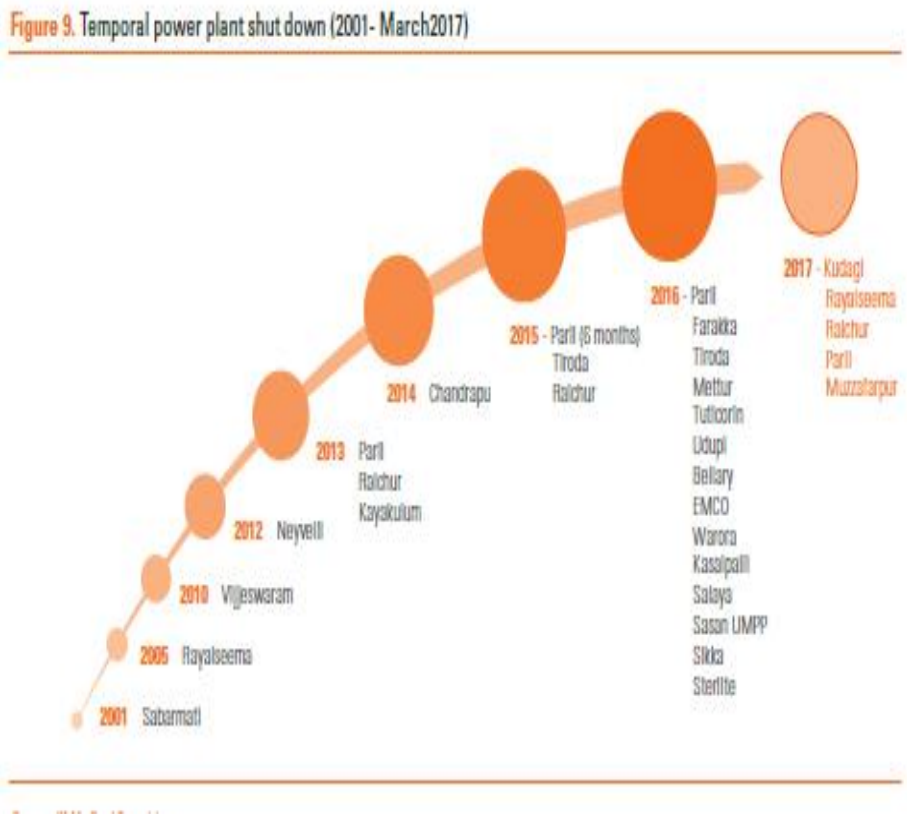
Climate policy can add to this or it can be an opportunity to take some control of existing trends and manage transition to the future.

Solutions must be context specific. Some selected insights…

- **«** *Anticipation. Anticipation. Anticipation! »*
- Facilitate inclusive dialogue on a chosen future for key stakeholders
- Be concrete: set a timeline with clear milestones
- Differentiated and targeted solutions for different worker types
- Jobs transfer programs generally better than retraining.
- Regional economic reslience and diversification strategies can succeed over long-term, but solutions depend on economic geography and local competitive advantg
- Dedicated governance framework for FF transitions necessary, often to simply ensure companies fulfil their responsibilities, do not hijack process.
- Coal transitions raise multi-level governance issues
- Invest for the next generation, save money and protect « human capital »

Coal transitions can help achieve other societal goals

Water resource contraints & Indian coal



Cheaper and more reliable access to power for the energy poor

Avoiding local pollution/resource competition, esp for water, air and soil.

Better health & more desirable and liveable local environment.

Avoided fiscal costs of supporting uncompetitive industry

Manage risks to energy system from international coal market

Main conclusions

1. **Coal transitions are happening already, but more effort is needed for Paris goals**

2. **<2°C-compatible coal transitions that ensure energy security and affordable electricity for all are technically and economically feasible.**

3. **A socially just transition for coal sector workers and citizens of coal producing regions is possible.**

4. **Coal transitions can help to provide numerous co-benefits for society**

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South Africa's coal transition in the context of Paris

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University of Cape Town

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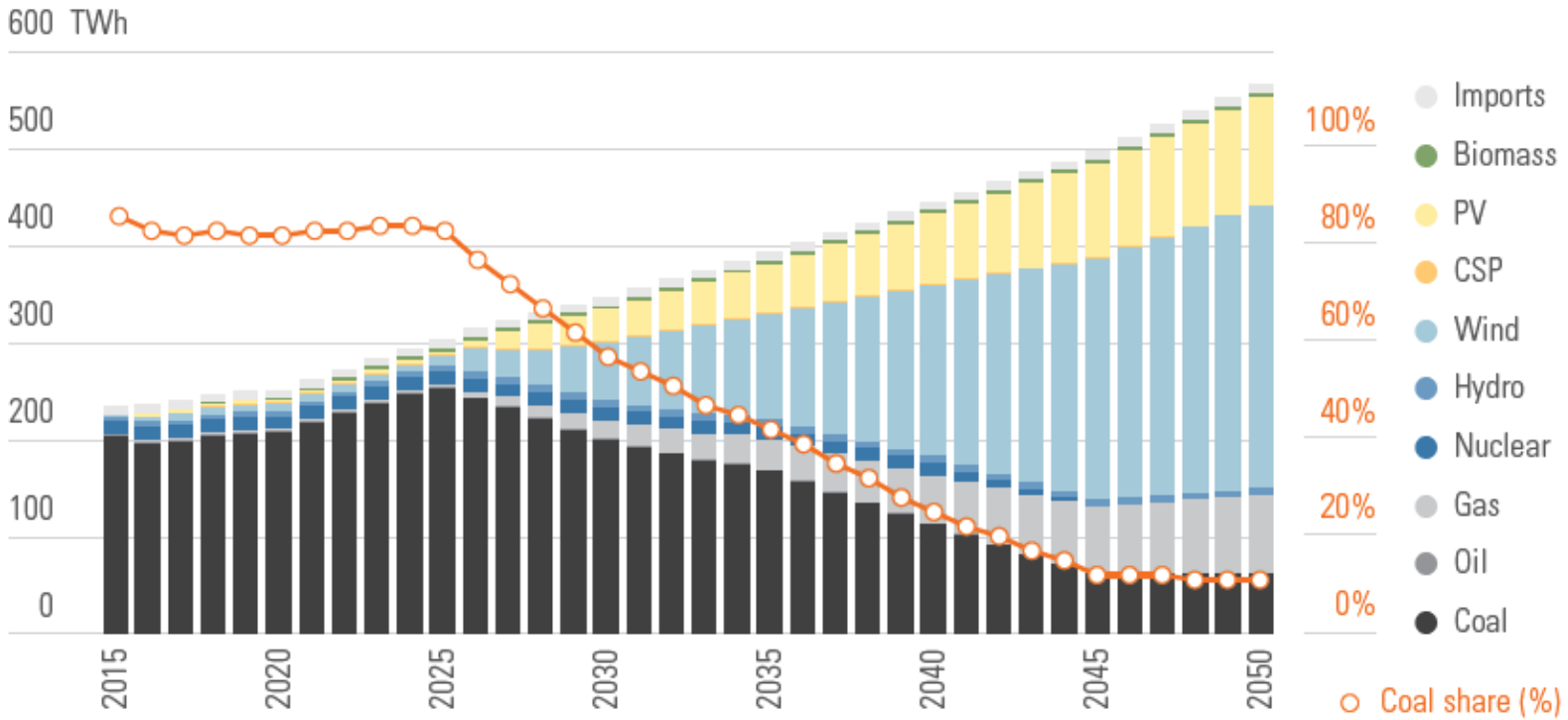
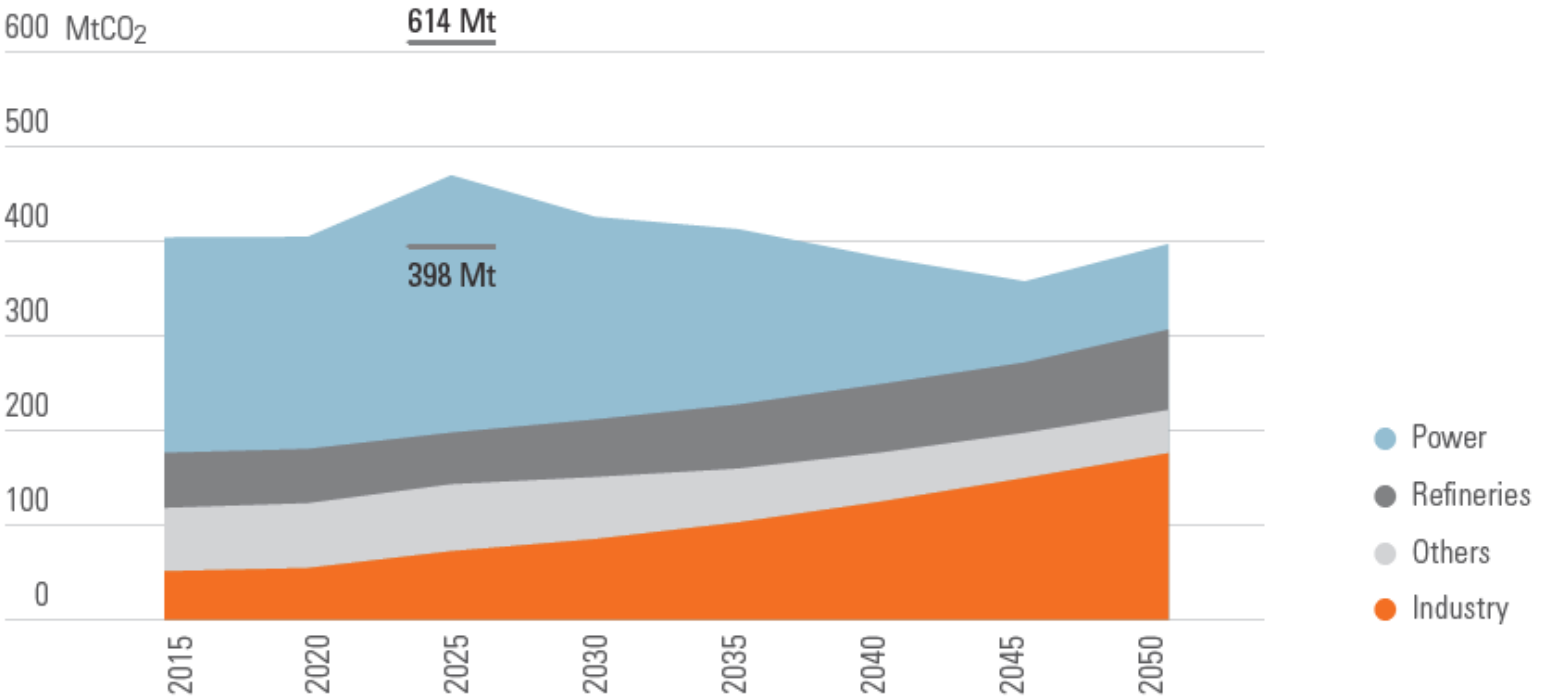
Reference case electricity build

Figure 6. Electricity generation by source (TWhs) and share of coal in generation (%) 2015-2050 (NDC scenario)



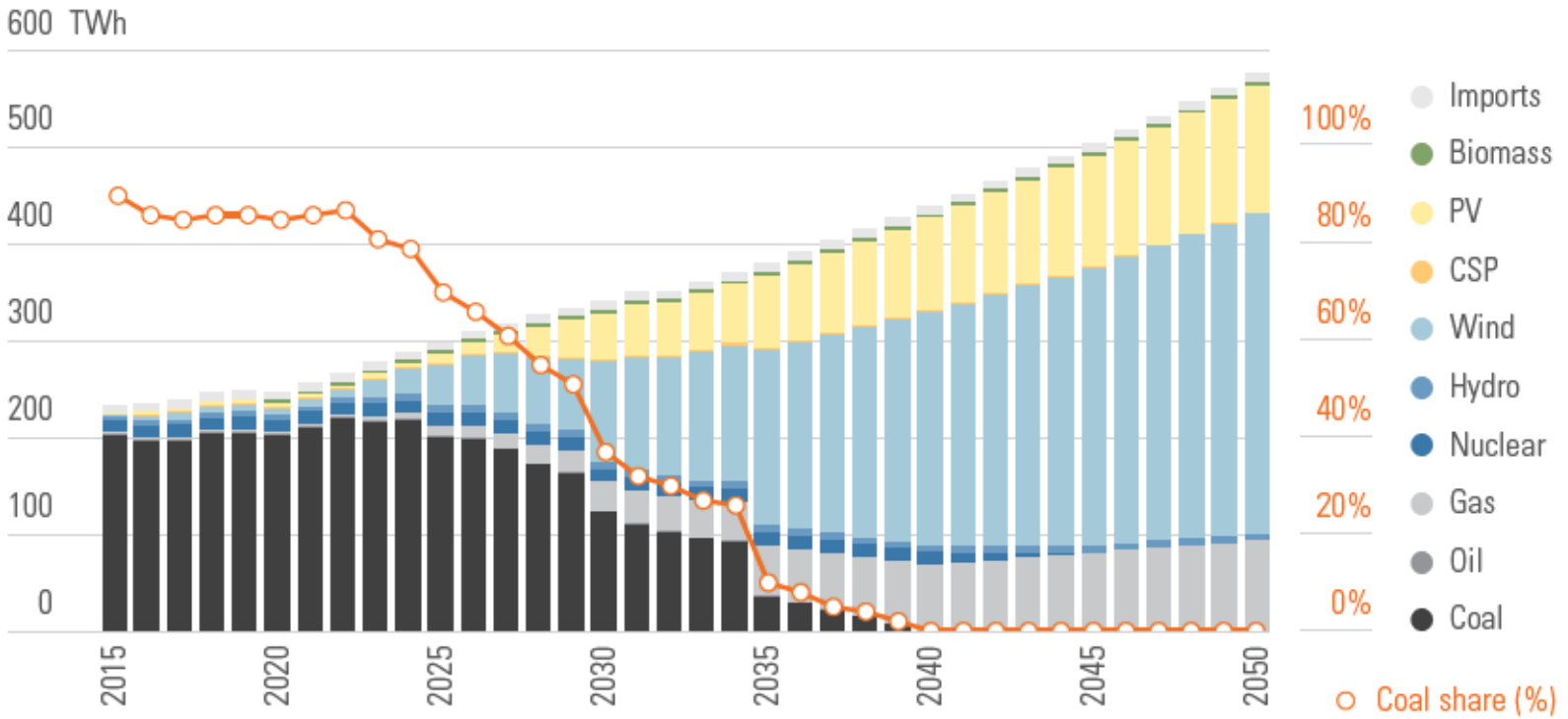
Reference emissions

Figure 7. Greenhouse gas emissions from energy supply and use (2015-2050) by sector (Mt CO2-eq) (NDC scenario)



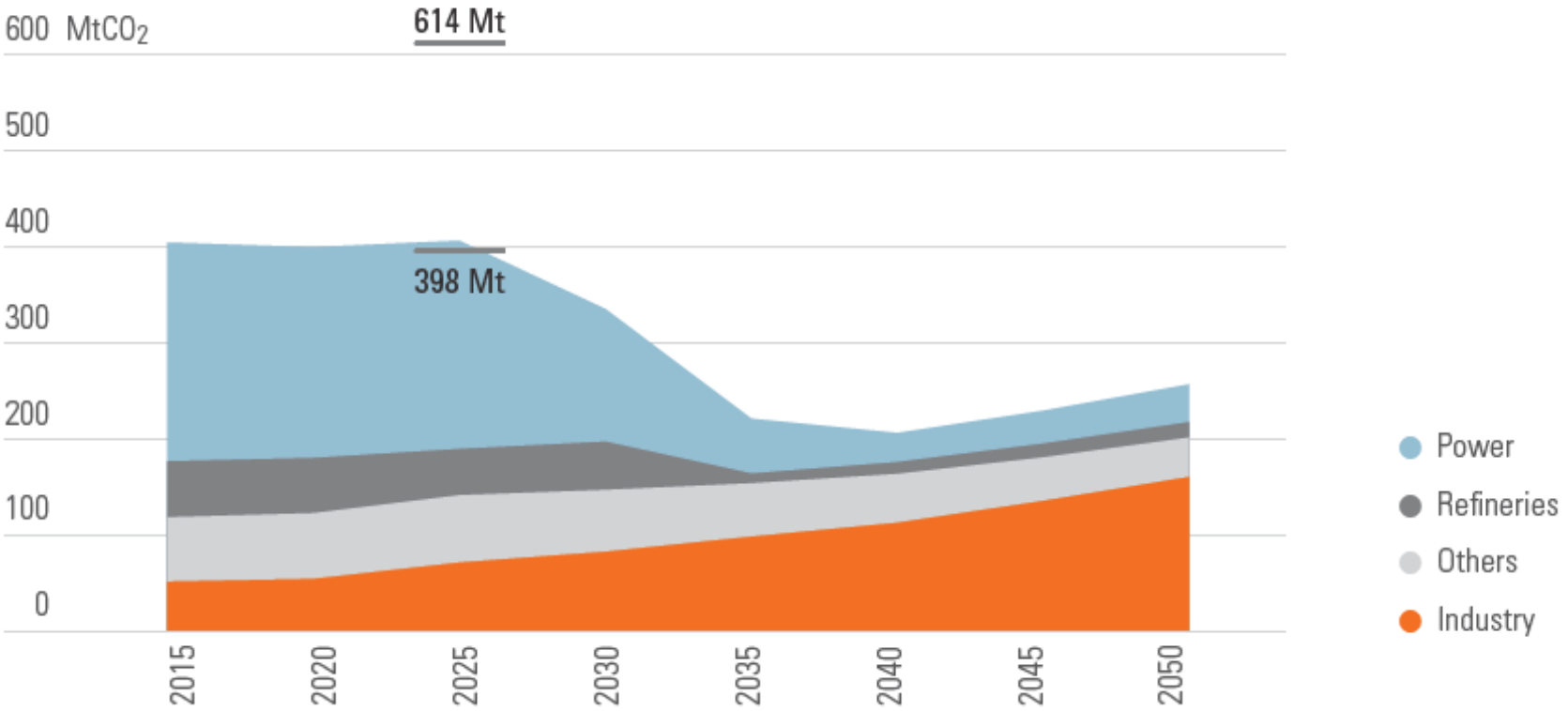
2°D/low-PPD electricity

Figure 12. Electricity generation by source (TWhs) and share of coal in generation (%) 2015-2050 (2°C scenario)



2°D/low-PPD emissions

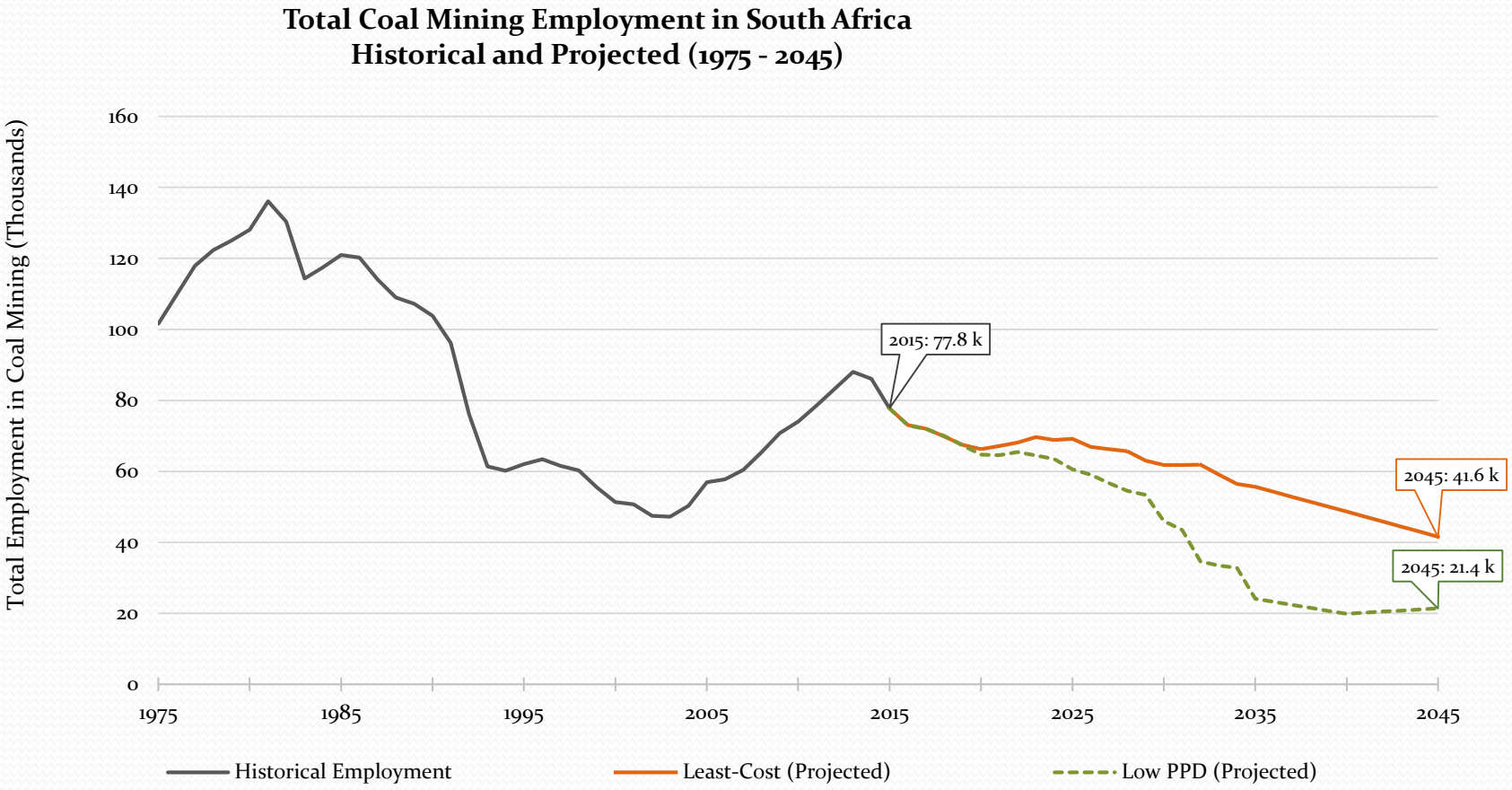
Figure 14. Greenhouse gas emissions by sector, 2015-2050, 2°C scenario



Key conclusions of meeting 2°D

- Coal power is phased out by 2040
- Plants close 5-15 years earlier than in the committed lifetime reference
- There is currently no plan for the workers at those plants or the mines that supply them
- Coal-to-liquids is phased out 10-15 years earlier
- Industrial emissions grow – needs further research and policy support to transition
- more rapid closures = higher risk

Why plan? Protect workers



Short-term implications

- Current supply crisis – no coal, failing coal plants
- Very high coal costs

- Eskom unilaterally announced early closures – but has not set aside funds for decommissioning, smoothing the transition, or planning
- "**[This] is not just an arrogant decision, but a hostile act of provocation directed at workers and their unions**," –COSATU

Future of coal in South Africa

- Overall the trade-off between cost and environment no longer exists but 2°C will require faster phaseout
- The challenge now is managed decline
- Should we keep coal plants open artificially, with negative cost effects on downstream industries and consumers?
- Better to support the transition for workers and communities directly
- Build worker transition plans, and inclusive, resilient economies

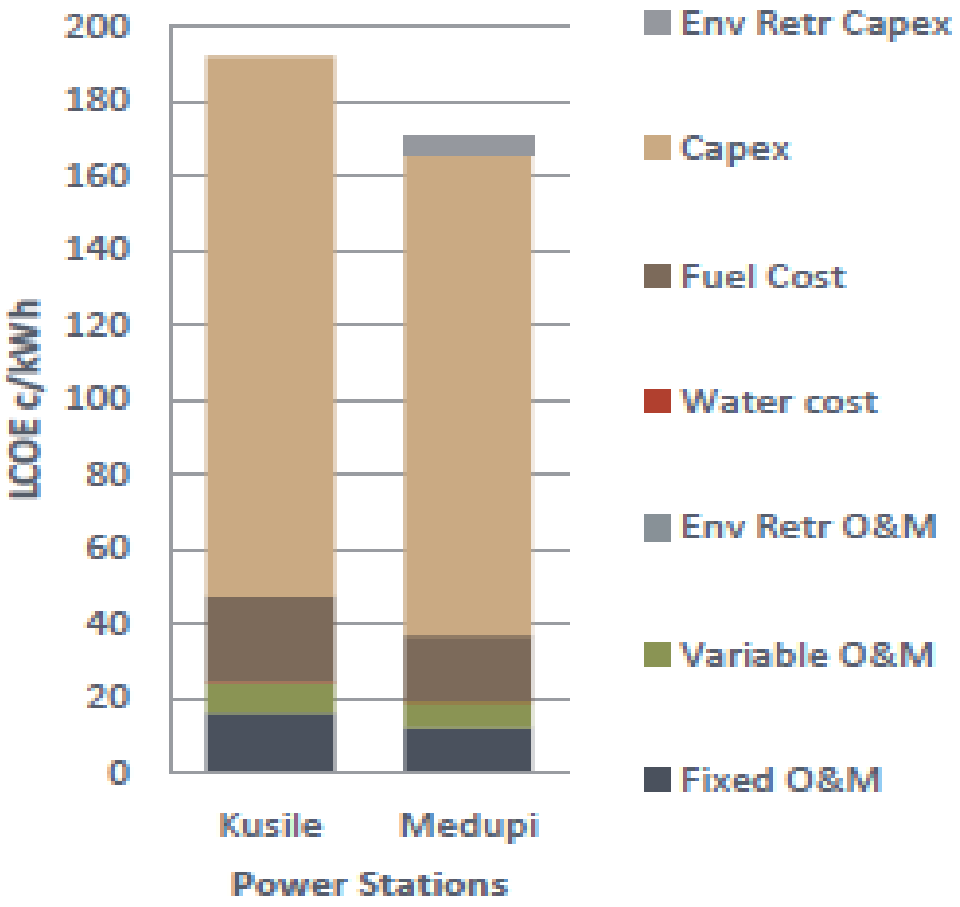
Thank you

Jesse.Burton@uct.ac.za

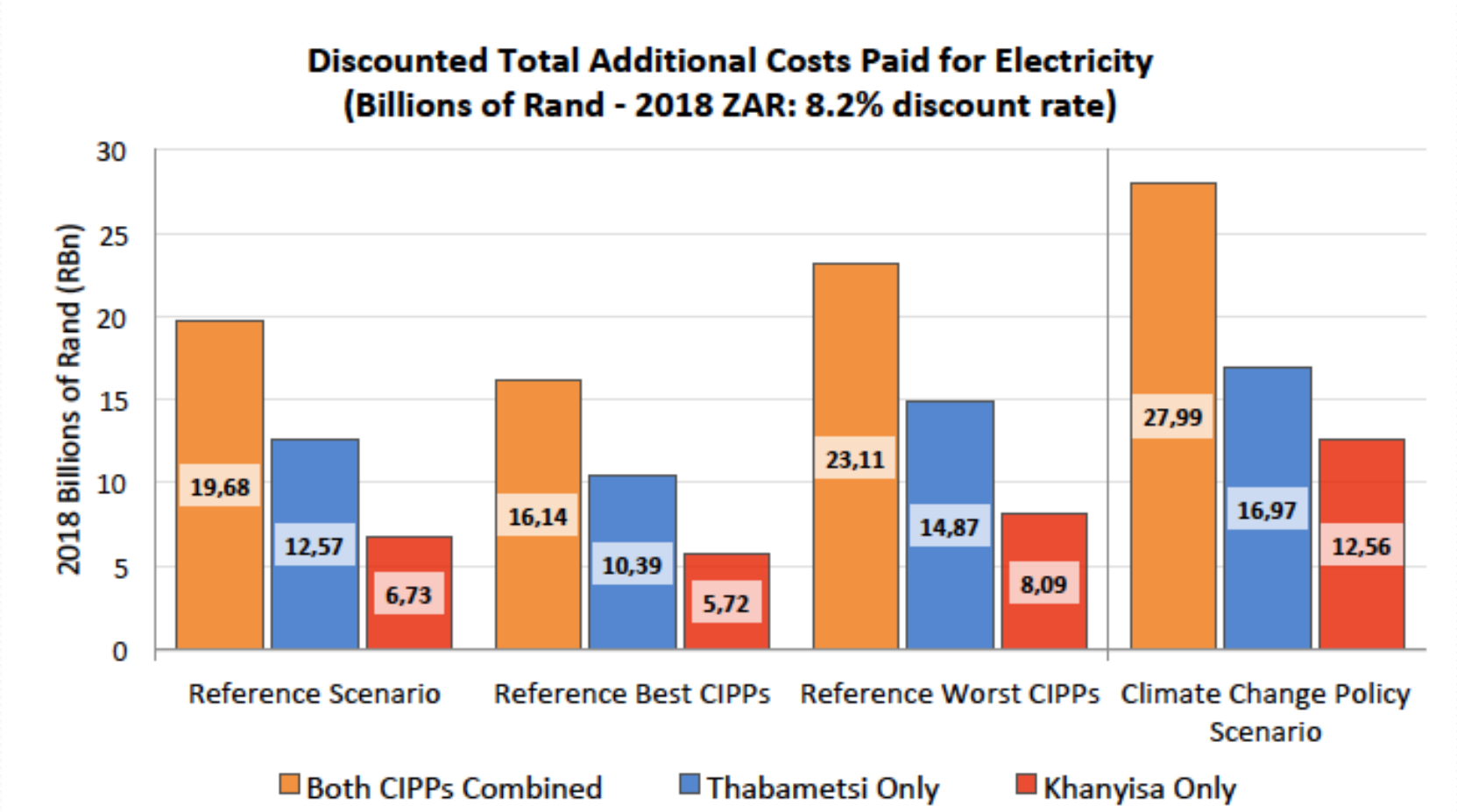
Thanks to our research associates and funders in the Coal Transitions study (KR Foundation)

Thank you also to my co-authors at ERC: Tara Caetano and Bryce McCall

New coal cost and time overruns



Coal IPPs - raise costs & emissions



Fossil fuel subsidies 2007-2015

Table 13.1 *Annual subsidy estimates by category for South Africa*

Subsidy category	2007	2008	2009	2010	2011	2012	2013	2014	2015
Direct transfers	–	830	830	1,001	169	134	12.8	17.0	1,707
Government revenue foregone	24.3	18.8	126	397	506	512	566	578	267
Sasol market price support	[a]	[a]	[a]	[a]	[a]	127	[a]	[a]	[a]

Note: All amounts in 2016 USD million.
[a] No transfers for that subsidy in a given year or lack of data.
Source: Authors' calculations; Lott 2016; see Lott et al. 2016 for assumptions.

Table 2. Summary of coal supply risks by station

Power plant	Primary Mine (if relevant)	Contract end	Decommissioning per IRP 2016/ 50 year LOPP *	Cause of supply risk
Arnot	Arnot/Optimum/multiple	2015/ 2023	2029	Eskom refusal to recapitalise/invest at Arnot mine; Corruption; Short-term contracting.
Camden	Usutu/multiple		2023	Insufficient supply from co-located mine.
Grootvlei	Palesa/multiple		2028	Full volumes not secured; Limited supply options; high transport costs.
Hendrina	Optimum		2026	Export risks - fixed price contract; Mine in business rescue; corruption; Under delivery of contractual volumes; Limited alternative supply options (transport infrastructure constraints at the station).
Duvha	Wolvekrans	2034	2034	Export risks – fixed price contract (no margin for mining company on the contract).
Kendal	Khutala	2033	2043	Under delivery of contractual volumes; Contract does not match end of station life; Life of mine is approaching and requires new investment; No agreement or extension to CSA negotiated yet for new open cast; Large shortfall in volumes from early 2020s when mine reaches end of life; Financing, contracting, timing risks of new investment.
Kriel	Kriel	2019	2029	Contract does not match end of station life; Life of mine reached 2019; New capex required or new contract/tender; Mine development risks; Potential higher costs of coal at new mine.
Komati	Koornfontein		2028	Higher cost supply (corruption); Under delivery of contracted volumes; Mine in business rescue.
Kusile	New Largo			Station volumes not secured; Tied mine not yet developed; Transport constraints and costs of imports.
Lethabo	New Vaal	2029	2040	Contract does not match end of station life.
Majuba	multiple		2051	No long-term supply; Rail line construction delays; Multiple contracts including Tegeta (business rescue).
Matla	Matla		2033	Eskom failure to recapitalise the mine; Under delivery of contractual volumes from cost-plus contract; Switch to multiple short-term contracts; Mining right lapses 2025.
Matimba Medupi	Grootegeluk	2038	2041	Supply risks associated with single mine supply to two stations; Export risk: fixed price contract.
Tutuka	New Denmark Multiple top up contracts	2029	2040	Long-term undersupply from cost-plus contract; Multiple short-term contracts; Contract does not match end of station life.

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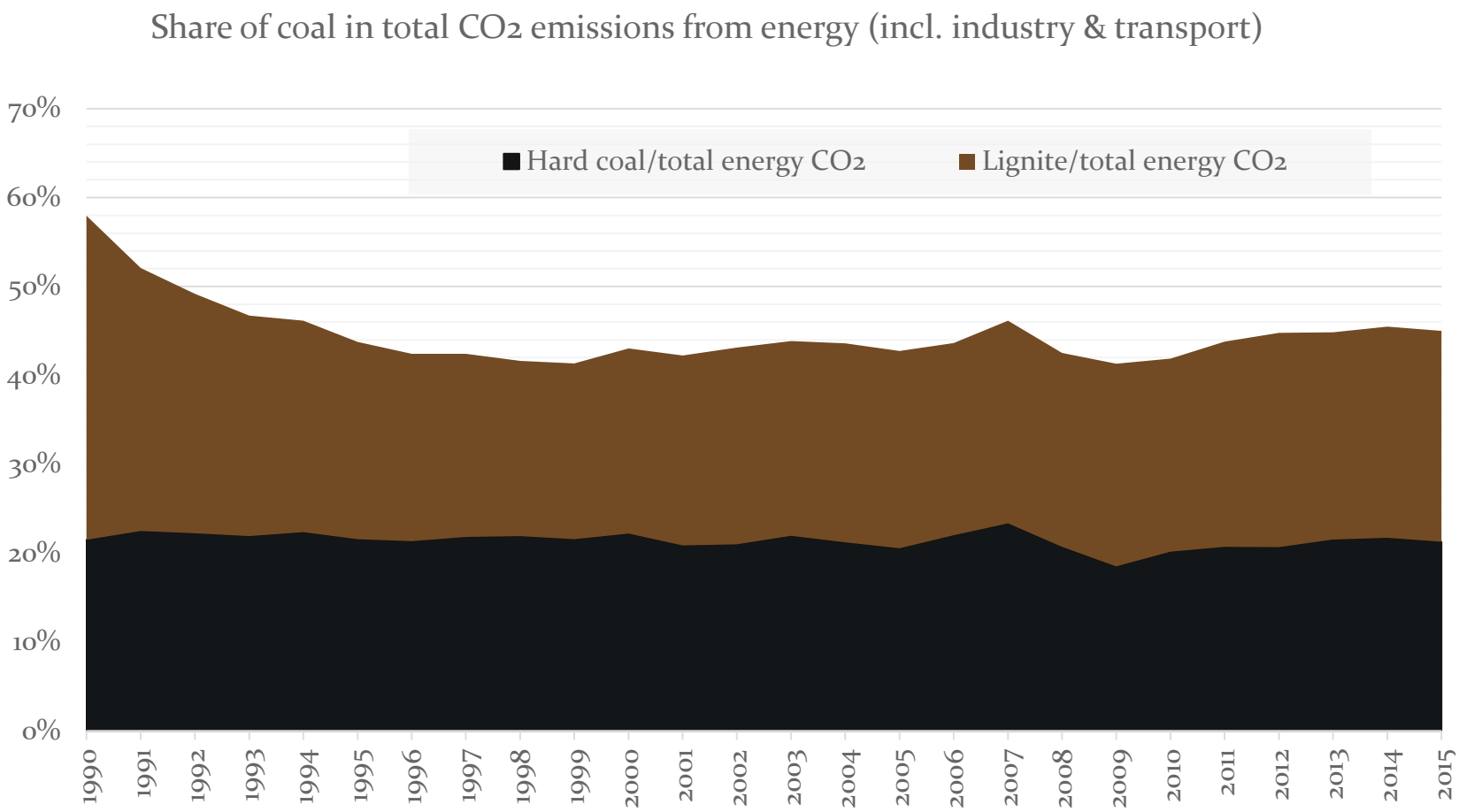
Learning from past transitions to build phase-out pathways

Coal transition(s) in Germany

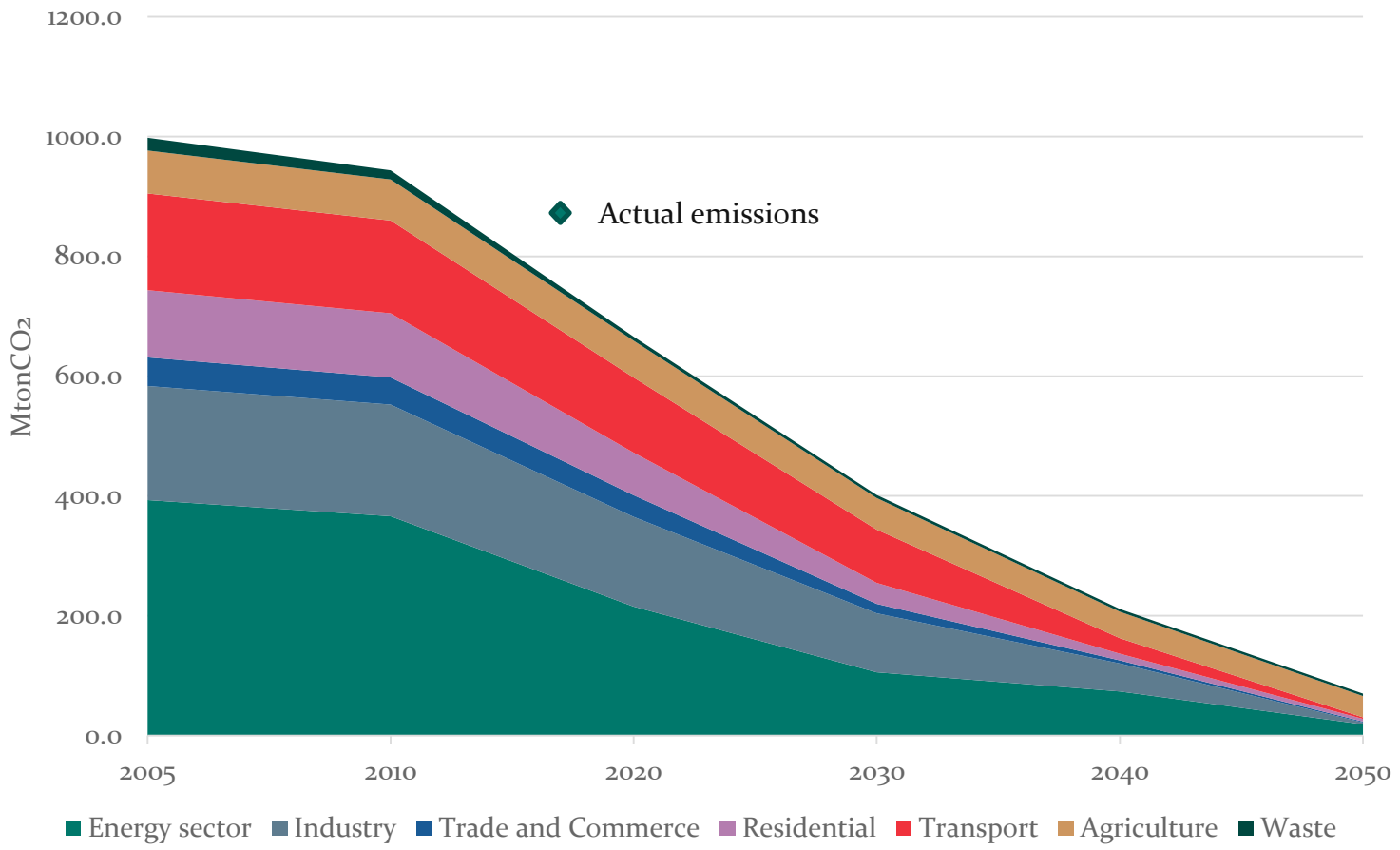
Jörn Richstein,
based on report with Hanna Brauers, Philipp Herpich, Christian von Hirschhausen, Ingmar Jürgens, Karsten Neuhoff, Pao-Yu Oei
Katowice, 06.12.2018

In Germany reducing emissions means reducing coal..



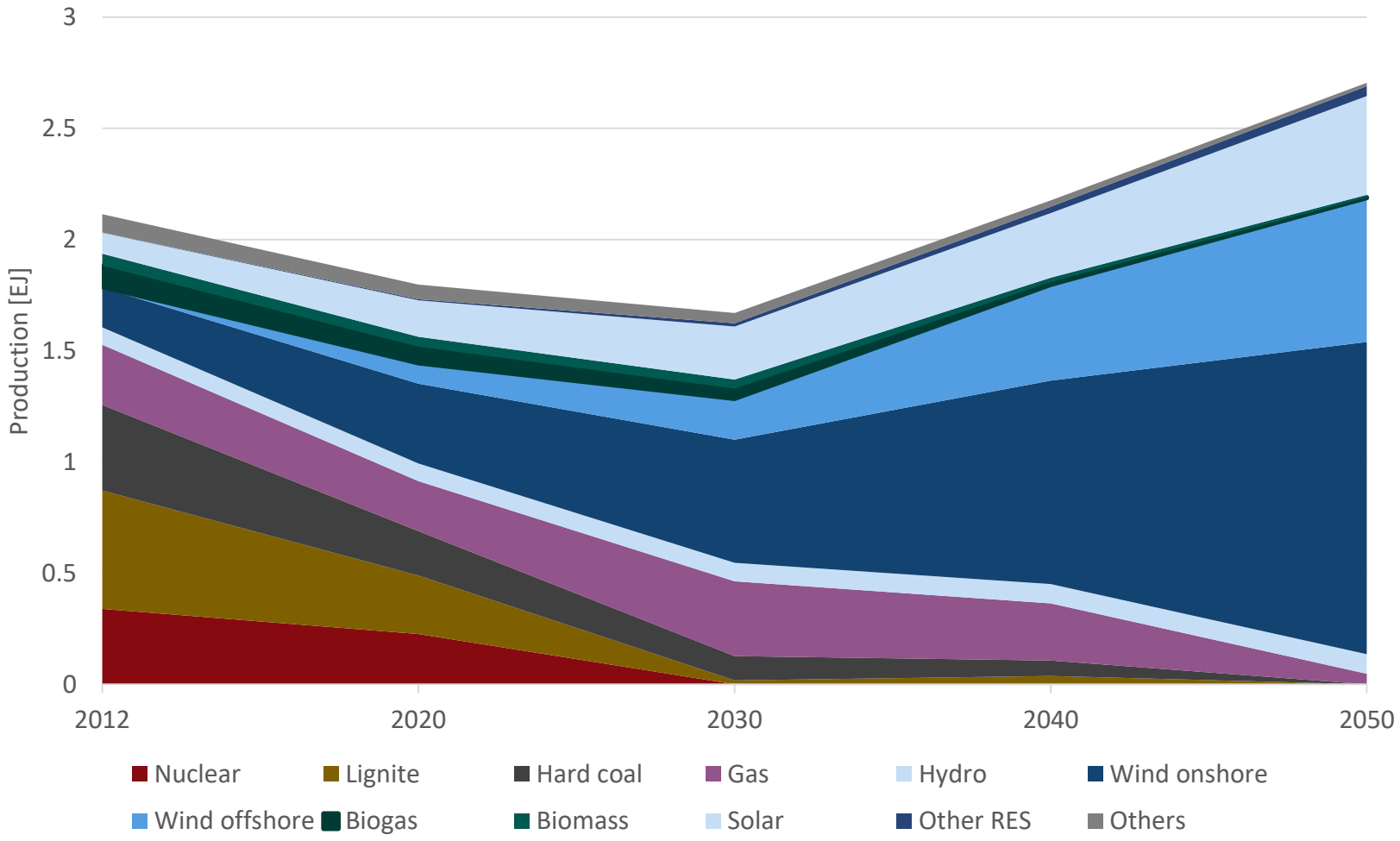
based on AG Energiebilanzen (2017).

To reach a two degree scenario (95% reduction), Germany needs to speed up



based on Öko-Institut e.V and Fraunhofer ISI (2015).

This means quickly reducing emissions , especially in the power sector

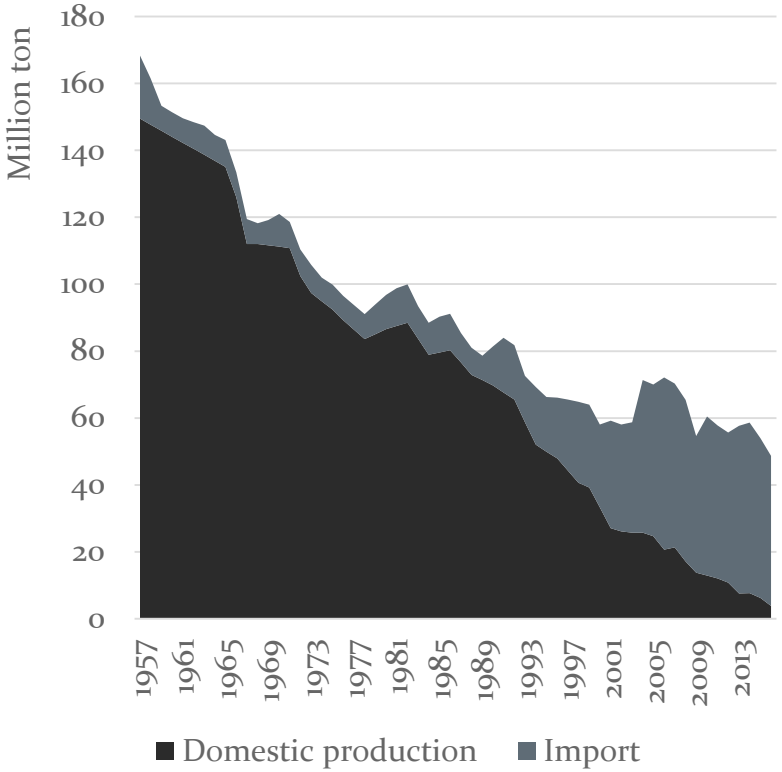


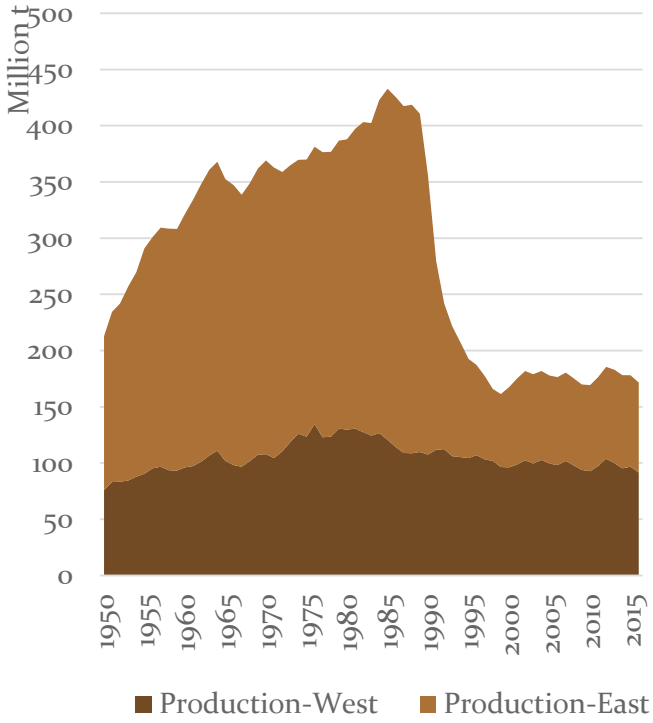
based on Öko-Institut e.V and Fraunhofer ISI (2015).

So what's stopping us?

- NOT the technical perspective – high shares of RES possible
  - But good power market design necessary
- NOT the economic perspective – a transition is affordable and beneficial
- But some key barriers
  - Structural breaks in lignite mining areas & effects on workers

However, Germany has plenty of experience with coal transitions ..



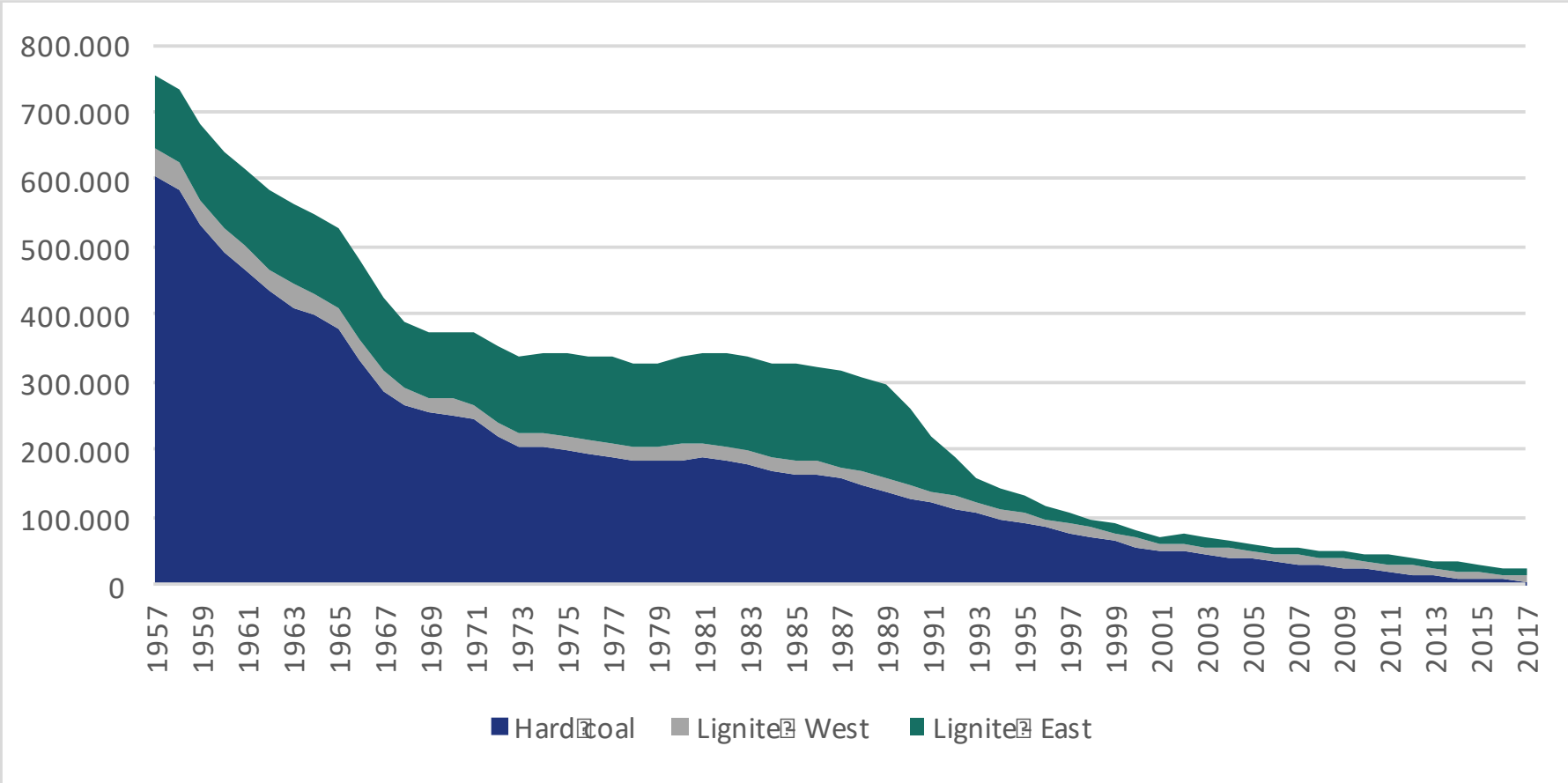


- Domestic hard-coal was uncompetitive (up to 4x)
- Substitutional processes in households and industry

- Reunification: Production in the east was inefficient, and other sectors modernized – substituted lignite

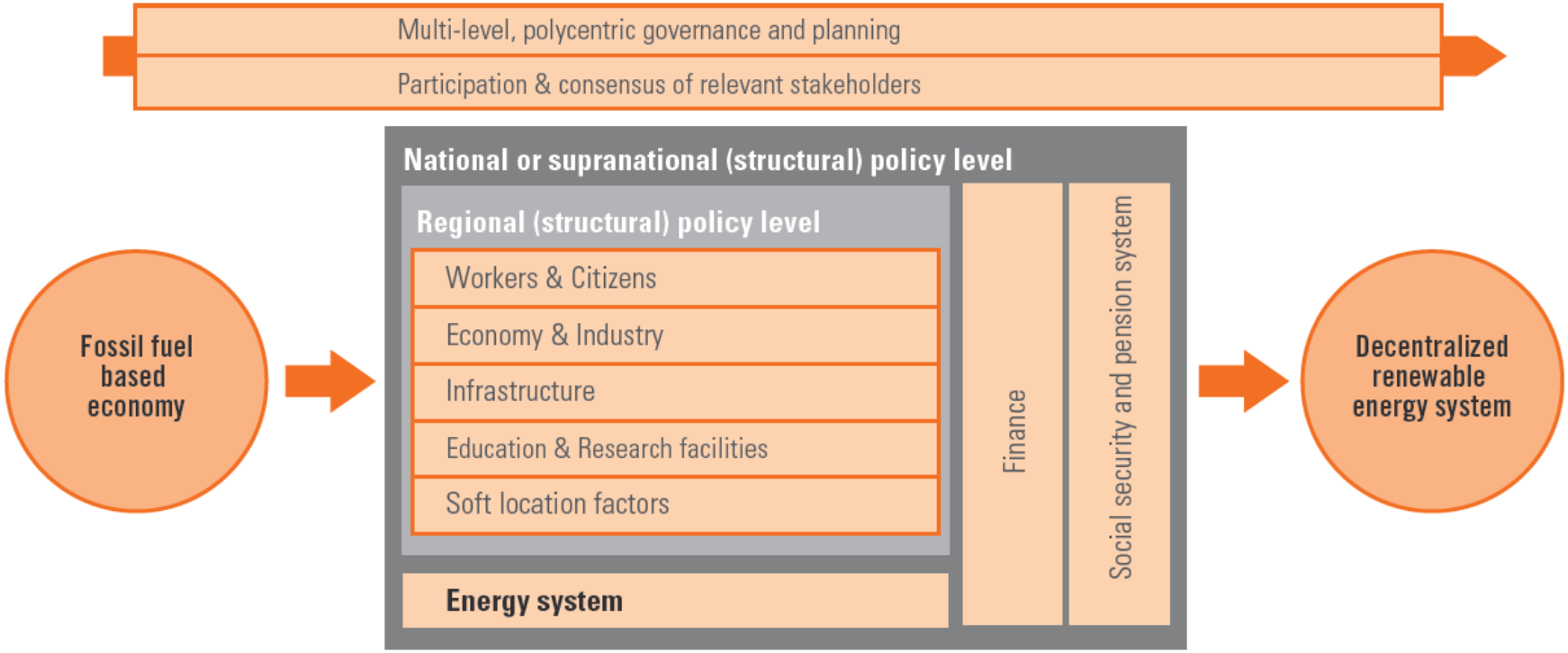
based on Statistik der Kohlenwirtschaft e.V. (2017d), Statistik der Kohlenwirtschaft (2017b, 2017c) and Verein der Kohleimporteure (2017).

.. the biggest structural breaks have already occurred



Employment in coal mining sectors in Germany, based on Statistik der Kohlenwirtschaft e.V. (2017d).

Just transition is necessary, lessons can be learned from past transitions



Note: The size of each area does not implicate any valuation in terms of financial volume or importance of the dimensions

Thanks for your attention

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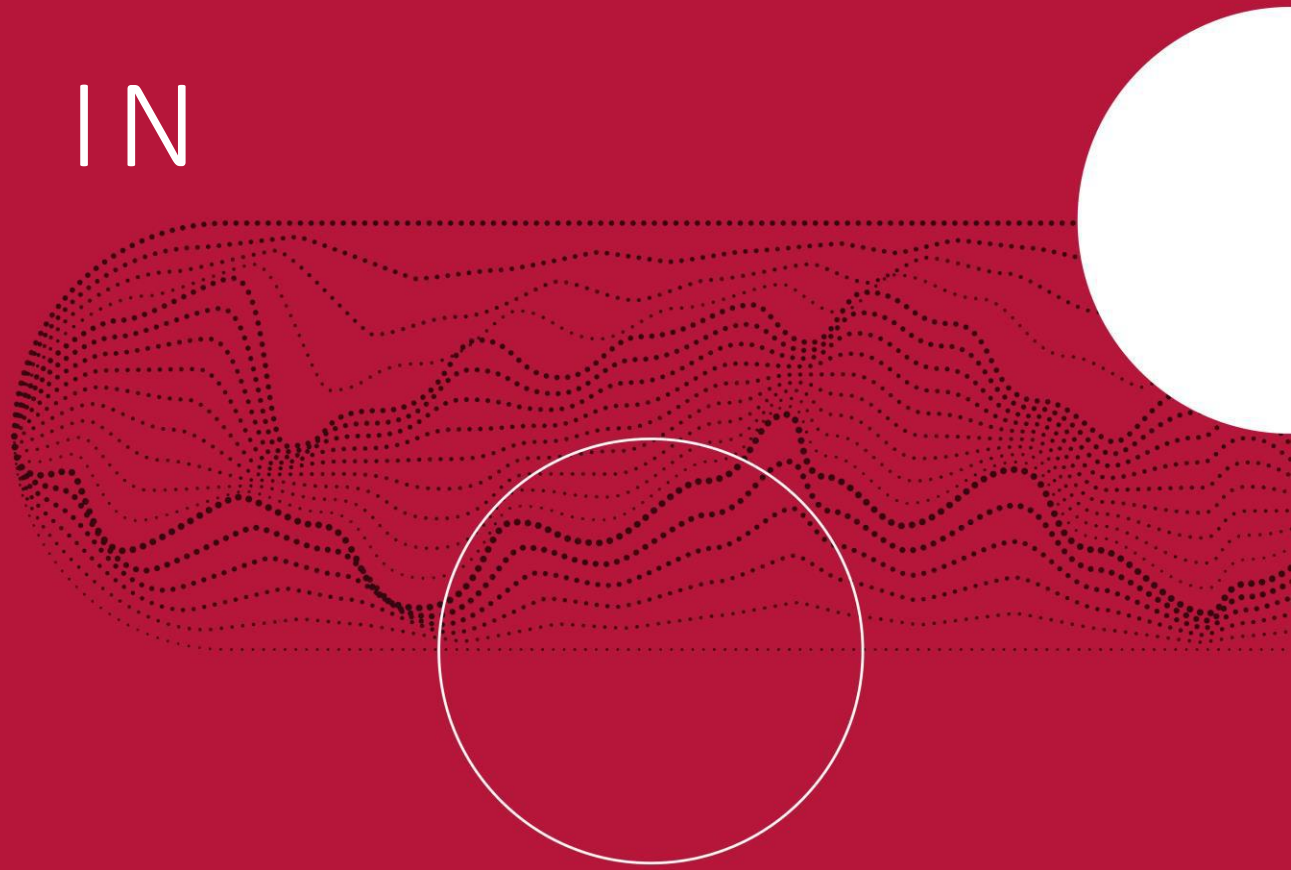
References

- AG Energiebilanzen e.V. 2017. “Bilanz 2015 Bearbeitungsstand 10.08.2017.” Bilanzen 1990 - 2015. August 10, 2017. https://ag-energiebilanzen.de/7-0-Bilanzen-1990-2015.html
- Öko-Institut e.V, and Fraunhofer ISI. 2015. “Klimaschutzszenario 2050 - 2. Endbericht.”
- Statistik der Kohlenwirtschaft e.V. 2017a. “Steinkohle.”
- Statistik der Kohlenwirtschaft. 2017. http://www.kohlenstatistik.de/18-0-Steinkohle.html
- ———. 2017b. “Steinkohle - Belegschaft im Steinkohlebergbau.” Steinkohle. 2017. https://kohlenstatistik.de/18-0-Steinkohle.html
- ———. 2017c. “Braunkohle.” Statistik der Kohlenwirtschaft. September 9, 2017. https://kohlenstatistik.de/19-0-Braunkohle.html.
- Verein der Kohleimporteure e.V. 2017. “Jahresbericht 2017 - Fakten und Trends 16/17.” Hamburg, Germany. http://www.kohlenimporteure.de/publikationen/jahresbericht-2017.html

institute for structural research

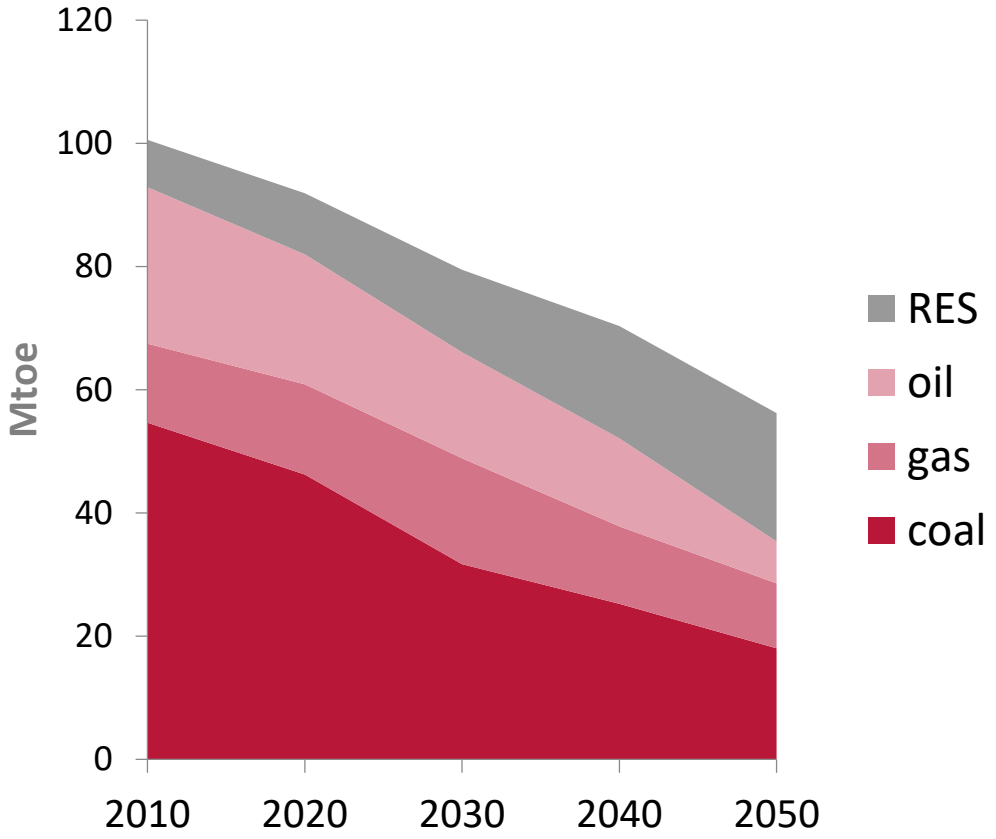
COAL TRANSITION IN POLAND



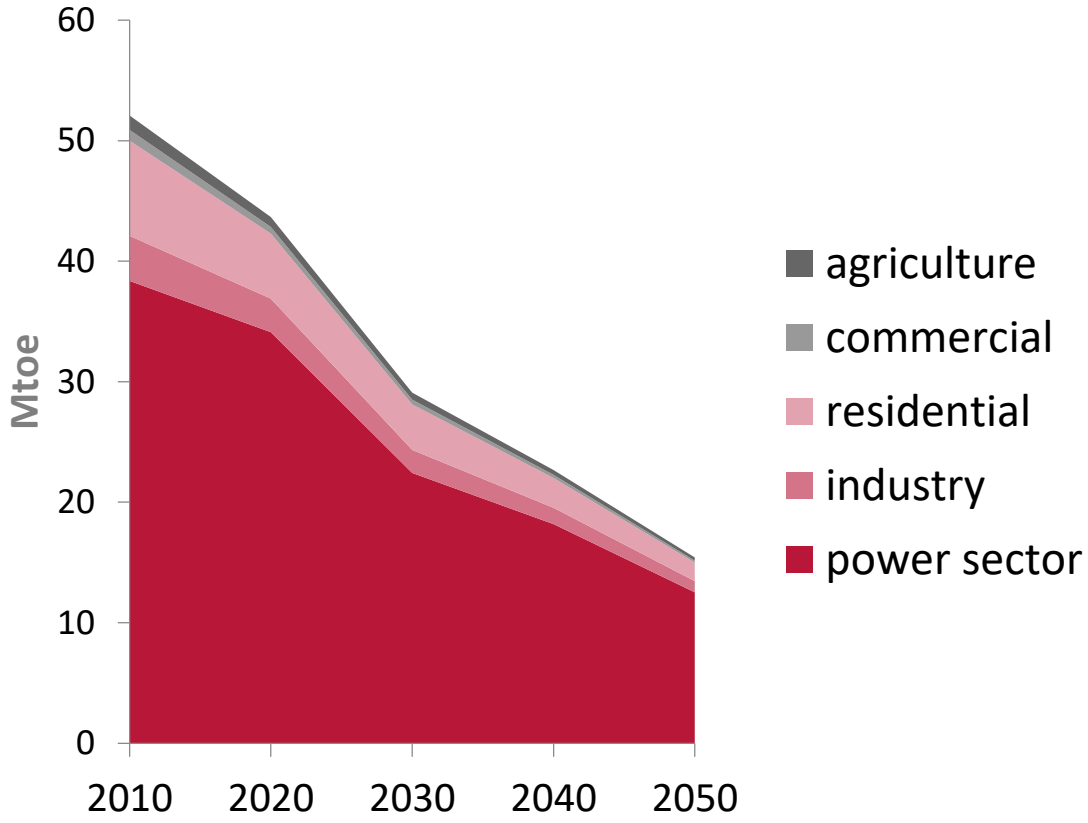
Jan Witajewski-Baltvilks

Consumption of coal in Poland expected to drop

Energy mix under 3-fold reduction in emissions

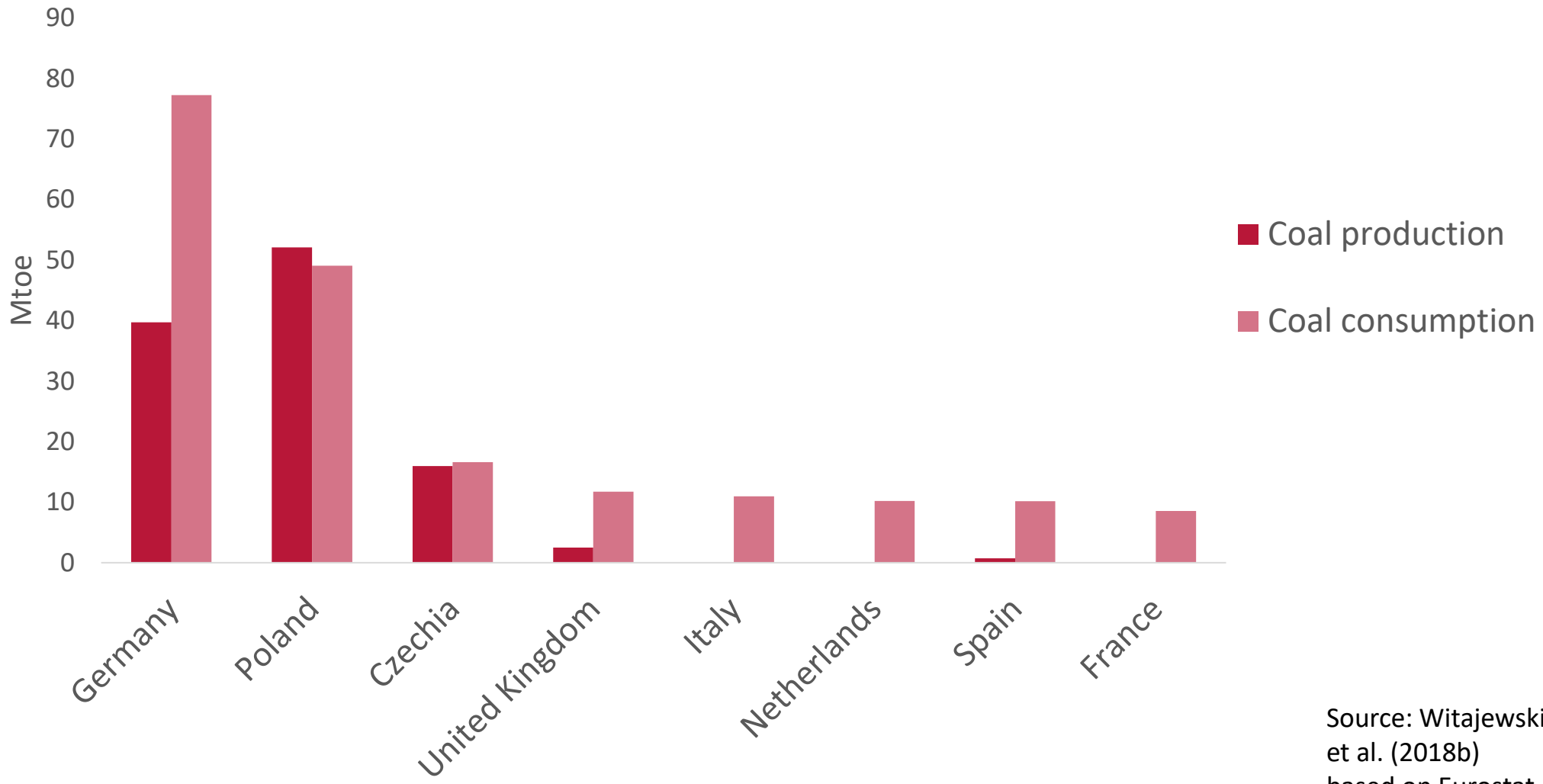


Sectoral decomposition of coal consumption



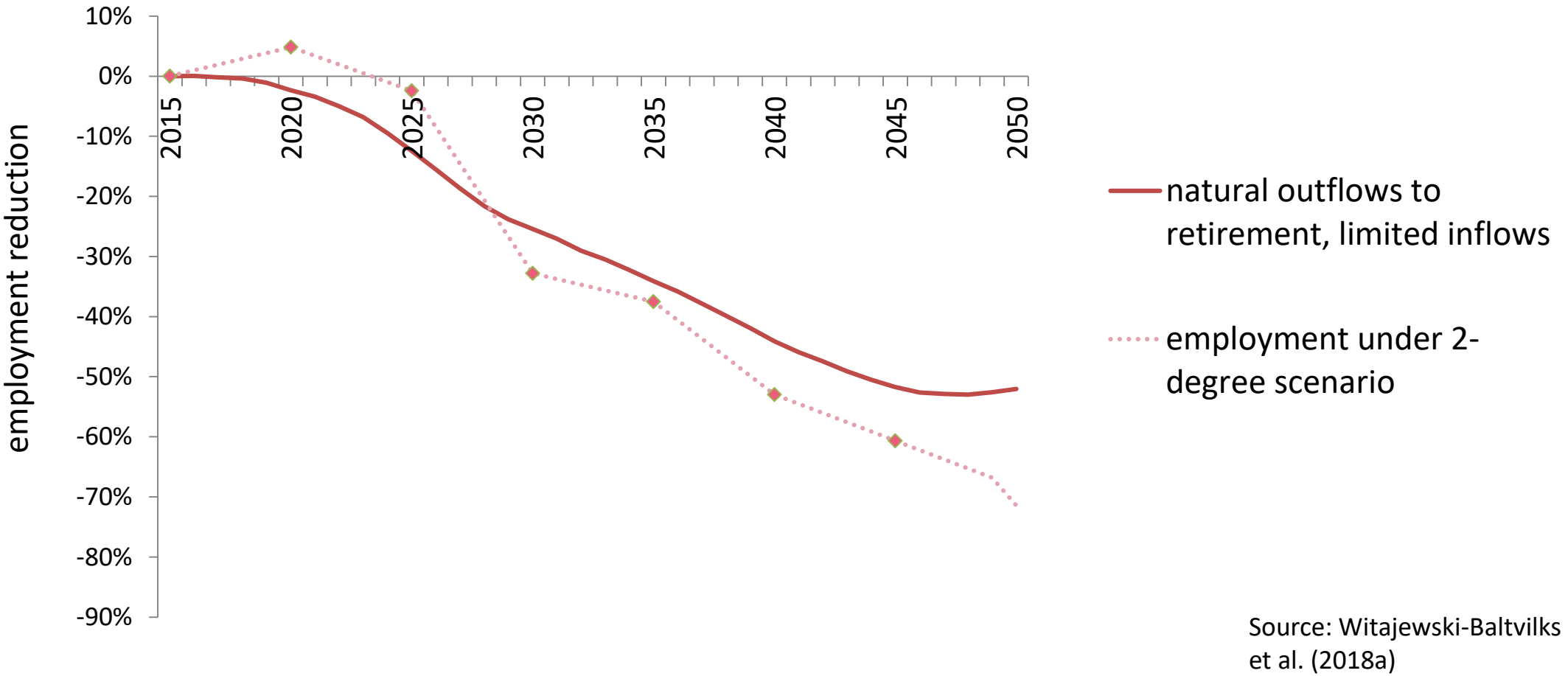
Source: Witajewski-Baltvilks et al. (2018a)

Drop in consumption implies phase-down of coal sector, unlike in most EU countries



Source: Witajewski-Baltvilks et al. (2018b)
based on Eurostat. Data for 2016.

Coal phase-down will take 30 years – no massive lay-offs expected



Source: Witajewski-Baltvilks et al. (2018a)

Cushion for the regional economy

- Educational policy: direct new cohorts to growing sectors
- Help laid-off workers to find new jobs
  - 10,000 additional jobs in Silesia may be created with ambitious retrofitting programmes
  - individual skill diagnoses will ensure that workers receive tailor-made retraining
- unconditional cash transfers should be offered only to workers close to retirement age

Thank you

The research leading to this paper was performed under the Coal Transition project that received funding from the KR foundation

For more details, consult

- Witajewski-Baltvilks et al. (2018a). Managing coal sector transition under the ambitious emission reduction scenario in Poland. *IBS research report 03/2018*
- Witajewski-Baltvilks et al. (2018b). Risks associated with decarbonising the Polish power sector. *IBS research report 05/2018*

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COAL TRANSITIONS

A Just Transition Strategy in Spain

Begoña María-Tomé Gil
Union Institute of Work, Environment and Health of Comisiones Obreras

Implementing Coal Transitions to Raise Climate Ambition. **UNFCCC COP24 Side Event**

Background in Spain: Coal Sector

1990

- 234 mining companies
- 19.3 million tons of coal production
- 45, 212 workers

2012

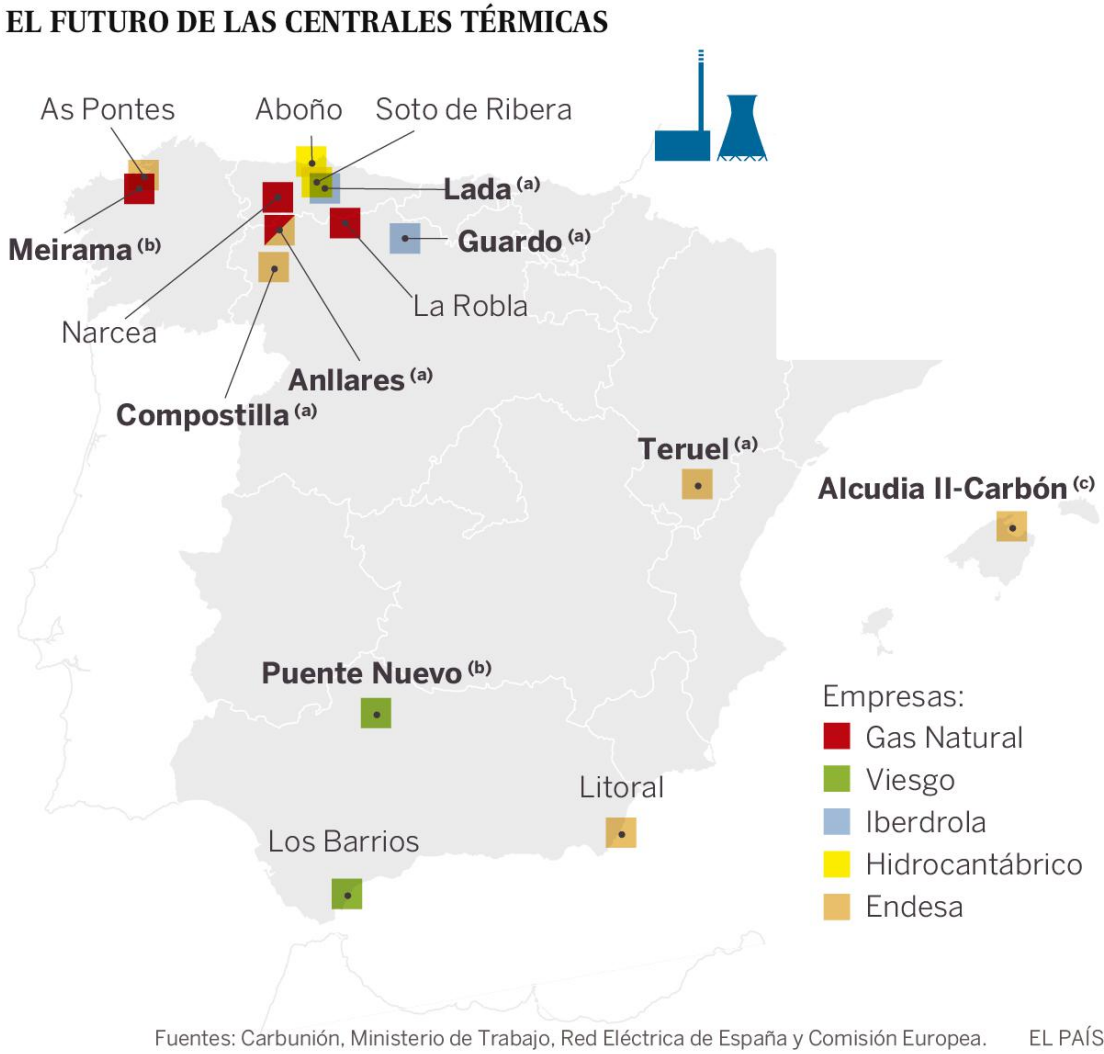
- 15 mining companies
- 6.5 million tons of coal production
- 3,400 workers

2017

- <10 mining companies
- 3.7 million tons of coal production
- 1,700 workers

Background in Spain: Coal Thermal Power Plants

- 15 coal-fired power plants, 10,000 MW (10% of the installed power)
- 10 plants are likely going to close before 2020
- The closure of some of these plants is going to increase the negative impact on the coal regions



“Framework Agreement for a Just Transition from Coal Mining and Sustainable Development of Mining Regions for 2019-2027”

A Just Transition Agreement for WORKERS

- A good agreement for the **DIRECT WORKERS** (early retirement, reduncancy payment for young miners, better compensations for workers with silicolis)
- A Labour Adjustment Program for **NON PRE-RETIRED WORKERS AND SUBCONTRACTORS WORKERS** to have priority access to training and re-skilling and to restoration activities.
- It is estimated the agreement can benefit 600 workers, 60% of employees will be eligible for early retirement

A Just Transition Agreement for COMMUNITIES

- 250 millions Euros for business initiatives and projects for the development
- Additional measures:
  - Restoration Plan for affected areas by minging operations
  - Energy Efficiency and Renewable Energies Plan
  - Just Transition Contracts

Additional positive elements for advancing JT in Spain

- A Climate Change and Energy Transition Bill
- A Just Transition National Strategy
- An Urgent Action Plan for the affected coal mining regions

Trade Union Contributions

- The major Spanish Trade Union, Comisiones Obreras (CC.OO.) has presented a proposal on how to develop a JT framework and necessary instruments.

Uncertainties and challenges

- How to survive to the changes of the governments?
- How to finance the just transition with guarantees and continuity over time?
- How to engage energy companies (utilities) to reinvest in sustainable economies in the affected territories and communities.
- How to finance the just transition with guarantees and continuity over time?
- We need to strengthen national tripartite social dialogue to be part of this process and monitor the implementation of the adopted policies

Thank you very much

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Lessons learned

- The lack of an audit of the results of the 24,000 million euros received through public funds (
- The lack of coordination between state and local administrations
- The absence of a strategy behind all these investments made
- Many of the funds were used unfairly to put those regions on the map, to provide them with the level of public services and infrastructures of the Spanish average.
- Not all funds have been used for anything, infrastructure has been developed and business initiatives have been launched in the sectors, especially in recent years. However, the economic crisis wiped out many of these immature projects (for example, renewable energies).

International Labour Organisation Office in Madrid

ILO Office in Madrid:

- Has announced a collaboration agreement with the Spanish Government to implement correctly the ILO guidelines about JT
- has published a report with the opportunities of the energy transition and challenges in terms of employment (energy generation, energy efficiency in buildings and mobility)