

# Modelling in Nova Scotia's Clean Power Plan

Nova Scotia Department of Natural  
Resources and Renewables

# 2030 Clean Power Plan

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- ▶ **Flexible.** Implementation of this Plan ensures that NS avoids decades of financial and technological lock-in. This creates flexibility for NS both on the path to coal closure by 2030; while also opening room for future investments in growth sectors like Offshore Wind, Hydrogen, Batteries etc.
- ▶ **Doable. On Time.** All the major electricity legislation or investments required to trigger the core actions of the Plan, and to close coal on time, have already been made by the NS Government, or will be set in motion in the coming months. And all can be delivered in time for 2030.
- ▶ **Affordable.** This Plan centres around Affordability – and ensures that the path to 2030 protects NS ratepayers (who already face high power bills) from being burdened with additional excessive risks or uncontrolled costs.

# Nova Scotia's Electricity Context

Nova Scotia has commitments to:

- ▶ Phase out coal & reach 80% renewables by 2030.
- ▶ Reduce GHGs from electricity by more than 90% (from 10.7 MT in 2005).

These commitments:

- ▶ Are driven by the Federal requirements for coal closure and new Clean Electricity Regulations.
- ▶ These create significant costs for NS ratepayers.

Unplanned, additional burdens must be managed:

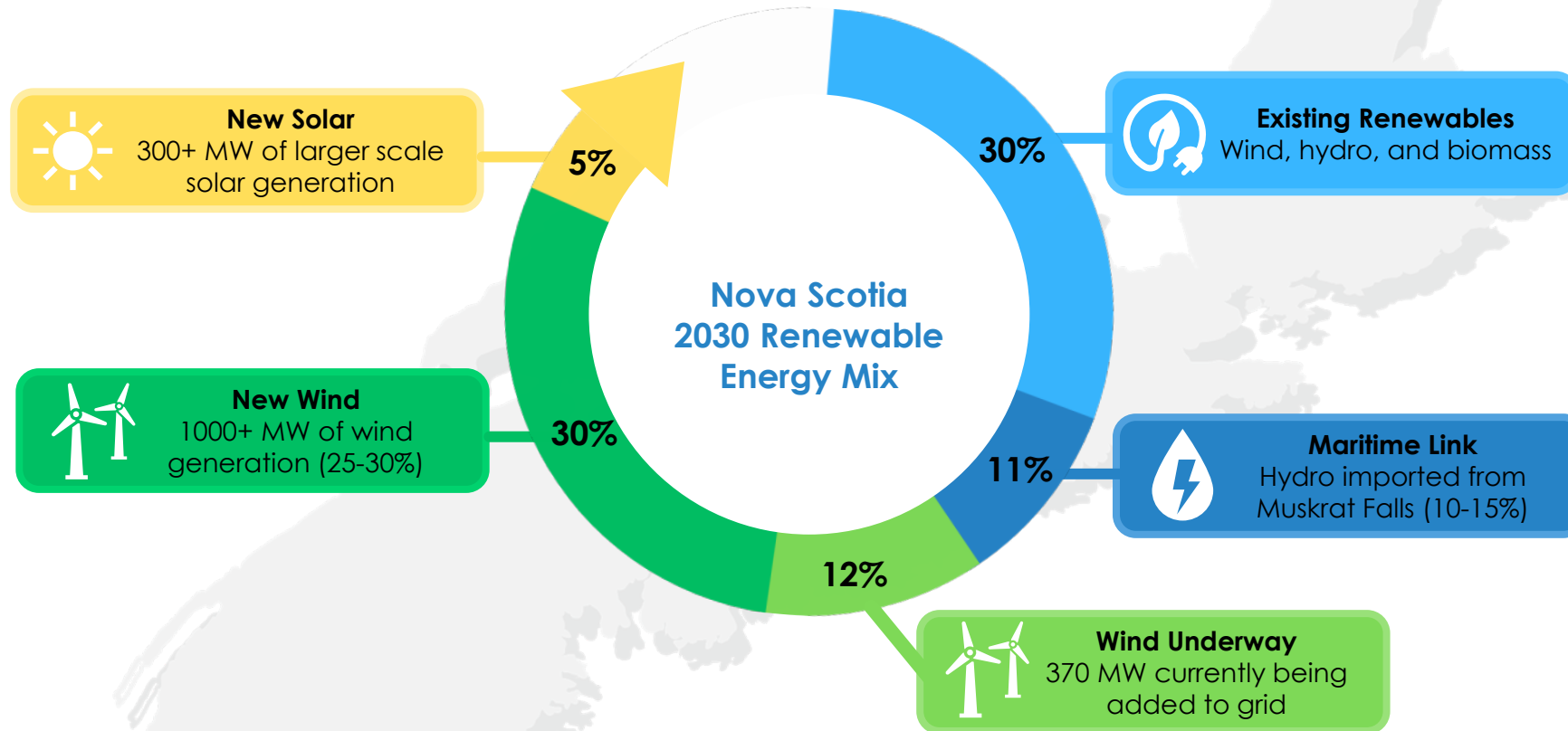
- ▶ Significant fuel cost pressures have arisen from the delayed and under-delivering Maritime Link, which forces increased purchases of expensive coal.
- ▶ More and stronger storms are impacting reliability.

## Historic Coal Prices (USD)








# Nova Scotia's 2030 Clean Power Plan

Achieve 80% renewables • Close coal • Cut electricity GHGs by 90% • Improve grid resiliency



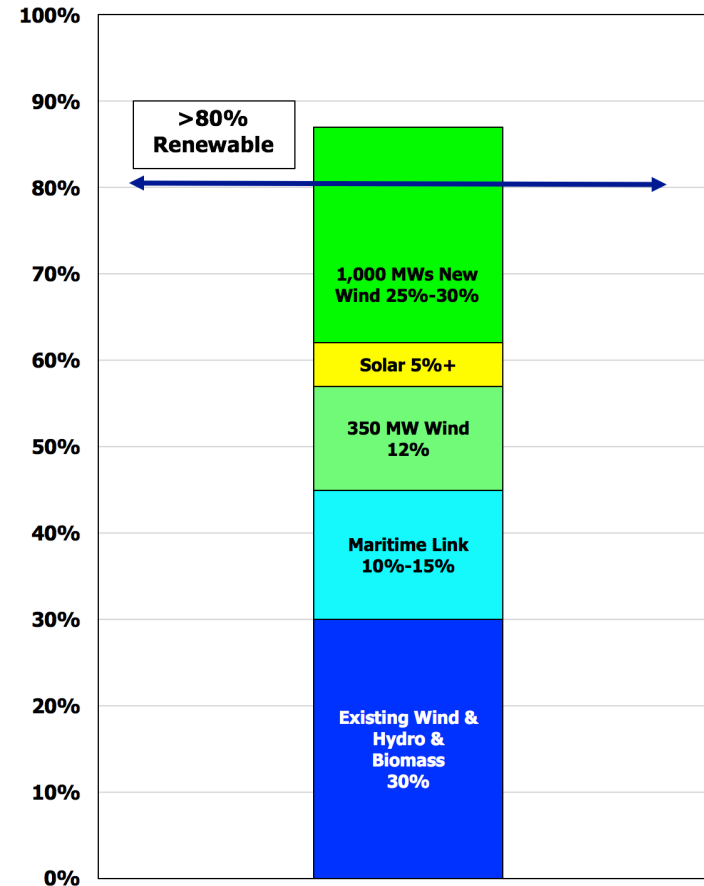
## Supporting Resiliency and Reliability of the Grid

- **Batteries: 300 MW**  
Innovative battery deployment underway
- **Fast Acting Generators: 300 MW**  
New, dispatchable generators
- **NS-NB Tie: 500+ MW**  
New 345kV reliability line to NB to help manage renewables
- **Reliability/Emergency Plants: 450 MW**  
Retain 4 oil/gas units for emergency use
- **Load Management: 150 MW**  
Peak management, demand response, and efficiency

# Achieving 80% Target & #1 in GHG Reductions

- ▶ More than 80% renewable power can be achieved by building out Nova Scotia's own local renewables.
- ▶ The 2030 Clean Power Plan will also reduce electricity GHGs by more than 90% (from 10.7MT in 2005 to <1MT in 2030 to 0.5 MT by 2035).
- ▶ Nova Scotia is already leading Canada in GHG reductions and by 2030 will be #1 in all of North America.
- ▶ Planning for the future also requires a greener, more flexible, and more reliable grid.

**NS Renewables 2030**



# Nova Scotia's 2030 Clean Power Plan

## Wind

Add 1,000+MW new onshore wind by 2030 (offshore potential post-2030)  
Green Choice procurement has begun, more every 18 months

## Solar

Net Metering now well-established and growing each year  
300MW+ large Solar by 2030 - Commercial begun, Community in Fall

## Batteries + Renewables Integration

300-400MW Batteries by 2030  
Additional renewable integration investments for reliability underway

## Electrification/Load Management

Peak Management, Demand Response and Efficiency investments  
to reduce 150 MWs of peak and peak growth

## Transmission

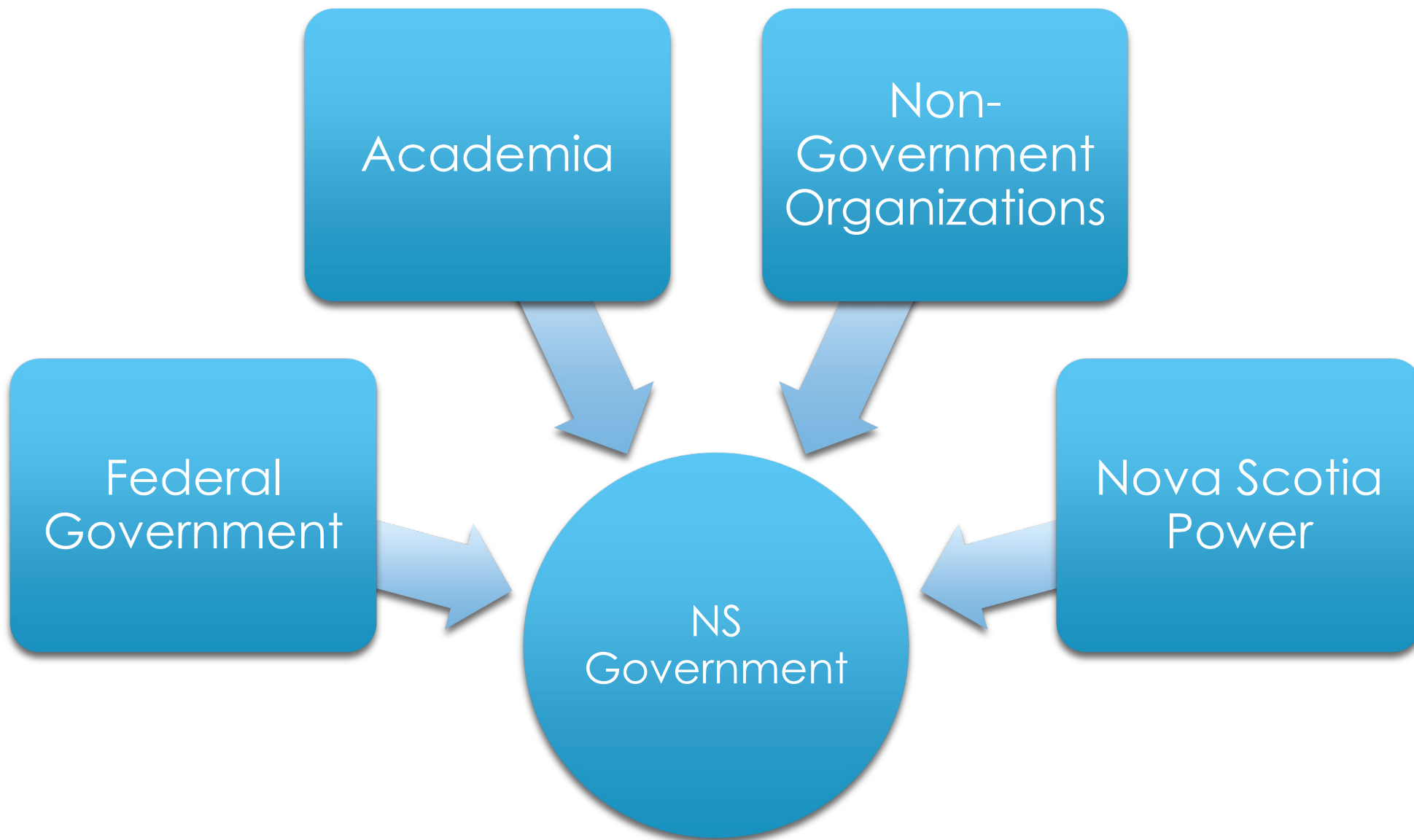
A new NS-NB Reliability Tie transmission line in service pre-2030  
Potential to extend new transmission to Point Lepreau, NB by 2030

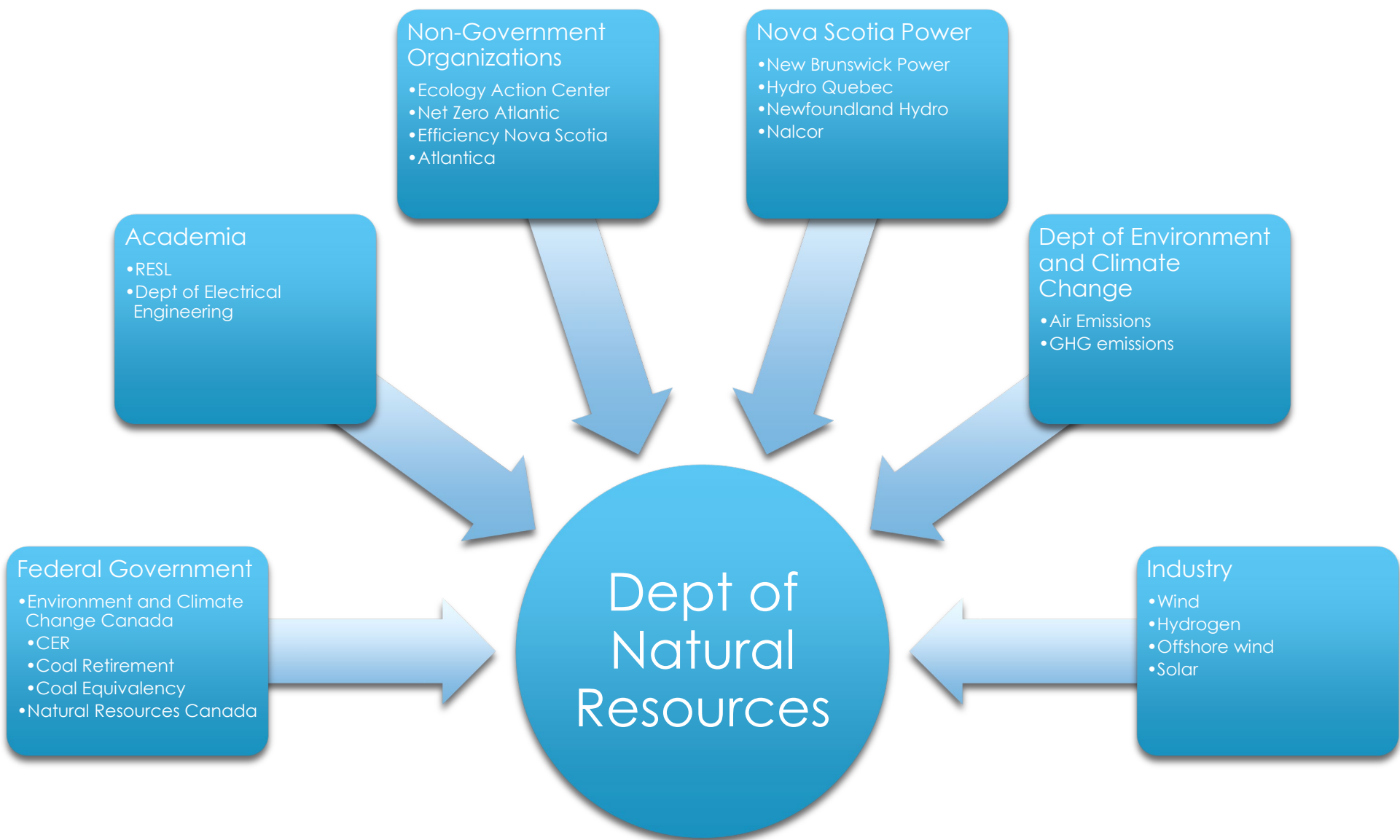
## Fast-Acting Generation

300MW Hydrogen Capable/Flex-Fuel generators by 2030  
Potential for 300+ MWs additional in 2030 or later

## Emergency & Reliability Back-Up

450+MW Emergency/Back-up oil generators (use of existing plants)  
Potential 100+ MW Coal-to-Gas conversions 2030



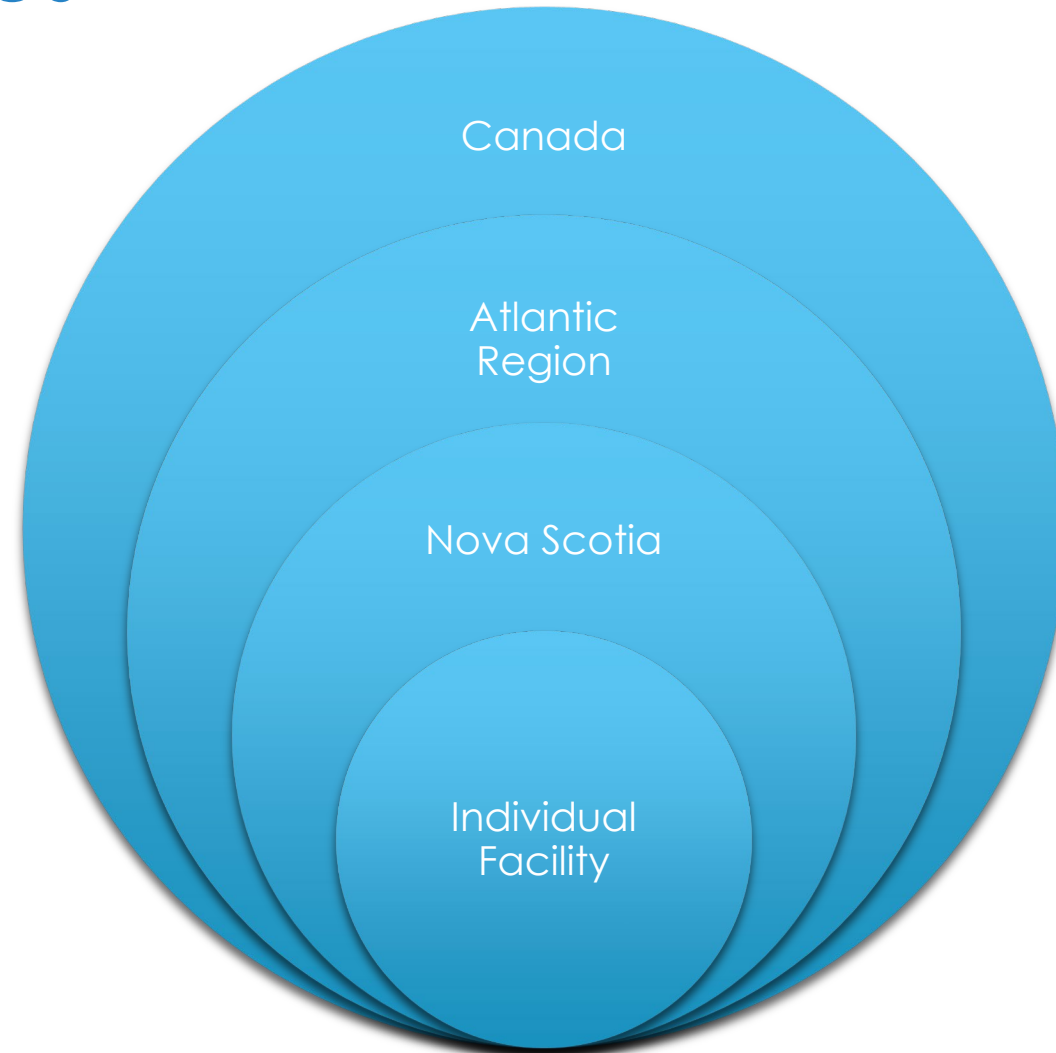




# Model Types

- ▶ Dispatch (Electricity System Operations)
- ▶ Load (Load Growth, Efficiency Potential)
- ▶ Economic (Jobs, GDP, population growth)
- ▶ Electrical (Power flows, stability)
- ▶ Emissions (Combustion emissions, including GHGs)
- ▶ GHG optimizing

# Model Scopes



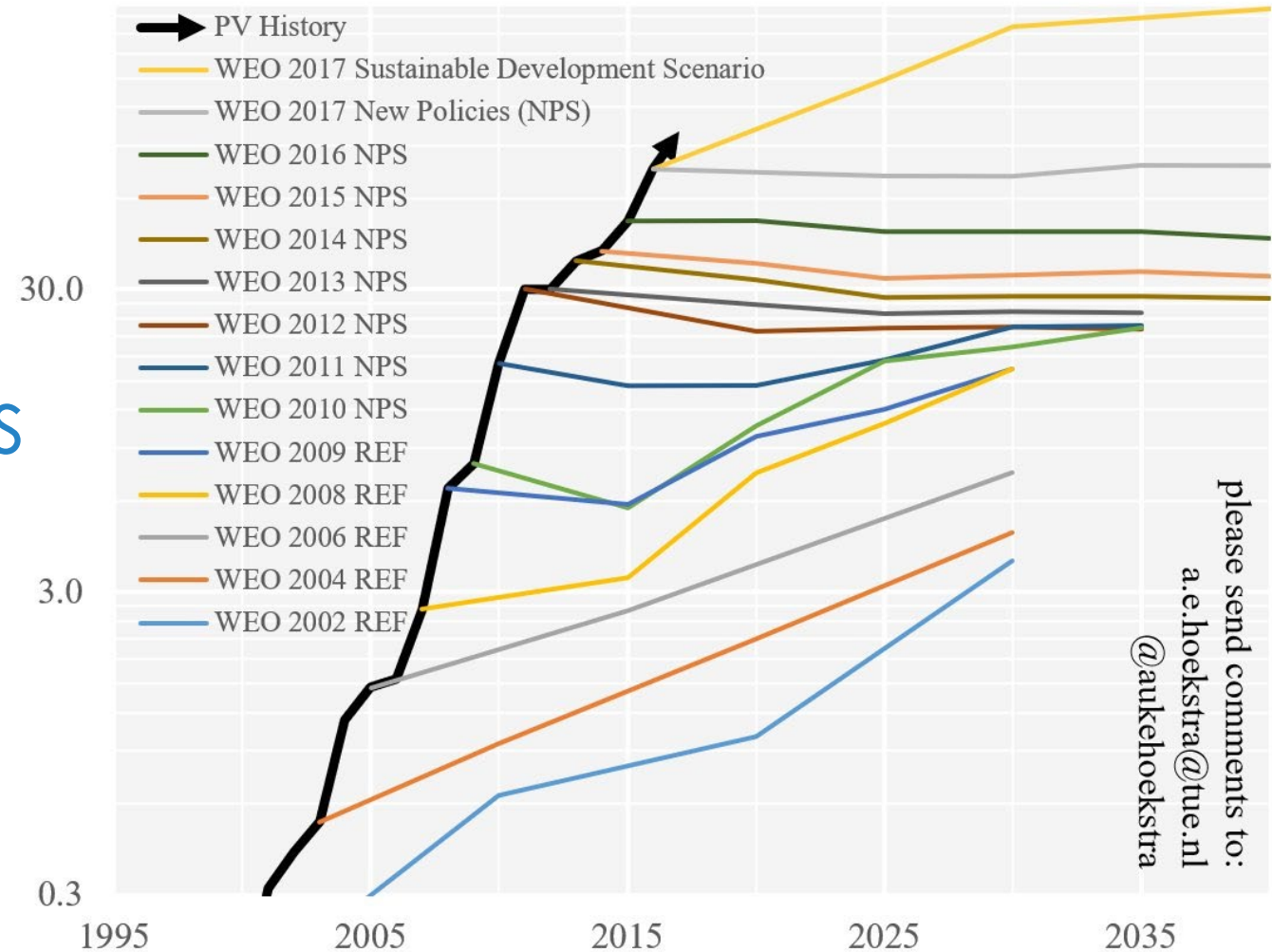
## Assumption of Cost Ranges (\$/MWh)

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NS Wind		\$45-\$75
Battery + NS Wind		\$70-\$100
Offshore NS Wind		\$70-\$140
Solar		\$80-\$130
Natural Gas		\$100-\$170
Imports (from NL, NB, NE)		\$150-\$200
Smart Grid/Efficiency		\$0-\$50

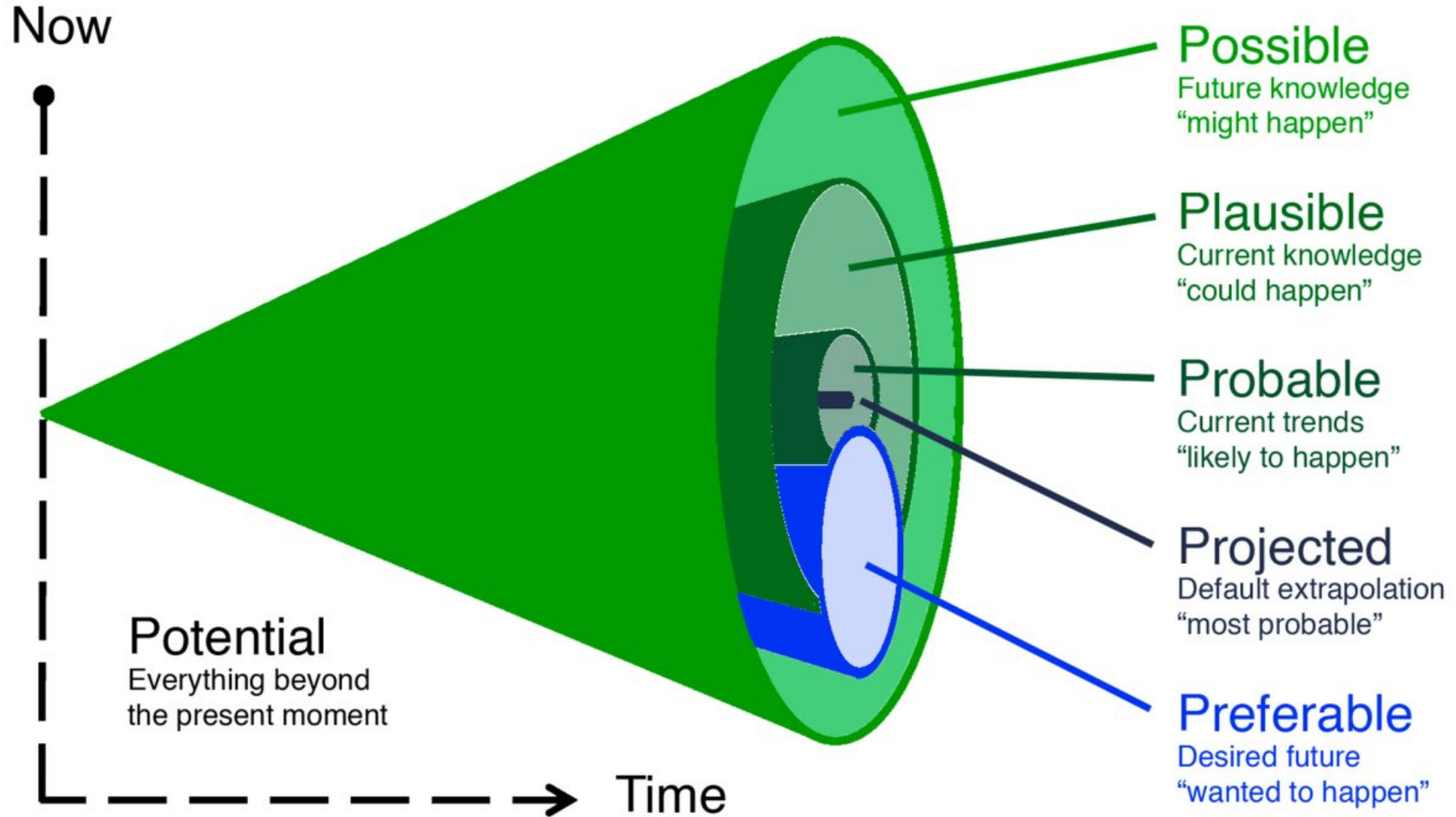
## Annual PV additions: historic data vs IEA WEO predictions

In GW of added capacity per year - source International Energy Agency - World Energy Outlook

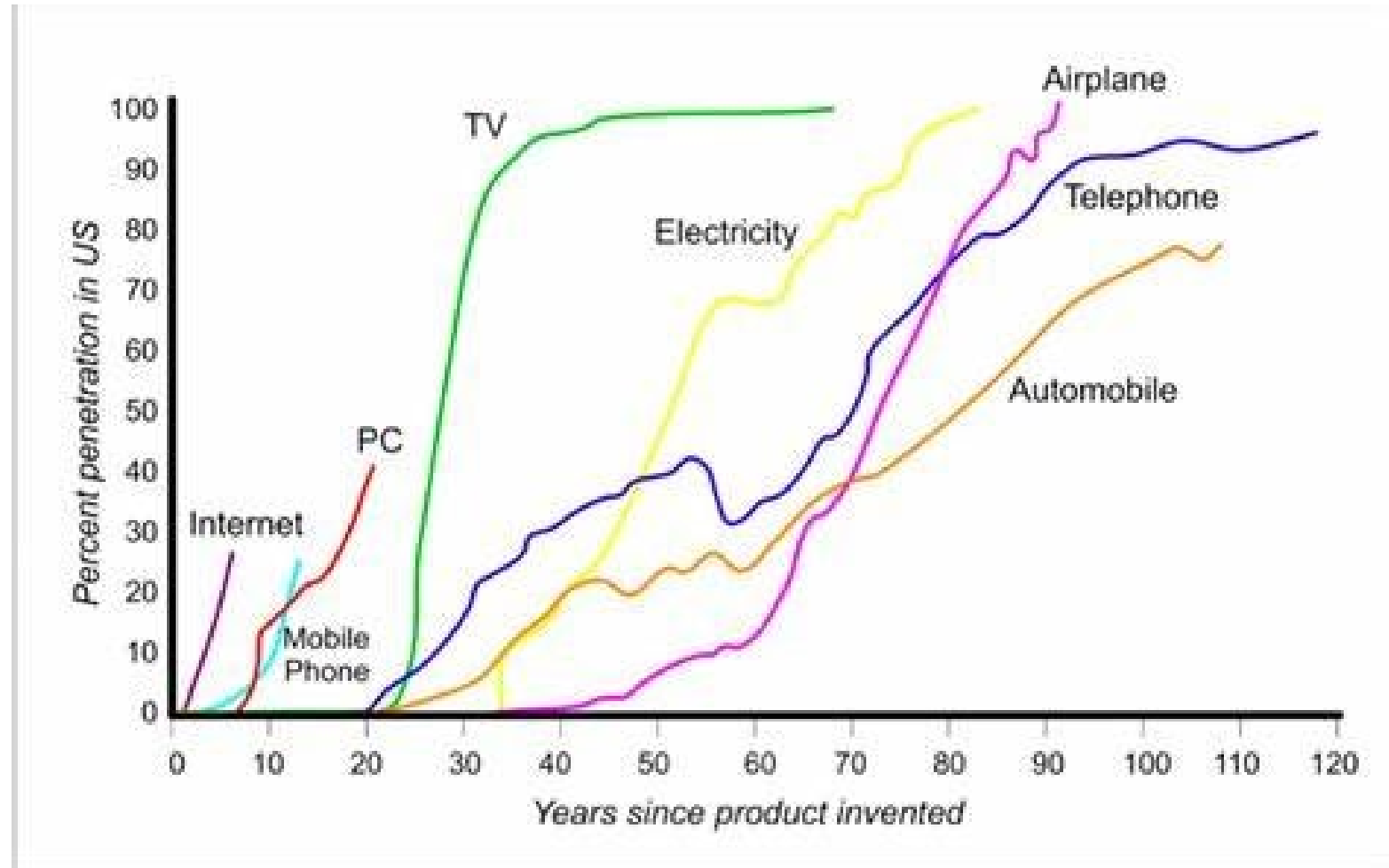


Bias Errors in Inputs

# Cone of Uncertainty

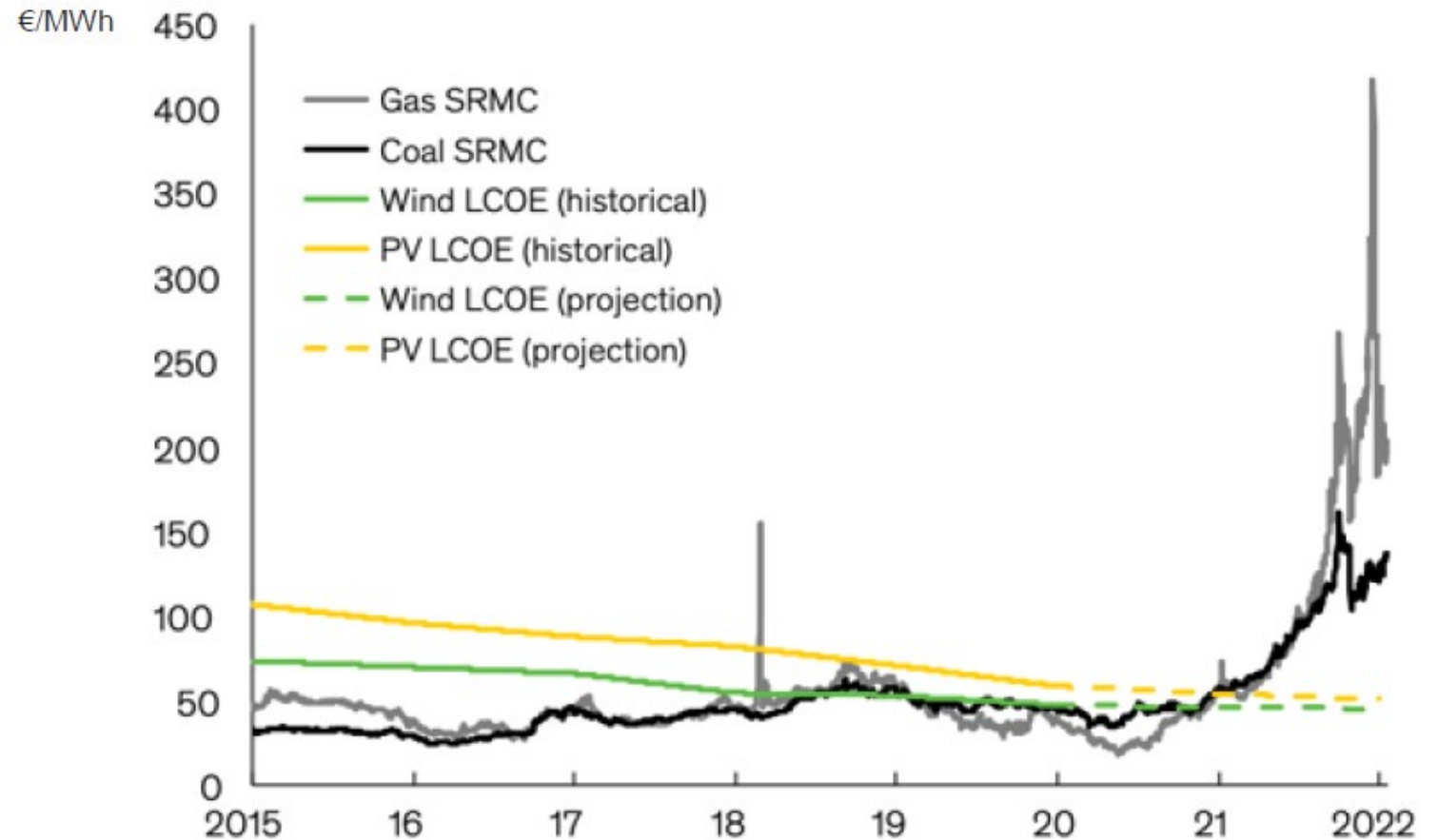


# Pace of Change – Adoption Curves



# The Unexpected

## Marginal Costs of Fossil Fuels vs. Total Cost of Renewables (Germany)



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