

# 100% Renewable Energy?



# Rooftop Solar

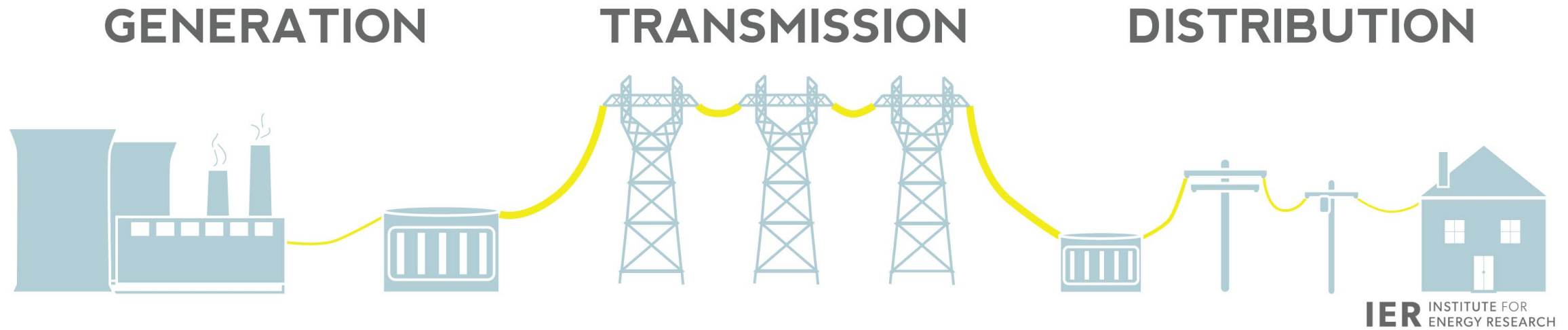
**% of households with rooftop solar**



**% of energy generated by PV rooftops**



# Electricity System



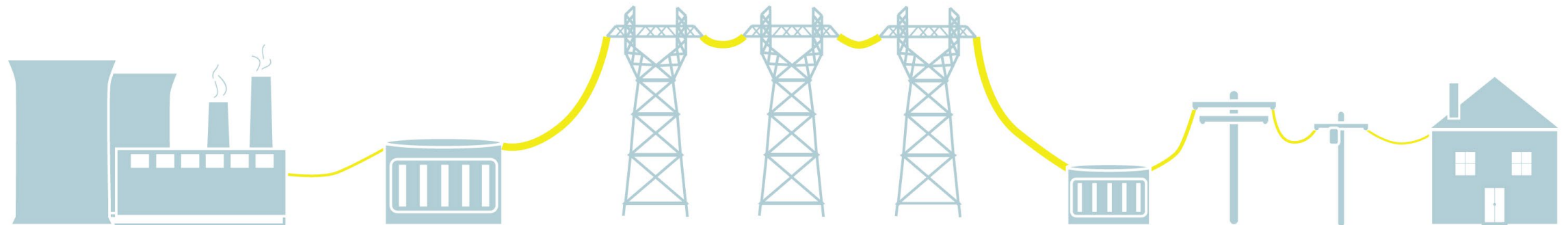
# Electricity System



**GENERATION**

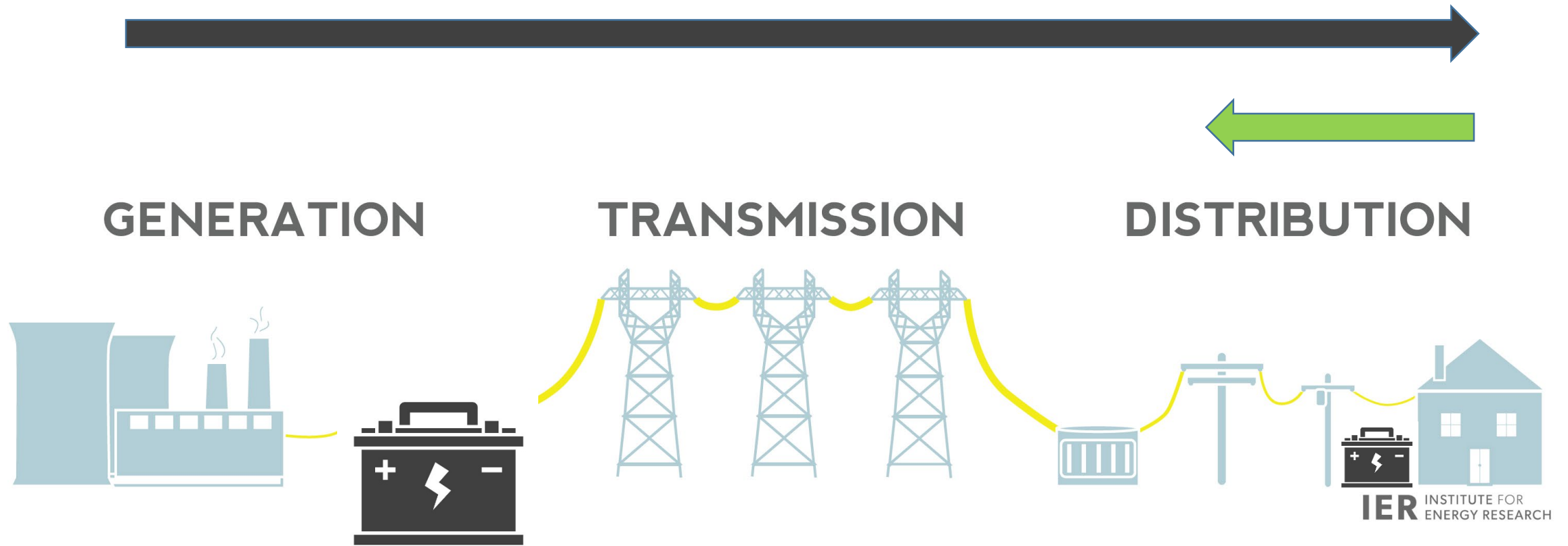
**TRANSMISSION**

**DISTRIBUTION**





# Electricity System



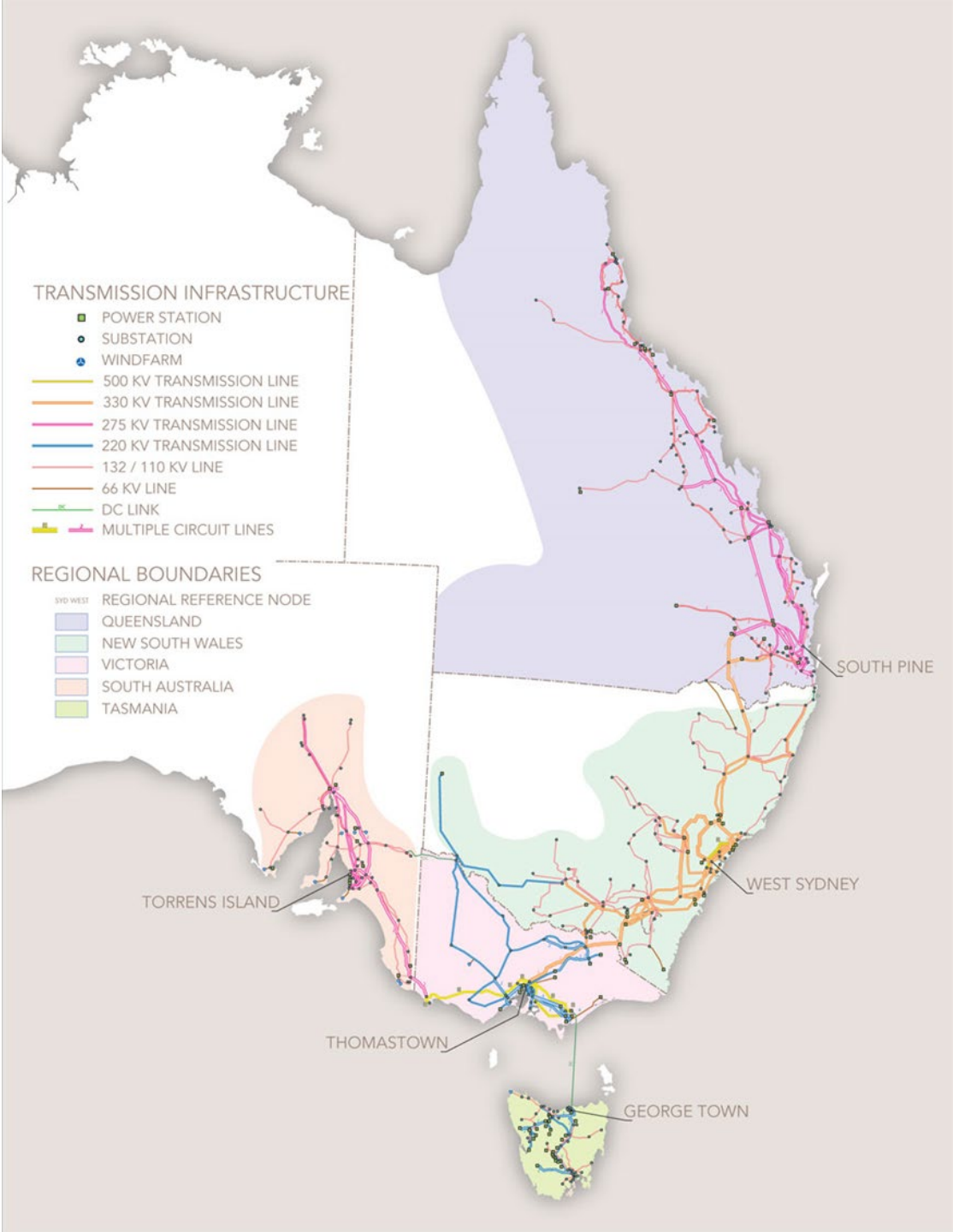
# Generation then

- Coal
- Gas
- Hydro

# Generation now

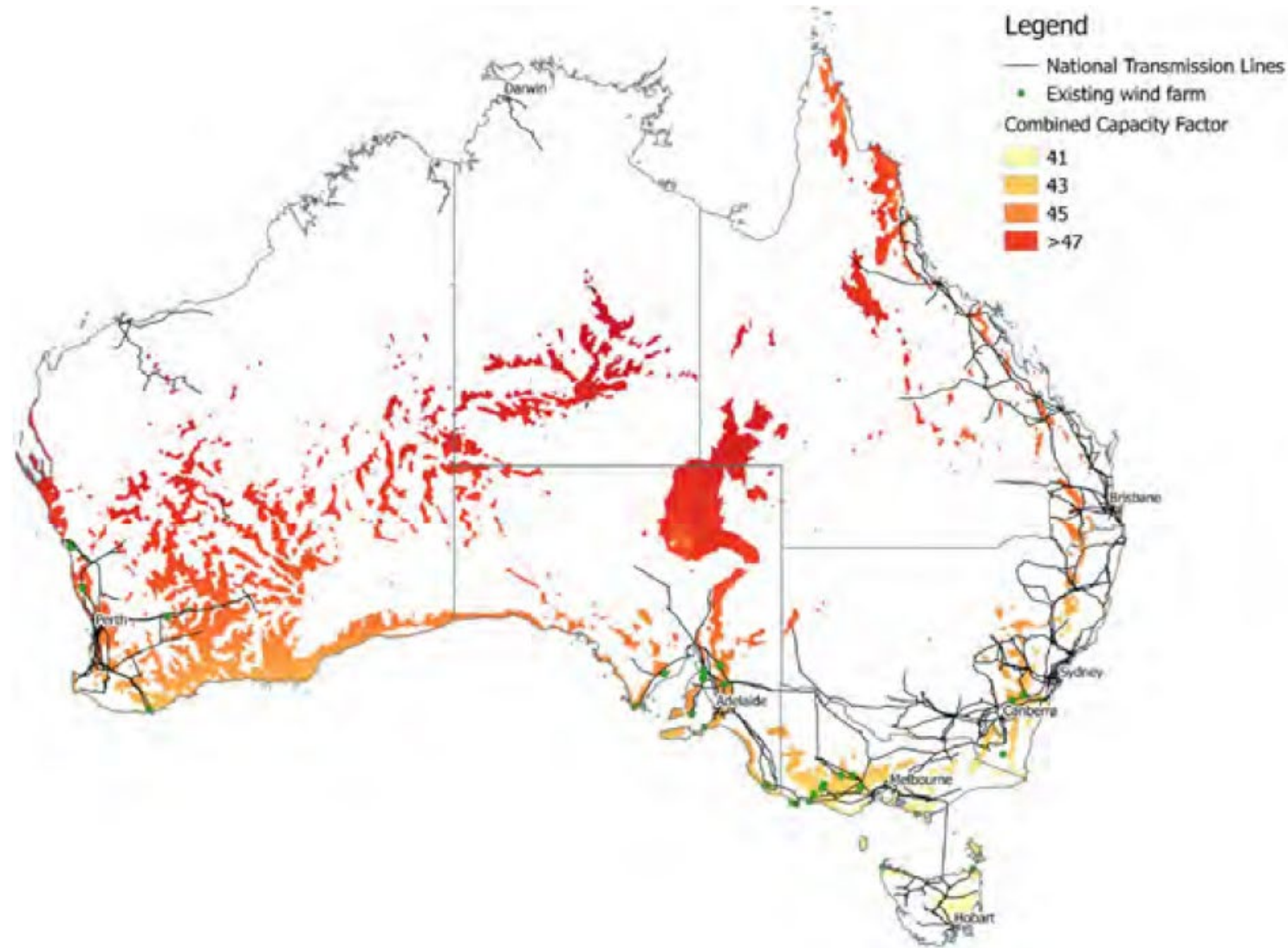
- **Solar**
- **Wind**
- **Coal**
- **Flexible demand**
- **Storage: Batteries (small and large), pumped hydro, other**
- **Bioenergy and waste to energy**
- **Gas**
  
- **Hydro**

# Transmission grid





# Wind and solar combined capacity factor



# Reliability and security

## **Reliability**

Having enough energy to supply the demand at any given moment

## **Security**

- Frequency
- Inertia
- Fault Current
- Black start
- Voltage

# Customers then

**Behind the meter (not really part of the system)**

- **Meters read every three months**
- **Customers disempowered**

# Customers now

## Part of the system

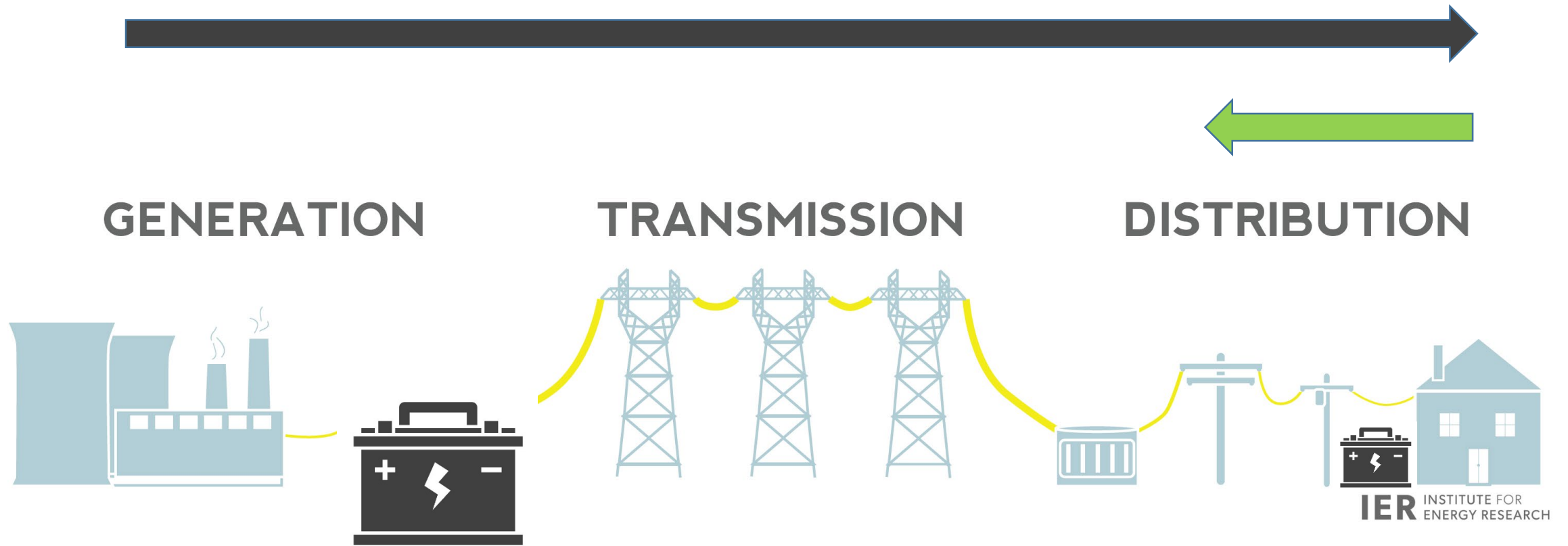
## Digital enablers

- Smart meters read every 5 minutes (1 second?)
- Consumer choice and control
- Demand response

## Consumers as generators and participants

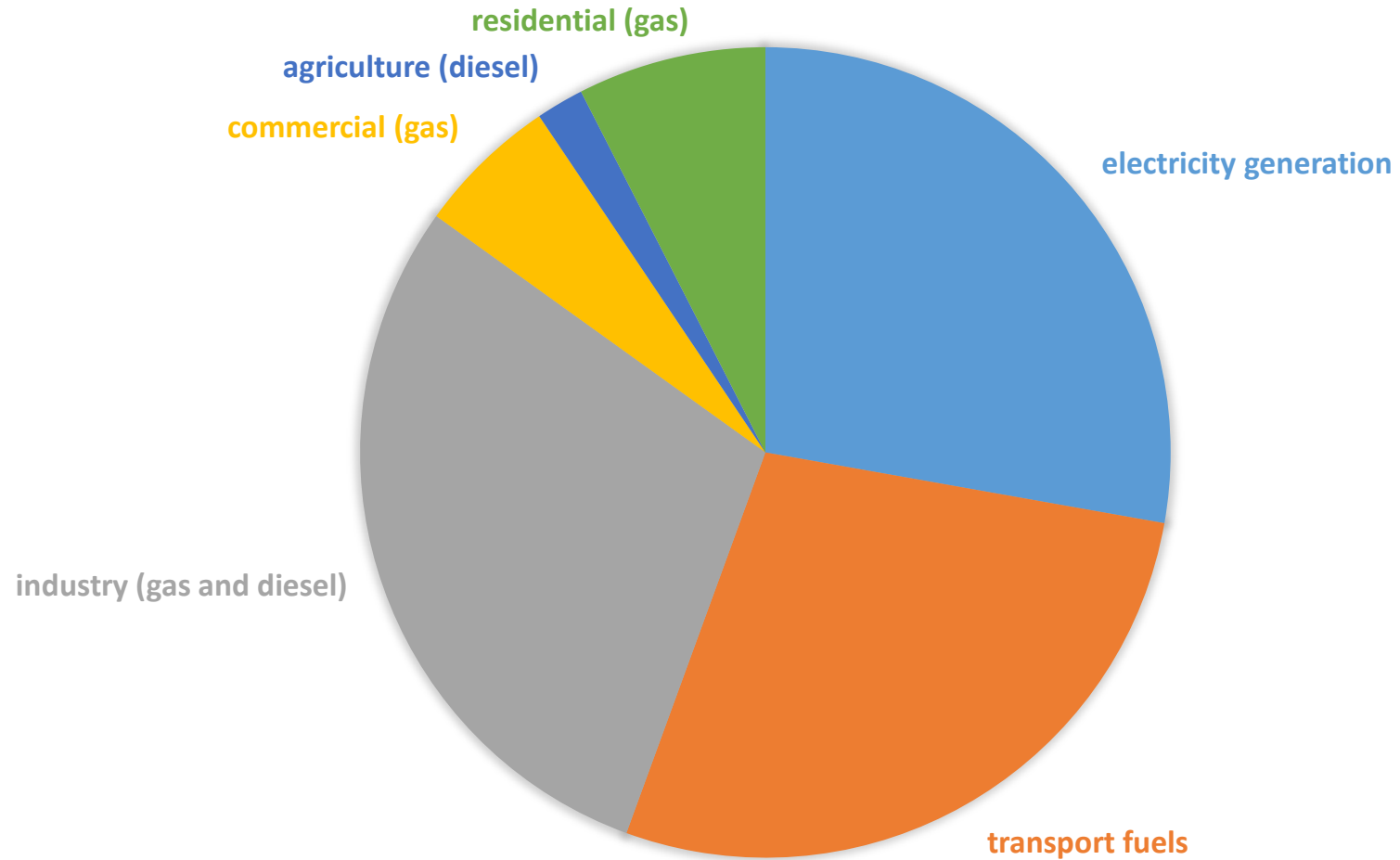
- Batteries and inverters
- Traders

# Electricity System



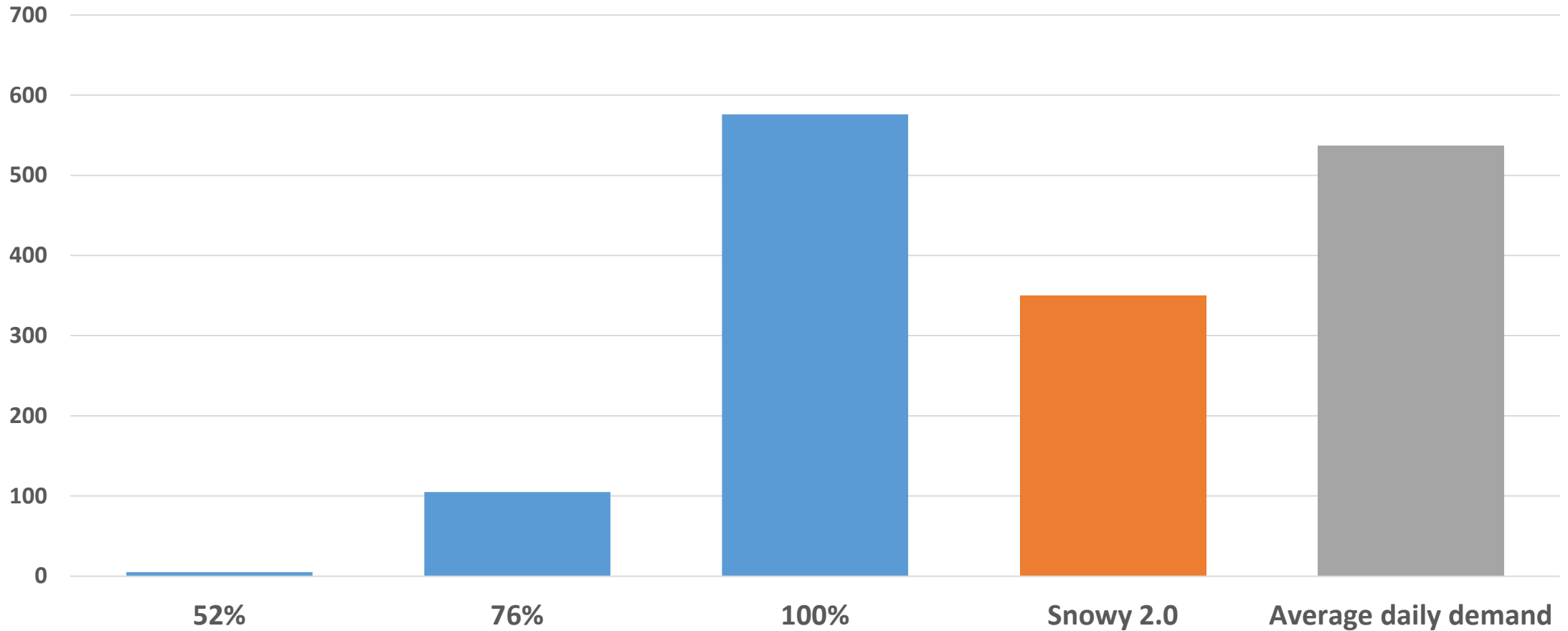
# Electricity is only part of the story

## PRIMARY ENERGY CONSUMPTION



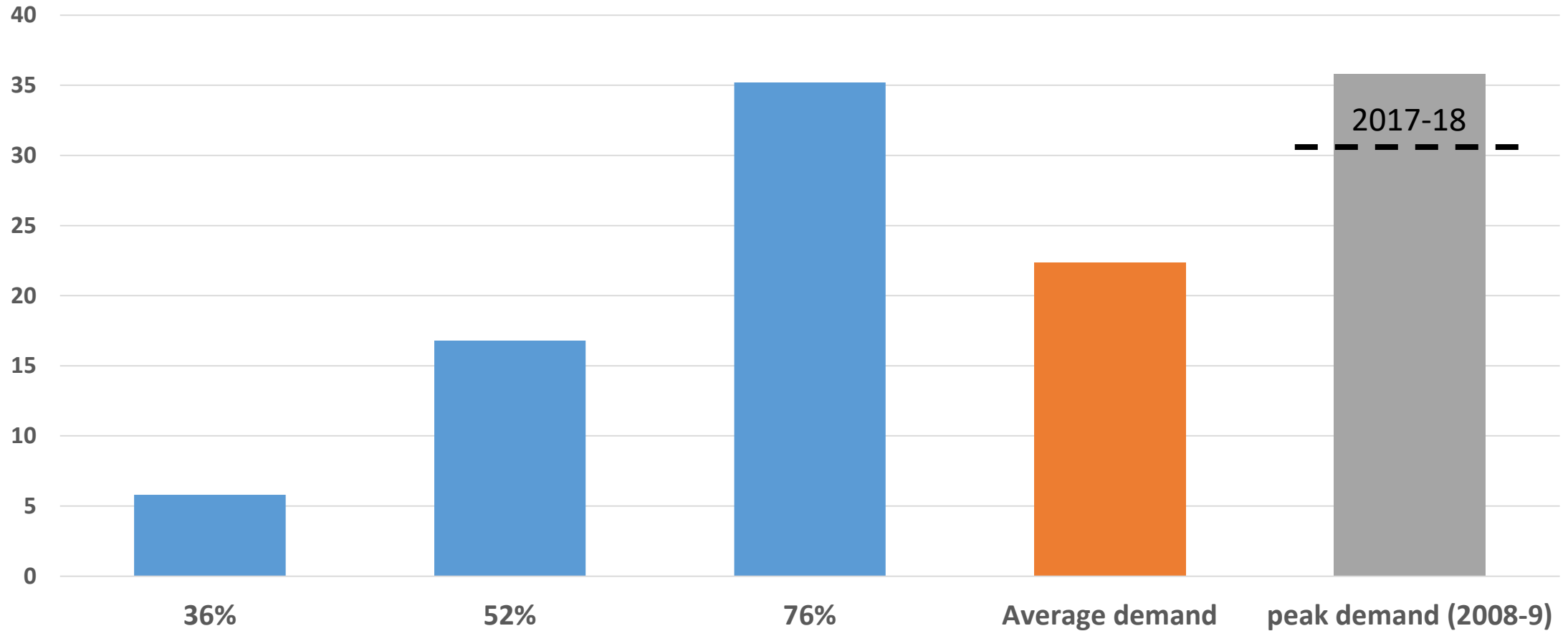


# NEM Storage Requirement (GWh)

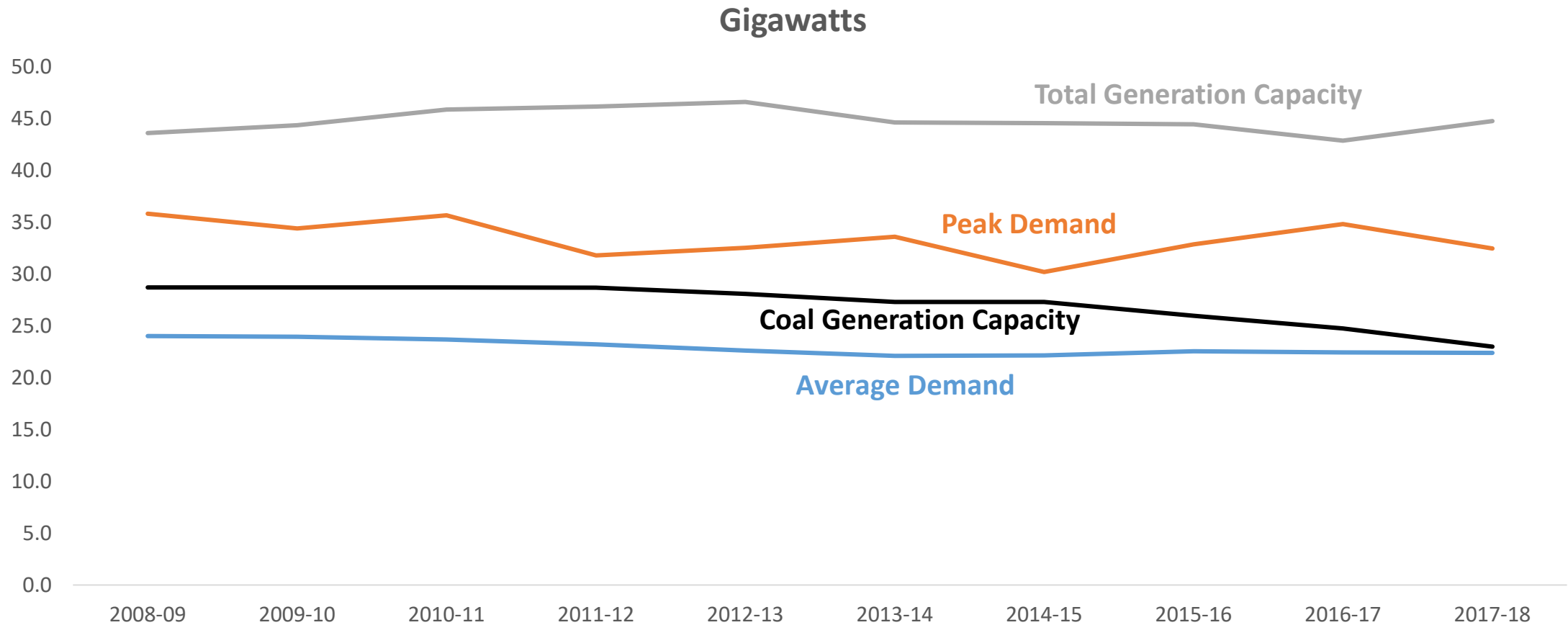


**Source:** *Storage Requirements for Reliable Electricity in Australia 2017*, The Institute for Sustainable Futures for ACOLA; *100% renewable electricity in Australia*, Blakers, Lu, Stocks; Snowy Hydro; AER

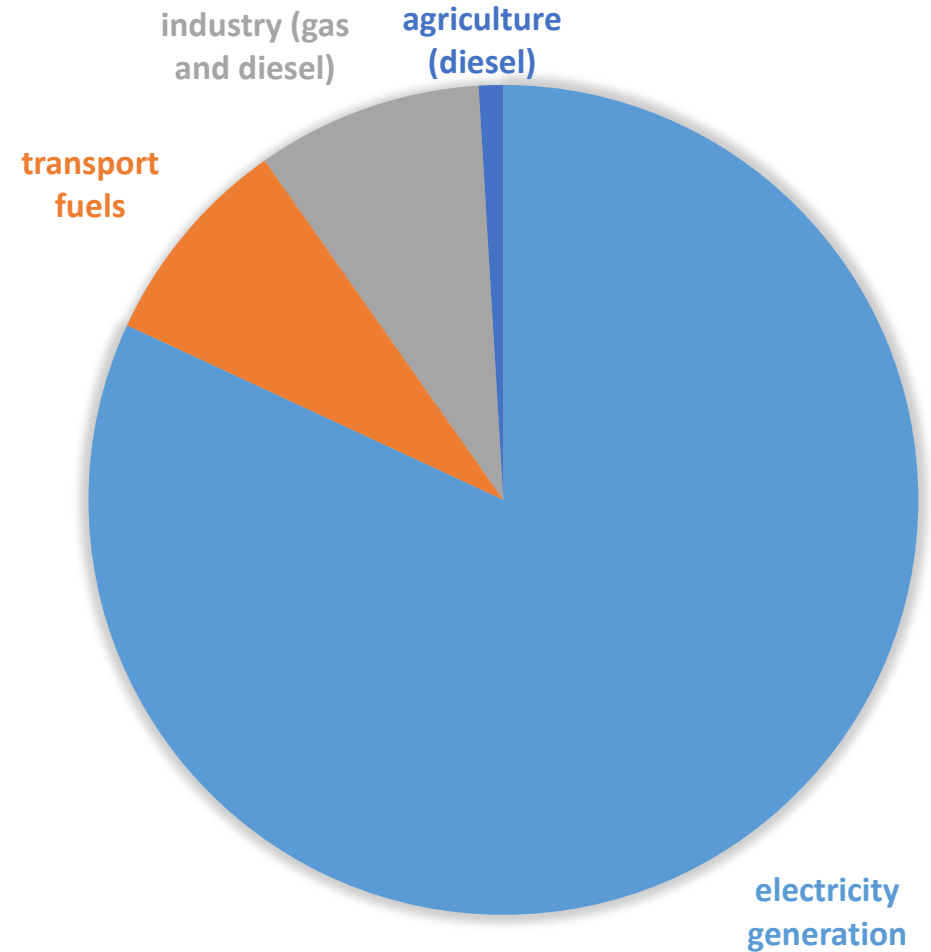
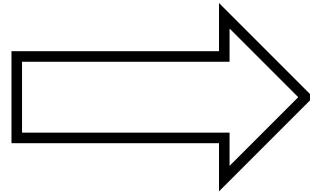
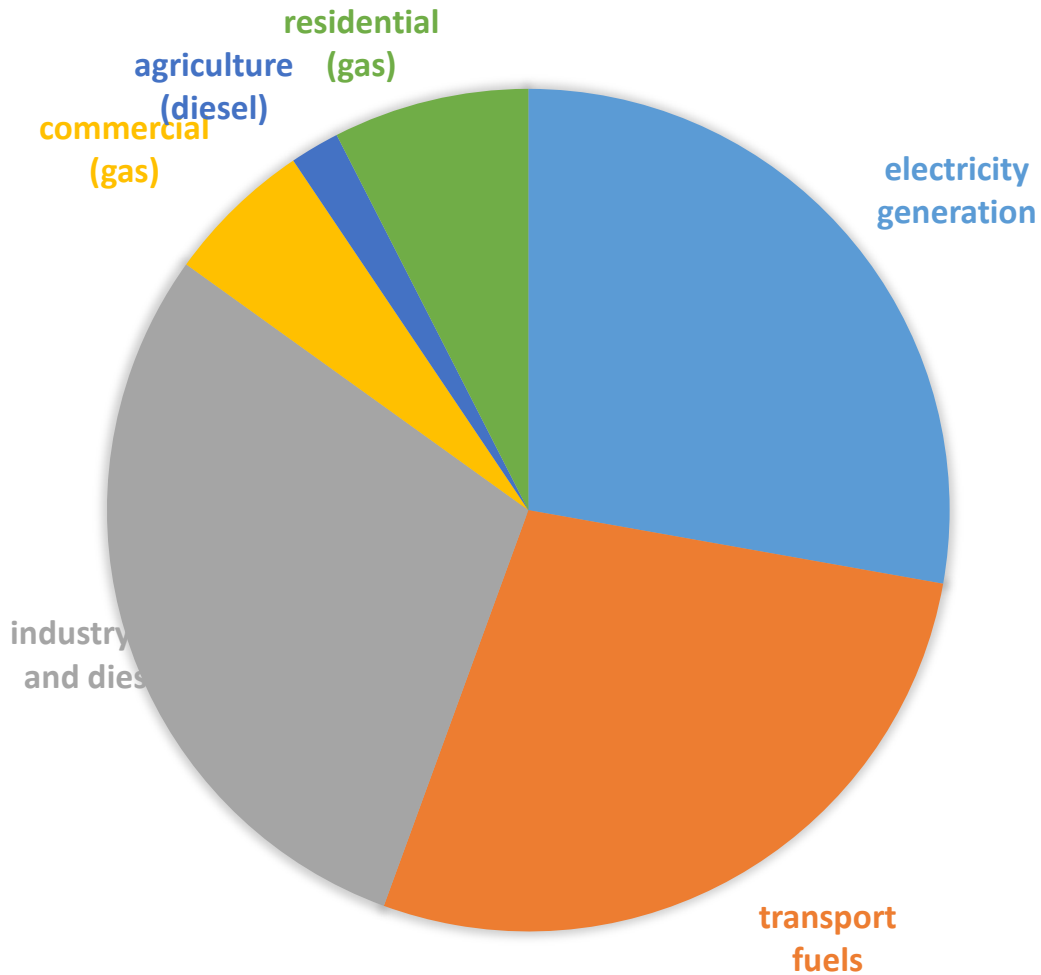
# NEM capacity needs for security (GW)



# Do we need baseload generation?



# Future primary energy consumption



# Future NEM

- **80+ GW of wind and solar PV (50+% of solar decentralized)**
- **35GW of flexible capacity (30+% decentralized)**
- **200-500 GWh of storage (10+% decentralized)**
- **Targeted network investments**
- **Market operator, networks and customers coordinate visibility and control of all energy assets**

# What can I do?

Be part of the future

- Reduce energy use through energy efficiency
- Buy greenpower and/or install solar
- Make your energy digital with IoT, smart meters/monitors, dashboards
- Consider a battery

Encourage your politicians to implement long-term stable policy