Distributed Power: a public policy for success

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Recognised Barriers to technology diffusion

- Technical know-how.
- Economics.
- Trust.

Lessons Learned

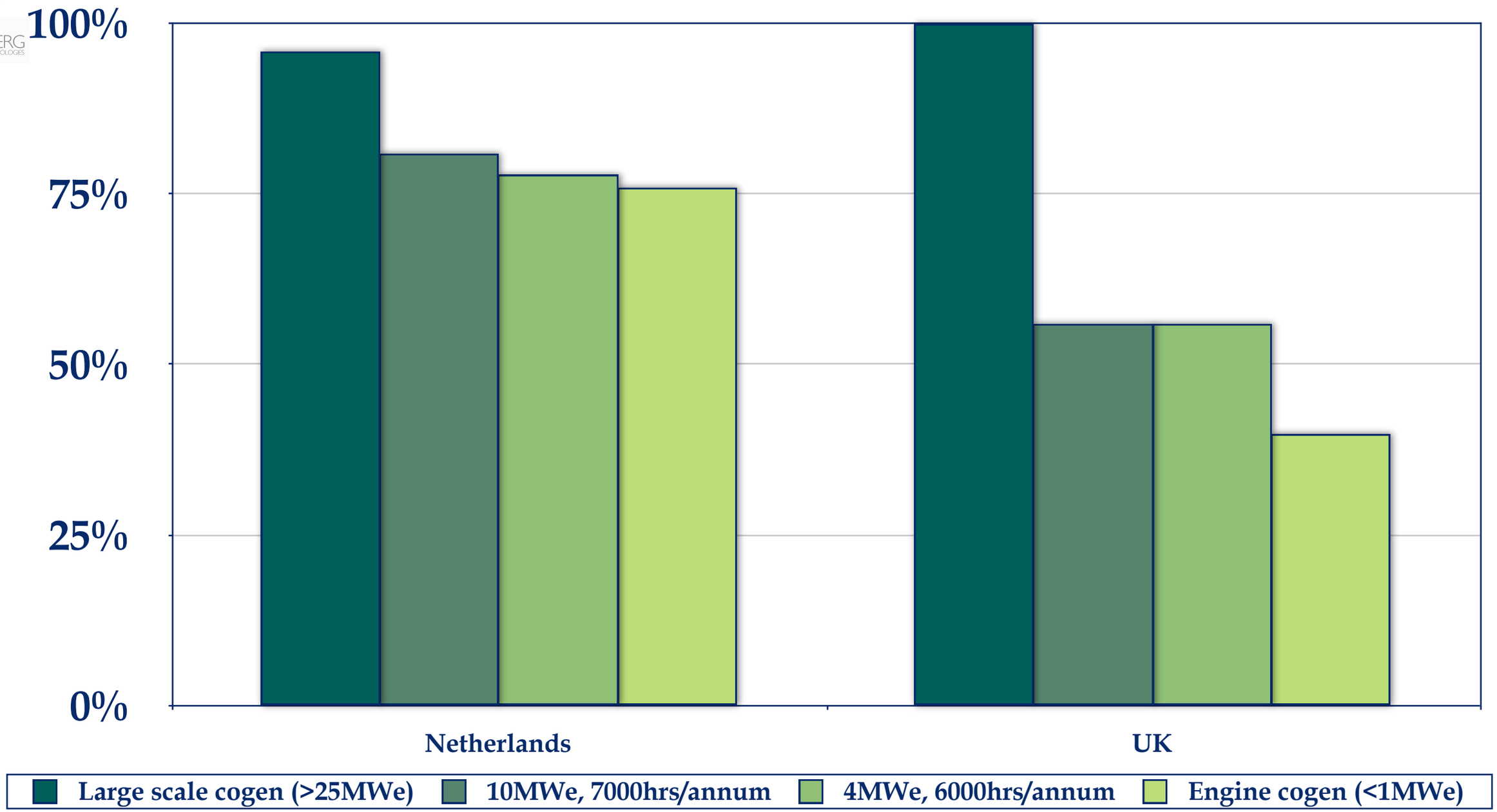
- We have over twenty years of experience with Distributed Generation systems. Some countries have succeeded off the bat (Netherlands) but at unnecessary cost to the tax payer. Others started off poorly (UK), but at a high cost to first movers.
- These lessons have clear implications for three issues:
  - Policy fostering economic returns.
  - Practice assuring economic performance.
  - Applications tailored to client needs & engendering trust.

Economics

- Inherently much more economical than central power.
- Inherently better for T&D of electricity and gas.

- **POLICY**:
  - Buy and sell power through net metering or at worse within 75% of system marginal costs.
  - Appropriate connection charges and T&D fees.
  - Appropriate gas contracts

Electricity buy-back tariffs



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More installations lowers maintenance costs

Lower maintenance costs improves economics

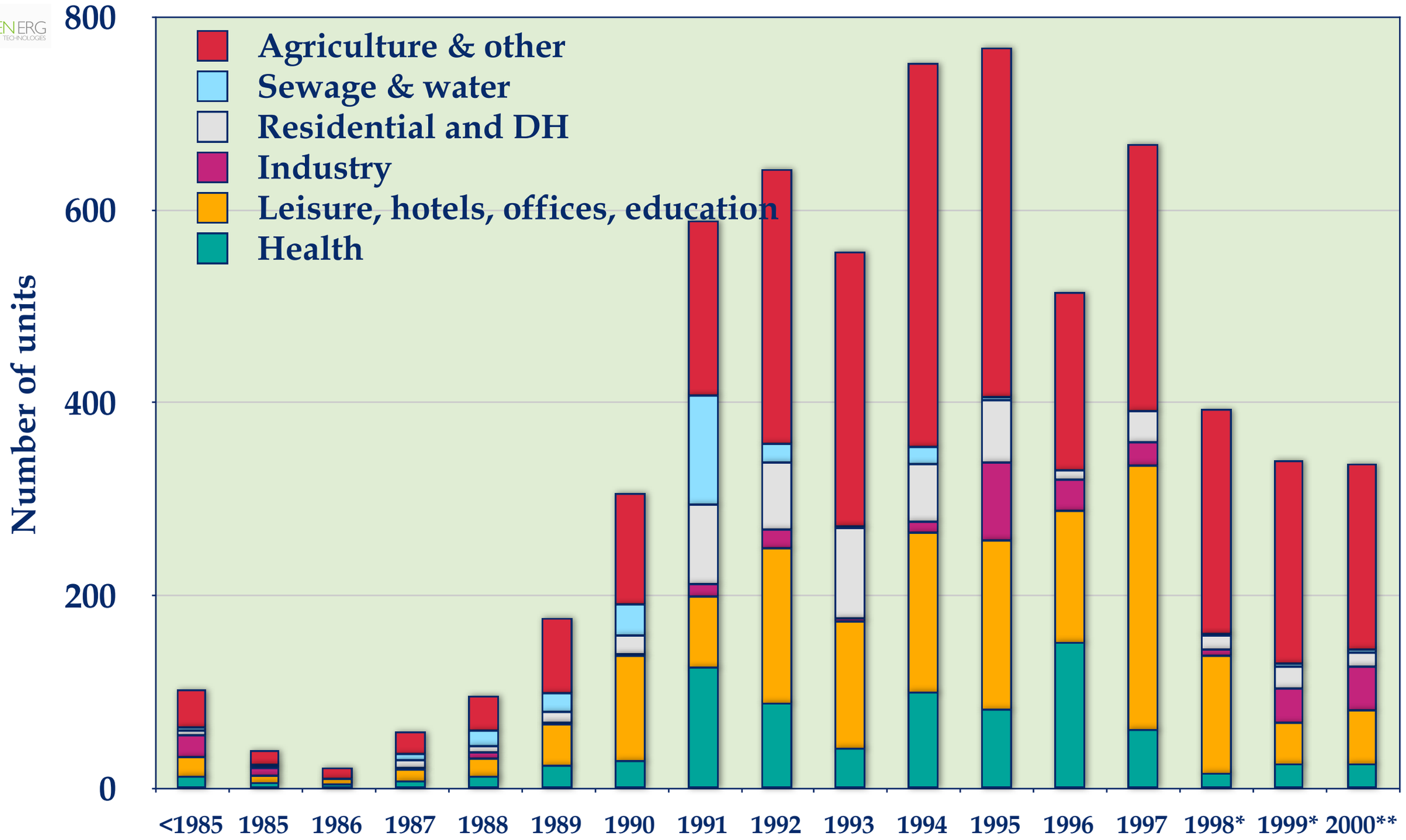
Best Practice

- Train and certify installers/operators/maintenance specialists.
- Establish standardised interconnections.
- We need environmental standards.
- **POLICY**:
  - Underwriting support for certified installations/ operations.
  - Adopt ONE approved connection standard.
  - Adopt ONE approved environmental standard.

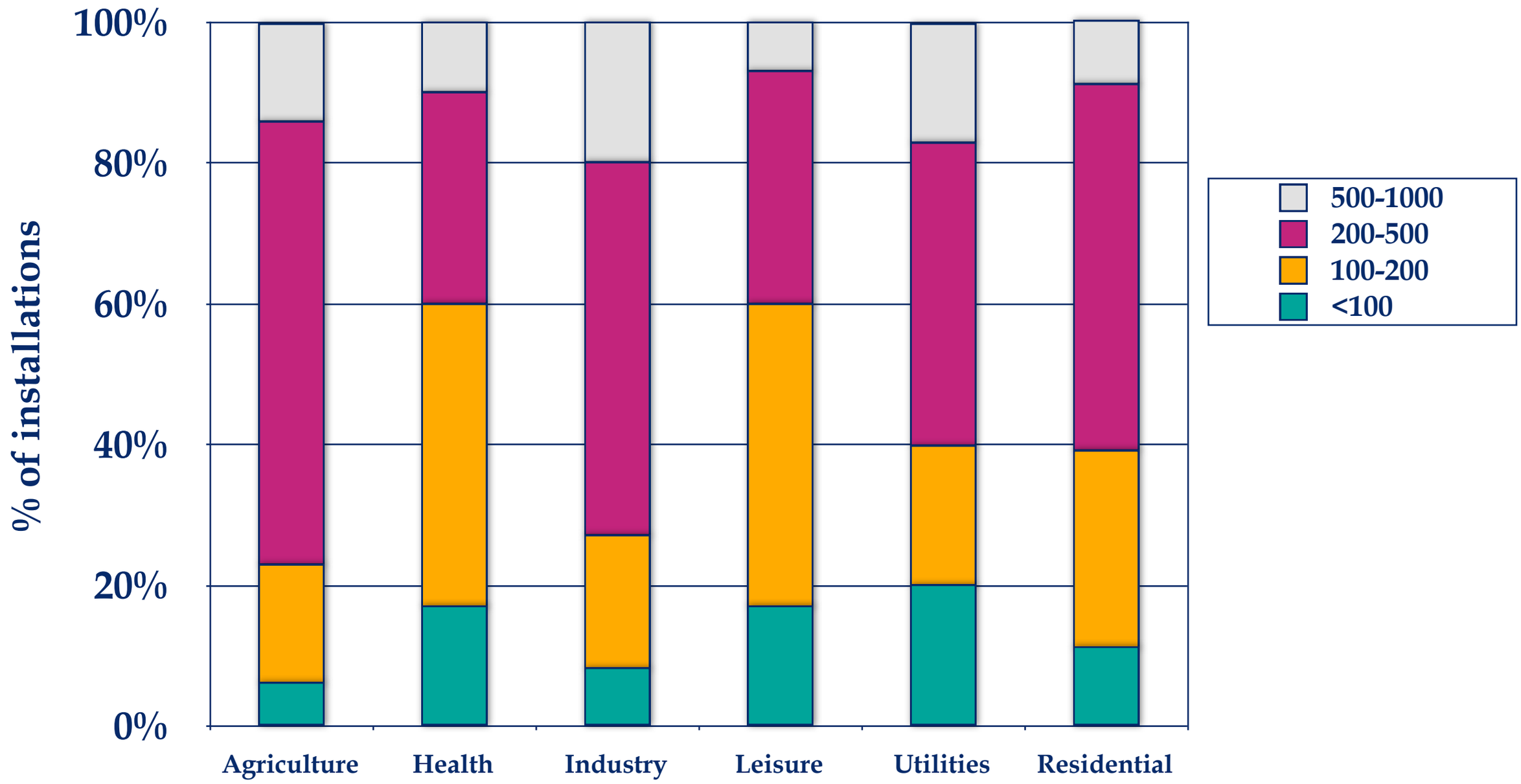
Best Applications

- Different Distributed poly-generation systems are best employed close to well-matched demands for power, heating, cooling and other products.
  - Petrochemicals already well established.
  - Yet to emerge in Canada:
    - hotels, recreation centres and hospitals,
    - food industry,
    - greenhouses,
    - water and sewer,
    -

Dutch installations by user



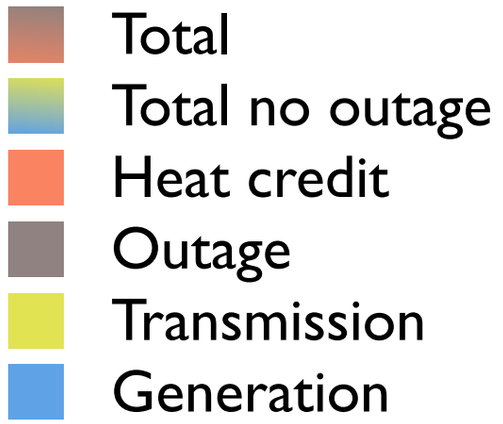
Netherlands sectors and sizes



Public policy basics

- What are the energy network effects of distributed poly-generation on:
  - The electric power system?
  - The natural gas delivery system?
- What are the impacts of closer proximity to power plants on exposure to pollution:
  - SOx, NOx, CO, PM, CO_2, CH_4 ?
  - Electromagnetic fields, Noise?

Calculating the costs: generation+delivery+outage +heat credit



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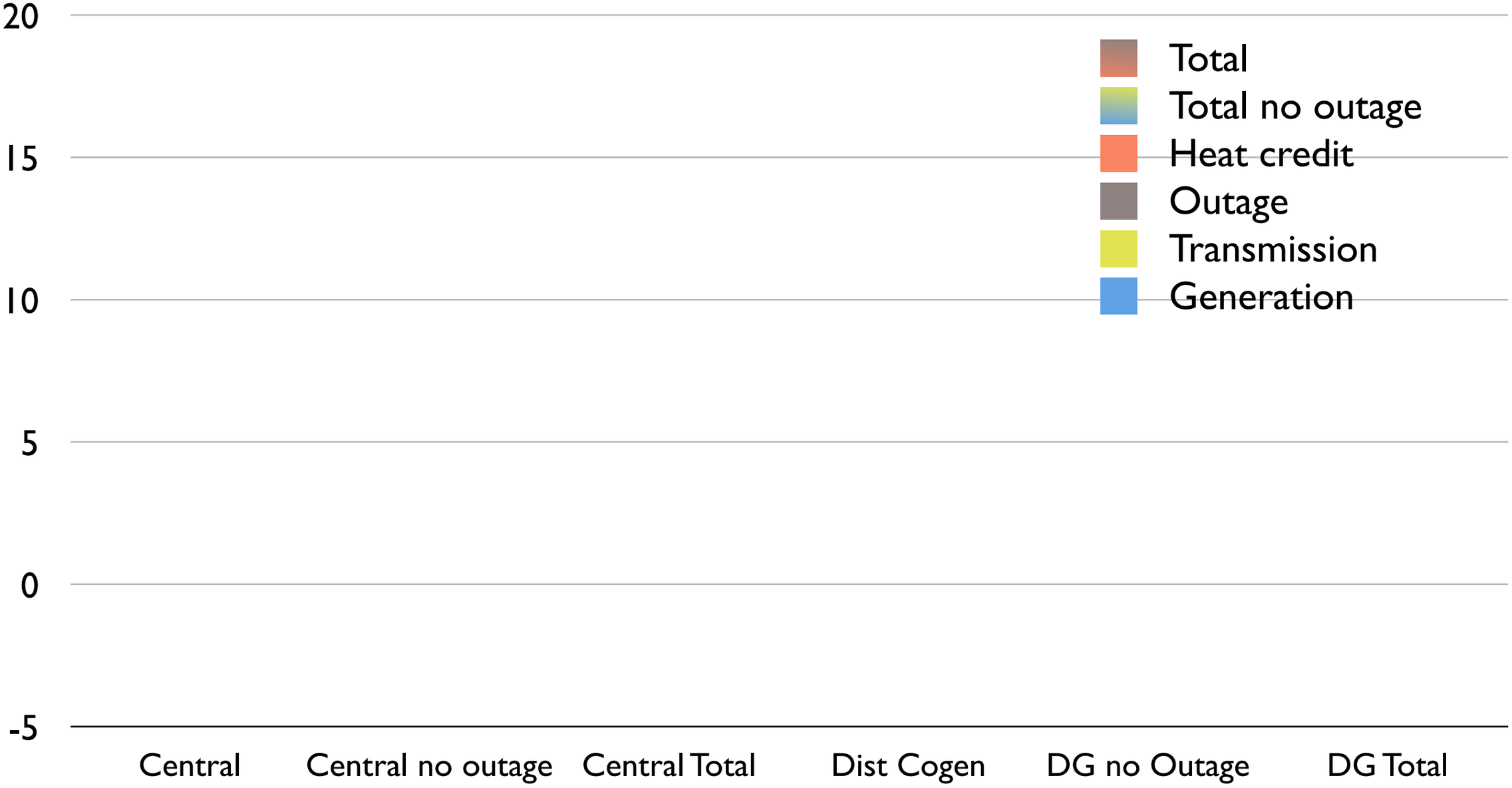

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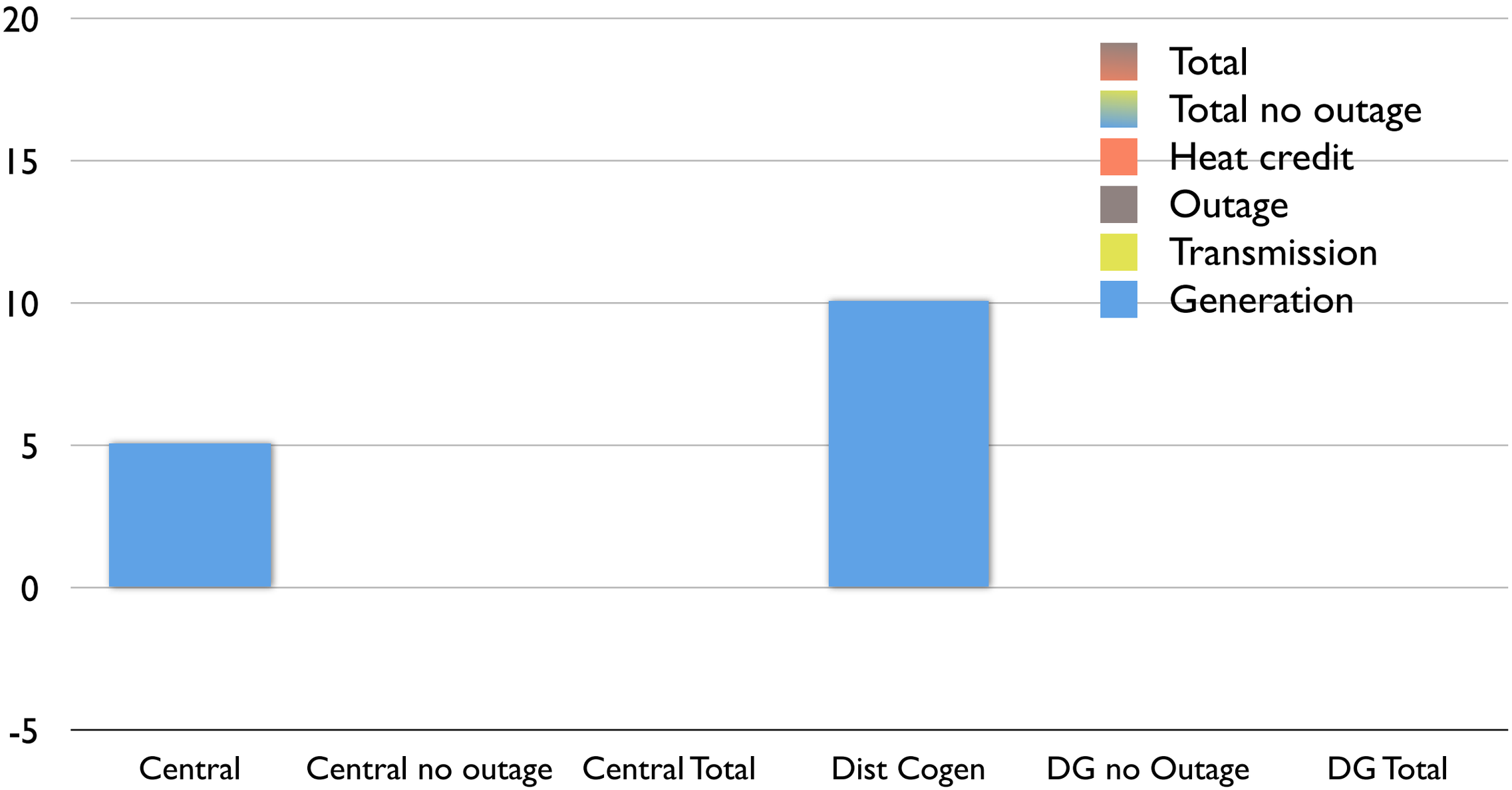

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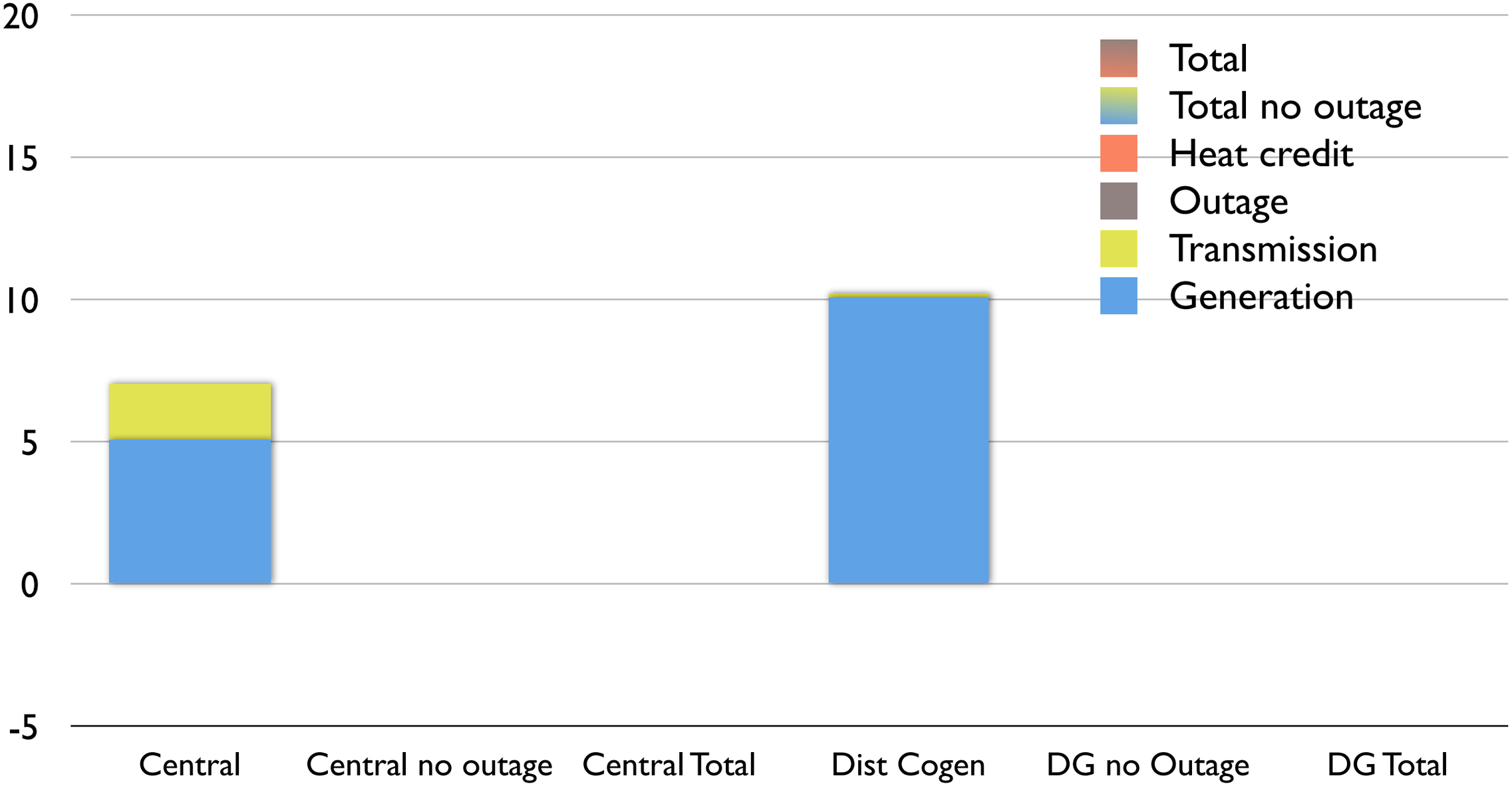

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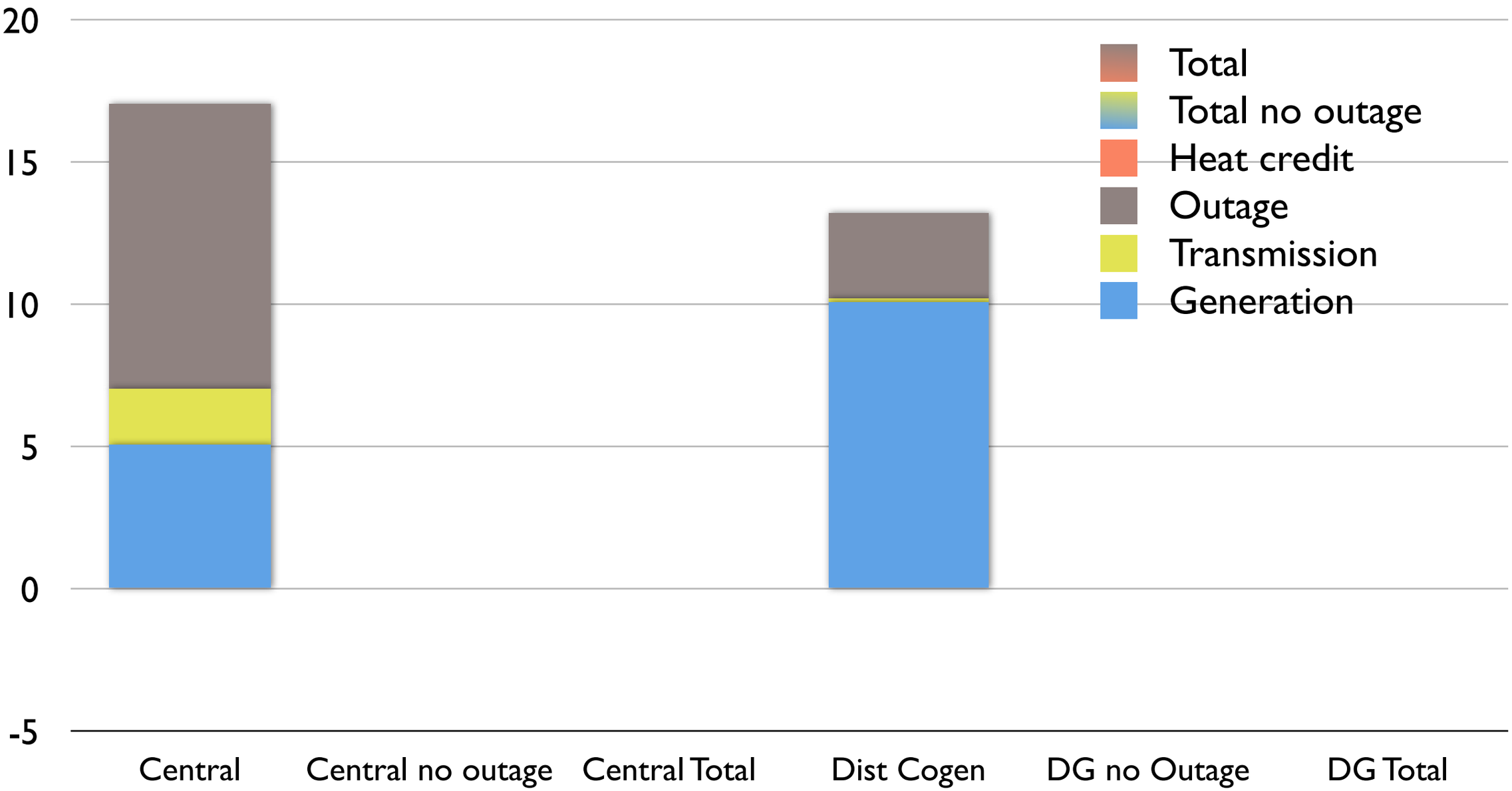

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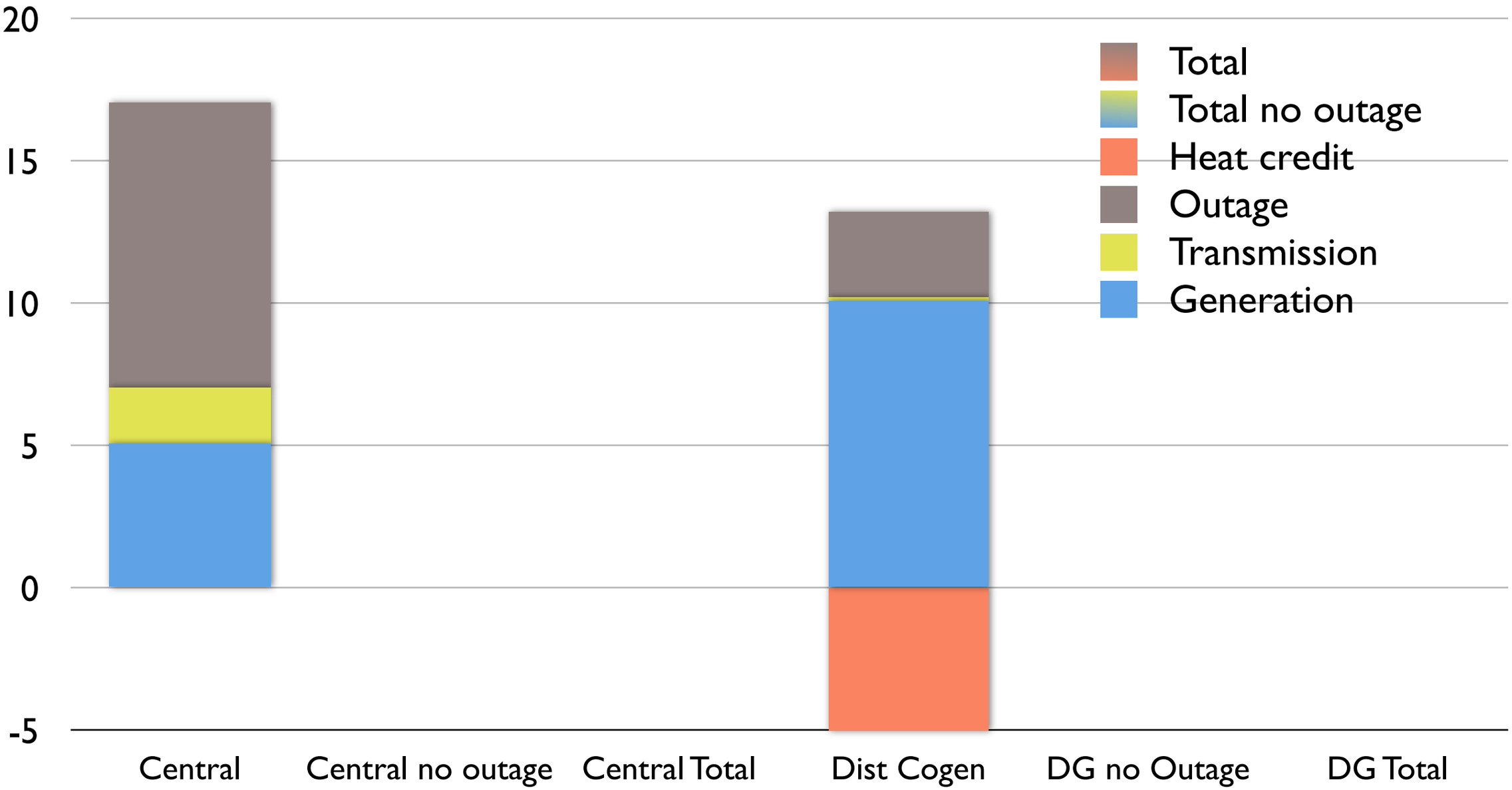

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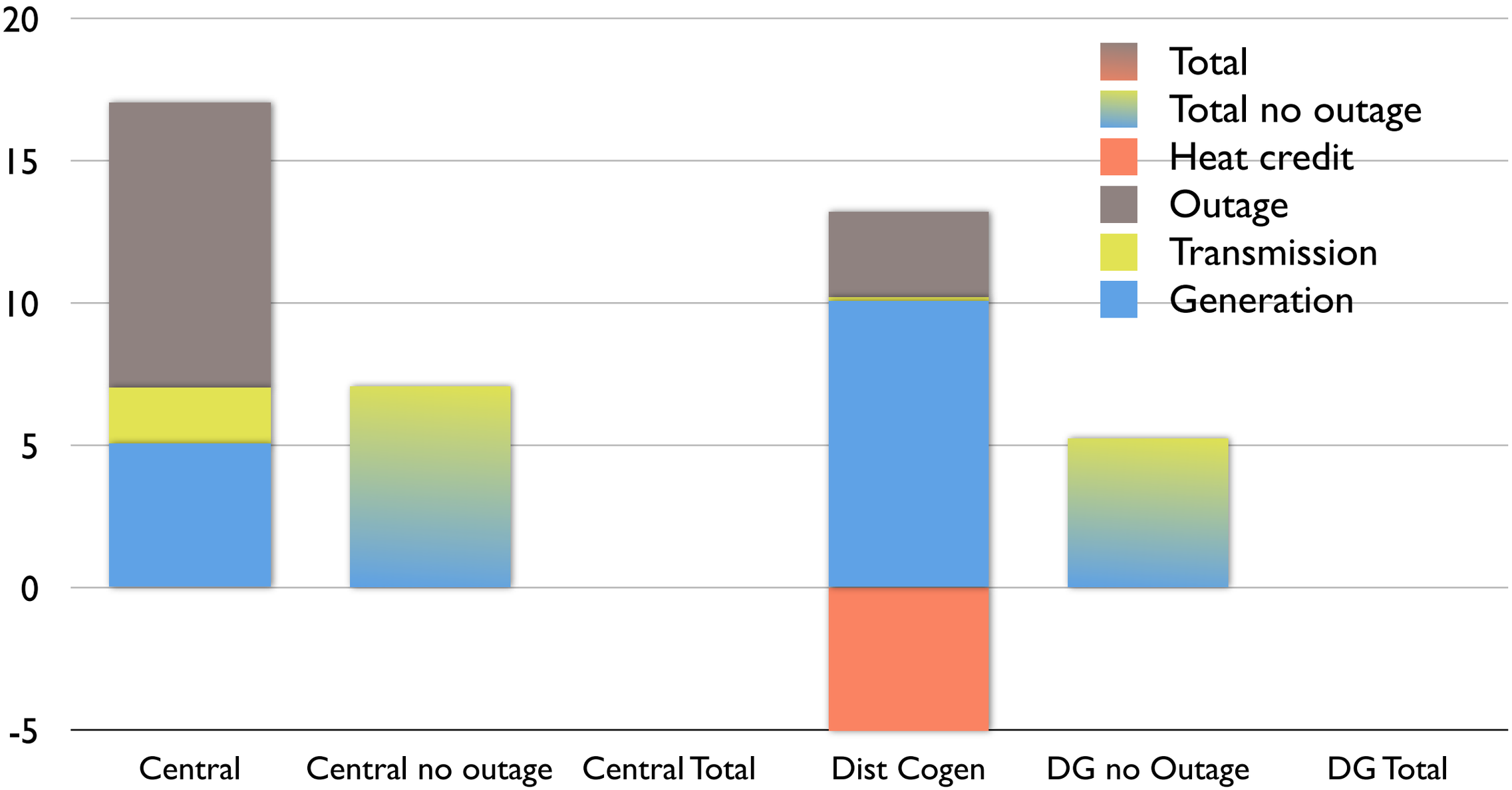

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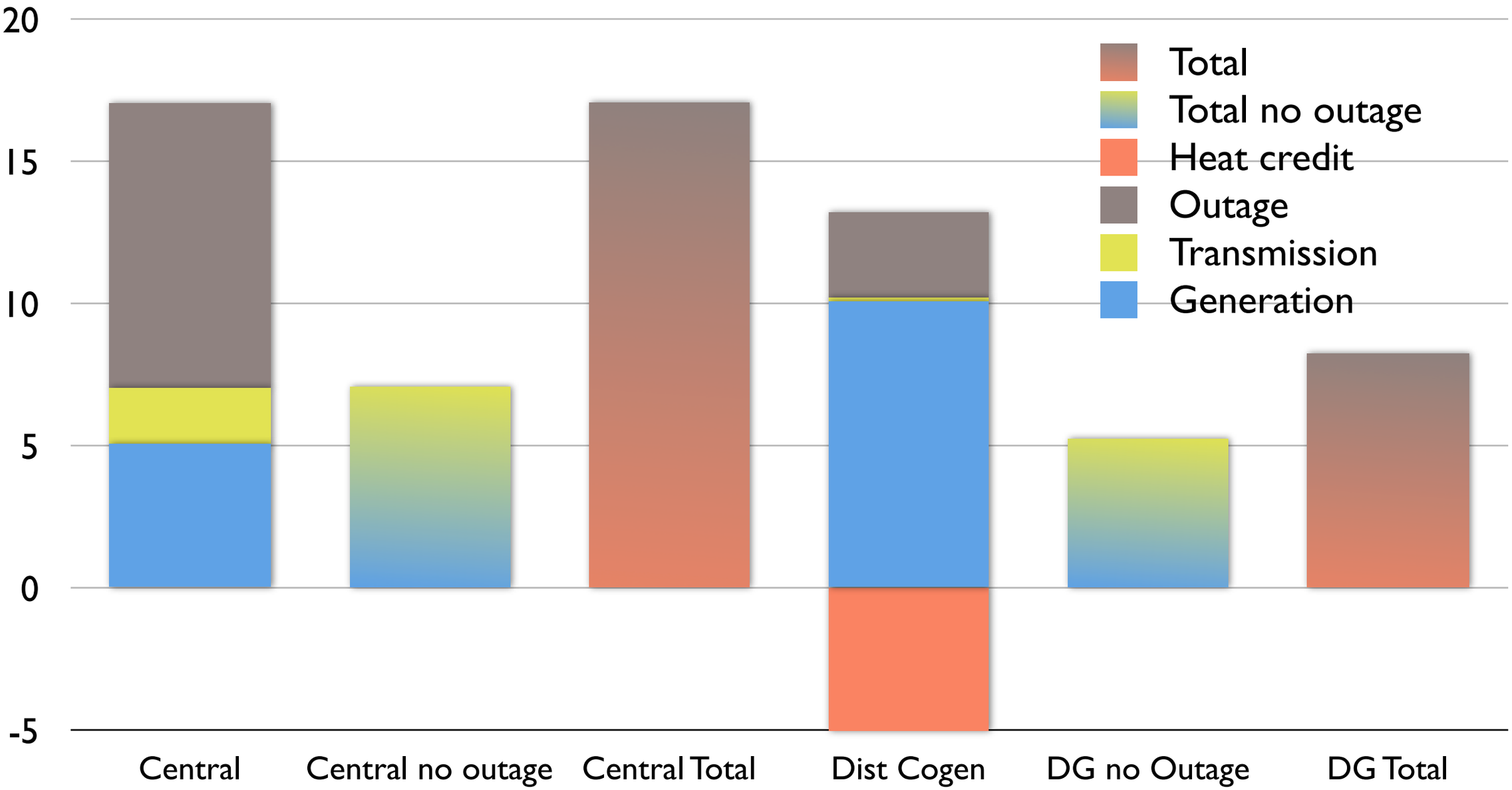


Ideal

- Provincial energy regulations based on integrated resource planning for each consumer class, not supplier.
- Such a move would provide superior:
  - energy efficiency and GHG reductions,
  - reduce congestion on electricity T&D,
  - reduce congestion on gas T&D,
  - and greater energy reliability.
- ... distributed generation would be a key supplier of all these gains

Summary

- Ideal public policy promotes superior energy services at higher efficiency and reliability.
- Distributed poly-generation is a proven corner-stone to this future.
- Canadian policy should be aimed at:
  - engendering competence and trust in suppliers,
  - leading to investments in the right locations, in the right sectors and using appropriate technologies.

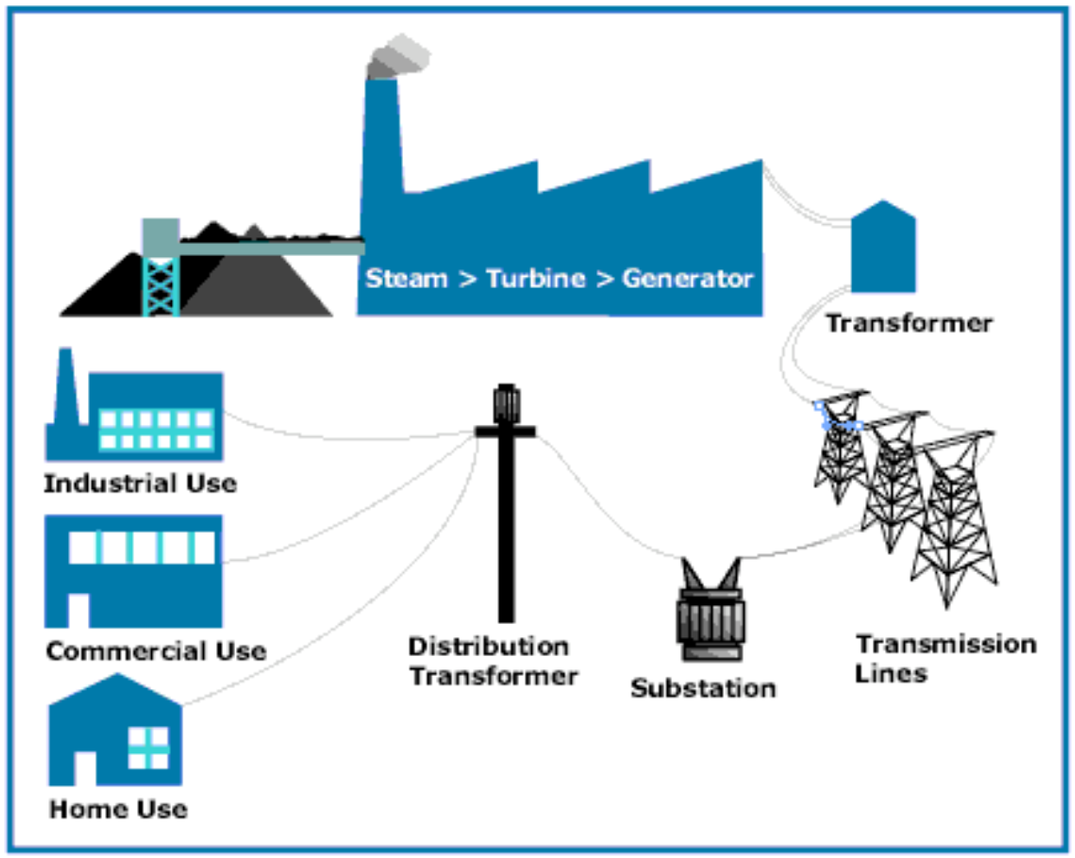
Additional Slides

Economics (II)

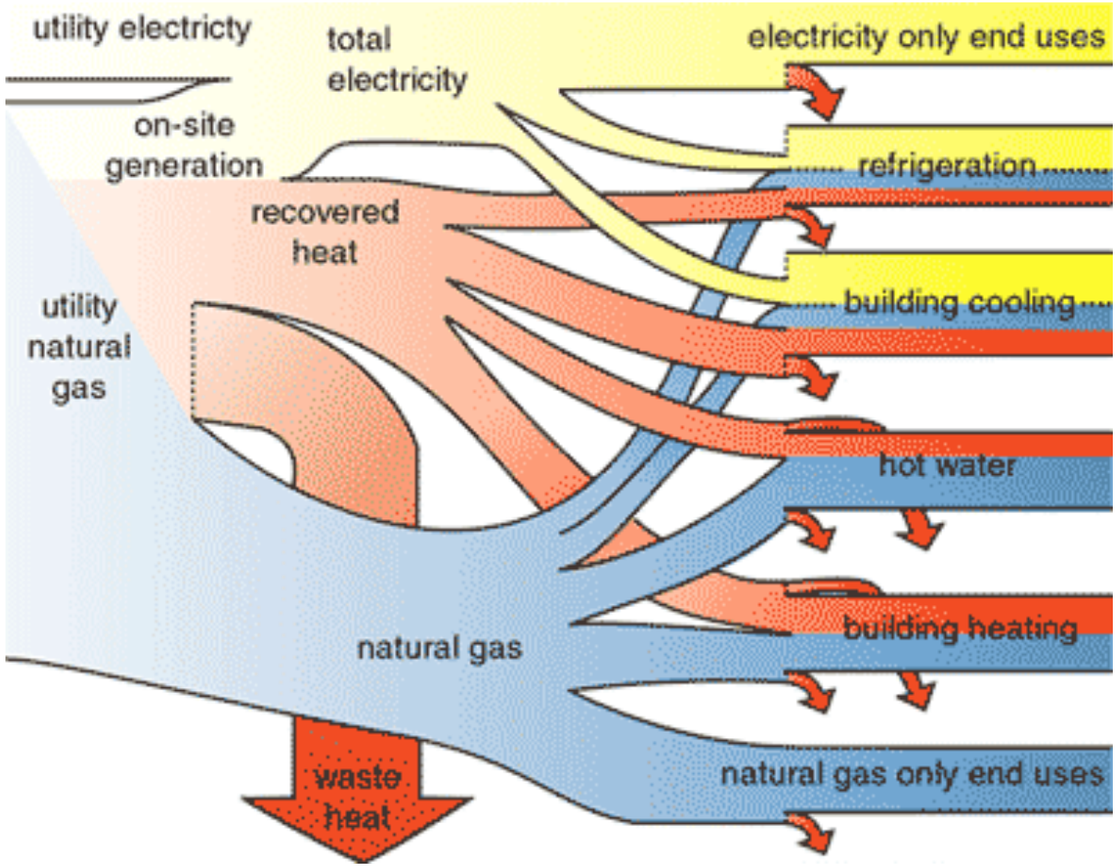
- Most renewable systems provide intermittent supply.
- Purchase contracts should reflect supply reliability.
- Some jurisdictions have energy storage capacity.

- **POLICY**:
  - Impose an electricity generation carbon efficiency standard.
  - Create a market for energy storage services that is open to all generators.
  - Restructure purchase contracts to reflect reliability of supply.

The Promise of Distributed Generation



http://www.tvakids.com/electricity/images/transmission.gif



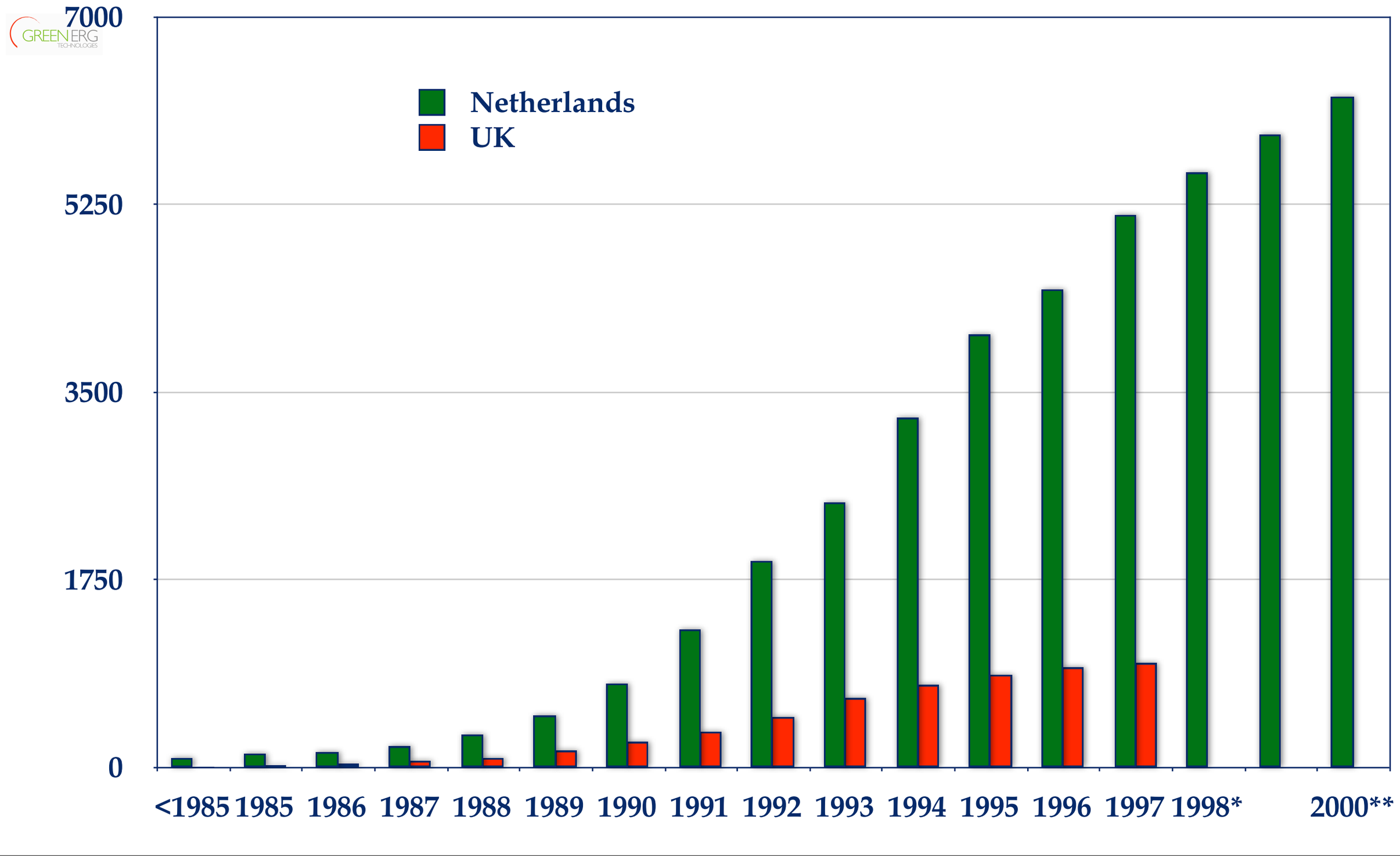
http://certs.lbl.gov/images/migrogrid-flow.gif

Typical gas-fired DG Units

Micro-turbine

IC Engine

Cumulative Installations in the Netherlands & the UK compared (# of Units Installed)



Promotion of cogen in the Netherlands & the UK

	The Netherlands	**The UK**
Capital subsidy	Yes	No
Fuel subsidy	Yes	No
Regulatory support	Yes	No
Information Office	Yes	Yes
Outcome	Exceeded target	Less than 10% of target

Reliability of supply: central generation

- Traditional central power generation uses a 20% margin. This is the capacity of installed equipment above the maximum demand, assuring an economically acceptable level of outages due to generation capacity constraints.
  - The 20% margin is necessitated by planned and forced outages of generation units, and the desire to keep outages below 1 hour in 20,000.
  - Actual outages in industrial countries is much closer to 1 in 1000 due to failures in the electricity transmission and distribution systems.

Reliability of supply: distributed generation

- Electricity delivery systems are designed for operational failure of less than 1 hours in 20,000. In a conventional central power system this leads to a design standard with ~20% capacity above peak demand.

- In distributed generation the planning margin can be 0% and provide a higher reliability standard.

  - If 10x 200MW central power generation units are replaced by 2000x 1MW distributed generation units will provide a much higher level of reliability -- even if the margin of safety is reduced from 20% to 0%.

  - Distributed systems also avoid widespread outages due to cascading faults in distribution and transmission networks.

Conclusions

- Distributed cogen fuelled with natural gas is both economical & environmentally friendly.
- Their successful diffusion depends on tariffs, correct application and mode of operation.
- Their integration into the energy infrastructure reduces load on gas delivery pipeline.
- Depending on their integration design, they can significantly improve reliability of supply.