



**SMART GRID**  
INNOVATION NETWORK



# A SYSTEMS APPROACH TO ENABLING RENEWABLES IN CANADA

HOSTED BY MARINE RENEWABLES

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# WHY RENEWABLES?

## OFFSHORE WIND AND SOLAR PROVIDE CLEANER ELECTRICITY

### Electrification Enables De-carbonization

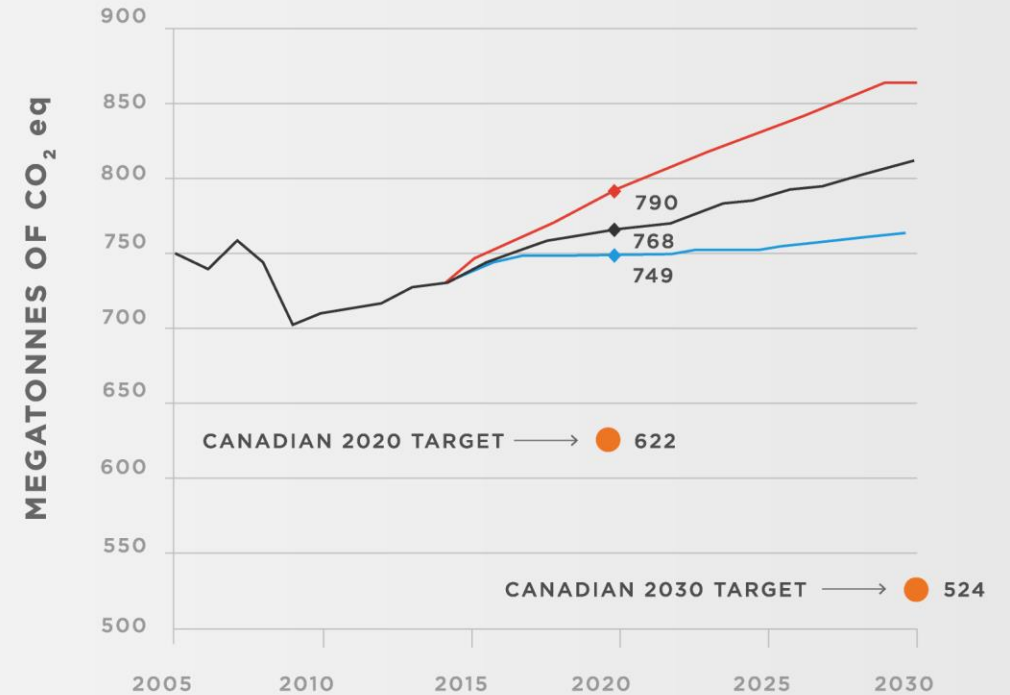
“One of the most economical means of lowering carbon emissions can be achieved by lowering a number of end uses of fossil fuels to electric loads supplied by zero-emitting renewable resources...including transportation, heating plants, industrial processes”<sup>1</sup>

## MORE ELECTRIFICATION OF GENERATION AND LOAD = A PATH TO DECARBONIZATION

<sup>1</sup>Michael Henderson in IEEE July 2018

<sup>2</sup> Environment and Climate Change Canada

CANADA'S EMISSION PROJECTIONS IN 2020 AND 2030 (Mt CO<sub>2</sub> eq)



GHG Emissions Forecast<sup>2</sup>

**EFFECTIVE  
POLICY**

**CLEAN ENERGY**

**CLEAN END USE**

GENERATION  
& TSO COMPANIES

TSOS

PROVINCES/  
MUNICIPALITIES

COMMERCIAL /  
PUBLIC BUILDINGS

RESIDENTIAL  
BUILDINGS



GOVERNMENT

HARVESTERS/  
TRANSPORT

ENERGY RETAILERS /  
TRADERS

DSOS

INDUSTRY

INFRASTRUCTURE

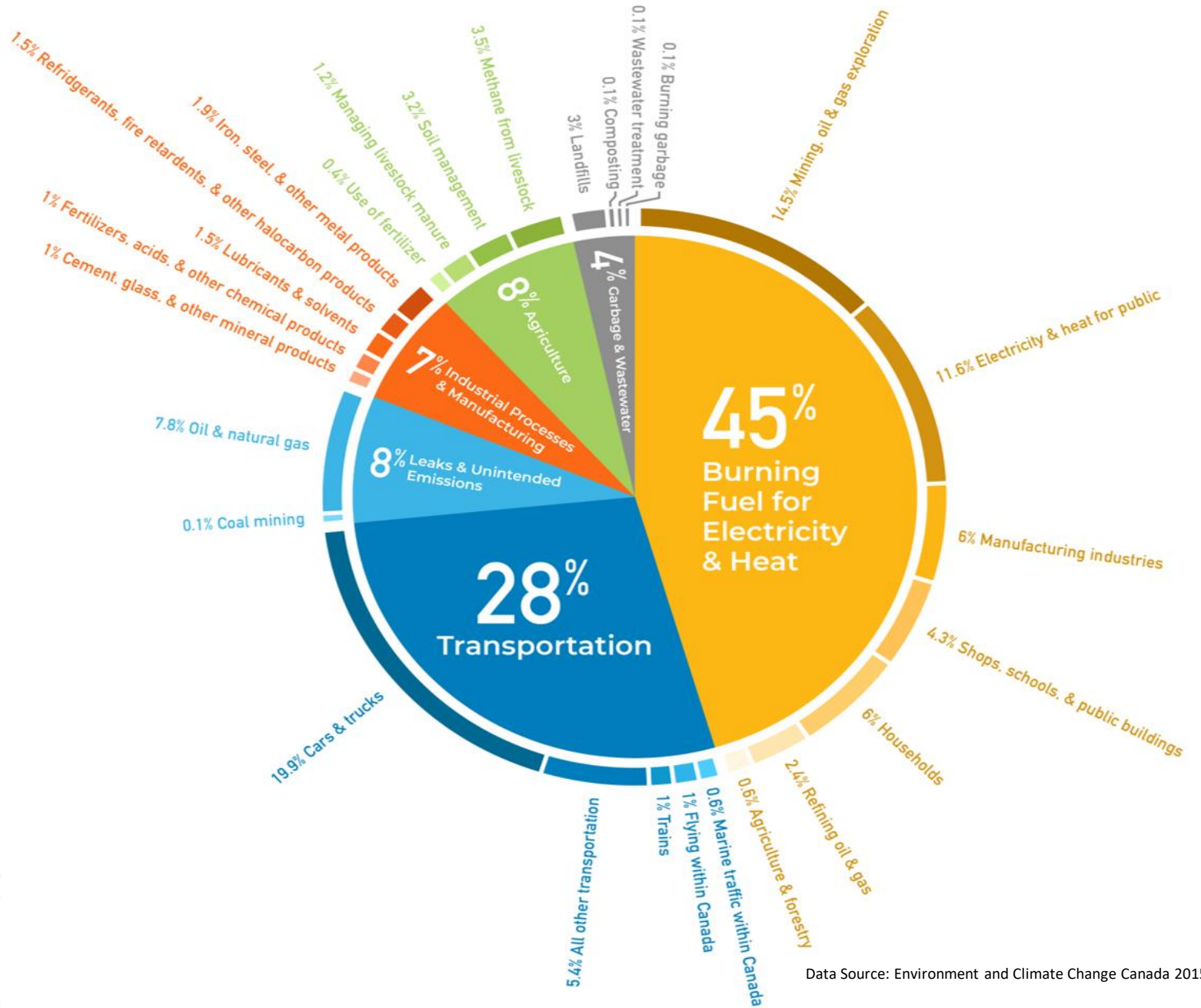
# THE OPPORTUNITIES

## Convert Uses to Electricity

73% of emissions are from Transportation, Electricity Generation and Heat (Total 735 MtCO<sub>2</sub>e)

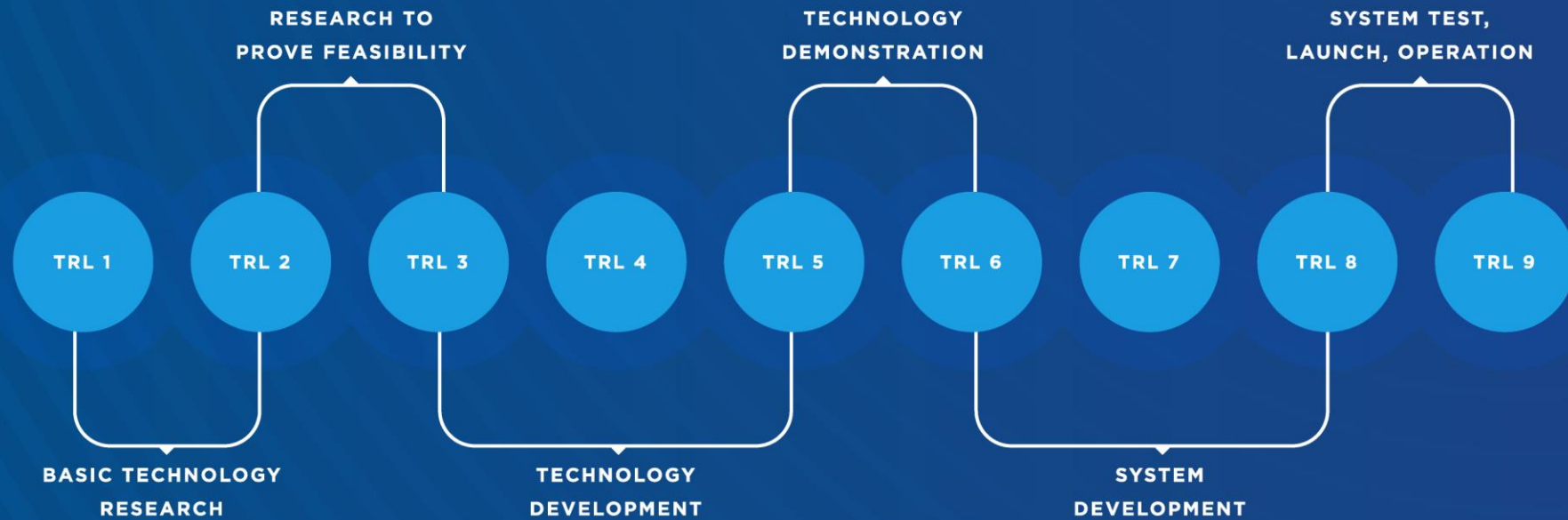
## Add renewables for current and expanding uses

9% of total emissions is from electricity, making up 19% of electricity generation (Total approx. 650 TWh per year)





# FROM R&D - PILOT - OPERATIONS - SCALE



THE BARRIERS TO SCALE?

# WHAT NEEDS TO BE ADDRESSED?

## Enabling Policies:

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- **Human Resources:** Transformational multi layer education/skill
- **Standards and Regulations:** Lagging behind technology, market acceptance, interoperability, security
- **New business models:** Aggregator, new flexibility based energy currencies, central enabler(s)
- **Regulatory:** Localized market design, change to capital bias/rate linkages, change to be innovation leading, streamline regulatory frameworks, Inter-jurisdictional clean energy agreements
- **Decision Support Tools:** grid & market hub, decarbonization dashboard, real time operations (ESP), strategy development
- **Sector redesign: Systems based** approach, organization(s) to guide R&D efforts at a regional then national level

## Enable Clean Energy Inputs

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- **Generation** - increase overall clean capacity – wind, nuclear, solar, hydro, (clean) hydrogen, tidal, bio fuels
- **Electrical Grid intelligence** - redesign of systems to enable high flexibility, more distributed system generation and resilience
- **Oil/Gas/Coal Infrastructure** - opportunities of reduced/optimized usages

## Increase Clean End uses:

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- Electrify **heat, transportation,**
- **Remote** community clean solutions,
- **Smart building** / community (SGA) / municipality, province / region,
- Energy and Industry **4.0**

# A NEW ENERGY FUTURE



## REMOVE THE FRICTION FROM WORK

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- Structured Collaboration
  - Data Sharing
  - Better decision making



## EDUCATE – NEW AND OLD GENERATIONS

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- New Business Models
  - New Technologies
  - New business cases



## POLICY GOALS

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- Financial incentives/disincentives
  - Community input in energy planning
  - Vision alignment



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**THANK YOU**

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