

Sri Lanka – Decarbonization Strategy

Ceylon Chamber of Commerce
and IITM Research Park



A land of plentiful renewable energy
resources, least waste lifestyle and harmony

Strategy: Make Going Green financially viable

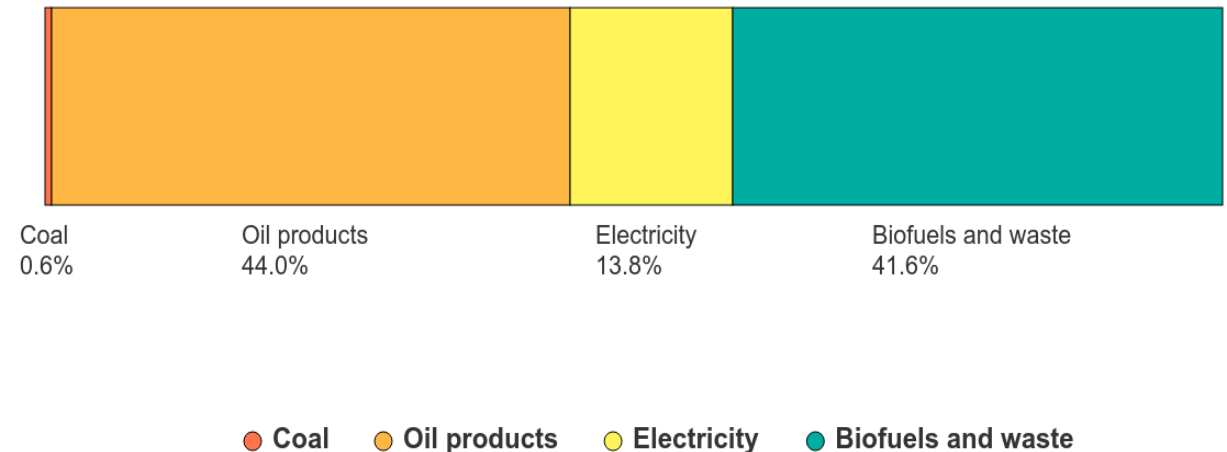
- Replacing use of fossil fuels with **Green** Electricity and enhancing **energy efficiency**
 - Will reduce GHG emissions
 - Will reduce pollution
- Equally important is to make each technology financially viable
 - such that its introduction will save **money**

- I. Convert fossil fuel usage to **Electricity**
 - a. Move **transport** to Electricity
 - b. Move **heating and cooling** (industry, commercial and domestic) to electricity and **maximise** energy **efficiency**
- II. Move Electricity generation to **Green**
 - a. Balance Supply and Demand using **hydro, Storage and Grid**
 - b. **Connect** Sri Lankan Grid to Indian Grid
- III. Reduce **Cost** of Energy Generation
- IV. **Recycle** Solar, Batteries and everything else
- V. Develop / acquire Technology and carry out **local manufacturing**
- VI. **Nurture** Sri Lanka **young talent** to carry out technology development

I. Converting fossil-fuel usage to Electricity

- Sri Lanka consumes 100 TWh of energy per year
 - About 45% from imported oil
 - Contributes significantly to Sri Lankan GHG emissions
 - Hurting Sri Lankan economy badly
- Can Energy Usage in Sri Lanka be converted to mostly Electricity?
 - Will this enhance energy efficiency?
 - Will this be economically viable?

Total final consumption, Sri Lanka, 2021



Fossil Fuel (Coal, gas and oil) usage today

- Transportation
- Industry usage
 - Heating and Cooling
 - Direct use of coal, oil and gas: Fertiliser, cement, steel, glass, chemicals, plastic, tar, wax and others
 - IC engine for Construction and Industry
 - Lighting: already moved to electricity
 - Miscellaneous
- Cooking

Fossil Fuel → Electricity Usage

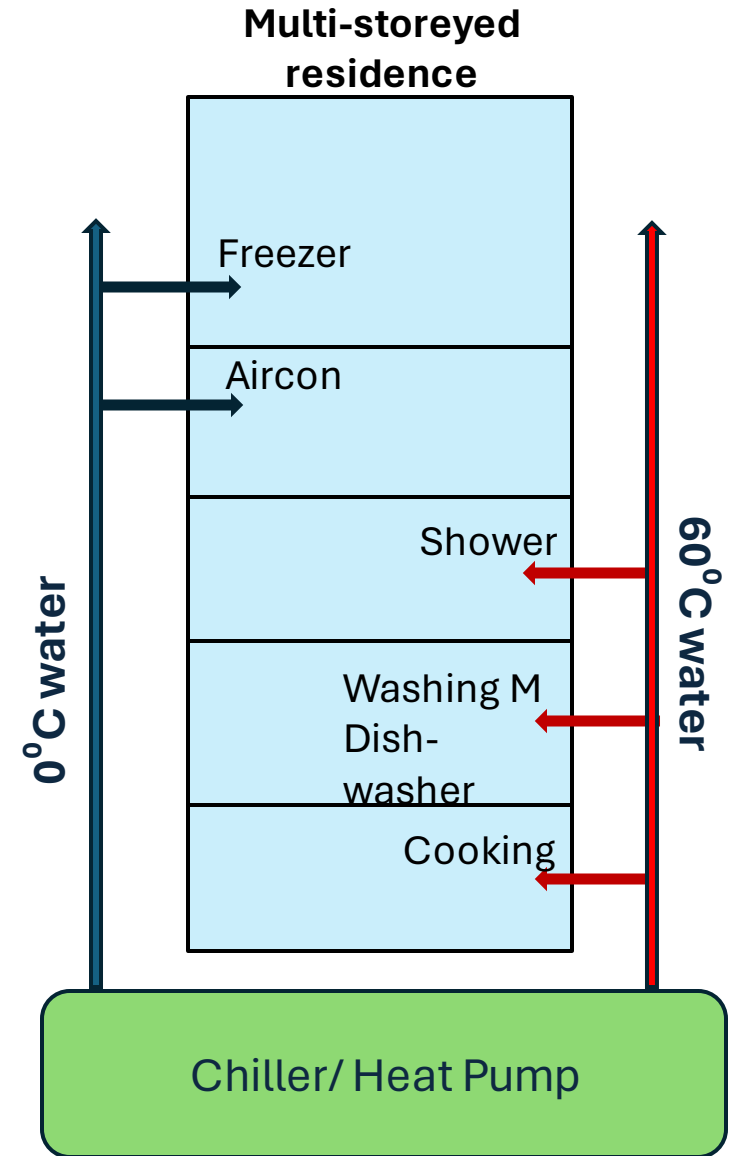
- Low-cost fossil fuel has hurt use of electricity so far
 - R&D and Innovation required to drive **Green Electricity** Usage of energy to become financially viable
- Transportation and use of IC Engine
 - Electricity driven motors and controllers to **replace IC engine**
 - Will require energy storage (battery)
 - Technology available today: Costs rapidly coming down and becoming financially viable
 - Academia and R&D needs to continuously innovate to accelerate transition
 - Industry needs to **commercialise technologies** and drive change
 - Government must **enable policy**
 - Shifting transportation fully to electric can **cut country's fossil import** to half
 - Must shift Railways to electricity

Heating and Cooling

- Fossil based Heating dominant today: can we replace it by electric?
- Electricity can **drive heating and cooling using Carnot Cycle**
 - Significantly enhance energy-efficiency
 - **Chillers** can cool to sub-zero temperature using right refrigerant
 - **Heat-pumps** can provide up to 150⁰C heating today
 - Higher temperature Carnot engines under R&D
- Simultaneous use of Heating and Cooling will enhance energy efficiency significantly
- Higher temperature heating would need either electric arc-furnace or Green Hydrogen
 - R&D and Innovation can make it financially viable in next few years

District Heating and Cooling for homes and offices

- Heating and Cooling consumes **50% or world's energy**
 - Fossil fuel based → highly inefficient
- Electric Heating/cooling: heat-pumps/chillers
 - 1 kWh electricity → 4 units of heat + 4 units of cooling (COP= 8)
- Hot and Cold-water pipes can be taken to each flat
 - Cold water for refrigerator, freezer and air-con
 - Hot water for Shower, Washing machine, dishwasher and cooking
 - **60°C water will help reduce cooking energy**
 - LPG cooking → induction stove



Cooking

- **Gas dominates** as cooking fuel today in South Asia
- Cooking using Induction stove highly efficient
 - But its costs will still not compete with subsidised gas-based cooking
- **Hot water availability in kitchens** using heat-pumps + induction-stove cooking will **make electricity viable for cooking**

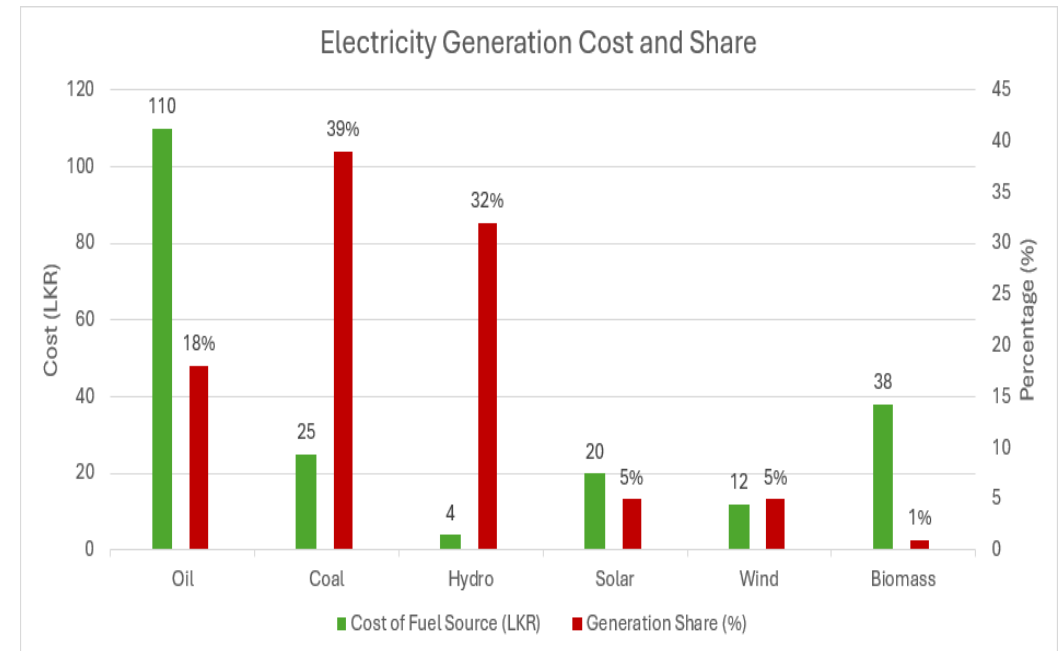
Biofuels

- 40% of energy in Sri Lanka comes from Bio-fuels today
 - Need continuous nurturing
- Should **explore use of Bio-Char**

II. Move Electricity generation to Green

Currently, 60% of SL electricity is fossil based

- Electricity from Renewable energy in Sri Lanka **costs less** than that from fossil fuels
 - Fossil fuel increases import bills
 - Has significant GHG emissions
 - Solar PV Costs can be further reduced
- Renewable energy potential in Sri Lanka is around 163 GW
 - Solar = 16 GW
 - **On-shore** + off-shore wind = 147 GW



Matching Supply and Demand

- Solar and Wind-based electricity is not controllable
 - To match supply with demand, one would have to control other sources of electricity generation
 - Fortunately, Sri Lanka has large hydro-electric generation plants, which can be **managed**
 - Must also develop use of **pumped hydro** as storage
 - Develop **Battery** based energy storage
- **Connect** Sri Lanka Grid to South Asian Grid to assist in demand-supply management and enhance RE usage in sub-continent
 - Wind generation in South Asia increases significantly during certain months and would need larger grid and storage

III. Reduce **Cost** of Energy Generation

- Cost of Energy as well as Electricity in Sri Lanka is very high
 - Hurts its people
 - Hurts its industry and economy
- Fortunately, Green (solar, wind and hydro) electricity generation is lower than that from fossil-fuel
 - Similarly, use of Green electricity as energy instead of using fossil-fuel directly also reduces costs
- Sri Lanka must accelerate usage of Green electricity to reduce cost of energy

IV. **Recycle** Solar, Batteries and everything else

- Technologies available today for complete recycling for batteries and solar panels
 - Possible to recover 90% to 95% raw material used and Reuse
 - Cost effectiveness can be further improved through innovations
 - Need streamlining of collections and processes so that every battery and solar panel are recycled
 - **Policy could drive industry faster**
- **R&D and Innovations** needed to help **improve process** and ensure full circular economy
 - Opportunity for Sri Lanka to recycle not just for itself but for the world
 - Will help overcome limited availability of materials in Sri Lanka

V. Develop / acquire Technology and carry out **local manufacturing**

- Large Markets needed to drive a new Technology: Sri Lanka should work towards a South Asia Strategy
- Sri Lanka should however be an important contributor to technology and not just be a market
 - In some technology area / subsystems, it should strive to **become a player**
- An eco-system of Industry – Academia - Startups Collaboration would **accelerate** this
 - IITM Research Park is an example

VI. Nurture Young talent to carry out technology development

- 400K youngsters in Sri Lanka turns 22 every year
 - They must be inspired to take up the development of Green Sri Lanka
 - Higher Education must focus on making them creative and innovative
- Possible to train and motivate them to master technologies
 - **Create** environment for entrepreneurship and innovation
 - **Right eco-system** of Startups, Industry and Academia
 - Collaborate extensively with similar organisations in India and South Asia
- South Asia can become Technology and Innovation hub for the world

To Sum Up

- **Aggressive adoption** of Green Energy would benefit Sri Lanka
 - Will benefit its economy
 - Could help its industry grow rapidly
 - Could inspire and enable youngsters in Sri Lanka

Technologies towards Net - Zero

Domestic	Industry / Commercial	Transport
Renewable Energy: Solar, Wind, Hydro		
Inter-connected Grid		
	Green Hydrogen Production	Electrification of 2, 3 and 4 -wheelers
Heat Pumps & Chillers		Retrofitting & EV charger infrastructure
Energy (Demand – Supply) management and Energy Storage: Pumped-hydro, Batteries and Thermal Storage		
	Electrification of construction equipment	
Sustainable Construction Materials		

Thank You!