Renewable Energy's Role in the Transition to Zero Carbon Electricity Sectors

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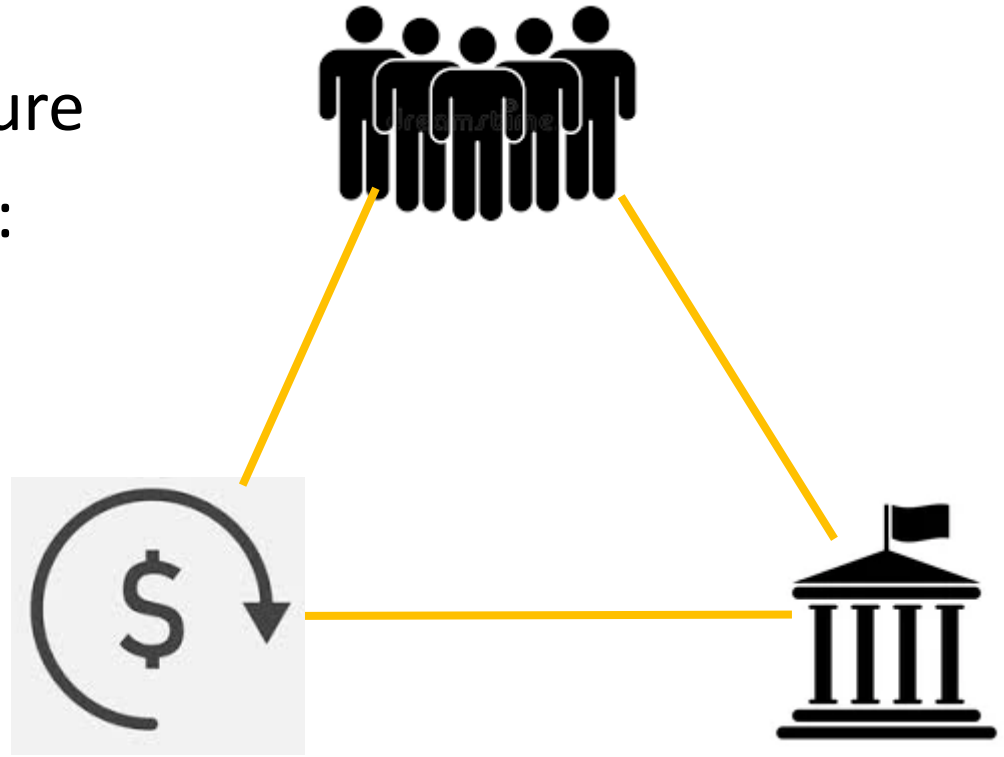
Who are we - CREEC - Arava Institute?

- Renewable Energy Workshop
- Global Monitoring Laboratory
- Organic Waste Recycling
- Biogas Production
- Energy Poverty
- Energy Security
- Water Energy Nexus
- Social Acceptance of Renewable Energy Technology
- Waste to Energy
- Battery Storage
- Internships
- ……..

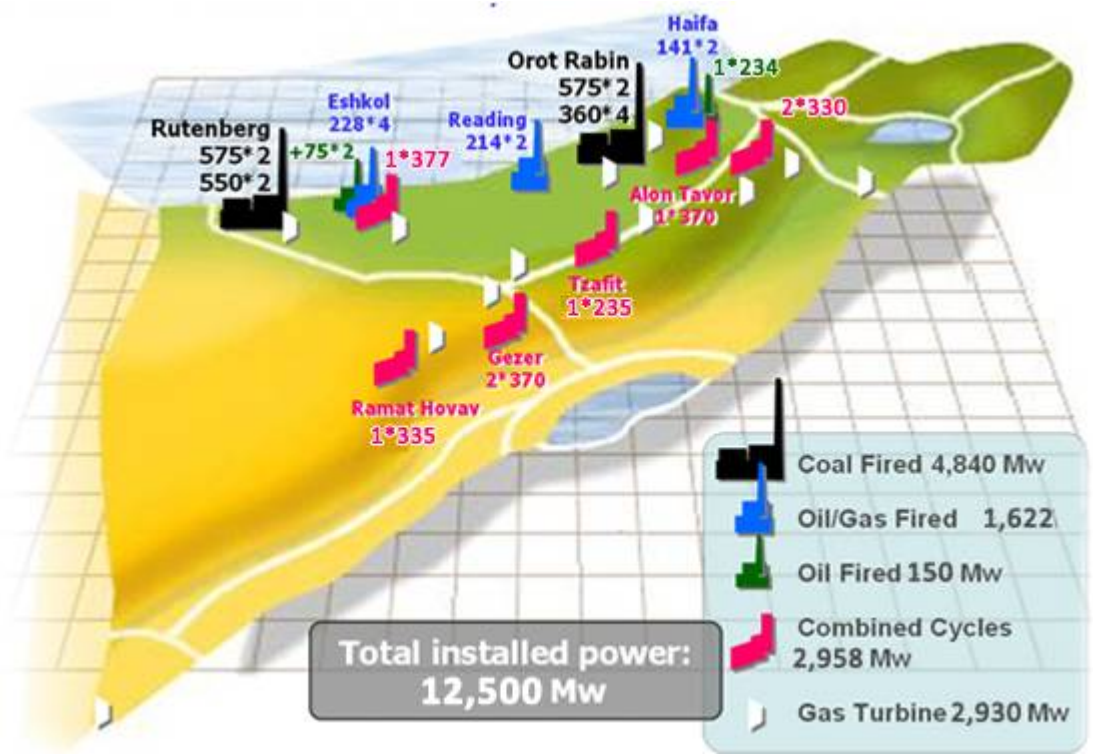
Dr. Tareq Abu Hamed

I. (Renewable) Energy Transition

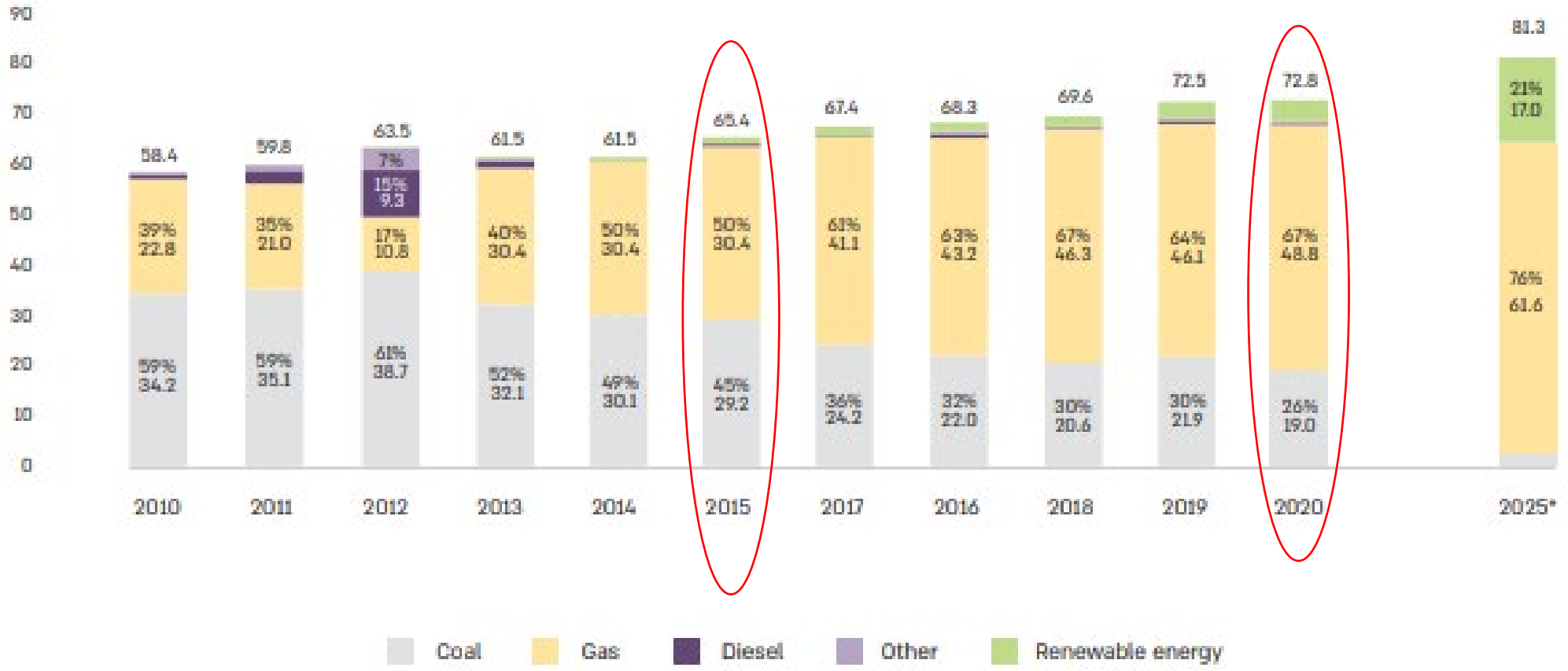
- Energy Transition: “growth and prosperity without petroleum and uranium” (Strunz, 2014)
- Energy Transition & Culture
- Energy transition drivers:



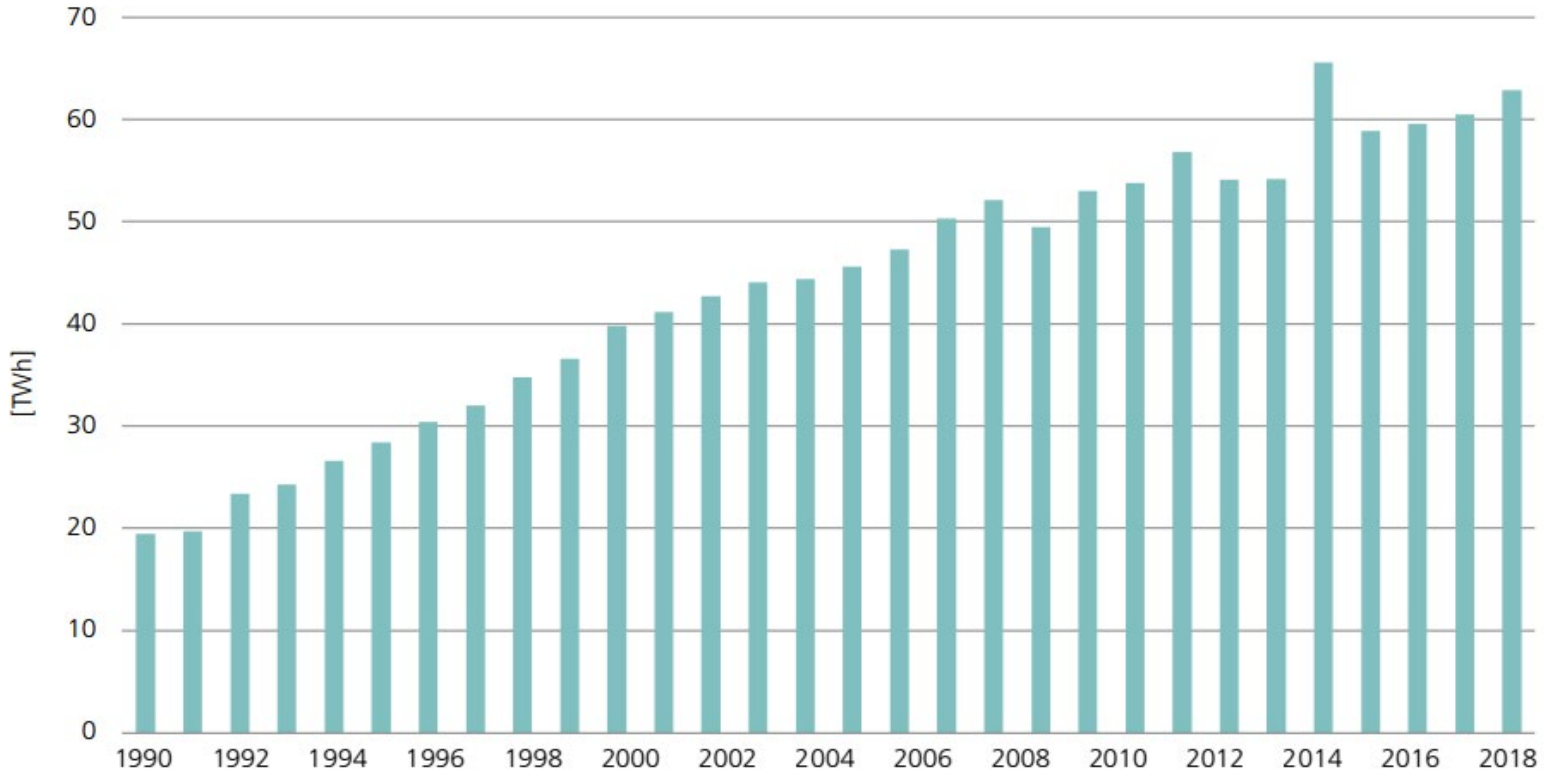
II. Energy Transition - *Israel*


Haifa
141*2
1*234
Orot Rabin
575*2
360*4
Eshkol
228*4
Reading
214*2
Rutenberg
575*2
550*2
+75*2
1*377
2*330
Alon Tavor
1*370
Tzafit
1*235
Gezer
2*370
Ramat Hovav
1*335
Coal Fired 4,840 Mw
Oil/Gas Fired 1,622
Oil Fired 150 Mw
Combined Cycles
2,958 Mw
Gas Turbine 2,930 Mw
Total installed power:
12,500 Mw

Energy in Numbers



Electricity consumption



(Source: based on data from IEA, 2020a)

What do we need for a successful renewable energy transition?

a) Society
b) Policy
c) Technology

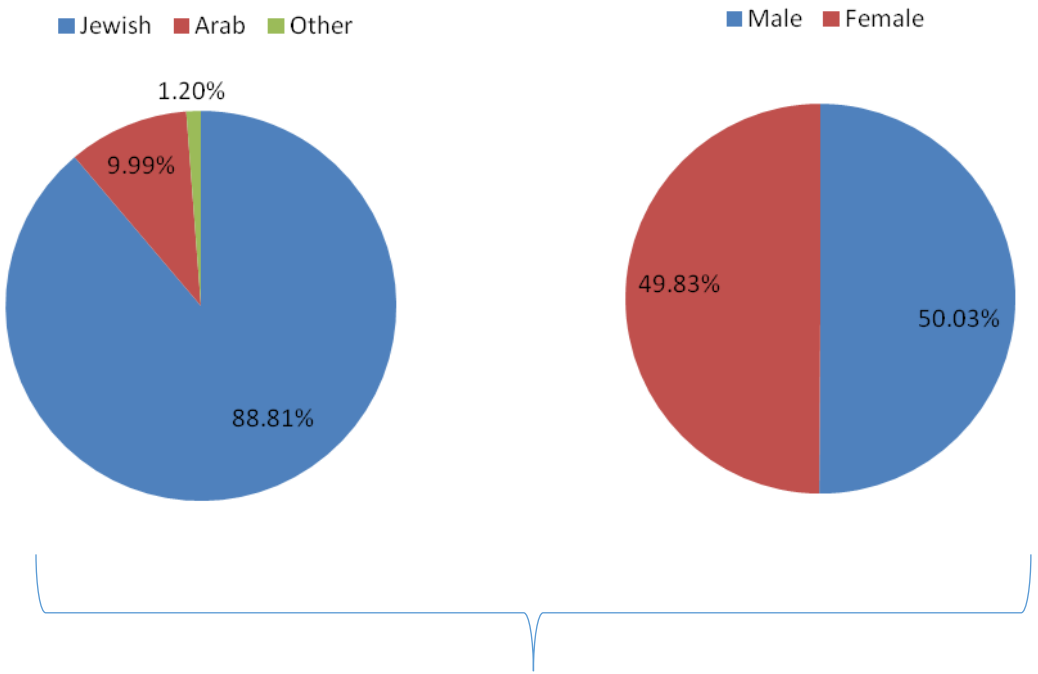
a) Society

- Education
- Research
- Citizens Involvements

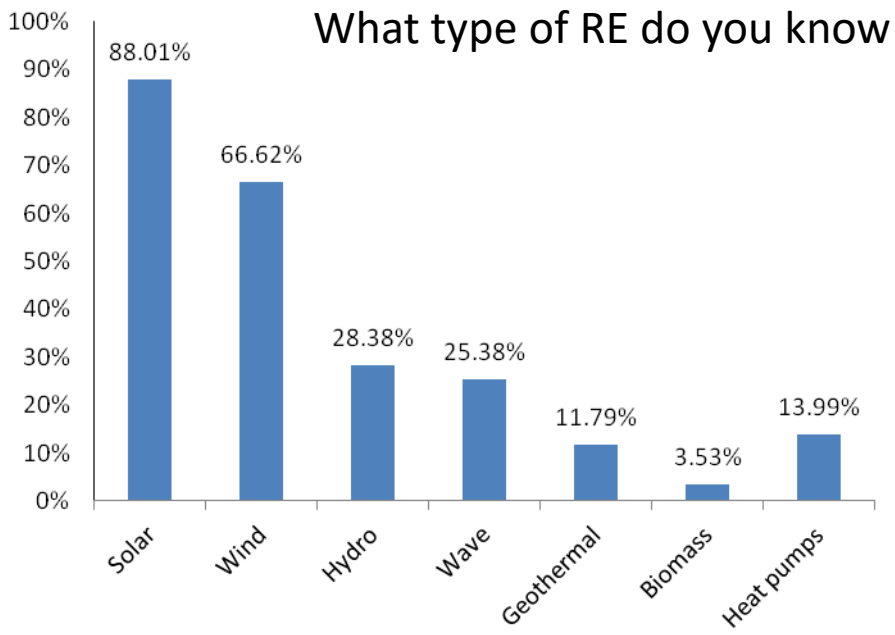
(e.g. Community Energy, Prosumerism)

- Public Awareness and Social acceptance

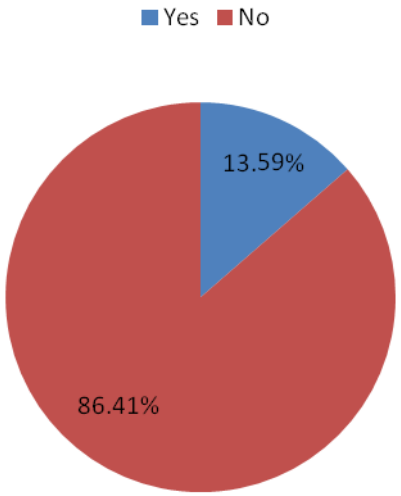
Society Awareness and Acceptance of RE



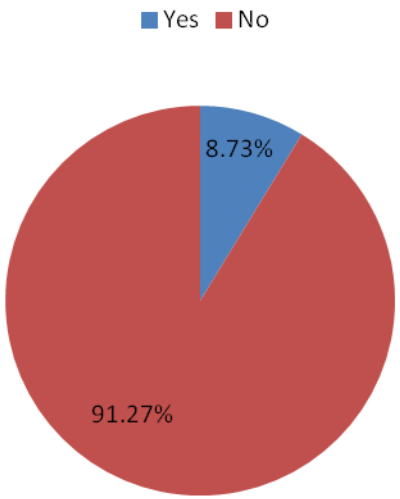
Demographic Information



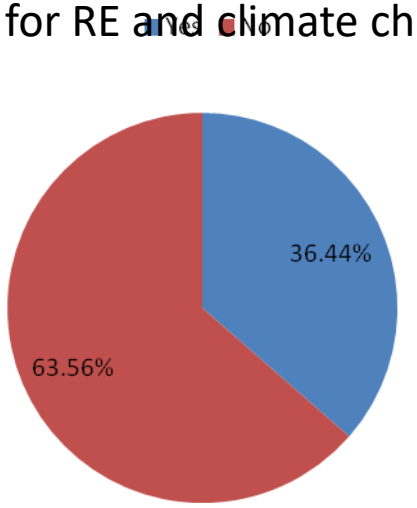
Do you know the country's policy and goals for RE and climate change?



Do you know the regulation and national standard in Israel regarding RE?



Do you think you have an influence on decision-making regarding state policies and goals for RE and climate change?

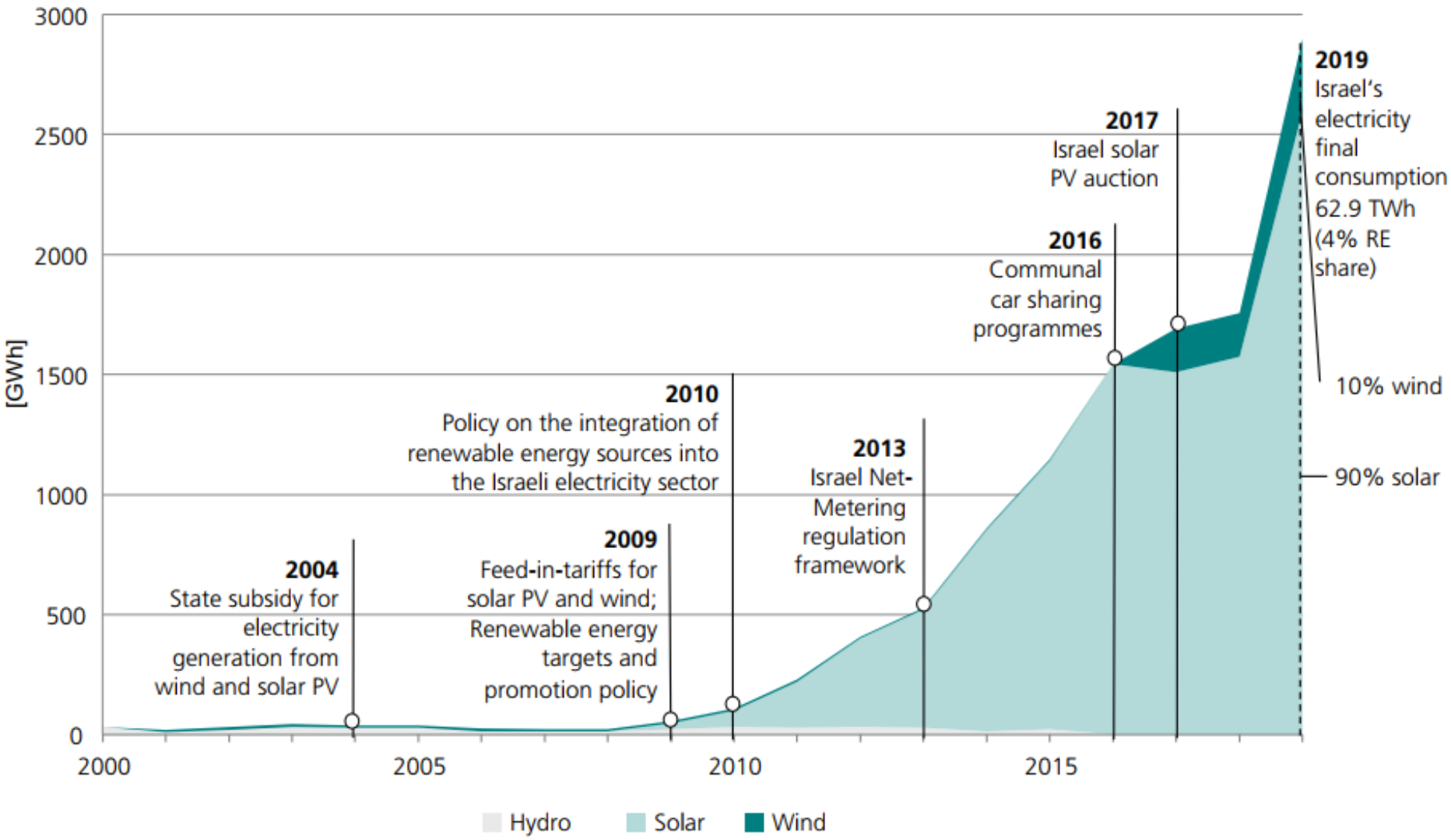


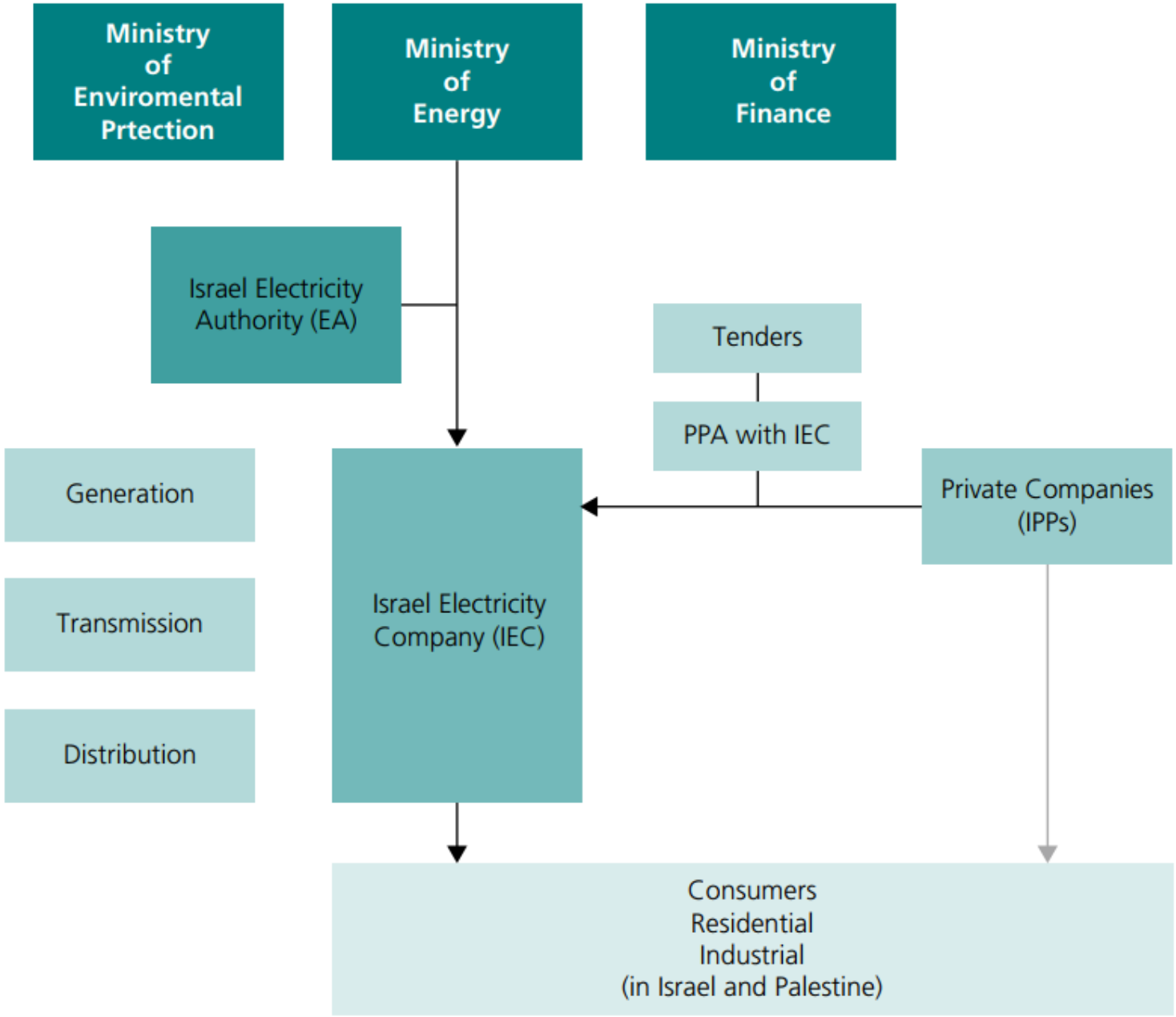
b) Policy

National Target	Latest Reported Value (2016)	Target Value (2020)	Target Value (2025)	Target Value (2030)
National Energy Efficiency Target	62.5 TWh	64.2 TWh	-	80 TWh
National Renewable Energy Target	2.6%	10%	13%	17%
National target for private car mileage reduction	43.9 million vehicle-km	-	-	44.4 million vehicle-km

1980: Domestic Solar Water – Heaters:

"solar water heating system for new residential buildings up to a height of 27 m.
The law was extended in September 2012 and now also applies to buildings above 27 m, stipulating the installation of solar water heaters for the first seven floors under the roof"




Ministry of Enviromental Prtection
Ministry of Energy
Ministry of Finance
Israel Electricity Authority (EA)
Tenders
PPA with IEC
Generation
Transmission
Distribution
Israel Electricity Company (IEC)
Private Companies (IPPs)
Consumers
Residential
Industrial
(in Israel and Palestine)

c) Technology

Los Angeles Times

NASA turns technology back toward Earth to focus on climate change

NASA Administrator Bill Nelson, right, takes questions after speaking to the Mars Perseverance mission team at Jet Propulsion Laboratory in La Cañada Flintridge. (Gina Ferazzi / Los Angeles Times)

Wednesday, October 20, 2021

46° Clear

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American innovators, not regulators, will solve climate change

By Quill Robinson Oct 17, 2021

BUSINESS NEWS

CarbonCapture Inc. Closes $35 Million Series A Funding

BY ANDY VITALICIO
Published on Tuesday, October 19, 2021 | 5:35 pm

Adrian Corless, CEO of Carbon Capture Inc. at company HQ in Pasadena, Calif. (Photo by James Manning)

Pasadena-based CarbonCapture Inc., a climate tech company that makes machines that remove carbon dioxide (CO_2) directly from the atmosphere, said they have closed a $35 million Series A funding round

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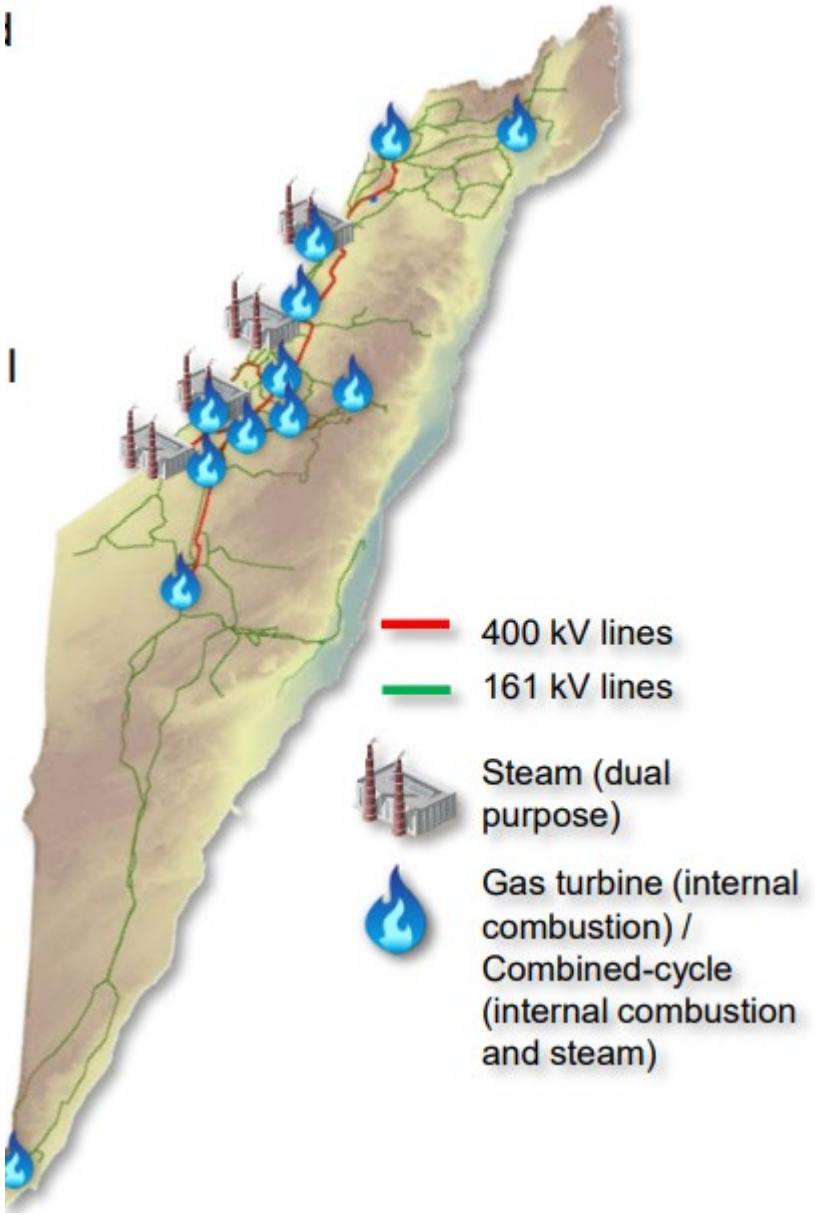
Explainer

Climate change: Seven technology solutions that could help solve crisis

Tuesday 12 October 2021 17:26, UK



Generation (1)

12.8 GW
Installed capacity

16
Power stations

Transmission (1)

5,661 km
High and ultra-high voltage transmission grid

215 (2)
Switching stations & sub-stations

Distribution (1)

66,670 km
Medium and low voltage lines

2.9 mn
Customers

Operational and planned RE projects

Operational wind power plants				
Site	Har Bnei Rasan	Gilboa	Sirin I	
Installed Capacity (MW)	6	12	9	
Planned wind power plants				
Site	Golan Heights	Suez Gulf		
Installed Capacity (MW)	189	500		
Status	PPA to be signed	–		
Operational solar power plants (CSP and PV)				
Site	Ashalim Plot A	Ashalim Plot B	Ashalim	Zeelim
Type	Solar thermal (parabolic trough)	Solar thermal (solar tower)	PV	PV
Installed Capacity (MW)	110	121	30	120
Planned solar power plants (CSP and PV)				
Site	Dimona solar power plant (PV)			
Installed Capacity (MW)	300			
Status	(under tendering)			
Operational hydro-electric power plants				
Site	Ein HaNatziv	Gesher Snir	Kfar HaNassi	Neve Yaakov
Installed Capaci-ty (MW)	1	2.2	3.45	0.11
Operational hydro-electric pumped storage power plants				
Site	Gilboa			
Installed Capacity (MW)	300			
Planned hydro-electric pumped storage power plants				
Site	Nesher, Jordan Star and Menara			
Installed Capacity (MW)	800 (total, 300 MW already met with Gilboa)			
Status	(under tendering)			

(Source: based on Enkhardt, 2019; Evwind, 2020; Negev Energy, 2016; The Windpower, 2019; Verma, 2020; Israel Government, 2019a)

Storage - Energy storage systems (ESSs) can be classified into five major groups:

1. Mechanical systems such as pumped hydroelectric storage (PHS), compressed air energy storage (CAES), falling weights, and flywheel energy storage (FES);

2. Chemical systems (e.g., hydrogen storage with fuel cell/electrolyser, synthetic natural gas (SNG), and reversible chemical reactions);

3. Electrochemical systems; in particular, different types of batteries;

4. Electrical systems including capacitors, supercapacitors, and superconducting magnetic energy storage (SMES); and,

5. Thermal systems (e.g., sensible heat storage, latent heat storage, as well as thermal absorption and adsorption systems).

- To reach 30% of renewables by 2030, Israel may require around 8 GWh of energy storage.
- Pumped storage quota of 800 MW has been approved that is divided between four projects: Gilboa (already implemented), Nesher, Jordan Star and Menara.
- Other technologies: Compress Air, flywheels

ISRAELI INNOVATION: ENERGYTECH

THERE ARE MORE THAN 100 COMPANIES IN ISRAEL IN THE ENERGYTECH SECTOR

Other sectors - **Mobility:**

1. all private vehicles will be 100% electric,
2. vehicles up to 3.5 tons: 20% compressed natural gas (CNG) and 80% electric,
3. trucks over 3.5 tons: 60% CNG and 40% electric, and
4. busses: 25% CNG and 75% electric

Year	2019	2020	2021	2022	2023	2024
Full electric	10%	10%	10%	10%	20%	35%
Plug-in	20%	25%	30%	40%	55%	83%
Hybrid	30%	45%	50%	83%	83%	83%

(Source: Israel Government, 2019)

Other sectors - **Power-to-X and hydrogen**

- The main driver in the field of power-to-X (PtX) is the private sector, as the government only supports R&D.

- The PtX sector in Israel is currently being studied

Other sectors - **Carbon capture and storage**

- No carbon capture and storage (CCS) technologies are currently in place, but CCS is being studied.
- Saline aquifers within the geological section in the northern Negev.

Necessary steps to decarbonize the electricity system

a) Israel's power sector is considered to be a conventional

power system: the supply-side assets are used as the primary source of flexibility. → Changing to supply and demand –side system.

b) Coupling between all end-user sectors: most of the current energy

transition debates in Israel have so far been limited mainly to the power sector.

c) Upgrade of the grid infrastructure

d) Tax reform for supporting RE

e) Citizen involvement in the RE Transition

"This really is an innovative approach, but I'm afraid we can't consider it. It's never been done before."