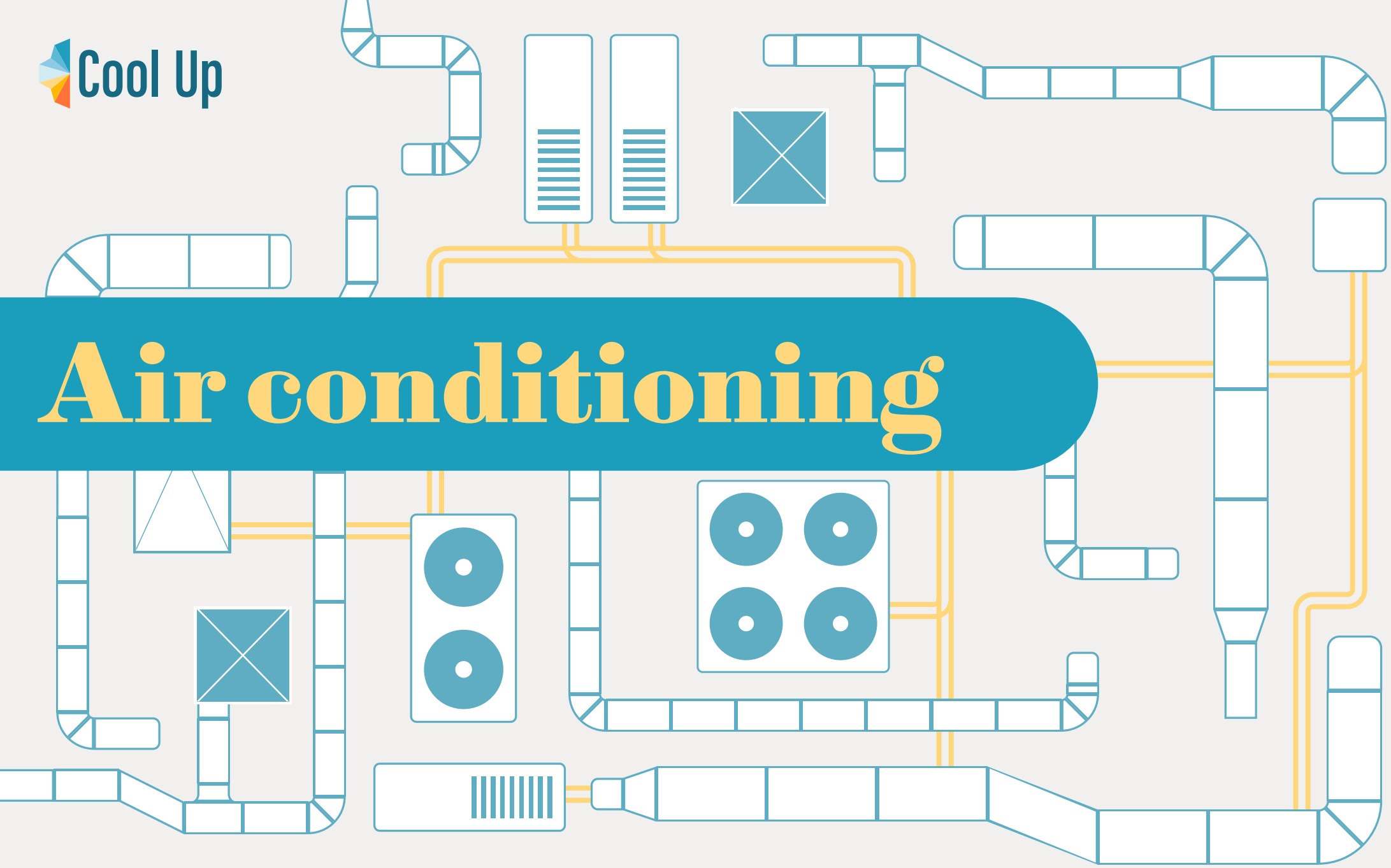
Cool Up

Air conditioning



High efficiency AC equipment

Stand alone systems

Single split units & window / wall units

EXISTING HFC REFRIGERANT SYSTEMS

Size Typical capacity range	**< 12 kW**
Functionality Humidity control Thermal storage	✗ ✗
Refrigerant leakage rates Estimated annual losses	**1 – 10 %**
Typical efficiency range EER Ratio (low to high) *	**2.2 – 5.2**

NATURAL REFRIGERANT SYSTEMS

R744 Carbon dioxide	! Not cost efficient for small systems
R290 Propane	✓ Established & efficient technology
R717 Ammonia	
R718 Water	

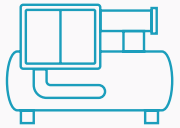
Central systems

VRF / multi split systems
Variable Refrigerant Flow systems

DX / rooftop systems
Direct expansion

Air cooled compression chillers
Air to water

Water cooled compression chillers
Water to water



Water cooled sorption chillers
Water to water

5 – 50 kW	**< 300 kW**	**> 10 kW**	**> 10 kW**	**5 – 5000 kW**
✗ ✗	✓ ✗	✓ ✓	✓ ✓	✓ ✓
1 – 11 %	**1 – 10 %**	**1 – 22 %**	**1 – 22 %**	**N.A.**
2.2 – 4.7	**2.4 – 4.3**	**2.8 – 4**	**4 – 6**	**0.5 – 1.3** (heat)

* EER energy efficiency ratio at design conditions according to EN 14511 (chillers: 35/7/12, others: 35/27)

! Low efficiency & high costs		! Low efficiency & high costs		
	! Efficient but immature technology	✓ Established, cost & energy efficient technology	✓ Established & efficient technology	
		✓ Efficient but requires specific safety considerations	✓ Efficient but requires specific safety considerations	✓ Efficient co- or tri-gen
		✓ Efficient, safe, but limited temp lift and costly	✓ Efficient, safe, but limited temp lift and costly	✓ Efficient, safe in co- or tri-gen, but limited temp lift

More information

Full reports

This snapshot is based on the 2022 series of reports entitled:

Catalogue of Technical Solutions for Sustainable Cooling in:

- **Egypt**
- **Jordan**
- **Lebanon**
- **Türkiye**

AC technologies

- **Domestic air conditioning:** cooltechnologies.org/sector/domestic-air-conditioning
- **Commercial / industrial air conditioning:** cooltechnologies.org/sector/commercial-industrial-air-conditioning
- **Hydrocarbon technologies database:** hydrocarbons21.com

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