Renewable Energy Policies in End-Use Sectors

International success stories and opportunities for Central Asia

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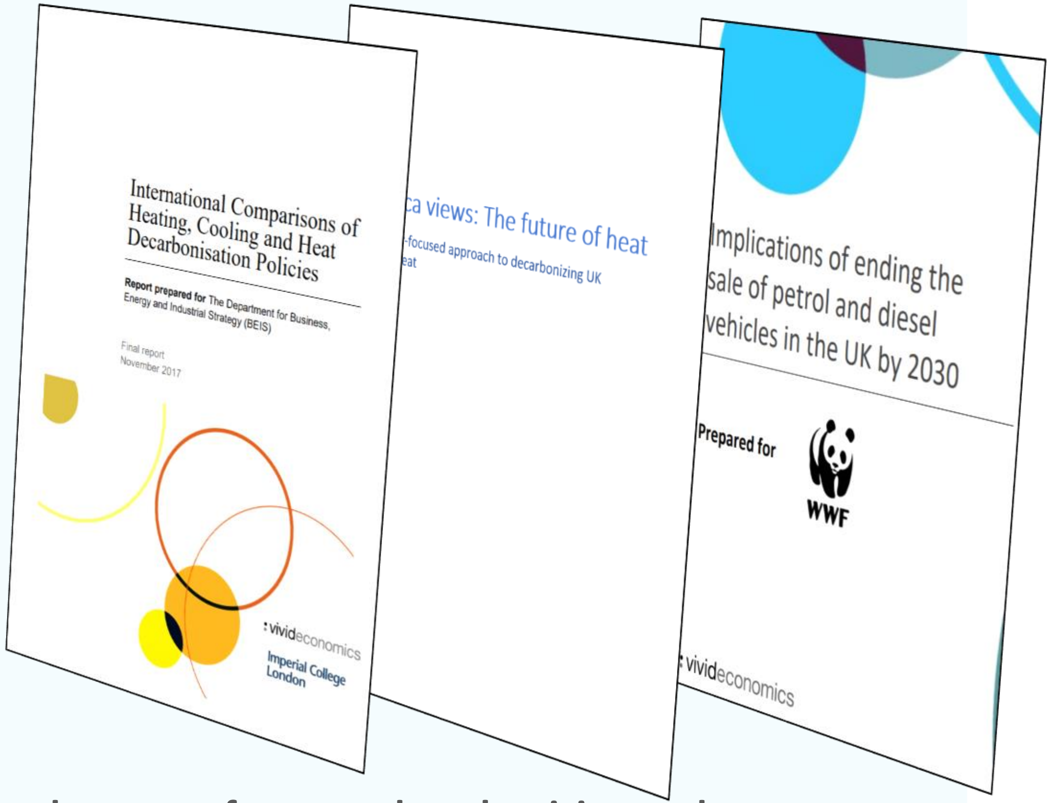


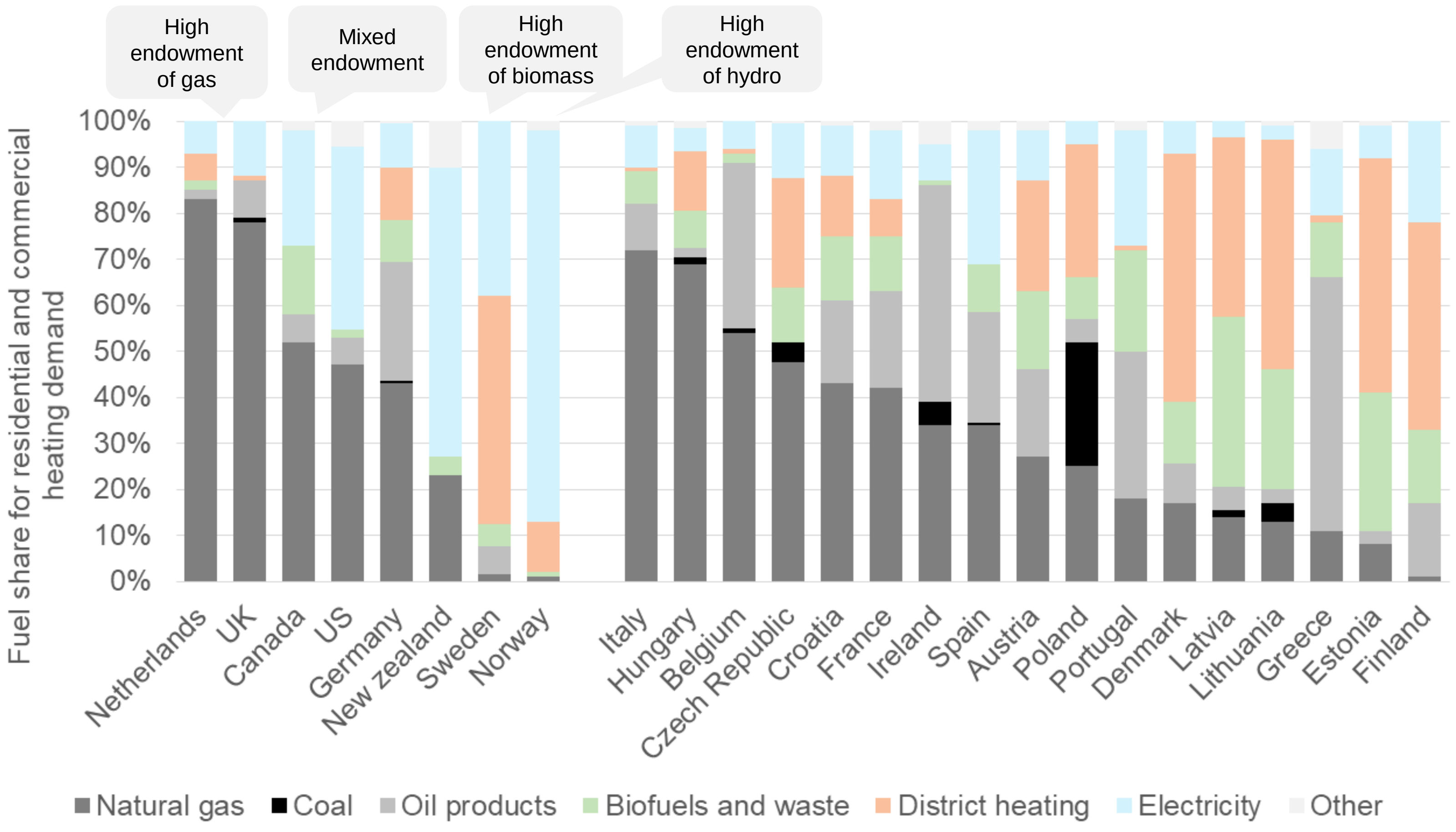
… and a strong focus on decarbonising end use sectors

The focus of this presentation is heating and cooling

Introduction	*What are the challenges associated with transitioning towards renewable energy?*
Success stories	*What can we learn from international case studies?*
Regional opportunity	*Given the local context, what do the international experiences imply?*

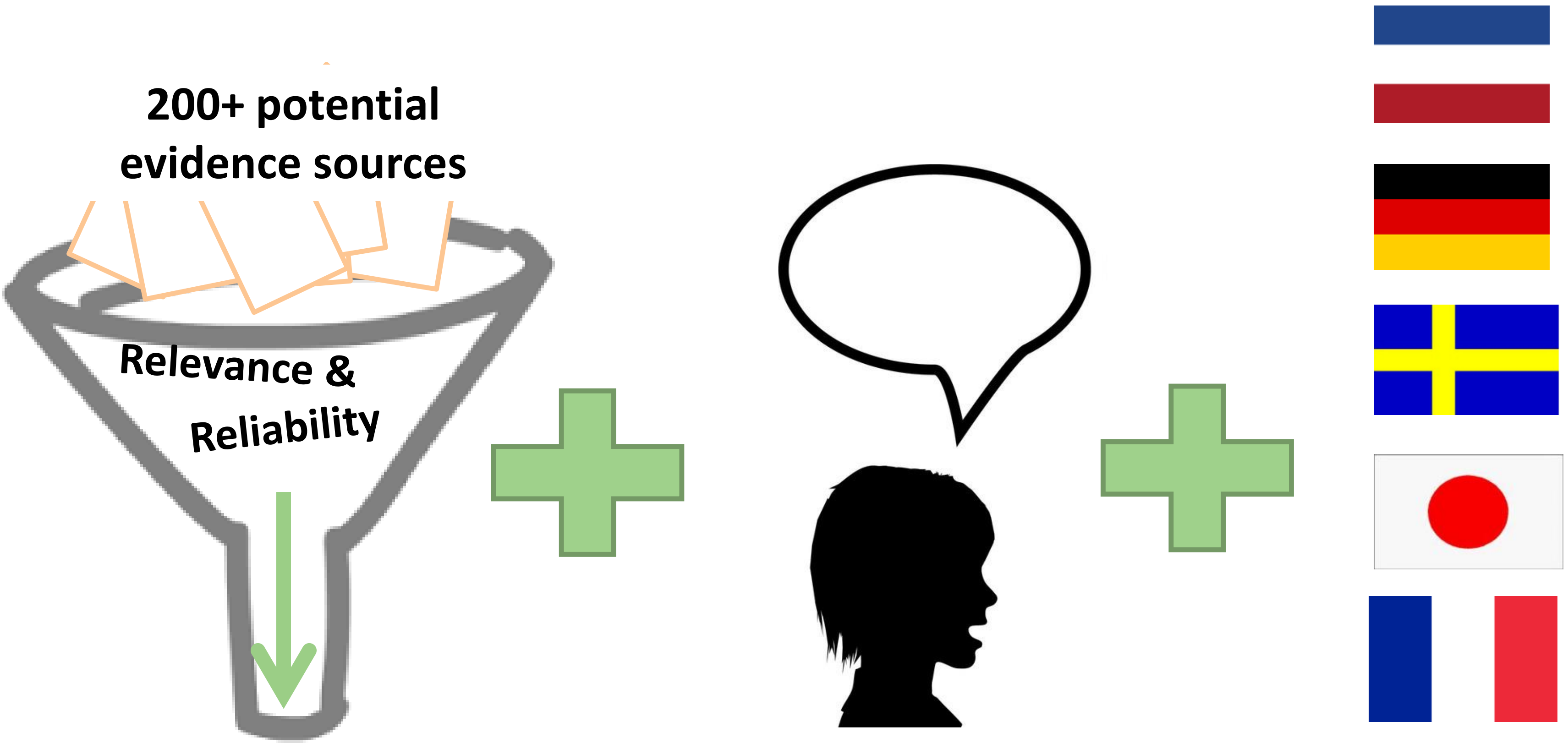
Natural endowment is important in determining the fuel mix (alongside other contextual factors – e.g. ownership structures and liberalisation)

FUEL SHARE FOR RESIDENTIAL AND COMMERCIAL HEATING DEMAND



Source: Vivid Economics (2017)

Our Analysis of heating and cooling transitions included reviewing evidence, interviews and case studies



~50 most relevant/reliable evidence sources reviewed

Interviews with policy makers

Case Studies

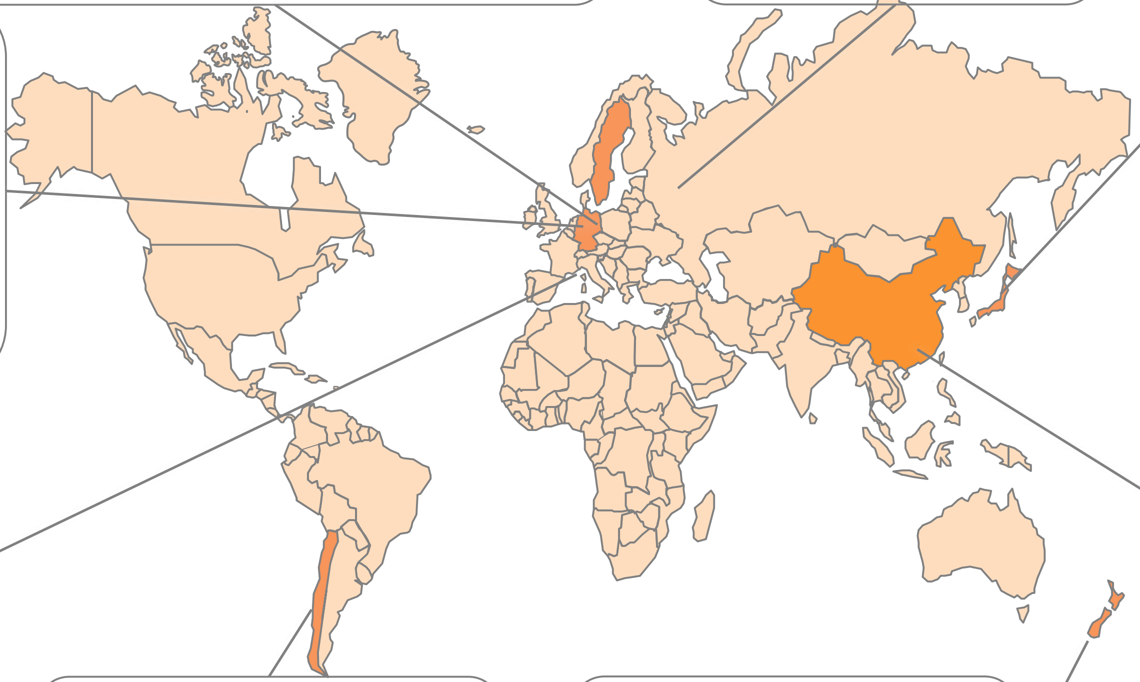
While heating and cooling is a “lagging” sector, there are some bright spots of activity

RES heat: 20% in 2004, 40% in 2016
Key policy: local heat zoning obligation
Target: 100% renewables in 2035

RES heat: 70%
Key policy: energy tax

RES heat: 1% in 2000 to 10% in 2016 heat pumps
Target: zero carbon 2050
Key policy: new build regs

Key policy: subsidies and tax credits since 2009; *Hydrogen society*



Target: ban on gas heating by 2050
Key policy: public subsidies

Target: 800 million m^2 of solar thermal 2020
13th FYP

Key policy: Tax credits for solar thermal on buildings since 2009

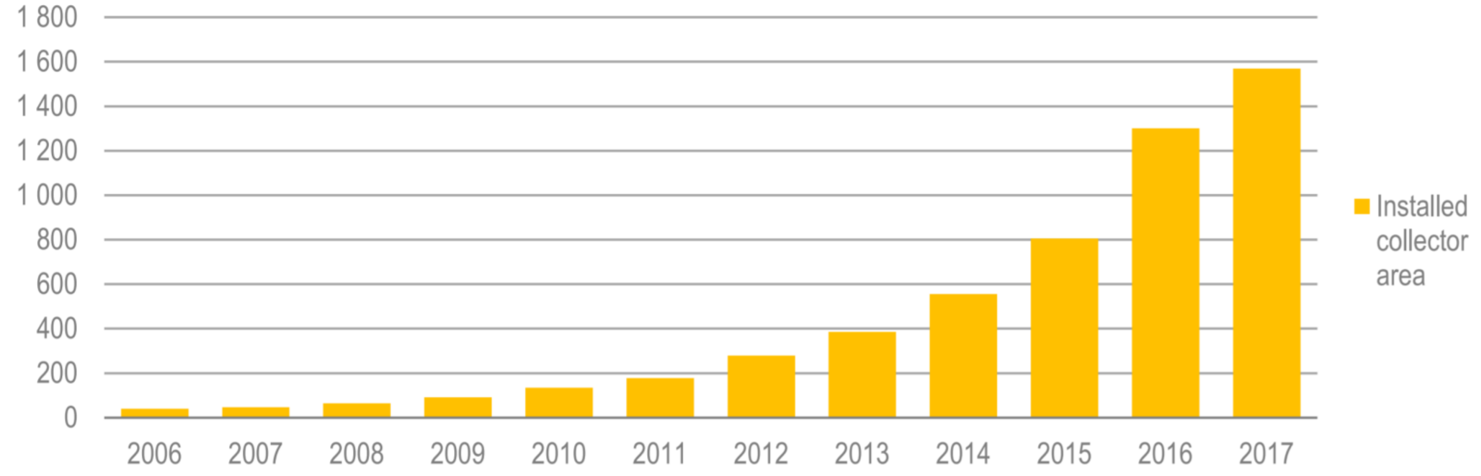
Key policy: Grant program since 2009, over 100,000 installations p.a.

Source: Vivid 2017

Denmark – 'greening' of its district heating system

- District heating a response to the 1970's oil crises (1979 Heat Supply Act). By 2000, 60% of heating is (mainly fossil) district heating
- Since 2000, shift towards renewables (39.6% in 2015, up from 20.6% in 2004). Biomass now accounts for 40% of fuel use in district heating.
- World's largest solar thermal plant to date entered operation in Silkeborg in Denmark
- Uses DH to balance excess renewables (electric boilers and heat pumps)

SOLAR DISTRICT HEATING IN DENMARK – CUMULATIVE COLLECTOR AREA (M^2)



Source: PlanEnergi, data provided to the IEA.

Source: PlanEnergi (chart in IEA (2018) https://www.iea.org/publications/insights/insightpublications/Renewable_Heat_Policies.pdf)

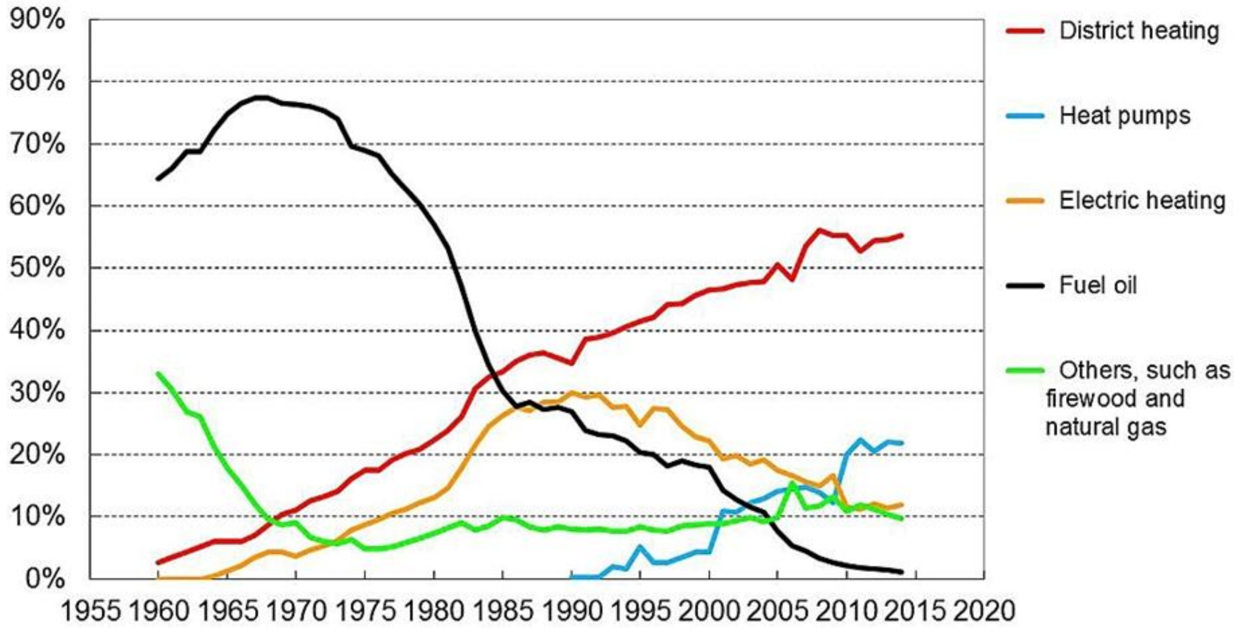
Sweden – replaced almost all of its oil-fired boilers

— a duel transition – towards heat pumps as well as an increase in the share of renewable energy for district heating

— oil fired boilers in **off-grid** homes have been replaced by biofuel based alternatives and heat pumps

— heating oil has been **heavily taxed**, **subsidies** in place to replace oil and direct electric heating

MARKET SHARES FOR HEAT SUPPLY TO RESIDENTIAL AND SERVICE SECTOR BUILDINGS IN SWEDEN

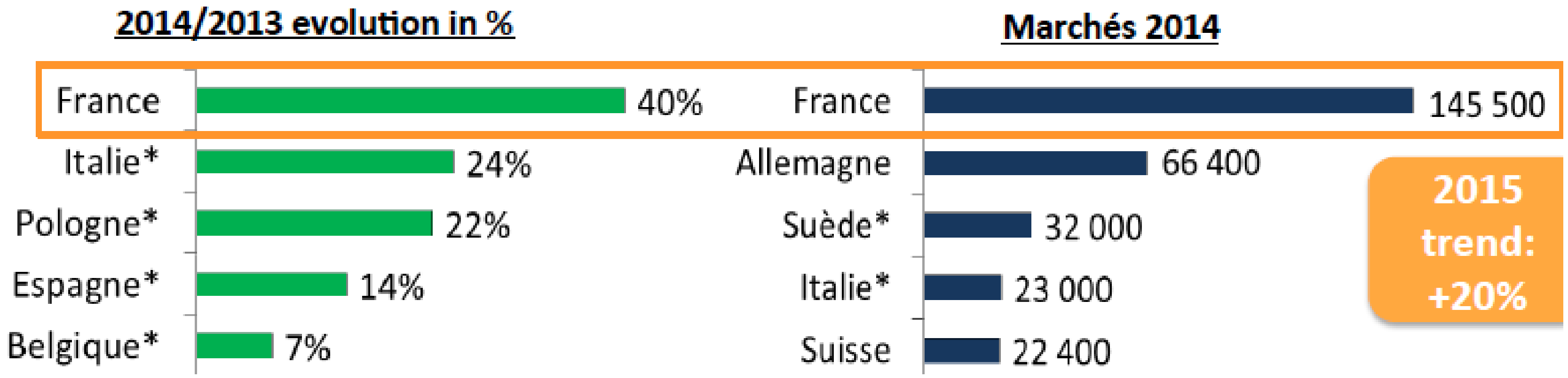


Source: : Werner (2017) District heating and cooling in Sweden. Energy, 126, p.419-429

France – subsidy regimes are driving an increase in heat pumps

- France has been once of the largest European growth markets for heat pumps in recent years
- tax credit provides lump-sum benefit after **defined interval** (next tax bill)
- recently announced switch to **post-installation premium payment** from 2019 would bring forward payment window
- over 6 million (c. 20%) households benefitted from tax credit at least once between 2005 and 2011

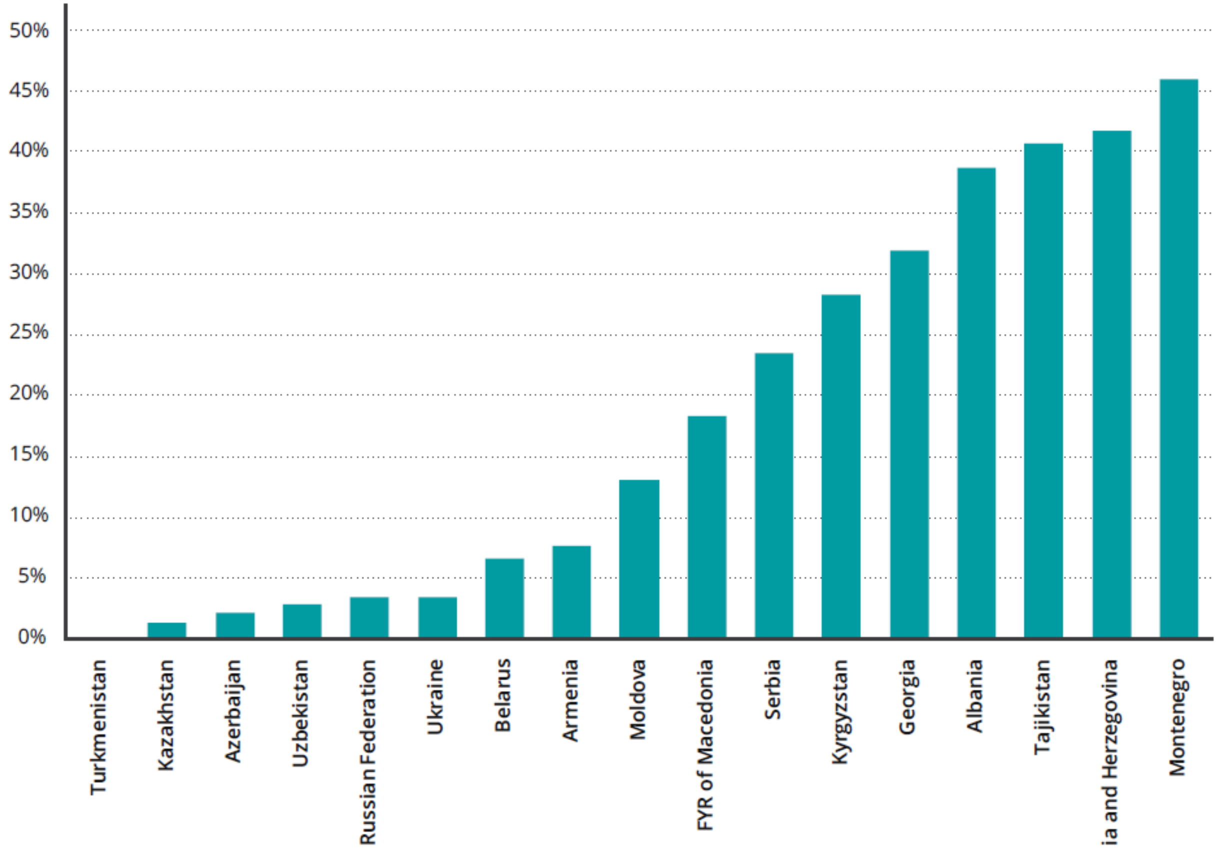
TOTAL MARKET IN AIR/WATER AND GROUND/WATER AND DHW HEAT PUMPS



Source: Vivid Economics (2017) Forthcoming, Nille (2015)

In EECCA countries renewable uptake is driven by endowments in hydro and biomass

Share of renewables in Total Final Energy Consumption, 2014



Note: Includes non-renewable waste (industry and municipal).
Source: See endnote 5 for this section.

Source: IRENA (2017) renewable energy status report

EECCA: Eastern Europe, the Caucasus, Central Asia and the Russian Federation.

Opportunities for EECCA

KEY MESSAGES

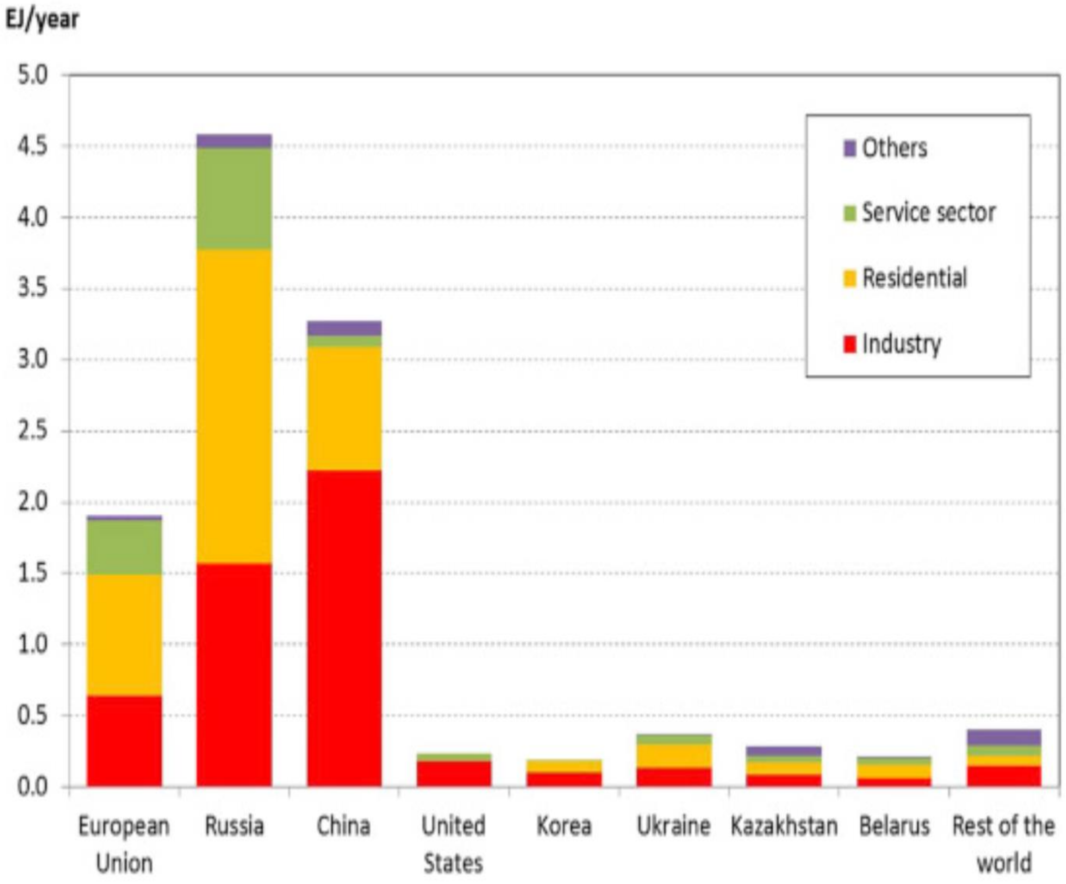
1. Transitions have been more successful where there is district heating and a renewable energy endowment

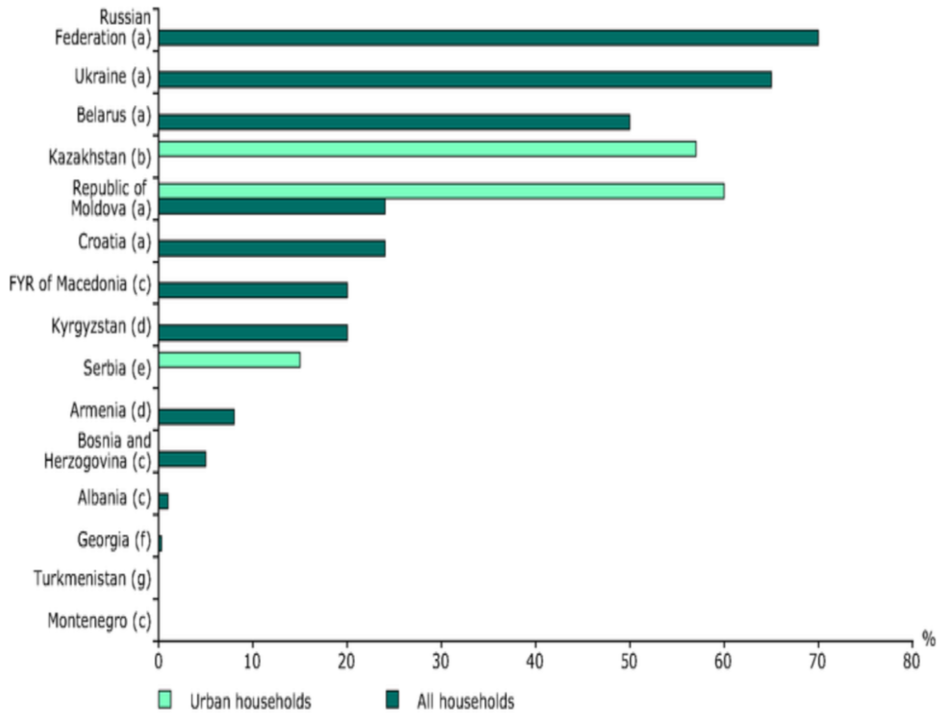
2. Historical transitions have occurred due to a mix of policies e.g. strong targets, provision of good information to investors, subsidies, standards and financing

3. There are opportunities to deliver multiple policy goals through renewables heating e.g. health and environmental (through solid fuel phase out) and resilience (through combining renewable fuels with electric heat)

EECCA has substantial existing district heating infrastructure

UPTAKE OF DISTRICT HEATING IN EECCA COUNTRIES





Source: https://www.sciencedirect.com/science/article/pii/S036054421730614X#fig2 and https://www.eea.europa.eu/data-and-maps/figures/percentage-of-households-connected-to-district-heating

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Introduction
Success stories
Regional opportunity

Pursue policy packages that address multiple market failures

MARKET FAILURE	EXAMPLES
Lack of information	Provide policy stability and continuity through longer term targets
Innovation and testing	System operator to provide system upgrades, testing of low cost renewable heat sources and integration with the electricity grid
Complete markets	Provide metering and tariffs at full cost recovery levels, and allow consumers to control heating
Address other externalities	Solutions to air pollution and resilience can also be addressed through electric heating options

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