

Costs, Benefits and Feasibility of Green Energy System Change: Renewable Energy Integration in Small Island Countries



International Symposium: Renewable Energy and Economic Competitiveness
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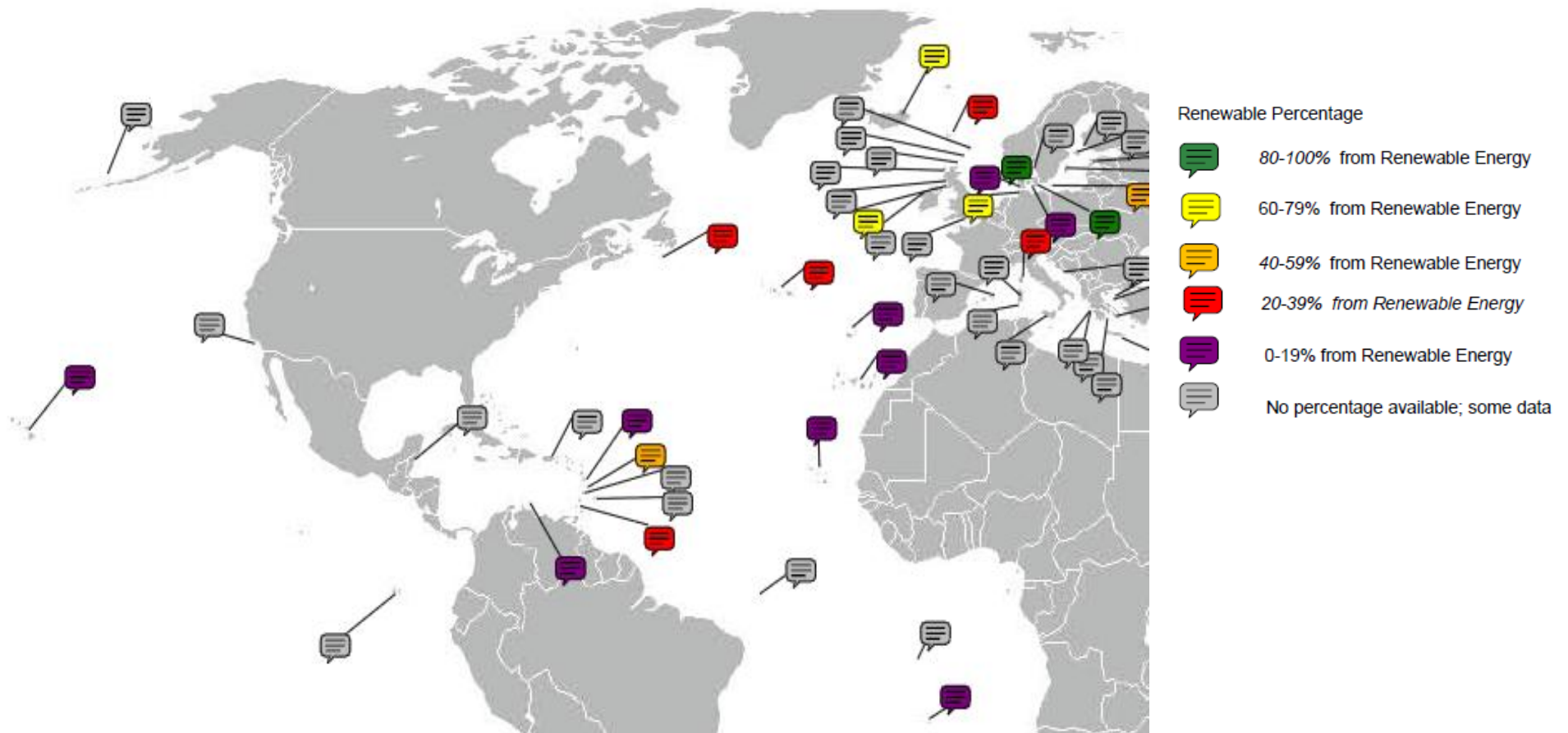


Presentation Outline

1. Status of RE Integration in Small Islands
2. Benefits of Green Energy System Change
3. Feasibility and Key Constraints
4. Discussion



RE Integration in the Power Sectors of Small Islands



Source: GENI



Benefits of Green System Change

“Return on investment” of RE integration on energy system levels (...)

- “ **Improvement of energy security through diversification of the energy mix** and reduction of dependency on imported oil products (up to 100% of power generation from diesel)
- “ **Decoupling of energy generation costs** from price volatility of the oil market (crude oil price doubled between 2005 and 2010)
- “ Possible **reduction of very high energy tariffs** (e.g. electricity tariffs between 20 and 35 USc/kwh and even higher in rural areas, high fuel prices for transport and process heat)
- “ Cost-competitive options to **cover the rapidly growing energy demand** particularly in **urban areas**, the **service sector** (e.g. high annual growth rates in tourism) and **transport** sector (e.g. biofuels)
- “ **Reduction of electricity demand** in combination with energy efficiency and saving measures (e.g. solar thermal heating and cooling and sea water desalination, labeling standards)
- “ Provision of **energy access** to modern, affordable and reliable energy services in rural areas with no access to centralized grid and supply chains (in the Pacific still 70% of the rural population rely on traditional biomass or kerosene).





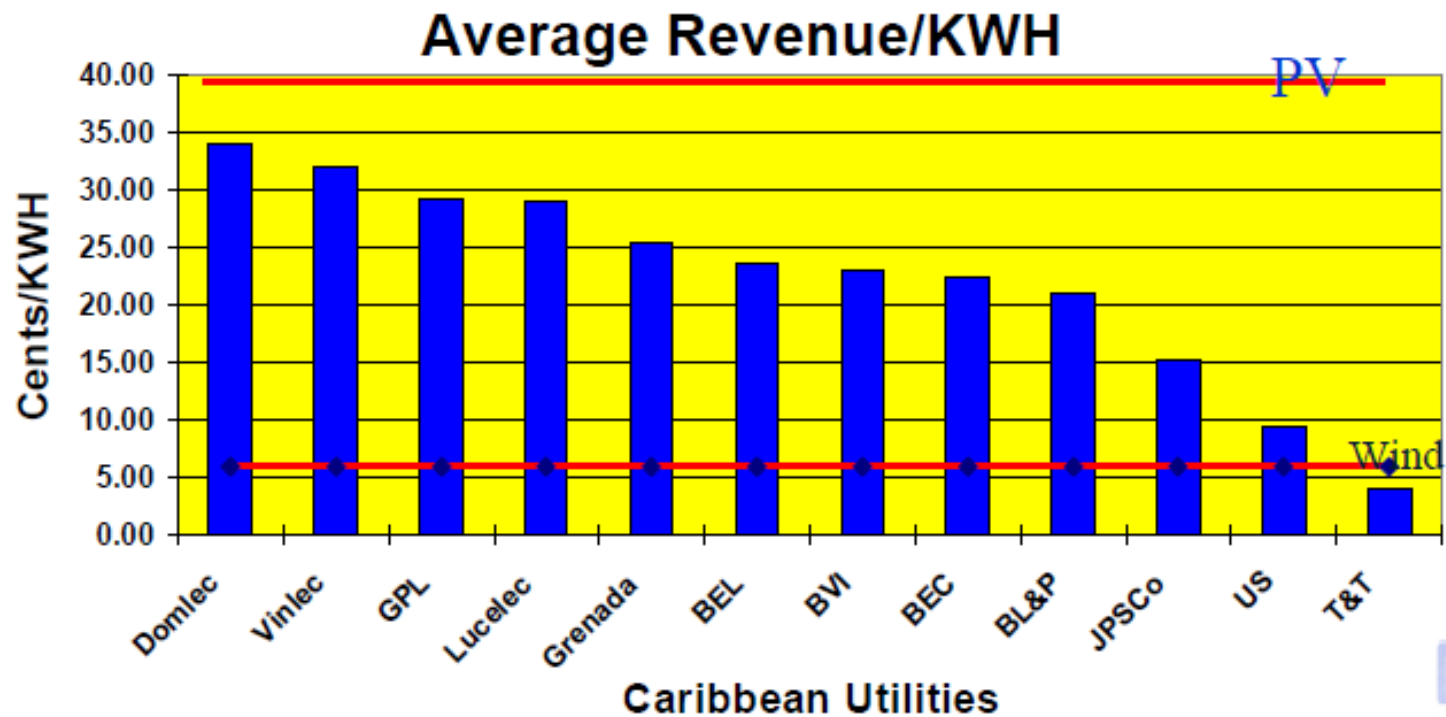
The High Cost of Electricity (in US cents per kWh)

Cook Islands	54
Chuuk	50
Kosrae	40
French Polynesia	34
Kiribati	36
New Caledonia	30
Solomons	53
Samoa	27
Tonga `	36
Vanuatu	41
Wallis & Fortuna	88

Source: SOPAC



Economic Environment- Average Electricity Prices (2005)



Source: CARICOM



Benefits of Green System Change

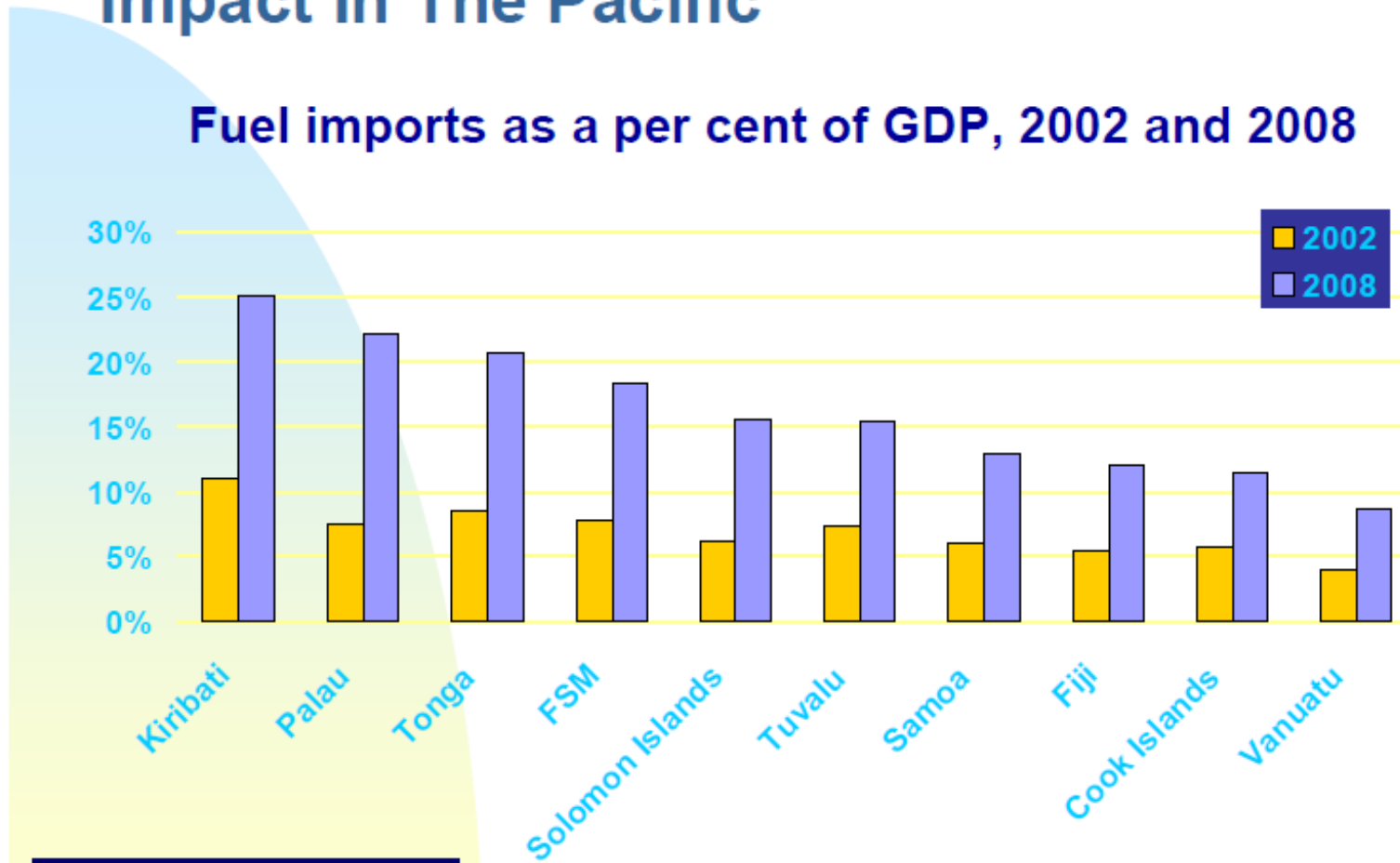
“Return on investment” with regard to sustainable social, economic and environmental development (...)

- “ **Secure, reliable and affordable energy supplies as essential element of social and economic development**
- “ **Reduction of the energy bill of national households** (up to 40% of GDP for fuel imports, absorption of large portion of export incomings) and increased state ability to invest in other sectors (health, education, industry)
- “ **Improved financial situation of utilities** and ability to reinvest in generation and transmission infrastructure (e.g. lower generation costs and improved ability and willingness to pay)
- “ Increased **competitiveness and productivity for companies and industry** (e.g. lower production costs, savings for hotels, no necessity for decentralized diesel generation)
- “ **Opportunities for private sector development and companies** (e.g. PPPs, IPPs, ESCOs); export opportunities for RE products and services (e.g. quality testing, financing)
- “ **Dynamic image and marketing tool** for the important tourism sector in small islands (e.g. Sal, Boa Vista)



The Rise In Oil Prices Is Having A Huge Impact In The Pacific

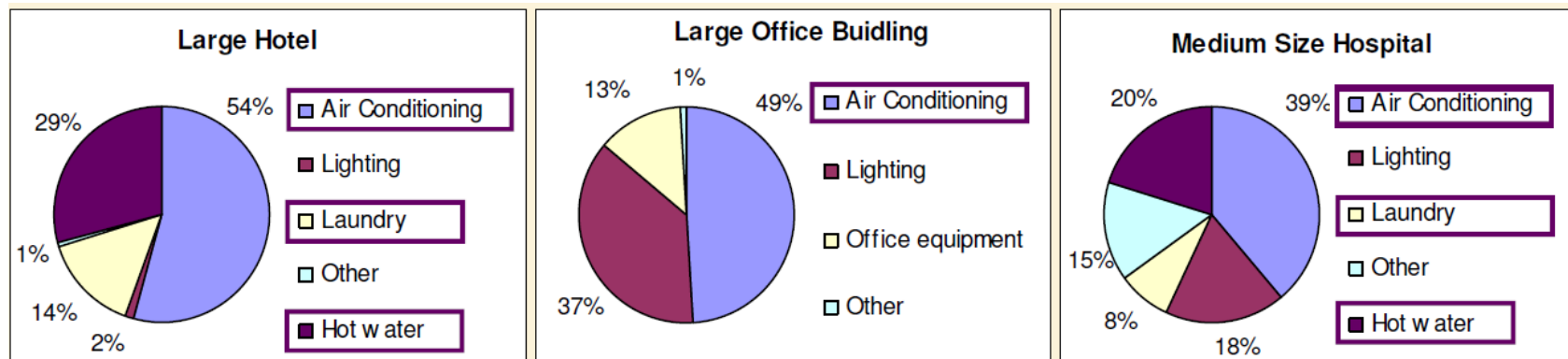
Fuel imports as a per cent of GDP, 2002 and 2008



Source: SOPAC



Electricity Consumption of Buildings in the Caribbean



Source: SOLID



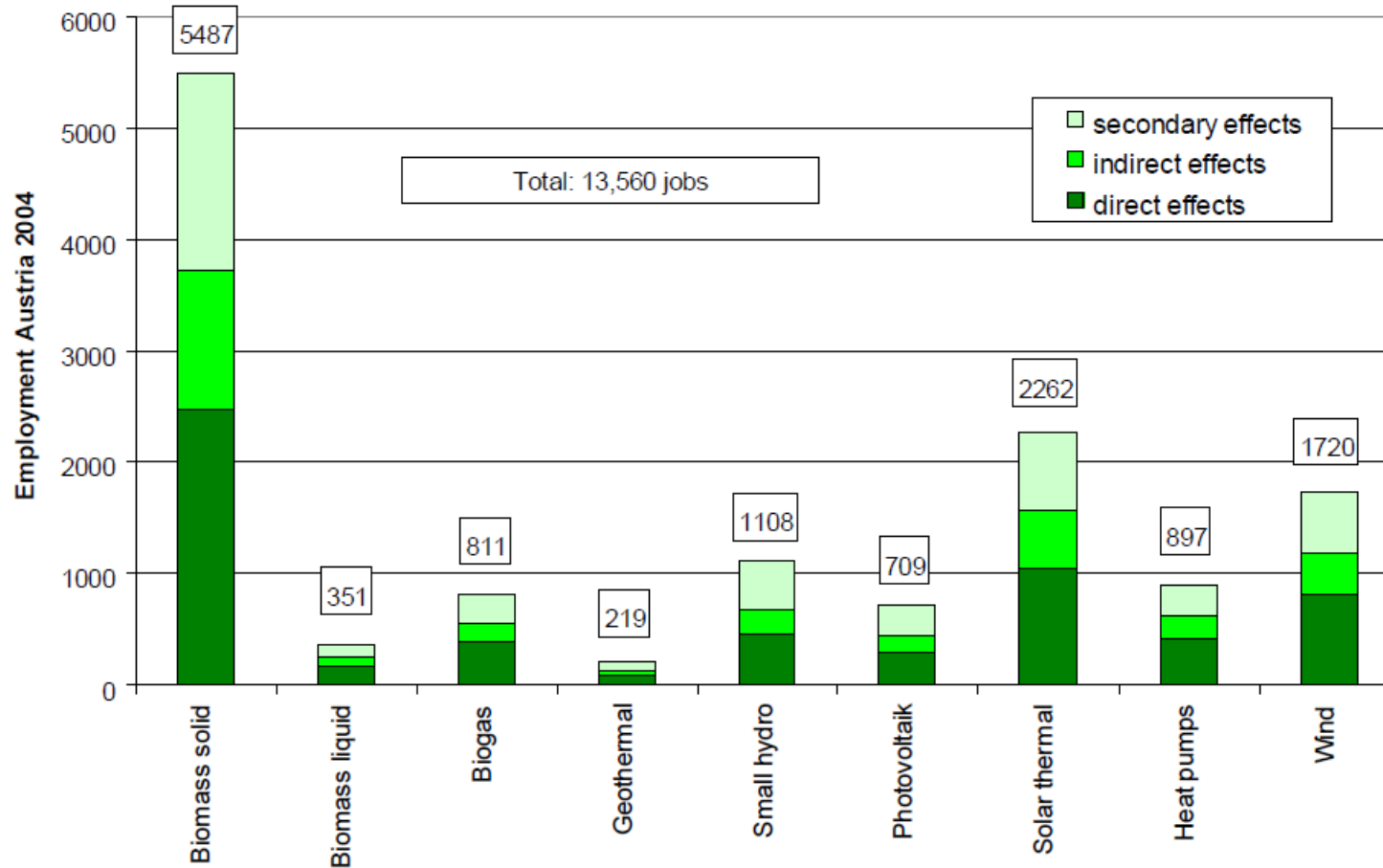
Benefits of Green System Change

“Return on investment” with regard to sustainable social, economic and environmental development (...)

- “ **Increased efficiency and effectiveness of public institution** to deliver their services (e.g. clinics, university)
- “ Direct **job creation** through construction, installation and maintenance of RE infrastructure and related services (job effects differ from technology to technology)
- “ **Indirect job creation** in other sectors (e.g. harvesting of biomass feedstock)
- “ **Increased household income** opens up opportunities for other productive uses
- “ **Improved live conditions for poor population groups** in rural areas (access to light, reduction of indoor pollution, access to clean water)
- “ **Reduction of energy related negative environmental externalities** (e.g. air and water pollution, GHG emissions, degradation)



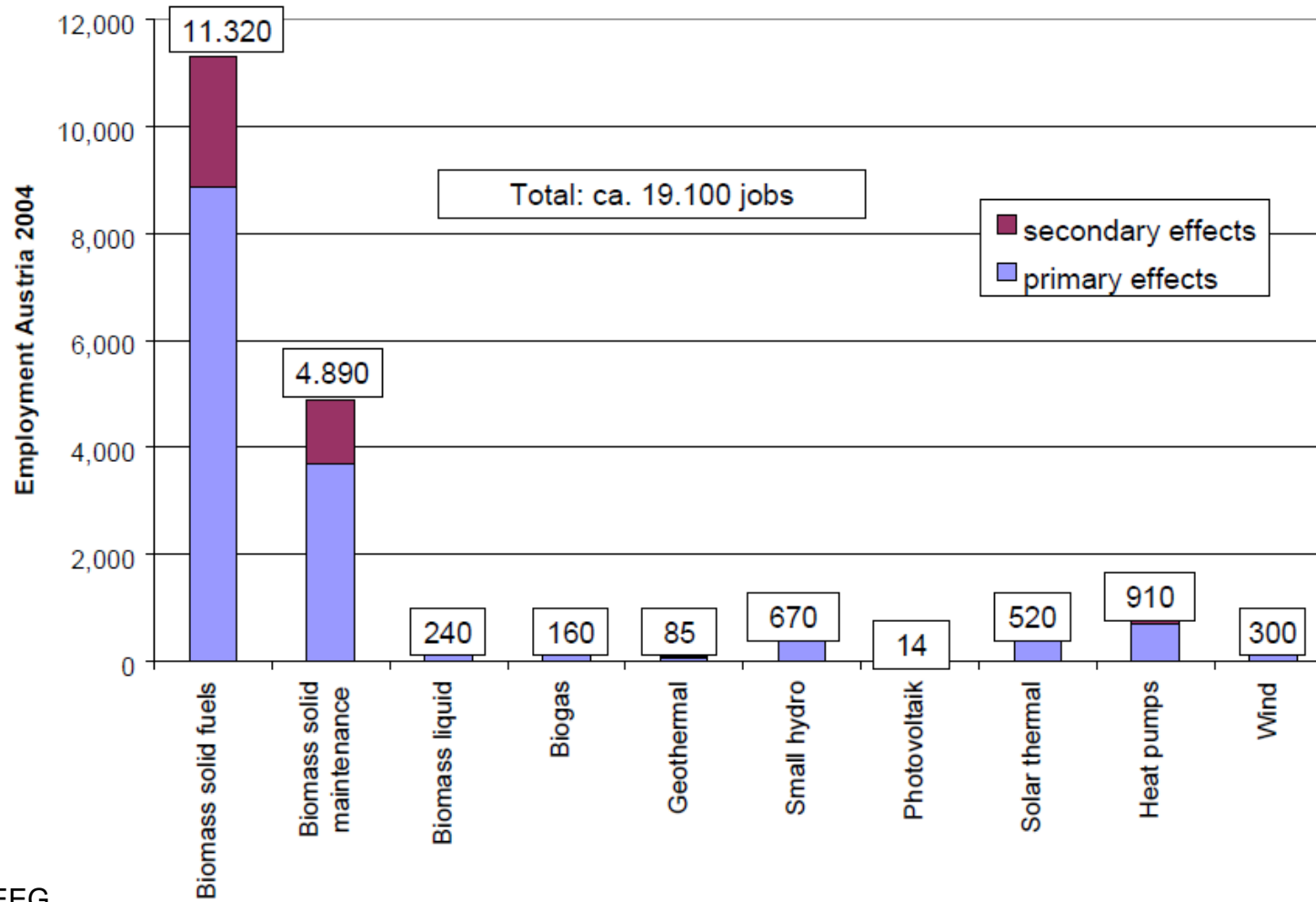
*Economic relevance of RES in Austria:
employment due to investment,
(no substitution effects considered)*



Source: EEG



*Employment due to operation,
(no substitution effects considered)*



Source: EEG

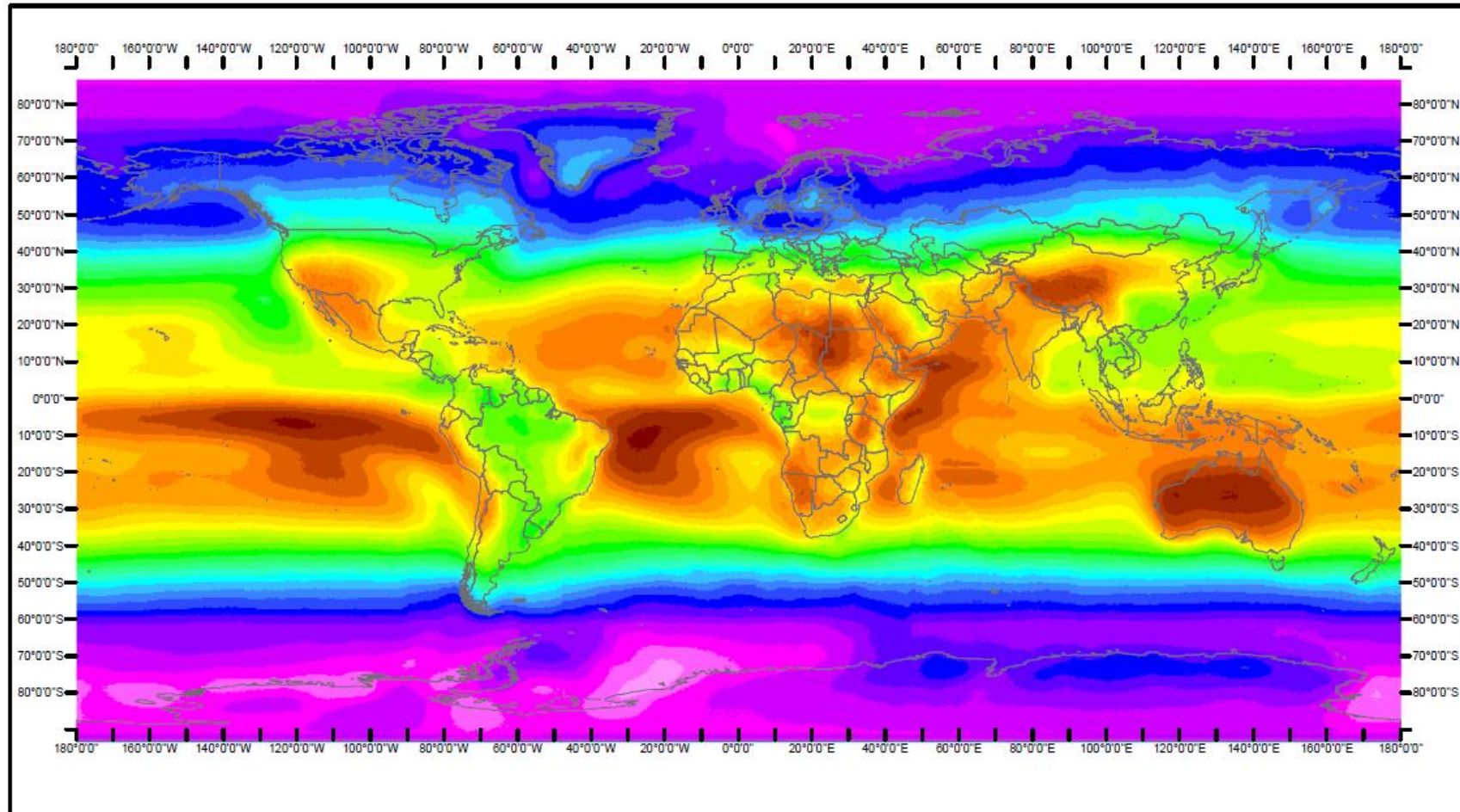


Feasibility of RE integration

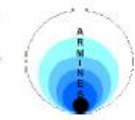
- “ Most islands provide **good framework conditions for RE integration** (e.g. various RE resources, high tariffs and generation costs, no possibility for power trade, need for small scale generation facilities);
- “ **RE policy planning & Knowledge base & Appraisal skills:** identify the most effective energy mix (according to the principle of economic, social and environmental sustainability)
- “ **Focus on energy efficiency first** (the cheapest energy is the one not consumed)
- “ Need for **individual solutions tailored to the specific context** of the island rather than blueprint solutions (demand driven not technology driven)
- “ **Technical, economic and financial feasibility and viability of RE technology options vary** from island to island (e.g. cost-effectiveness in relation to other options, availability of resources, land and feedstock, climate conditions, energy market, legal issues, available financing, cultural and social aspects)
- “ Availability of RE financing is important (tailored debt, CDM)



Averaged Solar Radiation 1990-2004

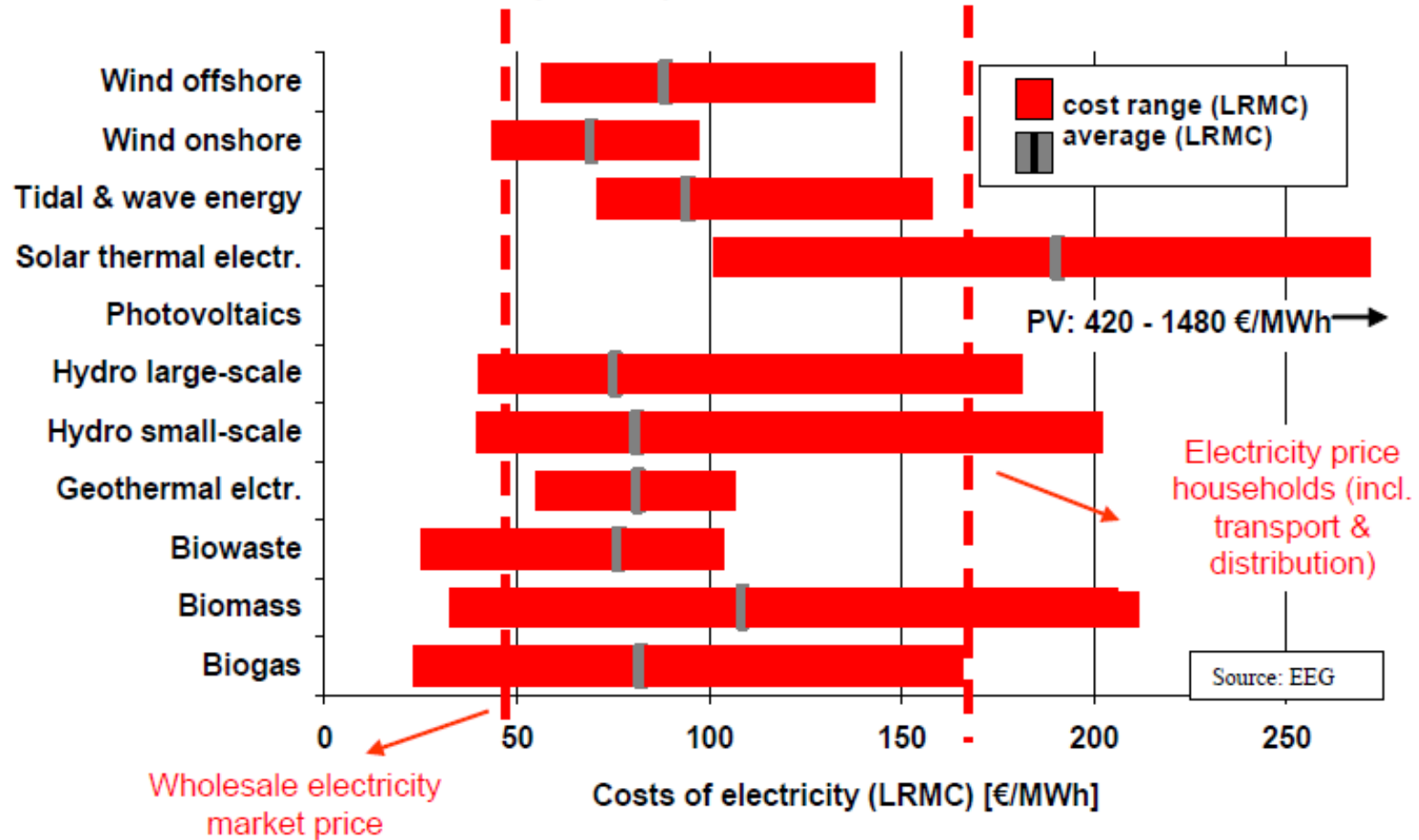


Yearly Mean of Irradiance in W/m²





Generation costs of RES-E (LRMC)



Source: EEG

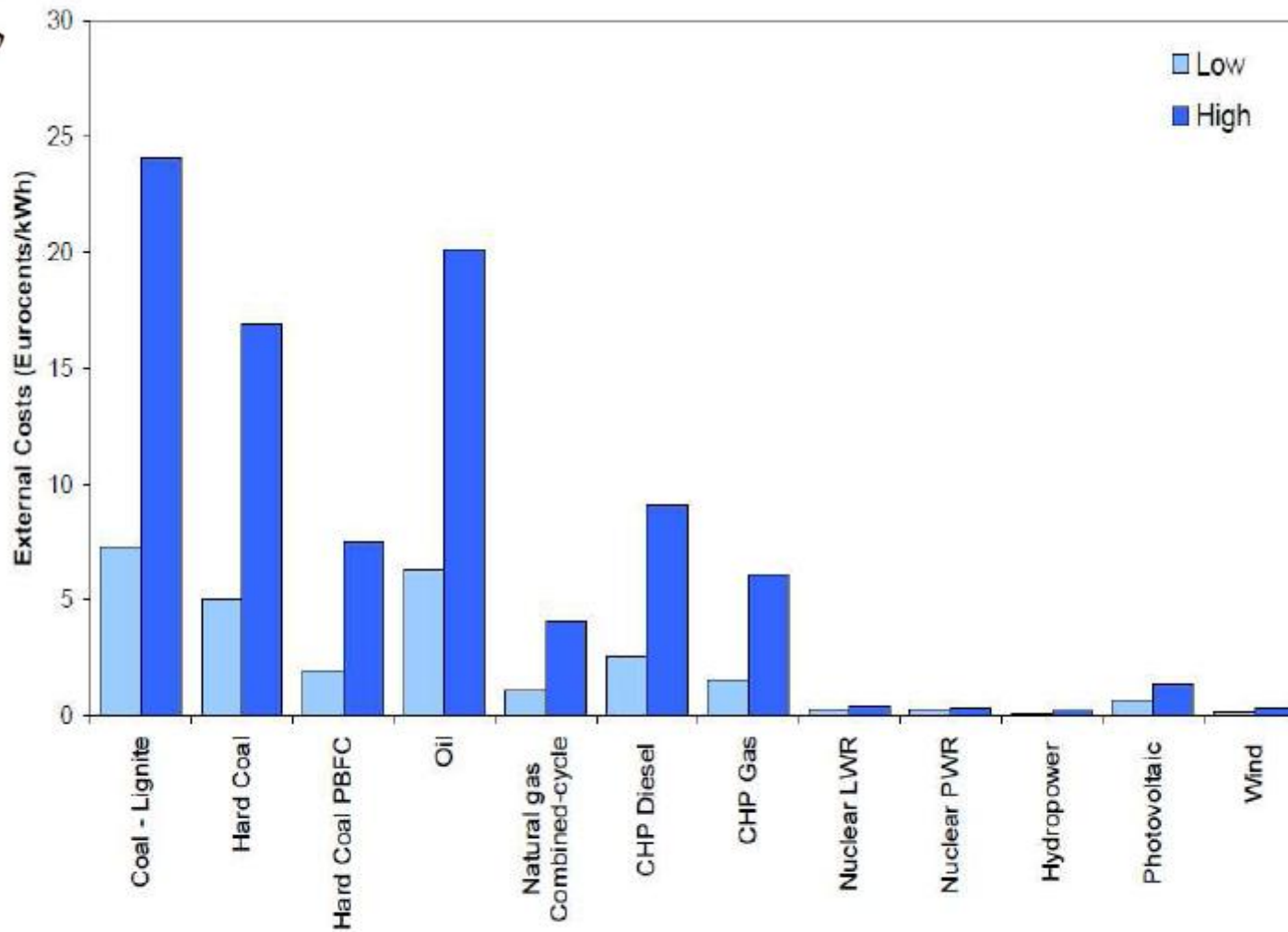


Figure 25: Estimated average EU-25 external costs for electricity generation technologies in 2004 - high and low estimates (EEA, 2005)



Feasibility of RE integration

Various technical, economic, financial, institutional, legal and capacity related barriers have to be addressed to harness the “return on investment”:

- . Lack of tailored RE&EE policy, legal and regulatory frameworks;
- . Lack of RE & EE quality standards and appraisal tools;
- . Low capacities and RE&EE knowledge base of key groups in public and private sectors;
- . Lack of awareness of key groups in public and private sectors on different levels (e.g. federal, provincial); lack of advocacy and lobby groups;
- . Lack of risk and investment capital and tailored financial schemes;
- . Lack of technology transfer and adaptation of technologies;
- . Lack of regional approaches, forums and information exchange of like-minded key groups;

Muito obrigado!



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Renewable Energy and Energy Efficiency*

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