STREAM MAP

Mapping the way forward for the hydro sector in the EU

Market Data Report

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ESHA

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Contents

- Basic information on the HYDI Market Section contents
- Data collection methodology
  at an example of Poland, Czech Republic and Slovakia
- Data aggregation at an example
  of specific investment cost and employment
- Sources of uncertainty and remedy measures
- General consideration and conclusions
- Road Map key messages on the market analysis

Towarzystwo Elektrowni Wodnych

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HYDI Market Section contents

Market data in two parts:

- Industrial - Companies in SHP Sector
  Employment in SHP Sector

- Economics - Investment Costs in SHP (€/kW)
  Operation and Maintenance Costs (% of total investment cost)
  Civil Costs (% of total investment cost)
  Energy Production Costs (€/kWh)
  Internal Rate of Return (%)
  Lifetime of SHP Plant (years)

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BHA British Hydropower Association

	A	B	C	H	I	J	K	L	M	N	P	Q
1	L.p.	Parameter		total annual production costs	annual operation and maintenance costs	average lifetime of electromechnical equipment	specific investment costs	civil engineering works	annual operation and maintenance costs	IRR	annual operation and maintenance costs	specific investment costs
2				PLN	PLN	lata	PLN/MW	%	%	%	PLN/MWh	PLN/MWh
3		Operator	Elektrownia	5	6	7	8	9	10	11	12	
4		SHP										
5	1		A	2 700 000	2 300 000	30	6 200 000	83,9	14,8	37,0	192,9	1 107,1
6	2		B	1 500 000	1 400 000	30	9 000 000	72,2	7,8	17,0	306,1	3 673,5
7	3		C	673 333	240 000		39 393 939	65,4	1,8	8,0	337,8	6 522,8
8	4		D	710 000	280 000		23 035 714	57,4	2,2	9,0	236,7	4 300,0
9	5		E	680 000	280 000		7 272 727	71,3	2,3	17,0	113,3	2 000,0
10	6		F	2 306 667	1 250 000		15 095 238	78,9	3,9	7,0	200,6	2 756,5
11	7	RZGW Wrocław	Malczyce				50 000 000	82,0				9 036,1
12	8	ZEW Rożnow	Maczki				26 923 077					
13	9	ZEW Jastrowie/ENEA	Oborniki				33 030 303					7 785,7
14	10	PGE EO	Dobrzeń				18 750 000					4 000,0
15	11		G				8 280 255					3 611,1
16	12		H				21 567 568					2 660,0
17	13		Podczerwone				8 444 444					
18	14		Koniówka				9 200 000					
19	15	RZGW Gdańsk	Michałowo				33 333 333					
20	16	MEW SA	Cieszyn				8 750 000					
21	17	MEW SA	Odra				11 500 000					
22	18	MEW SA	podlaskie				12 000 000					
23	19	MEW SA	Wisła I				20 000 000					
24	20	MEW SA	Wisła II				20 000 000					
25	21	MEW SA	lubelskie				24 000 000					
26	22	PGE Obrót	Smardzewice			36						
27												
28		nakłady jednostkowe										5886,9
29				8 570 000	5 750 000	32						
30		Suma/Średnio		8 570 000	5 750 000	32	25 546 801	80,4	5,6	10,9	207,0	
31				2 142 500	1 437 500		6 386 700				51,8	
32				EUR	EUR	lata	EUR/MW				EUR/MWh	
33												

Data collection example: Poland

Czech_Republic | **Poland** | Slovakia

L.p.	Company	2009 No. of companies	2009 Employment Total	2009 Employment Hydropower	2009 Employment SHP	2010 No. of companies	2010 Employment Total	2010 Employment Hydropower	2010 Employment SHP
	Budownictwo wodne		Civil engineering companies						
1		1							
2		1		0	0			0	0
3		1		0	0			0	0
4									
5		1							
6		1							
7		1		150	100			158	100
8		1		150	100			150	100
9		1							
10		0		3	1			3	1
		1	151	15	12		151	15	12
	Razem	8	151	318	213		151	326	213
	Eksploatacja i inne		Operation and others						
1		1	450,00	400,00	200,00			400,00	200,00
2		1	18,00	18,00	0,00		18,00	18,00	0,00
3		1		5,00	5,00			5,00	5,00
4		1	294,00	294,00	240,00		294,00	294,00	240,00
5		1		170,00	140,00			170,00	140,00
6		1	227,00	227,00	227,00		235,00	235,00	235,00
7		1	119,00	119,00	0,00		119,00	119,00	0,00
8		1		50,00	4,00			50,00	3,00
9		1		0,25	0,25			0,25	0,25
10		1		0,50	0,50			0,50	0,50
11		1		10,00	10,00			10,00	10,00
12		1		4,00	4,00			5,00	5,00
13		1		5,00	5,00			5,00	5,00
14		0		2,00	2,00			2,00	2,00
15		1							
16		1		3,00	3,00			3,00	3,00
17		294	588,00	588,00	588,00		597,00	597,00	597,00
		0		2,00	2,00			2,00	2,00
		0		2,00	2,00			2,00	2,00
	Razem	309	1696	1899,75	1432,75		1263	1917,75	1449,75
	Razem	379		2722,2	1982,25			2803,1	2055,25

Czech_Republic | Poland | Slovakia

Data collection example: Poland

Towarzystwo Elektrowni Wodnych

Three Central European states

	Poland	Czech Republic	Slovakia
General data			
Surface area, km^2	312 700	78 900	49 000
Population, thousands	38 100	10 470	5 400
GDP, mln €	362 400	147 900	64 800
Electrical power system			
Installed power, MW	32 639	20 073	7 338
Annual generation, GWh	157 414	85 910	27 430
Hydropower (RES)			
Technical potential, GWh/rok	13 700	3 380	7 560
Installed power, MW	939	1 478	1 802
Annual production, GWh	2 350	1 824	4 536
Small hydro (<10 MW)			
Number of power plants	718	1 438	218
Installed power, MW	265	303	89
Annual production., GWh	908	1 236	284

* Data as of 2010 and 2009

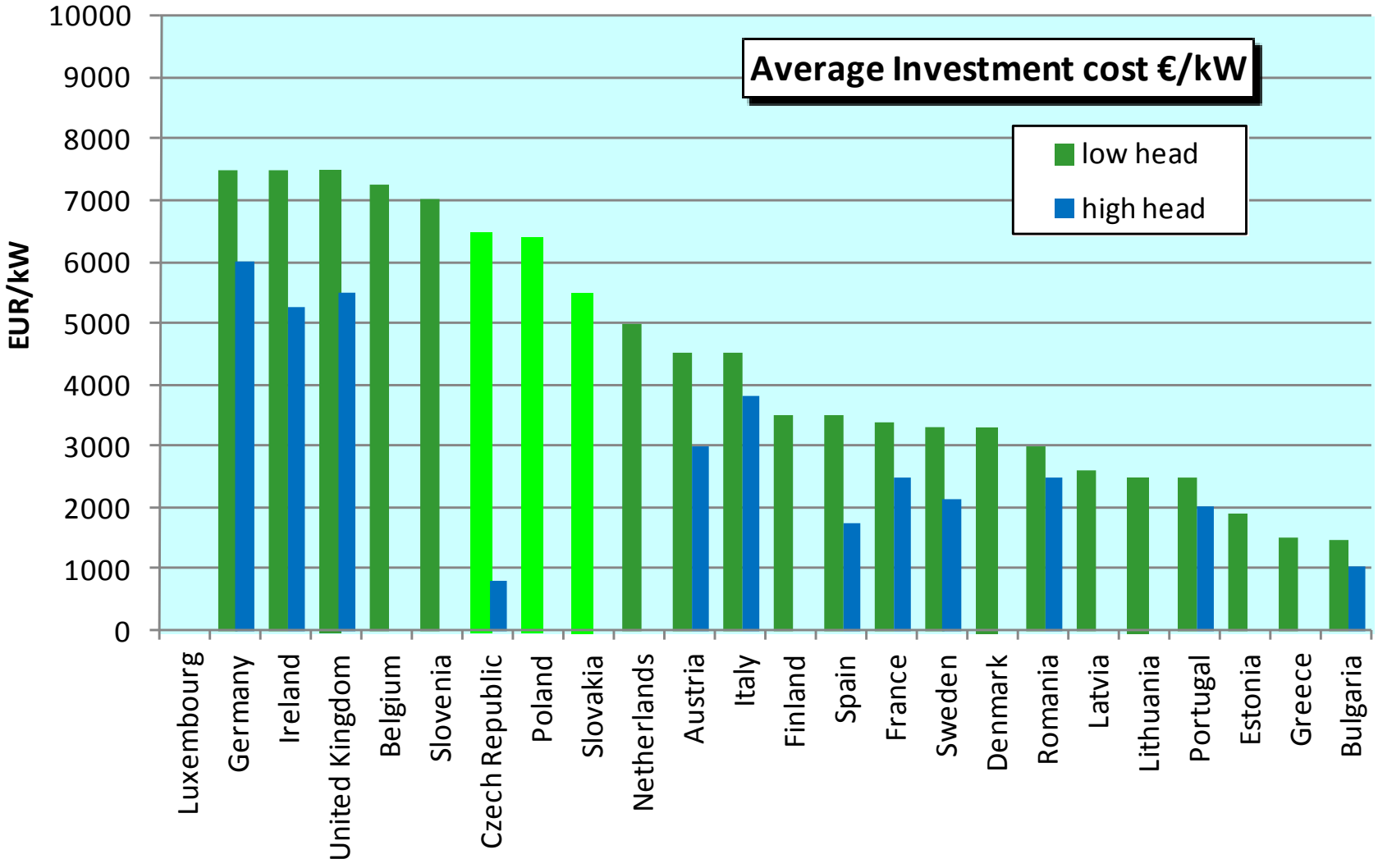
Current status: economic parameters

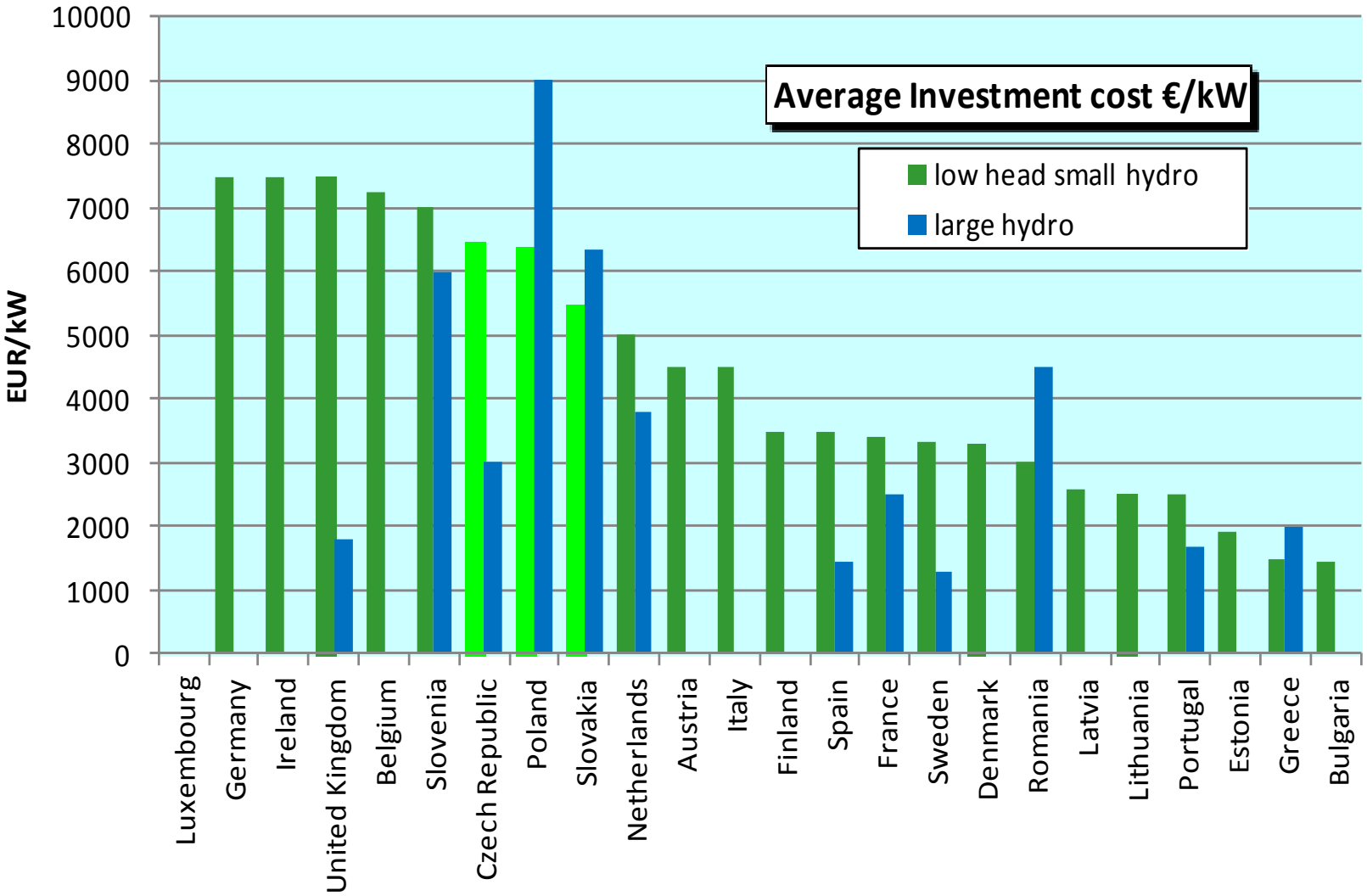
Investment costs, EUR/kW

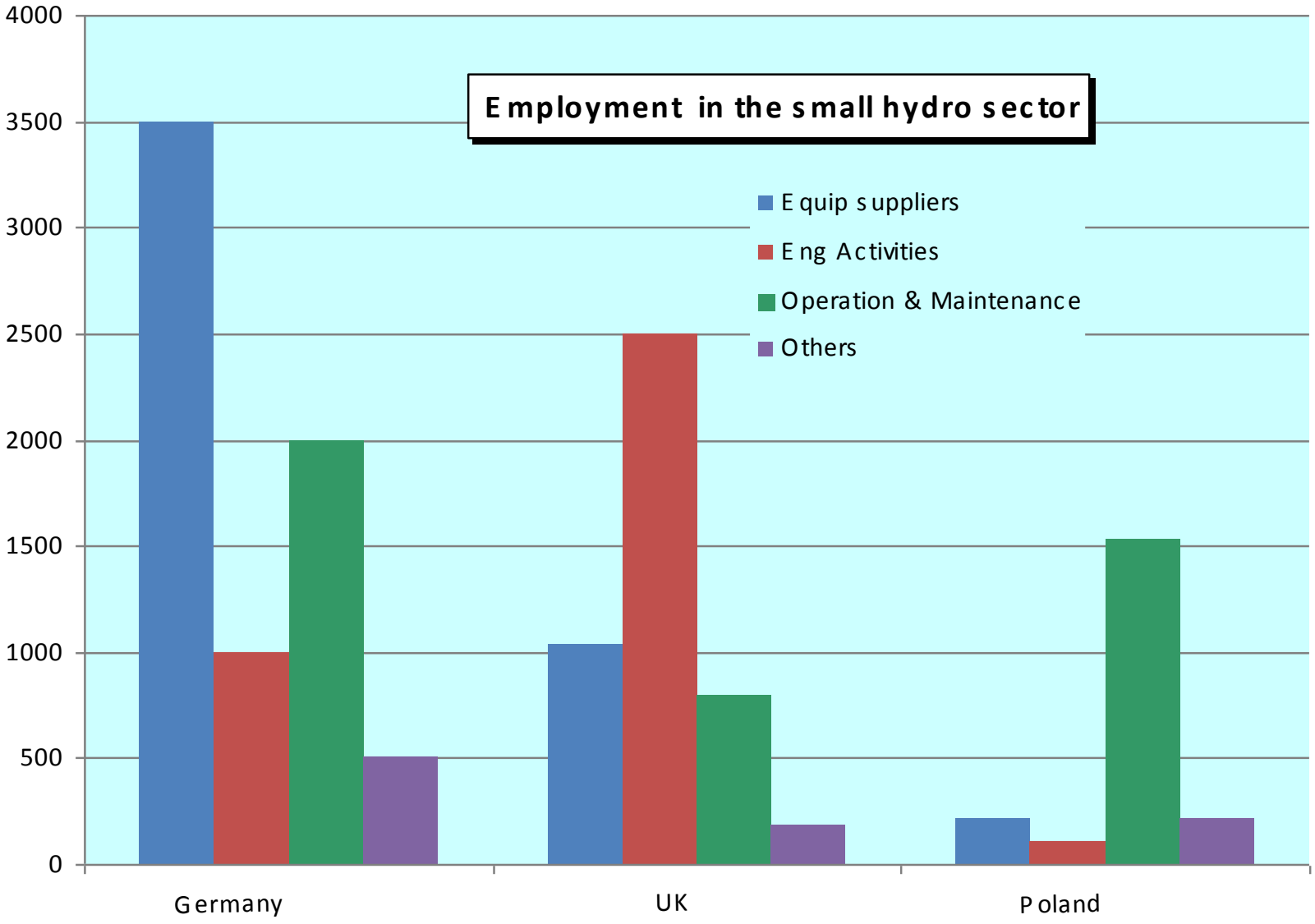
Country	Small hydro		Large hydro	
	low head	high head	classic	pumped storage
Poland	6 400		9 000	800
Czech Republic	6 450	800	3 000	
Slovakia	5 500		6 360	1 280

Companies

	Total	Small hydro
No. of companies	**380**	
Employment	**2810**	**2060**
Civil engineering	330	215
Equipment supply	240	210
Engineering activity	155	105
Maintenance	165	80
Plant operation & others	1920	1450


Average Investment cost €/kW
low head
high head
EUR/kW
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Luxembourg
Germany
Ireland
United Kingdom
Belgium
Slovenia
Czech Republic
Poland
Slovakia
Netherlands
Austria
Italy
Finland
Spain
France
Sweden
Denmark
Romania
Latvia
Lithuania
Portugal
Estonia
Greece
Bulgaria


Average Investment cost €/kW
low head small hydro
large hydro
EUR/kW
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Luxembourg
Germany
Ireland
United Kingdom
Belgium
Slovenia
Czech Republic
Poland
Slovakia
Netherlands
Austria
Italy
Finland
Spain
France
Sweden
Denmark
Romania
Latvia
Lithuania
Portugal
Estonia
Greece
Bulgaria


Employment in the small hydro sector
Equip suppliers
Eng Activities
Operation & Maintenance
Others
4000
3500
3000
2500
2000
1500
1000
500
0
Germany
UK
Poland

Sources of uncertainty and reasons for lacking data

1. General relactunce to respond questionnaires, especially those confining economic data
2. Lack of obligation to respond
3. Possible misunderstanding of some definitions by partners

Towarzystwo Elektrowni Wodnych

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Market Data

INDUSTRIAL

Overview

Three Main Factors affecting Companies and Employment:

- Economic status of Member States
- Politics and Policies of European Commission and operation of EU Directives by Member States
- Market Forces

Factors affecting Companies and Employment - Overall Effects

- ***Economic status*** *– Economic crisis and uncertainty affects hydropower development → Financing of projects was, and is, a major concern.*

- ***RE Policies*** *– Economic problems affect individual country policies. This drives the rate of development. "Cushioning" damage" by RES Directive and NREAP, but worsening of the economic climate and radical government changes could easily cause dramatic* ***changes to the size of the supporting industry and employment****.*

- ***Market forces*** *– the amount of manufacturing and services required for the hydropower market is a result of the two factors detailed above. It is further complicated by* ***industry's ability to serve the global market****. For the last decade the world hydropower market has been very buoyant and many of the* ***larger European companies have benefited****. As the world's economy swings this has an effect on these companies and their need for support manufacturing and services. Most of the export market is for the large hydropower sector and it can be assumed that* ***the effect of the global small hydropower market is considerably less important to European companies.***

Market Data

ECONOMICS

Overview

Shares the three Main Factors affecting Companies and Employment plus:

- Reducing Viability of SHP projects as development continues
- Increasing costs over time

Economics - Overall Effects

- ***Economic status***
- ***RE Policies***
- ***Market forces***
- ***Reducing Viability – "easier" ones are built first.*** *The ease of development includes aspects such as site accessibility, distance from grid connection/load concentrations, working in more environmentally sensitive areas and reliable water availability.*
- ***Increasing Costs - the "harder" it is to build a project, the more costly it is.***
  - *increases in labour*
  - *material costs.*

  Unique to the hydropower sector: *cost of satisfying environmental directives and regulation*

  → *Increased monitoring before, during and after construction, increased mitigation measures for fish passage and screening and reduction in water availability all serve to drive up costs and reduce project viability.*

  → *insurance, grid interconnection and "maintenance" due diligence, community charges/payments and rates.*

Investment in SHP

Average Operation and Maintenance costs (% of Investment cost):

- Ranges from 2 % to 20 % for both low and high head projects
- Average - Low Head 5.58 %
  High Head 5.12 %

Average Civil costs (% of Investment cost):

- Ranges from 22 % to 80 % for low head projects
  40 % to 75 % for high head projects
- Average - Low Head 52 %
  High Head 55 %

Lifetime of SHP plants

Average Lifetime for the mechanical plant in a SHP project:

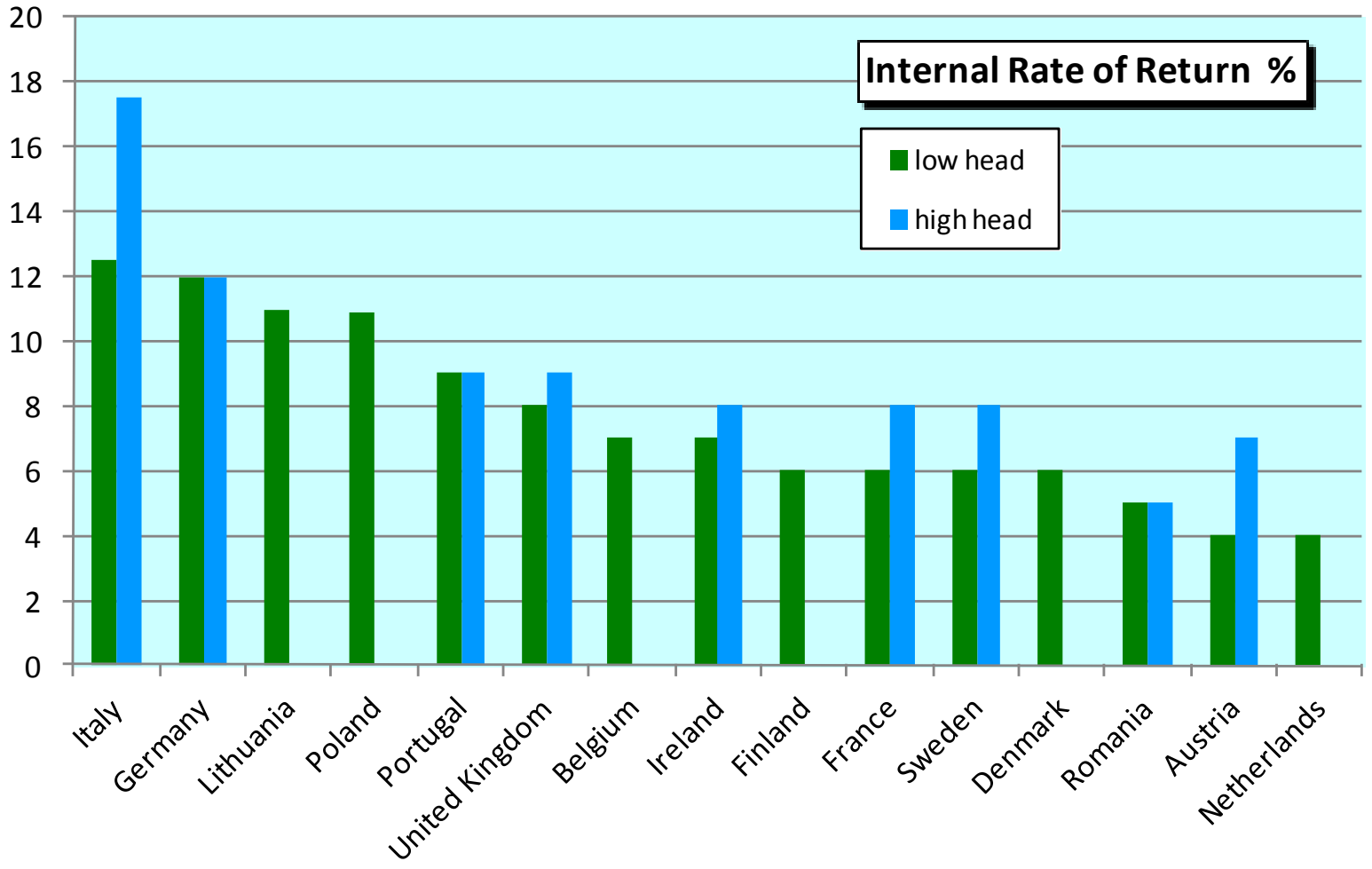
- Ranges from 10 to 50 years for both low and high head projects
- Average - Low Head 33 years
  High Head 38 years

Market Data - Comments

IRR is the most important indicator of SHP viability.
In general, IRR's throughout the Member States is adequate for SHP development. (10% is normal business minimum but for incentivised developments from 6% to 8% is generally regarded as acceptable)

SHP market is very sensitive to economic and political (directives & policies) changes and adverse regulation.
Uncertainty stops investment

It is therefore essential to try to maintain clear and acceptable regulation and encourage stable policies which will reduce uncertainty


Internal Rate of Return %
low head
high head
20
18
16
14
12
10
8
6
4
2
0
Italy
Germany
Lithuania
Poland
Portugal
United Kingdom
Belgium
Ireland
Finland
France
Sweden
Denmark
Romania
Austria
Netherlands

Road Map key messages on the market analysis

1. *The sector can be **financially sustainable if fair market rules are provided** - financial schemes for hydropower projects should account for multipurpose features of hydropower, not only production of green electricity, but also its incomparable high efficiency, its contribution to grid stability, and other benefits related with water resource management, as flood protection.*

2. *In fact, SHP has specific characteristics that are quite different from other renewable technologies, like time availability of the resource, long life time (up to 100 years), higher specific power investment and the multipurpose use of water.*

3. *However, like other renewables, **SHP needs regulatory stability and fair market rules**, especially concerning permit granting, technical rules and in the financial environment (tariffs).*