

# Renewable Energy in the Generation Mix

Katrina Polaski  
Head of Renewable Energy  
Sustainable Energy Ireland

# Overview



- Where we are now?
- What does policy ask for?
- What are the options (what resource is available)?
- What generation portfolio might look like in 2020?
- What are the implications of meeting targets with intermittent resource?

---

# Current Portfolio

---

# Current Renewable Electricity Generation Capacity

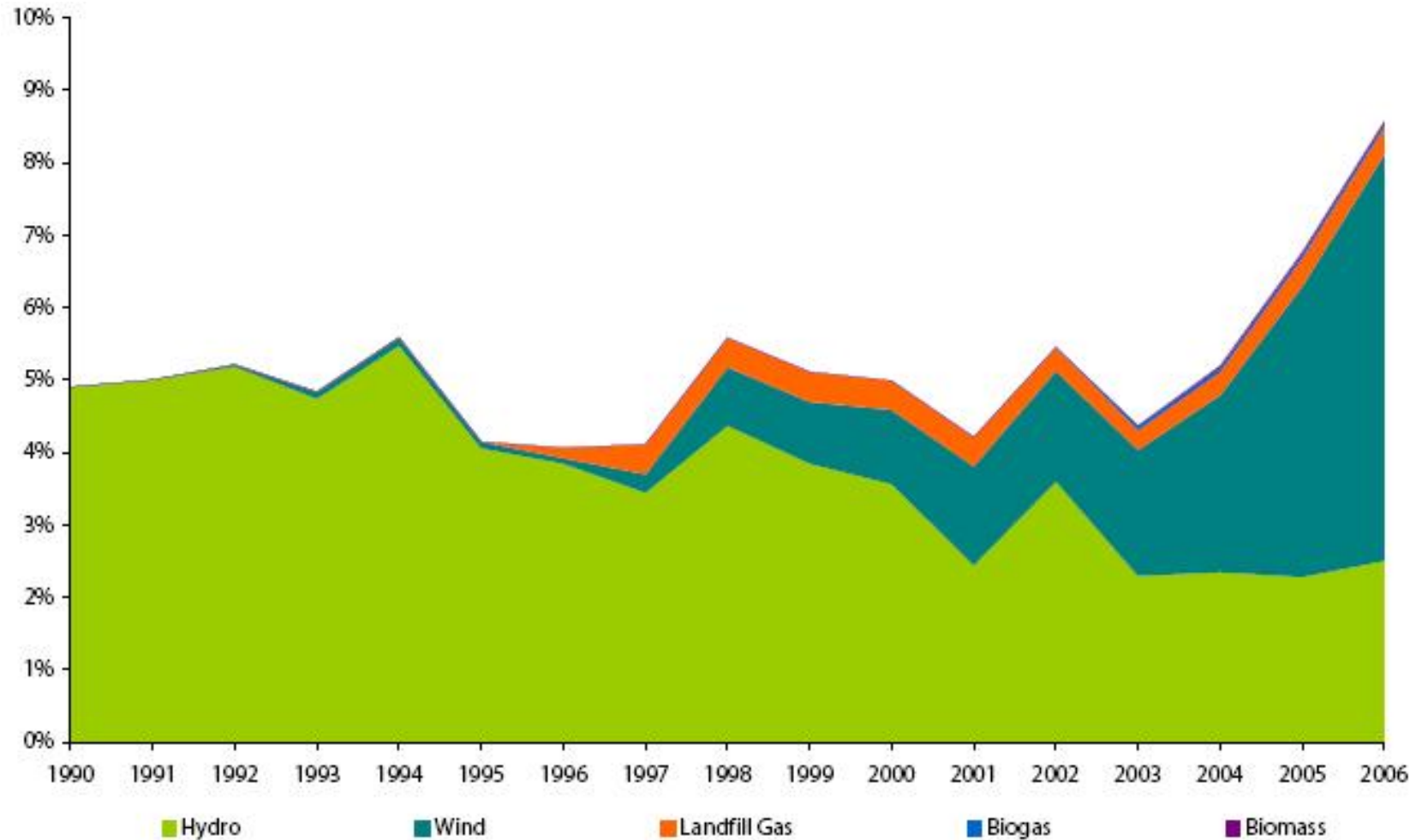


- **Wind** 792.9MW (July 2007)
- **Biomass** 28MW
- **Large Scale Hydro** 218MW
- **Small-Scale Hydro** 19MW

## Other potential Renewable Technologies

- **Ocean Energy**
  - Tidal Stream
  - Wave Power
- **Solar Photovoltaic**

# RES-E Contribution Growth



# RES-E Contribution to Gross Consumption



	2000	2006
<b>Renewables % of Gross Electricity</b>	4.99%	8.58%
Hydro	3.56%	2.51%
Wind	1.03%	5.61%
Biomass	-	0.03%
Landfill Gas	0.40%	0.38%
Biogas	-	0.06%

- Growth is in wind
- Context of 5% annual growth in demand makes increasing penetration demanding

# Growth story has been wind



- End of 2006 - **62** wind farms in Ireland
- Total generating capacity **744MW**.
- Annual wind power production **1.56TWh**
- **5.61%** of current national electricity supply
- Replaces hydropower as primary source of RES-E from 2004

---

# Policy Statements

---

# Policy Requirement



- European Council Target – 20% share of RE in EU energy consumption
  - Allocation to RES-E per RE Road Map – 34% electricity
  - Allocation to Member States not yet done
- White Paper Targets
  - 15% RES-E by 2010
  - 33% RES-E by 2020
  - 30% co-firing in peat stations by 2015
  - 500MW ocean energy capacity by 2020

# Policy Requirement Cont.



- Projected 2020 generation requirement 38,191 GWh (Energy in Ireland 1990-2005, EPSSU)
- White paper 2020 target 33% penetration requires 12,603 GWh renewable energy
- White paper 2010 target 15% penetration requires 4,884 GWh renewable energy
- If achieved, 500MW ocean energy could provide 1,500 GWh or 4%
- If achieved, 30% co-firing in peat plants could provide 850 GWh or 2%

---

# Resource Estimates

---

# Resource available to meet policy targets



- **Wind**
  - On-shore
  - Off-shore
- **Biomass**
  - Landfill gas
  - Co-firing
  - CHP
- **Ocean**
  - Wave
  - Tidal
- **Solar PV**
- **Hydro**

# Wind Resource

## Resource Available

- Technical Resource 666GW
- Accessible Resource 12GW

Source: ESBI Study 2004

## Status of Wind Connections 7/07

- Connected 792.9MW
- Contracted 443.8MW
- Gate 2 1295.2MW
- Other 2684.8MW
- Total 5216.7MW

Source: Eirgrid



Figure D-1 Geographical Location of Existing and Committed Future Wind Farms at the End of December 2005

# Biomass Resource for Electricity



## Medium Scenario 2020 – REDG Biomass Strategy Group

	<b>Electricity</b>	<b>CHP</b>	<b>Electricity</b>	<b>CHP</b>
	<b>MW</b>	<b>MWe</b>	<b>GWh</b>	<b>GWh</b>
<b>Wood Residue</b>	<b>48</b>	<b>127</b>	<b>333.5</b>	<b>738.6</b>
<b>Dry Agricultural residue</b>	<b>10</b>	<b>60</b>	<b>67.9</b>	<b>349.3</b>
<b>Wet Organic Residue</b>		<b>39</b>		<b>212</b>
<b>Landfill Gas</b>	<b>3.5</b>		<b>20.1</b>	
<b>Waste-to-Energy</b>		<b>82</b>		<b>411.5</b>
<b>Energy Crops</b>		<b>44</b>		<b>255.9</b>
<b>Total</b>	<b>61.5</b>	<b>352</b>	<b>421.5</b>	<b>1967.3</b>

*Source: Bioenergy in Ireland, 2006*

# Ocean Energy

## Wave

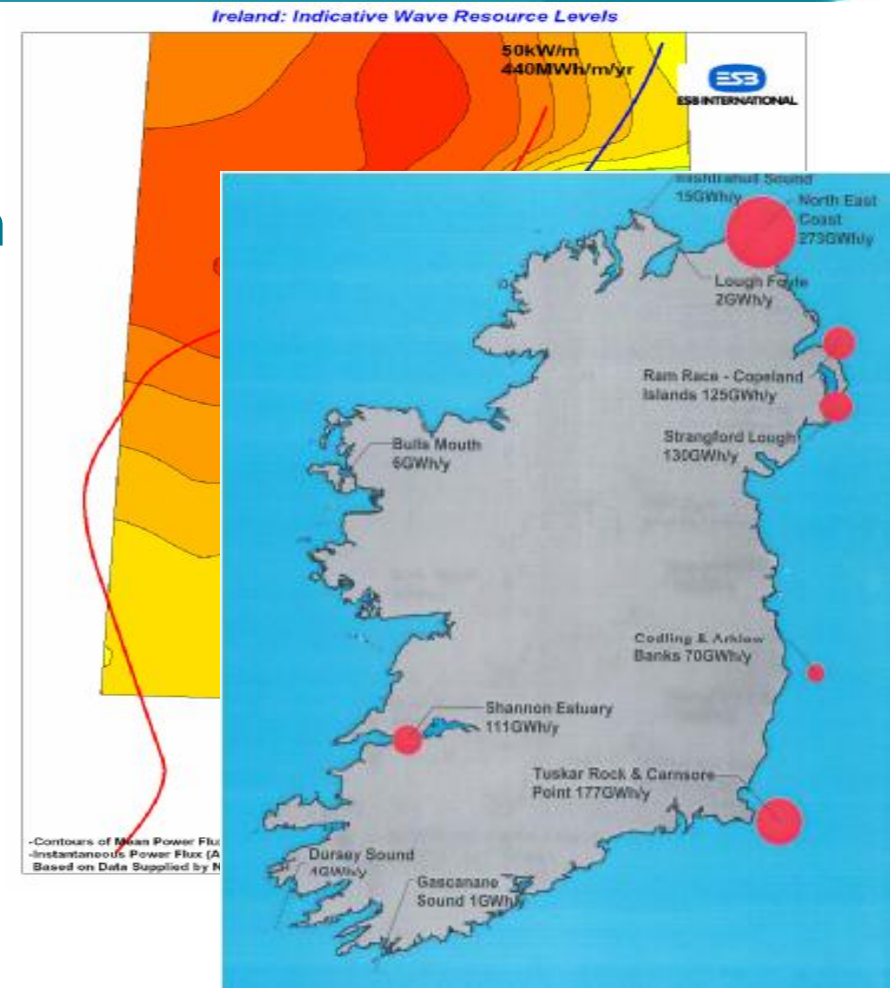
- Technical resource 525TWh
- Accessible resource 11.72 TWh

*Source: Wave Energy Atlas, 2005*

## Tidal

- Accessible 2.633 TWh
- Increases significantly with 2<sup>nd</sup> generation technology

*Source: Tidal Energy in Ireland, 2005*



# Other

- Solar Photovoltaic
  - Theoretical 9,619 TWh (cover the Island)
  - Possible (100,000 installations) 137 GWh
  - Cost prohibitive
- Hydro
  - Current resource 724 GWh
  - Little additional resource available
  - Variable dependant on rainfall
    - 2006 is 15% higher than 2005

# Resources overview



<u>Resource</u>	<u>GWh</u>	
Required by target	12,603	
Biomass	2,389	
Ocean	1,500	
Hydro	724	
Wind	7,990	(3000 MW)

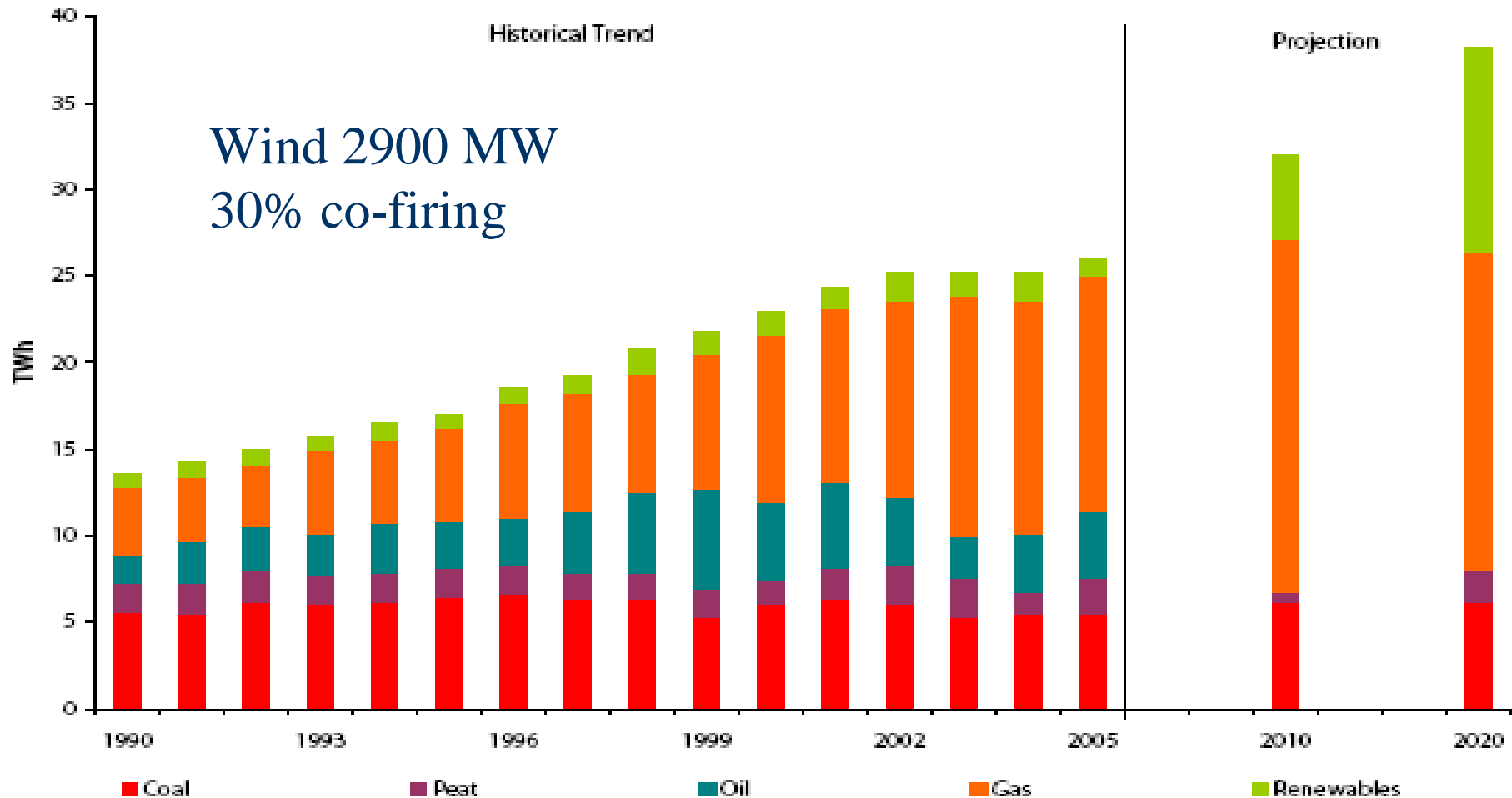
---

# Possible 2020 Generation Portfolios

---

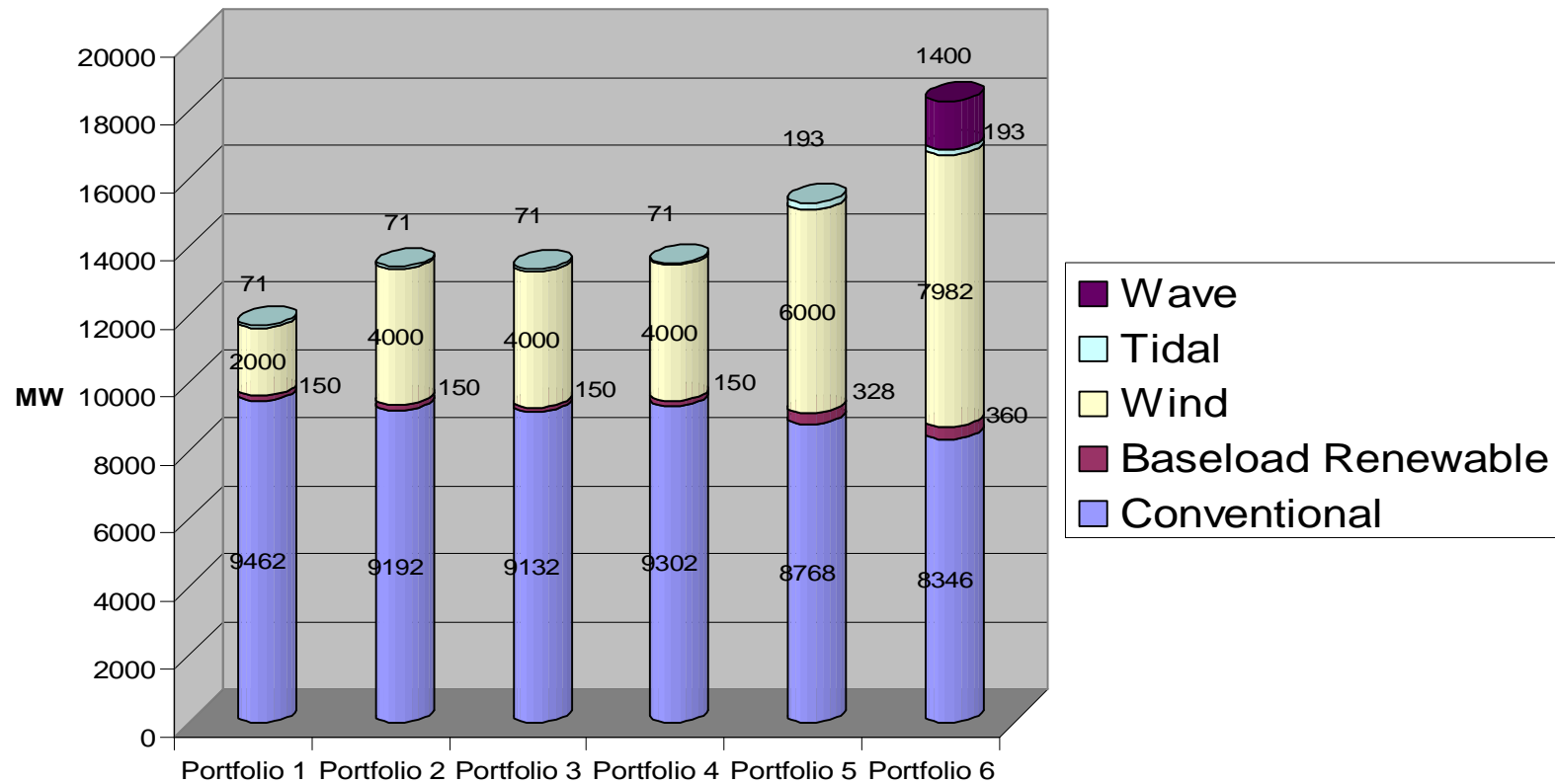
# Energy in Ireland

Source: EPSSU 2007



# All-Island Grid Study

All Island Grid Study Portfolios



---

## Implications of high levels of intermittent renewables in the mix

---

# The conventional mix is important



- Variable renewables provide low (no) carbon energy, with no fuel cost
- The balance of generation will need to evolve to provide reserve and system security in the near to medium term at least cost
- All-Island Grid Study considers the impact of various conventional portfolios with ~ 30% penetration levels of RES-E

# The network infrastructure is important



- Infrastructure can be planned with exploitation of high renewable resource areas prioritised
- Lead times for network construction often longer than that of generation
- Clarity of policy objectives can help to direct strategy

# Mitigation measures need investigation



- Storage options
- Flexible load
- System operation methods
- Increased interconnection
- Research and development to bring new technologies to maturity

# Conclusions

- Role for renewables is to provide carbon free, fuel free, low cost electricity
- Wind remains the dominant contributor in the near and medium term
- Cost is important, key questions regarding cost of balancing intermittent generation are addressed in All-Island Grid Study
- More questions will emerge, our capacity to investigate will increase
- Early indications of road map to achieve targets are key to planning the future