

# IL PICCOLO IDROELETTRICO E LE SUE POTENZIALITÀ

*Il contributo sostanziale d'una tecnologia matura*

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# Cos'è l'idroelettrico minore

In Italia: < 3 MW (nominali)

In Europa \*: < 1 MW in Lussemburgo

< 5 MW nel Regno Unito

< 8 MW in Francia

< 10 MW in Portogallo, Spagna, Irlanda, Grecia,  
Belgio

Nel mondo: < 10 MW (Commissione europea e UNIPEDE)

**IN PROSPETTIVA: < 10 MW**

*\* Aggiornamento al 2001*

## A USUAL CLASSIFICATION of HYDROPOWER PLANTS

| Name  | Capacity                               |
|-------|----------------------------------------|
| SMALL | $10 \text{ MW} \geq X > 1 \text{ MW}$  |
| MINI  | $1 \text{ MW} \geq X > 100 \text{ kW}$ |
| MICRO | $100 \text{ kW} \geq X$                |

# CHE CONTRIBUTO PUÒ DARE ALLO SVILUPPO DELLE RINNOVABILI UNA TECNOLOGIA MATURA COME L'IDROELETTRICO?

## COSA MOSTRA IL RECENTE PASSATO (1990-2001)



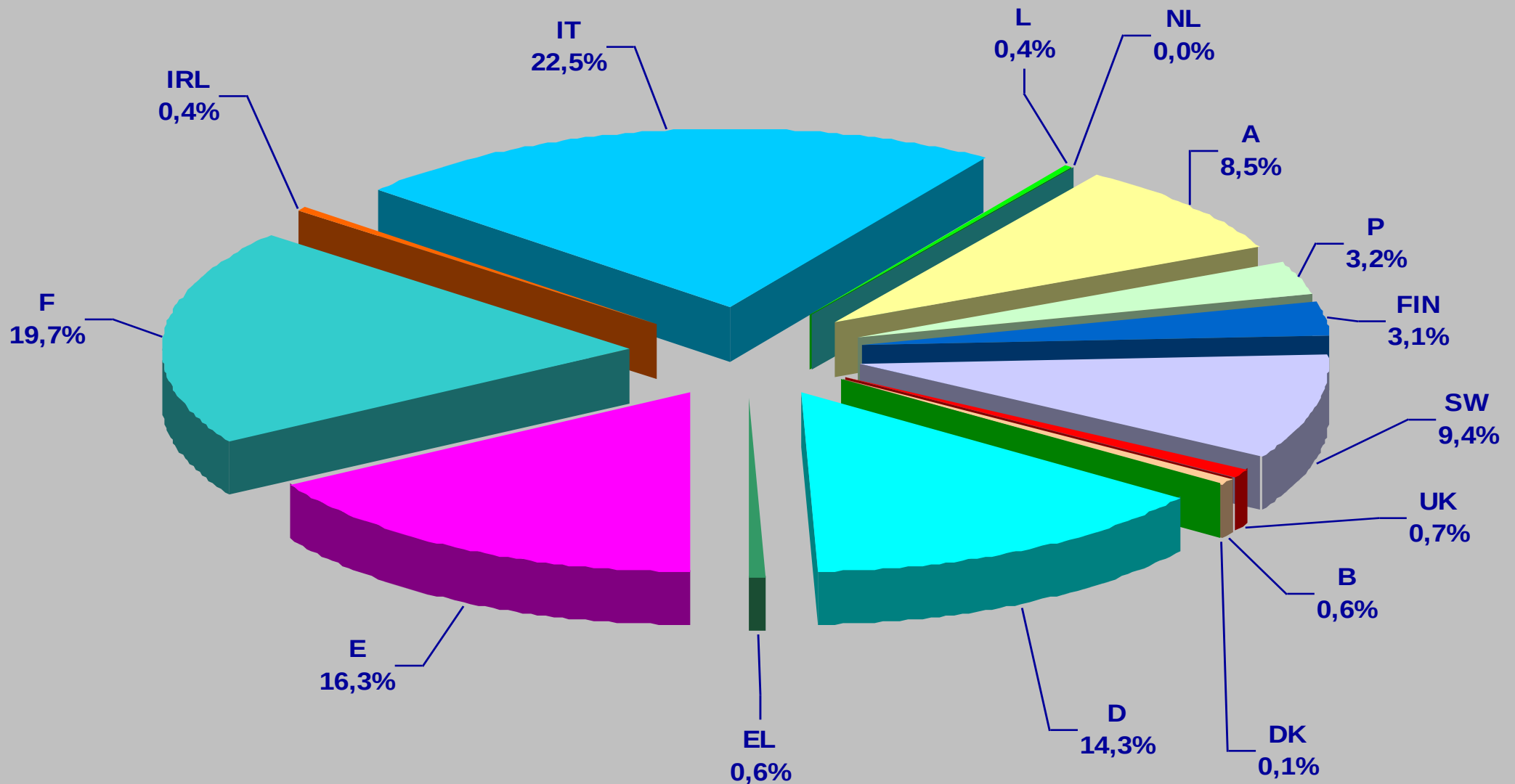
### SHP statistics in the EU, 1990-2001: Key figures

|                                                   | 1990   | 2001   | Total increase | Average annual increase |
|---------------------------------------------------|--------|--------|----------------|-------------------------|
| SHP installed capacity [MW]                       | 4.032  | 9.909  | 146%           | 7,8%                    |
| SHP electricity generation [GWh]                  | 11.462 | 39.397 | 244%           | 10,8%                   |
| SHP contribution to total electricity generation  | 0,56%  | 1,47%  | 163%           | 8,37%                   |
| SHP contribution to total electricity consumption | 0,64%  | 1,73%  | 170%           | 8,64%                   |

# Member States SHP Overview, 1990-2001

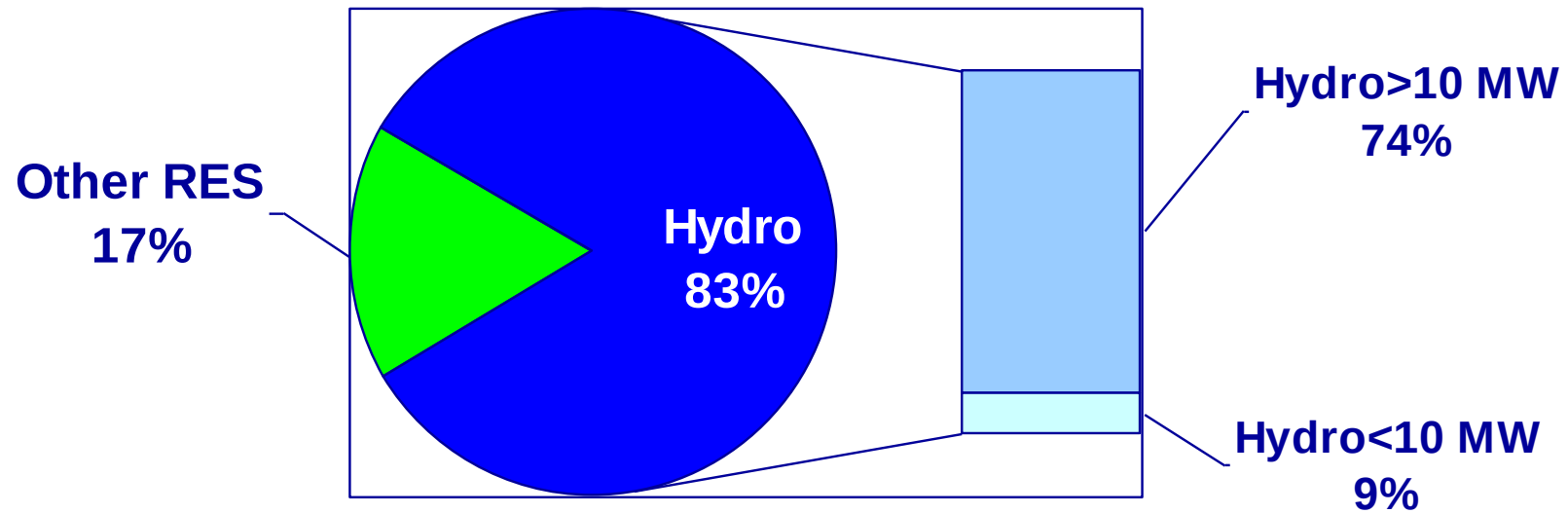
|     | SHP Installed Capacity in MW |       |       | SHP Electricity Generation in GWH |       |       |
|-----|------------------------------|-------|-------|-----------------------------------|-------|-------|
|     | 1990                         | 2001  | Trend | 1990                              | 2001  | Trend |
| B   | 2                            | 60    | ↑     | 7                                 | 246   | ↑     |
| DK  | 9                            | 10    | →     | 27                                | 29    | →     |
| D   | 360                          | 1.421 | ↑     | 2.850                             | 7.634 | ↑     |
| EL  | 30                           | 60    | ↑     | 60                                | 135   | ↑     |
| E   | 162                          | 1.618 | ↑     | 685                               | 4.436 | ↑     |
| F   | 1.732                        | 1.956 | ↑     | 5.392                             | 7.617 | ↑     |
| IRL | 7                            | 37    | ↑     | 20                                | 93    | ↑     |
| IT  | 317                          | 2.233 | ↑     | 1.044                             | 8.656 | ↑     |
| L   | 28                           | 40    | ↑     | 67                                | 133   | ↑     |
| NL  | 2                            | 2     | →     | 1                                 | 1     | →     |
| A   | 0                            | 843   | ↑     | 0                                 | 4.260 | ↑     |
| P   | 121                          | 317   | ↑     | 261                               | 982   | ↑     |
| FIN | 298                          | 309   | →     | 1.048                             | 1.158 | →     |
| SW  | 964                          | 935   | ↓     | 0                                 | 3.807 | ↑     |
| UK  | 0                            | 68    | ↑     | 0                                 | 210   | ↑     |

# Member States' Contribution to EU-15 installed capacity, 2001



Elaborazioni ESHA su dati EUROSTAT – database on SHP, 1990-2001

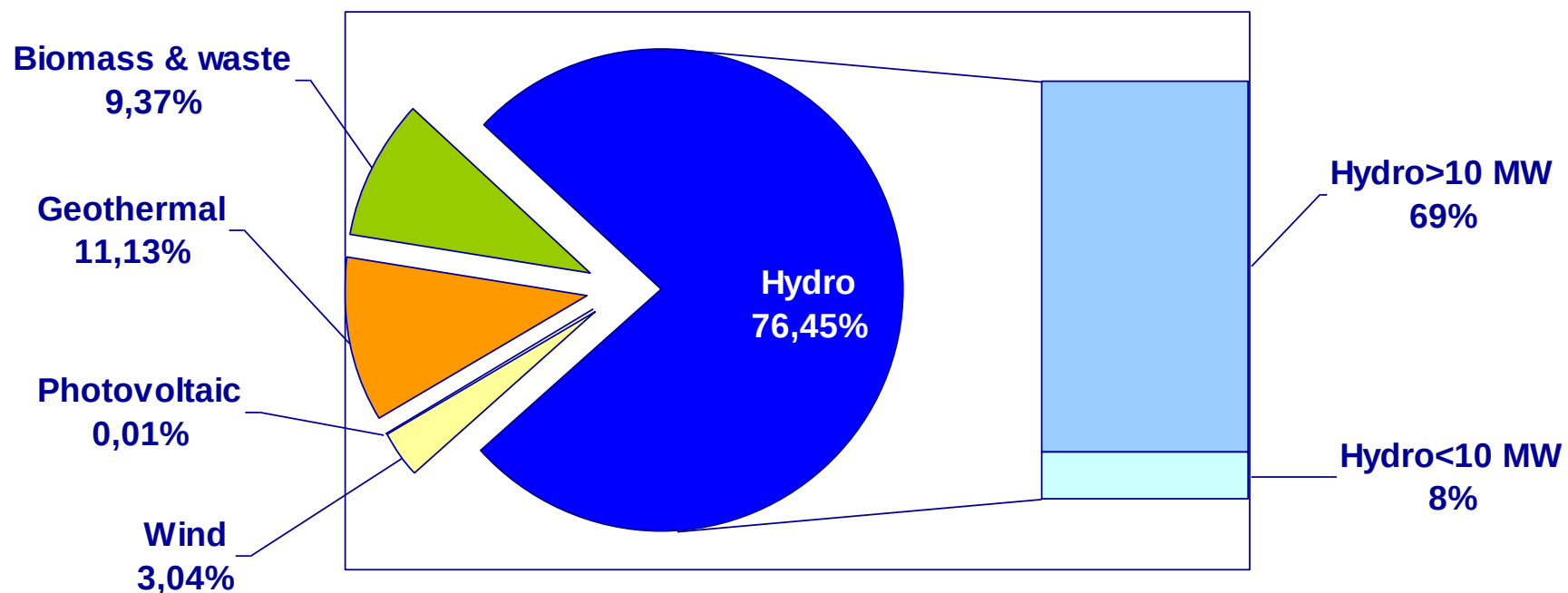
## RES electricity generation share in the EU-15,2001



*Elaborazioni ESHA su dati EUROSTAT – database on SHP, 1990-2001*



## RES electricity generation share in ITALY, 2001

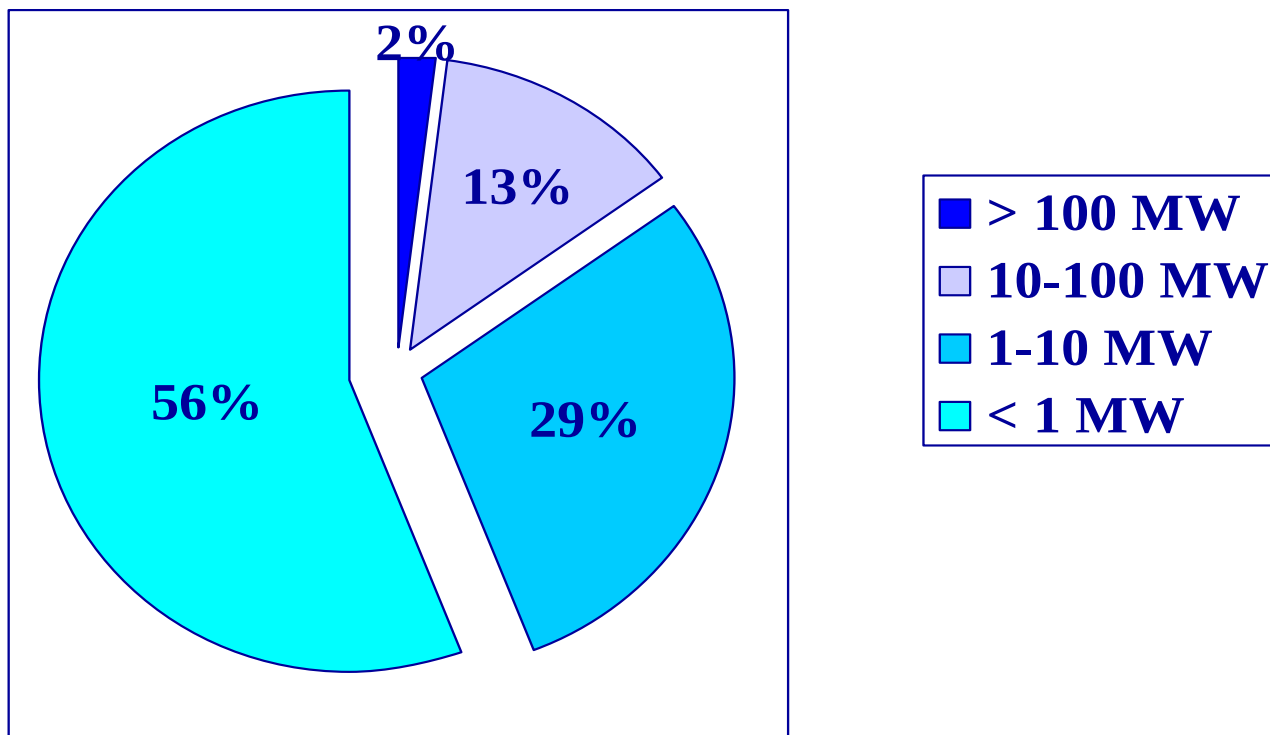


*GRTN – Elaborazione APER su dati statistici sull'energia elettrica in Italia – 2003*



# ITALY (2003)

## NUMBER of PLANTS for GENERATION CAPACITY

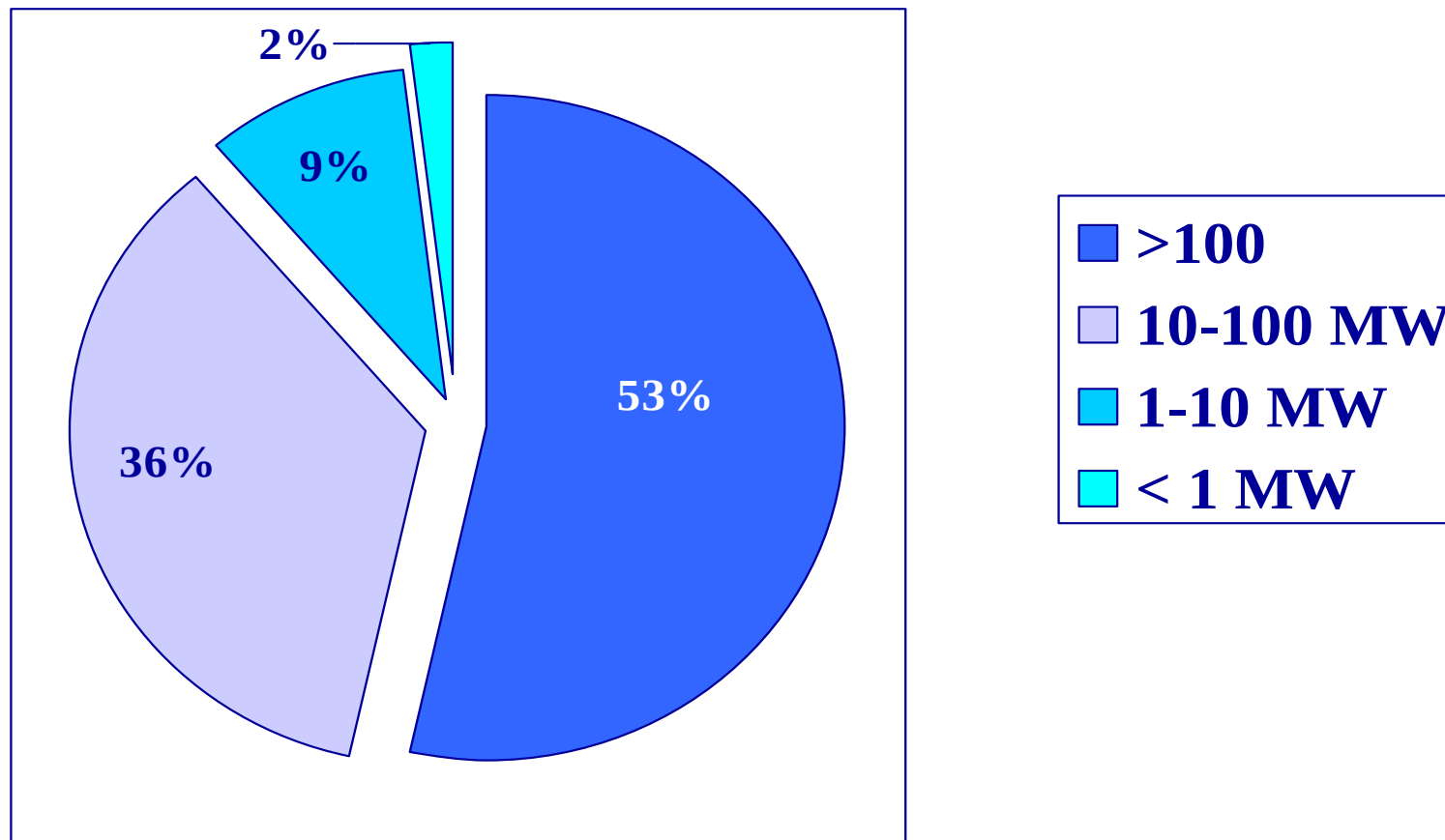


*GRTN – Elaborazione APER su dati statistici sull'energia elettrica in Italia – 2003*



# ITALY (2003)

## GENERATION of PLANTS for CLASSES



*GRTN – Elaborazione APER su dati statistici sull'energia elettrica in Italia – 2003*



# ITALY

## Targets for RES (*Italian White Paper on RES 1999*)

| Source                   | 1997   |            | 2002   |            | 2006   |            | 2008-2010 |            |
|--------------------------|--------|------------|--------|------------|--------|------------|-----------|------------|
|                          | MW     | PJp        | MW     | PJp        | MW     | PJp        | MW        | PJp        |
| Hydro > 10 MW            | 13.942 | 309        | 14.200 | 312        | 14.500 | 318        | 15.000    | 329        |
| Hydro < 10 MW            | 2.187  | 75         | 2.300  | 87         | 2.600  | 98         | 3.000     | 113        |
| Geothermal (el.)         | 559    | 36         | 620    | 42         | 700    | 47         | 800       | 54         |
| Wind                     | 119    | 1          | 700    | 13         | 1.500  | 28         | 2.500     | 46         |
| PV                       | 16     | 0          | 25     | 0          | 50     | 1          | 300       | 3          |
| Biomass and biogas (el.) | 192    | 5          | 500    | 28         | 9.000  | 50         | 2.300     | 127        |
| Waste (el.)              | 89     | 2          | 350    | 16         | 600    | 28         | 800       | 37         |
| Biofuels                 |        | 3          |        | 12         |        | 23         |           | 39         |
| Biomass and biogas (th)  |        | 45         |        | 59         |        | 67         |           | 73         |
| Solar Thermal            |        | 0          |        | 2          |        | 5          |           | 9          |
| Geothermal (th)          |        | 9          |        | 10         |        | 13         |           | 17         |
| Waste (th)               |        | 4          |        | 5          |        | 7          |           | 8          |
| <b>Total</b>             |        | <b>489</b> |        | <b>586</b> |        | <b>685</b> |           | <b>855</b> |

## Hydro technical potential in Europe (TWh)

| Country             | Technical Potential | Small Hydro-proportion | Proportion utilised |
|---------------------|---------------------|------------------------|---------------------|
| Belgium             | 0.6                 | 58%                    | 52%                 |
| Denmark             | 0.1                 | 100%                   | 18%                 |
| Germany             | 27.0                | 10%                    | 69%                 |
| Greece              | 25.0                | 8%                     | 10%                 |
| Spain               | 65.6                | 15%                    | 31%                 |
| France              | 72.0                | 11%                    | 86%                 |
| Ireland             | 1.6                 | 16%                    | 46%                 |
| Italy               | 150.0               | 15%                    | 24% (~60% SH)       |
| Luxembourg          | 0.5                 | 76%                    | 15%                 |
| Netherlands         | 0.6                 | 26%                    | 10%                 |
| Portugal            | 24.5                | 26%                    | 37%                 |
| UK                  | 7.5                 | 8%                     | 48%                 |
| <b>Total EC -12</b> | <b>376</b>          | <b>21%</b>             | <b>39%</b>          |

Fonte: DG XVII – The European renewable energy study – 1994.

## Hydro potential figures in the world

### Estimates of feasible Small-Hydro potential by region with two development scenarios (Capacities given in MW)

|                         | Baseline | "Business as usual" | Accelerated Development |
|-------------------------|----------|---------------------|-------------------------|
| Region                  | 1995     | 2020                | 2020                    |
| North America           | 4861     | 6152                | 12906                   |
| Latin America           | 1992     | 5751                | 6557                    |
| Western Europe          | 8822     | 12587               | 21692                   |
| E. Europe & the CIS     | 2801     | 3997                | 4197                    |
| Middle East / N. Africa | 81       | 233                 | 266                     |
| Sub-Saharan Africa      | 324      | 935                 | 1065                    |
| Pacific                 | 124      | 177                 | 306                     |
| China                   | 6963     | 20101               | 22915                   |
| Rest of Asia            | 614      | 1772                | 2021                    |
| Totals:                 | 26582    | 51705               | 71925                   |

(fonte: SMALL HYDRO POWER Peter Fraenkel, (IT Power Ltd), Dr Jochen Bard - ISET)

## *Some conclusions:*

- 1. SHP installed capacity in the EU-15 has followed an upward trend as for 1990 increasing more than double over the reference period and contributing by 2% to the total electricity installed capacity in the EU-15 in the year 2001.*
- 2. SHP electricity generation in the EU-15 has followed an upward trend as for 1990 increasing by 300% from 1990 to 2001. Electricity generation from SHP contributed about 2% to the total electricity generation in the EU-15 in the 2001. About 9% (in Italy 8 % ) of the RES electricity generation and 4% of the RES primary energy in the EU-15 were produced by SHP plants in 2001.*
- 3. In 2001, Italy accounted for 22% of the EU-15 SHP installed capacity and electricity generation holding a leading position in terms of SHP capacity and production.*
- 4. Trends in the SHP over the last decade show not only the positive impact of RES policy implemented across the EU-15 but also the negative effect and risk of some legislation and environmental movements in some member States.*
- 5. Many studies carried out on the sector perspectives show that the technical potential of SH is far to be completely exploited.*
- 6. According to the performances and prospects shown by several surveys, the definition of "mature technology" for hydropower must be conceived merely as the acknowledgment of its reliability and efficiency, certainly not of the lack of interesting development prospects, provided that the many obstacles on the way of the realization of new plants are removed.*

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