



# PV Market Overview & Implications for Energy Storage

Paul Garvison  
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# Market Snapshot 2003

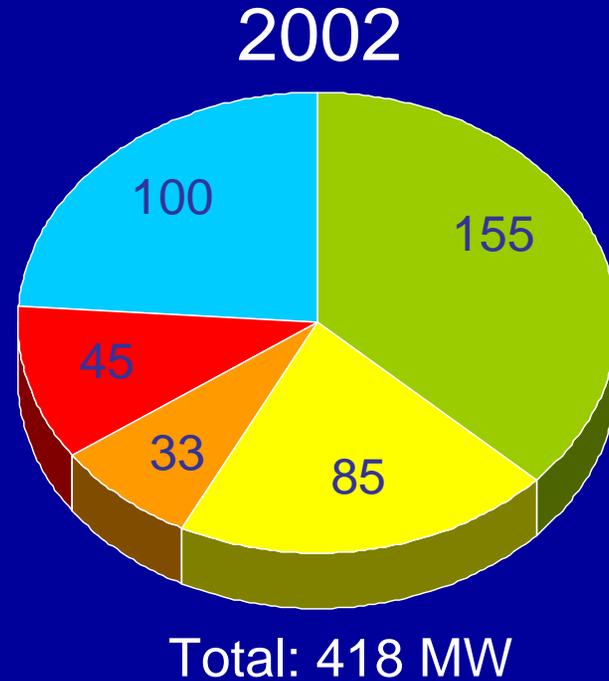
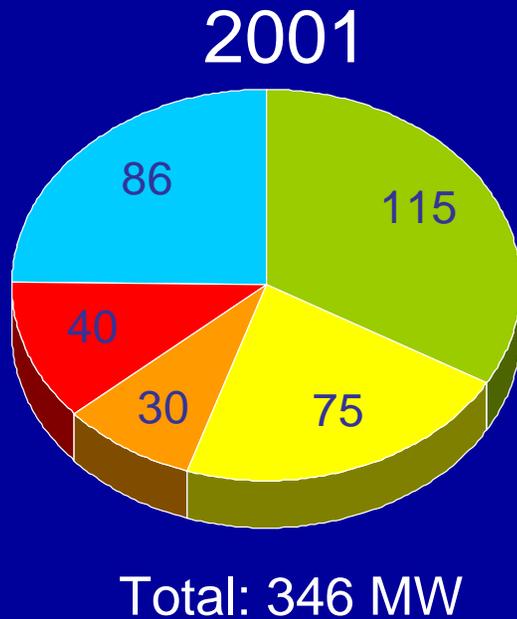


- The global market for PV will exceed 500 MW in 2003 (575 MW estimated).
- Market growth of over 30% is expected for 2003-2004
- Japan is now the world's largest PV market – 225 MW estimated for 2003.
- Grid connected markets now dominate with over 70% of the global PV demand.
- Many traditional off-grid PV markets are flat, led by the slump in telecom.
- The top 8 companies grew their share of the overall market from 84% in 2001 to 89% in 2002.

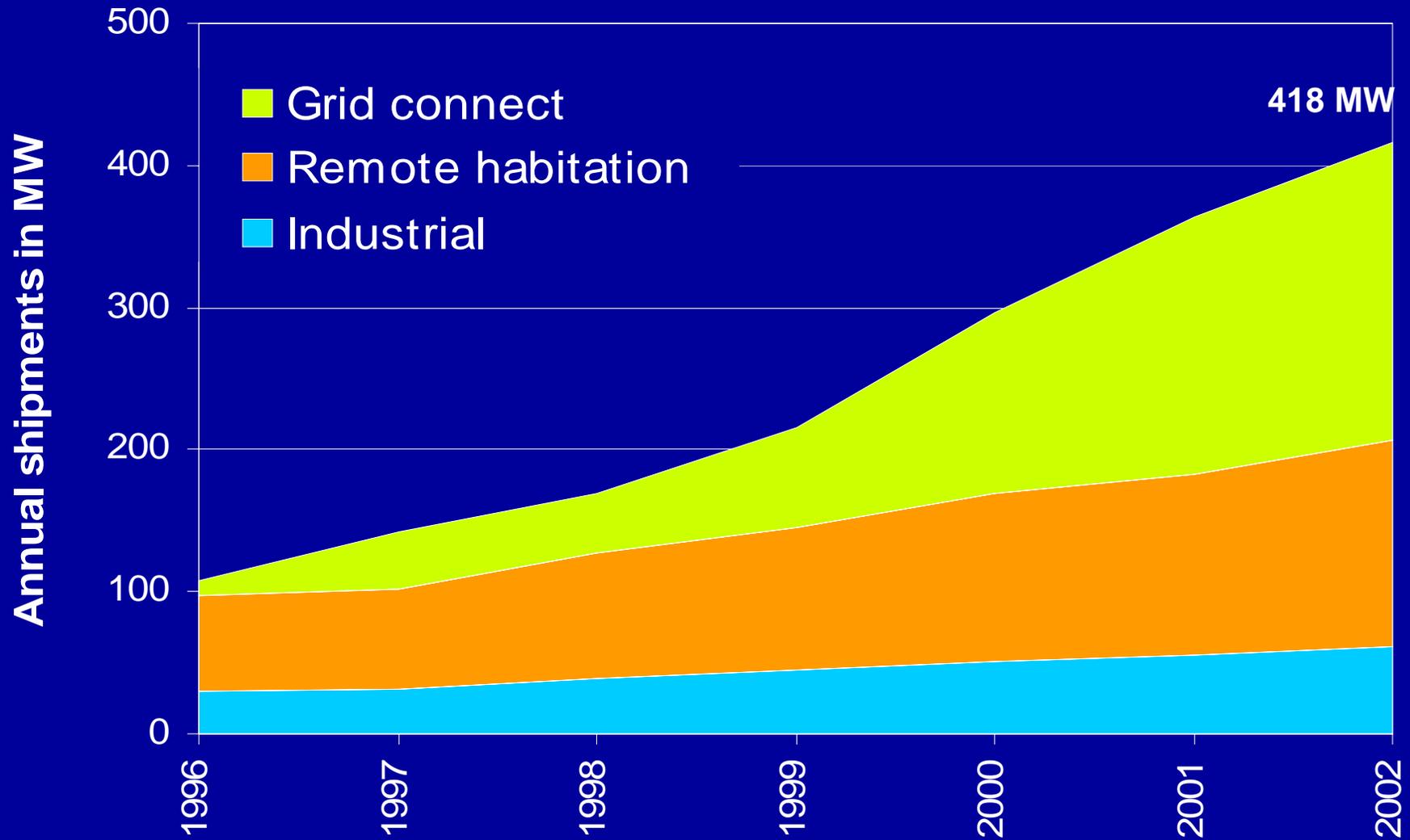
# Global market estimate



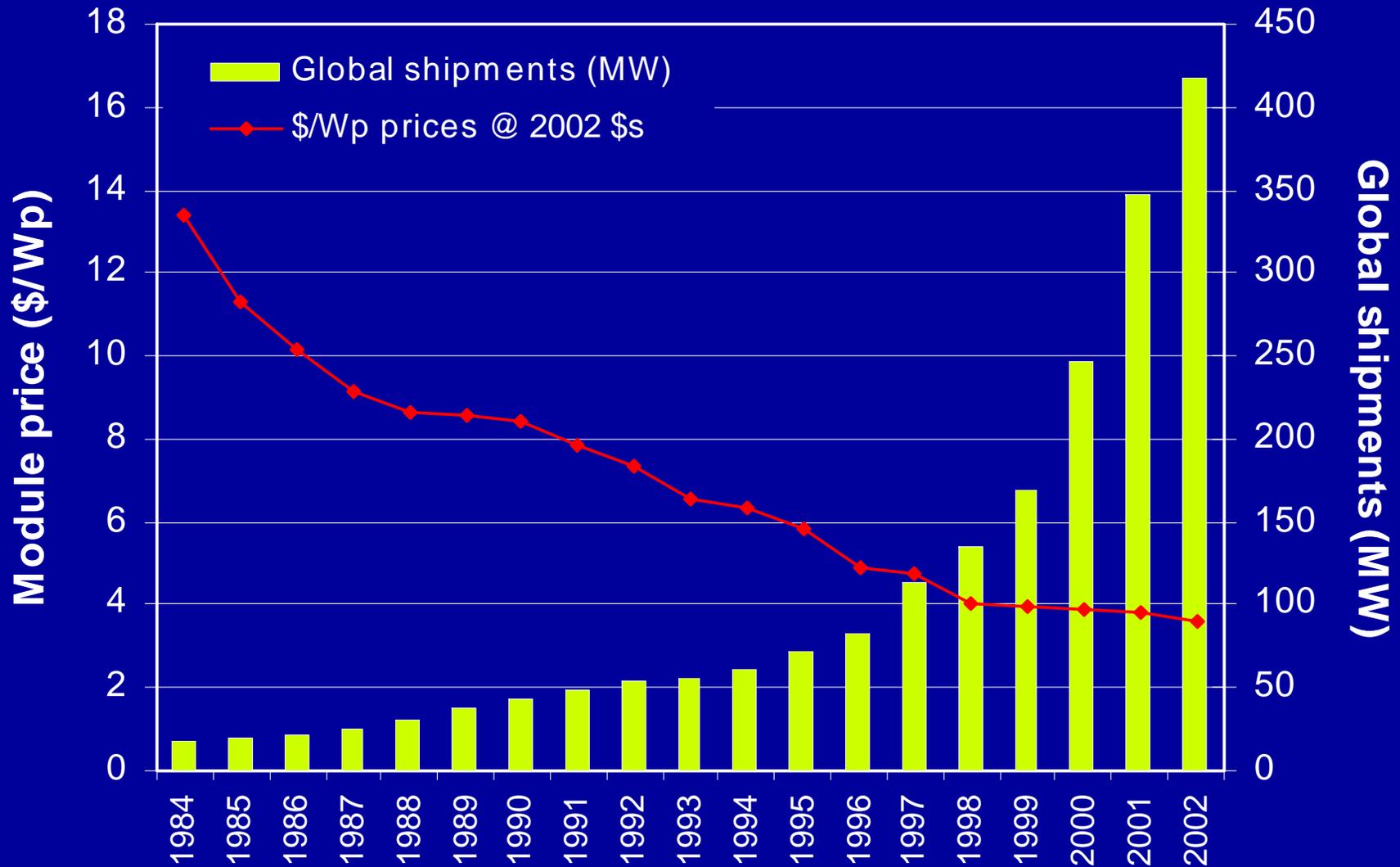
- Japan
- Germany
- Rest of Europe
- USA
- RoW



# Global market estimate



# Module price vs shipments



Source: Strategies Unlimited & BP Solar internal estimates

## Market overview - Japan



- The Japanese market is estimated to be 39% of the global market in 2003, up from 37% in 2002.
- Applications for the residential program are increasing at 35 –40% per year.
- The residential program accounts for over 80% of the Japanese market.
- Subsidies to residential customers are now less than \$1/Wp – lifecycle cost parity with grid electricity will occur in the next few years for residential customers.
- Growth in 2004 is expected to be 35%

# Market overview - Germany



- The German market will account for 21% of the global market in 2003, up from 20% in 2002.
- 2003 is the last year of the 100,000-roof program in its current form with the combination of concessional loan and feed-in tariff – approvals were closed in June. 350 MW have been installed.
- The new feed-in tariff law for renewables is soon to be debated in the German parliament – strong support still exists for solar but wind is under pressure and the program costs are an issue due to budget deficits
- Growth is expected to resume after the new law is in place

## Market overview - USA



- The US was about 12% of the global market in 2003.
- About 1/3 of the market is for grid connected applications in California.
- The funding for commercial (>30 kW) systems in CA is now secured through 2008, but residential funding will run out in 2004 without additional approvals
- New buydown programs in the Northeast will create expanding markets in NJ, NY, PA with some in CT and MA.
- Growth is expected to be 25% or more in 2004

## Market overview - ROW

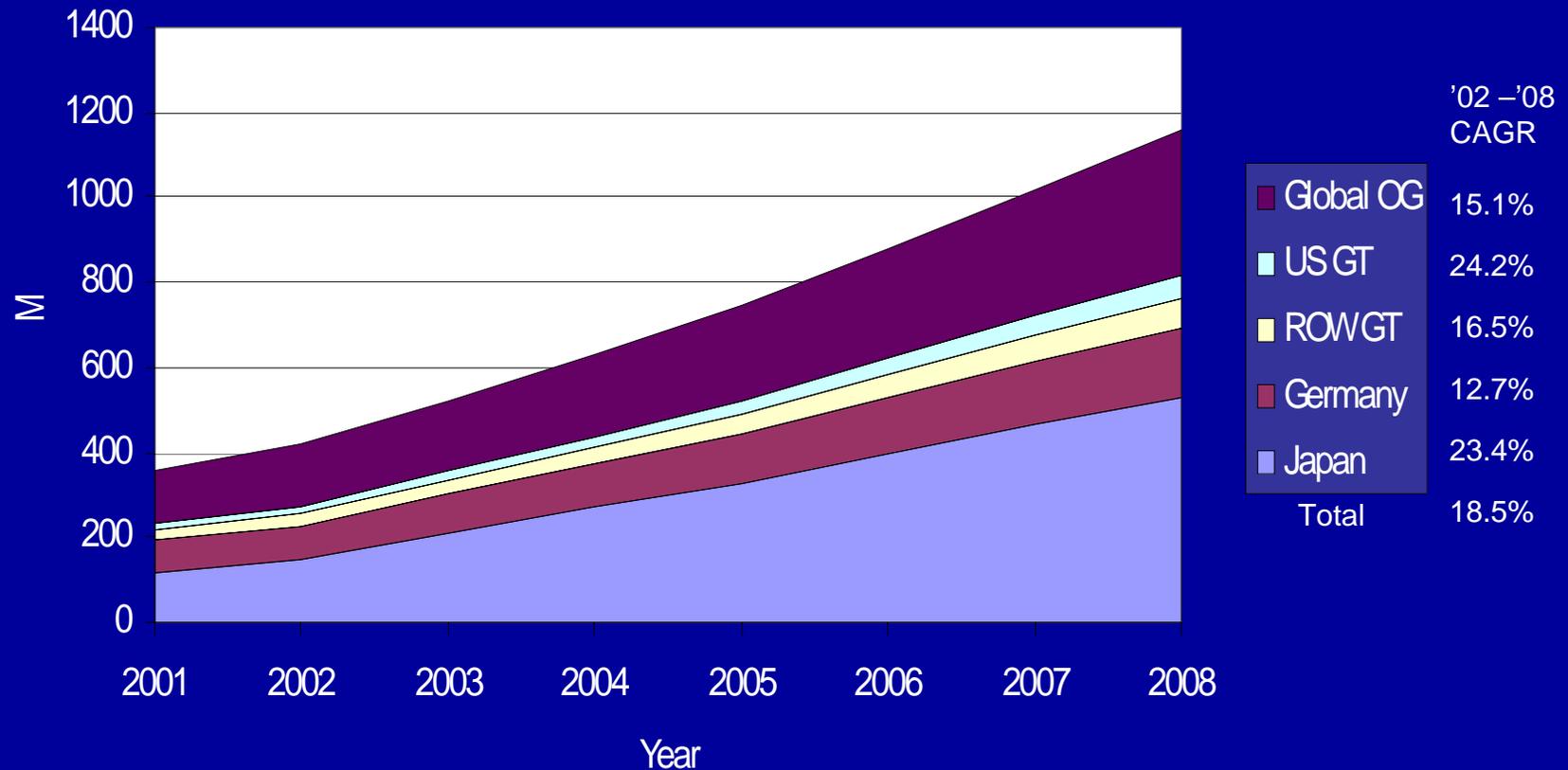


- Other European nations are now adding grid connected programs: Netherlands, Spain, UK, Italy, etc.
- Most of the rest is off-grid with a split between rural habitation and industrial of about 50/50.
- Large rural infrastructure projects such MSIP, MORD and PRODEEM are becoming more common.
- Grassroots markets where users purchase small systems outright, get microloans, or pay for services are growing in many less developed or developing countries like India.
- Growth is expected to be about 15% in 2004

# Global PV Market Projection



Global PVMarket



# PV Market External Drivers



- Green influence on national agendas
- Kyoto treaty compliance
- Energy independence/security issues
- Increasing costs of conventional sources
- Aging or inadequate transmission and distribution infrastructure
- IEA goals: 300 million grid connected homes in developing countries and 200 million homes in developed countries by 2010
- Most OECD countries now have programs to incentivize PV and other renewables
- Acceptance of PV as a viable means of providing rural electricity in many situations
- Wider user of remote electronic or telecom devices
- Enabling technologies such as LED lighting, high efficiency refrigerators, etc.

# Current PV Storage Market Estimate & Projection



- Off-grid PV market of 155 MW in 2003 translates to ~ 5000 MWh of storage @ \$100/kWh = \$500 m
- Off grid growth to 355 MW by 2008 implies storage requirement of ~ 11,000 MWh @ \$100/kWh = \$1.1B
- Replacement market by 2008 ~ 5000 MWh of storage @ \$100/kWh = \$500 m – assuming 1GW installed off grid and 6 year service life
- Little near term market for storage in GT sector in Japan and Europe due to high grid reliability – little perceived need.
- Small potential in the U.S. with existing business model - perhaps 10% of GT applications in 2008: 13 MW translates to ~130 MWh (2 days) = \$13 m.

# Market Directions for PV Energy Storage



- Lower lifecycle costs:
  - Longer life/higher reliability/lower maintenance
  - Lower capital cost
  - Reduced product stewardship costs
- Dispatchable power to grid
  - Requires reliable control system
  - Adds value to PV energy as a “peak shaving” method, but economics unclear with current technology
- Large scale storage – needed to achieve PV energy contribution beyond 5-10% of total electricity
- Energy security - some interest has appeared following recent grid outages in the Northeast
  - But economics of alternatives (eg. gensets) are presently considerable more attractive than PV/battery