Use of Alternative Fuels and Hybrid Vehicles by Small Urban and Rural Transit Systems

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Survey Overview

- Survey of 115 rural and small urban transit systems on use of:
  - Biodiesel
  - E85
  - Propane
  - CNG
  - Hybrid-electric vehicles
- Conducted April 2011
- Main topics
  - Use
  - Satisfaction
  - Problems
  - Perceived benefits/reasons for adoption
  - Deterrents

Number of Transit Agencies Surveyed

	Targeted	Surveys Sent	Surveys Successfully Delivered	Survey Responses Submitted
	----------Number of transit agencies----------			
Small Urban	394	305	NA	54+
Large Rural	270	245	NA	37+
Total	664	550	496	115

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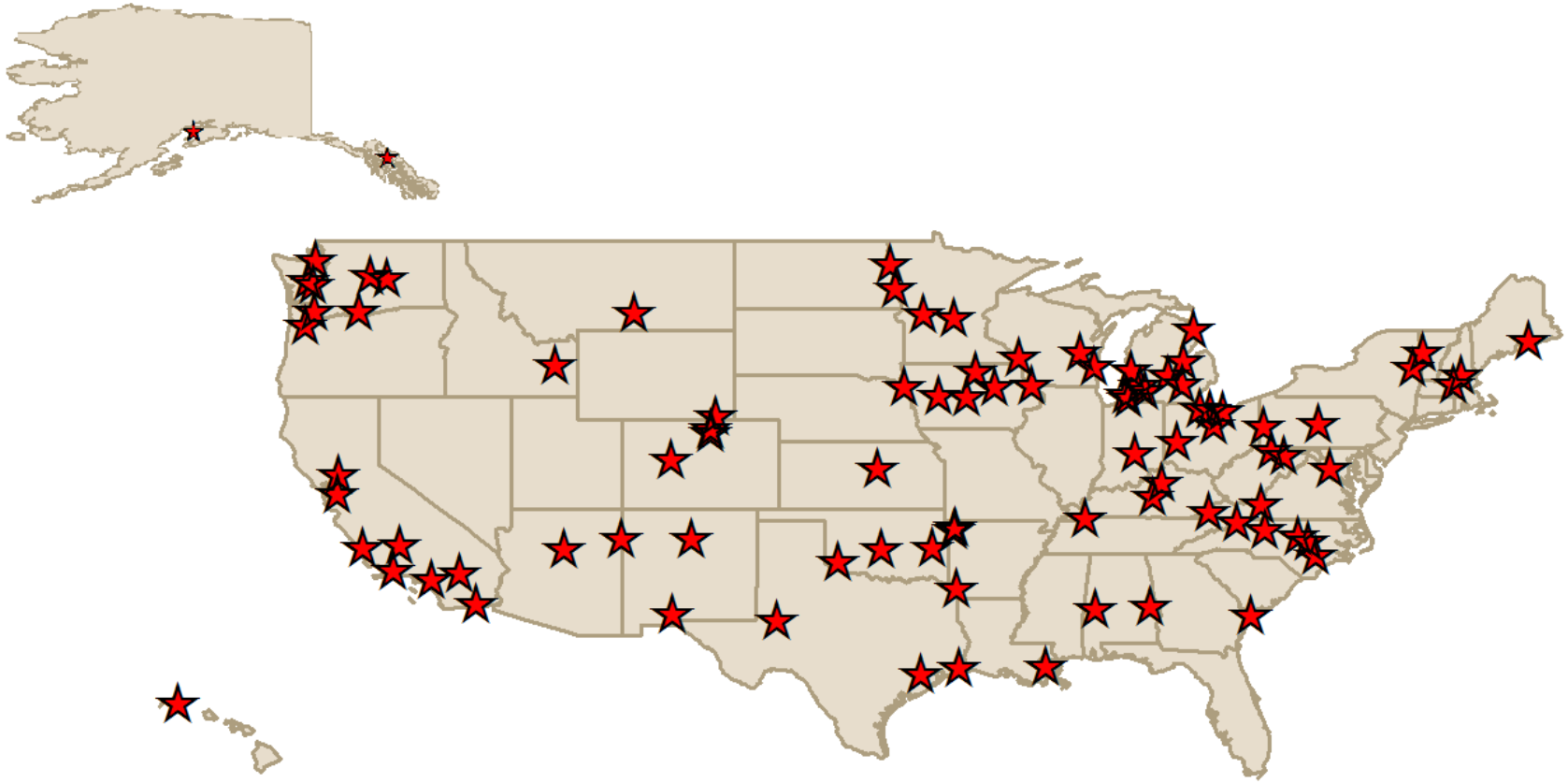
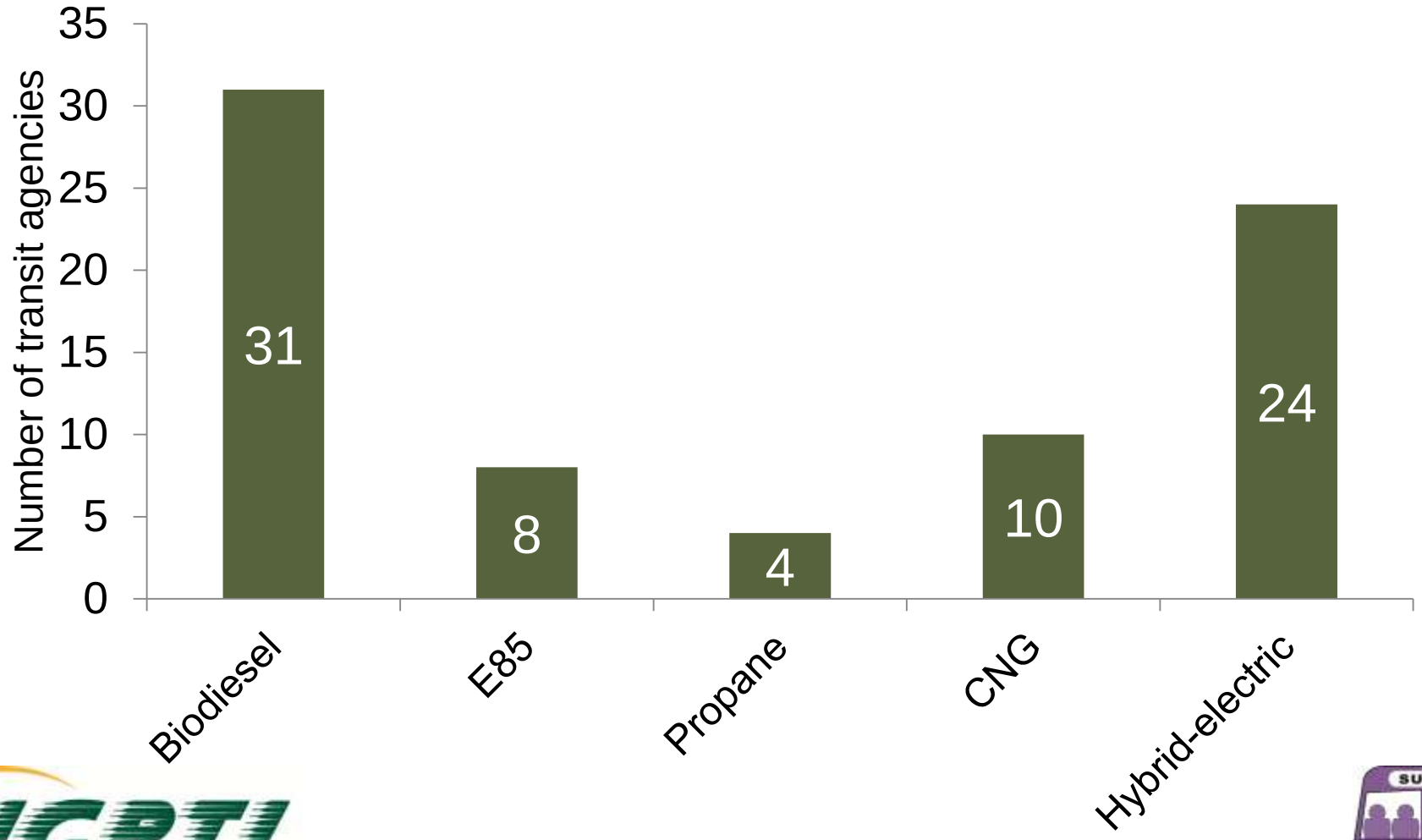
Locations of Transit Agencies Responding to Survey



Alternative Fuel and Hybrid Vehicle Use by Responding Agencies



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Use of Alternative Fuels and Hybrid Vehicles, by Urban and Rural

		Number (Percentage)	
		Yes	No
Urban			
	Biodiesel	18 (38%)	30 (63%)
	Flex Fuel Vehicle	16 (30%)	38 (70%)
	E85 in FFV	3 (19%)	13 (81%)
	Propane	2 (4%)	52 (96%)
	CNG	7 (13%)	47 (87%)
	Hybrids	19 (35%)	35 (65%)
Rural			
	Biodiesel	3 (12%)	23 (88%)
	Flex Fuel Vehicle	10 (27%)	27 (73%)
	E85 in FFV	3 (27%)	8 (73%)
	Propane	2 (5%)	35 (95%)
	CNG	2 (5%)	35 (95%)
	Hybrids	3 (8%)	34 (92%)

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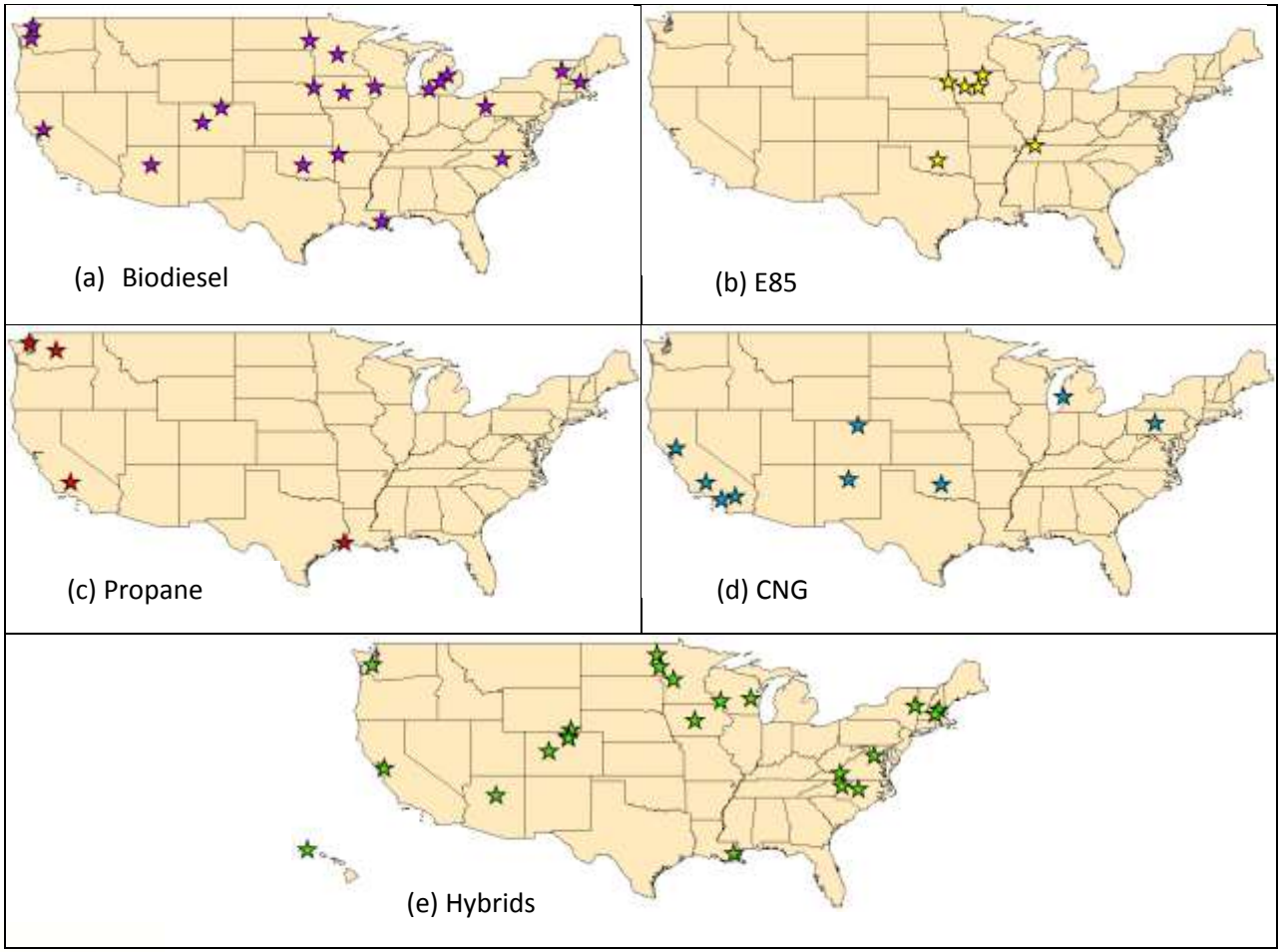
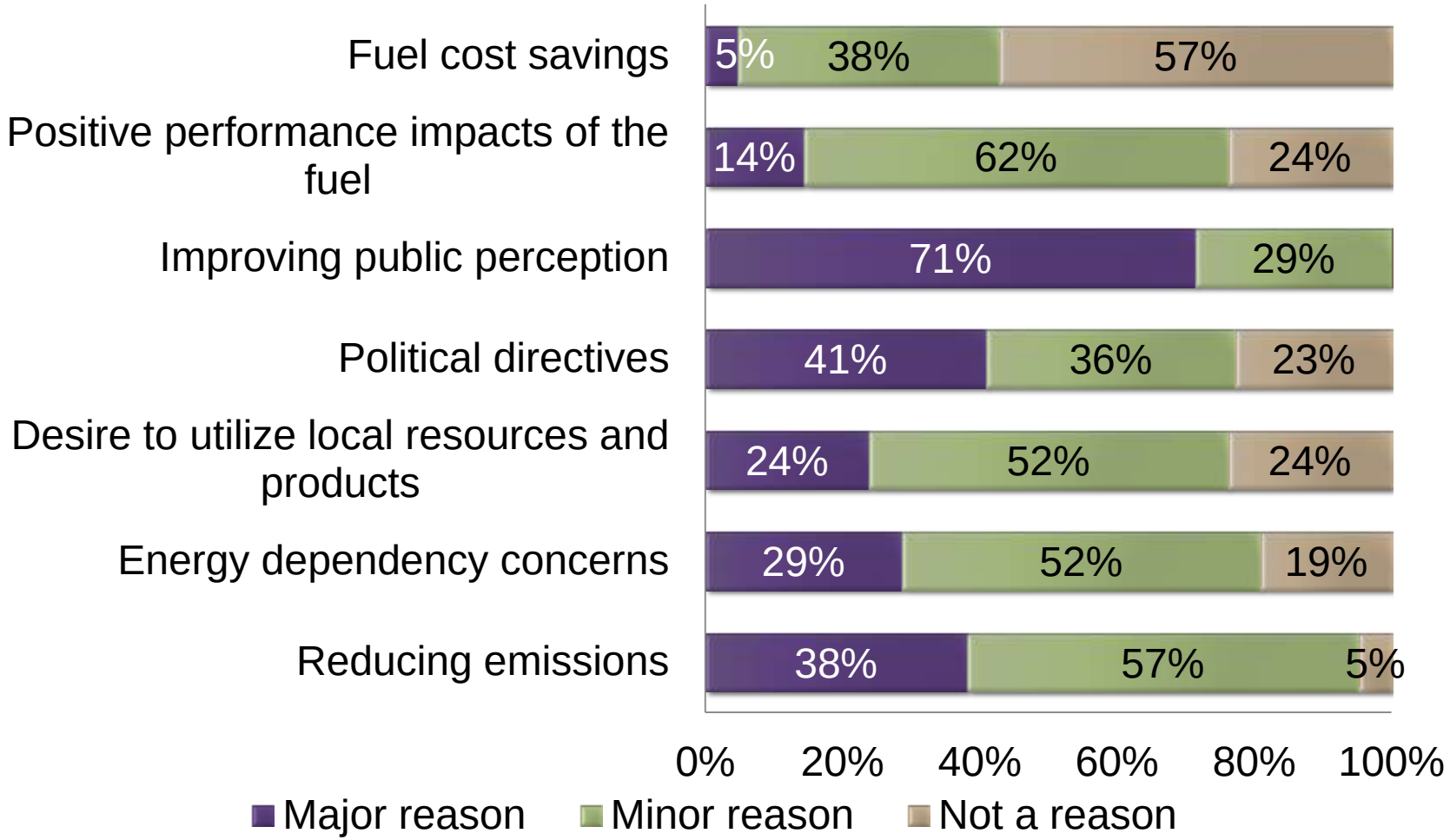
Locations of Responding Agencies the use Alternative Fuels or Hybrids



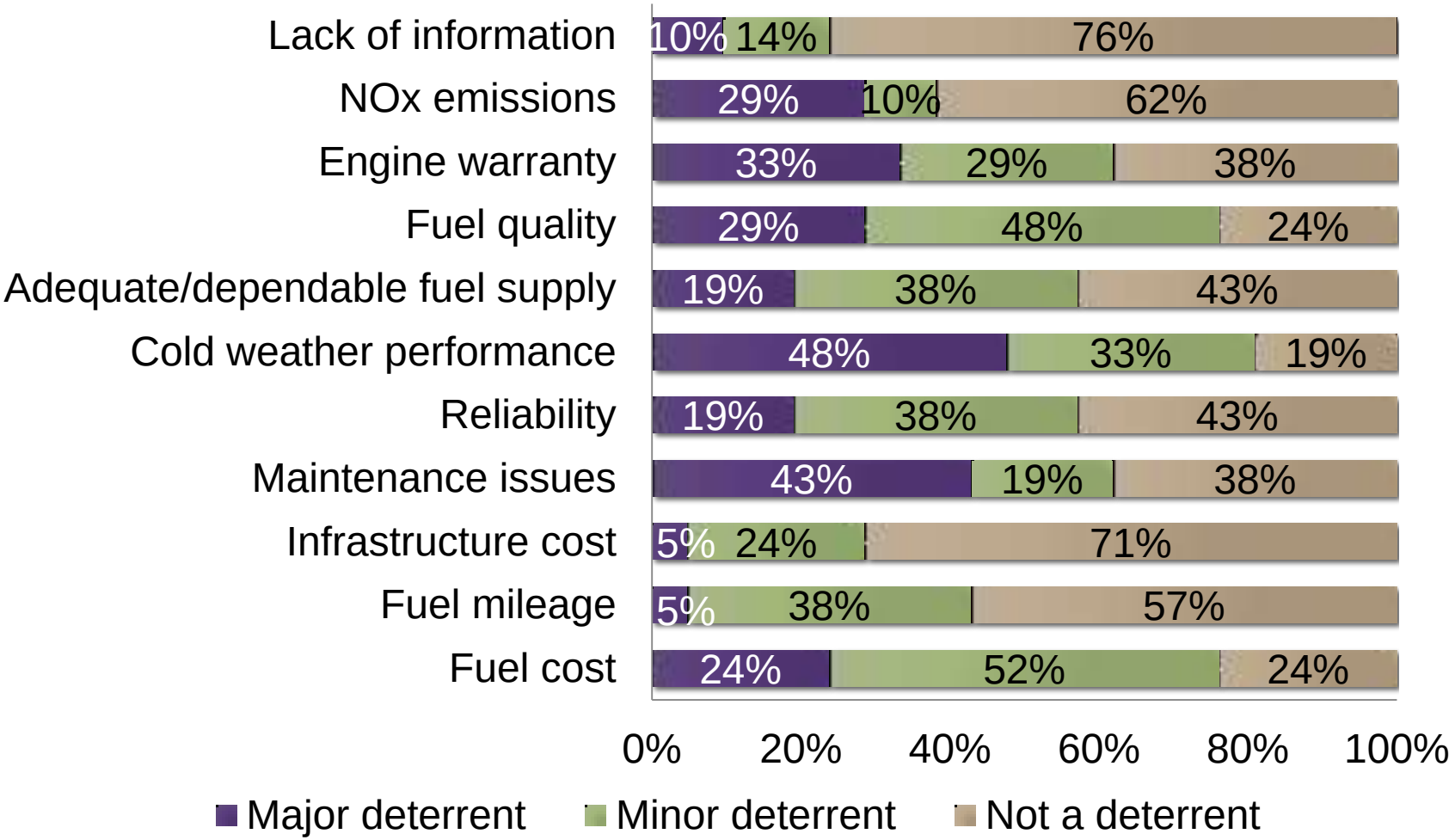
Satisfaction Reported by Users

	n	Very satisfied	Somewhat satisfied	Neither satisfied nor dissatisfied	Somewhat dissatisfied	Very dissatisfied
Biodiesel	22	27%	36%	14%	18%	5%
E85	7	29%	0%	57%	14%	0%
Propane	4	0%	75%	25%	0%	0%
CNG	9	56%	44%	0%	0%	0%
Hybrid-electric	24	50%	17%	8%	8%	17%

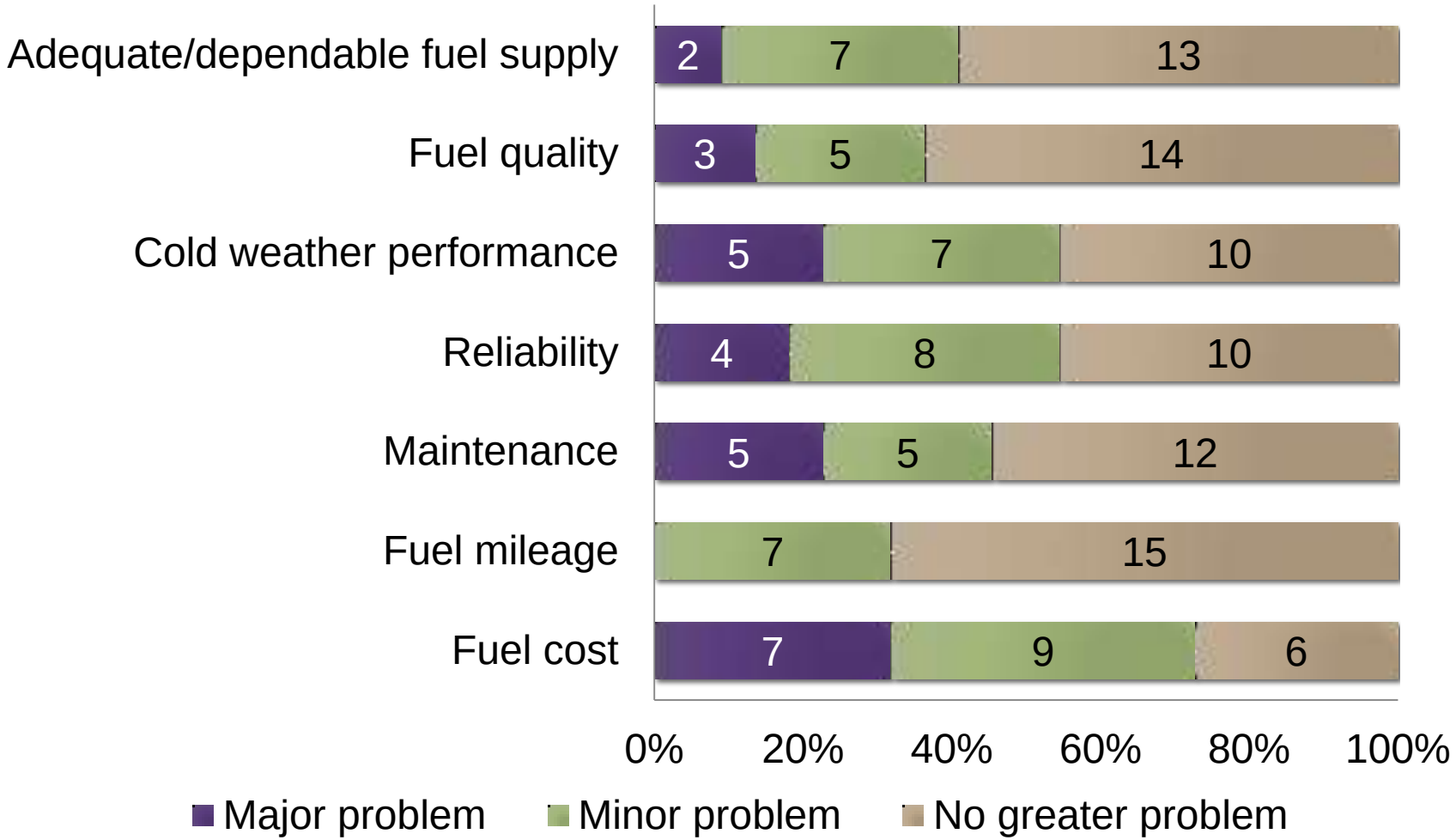
Reasons for Adopting Biodiesel



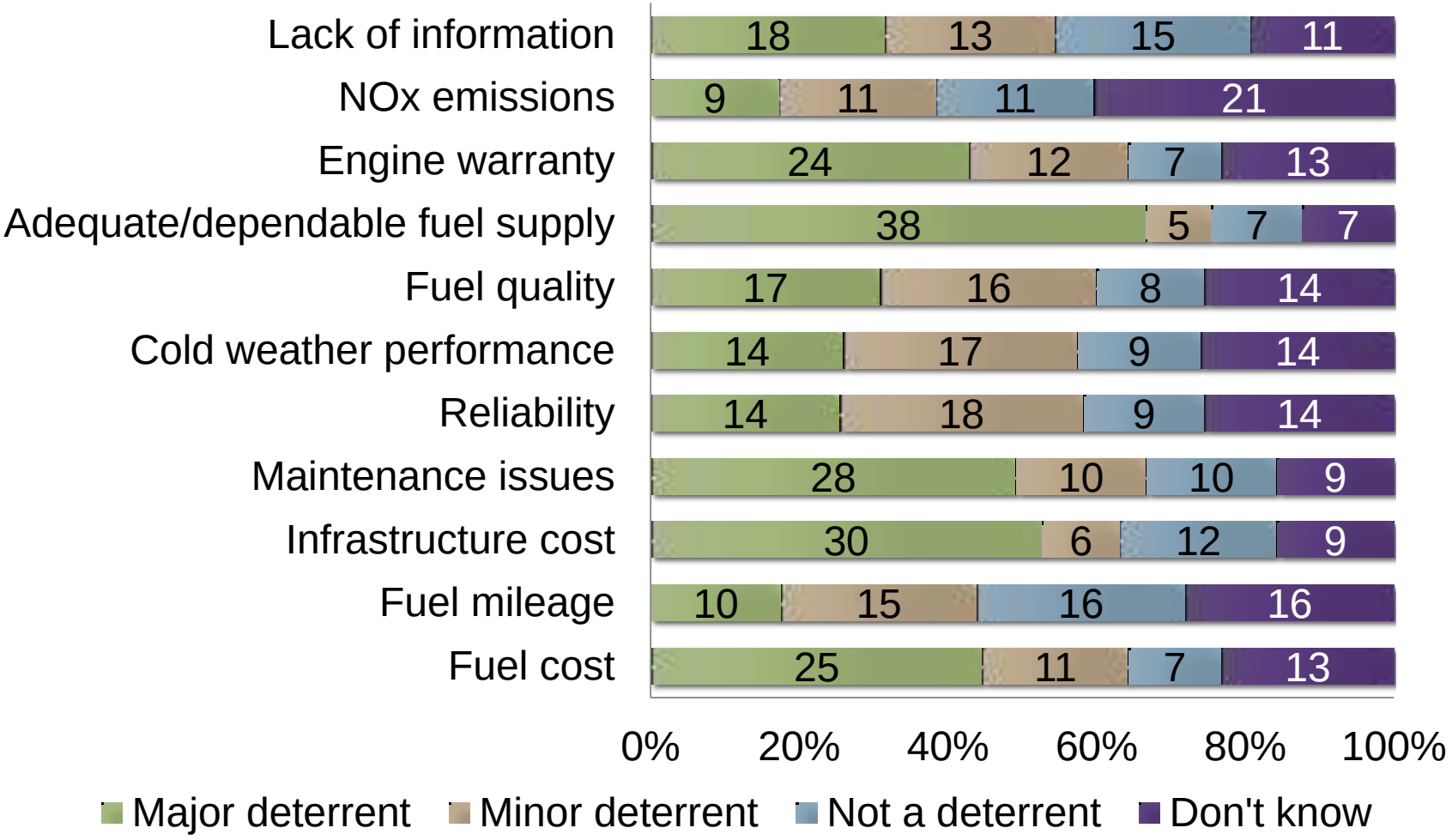
Deterrents before Adoption by Biodiesel Users



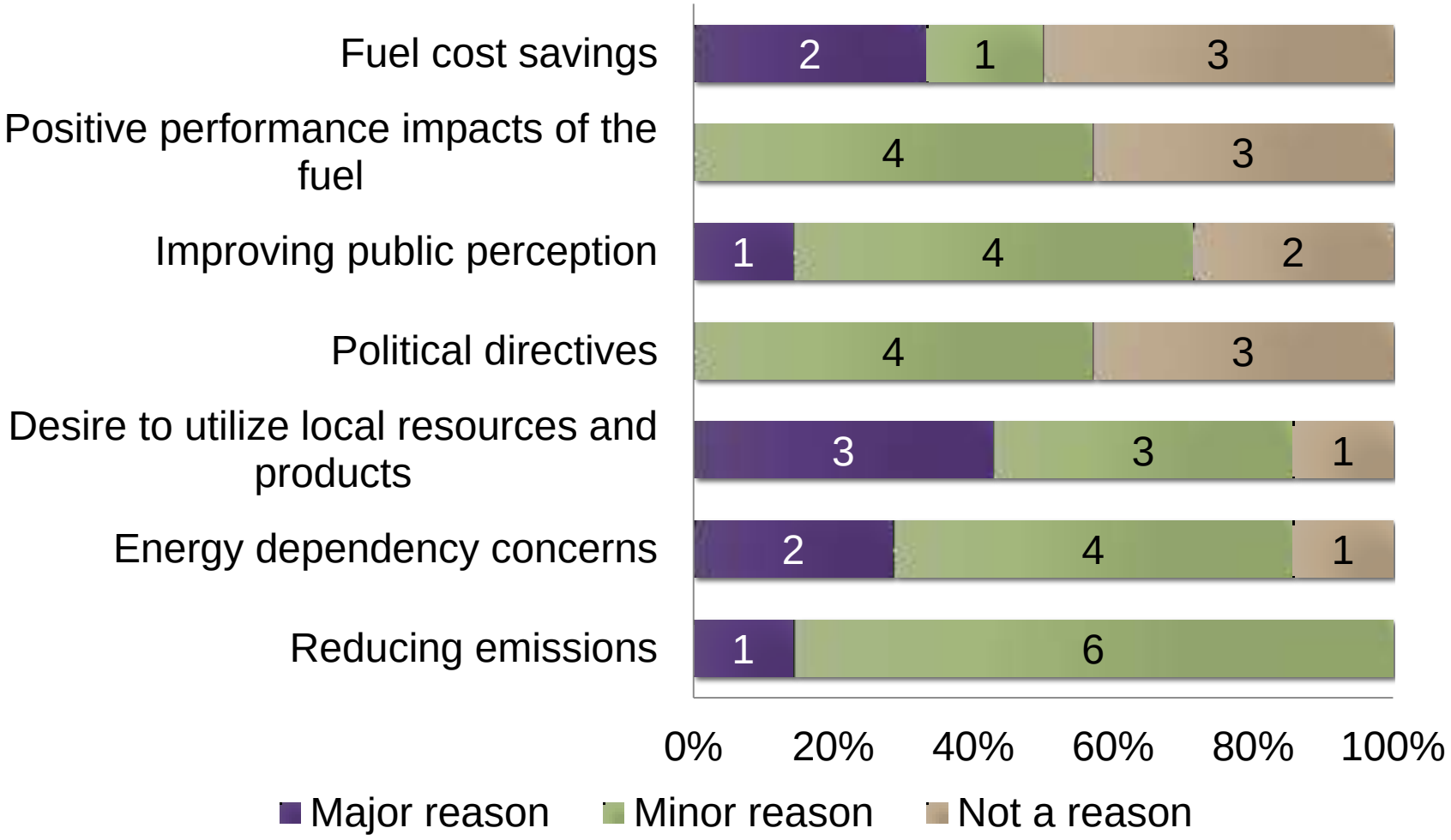
Reported Problems with Biodiesel



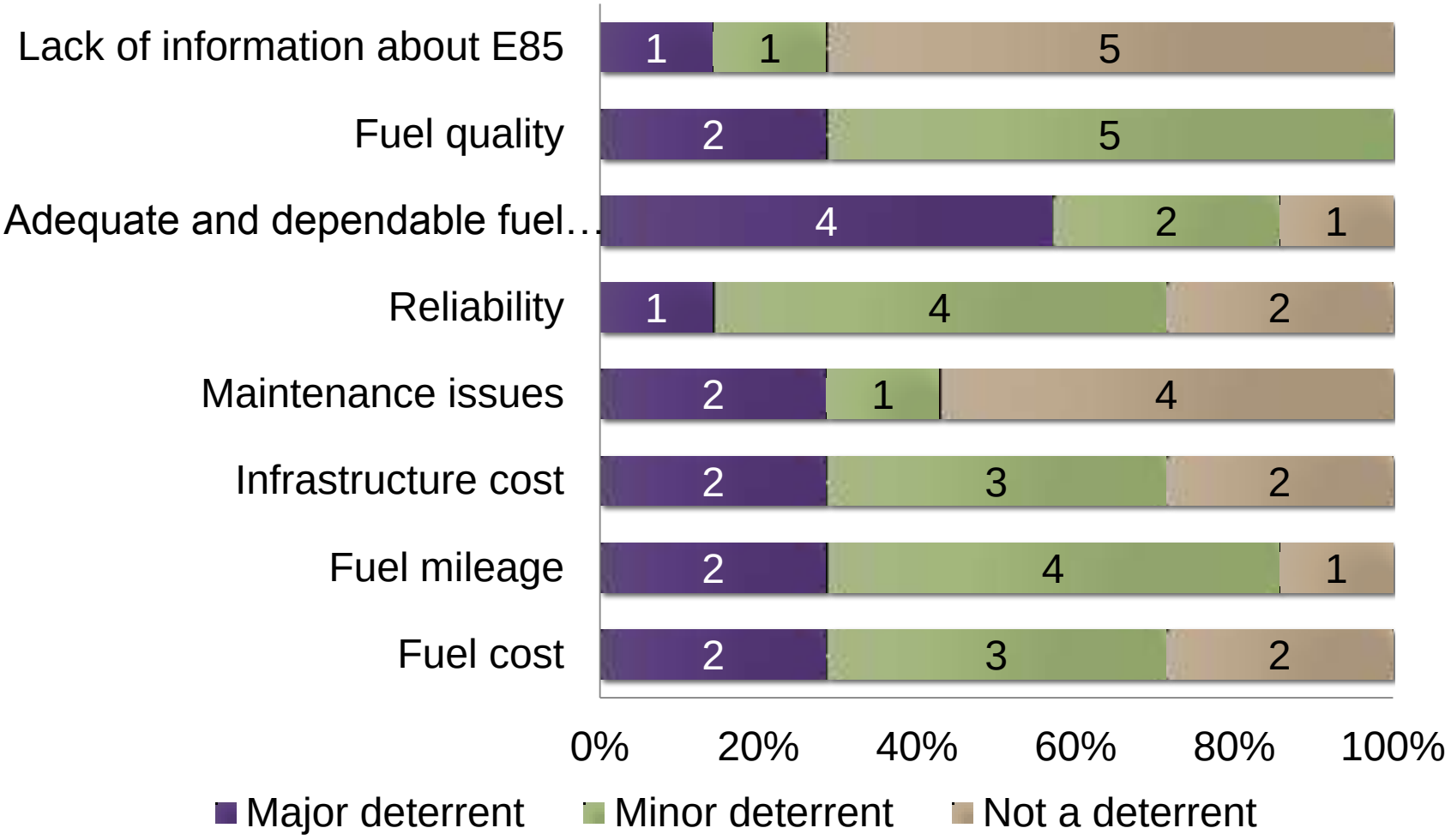
Deterrents for Agencies Not Using Biodiesel



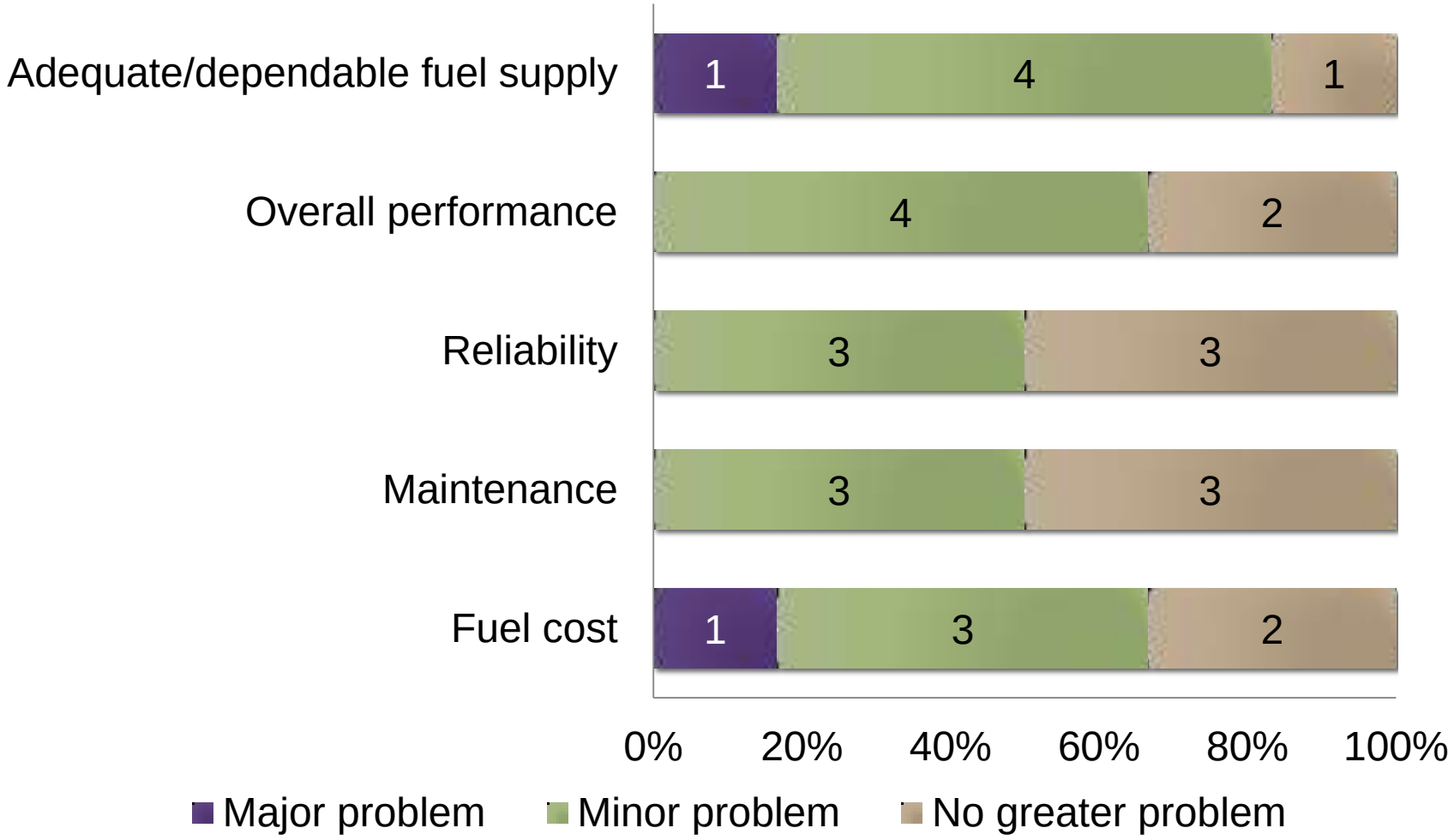
Reasons for Adopting E85



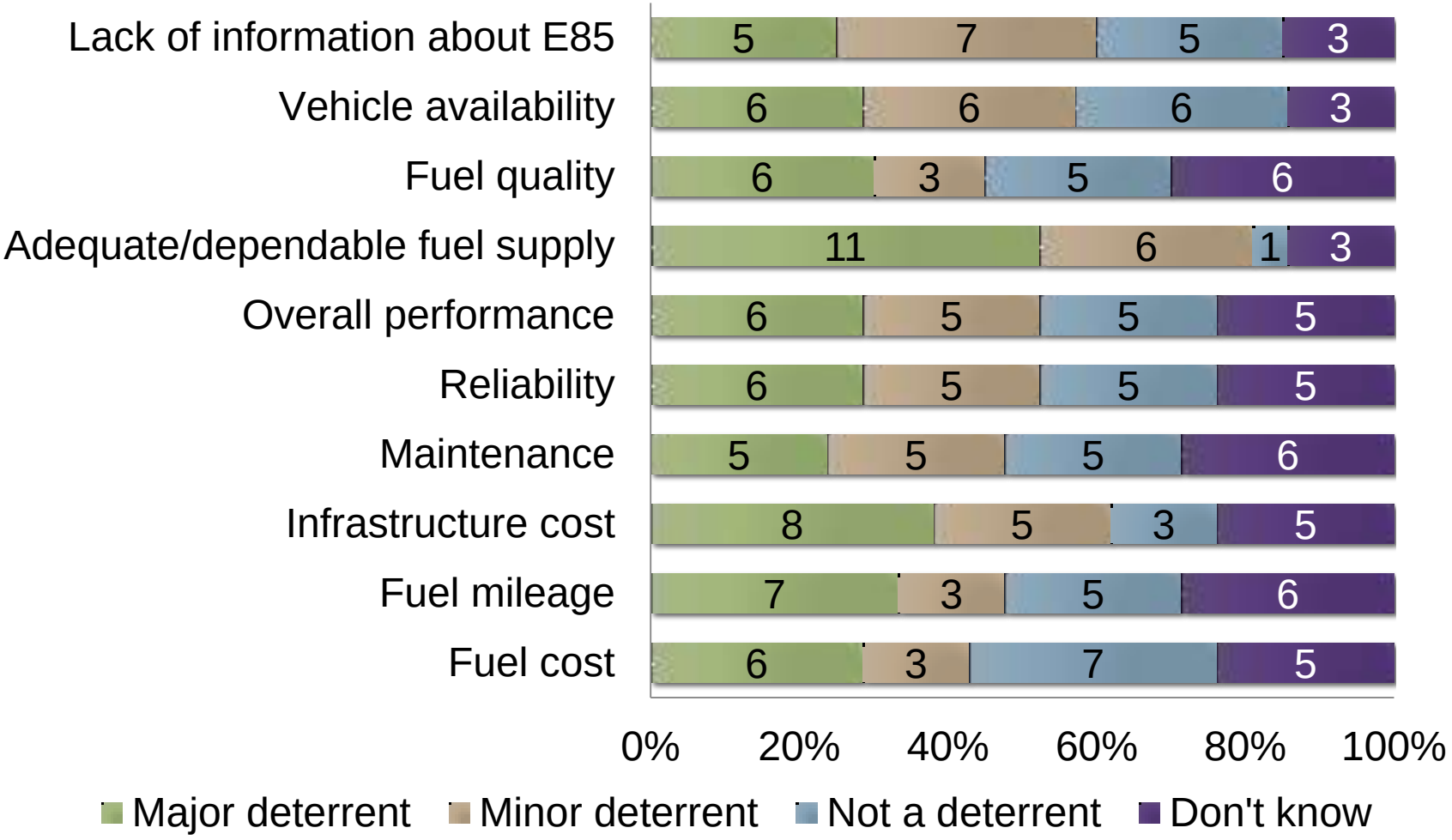
Deterrents before Adoption of E85



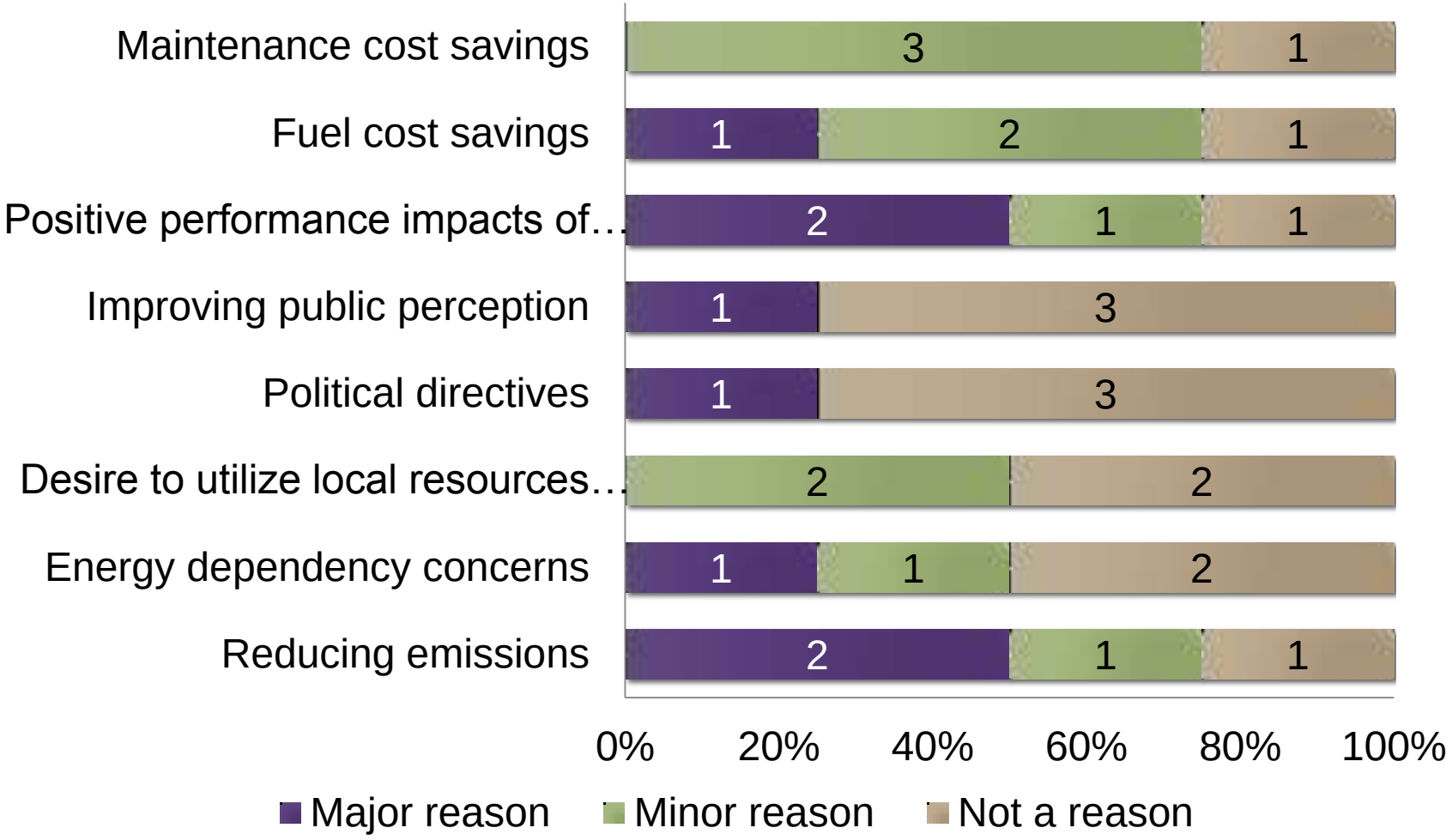
Reported Problems with E85



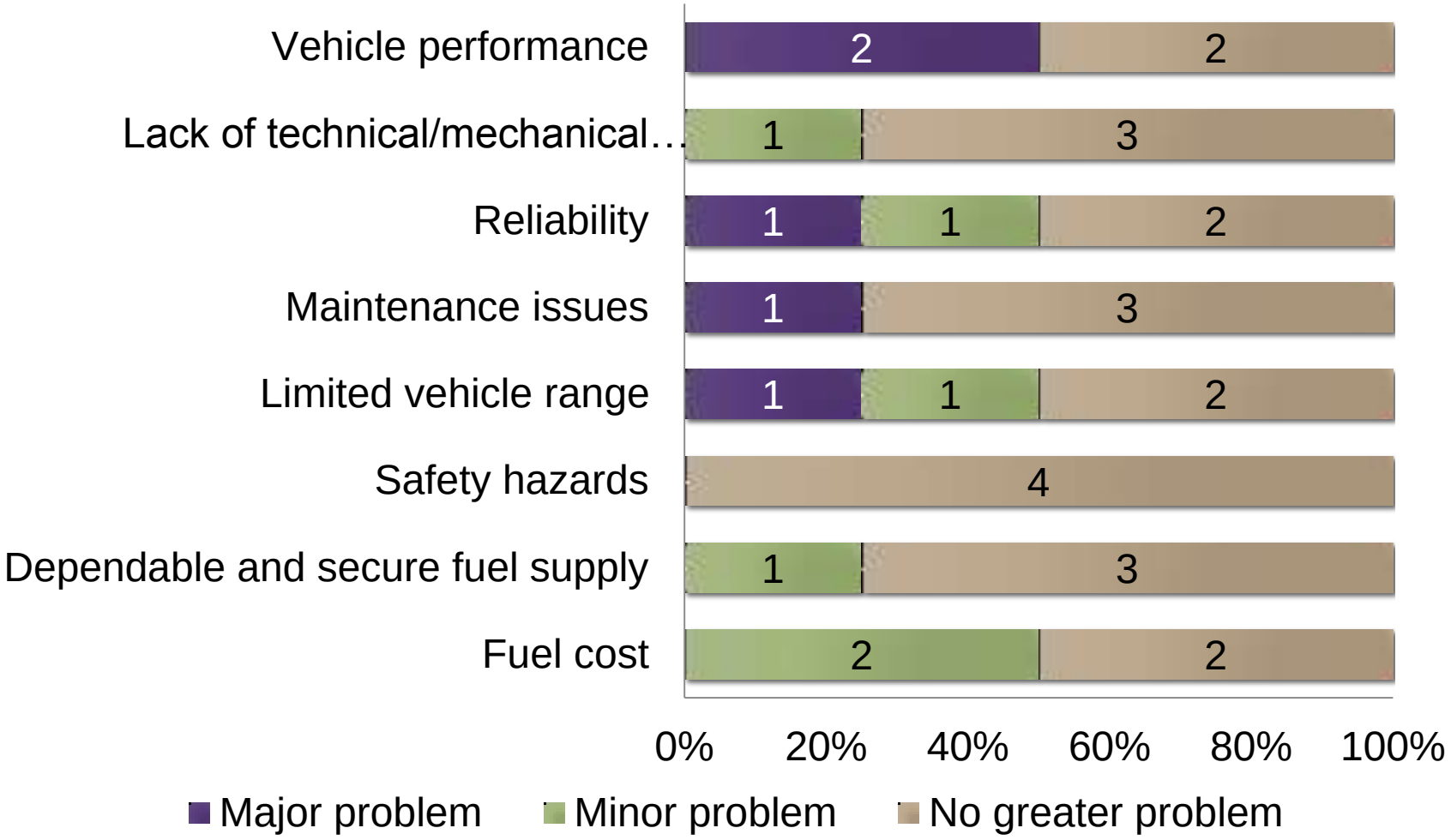
Deterrents for Agencies with Flex Fuel Vehicles that do not use E85



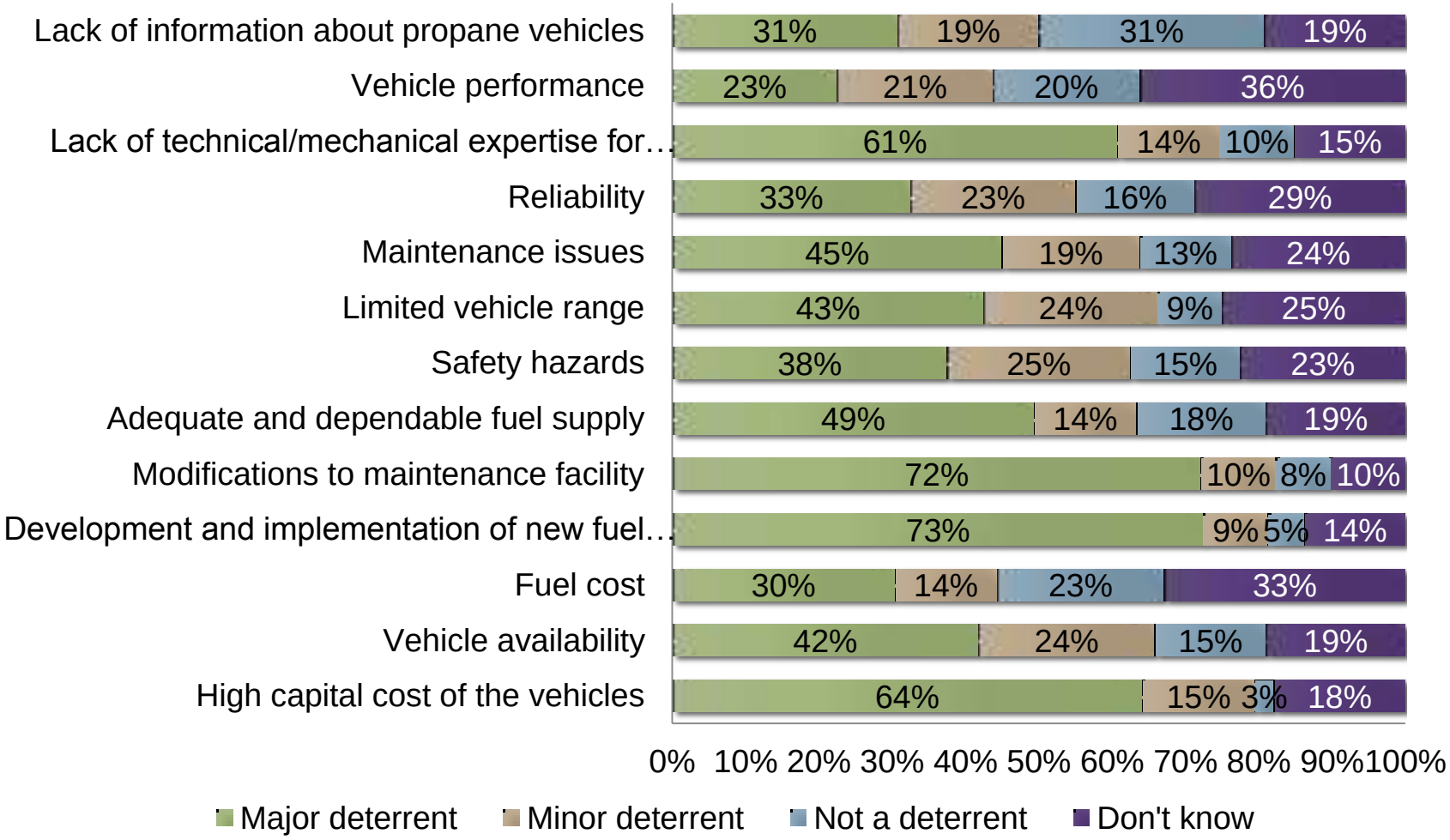
Reasons for Adopting Propane Given by Agencies that Use the Fuel



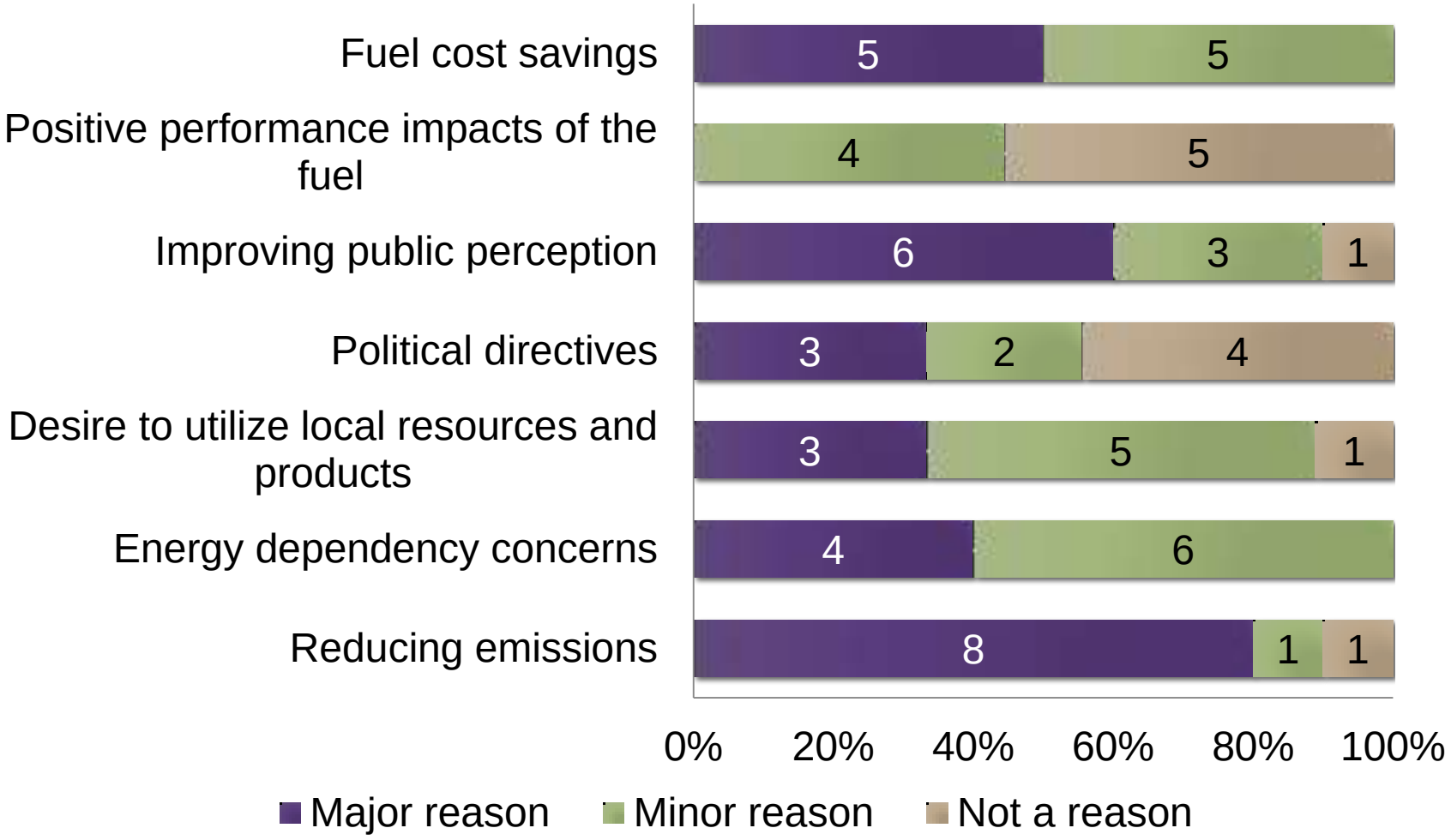
Problems Reported with Using Propane



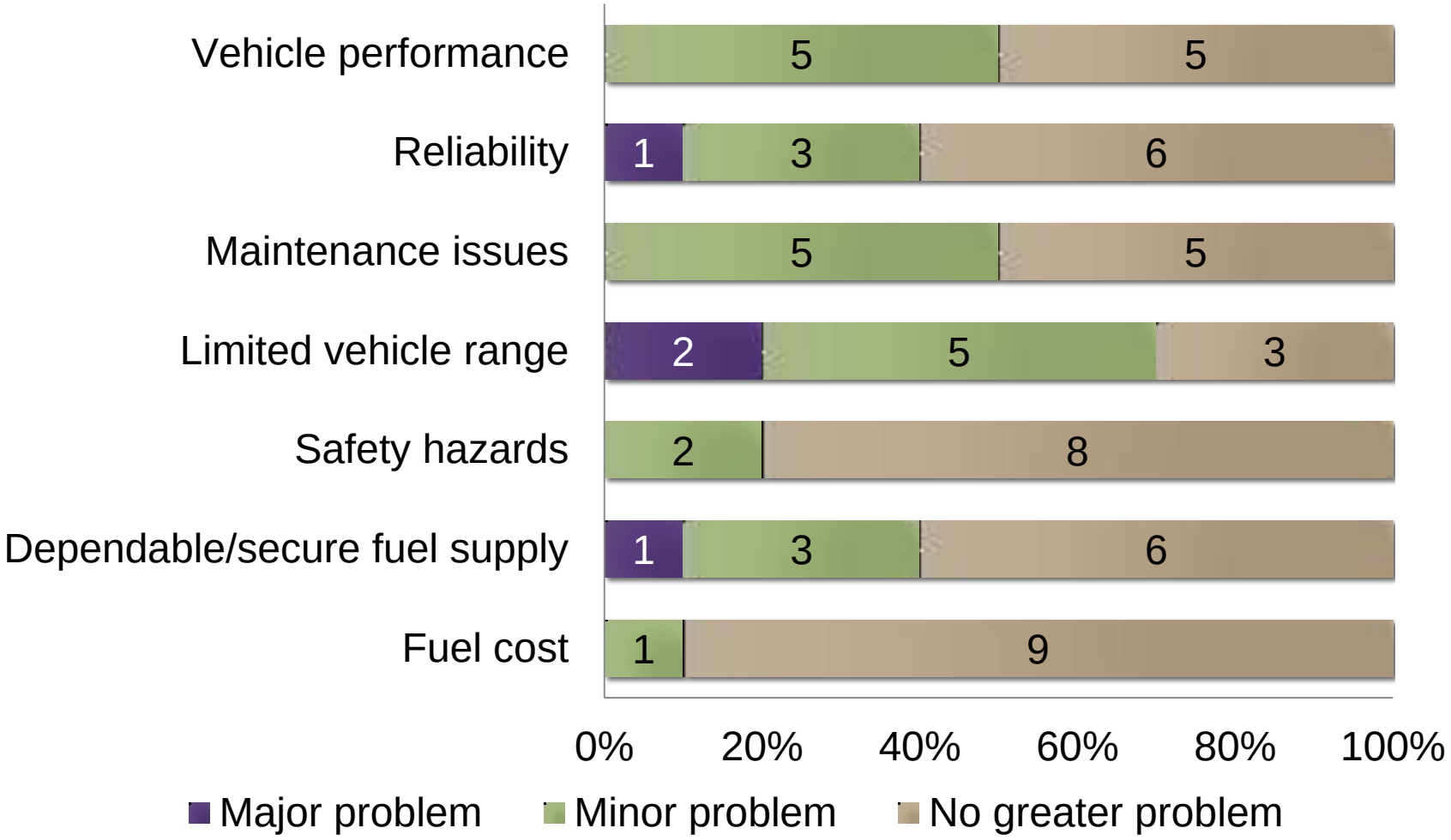
Deterrents from Adopting Propane by Agencies that Do Not Use Propane



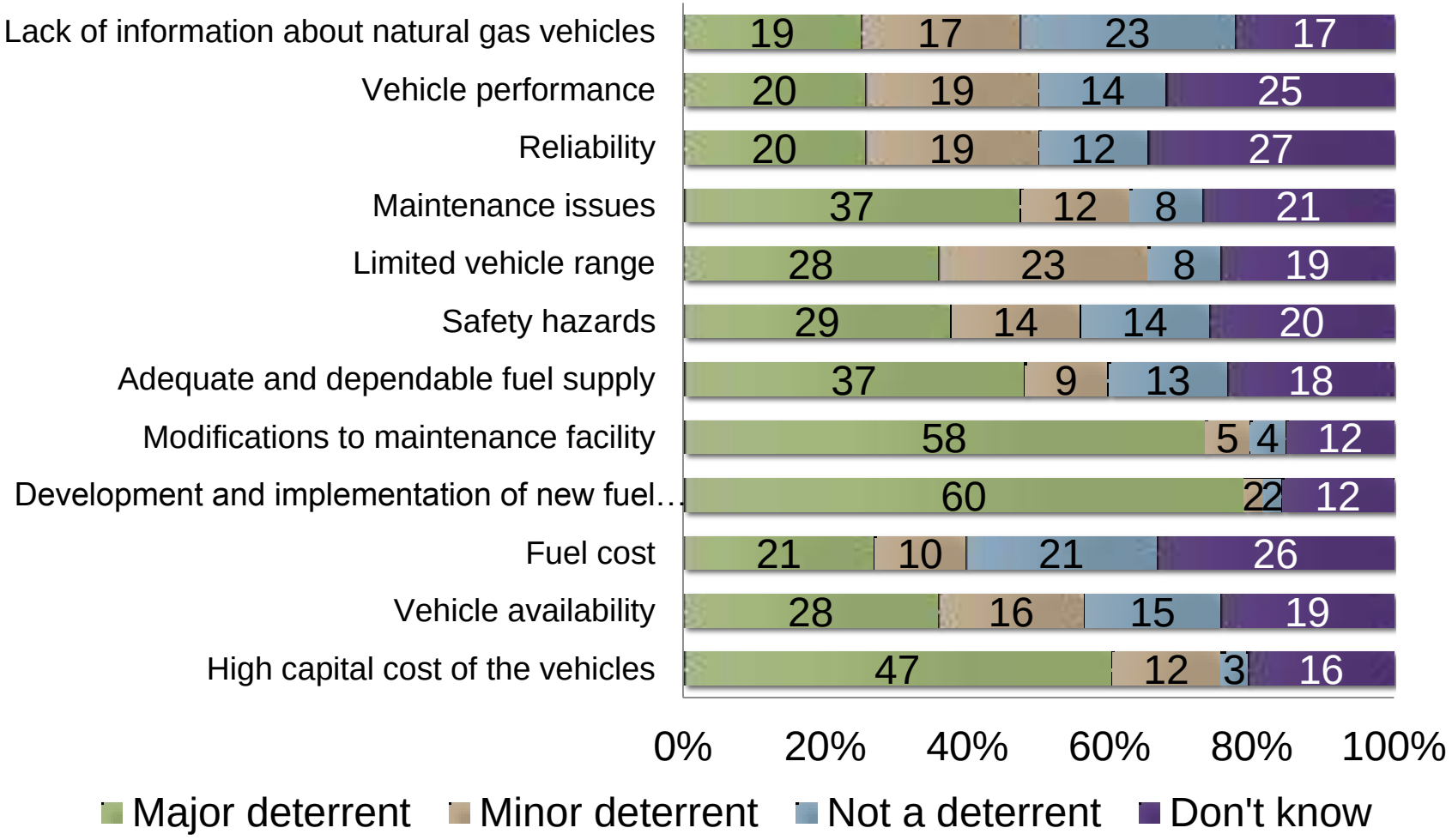
Reasons Given for Adopting CNG



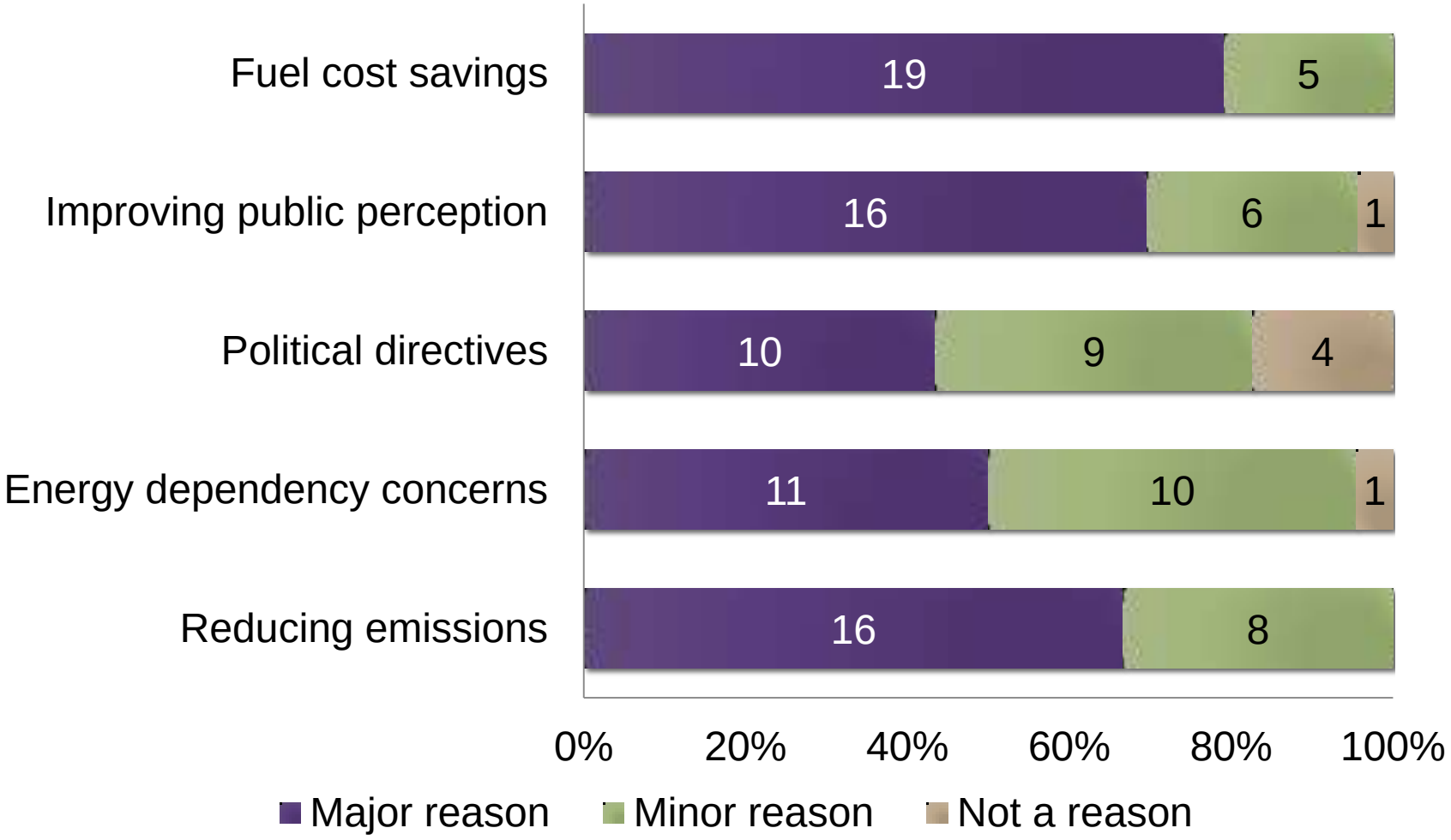
Problems Reported with CNG Vehicles



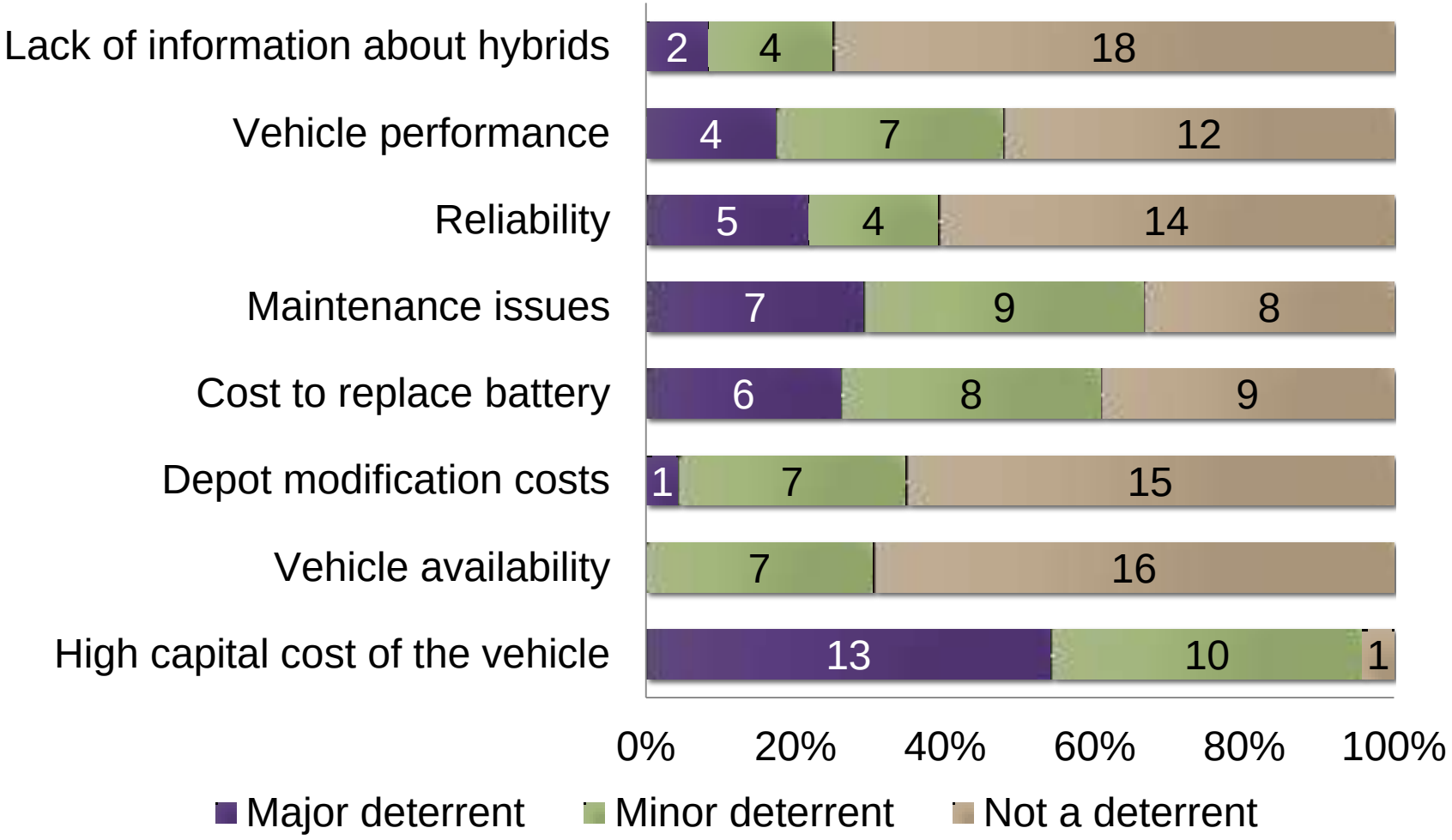
Deterrents for Adopting CNG by Agencies Not Using CNG



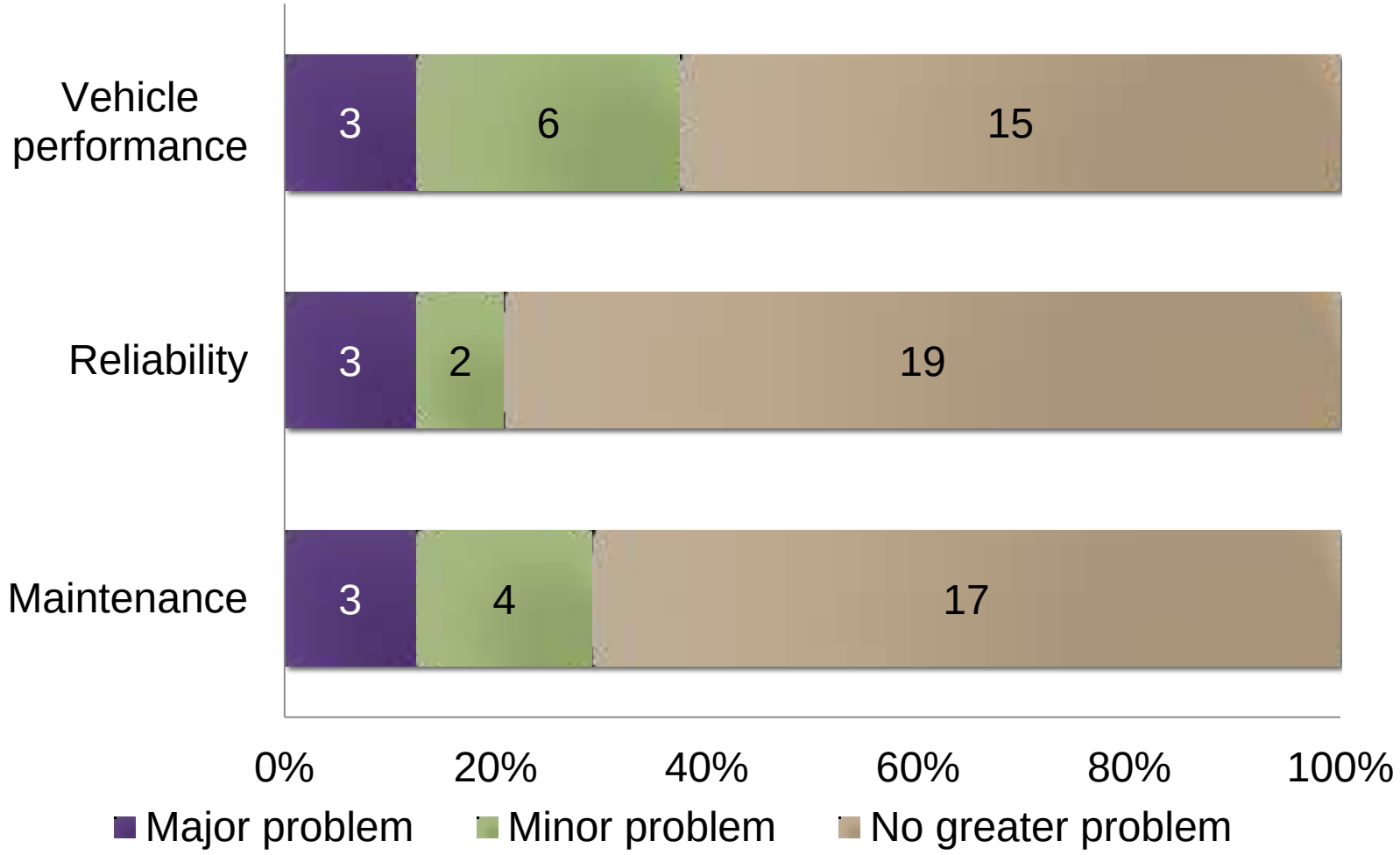
Reasons Given for Adopting Hybrids



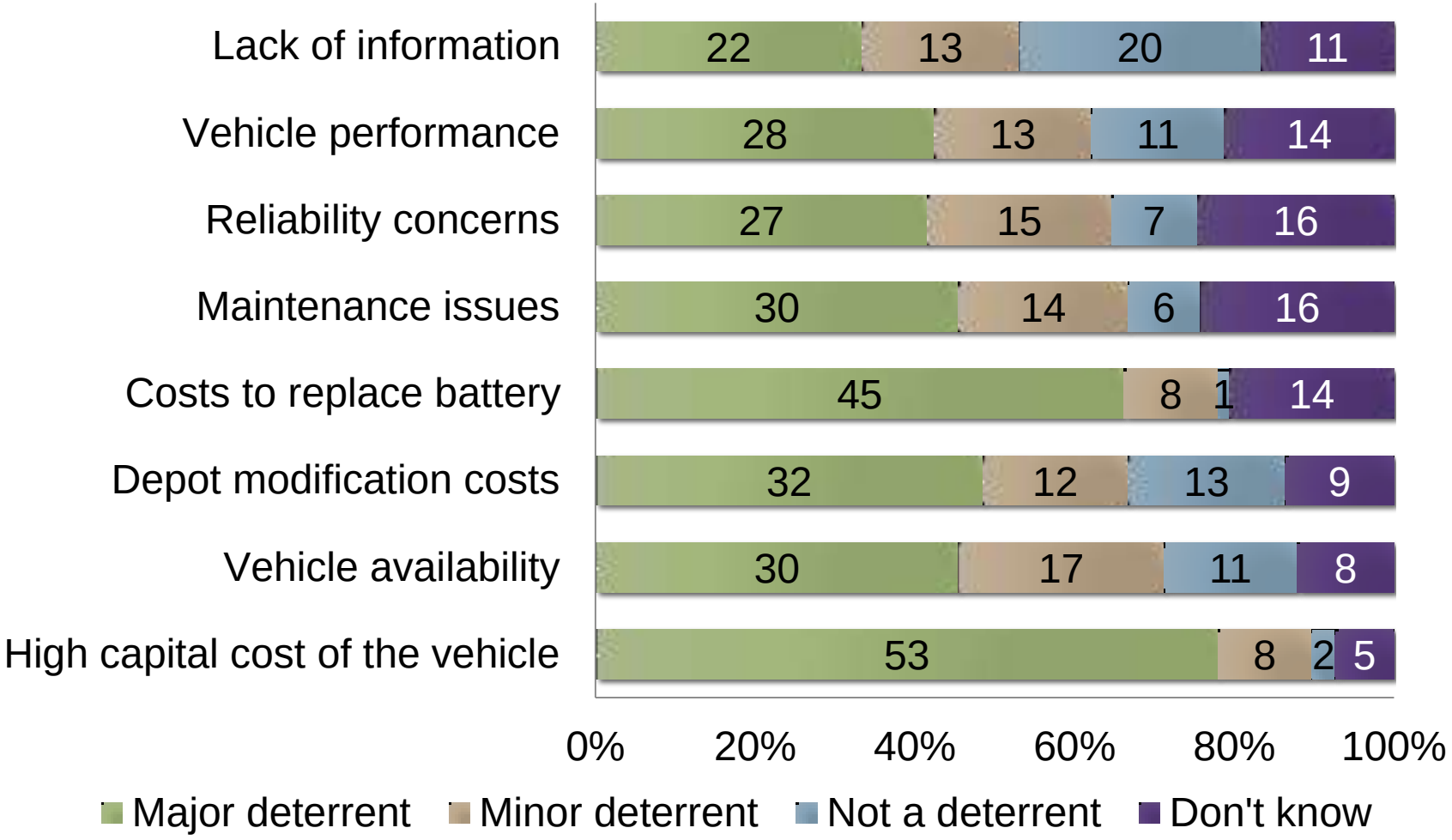
Deterrents for Hybrid Vehicles Considered by Agencies that Use Hybrids



Problems Reported with Hybrids



Deterrents for Adopting Hybrid Vehicles by Agencies that Do Not Use Hybrids



Major Findings

- Reducing emissions most important for hybrid or CNG adopters
- Energy dependency concerns, improving public perception, and fuel cost savings more important reason for hybrid adoption than biodiesel
- Fuel cost was found to most likely be a deterrent for biodiesel. Many agencies did not know if fuel cost would be a problem for the alternative fuels.
- Fuel mileage was often considered a major deterrent for E85, and some agencies also considered it a major deterrent for biodiesel.
- For agencies that did not use biodiesel, infrastructure cost was commonly mentioned as a major deterrent.

Major Findings

- Concern with maintenance issues was major deterrent. Some agencies were also concerned about fuel quality for biodiesel.
- Lack of an adequate and dependable fuel supply was a major deterrent for all alternative fuels. This was listed as a major deterrent for about half of E85, propane, and natural gas non-users and two-thirds of biodiesel non-users.
- Lack of information was considered a major deterrent for about one fourth to one third of agencies.
- Overall performance was most likely to be considered a deterrent for hybrid vehicles.
- Vehicle availability was a major deterrent for 45% of agencies for hybrids and 42% of agencies for propane vehicles. It was considered less of a deterrent for E85 and was not a deterrent for biodiesel use.

Major Findings

- Vehicle cost was the greatest deterrent for use of hybrids and also one of the most significant deterrents for propane and natural gas use.
- Development and implementation of new fuel infrastructure and modifications to maintenance facilities were the greatest deterrents for use of propane and natural gas.
- Safety hazards and limited vehicle range are also considered major deterrents by a significant number of agencies for adopting propane or natural gas.

Differences Between Users and Non-Users

- Larger agencies and those in urban areas more likely to adopt (with the exception of E85 and propane)
- Users are more likely than non-users to identify benefits
  - 71% of biodiesel users thought improving public perception was a major benefit, compared to just 31% of non-users
- Non-users more likely than users to identify deterrents
  - Deterrents may be real or perceived

Differences Between Urban and Rural Transit Providers

- Rural operators were less likely than urban operators to be “very satisfied” with hybrids or CNG
- Adequate and dependable fuel supply and limited vehicle range was a greater deterrent for rural operators
- Rural operators were less likely than urban operators to identify benefits from using hybrids, CNG, or propane
- Some rural respondents indicated there would be no or little benefit in using a hybrid vehicle in rural areas

Factors Affecting Adoption

- Agency characteristics
- Perceived benefits
- Perceived deterrent

Results from Binary Logit Model of Adoption

	Biodiesel	Hybrids
	Odds Ratio	
Vehicles (number)	1.067***	1.016
Vehicle miles (thousand)	1.001*	1.000
Vehicle hours (thousand)	0.959**	0.994
Urban	74.698**	8.420*
Perceived benefits		
Emissions	32.043**	1.343
Energy dependancy	0.322	0.146*
Local resources	0.525	
Public perception	33.154***	4.890*
Cost savings	0.525	5.113*
Deterrents		
Fuel cost	0.718	
Infrastructure cost/Depot modification cost	0.119	0.090**
Fuel supply	0.061*	
Lack of information	0.913	
Fuel efficiency	0.775	
Vehicle cost		0.635
n=86		

*$p < .10$ **$p < .05$ ***$p < .01$

Factors Affecting Satisfaction with Biodiesel

- Agency characteristics
  - Size, urban/rural
- Number of years using biodiesel
- Provision of training
- Change blend in winter months
- Percentage of fleet that uses biodiesel

Results from Ordered Logit Model of Biodiesel Satisfaction

	Odds Ratio
Vehicles (number)	1.119**
Vehicle miles (thousand)	0.998
Vehicle hours (thousand)	0.983
Urban	0.059
Years of experience	0.662
Training	0.348
Change blend	6.000
Percentage of fleet	1.070**
n=20	

*$p < .10$ **$p < .05$ ***$p < .01$

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Conclusions

- Larger, urban agencies more likely to adopt
- Beliefs about benefits and deterrents influence adoption
  - Beliefs about benefits of emissions reductions, improved public perception, and cost savings are motivating factors
  - Concerns about infrastructure costs and fuel supply influence decision to adopt
- Transit agencies generally satisfied with alternative fuels and hybrids, though some have reported problems
- Experiences of users can differ from the expectations or perceptions of non-users

THANK YOU

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